Fictions of Systematicity: Maimon's quest for a scientific method in philosophy

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Introduction

As one of the major figures preparing the ground for German Idealism, Solomon Maimon is mainly discussed for his skeptical assessment of Kant's critical philosophy, as well as for his infamous "coalition system" that combines rationalism and skepticism. What has mostly been neglected, however, is Maimon's innovative philosophy of science and the special role it plays in forming his metaphilosophical views. In less abstract terms, it is his thoughts on the nature and method of science that lead him to adopt a new method to transform theoretical philosophy into a proper science. In what follows, I will argue that Maimon's metaphilosophy includes a distinctive view on what the scientific role and method of philosophy should consist in: the production of *fictions of systematicity*. For that purpose, I will firstly outline the connection between Maimon's philosophy of science and his metaphilosophy, and secondly, how this leads to an engagement with the so-called "method of fictions" (1793a: 17).[1] To understand why he proposes the use of scientific fictions as method for philosophy, we must then turn to an investigation of Kant's *Appendix to the Transcendental Dialectic*, which introduces the notion of regulative ideas. Regulative ideas function bottom-up as "useful fictions" that instruct science to systematize existing knowledge and objectify systematicity through its practice. In continuity and contrast to this doctrine, Maimon's method of fictions will emerge as a top-down strategy through its positing of fictions of systematicity, which secure the possibility of scientific explanation in the absence of objective structures. Consequently, it will become clear how fictions of systematicity ground science in general and by virtue of that, establish a demarcation criterion.

1. All quotes and references are reproduced from the *Gesammelte Werke* (1965–1973a) edition, 1–7. All translations are mine, except translations of the *Essay on Transcendental Philosophy* (1790), as well as where indicated.

1. Maimon's Philosophy of Science and its Connection to Metaphilosophy

Maimon, like many of his contemporaries, was deeply invested in the study of the nature of science and a search for its defining standards.[2] Generally, he understands science as the endeavor of producing representations, models, explanations and predictions that are true of the world.[3] In order to properly fulfill its assigned purpose, science needs to justify *why* its descriptions and explanations grasp truth in a privileged way and thereby why it qualifies as a special kind of knowledge that is distinguished from other kinds of knowledge. Scientific knowledge, Maimon thinks, is distinguishable by virtue of a *demarcation criterion* and it is the task of theoretical philosophy to discover and define this criterion (1792: 42; 1793a: 12–13; 1794: XVIII–IX).[4] At second glance, however, it becomes clear that what undergirds Maimon's interest in the philosophy of science is his *metaphilosophical* aspirations. From Kant, he inherits the program of a scientification of philosophy. In continuity with the latter's transcendental philosophy, Maimon identifies the question of "how is metaphysics possible?" with the question of how *a priori* cognition of objects is possible (1790: 74). And just like Kant, he thinks that a potential answer must demonstrate whether and how theoretical philosophy can "enter upon the secure course of a science" (Kant 1998: Bxiv).[5]

In line with this observation, Maimon's discussions typically proceed from an analysis of what qualifies kinds of knowledge, e.g., mathematics, physics, and experimental knowledge, as scientific. He then goes on to analyze philosophical knowledge for its defining characteristics and method of production. On grounds of both analyses, he then compares exemplary cases of accepted scientific knowledge, e.g., mathematical knowledge, to philosophical knowledge in order to see whether it, according to any of these standards, can be qualified as scientific knowledge. Thus, the search for a demarcation criterion for science thus ultimately serves the goal of finding a standard or property that identifies philosophical knowledge as scientific and thereby seeks to establish the necessary conditions given which theoretical philosophy and the knowledge it produces can be counted as scientific. [6]

Maimon finds a demarcation criterion for science in scientific procedure, that is, he takes scientific knowledge to be true of the world because it is produced in a specific way. Whether a given process of knowledge-formation is successful in producing scientific knowledge depends on it having acquired and implemented the right method, i.e., an explicable set of theories, models, procedures, and skills that constitutes scientific procedure (1793a: 16–17; 1793b: LXXI; 1797: 160).[7] By

2. Note that although it is possible to treat Maimon's works (here from his early *Essay* (1790) up to his *Pragmatic History* (1797)) as expressing largely coherent views, he does seem to adopt a somewhat more critical stance toward the possibility of "real thinking" and, consequentially, the successfulness of scientific explanation. This connects to his revised conception of mathematical definitions and explanations. See Freudenthal (2006) for a detailed study on the development of the former's conception of mathematics, and also see Freudenthal's (2010) article, which traces how Maimon's post-*Essay* (1790) philosophy reflects this change in view.

