

Kant on Proving Aristotle's Logic as Complete

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Abstract

Kant claims that Aristotle's logic is complete. He defends this claim from the nature of a strictly scientific logic, and rejects as futile the attempts by some modern philosophers at extending it. I analyse what it means for Kant to regard Aristotle's (formal) logic as complete, explain the historical and philosophical considerations that commit him to proving the completeness claim and sketch the proof based on materials from his logic corpus. The proof will turn out to be an integral part of Kant's larger reform of formal logic in response to a foundational crisis facing it.

Keywords: formal logic, Kant, Aristotle, strict science, *principium*

1. Introduction

In the *Critique of Pure Reason* Kant claims that Aristotle's logic is complete ('completeness claim').¹ This claim has been largely cast in a negative light. By some accounts, Kant assumes but has no way to prove the completeness of Aristotelian formal logic.² Maimon, for instance, argues that Kant is unable to produce such a proof due to his treatment of formal logic as prior to transcendental philosophy, when in fact logical forms can be neither correctly classified nor completely enumerated 'without a prior [transcendental] critique' (Maimon 1794: 408). Fries, in contrast, traces Kant's failure to his viewing logic as absolutely independent of psychology (and anthropology) (Fries 1837: 5).³ If these remarks suggest that Kant has failed to supply the proper grounding for (formal) logic that would have ensured its completeness, Husserl reproaches Kant for failing to ask *any* transcendental question about the ground of formal logic – that is, to investigate how it is possible as science.⁴

Husserl's inquiry about the ground of formal logic may, according to Haaparanta, be seen as prompted by two conditions: a 'foundational crisis', which occurs when the received framework of logic is threatened, and the fact of 'various confrontations within logic and philosophy of logic'

(Haaparanta 2009: 149). Notably, Kant was in a similar situation.⁵ On the one hand, as Windelband puts it, the so-called Aristotelian logic had become ‘the object of most violent polemic’. The doctrine of syllogism, for instance, was to be ‘driven from its commanding situation’ – for being ‘incapable of yielding anything new’ and hence being ‘an unfruitful form of thought’ (Windelband 1958: 360).⁶ On the other hand, a survey of the developments in logic from humanism to Kant reveals profound disagreements over similar philosophical questions about logic that will confront Husserl (as well as many other post-Kantian philosophers). For example, is logic theoretical or practical? How is it related to other sciences such as metaphysics and psychology? Is it concerned merely with the form or also with the matter of knowledge (Husserl 1970: 56; see Capozzi and Roncaglia 2009)?

In such a context, Kant could not avoid querying the foundation of logic – particularly that of purely formal logic. If it is correct to say that – with the introduction of a transcendental viewpoint – he entirely changed the situation of logic (Windelband 1961: 1), the change lies not only in his adding a transcendental logic alongside formal logic, but also in his recognition that even the latter logic needed a new foundation in order to be a proper science. Thus, contrary to Husserl’s complaint, Kant was in fact concerned about how formal logic is possible as science. Only, as Jäsche points out in the editorial preface to the *Logic*, it would take Kant the transcendental philosopher not Kant the logician to address the question (Log, 9: 9).

Indeed, when we examine Kant’s defence of the completeness claim in the *Critique* in conjunction with his remarks about logic throughout his logic corpus,⁷ we shall see him being mindful of the necessity to establish formal logic on a firm ground – in a way that Aristotle supposedly failed to do. In the final analysis, it will be no exaggeration to say that the completeness claim encapsulates the key reformative aspects of Kant’s philosophy of logic, and that his defence of the claim reveals more disagreement with than allegiance to Aristotle’s approach to logic.

In the following, I explicate these points by reconstructing and analysing Kant’s proof of the completeness of what he takes to be the Aristotelian formal logic. I shall pay special attention to how he perceives and addresses the foundational crisis facing logic in his time.

2. What it Means to say Aristotle’s Logic is Complete

2.1 *The History of Logic from Kant’s Standpoint*

Logic underwent significant developments during the seventeenth and eighteenth centuries. These developments involved at least three topics

that would eventually become Kant's central concerns. First, the nature of logic: is it a 'science' (doctrine, theory) or an 'art' (instrument)? Second, the subject matter of logic: is it about the purely formal rules of thinking or the natural operations of the mind? Third, the basis of logical investigation: should it be founded on empirical observations about the human mind?⁸ Aristotle's logic (*Organon*) – the syllogistic perceived to be at its core – was the main target of contention.⁹

Such contention was manifest in the disagreements between Locke and Leibniz about logic. Locke argued that syllogisms are of little use to the attainment of new knowledge and unnecessary for the proper use of our reason, given that many people in fact think well without ever being taught syllogisms (Locke 1975: 668–79).¹⁰ Meanwhile, Locke took himself to have introduced 'another sort of logic', which is 'the doctrine of signs [i.e. ideas and words]' and which is one of the three sciences that 'fall within the compass of Human understanding', the other two being natural philosophy and ethics (Locke 1975: 720–1).¹¹ In response, Leibniz defended the syllogistic as 'a kind of universal mathematics', an invention that 'is one of the finest, and indeed one of the most important, to have been made by the human mind' (Leibniz 1996: 478). He contended that (formal) logic could not be proved useless, as Locke thought it had been so proven, by the empirical observation that 'the common run of men know nothing about logic as an art, and that they nevertheless reason as well as – and sometimes better than – people who are practiced in logic' (Leibniz 1996: 482). Furthermore, Leibniz rejected Locke's classification of logic as a separate science, regarding it instead as one of the various 'ways of organizing the totality of doctrinal truths' and 'the art of reasoning' or 'the art of using the understanding not only to judge proposed truth but also to discover hidden truth' (Leibniz 1996: 524; 1956: 755).

That Kant was familiar with such developments is clear from his frequent comments on the history of logic. To begin, consider these remarks about Aristotle's logic:

History of logic. Aristotle: merely objective laws, form of reason.
(Refl 1629, 16: 48)

Aristotle erred by including in logic a division of general concepts by means of which one can think objects; this belongs to metaphysics. Logic has to do with concepts whatever they might be, and deals only with their relation. (Refl 4450, 17: 556)

Aristotle can be regarded as the father of logic. But his logic is too scholastic, full of subtleties, and fundamentally has not been of

much value to the human understanding. It is a dialectic and an organon for the art of disputation. ... Still, the principal ideas from it have been preserved, and this is because logic is not occupied with any object and hence it can be quickly exhausted. (V-Lo/Wiener, 24: 796)

From Aristotle's time on, logic has not gained much in content, by the way, nor can it by its nature do so. But it can surely gain in regard to *exactness*, *determinateness*, and *distinctness*. ... Aristotle had not omitted any moment of the understanding; we are only more exact, methodical, and orderly in this. (Log, 9: 20)

We have no one who has exceeded Aristotle or enlarged his <pure> logic (which is in itself fundamentally impossible) just as no mathematician has exceeded Euclid. (V-Lo/Dohna, 24: 700)

These remarks deliver a nuanced assessment of Aristotle's logic. In terms of content, (1) this logic includes a presentation of the objective, formal rules of reason and the understanding, thereby giving names to all the moments (or forms) of thinking,¹² but (2) it also includes, erroneously, 'a division of general concepts by means of which one can think objects'. (This complaint refers to Aristotle's *Categories*.) That logic since Aristotle cannot gain much in content is due to (1). Meanwhile, regarding its manner of presentation, Aristotle's logic still needs improvement – to be more 'exact', 'determinate' and 'distinct'.

This call to improve Aristotle's logic in manner of presentation does not come from a mere interest in style. Rather, it indicates a concern about the status of logic as science. This concern becomes clear in light of how Kant regards Wolffian logic.

Among the moderns, Leibniz and Wolff are to be noted. The logic of Wolffius is the best to be found. It was subsequently condensed by Baumgarten, and the latter was again extended by Meier. (V-Lo/Wiener 24: 796; and see Log, 9: 21; V-Lo/Pölitz 24: 509)¹³

Kant praises Wolffian logic not so much for its specific content as for its formal features – for being 'demonstrative', 'distinct' and 'orderly' (Refl 1629, 16: 48; Refl 1641, 16: 62; V-Lo/Philippi, 24: 337–8). Notably, he uses similar terms in the *Critique* to describe 'the strict method of the famous Wolff ... who gave us the first example ... of the way in which the secure course of a science is to be taken' (Bxxxvi). The Wolffian method in question, as Kant interprets it, will turn out to be the method of

systematic demonstration that is supposedly essential to accounting for the possibility of logic as science and to proving a given logical system (e.g. the Aristotelian one) as complete. I shall return to this point in §2.2.

