

Kant's Dynamic Hylomorphism in Logic

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Abstract

The aim of this paper is to provide a dynamic interpretation of Kant's logical hylomorphism. Firstly, various types of the logical hylomorphism will be illustrated. Secondly, I propose to reevaluate Kant's constitutivity thesis about logic. Finally, I focus on the design of logical norms as specific kinds of artefacts.

Keywords

Logical Hylomorphism; Substantial Hylomorphism; Dynamic Hylomorphism; Pure General Logic; Act-Rationality, Rule-Rationality; Normativity of Logic.

The formality assumption underlies most of normative theories of logic. Paradoxically, logical form is not a formal concept of logic. It is generally accepted that the attempts to formalize informal notions of computability, decidability and provability provided decisive progress in modern logic. However, it is hard to see how we can formalize or even conceptualize logical form when we have to distinguish between different models of logical hylomorphism.

According to the doctrine of logical hylomorphism, logic is concerned with logical form, and not with logical matter. While a variety of definitions of the logical form and logical matter dichotomy have been suggested, in this paper I propose to distinguish between substantial and dynamic models of hylomorphism in logic.

Substantial hylomorphism considers logic as a theory of higher order formal objects which takes their general properties and turns them into general laws of deduction.

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Substantial hylomorphism presupposes the interpretation of the formal in terms of being unaffected by the variability of matter. This variability may concern terms or models. Thus, various modifications of substantial formality may be grouped into two clusters: the formal as schematic and the formal as model-theoretic invariance. Schematically, the form of argument represents a result of the substitution of all the non-logical terms with variables of the corresponding categories. Model-theoretically, the formality of logic is specified in terms of being invariant under permutations of objects in the domain (Tarski 1986) or under isomorphisms (Sher 1991), homomorphisms (Feferman 1999) or partial isomorphisms (Bonnay 2008) of structures.

In dynamic version of hylomorphism *what*-formality gives way to *how*-formality. From the dynamic point of view, logic is the domain of rule-governed and goal-directed inferential activity. Dynamic formality characterizes a special way of following the rule whose antithesis is not the material, but the informal in the sense in which we speak about informal behaviour or leadership. We can distinguish between constitutive and regulative formal rules. While regulative rules (e.g., rules of etiquette) regulate antecedently or independently existing activity, constitutive rules (e.g., rules of football or chess) create the very possibility of an activity by providing the conditions for it (Searle 1969, p. 33). Generally, constitutive rules form institutions while regulative rules correspond to ritual. However, this distinction is not sharp. For instance, regulative rules of polite behavior do create a new form of behavior, i.e. polite behavior. While constitutive rules of inference form the correctness of logical proof, regulative rules for the search for proof form its excellence.

Given these taxonomic distinctions, I propose to revisit Kant's logical hylomorphism. The aim of this paper is to provide a dynamic interpretation of Kant's formality criterion for general pure logic. What is gained, then, is a design-perspective on Kant's thesis of constitutivity and, at the same time, the normativity of logic which seems to be antinomical from other perspectives.

1. Dynamic Formality of Pure General Logic

For Kant, logic is a body of rules. In his *Logic* he writes that all the rules according to which the understanding acts are either necessary or contingent. Necessary rules of cognition are those "without which no use of the understanding would be possible at all"; contingent rules are those "without which a certain determinate use of the understanding would not occur" (Kant 1974, p. 12 / AA 9:12). Contingent rules are not universally applicable. These rules depend on certain objects of knowledge and are as diverse as these objects. Such as the use of understanding in mathematics, metaphysics, morals. On the contrary, general logic, as Kant pointed out in the *Critique of Pure Reason*, is concerned exclusively with "absolutely necessary rules of thinking, without which no use of the understanding takes place" (CPR A52/B76). Logic is pure when "we abstract from all the empirical conditions under which our understanding is exercised" (CPR A53/B77).