3. Even if Maimon is sometimes seen as skeptic, i.e., as someone who doubts the reality and maybe even the possibility of scientific knowledge, this skepticism is borne out of a (rationalist) commitment to some form of scientific realism. Science *ought* to produce theories that are true of the world and if scientists become skeptics, this is because science does not adhere to the normative standard entailed by the realist view, that is, it fails to prove that its theories are indeed true representations. For a variant of this argument, see Franks (2003) and Thielke (2008; 2014). Also, we will later see how instrumentalism, too, has its place in Maimon's conception of science.

4. The *problem of demarcation* denotes the problem of finding a secure criterion that distinguishes proper science from pseudo-science. Contemporary philosophy of science takes this debate to ensue from Popper's (1962), however, this question has long bothered philosophers and can be found in texts as early as Aristotle's *Posterior Analytics*, see Laudan (1983).

5. All citations of the *Critique of Pure Reason* refer to the standard pagination A/B. For English translations, I use the Cambridge Press Editions of Kant's works (1998).

6. It should be noted that the German notion *Wissenschaft* designates a much broader variety of studies than is denoted by the English term *science*; the former referring to any systematically structured study rather than a narrower set of studies, i.e., the natural sciences. Here, however, I take the notion *Wissenschaft* to refer to a strict science in the spirit of the English term *science*.

7. For a comprehensive overview on scientific method and its function as

defining the demarcation criterion in this way, Maimon defends the same view that Kant had introduced as part of the B Preface to the second edition of the *Critique of Pure Reason* (Bvii–Bxvi). There, Kant analyses scientific progress as being brought about by revolutions in method, i.e., in the way through which knowledge is produced, and thus he infers that the new philosophy which is to promise to metaphysics the secure course of a science must consist in an attempt "to transform the accepted procedure of metaphysics" (Bxxii). This makes finding the right method for philosophy key in its project of becoming a proper science. Maimon joins this program and asks: which method could serve as scientific method for philosophy?

First of all, it is crucial to know that Maimon characterizes the task of theoretical philosophy as determining the form of *all* sciences (1793a: 4, 13; 1794: XIX, XXXV): "[w]ithout philosophy no science is possible at all, it [philosophy] determines the form of science as such *a priori*"(1794: XVIII–IX). Philosophy is the science of the form of all science insofar as it determines the possibility of scientific cognition in general and thereby also the necessary criteria that distinguish scientific from non-scientific cognition.[8] Or in other words, theoretical philosophy must become the science of the form of all objects of cognition insofar as these objects can become objects of science. Theoretical philosophy determines objects only with regard to their form, since it is only the *form* of objects of cognition that can be known *a priori* and thus with absolute certainty. This is why Maimon classifies theoretical philosophy as formal science.

As formal science, philosophy has a special purpose: it unites all sciences under one form, no matter their individual objects or methods. Since there exist different scientific methods (e.g., mathematical methods, inductive and experimental methods in the natural sciences, etc.) which produce different varieties of knowledge that do not, for Maimon, cohere with each other, it only makes sense that it should be part of the scientific enterprise to look for a method fit to equip *all* sorts of knowledge claims from the various individual sciences with scientific form.[9] The different sciences must be united under one criterion that makes them what they are: sciences.

And indeed,

> Philosophy is *the science of all sciences*, through which they [i.e., all other sciences] only ever *acquire their status as sciences*. […]. If the objects of nature are *ordered philosophically* under principles, are brought into a system, they *become* a natural science proper. (Maimon 1793a: 12; emphasis added)

Philosophy's job, Maimon proposes, is to develop a method to discover the scientific form of all sciences, which will then, although each proceeds according to different methods, come to be unified under one form, the scientific form (as such). Thereby, philosophy assumes a *normative* role for the individual sciences, as only by its means, i.e., by virtue of the form philosophy establishes and confers onto them, do these obtain their status as proper sciences.[10] The next question thus must be: *what* form should be conferred?

