

8-1-2017

Making < cinnabar > : Kant on Made A Posteriori Concepts

Sophie Cote

University of Wisconsin-Milwaukee

Follow this and additional works at: <https://dc.uwm.edu/etd>

 Part of the [Philosophy Commons](#)

Recommended Citation

Cote, Sophie, "Making < cinnabar > : Kant on Made A Posteriori Concepts" (2017). *Theses and Dissertations*. 1600.
<https://dc.uwm.edu/etd/1600>

This Thesis is brought to you for free and open access by UWM Digital Commons. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of UWM Digital Commons. For more information, please contact open-access@uwm.edu.

MAKING <CINNABAR>:
KANT ON MADE A *POSTERIORI* CONCEPTS

by
Sophie Cote

A Thesis Submitted in
Partial Fulfillment of the
Requirements for the Degree of

Master of Arts
in Philosophy

at
The University of Wisconsin-Milwaukee
August 2017

ABSTRACT

MAKING <CINNABAR>:
KANT ON MADE A *POSTERIORI* CONCEPTS

by

Sophie Cote

The University of Wisconsin-Milwaukee, 2017
Under the Supervision of Professor William Bristow

The topic of this paper is Kant's distinction between given and made concepts. A made concept is 'created by us arbitrarily', while a given concept is 'produced either through the nature of our understanding or through experience' (24:131). Kant's most frequent examples of made concepts are mathematical concepts, such as <triangle>. But mathematical concepts exemplify just one kind of made concepts, namely made *a priori* concepts. Concepts can also be made *a posteriori*. The question 'What is a made *a posteriori* concept?' has received little attention. The purpose of this paper is to address this question. I argue that made *a posteriori* concepts are representations of real essences. As such made *a posteriori* concepts serve to explain—or grant 'insight' into the causes of—observable properties of objects. I show further that made *a posteriori* concepts are not abstracted from experience. Rather, they are posited as hypotheses in the course of scientific investigation and are for this reason 'created by us arbitrarily'. Hypotheses are justified by their explanatory power in relation to observable properties of objects and are for this reason *a posteriori*. In closing I suggest that my reading helps account for the connection between making a concept and making an object which Kant draws, not just in mathematics, but also in the empirical sciences.

TABLE OF CONTENTS

1	Two preliminaries	2
1.1	The distinction between given and made concepts	2
1.2	Kant's examples of made a posteriori concepts	4
2	Making room for a new reading	5
2.1	The amplification reading	5
2.2	Two objections to the amplification reading	6
3	Sketching a new reading	8
3.1	Made concepts and superordination	8
3.2	Given concepts and coordination	10
3.3	Made a posteriori concepts result from investigation	12
3.4	'Arbitrary' and 'a posteriori', redux	14
3.5	Tying up loose ends	16
4	Further evidence: from making the concept to making the object	17
5	References	21
6	Appendix: original German passages	25

Introduction

The topic of this paper is Kant's distinction between given and made concepts. A made concept is 'created by us arbitrarily', while a given concept is 'produced either through the nature of our understanding or through experience' (24:131).¹ Kant's most frequent examples of made concepts are mathematical concepts, such as <triangle>. For this reason, the distinction has figured prominently in discussions of Kant's philosophy of mathematics.² But mathematical concepts exemplify just one kind of made concepts, namely made *a priori* concepts. Concepts can also be made *a posteriori*. The question 'What is a made *a posteriori* concept?' has received little attention. The purpose of this paper is to address this question.

The distinction between given and made concepts is central to Kant's philosophy of science. Kant takes Newton to have shown that mere observation cannot yield scientific knowledge of the natural world. Instead, the given representations obtained from observation must be ordered by made concepts; only then can 'the agreement among appearances ... count as laws' (Bxiii). Made *a priori*, or mathematical, concepts order the observations of physics. Do made *a posteriori* concepts fulfill an analogous function? In the literature, all authors deny that they do. I show that this is a mistake, which rests on various incorrect answers to the question 'What is a made *a posteriori* concept?'. I argue that made *a posteriori* concepts are hypothetical representations of essences. As a result, I suggest that made *a posteriori* concepts order the observations of chemistry.

Here is the plan for the paper: To begin, I say more on the distinction between given and made concepts, and present Kant's examples of made *a posteriori* concepts (§1.1-1.2). I then refute available accounts, with an eye to undermining the claim that made *a posteriori* concepts are inconsequential to Kant's philosophy of science (§2.1-2.2). This makes room for my own account, which I spend the bulk of the paper defending. I argue that made *a posteriori* concepts grant insight into

1. References to the *Critique of Pure Reason* are to the A and B pagination of the first and second editions. References to the *Reflexionen* are by numbers. All other references are to the volume and page of the *Gesammelte Schriften* (Kant 1900). I follow the *Cambridge* translations where available (Kant 1992, 1997, 1998, 2003, 2004, 2005, 2012). Translations are otherwise my own, and I give the German in an appendix.

2. See Callanan 2014, 583-4, 590; Capozzi 1980, 426; Carson 1999, 633-5; 2006, 10-12; 2013, 309-15; Dunlop 2012, 94-96; 2014, 677; Heis 2007, 149; 2014, 608-9; forthcoming; Jong 1995, 245-6; Kim 2006, 156; Shabel 2006, 99.

things by explaining the causes of their properties. In other words, made *a posteriori* concepts are representations of essences (§3.1-3.3). Next, I propose that made *a posteriori* concepts are ‘created arbitrarily’ because they are scientific hypotheses (§3.4-3.5). In closing, I substantiate my reading by showing that it accounts for three of Kant’s remarks on methodology in chemistry (§4).

1 Two preliminaries

1.1 *The distinction between given and made concepts*

According to Kant, concepts are either given or made. Given and made concepts do not differ in form. *All* concepts apply to potentially many objects, so all concepts are general in form (9:91). What’s more, *we* confer generality to our representations, and thus ‘the form of a concept ... is always made’ (9:93).³ Given and made concepts differ rather in what determines their content. On Kant’s view, each concept is composed of various ‘marks’, which are both predicates and properties of objects.⁴ The content of a concept is the marks that make it up. For example, the content of <octagon> is <figure> and <eight sides> (24:254). (I indicate concepts in angle brackets.)

All given concepts are formed tacitly. Given *a posteriori* concepts are ‘given to us through experience’ (24:914). Experience consists in ordered sensory impressions (A1=B1); that is, experience presents us perceptually with objects (Bxvii). At first blush, then, given *a posteriori* concepts are determined only by past perceptual encounters with objects.⁵ Examples include the concepts of a horse, a sheep (24:253) and water as ‘a fluid body’ (24:914). What the class of given *a posteriori* concepts encompasses is at issue, so I defer a more meticulous analysis. Given *a priori* concepts are determined by ‘the nature of our understanding’ (24:131). The understanding is our capacity for thought; it conceptually structures experience (A19=B33). Given *a priori* concepts are preconditions on our experiencing the world as we do. These include <quantity> and <cause> (24:756).

3. For discussion, see Longuenesse (2001, 61-8), Newton (2015, 469-73 and *passim*) and Pippin (1982, 112-19).

4. In Kant’s words: ‘A mark is that in a thing which constitutes a part of the cognition of it, or ... a partial representation, insofar as it is considered as ground of cognition of the whole representation’ (9:58). The move from property (‘that in the thing’) to predicate (‘a partial representation’) is of course puzzling. For discussion, see Smit 2000, 247-8.