Kant's comments on other developments in modern logic are also informative, albeit largely negative.

Locke: origin of concepts. ... Modern: not pure, but mixed logic with psychology. Crusius: fanatic logic. Lambert: an organon of mathematics and physics. (Refl 1629, 16: 48)

After [Aristotle and Peter Ramus] come Malebranche and Locke. This last wrote a treatise *de intellectu humano*. But both writings deal not only with the form of the understanding but with content.¹⁴ They are preparatory exercises for metaphysics. ... The logic of Crusius is crammed full of things that are drawn from other sciences, and it contains metaphysical and theological principles. Lambert wrote an organon of pure reason. (V-Lo/Wiener, 24: 796; and see Log, 9: 21; V-Lo/Philippi, 24: 337–8; V-Lo/Dohna, 24: 701; V-Lo/Hechsel, LV, 2: 288–90)

These remarks touch upon two philosophical questions about logic that greatly interested Kant. The first is how logic relates to empirical psychology. This question, as I shall explain later, is ultimately about the ground of logic as science. The second question is what belongs to logic as a science that sharply differs from other sciences like metaphysics. For Kant, a strictly scientific logic deals with nothing other than the form of thinking, in abstraction from all relation (*Beziehung*) to the object – that is, from all content (*Inhalt*) of thought (A55/B79). This notion of logic underlay Kant's earlier complaint that Aristotle's logic wrongly included a division of the concepts by which to think objects. It is now also his basis for charging Locke with mixing in logic a metaphysical topic, namely the origin of concepts,¹⁵ and Lambert with making logic an instrument or 'organon' of substantive knowledge.

This overview of Kant's comments on the history of logic provides a crucial background for interpreting his appeal to the work of past logicians. Take for instance his claim that *apropos* judging – as the act of the understanding that is the basis for discovering all categories – he had before him

already finished though not yet wholly free of defects, the work of the logicians, through which I was put in the position to present a complete table of pure functions of the understanding, which were however undetermined with respect to every object.

Finally, I related these functions of judging to objects in general ... and there arose pure concepts of the understanding [i.e. categories]. (Prol, 4: 323–4)

By ‘the work of the logicians’ is likely meant whatever logic texts retained the part of Aristotle’s logic that supposedly belongs to logic proper, which should contain all the ‘pure functions of the understanding’ listed in Kant’s Table of Judgements (A70/B95), although the logicians themselves might not recognize them as such. If so, Kant must explain his decision to privilege such work and deem it ‘already finished’. After all, given his awareness of the anti-Aristotelian developments in logic, he could not simply take the Aristotelian texts for granted. To the contrary, absent any consensus among the previous philosophers about the nature, subject matter and proper content of logic, Kant would need a great deal of philosophical manoeuvre to get himself ‘in the position’ to extract a list of all the logical functions of judging from the purported work of the logicians. Moreover, as will become clear next, Kant would be compelled by some of his own philosophical commitments to reconstruct the Aristotelian logic on an independent ground before he could help himself with those functions of judging in a deduction of categories.

2.2 *Completeness and Kant’s Notion of Logic as Science*

Kant takes Aristotle’s logic to be complete in the quantitative sense, in having not omitted anything that *ought* to be included in logic proper.¹⁶ Thus the completeness of Aristotle’s logic essentially concerns the nature of logic. This point was implied in Kant’s previously cited comments on Aristotle’s logic, the gist of which can be recapitulated as follows. Logic deals solely with the form of thinking; as such, its content is quickly exhaustible, as it includes nothing other than the formal rules of thinking in general;¹⁷ Aristotle’s logic has not left out any of those rules, to which extent it is complete.

Kant makes the same point in the second preface to the *Critique*, which opens with the topic of whether ‘the treatment of the cognitions that belong to the business of reason travels the secure course of a science’ (Bvii). Logic has allegedly travelled such a course in that, since Aristotle, it ‘has not had to retrace any step (*keinen Schritt rückwärts hat tun dürfen*)’ and ‘has also been unable to take any step forward (*keinen Schritt vorwärts hat tun können*)’ – and therefore seems complete (Bviii). Note Kant’s use of modal language: his claim is not just that logic has not taken any step backward or forward since Aristotle, but that it has ‘not had to’ or has been ‘unable to’ do so. What has happened to logic is history. What has to or can happen concerns its nature.

This focus on the nature of logic is again manifest in how Kant dismisses the attempts of 'some moderns' to expand logic by interpolating psychological, metaphysical or anthropological chapters: these attempts betrayed 'ignorance about the peculiar nature of this science', as 'a science that exhaustively presents and strictly proves nothing but the formal rules of all thinking' (Bviii–ix). Thus, if logic has been able to take the secure path of a science to the extent of allowing no *possible* expansion, it is thanks to its essential 'restriction (*Eingeschränktheit*)' to the mere form of the understanding (Bix).

The nature of logic, however, at best explains how a system of logic, whatever it may be, can be complete in the quantitative sense specified above. It does not show that *Aristotle's* logic is indeed complete in that sense. Especially, it is far from proving that the specific logical forms of thinking (or judging) named by Aristotle – i.e. the ones listed in Kant's Table of Judgements – are what ought to be included in logic proper. To invalidate any attempt at expanding logic beyond the Aristotelian system and do so without begging the question, Kant needs to do more than just delineate the boundaries of logic. He must find a way to prove that exactly such and such logical forms must be included therein.

To see how the requisite proof might go, it will be instructive to consider Kant's view on what makes us certain about the completeness of a science. As he puts it in the *Critique*, for a given science, 'a full guarantee (*Gewährleistung*) for the completeness ... of all the components that comprise [its] edifice' can only come from its 'idea', whereby its entire plan is outlined 'architectonically, i.e., from principles (*Principien*)' (A13/B27).¹⁸ If the certainty about the completeness of a science has thus to do with its grounding 'principles', Kant appeals to the same connection while comparing how he and Aristotle, respectively, arrived at the categories. On Kant's part,

[the Table of Categories] is systematically generated from a common principle (*aus einem gemeinschaftlichen Princip ... erzeugt*), namely the faculty for judging (which is the same as the faculty for thinking), and has not arisen rhapsodically from a haphazard search for pure concepts, of the completeness of which one could never be certain (*gewiß*). (A80–I/B106–7)

By contrast, Aristotle 'had no principle (*Principium*)' in his search for categories, but 'rounded them up as he stumbled on them' (A81/B107). The point of this contrast is straightforward: one arrives at categories either by systematically generating them from a principle or by searching for them without any such principle, as Aristotle allegedly did; one can be

certain about having completely presented them in the former but not the latter case.

Mutatis mutandis, Kant would make the same point about Aristotle's presentation of the formal rules of thinking. If Aristotle got the credit for having named all those rules, Kant never saw him as having derived them in accordance with a principle. If Aristotle's logic contains things that do not belong to logic proper, Kant would trace this problem to a failure to build logic from the idea of such a science, which would have marked its precise boundaries vis-à-vis other sciences. Kant might be alluding to such an idea when he exalted Wolff's logic for being 'demonstrative', 'distinct' and 'orderly' but suggested that Aristotle's lacked those qualities. Meanwhile, if a presentation of logic fails to exhibit those qualities, it lacks the proper form of science – and so one cannot yet be certain about its completeness.¹⁹ Such is the situation of logic as Aristotle handed it down.

Accordingly, Kant's first step toward proving Aristotle's logic as complete is to articulate the idea of a scientific logic. This idea is implied in Kant's notion of pure logic.