Here, Maimon is very explicit. He states that philosophy produces a specific *type* of form: *systematic unity*. Hence, philosophy, in order to count as science itself, requires a method to bring about systematic

demarcation criterion, see Nola & Sankey (2007).

8. Of course, this does not already mean that it is the science of *all* that makes science scientific. That is to say, it could still be that there is some other marker of scientific knowledge, that is not a formal feature but still a feature that identifies some piece of knowledge as scientific knowledge. And indeed, as we will see, Maimon does think that being produced by virtue of scientific method is one such marker. However, the formal feature of scientificity will figure as the universal feature that determines the reason why all different sorts of scientific knowledges qualify as scientific and as belonging to one unified system of science.

9. This, for Maimon, results from the fact that some of the methods of the mathematical sciences apply a different standard of truth and inquiry than the experimental natural sciences, see for example (1793b) and (1793c).

10. Maimon not only looks at "ways of thinking, methods and the exhibition of systems" (1793a: 6), he also undertakes the task of dividing the sciences in different categories, i.e., pure, applied, and practical sciences (ibid.: 11f.).

unity amongst all different sorts of knowledge claims. By virtue of its constitutive role for all other sciences, "[t]his form [i.e., systematic form] is a demand of reason that concerns each and every object if it is to be treated as object of science" (Maimon 1792: 43). In its proper and scientific use, philosophy endows other epistemic practices with a specific form, i.e., systematic form, that transforms them into proper sciences. This confronts us with a tension to be resolved regarding Maimon's outlook on science, namely that he seems to introduce two demarcation criteria (i.e., scientific method and systematicity) and thereby potentially two notions of 'science'. I will return to this problem in the last section of this paper, when explaining Maimon's plan for a revision of the sciences that comes with the introduction of a new demarcation criterion. For now, let us return to the methodological demarcation criterion.

2. Finding a Scientific Method for Theoretical Philosophy

Maimon concludes that since theoretical philosophy as *a priori* science cannot make reference to any *a posteriori* evidence, it also cannot employ the empirical methods of the natural sciences.[11] As science that studies formal systems, or more precisely, systematic form as such, philosophy does better by turning to the methods of other formal sciences. A first natural option would be to conceive philosophy in purely logical terms, i.e., as the study of the logical form of judgments and their propositional structure, as well as the ways in which we can move from one set of true judgments to another. Such a conception of philosophy, however, does not satisfy the requirements Maimon thinks philosophical science ought to be responding to. Theoretical philosophy is not concerned with "undetermined objects in general", but with the form of the objects of science in general (1790: 3; 1793a: 4, 13; 1795: XIX, XXXV). And the objects of science in general must be conceived as objects that are determined by the conditions of possible experience. This is so because science not only aims at explaining objects as they are thought, but also at objects as they are observed and manipulated in scientific experiments.

A second option, which has indeed been taken up by many philosophers before and after Maimon (i.e., Descartes or Spinoza), is to conceive of philosophical method as analogous to *mathematical procedures*. Kant himself has also considered and ruled out this option as part of his efforts to establish a scientific procedure for theoretical philosophy in the final chapter of his *Critique*, the Doctrine of Methods. Owing to the discursive character of philosophical cognition (and its resulting inability to provide its concepts with corresponding intuitions in an *a priori* manner), he consequently denies theoretical philosophy the possibility of constructing its concepts (A713/B741–A738/B766).[12] Maimon accepts this result and repeats that philosophy is indeed incapable of "demonstrating the reality of its concepts" (1793a: 50). Nevertheless, mathematical method and the kind of knowledge it produces play an important role in Maimon's metaphilosophical conception.

As has been noted earlier, Maimon's philosophy of science engages with identifying and analyzing scientific forms of reasoning, which can then serve to develop a new model for philosophical reasoning. His philosophy of mathematics, in particular, plays an important role in the formation of his metaphilosophical views. Firstly, it teaches the difference between real and discursive thinking in providing an instance of real thinking[13] that is similar to divine cognition, and which

11. McGinn (2015) makes an interesting case for why philosophy as formal science still proceeds by virtue of empirical method insofar as it employs thought experiments that result in a cognitive experience.

12. For an overview on the topic of mathematical construction in relation to Kant, see Posy (1992); for discussions on its import for philosophical method, see Ende (1973), Schubbach (2017), and Taureck (1975).