5. I borrow the phrase from Rosenberg (2005, 33).

Made concepts, in contrast, are ‘created by us arbitrarily [*willkürlich*]’ (24:132). Following the eighteenth-century usage, ‘arbitrarily’ means electively, and not at random. As Kant clarifies elsewhere, made concepts are determined only by our own volition, or power of choice [*Willkür*] (24:914).⁶ In practice, made concepts originate in something like a stipulative definition, or ‘arbitrary synthesis’ (24:918). (I have some misgivings about the talk of stipulation, which I explain in due course.) Mathematical concepts, according to Kant, are made in this sense: ‘[w]hatever the concept of cone may ordinarily signify, in mathematics the concept is the product of the arbitrary representation of a right-angled triangle which is rotated on one of its sides’ (2:276).

Mathematical concepts are made *a priori* (24:915). But concepts can also be made *a posteriori*: ‘[a]rbitrary concepts can be made both *a priori* and *a posteriori*’ (24:918). I pause to say a word on Kant’s usage of the phrase ‘*a posteriori*’. Setting difficulties aside, a concept is *a posteriori* if its content is answerable to experience (B2). Now, it is not immediately obvious how a concept can be both made—its content determined only by my own volition—and *a posteriori*—its content answerable to experience. Kant offers just two examples, and both are drawn from chemistry: ‘the concept of the essence of gold’ and ‘the nature of metal’ (24:132; 24:914).⁷

I have steered clear of the term ‘empirical’. I believe that Kant does not use ‘empirical’ and ‘*a posteriori*’ interchangeably, at least in the context relevant to my topic. Here my reading departs from others I consider. In order not to beg any questions, I avoid the term ‘empirical’ until §3. Last, and by way of summary, here are Kant’s examples again:

	<i>a priori</i>	<i>a posteriori</i>
given	<quantity>	<horse>
made	<triangle>	<essence of gold = ...>

6. *Willkür* is also, and primarily, the capacity to decide how to act. Kant quotes Juvenal’s ‘*sic volo, sic jubeo*’ [thus I will, thus I command] to describe both the autonomous law-givingness of practical reason (5:31) and the arbitrariness of mathematics: ‘The mathematician says in his definition: *sic volo, sic iubeo* [sic]’ (*Reflexion* 2930, my translation).

7. I assume with other interpreters that what is made is the concept we acquire of the essence, not the one composed strictly of the two marks <essence> and <of gold>. In the table below, I resort to an ellipsis: <essence of gold = ...>.

1.2 Kant's examples of made *a posteriori* concepts

The scientific character of Kant's examples of made *a posteriori* concepts has not generally been noted. On the contrary, it has been claimed that Kant puts forward a non-scientific example. The purported example is found in the *Critique*, where Kant mentions the concept <ship's clock> and says it is made (A729=B757). A ship's clock is a clock precise enough for the computation of longitude. Such an instrument did not exist until 1773, and before then the concept applied to a merely fictive object (Kant 1998, 752 n10). Many have speculated that <ship's clock> is a made *a posteriori* concept (Callanan 2014, 589; Dunlop 2012, 96; Heis forthcoming, 12; Paton 1936, 197).

Two existing accounts of made *a posteriori* concepts are premised on the conjecture that <ship's clock> is made *a posteriori*. Heis and Paton propose that a concept is made *a posteriori* if the concept is stipulated and applies, or would apply, to physical objects. Besides <ship's clock>, alleged examples include <swampman> (Heis 2007, 149) and <centaur> (Paton 1936, 197). Messina and Stang suggest that a concept is made *a posteriori* if the concept applies to a merely conventional kind, i.e. not a natural kind. Alleged examples include <table> (Messina 2015, 429) and <weed> (Stang 2016, 237). The two readings are sketched in passing. Perhaps this betrays the widespread assumption that made *a posteriori* concepts are inconsequential to Kant's philosophy of science. If either of these readings is correct, the assumption is of course quite justified.

But <ship's clock> is not made *a posteriori*. In a lecture contemporaneous with the *Critique*,⁸ Kant writes: 'we can also have a concept *a priori* factitius [or made] This is how it happens with someone who invents a new instrument' (24:915). That is, the concepts of invented instruments are made *a priori*. The context rules out any confusion, as Kant is explicitly contrasting made *a priori* and *a posteriori* concepts. <ship's clock> is the concept of an invented instrument, so we must infer that it is made *a priori*.⁹ Therefore the example does not lend support to either reading; on the contrary, it constitutes a counter-example to both. In conclusion, Kant's only examples of made *a posteriori* concepts (<essence of gold> and <nature of metal>) are scientific concepts.

8. Adickes dates the *Vienna Logic* to 1780-1. This dating is matter of dispute, however. See Forster (2012, 490-3).

9. Only Nunez advances the correct diagnosis, but without textual evidence (2014, 653 n10).

2 Making room for a new reading

I now present and refute the third available reading of made *a posteriori* concepts, which I dub the ‘amplification reading’. This makes room for my own reading, which I defend in the next section.

2.1 The amplification reading

The third extant reading does justice to Kant’s own examples. Indeed, the reading takes as its starting point the dependence of made *a posteriori* concepts on scientific investigation. Kant writes:

I have a piece of metal[;] that is always given *a posteriori*, not made. If I want to have a distinct concept of it, however, then I have to test the metal for all its properties ... the nature of metal is thus a concept made *a posteriori*. (24:914)

That is, a given *a posteriori* concept precedes investigation, while a made *a posteriori* concept results from it (‘I have to test the metal’). If so, perhaps a given *a posteriori* concept is the concept I first possess of the object, or a conceptual stereotype that allows me to so much as recognize the object. Investigation takes place when I decide to add to my concept by acquiring further information about the thing. A concept that contains a mark obtained from investigation is made *a posteriori*. Call this the ‘amplification reading’. This reading is defended by Dunlop (2012), Nunez (2014) and Young (1992; 1994).¹⁰

If made *a posteriori* concepts are characteristically scientific, it is because science is the main avenue for ‘conscious investigat[ion]’ (Young 1994, 338). But given and made *a posteriori* concepts do not constitute radically different kinds of representations. Both are empirical concepts (Dunlop 2012, 94), because both are formed from marks obtained through observation. Kant calls

10. The main text presents a neutral gloss on the view. Let me briefly address the variants.

- (i) As noted in §1.2, Dunlop takes <ship’s clock> to be made *a posteriori*. So far as I can tell, made *a posteriori* concepts are believed to form a disparate class (2012, 94, 96, 117 n19).
- (ii) For Nunez, made *a posteriori* concepts are ‘arrive[d] at through hypothesis ... which we test against appearances through observation’ (Nunez 2014, 653 n10). Perhaps the emphasis on hypotheses sets Nunez’s proposal apart—and closer to the one I am about to defend. Nevertheless, I discuss a disagreement in footnote 29.