According to Kant, the formality of pure general logic arises from the fact that it investigates absolutely necessary rules of thinking. Pure general logic

abstracts from all content of knowledge, that is, from all relation of knowledge to the object, and considers only the logical form in the relation of any knowledge to other knowledge; that is, it treats of the form of thought in general (*CPR* A55/B79).

The necessity of rules of pure general logic entails its emptiness. Being generally applicable, these rules abstract from all differences between objects. As MacFarlane claims,

formality is not, for Kant, a defining feature of logic, but rather a substantive consequence of the generality of logic, given Kant's other philosophical commitments (MacFarlane 2000, p. 80).

In fact, Kant argues for the formality of logic on the basis of the general applicability of its necessary rules. The point is that the necessary rules of thought in general may concern its form, and not its matter. Form, for Kant, is not an object of the understanding, but a condition of the use of the understanding. Being a canon of understanding, the rules of pure general logic should be gained *a priori* and independently of any experience.

Historically, Kant was the first modern philosopher to use formality as a criterion for the demarcation of the boundaries of logic (MacFarlane 2000; Dutilh Novaes 2012). Metaphysical hylomorphism goes back to the Aristotelian form (*morphe*) versus matter (*hyle*) dichotomy. But this dichotomy is absent from the *Organon*. Aristotle applies this distinction to logic only twice: in *Physics* (195a18–19) and in *Metaphysics* (1013b19–20). The two passages are almost identical. He observes that the premises of an inference (hypotheses) are the matter for the conclusion. These passages do not imply logical hylomorphism because they say nothing about the logical form or the formal structure of the premises and the conclusion. Surprisingly, as MacFarlane pointed out,

the father of both formal logic and hylomorphism was not the father of logical hylomorphism (MacFarlane 2000, p. 255).

The freedom of paraphrase which Aristotle allows himself in representing and interchanging syntactically different arguments with the same meaning implies Łukasiewicz's verdict "Aristotelian logic is formal without being formalistic" (Łukasiewicz 1957, p. 15).

But logic cannot be schematically formal without being formalistic. Moreover, Aristotle did not create a formalized language as a canon for syllogistic reasoning but rather provided a formal criterion for determining when no assumption of syllogisms is missing. The Aristotelian reductive approach to patterns of inference (i.e. to syllogistic moods in the three figures) shifts the focus from the schematic towards the dynamic model

of formality. While Aristotle did not apply formality as a criterion for logicity, Kant demarcated the boundaries of pure general logic via its dynamic formality.

2. The Constitutivity Thesis: Logic as Grammar

Kant's logical hylomorphism is not substantial, but dynamic. Since logic is a canon of understanding as "the faculty of rules" (*CPR* A13/B171), logic is "the science of the rules of the understanding in general" (*CPR* A52/B76).

The traditional view is that Kant considered rules of logic as constitutive of what we would define as thinking. Linnebo incorporates into the Kantian conception of logic the *Constitutivity Thesis*:

Logic is constitutive of thought. More precisely, there are non-empirical notions of thought and understanding, and the laws of logic are constitutive of thought and understanding thus understood (Linnebo 2003, p. 240)

For Kant, logic is internal of thought, i.e. illogical thinking would seem not to be thinking at all. He explained the conception of logic as formal because constitutively normative of thought through an analogy with grammar. Logic is like

a general grammar which contains nothing beyond the mere form of a language in general, without words, which belong to the matter of the language (Kant 1974, p. 15 / AA 9:15).

Following Kant, Wittgenstein considered inferential rules as grammatical rules rather than as meaningful empirical statements. According to Wittgenstein,

Grammar is not accountable to any reality. It is grammatical rules that determine meaning (constitute it) and so they themselves are not answerable to anything and to that extent are arbitrary (Wittgenstein 1974, p. 187).

Logical rules constitute the possibility of structure. Wittgenstein writes in *Tractatus*:

Logic must look after itself... In a certain sense, we cannot make mistakes in logic ... What makes logic a priori is the impossibility of illogical thought (Wittgenstein 1922, 5.473; 5.4731).