In general logic the part that is to constitute the pure doctrine of reason ... alone is properly science, although brief and dry, as the scholastically correct (*schulgerecht*) presentation of a doctrine of the elements of the understanding requires. ... As pure logic it ... is a proven doctrine (*eine demonstrierte Doktrin*), and everything in it must be completely a priori. (A53–4/B78)

'Scholastically correct presentation' is part of what puts a system of cognitions (e.g. metaphysics) on the secure path of a strict science (Bxxxvi).²⁰ A strict science on Kant's account has three key features: it is systematic, as 'a whole of cognition ordered according to principles'; it 'treats its object wholly according to a priori principles'; and it is apodictically certain (MAN, 4: 467–8). If logic is to be strictly scientific, then, its content must be cognized entirely *a priori*, i.e. derived from *a priori* principles. Logic in this sense is a 'demonstrated science', which 'rests on' and 'can be taught from *principia a priori*' (V-Lo/Wiener, 24: 793; and see: V-Lo/Blomberg, 24: 13; V-Lo/Dohna, 24: 694; V-Lo/Pölitz, 24: 505–6; Log, 9: 14–15). In these terms, Kant's assessment of Aristotle's logic may be rephrased as follows: although it includes all the items belonging to logic proper, namely the formal rules of thinking, it lacks the form of a strict science, insofar as those rules have not been systematically derived from *a priori principia*. Hence, to prove Aristotle's logic as complete, Kant must begin by identifying the requisite principle(s).

3. Rendering Aristotle's Logic Scientific and Proving its Completeness

3.1 *The principium of a Scientific Logic*

To sort out Kant's view regarding the *principium* or ground on which a scientific logic rests, I shall examine two groups of texts: those in which he directly states what the ground of true logic is, and those in which he discusses the nature of logic and thereby explains why its ground must be so construed.

To begin, consider this remark: 'Locke's book *de intellectu humano* is the ground of all true *logica*' (V-Lo/Blomberg, 24: 37). Kant is referring to *An Essay Concerning Human Understanding*. It might seem puzzling that he should hold the *Essay* in such a high regard, given that he repeatedly criticized Locke for including in logic topics that belong, say, to metaphysics. The remark makes sense, however, when we take into account its broader context, where Kant contrasts two ways of philosophizing – the critical versus the dogmatic (V-Lo/Blomberg, 24: 37). Kant takes dogmatic philosophizing, as Leibniz and Wolff have allegedly practised it, to be 'quite mistaken' and to have 'so much in it that is deceptive that it is in fact necessary to suspend the whole procedure'. Meanwhile Locke, by '[seeking] to analyze the human understanding', has supposedly 'set in motion another, the *method of critical philosophizing*, which consists in investigating the procedure of reason itself, in analyzing the whole human faculty of cognition and examining how far its *limits* may go' (Log, 9: 32; and see: V-Lo/Wiener, 24: 804; V-Lo/Hechsel, LV, 2: 301). In terms of this contrast, Kant's claim that Locke's *Essay* is 'the ground of true *logica*' marks his recognition that logic must be preceded by and grounded in an analysis of human understanding.

Kant disagrees, however, with Locke over the exact nature of the needed analysis. The disagreement is telling. From Kant's perspective, the Lockean analysis is physiological, as it considers the actual operations of our mind under empirical conditions – and therefore amounts to an empirical psychology (Refl 4866, 16: 14; Refl 4893, 18: 21; Refl 4951, 18: 10). A strictly scientific logic cannot build on empirical psychology, but must be grounded on a true critique, which 'separates 1. the pure from the empirical faculty of cognition, 2. sensibility from the understanding' (Refl 4951, 18: 9). This contrast between the Lockean analysis and a true critique of human understanding underlies Kant's distinction between pure and applied logics. If applied logic 'is directed to the rules of the use of the understanding under the subjective empirical conditions that psychology teaches us', pure logic 'has strictly to do with a priori principles' and therefore 'draws nothing from psychology' (A53–5/B77–8). More specifically,

[in pure logic] we abstract from all empirical conditions under which our understanding is exercised, e.g., from the influence of the senses ... indeed in general from all causes from which certain cognitions arise or may be supposed to arise, because these merely concern the understanding under certain circumstances of its application, and experience is required in order to know these. (A53/B77)

Applied logic, to the contrary, is ‘a representation of the understanding and the rules of its necessary use *in concreto*, namely under the contingent conditions of the subject, which can hinder or promote this use, and which can all be given only empirically’ (A54/B78–9). This logic cannot be a ‘true and proven science’ (A55/B79) – for a truly scientific logic must treat its object (i.e. the faculty of thinking) entirely *a priori*, no matter how it operates under empirical conditions.

Apart from the demand of the strict notion of science, Kant has another reason to think that true logic must have an *a priori* ground. This reason concerns the nature of logical rules as the ‘universal rules of the use of understanding in general’ (Refl 1620, 16: 41) and as what are ‘necessary ... and essential to thinking in general’ (Refl 1628, 16: 44). The universality of the rules entails their necessity: logic, as a ‘universal theory of understanding’, ‘puts forward only the necessary rules of thinking ... hence only the form of thinking in general and the rules without which nothing could be thought at all’ (Refl 1620, 16: 40). The necessity of the rules in turn requires that they be ‘derived a priori’ (V-Lo/Wiener, 24: 792). This connection among the universality, necessity and apriority of logical rules echoes Kant’s account of ‘strict universality’ in the *Critique*, which is characteristic of a rule to which ‘no exception at all is allowed to be possible’. (By contrast, a rule has merely ‘comparative universality’ if ‘as far as we have yet perceived, there is no exception’ to it.) To be strictly universal, then, a rule must be derived independently of experience. This requirement ‘points to a special source of cognition (*Erkenntnisquell*) for it, namely a faculty (*Vermögen*) of a priori cognition’ (B3–4). Similarly, if logical rules need ‘a ground from which they are derived’ as the conditions without which no thought would be possible, the derivation must establish them as ‘universal according to reason’, reason being the faculty for cognizing them *a priori* (V-Lo/Dohna, 24: 694).

A further feature of logic holds the clue to the specific *a priori* ground from which logical rules are to be cognized: logic is a ‘self-cognition of the understanding and of reason’, in that the understanding (in the broad sense), which cognizes logical rules, is also the very object of logic (Log, 9: 14; and

see: V-Lo/Blomberg, 24: 24–5; V-Philippi, 24: 315; V-Lo/Dohna, 24: 695; V-Lo/Wiener, 24: 792; V-Lo/Bauch, LV, I: 10, 13–14; V-Lo/Hechsel, LV, 2: 278, 280).²¹ More precisely, since logic deals only with the necessary rules of thinking, it must proceed from an analysis of the understanding as the faculty of thinking – ‘*logica* will thus have no other grounds or sources than the nature of human understanding’ (V-Lo/Blomberg, 24: 25). Accordingly, the *a priori* cognition of logical rules is to proceed in roughly these steps: it starts with a reflection on the understanding merely as regards its capacity to think; on that basis, a set of rules are derived as what determine the possibility of thinking (as regards its form).

Before we turn to Kant’s logic corpus for more details about such a procedure, it is important to bear in mind a distinction between two kinds of ‘principle’ pertaining to logic. On the one hand, Kant takes logic to present ‘principles of all logical assessment (*Beurtheilung*) of our cognition’ (A60/B84) – namely principles for evaluating a given cognition as regards its formal correctness (Log, 9: 15; V-Lo/Dohna, 24: 696). Among these evaluative principles is the law of contradiction, which is the most general albeit merely negative principle of all our cognition – if it is to be true – in that whatever violates the law is false (A150–1/B189–90). On the other hand, when Kant inquires about the principle of logic as science, he is seeking to uncover the ground or source of a properly scientific cognition of the rules of thinking in general. This inquiry should not be confused with a project of reducing all logical rules, in an axiomatic-deductive manner, to a self-evident principle like the law of contradiction.²²

Moreover, there are two kinds of logical rules according to Kant. There are generative rules, which specify the logical functions of the understanding whereby any thought – a concept, a judgement, or an inference – may be *generated* as to form. Then come truth rules, which include the law of contradiction among others and which constitute the formal conditions of the *truth* of a given thought.²³ When Kant takes Aristotle’s logic to be complete in having not omitted any ‘moment’ or ‘form’ or ‘function’ of thinking, he is referring to the first kind of rules. These rules are my focus in this paper.

3.2 *From the Nature of the Understanding to Logical Rules*

In the *Critique*, Kant introduces the notion of logic against the backdrop of a contrast between sensibility and the understanding. Sensibility is ‘the *receptivity* of our mind to receive representations insofar as it is affected in some way’. The understanding is the faculty of spontaneity, namely ‘the faculty for bringing forth representations itself’ or the capacity to

think in a way that can transform received representations into a thought of something, a thought that is essentially conceptual. Although these two faculties must work together to produce cognition in the strict sense, their roles are distinct and must be investigated independently of each other. Thus arise two sciences – aesthetic, ‘the science of the rules of sensibility in general’, and logic, ‘the science of the rules of the understanding in general’ (A51–2/B75–6). Logic, so construed, ‘abstracts ... from all content of cognition, i.e. from any relation of it to the object, and considers only the logical form in the relation of cognitions to one another, i.e. the form of thinking in general’ (A55/B79). This indicates that logic, as a scientific cognition of the formal rules of all thinking, must build on an account of the form of thinking.