‘empirical synthesis’ the process of adding marks to a concept through observation, and concepts obtained in this way are ‘made empirically’ (24:918). On the amplification reading, made *a posteriori* concepts are made by empirical synthesis, or made empirically. As proponents of this reading point out (Dunlop 2012, 95; Young 1992, 338 fn16), §102 of the *Jäsche Logic* seems to offer conclusive evidence in support of this reading: ‘the synthesis of concepts that are made ... is either that of *exposition* (of appearances) or [*a priori*]. ... the former ... are made empirically’ (9:141).

Authors diverge in how they explain the arbitrariness of made *a posteriori* concepts. Perhaps the content of a made *a posteriori* concept is contingent upon our choice of experiment; or perhaps our investigation of the thing must ‘begin as it were, by legislating the conditions a thing must satisfy to qualify as an instance of the concept in question’ (e.g. let’s only call ‘water’ what has a hydrogen-1 isotope) (Young 1992, 111). In either case, the arbitrariness of made *a posteriori* concepts consists in the contingency of their content, and the ‘madness’ of made *a posteriori* concepts is of little philosophical interest.

2.2 *Two objections to the amplification reading*

The dependence of made *a posteriori* concepts on investigation is central to Kant’s view. My first objection, however, is that the reading mischaracterizes this dependence. Again, the suggestion is that a concept is made *a posteriori* if it contains at least one mark obtained from empirical investigation. But in a previously cited passage Kant makes a different point. To possess a made *a posteriori* concept, I must test the thing ‘for *all* its properties’ (24:914, my emphasis). Testing for just one property does not yield a made *a posteriori* concept. This conclusion entails further that the arbitrariness of made *a posteriori* concepts cannot consist in the contingency of their content. If I must test the thing of all its properties, then my decision to first investigate a certain property, or to treat it as characteristic of the kind, does not influence the content of my concept.

Perhaps the passage should not be read literally. Indeed Kant often asserts that we ‘cannot possibly examine an object regarding all its properties’ (Kant 1992, 409). If read literally, the passage imposes a condition on made *a posteriori* concepts that simply cannot be met; yet there

exist made *a posteriori* concepts. This contradiction is reason not to read the passage literally. If testing a thing for all its properties is not a condition on our possessing a made *a posteriori* concept, maybe it is one goal of scientific inquiry. Yet a *Reflexion* of the same period rules out this non-literal reading. A made concept of an object of experience is ‘only possible if’ the object is ‘grasped in all its determinations’ (*Reflexion* 5221, my translation). For present purposes, a determination just is a property (24:931; A598=B626). This *Reflexion* reaffirms that testing for just one property does not yield a made *a posteriori* concept. The amplification reading is forced to disregard these passages. I will shortly defend a solution to the tension between Kant’s various claims that is interpretively more satisfying and philosophically more interesting.

My second objection is that the amplification reading is incompatible with the very text—the *Jäsche Logic*—that is used to motivate it. Recall that on this reading, (i) given and made *a posteriori* concepts are empirical, and (ii) a concept is made *a posteriori* if it is made empirically, or by empirical synthesis. We saw that §102 is evidence in support of (ii). Difficulties arise, however, from the footnote to §102, which reads: ‘all empirical concepts must thus be regarded as concepts that are made, whose synthesis is ... empirical’. Factoring (i) and (ii) into this footnote produces the claim that all given or made *a posteriori* concepts are made *a posteriori*. Yet Kant upholds the distinction between given and made *a posteriori* concepts in the *Jäsche Logic* (9:141), and makes clear that the class of given *a posteriori* concepts is not empty (9:64). Thus, claims (i) and (ii) entail textual contradictions in spite of textual evidence in support of (ii).¹¹

We must weigh the main text of §102 against the rest of the *Jäsche Logic*. I suggest we dismiss whatever evidence §102 offers in support of claim (ii), that is, the claim that made *a posteriori* con-

11. In response to something like this objection, Dunlop writes (2012, 117 fn19):

In *Reflexionen* 2910 and 2914, Kant indicates that all empirical concepts are made in this way [empirically]. But at this stage, he does not seem to recognize *a priori* factitious concepts as different in kind from both empirical and “rational” (*a priori*) given concepts, which suggests that the given/made distinction has not yet become an axis of classification distinct from the rational/empirical one. ... §102 of the *Jäsche Logic* can thus be taken to address the inadequacy of the earlier taxonomy.

But *Reflexion* 2910 is dated by Adickes to 1776-1778 or 1790-1792, and the distinction between given and made concepts—each *a priori* or *a posteriori*—appears as soon as the *Blomberg Logic* of the early 1770’s. At any rate, and as I show in the main text, the same tension is found within the confines of §102.

cepts are made empirically, or by empirical synthesis.¹² What motivates this interpretive decision are the following two considerations. First, the footnote to §102 indicates that concepts made empirically are ‘not arbitrary, however’. There is no reason, besides §102, to suspect that Kant gave up the view that made *a posteriori* concepts are arbitrary. Second, Kant elsewhere contrasts the arbitrary synthesis of made *a posteriori* concepts with the empirical synthesis of empirical concepts (24:918). Thus the evidence for (ii) is flawed, and I rule against the amplification reading.

3 Sketching a new reading

I now defend an alternative reading. I hope to demonstrate that the connection between made *a posteriori* concepts and scientific investigation runs deeper than existing interpretations suggest.

3.1 *Made concepts and superordination*

I begin to build my case by noting the link between made *a posteriori* concepts and ‘having insight’. The latter is a term of art. Kant follows the rationalist tradition in identifying seven ways we can apprehend objects, from representing [*sich etwas vorstellen*] to comprehending [*comprehendere, begreifen*]. In an overlooked passage of the *Blomberg Logic*, Kant discusses made concepts in relation to the sixth and penultimate degree, having insight [*einsehen*] (24:132-5). The concept of the essence of gold, Kant seems to suggest, grants insight into gold. This connection, between a made *a posteriori* concept and having insight, is the one I wish to expound and build on.

To have insight into a thing, Kant indicates in the passage under discussion, is to represent a thing ‘through mediate marks, [to] infer, then, and thus search for a *nota notae*, a mark of the mark’ (24:135).¹³ This gloss poses an interpretative difficulty. Kant departs from the rationalist tradition in distinguishing between two sorts of mediate marks, namely, *logically* and *really* mediate marks. It is not clear from Kant’s gloss which sort of mediate marks is required to have insight.

12. Paton also alleges ‘some confusion’, ‘perhaps due to the notetaker’ (1936, 197 fn4).

13. All concepts are mediate representations, because they apply to objects *via* the marks they contain (A68=B93). But concepts may be mediate or immediate marks of a thing. Cf. Longuenesse (2001, 88 fn15).

Here is first a general characterization of mediate marks. Consider an object x and two distinct marks M_1 and M_2 correctly predicated of x . If M_2 is superordinate to M_1 , then M_2 is a mediate mark of x . Conversely, if M_1 is superordinate to no mark of x , then M_1 is an immediate mark of x (24:108). The explanatory burden is now on superordination. (By ‘superordination’ I mean the inverse relation to subordination. Talking of superordination enables me to keep the focus on mediate marks.) Superordination is a deductive relation amongst marks. It comes in two kinds (2:260), corresponding to the two aforementioned sorts of mediate marks.