In fact, if logic is the 'grammar of thought', then a logical error seems not to be possible altogether. For Kant, a logical error 'in the formal sense of the world' would be a form of thinking contrary to itself. It is difficult for him to comprehend "how any force should deviate from its own essential laws" (Kant 1974, p. 59 / AA 9:59). The faculty of understanding, when considered by itself, cannot violate its own rules. However, if logical mistakes are impossible in principle the logic cannot be normative for thought. Kant needs

his dichotomy of sensibility and understanding as different universal human faculties to explain the possibility of logical mistakes. He believed that “if we had no other power of cognition beside the understanding, we would never err” (ibid.).

According to Husserl, Kant did not make analytic *a priori* a problem. He considered Kant's attempt to give an interpretation of logic in terms of subjective human faculties as *specific relativism*. Logic should be objective. As Husserl pointed out,

we should bear in mind that, as formal ontology, logic presupposed at least possible worldly being, which, after all, it must have acquired as a possibility variant of the undoubtedly actual world (Husserl 1969, p. 224).

He believed that the transcendental justification of logic is possible only if we postulate a special region of formal categorical objects. The objects of this region hypostasize psychical relations which, as distinct from physical relations, have no impact on other properties and relations of objects, but themselves exist by virtue of these other properties and relations. Model-theoretically, types of isomorphism may be considered as categorical objects of Husserl's formal region (Dragalina-Chernaya 2012). Generalizing, we might say that Husserl's higher-level region should save logic from naturalism and specific relativism.

Does the ‘grammatical’ approach to logic require adopting a naturalistic (e.g., psychological) notion of normativity? For Wittgenstein, to think illogically means to try speaking against grammatical rules. However, knowing of a rule is not a state of consciousness. What we mean when we say that someone ‘cannot think it’ is not:

try as he may, he can't think it, but it is for us an essential part of ‘thinking’ that – in taking, writing, etc. – he makes *this sort* of transition (Wittgenstein 1978, sec. 80).

Wittgenstein claims in *Tractatus* that

we could not *say* what an ‘illogical’ world would look like. It is impossible to represent in language anything that ‘contradicts to logic’ as it is in geometry to represent by its coordinates a figure that contradicts the laws of space, or to give the coordinates of the point that does not exist (Wittgenstein 1922, 3.031; 3,032).

The fact that we cannot imagine ‘illogical’ world does not shift focus from logic towards psychology. As Wittgenstein remarks,

When dealing with logic, ‘One cannot imagine that’ means: one doesn't know what one should imagine here” (Wittgenstein 1977, p. 6).

He characterizes the reasoning rules as *inexorable*:

“thinking and inferring (like counting) is of cause bounding for us, not by an arbitrary

definition, but by natural limits corresponding to the body of what can be called the role of thinking and inferring in our life” (Wittgenstein 1978, sec. 116).

Thus, to look at logical normativity in separation from the way the inferring enters our life is misconceived. To demarcate the bounds of logic as a normative discipline means to specify its “civil status”; cf.: “The civil status of a contradiction, or its status in civil life: there is the philosophical problem” (Wittgenstein 1958, sec. 125). Since norms are goal-oriented, the focus of a normative theory of logic must be on the institutional role played by the goal in reasoning.

According to Searle, constitutive rules capture the essence of institutions making institutional actions possible. As he pointed out,

The essential role of human institutions and the purpose of having institutions, is not to constrain people as such, but, rather, to create new sorts of power relationships. Human institutions are, above all, enabling, because they create power, but it is a special kind of power. It is the power that is marked by such terms as: rights, duties, obligations, authorizations, permissions, empowerments, requirements, and certifications. I call all of these deontic powers (Searle 2005, p. 10).

Institutional relations are entered into not by things or abstractions, but by people. Therefore, the real medium of institutional ontology is not a set of physical objects (chess pieces, money) or even institutions that arise when status functions are collectively ascribed to objects, but acting agents vested with deontic powers. It would be a nice challenge if we shift attention from rules to goals of reasoning. Instead of focusing on the *a priori* essence of logical rules, we may put the question about the design of constitutive norms of logic. But now here is a puzzling new question: what does the deontic power of a logical designer consist of?