We can find such an account in the ‘Prolegomena’ to most of the extant transcripts of Kant’s logic lectures, as well as in the ‘Introduction’ of the *Logic* edited by Jäsche.²⁴ It centres on an analysis of the understanding as the faculty of thinking. Briefly, it revolves around the following theses (besides the aforementioned conception of the understanding as a faculty of spontaneity).

- (i) Thinking is the act (*Handlung*) of the understanding and, as such, is governed by rules.

Everything in nature ... takes place *according to rules* ... The exercise of our powers (*Kräfte*) also takes place according to certain rules ... Like all our powers, *the understanding* in particular is bound in its acts (*Handlungen*) to rules, which we can investigate. (Log, 9: 11; and see V-Lo/Philippi, 24: 311; V-Lo/Pölitz, 24: 502; V-Lo/Dohna, 24: 693; V-Lo/Wiener, 24: 790; V-Lo/Bauch, LV, 1: 3–6; V-Lo/Hechsel, LV, 2: 271–2; V-Lo/Warschauer, LV, 2: 505)²⁵

- (ii) Thinking has both matter and form. Specific sciences differ as to matter.²⁶ They nevertheless have one thing in common, namely the ‘use of the understanding in accordance with rules of which one is conscious’.²⁷ Logical rules, as what pertain to the mere form of thinking, are presupposed by all sciences.

In all thought there is matter and form. Matter concerns the object and form the mode of treatment.

Our understanding has various objects of cognition and of science, such as history, mathematics – but universal logic abstracts from all this content, from all variety of cognition, and considers in everything only the form of concepts, judgements, and inferences. In short, it is one of the sciences that prepare us for

others. (V-Lo/Wiener, 24: 791; and see V-Lo/Dohna, 24: 693; V-Lo/Warschauer, LV, 2: 506; Log, 9: 12–13; A52/B67; Refl 1603, 16: 33; 1620, 16: 40; 1628, 16: 43–4)

- (iii) There are rules for how we think and there are rules for how we ought to think. The latter rules are those without which no thought would be possible.

We can divide the laws of our understanding in the following way[:]

1. Rules for how we think.
2. Rules for how we ought to think.

... Logic teaches us this last, namely, how to use the objective rules of our understanding. ... the universal rules are the sole condition of our thought [as to form]. (V-Lo/Wiener, 24: 791–2; and see V-Lo/Pöhlitz, 24: 502; V-Lo/Dohna, 24: 694; Log, 9: 14; also Refl 1579, 16: 18, 20–1; 1599, 16: 30; 3939, 17: 356)

- (iv) Three kinds of cognition, as to form, originate through the act of thinking (as the spontaneous act of bringing forth representations).

Logically, all origins (*Anfänge*) in thought are divided thus:

1. The cognition is a simple cognition, a *concept*.²⁸
2. The cognitions are combined in a *judgement*.
3. That judgements are combined and that *inferences* arise therefrom. (V-Lo/Wiener, 24: 904; and see V-Lo/Pöhlitz, 24: 565; V-Lo/Hechsel, LV, 2: 389)²⁹

These theses together suggest that logical rules first include the ones that determine the acts of the understanding whereby concepts, judgements and inferences are to be generated. To specify these rules, one begins with an analysis of the nature or 'form' of concept, judgement and inference, respectively.³⁰ This procedure is most clearly manifested in Part I of the Logic ('Universal doctrine of elements'), which comprises three sections ('Of concepts', 'Of judgements', 'Of inferences'), although the same procedure can also be recovered from many transcripts of Kant's lectures.³¹

For a brief illustration of this procedure, we start with concepts. Every concept has the form of a 'universal representation, or a representation of what is common to several objects' (Log, 9: 91; and see V-Lo/Pöhlitz, 24: 567–8; V-Lo/Wiener, 24: 904, 908; V-Lo/Bauch, LV, 1: 151–2; V-Lo/Hechsel, LV, 2: 390, 395; V-Lo/Warschauer, LV, 2: 609). As such, a concept is 'always made (*gemacht*)' (Log, 9: 93). Accordingly, there

are rules that determine how the representations that are ‘given to [the understanding] from elsewhere, whatever this may be’, may be ‘transform [ed] ... into concepts’ (A76/B102; and see Log, 9: 93; V-Lo/Pölitz, 24: 566; V-Lo/Wiener, 24: 907). These rules specify the ‘logical *actus* of the understanding’ – i.e. comparison, reflection and abstraction – that constitute ‘the essential and universal conditions for generation of every concept whatsoever’ (Log, 9: 94; and see V-Lo/Wiener, 24: 907–10; V-Lo/Hechsel, LV, 2: 393–5; V-Lo/Warschauer, LV, 2: 609–10).

Next, an analysis of the nature of judgement serves as the basis to derive the formal rules for generating all possible judgements. Briefly, a judgement relates a multitude of cognitions in the unity of one representation. Different forms of judgement are just different ways in which such a unified relation may be effected (Log, 9: 101; V-Lo/Pölitz, 24: 577; V-Lo/Wiener, 24: 928–9; V-Lo/Hechsel, LV, 2: 422; V-Lo/Warschauer, LV, 2: 623). Relating multiple cognitions in one is an act of the understanding, which is to manifest itself in twelve forms under four titles – quantity (singular, universal, particular), quality (affirmative, negative, infinite), relation (categorical, hypothetical, disjunctive), and modality (problematic, assertoric, apodictic).³² These are precisely the twelve moments of ‘the function of thinking’ listed in Kant’s Table of Judgements (A70/B95). It is not surprising, then, that he occasionally introduces logical forms of judgement simply as the various ‘acts of the understanding (*Verstandeshandlungen*) that appear in a judgement’ (V-Lo/Wiener, 24: 929; and see V-Lo/Pölitz, 24: 577; V-Lo/Hechsel, LV, 2: 423; V-Lo/Warschauer, LV, 2: 623–4).

Finally, the derivation of the rules for generating (syllogistic) inferences likewise proceeds from a general analysis of inference (Log, 9: 114–30; V-Lo/Pölitz, 24: 583–93; V-Lo/Bauch, LV, 1: 181–203; V-Lo/Hechsel, LV, 2: 439–73; V-Lo/Warschauer, LV, 2: 632–47).³³

By this sketch of Kant’s procedure for deriving logical rules, my intention is to clarify what *kind* of proof he would give for the claim that Aristotle’s logic is complete, without dwelling on how exactly each one of those rules is supposed to be derived. In short, if Kant had the aforementioned rules in mind when he claimed that Aristotle exhaustively named all the formal rules of thinking, the claim is justified – by the Kantian standard – insofar as those rules can be systematically derived from a common principle or ground in the way described above. Philosophically speaking, I submit, what is important here is not whether the proof is convincing in its details, but what it has revealed about Kant’s theory

of logic – especially in connection with some of the pre-Kantian developments in logic.

One would be missing Kant's point, then, to read his completeness claim as a mark of uncritical adherence to the Aristotelian logical tradition. Kemp Smith writes: 'however many provisos [Kant] made and defects he acknowledged, they were to him merely minor matters, and he accepted its teaching as complete and final' – for, since Aristotle's logic 'has stood the test of 2000 years, and remains practically unchanged to the present day, its results can be ... employed without question in all further inquiries'. No wonder Kemp Smith is frustrated when observing that 'Kant recasts, extends, or alters [its doctrines] to suit his own purposes' in the *Critique* (Kemp Smith 1918: 184–5). This frustration is self-inflicted in a way: Kemp Smith is looking at the wrong thing. The completeness claim, as Mosser puts it, in fact 'tells us much more about Kant's conception of logic ... than it does about what he thinks of Aristotle' (Mosser 2007: 131). Given that the need for Kant to prove the claim is rooted in his idea of a strictly scientific logic, the proof amounts to deducing and reconstructing Aristotle's logic – or, more precisely, the part of this logic that contains all the formal rules of thinking – from an *a priori* ground and thereby *transforming* it into a true science. It is this reformed Aristotelian logic that Kant feels assured to use in the *Critique*. The assurance is not from Aristotle's authority as the father of logic or from any time-tested prevalence of the Aristotelian tradition. (Moreover, as we saw, the Aristotelian logic no longer enjoyed uncontested prevalence during Kant's time.) It is rather founded on Kant's own philosophical convictions about logic as a proper science.