Logical superordination is a matter of conceptual containment. M_2 is logically superordinate to M_1 if M_1 contains M_2 as a constituent (24:108). For example, <man> is logically superordinate to <bachelor>. Imagine I recognize Tim as a bachelor and affix the mark <bachelor> to Tim. <man> is logically superordinate to <bachelor>, so <man> is a logically mediate mark of Tim.

Real superordination is a matter of causal entailment.¹⁴ M_2 is really superordinate to M_1 if M_2 is the cause of M_1 (24:260). For example, <was chilled> is really superordinate to <catches a cold> (28:403). Consider then sick Tim, who possesses the mark <catches a cold>. <was chilled> is really superordinate to <catches a cold>, so <was chilled> is a really mediate mark of sick Tim.

Back to having insight. Recall that to have insight into a thing is to ‘cognize [the thing] through mediate marks’. But which sort, if not both? On two occasions, Kant suggests that having insight requires cognizing the thing through really mediate marks. ‘[B]y means of analysis’, Kant writes, ‘I cannot have insight’ (2:370);¹⁵ analysis just is the cognition of logically superordinate marks (9:142). Second, Kant once glosses having insight as knowing causes (24:51). I conclude that to have insight into a thing I must cognize at least one of the thing’s really mediate marks.¹⁶

14. I assume that real superordination is only causal. See 24:260: ‘Real [super]ordination ... consists in the fact that marks ‘cohere as causes and effects’. In spite of like passages, Stang perceives a distinction between causal and non-causal real superordination, and contends that essential and non-essential marks—which are at issue in this paper—stand in a relation of non-causal real superordination (2016, 209). I believe this much is mistaken, for Kant indicates that essential marks are causes (24:113). At any rate, the precise nature of the relation plays no role in my argument.

15. The *Cambridge* edition incorrectly renders ‘einsehen’ as ‘understanding’, and obscures this point (2003, 356).

16. Two remarks on this conclusion: (i) I acknowledge that most often Kant’s glosses are ambiguous (24:152, 24:539, 24:730, 24:840, 28:24). Still, there is no doubt that insight into at least empirical objects requires more than logically mediate marks. This claim fuels Kant’s objections to the Leibnizian-Wolffian program. (ii) To have insight is also to cognize *a priori* (24:133). I believe Kant intends here only the Leibnizian sense of priority as cognition through mediate marks (*cf.* Smit 2009; Stang 2016, 23)

I noted that Kant suggests a connection between made *a posteriori* concepts and having insight. In light of my discussion of ‘having insight’, I hypothesize that a concept is made *a posteriori* if it is made up of some of the really mediate marks of a thing. I now substantiate this hypothesis.

Evidence for this hypothesis can be adduced from Kant’s own examples. Recall that the concepts of the essence of gold and the nature of metal are made *a posteriori*. ‘Nature’ and ‘essence’ are synonyms (24:840).¹⁷ Now, Kant defines ‘essence’ as ‘the first ... ground of all that which belongs to the thing itself’ (29:820);¹⁸ a ground is nothing other than a mediate mark. Furthermore, Kant elsewhere clarifies that the essence contains the really mediate marks of the thing (28:49). In summary, the essence of a thing is made up of the really mediate marks most superordinate to ‘all that which belongs to the thing itself’.

Let us now ask what ‘belongs to the thing itself’. On an intuitive picture, the essence of a thing causes only its necessary properties. The essence of gold plausibly causes its conductivity and malleability, but not that it is valued at \$37 per gram. This is just Kant’s view. The essence of a thing is the sufficient cause of its *attributa* (or ‘Eigenschaften’) (8:229, translated in Kant 1973, 141). Equivalently, the *attributa* are the consequences of the thing’s essence. As Kant makes plain, *attributa* just are ‘necessary marks’ (9:113).

To sum up, here is what I have just shown. Kant’s own examples suggest that a concept is made *a posteriori* if it explains the causes of the thing’s properties. That is, a concept is made *a posteriori* if it contains the thing’s really mediate marks. For this reason, made *a posteriori* concepts grant insight into the thing.

3.2 *Given concepts and coordination*

I have not yet shown that the connection to having insight is characteristic of made concepts. I now argue that given *a posteriori* concepts only grant the fifth and immediately lower degree of cognition, understanding. (Understanding should not be confused with the understanding

17. Or close enough, and at least for concrete objects (Messina, forthcoming, 16; Oberst, n.d.; Stang 2016, 238-239).

18. I omit (with an ellipsis) the qualification, ‘inner’ ground. An object is also determined by ‘outer’ grounds, which do not however figure in its essence (28:52). These include the conditions on sensible experience.

[*der Verstand*], which is our capacity for thought. All concepts originate in the understanding.) In contrast to having insight, to understand is to represent a thing ‘through immediate marks’ (24:132). I proceed in two steps. I show that: (i) all given *a posteriori* concepts are abstracted from experience, and (ii) all concepts abstracted from experience contain only really immediate marks.

To abstract a concept from experience is roughly to single out the sensible marks common to all known instances of the kind (24:126). The shortest argument to (i) is simply to point out that at 24:253 Kant writes: ‘[a]ll *conceptus a posteriori dati* [given *a posteriori* concepts] are abstracted *ab experientia* [from experience]’. A more roundabout argument is available, which relies on Kant’s technical use of the term ‘empirical’. First, a concept is empirical if and only if it is abstracted from experience (24:905). Second, a given *a posteriori* concept just is an empirical concept. Kant lists the two as synonyms at 24:756 and 24:918. Again we must conclude that all given *a posteriori* concepts are abstracted from experience.

I now turn to (ii), *viz.* the claim that all concepts abstracted from experience contain only really immediate marks. First, note that two immediate marks of a thing cannot stand in a relation of superordination to one another. If a mark is superordinate to another, it is mediate relative to the thing. Marks that are not superordinate are coordinate. Kant thinks that ‘with empirical cognitions, there is not a series of [super]ordinate, but only of coordinate’ marks (24:155). Equivalently, experience only provides immediate marks (2:294), and one ‘can never experience a cause’ as a cause (24:752). Thus relations of real superordination are not abstracted from experience.

I pause to acknowledge a difficulty. If experience only provides immediate marks, then relations of logical superordination are not abstracted from experience either. This is indeed Kant’s view (see A305=B362). Relations of logical superordination arise only through reflection on what is common to various concepts. For example, and very roughly, reflection on <rabbit>, <cat>, <horse> etc. yields the superordinate concept <mammal>. It may be objected that this aspect of Kant’s view is at odds with the reading I defend. I have argued that all empirical concepts are abstracted from experience. Yet, the objection goes, we routinely deduce logically superordinate marks. For example, we may deduce from the fact that Tim is a bachelor that he is a man and

therefore mortal. Such a logical deduction follows relations of logical superordination that are not abstracted from experience. Perhaps my reading entails the implausible claim that the concept I possess after the logical deduction (e.g. <Tim = bachelor, mortal>) is not empirical.

I grant that this would be an implausible claim. But such a claim is not entailed by my reading. For Kant, logical deduction serves to clarify the content of my concept, but not to change it in any way. The mark <mortal> 'is already there' as soon as I recognize Tim as a bachelor (24:131). Of course, this mark may be only 'obscure[ly]' thought (24:130). Logical deduction serves precisely to clarify the content of my concept. But logical inference does not amplify the concept I possess of the thing, so I 'do not cognize any more in a thing than [I] have already thought in it previously' (24:131). In conclusion, the content of given *a posteriori* concepts is wholly abstracted from experience. In contrast, made *a posteriori* concepts contain really mediate marks of the thing, which do amplify my knowledge of the thing and are not abstracted from experience. Thus a clear distinction between given and made *a posteriori* concepts can be maintained.