3. Act-Rationality vs. Rule-Rationality in Reasoning

Nowadays there is no philosophical consensus about the normativity of logic for real-life reasoning. It turns out to be surprisingly hard to distinguish between normativity drawn from logic and the non-logical features of resource-limited and domain-sensitive reasoning. For instance, psychological experiments with conditional reasoning show the collision of everyday reasoning intuitions with the truth-preserving rules of inference derived from logic. Let us consider Byrne’s *suppression task* (Byrne 1989).

Suppose one presents a subject with the following premises:

(1) *If she has an essay to write she will study late in the library.*

She has an essay to write.

In this case almost 90% of subjects draw the conclusion *She will study late in the library.*

Next suppose the premise

(2) *If the library is open, she will study late in the library*

is added. In this case only 60% concludes *She will study late in the library*. However, if instead of the premise (2) the premise

(3) *If she has a textbook to read, she will study late in the library*

is added, then more than 90% of subjects draw the conclusion *She will study late in the library*.

Thus, experimental subjects seem to be guided not by a formal rule of inference (e.g., *modus ponens*) but by surrounding context, basic knowledge, and belief biases. If accordance with logical rules is a pre-requisite for rational acts, a real man-in-the-street seems to act irrationally.

Not only ordinary reasoning but also economical behavior of real agents violates systematically the act-rationality. In a famous *Ultimatum Bargaining* experiment (Güth, Schmittberger, and Schwarze 1982) two players were asked to divide a sum of money (say, one hundred DM). The first player made an offer, which could be either accepted or rejected by the second player. If it was rejected, nobody got anything. The players did not know each other and communicate via the computer. 'Rational' play would predict a 99 to 1 split. In fact, the offered split was between 50-50 and 65-35. Moreover, in most cases when the second player was offered less than 30 %, he refused. It is hard to explain these decisions with the ordinary notion of utility maximization.

To provide a synthesis between rationalistic neo-classical economic theory and behavioral economics Aumann put forward a paradigm called *rule-rationality* which originates from Rawls distinction between act- and rule-utilitarianism (Rawls 1995). According to rule-rationality, economic agents maximize utility over rules rather than acts. A rule does not need to be consciously adopted. Often it is executed by means of an indirect mechanism (e.g., 'honor' or 'altruism'). Thus, being rule-rational, ordinary people do not behave in a consciously rational way in their day-to-day actions. Rather, they follow the rules that work well in general. One such rule is "Don't let people humiliate you". The rule doesn't apply to the Ultimatum Bargaining experiment, because of the anonymity of its participants.

According to Aumann, under rule-rationality people do not maximize utility of an act, rather,

they adopt rules, or modes of behavior, that maximize some measure of total or average or expected utility, taken over all decision situations to which that rule applies; then, when making a decision, they choose an act that accords with the rule they have adopted (Aumann 2008, p. 2).

At first sight, Byrne's suppression task is an excellent example of rule-rationality in everyday reasoning with conditionals. Actually, conditionals in real-life reasoning seem to be defeasible and presuppose the closed world reasoning (Stenning and van Lambalgen 2008). According to the rules of closed world reasoning, what is not forced to be true can be assumed to be false. If there is no positive information about exceptions, to assume that they do not occur is rule-rational. In general, closed world domain-oriented reasoning is

strategically more attractive than indefeasible deduction, which is extremely expensive from a computational point of view. In standard situations, rules of closed world reasoning work well and maximize some measure of expected utility. In this way a real man-in-the-street usually justifies the pattern of *modus ponens*. But this justification no longer works in the presence of the additional premise, since the fact that the library is closed is an exception to the rule. At the same time the turn from act to rule-rationality in the theory of fallacies gives rise to a worry. How act-irrational logical mistakes may result from the rule-rational principles of inference? In what sense (if any) does logic deal with utility over rules of inference? Does the *Constitutivity Thesis* about logic mean that the very idea of maximizing utility over logical rules of inference should be rejected?