4. The Above Proof as Part of a Larger Reform

The proof of the completeness of Aristotle's logic sketched above helps to answer another question that concerns the critical Kant: what is the legitimate use of logical rules? This brings us back to the Wolffian approach to logic. Earlier I explained that Kant extols Wolff's logic as what, among the available logical systems, best satisfies the formal conditions of a proper science. I also mentioned, however, that Kant rejects the dogmatic philosophizing practiced by Wolff among others, which proceeds without a prior critique of human understanding.³⁴ Now, given that Kant views logic as a pure cognition *a priori*, he would worry about the danger of dogmatism in this case as well: reason might be tempted to employ logical rules for purposes they cannot serve. Meanwhile, by grounding pure logic in a philosophical analysis of the understanding, Kant has also signalled a remedy for the said temptation.

I shall briefly explain these points, as they show how Kant's proof of the completeness of Aristotle's logic fits with his overall reformative project regarding logic.

To appreciate Kant's worry about the danger of approaching logic dogmatically, note his following caution against a certain misuse of (general) logic.

[G]eneral logic, which is merely a *canon* for assessment (*Beurtheilung*), has been used as if it were an *organon* for the actual production of at least the semblance of objective assertions, and thus in fact it has thereby been misused. (A61/B85)

To say that logic is 'a *canon* for assessment' is to say that it is an *a priori* proven 'doctrine of the elements of the understanding' (A54/B78) that 'subsequently serves for critique, i.e., as the principle for the assessment of all use of the understanding in general' (Log, 9: 15; and see V-Lo/Dohna, 24: 696; V-Lo/Wiener, 24: 793; Refl 160I, 16: 32). Now logic is a canon of the understanding 'only in regard to what is formal in [its] use, be the content what it may' (A53/B77). Thus it can only serve for assessing cognitions with respect to their form, without providing us with any resources for judging about their material truth.

General logic analyzes the entire formal business of the understanding and reason into its elements, and presents these as principles of all logical assessment of our cognition. ... But since the mere form of cognition, however well it may agree with logical laws, is far from sufficing to constitute the material (objective) truth of the cognition, nobody can dare to judge of objects and to assert anything about them merely with logic without having drawn on antecedently well-founded information about them from outside of logic[.] (A60/B84–5; and see Log, 9: 15; V-Lo/Dohna, 24: 694, 696)

It is therefore 'nothing but idle chatter' to use logic – which teaches us only the formal conditions of the use of the understanding – 'as a tool (*organon*) for an expansion and extension of its information (*Kenntnisse*)' (A61–2/B86).³⁵

Nevertheless, Kant recognizes that 'there is something so seductive in the possession of an apparent art (*scheinbaren Kunst*) for giving all of our cognitions the form of understanding' that logic has been mistaken as an

organon for obtaining material cognitions (A60/B85). Tellingly, this recognition echoes Kant's diagnosis of the surreptitious move that reason makes in using conceptual analysis – which can afford only formal (analytic) truths – to make material (synthetic) claims.

Now since this [analysis of concepts] does yield a real a priori cognition, which makes secure and useful progress, reason, without itself noticing it, under these pretenses surreptitiously makes (*erschleicht*) assertions of quite another sort, in which it adds something entirely alien to given concepts and indeed does so a priori, without one knowing how it was able to do this and without such a question even being allowed to come to mind. (A5–6/B9–10)

Note that reason would make the surreptitious move 'without itself noticing it'. Hence, to forestall the move, reason must first examine the nature and possibility of analytic and synthetic cognitions respectively (A6/B10). Likewise, to prevent any unintended misuse of logical rules, reason must first reflect on the nature and possibility of logic as science and, on that basis, specify what counts as the valid use of its rules.³⁶ Once it is clarified that logic – as a strictly scientific cognition of the necessary rules of thinking in general – concerns the mere form of thought, one can see that logic is only a 'propaedeutic ... to the sciences' and that 'when it comes to information (*Kenntnissen*) ... its acquisition must be sought in the sciences properly and objectively so called' (Bix). Only this reflective understanding of the limited function of logic can prevent its misuse as a tool for extending material cognitions.

By this analysis, the misuse of logical rules that Kant wishes to counter is a result of reason being *unknowingly* tempted by the deceptive appearance of logic as an art for acquiring new cognitions, which is in turn rooted in a failure to examine the true ground of logic. So construed, the misuse is a symptom of dogmatic philosophizing and can be treated only through the adoption of a critical method. To paraphrase Kant's earlier contrast of the two methods, there are so many deceptive elements in a dogmatic philosophy that the whole thing must be suspended. In the case of logic, reason must start all over again, beginning with an inquiry about its ground.

The fact that the same inquiry was pivotal to Kant's proof of the completeness of Aristotle's logic suggests that, if Kant would indeed prove Aristotle's logic as complete by systematically deducing the formal

rules of thinking named therein from an *a priori* ground, such deduction would be an integral part of his overall critical reform concerning logic. The reform, as I have portrayed it, involves a complex response to two inspiring pre-Kantian developments in logic, each of which has in its own way exceeded Aristotle's original treatment of logic. On the one hand, Kant agrees with Locke that logic is an independent science with its own subject matter and that it is important to ground logic in an analysis of human understanding, but rejects Locke's empiricist treatment of such a ground. On the other hand, if Kant models the scientific form of pure logic after the Wolffian philosophy, he also recognizes how Wolff's dogmatic procedure could lead reason to misuse logic as an organon for the material extension of cognition. Thus Kant's insistence on constructing pure logic from an *a priori* analysis of the understanding amounts to a serious engagement with some of the major developments in logic during the seventeenth and eighteenth centuries – in an attempt both to establish logic as a proper science and to specify the valid use of its rules. For Kant, an effective and fruitful engagement with those developments – and with Aristotle's logic in its original shape – must centre on a true critique of human understanding.

Only if this [critique] is one's ground does one have a secure touchstone for appraising the philosophical content of old and new works in this specialty; otherwise the unqualified historian and judge assesses the groundless assertions of others through his own, which are equally groundless. (A13/B27)

As far as the philosophical evaluation of his intellectual heritage goes, then, Kant is taking nothing for granted. Logic is no exception.

5. Conclusion

In this paper, I have read Kant's inquiry about the ground of (formal) logic in connection with certain developments in logic during the seventeenth and eighteenth centuries. On this reading, Kant has to prove the Aristotelian formal logic as complete not merely to justify its role in his critical philosophy, but also because the previous developments in logic have presented him with new philosophical questions – especially about the ground, subject matter, scope and legitimate use of logic. Kant's proof of the completeness claim, as I have reconstructed it, serves to bring together his answers to all these questions.

By giving a historically informed reconstruction of the said proof, my goal is not to show that it was successful. (Assessing the success or failure of the

proof would require a careful explication of the relevant success criteria, which I have not provided.³⁷) Nor do I deny that Kant's inheritance of the Aristotelian tradition marks his fundamental limitations when it comes to logic. These limitations are not however unique to Kant. In a sense, the chief players in logic during his era all started with the Aristotelian logic, asking, among other things, whether it can serve as an effective instrument for the discovery of truths and whether it constitutes the universal standard for the proper use of our cognitive faculties. When innovative steps were taken, they fell on either side of such questions. Even Leibniz, who may be seen as having sparked the most exciting developments in formal logic through his vision of a universal logical calculus, made special efforts to defend the Aristotelian syllogistic as an indispensable part of the universal logic (see §2.1).³⁸ As for Kant, he did not mean to be an innovator in logic *per se*, but rather focused on the philosophical issues raised by the sundry developments in logic that faced him. He had a good reason to be so focused: without sorting out those issues, all the innovative attempts in logic would be blind if not a total waste of time.