3.3 *Made a posteriori* concepts result from investigation

Let us then ask how made *a posteriori* concepts arise, or—what is the same—how really mediate marks are obtained. Kant's answer, in short, is that really mediate marks (i.e. the *relata* of causal relations) are inferred on the basis of experience (28:24; 24:237). '[T]here is a sun in the heavens, the barometer has fallen or risen', 'gold does not rust' (24:231)—these judgments ascribe immediate marks to their subjects and are evident from perceptual experience (Vanzo, forthcoming, 23). The cause of these various marks are only grasped by careful empirical investigation and scientific inference (24:231). The same is true of the causes of a thing's properties:

To understand something is far easier than to have insight into something, for in the first case it is only necessary that I coordinate the marks of a thing, but in the other case I must [super]ordinate them. To understand what gold is I need nothing more than to know the properties [*Eigenschaften*] of this metal, that it is, e.g., ductile, yellow,

heavier than others, etc., that it does not rust. But to have insight into what gold is I must investigate one of its marks in particular and abstract from it its ground. E.g., why it does not rust, why is it ductile, heavier than others. (24:135)

Inferring essential marks poses specific difficulties.¹⁹ For most of his writing years, Kant endorses the phlogistic theory of the German chemist Georg Stahl. For Stahl, and for Kant, the essences of things consist in chemical elements that are in principle unobservable (A646=B674; 29:162). Therefore made *a posteriori* concepts are made up of marks that are in principle unobservable. By way of illustration, the essence of cinnabar, for Stahl, is (S+P+M)+M+[(W+S)+P]+(W+S), where S = salt, P = phlogiston, M = mercury—three unobservable elements—and W = water—a vehicle. On my reading, <essence of cinnabar = (S+P+M)+M+[(W+S)+P]+(W+S)> is a made *a posteriori* concept. In contrast, <cinnabar = red, heavy, mineral> is a given *a posteriori* concept. (Given *a posteriori* concepts are not limited to the ways things *look*—or sound, smell, taste, and feel. They also feature dispositional properties, e.g. <does not rust>, and what Kant dubs negative and comparative marks, e.g. <without odor> and <14 times lighter than quicksilver> (24:118).)

I now consider one objection. That made *a posteriori* concepts are representations of essences is central to my account. Yet Kant often insists that the ‘essence of things is inscrutable to us’ (28:557). If so, we may question the plausibility of my reading. In response to this objection, I note first that Kant sometimes breaks with this skepticism concerning our ability to cognize essences. When he does, his examples are drawn from chemistry: ‘“The essence of the defined thing”: This, we cannot always find, but in brass it can be found’ (*Reflexion* 2988, my translation). (Stahl discusses the essence of brass in his main work, the *Philosophical Principles of Universal Chemistry* (1730, 335).) Second, the 28:557 passage continues: the ‘essence of things is inscrutable to us, although we cognize many essential aspects.’²⁰ That is, our knowledge of essences is perhaps partial and fallible, yet we may still cognize some essential marks of objects. Importantly, Kant explains that we come to know these essential marks ‘bit by bit in experience’ by ‘infer[ring] ...

19. This paragraph is indebted to Carrier (2001, 216-26), Friedman (1992, 265-89) and Metzger (1930, 148-152).

20. So it is false, *pace* Gibson, that ‘[w]e have ... no insight into the nature (i.e., the essence) of objects at all’ (2011, 15).

from the properties known to us' (28:557). Finally, I point out that many have recently argued that for Kant all chemical laws are derived from, or grounded in, the essences of things.²¹ If this is right, it is likely that our chemical theories will need to feature made *a posteriori* concepts, i.e. representations of essences.

To sum up: Given *a posteriori* concepts are abstracted from experience; made *a posteriori* concepts result from scientific investigation and inference. If I am right, only the latter possess explanatory power. This is just what Kant suggests: '[w]ith all empirical concepts there is only a description' (24:270), and '[i]n all description one seeks more to understand the thing than to have insight into it' (24:109). Description contrasts with explanation, where 'one seeks again on the contrary more to have insight into the thing than to understand it' (24:109).

3.4 'Arbitrary' and 'a posteriori', redux

In §1.1. I presented Kant's characterization of made concepts. All made concepts are 'created by us arbitrarily' (24:132). I have not yet explained in what sense made *a posteriori* concepts are created arbitrarily. In addition, I noted that it is not immediately obvious how a concept can be both made—its content determined only by my own volition—and *a posteriori*—its content answerable to experience. In this subsection, I argue that (i) all hypotheses are arbitrary, and (ii) all made *a posteriori* concepts are hypotheses. Finally, I suggest that the content of made *a posteriori* concepts is answerable to experience because hypotheses must be justified by experience.

First is the claim that (i) all hypotheses are arbitrary. Kant defines a hypothesis as 'something [that] is accepted as a ground from which I can have insight into the sufficient ground of given consequences' (24:886). The ground which is put forward as a hypothesis, Kant suggests, is constrained but not determined by experience. For this reason, 'with a hypothesis the consequences are given but the ground is invented' (24:222). As Kant puts it again in the *Critique*, to hypothesize is 'to invent', albeit 'under the strict oversight of reason' (A770=B798; see Butts 1961, 155). Kant concludes that the content of all hypotheses is determined by our volition, and 'all *hypotheses* are

21. See Kreines 2009, 528-39; Messina, forthcoming; Stang 2016, 228-257; Watkins 2005, 346, 396-7, 401-7.

posited *arbitrarily*' (24:221).

I now argue that (ii) made *a posteriori* concepts are hypotheses. Of this paper's various steps, this claim is supported by the least direct textual evidence. Yet it is not without warrant. Clues can be obtained by tracking Kant's use of the term 'fiction' (*fictio*) and its cognates (notably *fictitius*). First, Kant asserts that hypotheses constitute a kind of fiction, apparently because to hypothesize is to invent (24:223-4; 24:262).²² Second, Kant insists that made concepts are fictions (24:133; 24:252; 24:261-2). That both hypotheses and made concepts are fictions does not appear to be a coincidence, for Kant once ends a discussion of made concepts with the contention that 'hypotheses are of this kind' (24:262). It is a short step to the conclusion that made *a posteriori* concepts are fictions because they are hypotheses, and one I propose to take. Therefore, made *a posteriori* concepts are 'created by us arbitrarily' because they are scientific hypotheses.

I want to underscore in passing the connection between hypotheses and having insight. Again, a hypothesis is 'something [that] is accepted as a ground from which I can have insight into the sufficient ground of given consequences' (24:886). If I am right to conclude that made *a posteriori* concepts are hypotheses, then Kant's definition of hypotheses offers further evidence for the connection between made *a posteriori* concepts and having insight that is central to my reading.