4. The Normativity of Logic: A Design-Perspective

According to psychological logicians, logic is a generalization of those inferences that people judge to be valid. But inference has an intrinsic connection with truth as its goal. What is true does not depend on psychological laws of taking-to-be-true. Thus, logical norm should be designed in view of achieving the ultimate goal, truth. Does it mean that logical norm should be grounded in designer's acceptance of *substantive claims*, i.e. laws of truth?

In the classical debate on 'logical aliens', i.e. on beings whose laws of thought are supposed to contradict ours, Frege considered the logical aliens' 'thought' as a kind of 'madness' rather than instances of thinking at all. In the *Basic Laws of Arithmetic* he wrote:

“what if beings were [...] found whose laws of thought flatly contradicted ours and therefore frequently led to contrary results even in practice? The psychological logician could only acknowledge the fact and say simply: those laws hold for them, these laws hold for us. I should say: we have here a hitherto unknown type of madness. Anyone who understands laws of logic to be laws that prescribe the way in which one ought to think – to be laws of truth, and not natural laws of human beings” taking a thing to be true – will ask, who is right? Whose laws of taking-to-be-true are in accord with the laws of truth? The psychological logician cannot ask this question; if he did he would be recognizing laws of truth that were not laws of psychology” (Frege 1964, p. 14).

Yet, what is to be gained by focusing on laws of truth instead of rules of inference? Clearly, saying that the second-order rules regulate the application of rules of reasoning seems to presuppose acceptance of a third-order rule in virtue of which the application is correct. As Wittgenstein asks:

“Can't we imagine a rule determining the application of a rule, and a doubt which it removes - and so on?” (Wittgenstein 1958, sec. 84).

There would be an infinite regress; cf. Carroll's puzzle of Achilles and the Tortoise (Carroll

1895).

Nevertheless, I take the view that we can avoid this infinite regress without substantive claims if we consider logical norms as specific kinds of *artefacts*. The designers of these artefacts act in the institutional reality rather than in the *Third Realm*. While the ultimate purpose of the design of a dishwasher is cleaning dishes, the ultimate goal of the design of a logical norm is achieving truth. However, a purpose intended by a designer does not constitute the essence of an artefact. We have to take into account not only the intentions of a producer, but also the institutions and social conventions which are necessary conditions for the existence of many kinds of artefacts. Moreover, actual practice of the social use of artefacts (e.g., drugs) frequently finds out their new useful functions 'unintended' by their designer. The functions of artefacts depend on a collective intentionality of their designers and users, therefore strategical mistakes as pertaining to designing of logical norms are mistakes of *we-intentionality*.

Our skill in reasoning is a matter of strategic choice. It pertains to the entire organization of particular steps of inference and cannot be discussed move by move, act by act. As Hintikka remarks,

there can be a separate, nonpsychological theory of fallacies only so far as fallacies are thought of as strategic mistakes, not violations of the 'rules of inference' of logic (Hintikka 2001, p. 39).

A reasoning task is not given, but needs to be *we-intentionally* constituted. Thus, there is no way of determining in advance the rules of inference unaffected by the reasoning task at hand. Rules of inference say nothing about utilities of steps of inference. Utilities can be associated only with strategic rules which tell how to reason better or worse. Being regulative for reasoning, strategic rules do not constitute the institution of correct reasoning. However, like regulative etiquette rules that constitute cultural behavior, strategic rules constitute the excellence in reasoning.

Conclusion

To say that logic is normative is to say that humans ought to reason formally. But why should we care about formality in reasoning? An essential part of the answer to this question is that deliberative reasoning depends on our ability to reason formally.

According to Kant,

Logic shall teach us the right use of the understanding, i.e. the one that agrees with itself (Kant 1974, p. 16).

Strategical mistakes as pertaining to the design of logical norms are mistakes of *we-intentionality*, but it is up to a person to take responsibility for the formal transparency and strategic excellence of reasoning.

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