In this connection, it is important to add, the *philosophical questions* Kant addressed while defending the completeness of Aristotle's formal logic are not limited to that logic, but can be raised with respect to any purported formal-logical system. Hence, if the logic Kant inherited has, as Paton puts it, 'suffered serious, and perhaps shattering, blows' (Paton 1936: 188), the reformative elements of his philosophy of logic – as are manifested in his attempt to defend that logic – nevertheless remain as historically significant insights.³⁹

Notes

1. Bviii. References to Kant's first *Critique* take the standard A/B form. References to his other works are to the volume and pagination of either the Akademie edition or Tillman Pinder's edition (Kant 1998) of the *Logik Vorlesung* ('LV'). I use Cambridge translations when they are available, with occasional modifications. Other translations are my own. Abbreviations are as follows: Anth = Anthropologie in pragmatischer Hinsicht; DfS = Die falsche Spitzfindigkeit der vier syllogistischen Figuren erwiesen; Log = Logik; MAN = Metaphysische Anfangsgründe der Naturwissenschaft; PND = Principiorum primorum cognitionis metaphysicae nova dilucidatio; Prol = Prolegomena zu einer jeden künftigen Metaphysik; Refl = Reflexion; V-Lo/Bauch = Logik Bauch; V-Lo/Blomberg = Logik Blomberg; V-Lo/Dohna = Logik Dohna-Wundlacken; V-Lo/Hechsel = Logik Hechsel; V-Lo/Philippi = Logik Philippi; V-Lo/Pölitz = Logik Pölitz; V-Lo/Warschauer = Warschauer Logik; V-Lo/Wiener = Wiener Logik; V-Met/Mron = Metaphysik Mrongovius.
2. A reader today might find this charge obviously true: Kant would not have been able to prove Aristotelian logic as 'complete' in the modern (Gödelian) sense. We shall see, however, that Kant had an altogether different notion of completeness, which carries distinctive philosophical significance and deserves attention on its own right. See n. 16.

- 3 Fries distinguishes philosophical (formal) logic and anthropological logic, arguing that the latter is independent from but provides foundation for the former (Stelzner 2003: 85–6). Capozzi and Roncaglia, after opining that Kant ‘lacks conclusive arguments to support’ his completeness claim, suggests something along a similar line: ‘one must consider that a proof of the completeness of logic would have been easy if Kant had preserved the foundation of logic on empirical psychology and ontology, both ultimately guaranteed by God’ (Capozzi and Roncaglia 2009: 144).
- 4 Husserl claims that Kant ‘asked no transcendental questions about it [i.e. formal logic], but rather ascribed to it an extraordinary apriority, which exalts it above such questions’ (Husserl 1969: 258). For relevant commentaries, see Haaparanta 2009: 148–9 and Bachelard 1990: 200–4.
- 5 I am not suggesting that what Haaparanta describes as the ‘foundational crisis’ of logic in Husserl’s time is identical to the one in Kant’s or that the description captures all the problems facing logic in the nineteenth century. My emphasis is on the need for a ground-up philosophical reform of logic that was felt by Kant and by the post-Kantian philosophers alike – no matter what the needed reform might come down to in each case. In particular, by the time Husserl published the *Logical Investigations* (1900–1), he had witnessed decades of intense debate over the so-called ‘logic question’, which primarily concerned the *philosophical* status of formal logic. The debate solidified a call for reforming logic by reworking its entire system from the very foundation, although the major players in the debate disagreed about what this foundation should be. See Vilkkio 2009; Käufer 2010; Heis 2012.
- 6 In §2.1, we shall see how the controversy over the utility of syllogisms will play out between Locke and Leibniz – and, more importantly, how such a controversy will reflect a deeper disagreement over the nature and foundation of logic. For, as Kant will eventually make clear, it is impossible to settle a debate about the utility of any purported logical rules without clarifying the ground from which they may be derived in the first place.
- 7 Kant’s logic corpus is usually taken to include (1) items he himself prepared for publication, including (though not limited to) the various sections in the *Critique* that discuss logic, (2) his handwritten notes (*Reflexionen*) on logic, (3) transcripts of his logic lectures, and (4) the *Logic* edited by Jäsche (Conrad 1994: 43–5; Young 1992: pp. xviii–xix). When I refer to Kant’s logic corpus in this paper, I include only (2)–(4). These materials have various philological problems, as have been discussed by Boswell (1988), Young (1992) and Conrad (1994) among others. Still, they are indispensable to a full understanding of Kant’s theory of logic. To be methodical, I cite from the corpus only what reflects or is at least compatible with Kant’s views on similar or related topics in his published writings.
- 8 For relevant overviews and discussions, see Buickerood 1985; Hatfield 1997; Capozzi and Roncaglia 2009; Jesseph 2013.
- 9 It was not Aristotle, but later commentators, who collected six of his treatises under the title ‘organon’: *Categories, On Interpretation, Prior Analytics, Posterior Analytics, Topics and On Sophistical Refutations*. As Smith (2014) has pointed out, it is biased to call Aristotle’s logic ‘organon’, since it is debatable whether logic proper is an organon or a canon (i.e. a theoretical science with its own subject matter). As for the syllogistic, I here emphasize its ‘perceived’ centrality in Aristotle’s formal logic. I shall return to this point in n. 35.
- 10 The anti-Aristotelian movement in logic already started before Locke wrote his *Essay*. Bacon, for instance, contended that syllogistic logic is ‘useless for the discovery of sciences’ and is indeed ‘positively harmful’ (Bacon 2000: 35). In its place, he introduced a logic – a new organon – that ‘instructs the understanding and trains it ... to dissect nature truly’ (Bacon 2000: 219–20). Similarly, according to Descartes, the traditional logic merely ‘teaches ways of

- expounding to others what one already knows', whereas a new kind of logic will 'teach us to direct our reason with a view to discovering the truths of which we are ignorant' (Descartes 1985: 186). This new logic would be developed and popularized first through the Port-Royal Logic (Arnauld and Nicole 1996), then through Malebranche's *The Search after Truth*, and finally through Locke's *Essay*. See Schuurman 2004: 34–55.
- 11 For the status and influence of Locke's *Essay* as a treatise on logic, see Buickerood 1985; Winkler 2003; Schuurman 2004: 70–88.
 - 12 Here I treat logical 'forms', 'functions' and 'rules' of thinking or judging interchangeably. As will become clear, the rules that matter to Kant's completeness claim are the ones that govern the act of the understanding in generating various forms of cognitions.
 - 13 Kant based his logic lectures on Meier's *Vernunftlehre* and *Auszug aus der Vernunftlehre*. See 'Kant in the Classroom', <<http://www.manchester.edu/kant/Lectures/lecturesListDiscipline.htm#logic>>.
 - 14 See Malebranche 1997: 209–10, 437, 440–3.
 - 15 For Kant, the Lockean account of the origin of concepts is metaphysical because it concerns the content or matter of cognition. His point is not that logic should not discuss the origin of concepts at all, only that it should not investigate their material origin. It can still – as Kant's own logic of concepts will – explain their logical origin or origin 'as to mere form' (Log, 9: 93).
 - 16 This notion of completeness is clearly different from how 'completeness' is understood today with respect to logic. For an instructive overview of the development of the latter notion since Gödel, see Manzano and Alonso 2014.
 - 17 By the 'content' of logic, I am referring to whatever logic as a science or theoretical doctrine 'presents' (*darlegt*), to borrow Kant's terminology at Bix. This reference is compatible with Kant's aforementioned claim that logic in the proper sense must abstract from all content of thought (i.e. from all its relation to the object).
 - 18 Kant uses the term 'science' in at least two senses – to mean either a system of cognitions arranged by certain principles *whatever they may be*, or a system grounded solely on *a priori* principles. What is a science in the first sense may not be one in the second. For instance, though Kant occasionally refers to psychology as a science (V-Lo/Blomberg, 24: 25; Log, 9: 18; V-Lo/Wiener, 24: 791–2; Refl 1579, 16: 18), he denies it is strict science, for not being based on *a priori* principles (MAN, 4: 471). Now to the extent that Kant is concerned with our *certainty* about the completeness of a science and that we can obtain such certainty – if it is to be objective – only by deriving the entire system of the science from *a priori* principle(s), he must have the strict notion of science in mind. Meanwhile, although A13/B27 refers specifically to 'transcendental philosophy', what makes Kant's remark about its completeness applicable to other strict sciences is his focus on the *possibility* of completion: such possibility 'can be assessed in advance from the fact that our object is not the nature of things, which is inexhaustible, but the understanding [in its *a priori* aspect]' (A12–13/B26).
 - 19 Having the proper form of science is therefore necessary for the possible completion of a system (insofar as we can prove its completeness). It does not immediately follow, however, that whatever has the proper form of science is for that very reason completable (or such that we can be certain about its completeness). As I suggested in the preceding note, the possible completion of a science has fundamentally to do with the nature of its object. Hence, as we shall see, pure logic is completable ultimately thanks to it being a *self-cognition* of the understanding. As such, to borrow Kant's wording at A13/B26 again, its content cannot remain hidden from us, but can rather 'be completely recorded, its worth and worthlessness assessed, and subjected to a correct appraisal'.