Kant's discussion of hypotheses also explains in what sense the content of made *a posteriori* concepts is answerable to experience. As we saw, a concept is *a posteriori* if it is answerable to experience. Hypotheses are answerable to experience insofar as they are confirmed by their connection to observable consequences. As Kant puts it, a hypothesis that is 'confirmed and derived ... through relation to [its] consequences' is *a posteriori* (24:221). In §1.1 I noted my reluctance to gloss all made concepts as stipulated concepts. We now see why. All made concepts originate in an arbitrary synthesis (24:918). Perhaps in the case of made *a priori* concepts the arbitrary synthesis amounts to a stipulation.²³ If so, the concepts' content depends only on their definition,

22. Kant occasionally points out that hypotheses are not mere 'arbitrary inventions' or 'mere chimeras' (A822=B850; 9:85). As the context makes clear, and the passages cited in the main text further establish, these reminders serve only to distinguish hypotheses from unconstrained metaphysical speculation, not to deny that hypotheses are fictions.

23. Carson (1999, 633), Chignell (2009, 162), Dunlop (2012, 94) and Heis (2007, 149) use the term 'stipulation'.

and calls for no further justification. But made *a posteriori* concepts are answerable to experience. Here the arbitrary synthesis amounts rather to a positing.

This completes my positive proposal. I have argued that made *a posteriori* concepts are scientific hypotheses concerning the essences of things, and as such grant insight into things.

3.5 *Tying up loose ends*

With my account now firmly in view, I revisit Kant's claim that a made *a posteriori* concept requires that I test the thing 'for all its properties' (§2.2). I opposed this claim to the amplification reading, but it remains unexplained. As we saw, this claim entails a contradiction. Kant holds that we cannot possibly test anything for all its properties; and yet he gives examples of actual made *a posteriori* concepts. My solution to this tension is two-fold. First, I interpret the claim at issue in terms of justification. I have just presented Kant's claim that hypotheses are confirmed 'through relation to their consequences'. Kant naturally draws the further conclusion that a hypothesis is fully confirmed if and only if it explains all consequences that are to be explained. To fully justify a hypothesis, then, I must know all consequences that are to be explained.

Second, I underscore that made *a posteriori* concepts are hypotheses concerning the essence of a thing. The essence of a thing is the cause of all the thing's properties, so 'to find the real essence [I] must be acquainted with all the marks that belong to the thing Then [I] must search further for the ground of these' (24:118). Although testing for all properties is not a condition on my possessing a made *a posteriori* concept, it is a condition on my made *a posteriori* concept being fully justified. My solution requires tweaking Kant's words. Yet I think it captures an important lesson of Kant's philosophy of science. Namely, that the explanatory ambition of the empirical sciences is frustrated by the inexhaustible richness of empirical experience.

Next, I want to address the fact that Kant's own examples of made *a posteriori* concepts are drawn from chemistry. On the amplification reading, any scientific concept is made *a posteriori*, including e.g. descriptions from biology.²⁴ This position weakens the link between made *a pos-*

24. By way of illustration: 'Horses from Barbary ... are mostly grey and four foot eight inches high' (9:321).

teriori concepts and chemistry. Moreover, it conflicts with Kant's assertion that '[t]he concept of every species and genera ... is a *conceptus abstractus*[,] ... given *per experientiam*' (24:253). No matter the content of our concepts of species and genera, Kant suggests, these are given *a posteriori*.

In contrast, the connection to chemistry is integral to my account. Kant defines chemistry as the 'cognition [of] an interconnection of grounds and consequences' (4:468). That is, the investigation of causes is the prerogative of chemistry. This definition is standard in the eighteenth-century.²⁵ Chemistry differs from physics, which is the study of matter as such and does not explain the necessary properties of particular objects. More to the point, chemistry differs from biology, which concerns itself only with similarities between kinds and is a strictly taxonomic science (4:468). Therefore only chemistry features made *a posteriori* concepts. To be clear, the connection between made *a posteriori* concepts and chemistry is contingent on the science of Kant's day. If biology were to explain the properties of horses by their essence, then the biological concept of the essence of a horse would be made *a posteriori*.²⁶

4 Further evidence: from making the concept to making the object

In this section, I call attention to three of Kant's remarks on scientific methodology that I argue give credence to my reading. Consider first:

we see, whether we can also make the concept. E. g. the definition of cinnabar, sublimed Quicksilver and Sulphur give cinnabar: I can then make cinnabar and define it.
(24:660, my translation)

One can define [*later addition: explicate*]²⁷ empirical concepts, if one can make the

25. See the definitions in Boerhaave (1735, 19) and Boyle (1772, II, 474). For recent discussion, see Holmes (1997).

26. More correctly still, the connection is a matter of stipulation: *any* scientific investigation of natural causes would have constituted chemistry. Textbooks commonly contained sections on vegetals and animals, which discussed anything from the growth of plants to physiological processes and fluids. Indeed, a hugely influential textbook defined chemistry as the 'science of all natural things' (Le Febvre 1670, Preface). But the essence of organisms of course remained mysterious, which explains why Kant would have picked instead the example of metals.

27. Definitions proper are exhaustive and precise. A definition is exhaustive if the *definiens* contains all the marks that make up the *definiendum*; it is precise if the *definiens* contains no redundant marks. A definition merely *expounds* if it is either incomplete or imprecise. In the passage above, Kant retains the clause 'complete exposition'. I conclude that the definition is only imprecise. Imprecision is a negligible flaw ('a mistake ... but not an error'; 24:269).

object e.g. gypsum, cinnabar, sulphur. A complete exposition of the appearance. (*Reflexion* 2964, dated 1776-1789, my translation)

Kant here suggests two connections: (i) between making a concept and making the object; (ii) between making the object and defining it. (The passages contain likely references to Stahl's *Philosophical Principles of Universal Chemistry*. Stahl discusses the elemental composition of gypsum, cinnabar and sulphur in three consecutive sections (1730, 167-84), and gives an identical definition of cinnabar (1730, 167, 173).)

Much in these remarks will surprise readers familiar with Kant's philosophy of mathematics. The connections between making a concept, making the object, and defining it are a mainstay of Kant's writings on mathematics. Kant (and certainly interpreters) often suggests that only mathematics can exemplify this connection.²⁸ This naturally raises the question of whether these unpublished remarks represent Kant's considered view. I do not wish to investigate this issue here, however. My aim in this section is more limited. I suggest simply that the reading I defend renders these passages intelligible.

The connection between a made *a posteriori* concept and making the object can be explained by my reading. Made *a posteriori* concepts are hypotheses concerning the causal grounds of the properties of the thing. If our hypothesis concerning these causal grounds is adequate, it is plausible that we would be in a position to make the thing. Indeed, the ability to make the thing is evidence of the adequacy of our concept. In this sense, made *a posteriori* concepts are similar to made *a priori*, or mathematical, concepts. This leads us to the link between making an object and defining it. Kant follows Aristotle's lead in claiming that to define a thing just is to give its essence (9:143). The ability to produce the thing offers evidence that our concept of the essence is adequate, so the making the thing is evidence that our definition of it is correct.²⁹

28. E.g. Heis: 'Kant was committed to a particularly strong thesis about mathematical concepts and definitions. He believed that possessing a concept, having its definition, and being able to construct instances of it were all coeval abilities.' (2014, 608).

29. Nunez (2014, 653 fn10) notes the 24:660 passage but resists the conclusions I draw:

such a definition [of cinnabar], made out of empirical concepts, however, is not a counterexample to Kant's claim that empirical concepts cannot be defined [because these are technical concepts for making

Kant expands on this connection in the following passage:

Chemistry, which decomposes [or analyses] water, and produces it back Whether I can produce a decomposed concept by synthesis, should be evident from the properties that flow from it. (*Reflexion* 2402, dated 1776-1789, my translation)

This passage is of interest to me for the similarity it bears to one of Kant's conditions on justified hypotheses. As we saw earlier, Kant contends that a hypothesis is justified only if the consequences that it must explain can be derived from it. Repeatedly, in formulating this condition, Kant uses the phrase 'flowing from'. A hypothesis is more than a 'mere chimera' if and only if '[f]rom the assumed ground the consequences ... flow correctly' (9:85; cf. 24:111; 24:221; 24:746). We may infer that a made *a posteriori* concept is the *assumed ground*, and the properties of the object, the *consequences* of that ground. If this is so, the passage provides further evidence that chemical concepts are hypotheses, and thus arbitrary.

Finally, Kant often asserts that 'we only have insight into what we can make', and offers chemical examples, such as the dissolution of salt (*Reflexion* 2394, 2398). Insofar as I am right to posit a link between made *a posteriori* concepts and making the object, these passages strengthen the connection to having insight that is central to my reading.³⁰

Conclusion

The purpose of this paper was to answer the question 'What is a made *a posteriori* concept?'. I have argued that a made *a posteriori* concept is a hypothetical representation of a thing's essence, which grants insight into the thing. In the course of arguing for this conclusion I have demonstrated the

things, not the kind of empirical concept we might mistakenly want to define in an empirical science.

I grant that 'sublimed quicksilver and sulphur give cinnabar' (the 'technical concept') is not itself a definition. But the success of this synthesis procedure reveals the elemental composition of cinnabar. And there is no doubt that Kant is using the term 'definition' in its technical sense. The passage continues: '*Definitio nec sit latior nec sit angustior* [the definition is neither broader nor narrower]'. This is Kant's gloss on definitions proper (24:265-7; 24:759; 24:924-5).

30. Kant's view, as I reconstruct it, bears striking similarities to much recent work in philosophy of chemistry. Many have observed that the chemist 'know[s] through making' (Bensaude-Vincent 2009, 167), and that 'making something', not refutation, 'is the leitmotif' of chemical investigation (Hoffmann 2007, 321).

significance of the distinction between given and made *a posteriori* concepts. The distinction lies, I believe, behind Kant's famous words in the B-Preface to the *Critique* (Bxii-xiii, my emphasis):

When ... Stahl changed metals into calx and then changed the latter back into metal by first removing something and then putting it back again, a light dawned on all those who study nature. They comprehended that *reason has insight only* into what it itself produces according to its own design

Made *a posteriori* concepts are not, on my reading, simply gleaned from experience. Like mathematical concepts, made *a posteriori* concepts constitute a cognitive achievement.

5 References

- Bensaude-Vincent, Bernadette. 2009. "Philosophy of chemistry." In *French Studies In The Philosophy Of Science*, edited by Anastasios Brenner and Jean Gayon, 165–186. Boston Studies in the Philosophy of Science 276. Dordrecht, Netherland: Springer.
- Boerhaave, Herman. 1735. *Elements of chemistry*. Translated by Timothy Dallowe. London, UK: Printed for Pemberton et al.
- Boyle, Robert. 1772. *The works of the Honourable Robert Boyle*. Edited by Thomas Birch. London, UK: Printed for Rivington et al.
- Butts, Robert E. 1961. "Hypothesis and explanation in Kant's philosophy of science." *Archiv für Geschichte der Philosophie* 43 (2): 153–170.
- Callanan, John J. 2014. "Kant on the Acquisition of Geometrical Concepts." *Canadian Journal of Philosophy* 44 (5): 580–604.
- Capozzi, Mirella. 1980. "Kant on Mathematical Definition." In *Italian Studies in the Philosophy of Science*, edited by Maria Luisa Dalla Chiara, 423–452. Boston Studies in the Philosophy of Science 47. Dordrecht, Netherlands: Springer.
- Carrier, Martin. 2001. "Kant's Theory of Matter and His Views on Chemistry." In *Kant and the Sciences*, edited by Eric Watkins, 205–230. Oxford, UK: Oxford University Press.
- Carson, Emily. 1999. "Kant on the Method of Mathematics." *Journal of the History of Philosophy* 37 (4): 629–652.
- . 2006. "Locke and Kant on Mathematical Knowledge." In *Intuition and the axiomatic method*, edited by Emily Carson and Renate Huber, 70:3–19. Western Ontario Series in Philosophy of Science. Dordrecht, Netherland: Springer.
- . 2013. "Pure intuition and Kant's synthetic a priori." In *Debates in Modern Philosophy: Essential Readings and Contemporary Responses*, edited by Stewart Duncan and Antonia LoLordo. London, UK: Routledge.
- Chignell, Andrew. 2009. "Kant, Modality, and the Most Real Being." *Archiv für Geschichte der Philosophie* 91 (2): 157–192.
- Dunlop, Katherine. 2012. "Kant and Strawson on the Content of Geometrical Concepts." *Noûs* 46 (1): 86–126.
- . 2014. "Arbitrary combination and the use of signs in mathematics: Kant's 1763 Prize Essay and its Wolffian background." *Canadian Journal of Philosophy* 44 (5-6): 658–685.
- Forster, Michael N. 2012. "Kant's Philosophy of Language?" *Tijdschrift Voor Filosofie* 74 (3): 485.
- Friedman, Michael. 1992. *Kant and the Exact Sciences*. Cambridge: Harvard University Press.
- Gibson, Martha I. 2011. "A Revolution in Method, Kant's "Copernican Hypothesis", and the Necessity of Natural Laws." *Kant-Studien* 102 (1): 1–21.
- Heis, Jeremy. 2007. "The fact of modern mathematics: Geometry, Logic, and Concept Formation in Kant and Cassirer." PhD diss., University of Pittsburgh.