- 20 Kant contrasts ‘scholastic’ with ‘popular’ presentation (Refl 6358, 18: 683; Log, 9: 19, 47, 148; V-Lo/Dohna, 24: 779; V-Lo/Wiener, 24: 795–6). On his account, every strict science must be expounded with scholastic correctness (V-Lo/Dohna, 24: 696).
- 21 The understanding in the broad sense is ‘the faculty of cognition of rules (and thus cognition through concepts) in general’, which includes three powers: reason, the understanding in the narrow sense (defined at A51–2/B75–6, as what conjoins with sensibility to yield cognition proper), and the power of judgement (Anth, 7: 196–7). Unless otherwise noted, I will be referring to the understanding in the broad sense.
- 22 Such a reductive project would be more interesting to a logician than to Kant the philosopher. At any rate, no matter whether one succeeds in identifying a set of axiomatic principles to which the rest of a logical system may be reduced, one will still face the foundation question. From the Kantian standpoint, one cannot settle this question just by finding a further principle from which to prove the truth of the axioms. The question is about the *source* of the purported axiomatic principles (or, rather, our representations of them). To answer this question one might say, for instance, that these principles are innate, which we access by intellectual intuition, or that they are acquired through abstraction from experience. Kant would reject both.
- 23 The notion of truth here applies to inferences as well as judgements. Kant sometimes regards a valid or invalid inference as true or false *in forma* (V-Lo/Hechsel, LV, 2: 455). In his view, it is worth adding, the formal truth of a syllogism is not grounded in the law of contradiction (V-Lo/Dohna, 24: 773). Different kinds of syllogism – e.g. categorical versus hypothetical syllogisms – have different principles to determine their validity. For example, the principle of all affirmative categorical syllogisms is ‘a characteristic mark of a characteristic mark is a characteristic mark of the thing itself’, which differs from the principle for all negative categorical syllogisms (DfS, 2: 49). In either case, the principle is not meant to tell us whether a set of judgements constitute an inference at all, but to determine whether a given inference is valid, provided it has the form of an affirmative or negative categorical syllogism.
- 24 Jäsche suggests that his edition of the *Logic* accords with how Kant – as ‘the great reformer of philosophy and ... of this part of theoretical philosophy in particular [i.e. logic]’ – ‘would have worked on logic according to *his* architectonic plan’. The Introduction of the *Logic* can then be read as an articulation of what Jäsche takes to be the Kantian ‘architectonic ideas for a truly purposeful and well-ordered arrangement and treatment of this science’ (Log, 9: 5).
- 25 In many of these passages, Kant compares logical laws with the laws of physics. The gist of the comparison is as follows: the understanding, like everything else in nature, is necessarily governed by laws in its acts of thinking – much as bodies are governed by the laws of physics in their movements. Thus logical laws are *constitutive* of or *essential* to the function of the understanding, to the extent that no thinking would be possible without these laws – much as no bodily movement would be possible without the laws of physics.
- 26 For example, metaphysics ‘discusses the universal objects of the understanding’, physics ‘deals with corporeal objects’ and mathematics treats quantities. See V-Lo/Blomberg, 24: 31, 229; V-Lo/Wiener, 24: 797; V-Lo/Dohna, 24: 717.
- 27 V-Lo/Blomberg, 24: 23; and see: Refl 1579, 16: 20. On Kant’s account, science presupposes a reflective consciousness of the ‘main principle, from which everything else is derived [and which] lies at the basis’ (V-Lo/Dohna, 24: 704; see Log, 9: 139; V-Lo/Blomberg, 24: 227–8).
- 28 Concepts are ‘simple’ in that they are the most basic units of cognition to be treated in logic. It does not follow that they must be assumed as given. To the contrary, as we shall see, even concepts are generated – in respect of their form – through the logical acts of the understanding.

- 29 Thesis (iv) does not appear in the introductory section of the lectures, but only later in the part on concepts. It can nevertheless be included in Kant's prolegomena on thinking in general for two reasons. First, it further specifies his notion of the understanding as the faculty of spontaneity, by telling us what sorts of cognition it is capable of bringing forth itself. Second, this thesis complements thesis (ii), where logic is said to investigate the form of concept, judgement and inference, respectively.
- 30 'Form' has two meanings in Kant's logic corpus. It often means the manner in which a multitude of representations can be combined with one another. (In this sense, for instance, Kant distinguishes different forms of judgement.) Occasionally, however, Kant also uses the same term to mean the nature or essence of a representation. In this sense, one can talk about the form of all concepts (namely, universality or the capacity to represent many things) or that of all judgements (namely, unity of multiple representations in one consciousness).
- 31 Jäsche claims that, in presenting the *Logic* as 'a manual for lectures', he adhered to '[Kant's] express explanation, according to which nothing more may be taken up in the proper treatment of logic, and in particular in its *Doctrine of Elements*, than the theory of the three essential principal functions of thought: *concepts, judgements, and inferences*' (Log, 9: 4). According to Boswell, if Jäsche used problematic editorial methods while compiling the *Logic*, it should not affect the fact that at least 'he was a professional philosopher and ... that Kant himself thought enough of his competence to assign him the task of editing his logic [see Br, 12: 372]' (Boswell 1988: 201). The same cannot be said about the transcribers of Kant's logic lectures.
- 32 See Lu-Adler 2015.
- 33 In 'The False Subtlety of the Four Syllogistic Figures', Kant argues that the second to fourth figures of categorical syllogism are superfluous, being somehow reducible to the first figure. Accordingly, what he takes to be the supreme principles of all affirmative and negative (categorical) syllogisms apply directly to the first figure (DfS, 2: 49). As I pointed out in n. 23, however, such principles concern only the validity of syllogisms. Kant would agree that logic – to ensure an exhaustive treatment of each one of the three topics of its *Doctrine of Elements* (concept, judgement, inference) – must present all possible ways of, say, combining categorical judgments to form categorical syllogisms *before* analysing their relations to one another and stipulating the most basic principles of their validity. Provided in categorical syllogisms singular judgements can be treated like universal ones and infinite judgements like affirmative ones (A71–2/B96–7), 256 possible forms of categorical syllogism can in theory be constructed out of categorical judgements. Accordingly, a complete derivation of the rules for generating inferences – regardless of whether they are valid – must include all such forms.
- 34 This remark suggests that, if Kant takes the Wolffian logic to satisfy the formal conditions of science (i.e. systematicity and apriority), it is not completely *a priori* in Kant's sense. The apriority that Kant deems essential to a non-dogmatic scientific logic requires not simply that all its rules be derivable from a highest logical principle (say, the law of contradiction) in an axiomatic-deductive manner, but that the entire science be grounded in an *a priori* analysis of the faculty of thinking governed by those rules. That is, the rules must be demonstrated from a transcendental standpoint, as what constitute the *a priori* conditions of thinking in general. By contrast, Wolff's logic is a *mere* 'system of science' by the Kantian standard: proceeding dogmatically, all Wolff can offer with respect to logic is 'expound[ing] a system without indicating how all this came about', namely, without grounding it on a 'critique' (V-Met/Mron, 29: 764; and see Refl 4866, 18: 14)