- Heis, Jeremy. 2014. "Kant (vs. Leibniz, Wolff and Lambert) on real definitions in geometry." *Canadian Journal of Philosophy* 44 (5): 605–630.
- . Forthcoming. "Kant on Parallel Lines." In *Kant's Philosophy of Mathematics: Modern Essays*, edited by Ofra Rechter and Carl Posy, vol. 1.
- Hoffmann, Roald. 2007. "What might philosophy of science look like if chemists built it?" *Synthese* 155 (3): 321–336.
- Holmes, Frederic Lawrence. 1997. "What was the chemical revolution about? (1994 Dexter Award Address)." *Bulletin for the History of Chemistry* 20:1–10.
- Jong, Willem R. de. 1995. "How Is Metaphysics as a Science Possible? Kant on the Distinction between Philosophical and Mathematical Method." *The Review of Metaphysics* 49 (2): 235–274.
- Kant, Immanuel. 1900. *Gesammelte Schriften*. Berlin-Brandenburgische Akademie der Wissenschaften. Berlin, Germany: De Gruyter.
- . 1973. *The Kant-Eberhard Controversy: An English Translation, Together with Supplementary Materials and ... an Earlier One*. Edited and translated by Henry E. Allison. Baltimore: Johns Hopkins University Press.
- . 1992. *Lectures on Logic*. Edited and translated by J. Michael Young. The Cambridge edition of the works of Immanuel Kant. Cambridge, UK: Cambridge University Press.
- . 1997. *Lectures on Metaphysics*. Edited and translated by Karl Ameriks and Steve Naragon. The Cambridge edition of the works of Immanuel Kant. Cambridge, UK: Cambridge University Press.
- . 1998. *Critique of Pure Reason*. Edited and translated by Paul Guyer and Allen W. Wood. The Cambridge edition of the works of Immanuel Kant. Cambridge, UK: Cambridge University Press.
- . 2003. *Theoretical Philosophy, 1755-1770*. Edited by David Walford. Translated by Ralf Meerbote and David Walford. The Cambridge edition of the works of Immanuel Kant. Cambridge, UK: Cambridge University Press.
- . 2004. *Metaphysical Foundations of Natural Science*. Edited and translated by Michael Friedman. Cambridge, UK: Cambridge University Press.
- . 2005. *Notes and Fragments*. Edited by Paul Guyer. Translated by Curtis Bowman, Paul Guyer, and Frederick Rauscher. The Cambridge edition of the works of Immanuel Kant. Cambridge, UK: Cambridge University Press.
- . 2012. *Natural Science*. Edited by Eric Watkins. Translated by Lewis White Beck, Jeffrey B. Edwards, Olaf Reinhardt, Martin Schönfeld, and Eric Watkins. The Cambridge edition of the works of Immanuel Kant. Cambridge, UK: Cambridge University Press.
- Kim, Joongol. 2006. "Concepts and Intuitions in Kant's Philosophy of Geometry." *Kant-Studien* 97 (2): 138–162.
- Kreines, James. 2009. "Kant on the Laws of Nature: Laws, Necessitation, and the Limitation of Our Knowledge." *European Journal of Philosophy* 17 (4): 527–558.

- Le Febvre, Nicaise. 1670. *A Compleat Body of Chemistry: Wherein ... Preparation of Animals, Vegetables and Minerals*. London, UK: Printed for Octavian Pulleyn Junior.
- Longuenesse, Béatrice. 2001. *Kant and the Capacity to Judge*. Princeton: Princeton University Press.
- Messina, James. 2015. "Conceptual Analysis and the Essence of Space: Kant's Metaphysical Exposition Revisited." *Archiv für Geschichte der Philosophie* 97 (4): 416–457.
- . Forthcoming. "Kant's Necessitation Account of Laws and the Nature of Natures." In *Kant and the Laws of Nature*, edited by Michela Massimi and Angela Breitenbach. Cambridge, UK: Cambridge University Press.
- Metzger, Hélène. 1930. *Newton, Stahl, Boerhaave et la doctrine chimique*. Paris, France: F. Alcan.
- Newton, Alexandra. 2015. "Kant on the Logical Origin of Concepts." *European Journal of Philosophy* 23 (3): 456–484.
- Nunez, Tyke. 2014. "Definitions of Kant's categories." *Canadian Journal of Philosophy* 44 (5): 631–657.
- Oberst, Michael. n.d. "Kant on real essence as the formal nature of a thing." Cited with permission.
- Paton, H. J. 1936. *Kant's Metaphysic Of Experience*. Vol. 1. London, UK: G. Allen & Unwin.
- Pippin, Robert. 1982. *Kant's Theory of Form: An Essay on the Critique of Pure Reason*. New Haven: Yale University Press.
- Rosenberg, Jay F. 2005. *Accessing Kant: a relaxed introduction to the Critique of Pure Reason*. Oxford, UK: Oxford University Press.
- Shabel, Lisa. 2006. "Kant's Philosophy of Mathematics." In *The Cambridge Companion to Kant and Modern Philosophy*, edited by Paul Guyer, 94–128. Cambridge, UK: Cambridge University Press.
- Smit, Houston. 2000. "Kant on Marks and the Immediacy of Intuition." *Philosophical Review* 109 (2): 235–266.
- . 2009. "Kant on Apriority and the Spontaneity of Cognition." In *Metaphysics and the Good: Themes From the Philosophy of Robert Merrihew Adams*, edited by Samuel Newlands and Larry M. Jorgensen. Oxford, UK: Oxford University Press.
- Stahl, Georg Ernst. 1730. *Philosophical Principles of Universal Chemistry: or, The foundation of a scientific manner of inquiring ... business*. Translated by Peter Shaw. London, UK: Printed for J. Osborn & T. Longman.
- Stang, Nicholas F. 2016. *Kant's Modal Metaphysics*. Oxford, UK: Oxford University Press.
- Vanzo, Alberto. Forthcoming. "Kant's 'False Subtlety of the Four Syllogistic Figures' in Its Intellectual Context." In *The Aftermath of Syllogism*, edited by Luca Gili and Marco Sgarbi. London, UK: Bloomsbury.
- Watkins, Eric. 2005. *Kant and the Metaphysics of Causality*. Cambridge, UK: Cambridge University Press.
- Young, J. Michael. 1992. "Functions of Thought and the Synthesis of Intuitions." In *The Cambridge Companion to Kant*, edited by Paul Guyer, 101–122. Cambridge, UK: Cambridge University Press.

Young, J. Michael. 1994. "Synthesis and the Content of Pure Concepts in Kant's First Critique."
Journal of the History of Philosophy 32 (3): 331–357.

6 Appendix: original German passages

24:660: wenn man sieht, ob man auch den Begriff machen könne Z. E. Die Definition des Zinnober, Quecksilber und Schwefel sublimirt giebt Zinnober: ich kann also den Zinnober machen und definiren.

Refl. 2394: Wir sehen nichts ein, als was wir machen können.

Refl. 2398: Wir begreifen* nur, was wir selbst machen können.

(* 'Begriffen' is to have insight that 'is sufficient for a certain purpose' (24:133).)

Refl. 2402: Die methode der inversion ist die, da ich aus den Erklärungsgründen umgekehrt den Begriff des Erklärten wieder *a priori* hervorbringen kan. *e. g.* Chemie, welche mineralische wasser auflöset uns sie wieder hervorbringt, nicht aber Wein. ... Ob ich einen zergliederten Begriff synthetisch wieder hervorbringen kan, muß sich aus den Eigenschaften, die daraus fließen, zeigen.

Refl. 2930: Der *Mathematicus* in seiner Definition sagt: *sic volo, sic iubeo*.

Refl. 2964: Man kan doch empirische Begriffe definiren [expliciren], wenn man den Gegenstand machen kan. *e. g.* Gips. Zinnober. Schwefel. Complete exposition der Erscheinung.

Refl. 2988: „Wesen der erklärten Sache“: Man kan daßselbe nicht immer finden. aber im Meßing kan es gefunden werden. Der Zirkel.

Refl. 5221: Wir müssen uns, wenn wir die Erscheinung vollständig apprehendirten, einen Erzeugungsbegriff* machen können. Dieser ist aber nur möglich, wenn das zufällige, was geschieht, im ganzen genommen oder in seiner ganzen Bestimmung genommen nothwendig ist.

(* *Made concepts are 'von uns erzeugt'* (24:131; A234=B287; 2:282), hence my translation of 'Erzeugungsbegriff'.)