- 35 In the same terms, Kant can address the Locke–Leibniz controversy about the usefulness of the syllogistic (see §2.1) briefly, by saying that it is indeed useful, but only in a limited sense: it presents the rules for assessing the formal correctness of our reasoning, but cannot help to extend our material cognition. If the traditionally perceived centrality of the syllogistic in Aristotle’s logic (see n. 10) had much to do with its pivotal role in Aristotle’s theory of scientific knowledge (*epistēmē*) (see Smith 2014), denying syllogisms any material function in knowledge acquisition also serves to remove the syllogistic from its central position in the Aristotelian logical system. If this is a consequence of Kant’s reconstruction of the Aristotelian formal logic from the ground up, it also reaffirms my earlier suggestion that the debate about the utility of a syllogistic logic cannot be settled without first uncovering the true foundation of this logic (n. 5).
- 36 In the *Dohna-Wundlacken Logic*, warning against the misuse of logic as organon, Kant says: ‘Reason can deceive itself unintentionally when it oversteps the laws of logic.’ (V-Lo/Dohna, 24: 695)
- 37 One thing seems clear in this regard: given Kant’s objection to dogmatic philosophizing, he would refrain from invoking any dogmatic metaphysical claim about our mental constitution to judge whether a particular set of logical rules exhaust all the necessary, formal rules of thinking. The reason likely has to do with the demand to account for the normativity of logical rules. After all, as Conant puts it, no appeal to our mental constitution (metaphysically construed) – be it caused ‘by our Creator, or by the workings of nature’ – would suffice to establish logical rules as absolutely binding (Conant 1991: 130–1). Kant’s approach would then differ from Descartes’s, for example, which would base the binding force – and, for that matter, the possibility of a complete representation – of all putative logical rules on the ordainment of God as ‘the supreme legislator’ (Descartes 1984: 294).
- 38 Kant is evidently familiar with the developments in logical calculus inspired by Leibniz’s vision (PND, 1: 390).
- 39 I am indebted to the anonymous referees of this paper for many insightful comments and constructive suggestions that led to substantive improvements. I am also thankful to Jessica Gordon-Roth, Kristen Irwin, Jennifer Marusic, Lara Ostaric and Alison Simmons for discussions on the earliest version of the paper. Any infelicities that may remain are purely my own.

References

- Arnauld, Antoine, and Pierre Nicole (1996) *Logic or the Art of Thinking* (Port-Royal Logic), trans. and ed. Jill V. Buroker. Cambridge: Cambridge University Press.
- Bacon, Francis (2000) *The New Organon*, ed. Lisa Jardine and Michael Silverthorne. Cambridge: Cambridge University Press.
- Bachelard, Suzanne (1990) *A Study of Husserl’s Formal and Transcendental Logic*. Evanston, IL: Northwestern University Press.
- Boswell, Terry (1988) ‘On the Textual Authenticity of Kant’s Logic’. *History and Philosophy of Logic*, 9, 193–203.
- Buickerood, James G. (1985) ‘The Natural History of the Understanding’. *History and Philosophy of Logic*, 6, 157–90.
- Capozzi, Mirella, and Gina Roncaglia (2009) ‘Logic and Philosophy of Logic from Humanism to Kant’. In Leila Haaparanta (ed.), *The Development of Modern Logic*. Oxford: Oxford University Press, pp. 78–158.
- Conant, James (1991) ‘The Search for Logically Alien Thought’. *Philosophical Topics*, 20(1), 115–80.

- Conrad, Elfriede (1994) *Kants Logikvorlesungen als neuer Schlüssel zur Architektonik der Kritik der reinen Vernunft*. Stuttgart: Frommann-Holzboog.
- Descartes, René (1984) 'Objections and Replies'. In John Cottingham *et al.* (trans. and ed.), *The Philosophical Writings of Descartes*, vol. 2 (Cambridge: Cambridge University Press), pp. 63–397.
- (1985) 'Principles of Philosophy, preface to French edition'. In John Cottingham *et al.* (trans. and ed.), *The Philosophical Writings of Descartes*, vol. 1, (Cambridge: Cambridge University Press), pp. 179–90.
- Fries, Jakob Friedrich (1837) *System der Logik*. Heidelberg: C. F. Winter.
- Haaparanta, Leila (2009) 'The Relations between Logic and Philosophy, 1874–1931'. In Leila Haaparanta (ed.), *The Development of Modern Logic* (Oxford: Oxford University Press), pp. 222–62.
- Hatfield, Gary (1997) 'The Workings of the Intellect'. In Patricia Easton (ed.), *Logic and the Workings of the Mind* (Atascadero, CA: Ridgeview Publishing), pp. 21–45.
- Heis, Jeremy (2012) 'Attempts to Rethink Logic'. In Allen W. Wood and Songsuk Susan Hahn (eds), *The Cambridge History of Philosophy in the Nineteenth Century (1790–1870)* (Cambridge: Cambridge University Press), pp. 95–132.
- Husserl, Edmund (1969) *Formal and Transcendental Logic*, trans. Dorion Cairns. The Hague: Martinus Nijhoff.
- (1970) *Logical Investigations*, trans. J. N. Findlay. London: Routledge & Kegan Paul.
- Jesseph, Douglas M. (2013) 'Logic and Demonstrative Knowledge'. In Peter R. Anstey (ed.), *The Oxford Handbook of British Philosophy in the Seventeenth Century* (Oxford: Oxford University Press), pp. 373–90.
- Kant, Immanuel (1998) *Logik-Vorlesung: Unveröffentlichte Nachschriften*, ed. Tillmann Pinder. Hamburg: Felix Meiner Verlag.
- Käufer, Stephan (2010) 'Post-Kantian Logical Radicalism'. In Dean Moyar (ed.), *The Routledge Companion to Nineteenth Century Philosophy* (New York: Routledge), pp. 809–36.
- Kemp Smith, Norman (1918) *A Commentary to Kant's 'Critique of Pure Reason'*. London: Macmillan.
- Leibniz, Gottfried W. (1956) 'Letter to Gabriel Wagner on the Value of Logic, 1696'. In *Philosophical Papers and Letters*, trans. and ed. Leroy E. Loemker (Chicago: Chicago University Press), pp. 753–69.
- (1996) *New Essays on Human Understanding*, trans. and ed. Peter Remnant and Jonathan Bennett. Cambridge: Cambridge University Press.
- Locke, John (1975) *An Essay Concerning Human Understanding*, ed. Peter H. Nidditch. Oxford: Oxford University Press.
- Lu-Adler, Huaping (2015) 'Constructing a Demonstration of Logical Rules, or How to Use Kant's Logic Corpus'. In Robert R. Clewis (ed.), *Reading Kant's Lectures* (Berlin: Walter de Gruyter), pp. 136–58.
- Maimon, Salomon (1794) *Versuch einer neuen Logik oder Theorie des Denkens*. Berlin: Ernst Felisch.
- Malebranche, Nicolas (1997) *The Search after Truth*, trans. and ed. Thomas M. Lennon and Paul J. Olscamp. Cambridge: Cambridge University Press.
- Manzano, Maria and Enrique Alonso (2014) 'Completeness: from Gödel to Henkin'. *History and Philosophy of Logic*, 35(1), 50–75.
- Mosser, Kurt (2007) 'Kant's Logic(s) and the Logic of Aristotle'. *Southwest Philosophy Review*, 23(1), 125–35.
- Paton, H. J. (1936) *Kant's Metaphysics of Experience*, vol. 1, London: George Allen & Unwin.

- Schuurman, Paul (2004) *Ideas, Mental Faculties, and Method*. Leiden: Brill.
- Smith, Robin (2014) 'Aristotle's Logic'. In *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta (ed.), <<http://plato.stanford.edu/archives/spr2014/entries/aristotle-logic>>.
- Stelzner, Werner (2003) 'Psychologism and Non-Classical Approaches in Traditional Logic'. In Dale Jacquette (ed.), *Philosophy, Psychology, and Psychologism: Critical and Historical Readings on the Psychological Turn in Philosophy* (Dordrecht and Boston: Kluwer Academic Publishers), pp. 80–112.
- Vilkko, Risto (2009) 'The Logic Question during the First Half of the Nineteenth century'. In Leila Haaparanta (ed.), *The Development of Modern Logic* (Oxford: Oxford University Press), pp. 203–21.
- Windelband, Wilhelm (1958) *A History of Philosophy*, trans. James H. Tufts. New York: Harper & Brothers.
- (1961) *Theories in Logic*, trans. B. Ethel Meyer. New York: Philosophical Library.
- Winkler, Kenneth (2003) 'Lockean Logic'. In Peter R. Anstey (ed.), *The Philosophy of John Locke: New Perspectives* (London: Routledge), pp. 154–78.
- Young, Michael J. (1992) 'Translator's Introduction'. In Michael J. Young (ed.), *Lectures on Logic* (Cambridge: Cambridge University Press), pp. xv–xxxii.