13. For Maimon, mathematical method is not interesting because of its usefulness for "philosophy but because it teaches us the difference between merely discursive thinking and real thinking" (1793a: 20). Discursive thinking denotes a thinking that relates to possible objects via universal concepts, its relating activity is dependent on these objects being *given* to it in intuition. Real thinking, on the other hand, is a thinking that in its very act of thinking objects brings about those objects. Hence, it is a thinking that does not create the need for justifying the objective validity of its principles, for "[a]ll concepts of mathematics are *thought* by us, and simultaneously *exhibited* as *real objects* through *a priori* construction" (1793a: 20). What mathematical method

thus exemplifies the standard for genuine scientific explanation.[14] Secondly, Maimon identifies the methods of differential calculus as examples of the method of fictions which will provide the model for the new philosophical method. For the purposes of this paper, we will only be concerned with the second point. Theoretical philosophy can determine "the form of science as such *a priori*" without being able to "demonstrate the reality of its concepts" (1793a: 50) if it employs useful fictions in the same way than analytic geometry and some of the natural sciences do.

Before we turn to its specifics, it is important to note that by virtue of this method, Maimon is not only introducing a new procedure to theoretical philosophy, but he is also offering a positive alternative to Kant's transcendental philosophy. Maimon is maybe best known for his criticisms of Kant's first *Critique*. In one sentence, this criticism laments that transcendental philosophy has "not yet been able to build a bridge that enables the transition from the transcendental to the particular" (1793a: 16). Maimon motivates this general objection in the form of two skeptical arguments: the *quid facti?* and the *quid juris?* arguments. On the basis of these arguments, he thinks to have raised sufficient doubt to deny that transcendental philosophy is either (i) in possession of a fact that proves the objective validity of its principles, or (ii) in possession of an explicit set of rules that determines how categories are applied to particular objects of the senses.

(i) Concerning the question of factual proof, Maimon argues that neither scientific nor ordinary experience provides instances which actually prove (rather than just assume) an application of categories to given cognitive matter (1790: 188–189, 1793a: 191–196).[15] With reference to Hume, he contends that regularities in perception (i.e., the perception of conjunctions of events) can and are just as well explained through empirical laws of association than through postulating *a priori* laws of experience (ibid.: 72–73, 129).[16] Furthermore, Maimon notes that even if it were a fact that we perceive universal and necessary connections between events, we could still not infer to "a knowable ground" that explains how a determine cause is assigned to a particular event and hence the fact would still not be evidence for an application of categories to particular objects of intuitions (1794: 431–432).[17]

(ii) Furthermore, Maimon also calls into question whether transcendental philosophy has the resources that are required to articulate how a rule-governed application of categories to particular sensible objects is possible. That is, his doubt concerns the possibility of showing that we are justified in doing so. Maimon contends that such justification cannot be given through a dualist account because Kant's account determines form and matter of cognition (i.e., concepts and intuitions) as heterogenous to each other (1793a: 16). On Maimon's

teaches theoretical philosophy is that there exist examples of scientific procedures that generate knowledge in the right kind of way, thus offering a starting point to explicate how *a priori* cognition of objects is possible.

14. Maimon goes even further and argues that mathematical cognition can be used as exemplary to understand the nature of divine cognition:

> [I]ndeed, God thinks *real objects*, not only according to the *principle of contradiction* praised so highly in our philosophy, but as we do (although in less perfect manner) when we think the *objects of mathematics*, i.e., *through thinking* these objects, he simultaneously *brings them about*. (1793a: 20)

Divine cognition is generative in much the same as mathematical cognition is: "God generates the *objects of nature* in the same way than we generate *the objects of mathematics* through *real thinking*, i.e., through *construction*" (1793a: 58).

15. E.g., "Kant merely *presupposes* the fact, but he does not prove it. So the principles remain merely probable, but not necessary" (1790: 342).

16. In fact, Maimon argues that we even have more reason to adopt a naturalistic explanation, since we thereby avoid violating the principle of parsimony. As Franks points out, Maimon refers us to Newton's methodological principle that "one should assume no new principle for the explanation of a phenomenon, which may be explained from other, long since known principles" (1793a: 217, as cited in Franks 2014: 43).

17. E.g., "[E]ither the fact itself […] is false, and the cited examples (e.g. of empirical judgments) are based upon a deception of the imagination, and […] the categories have no use at all; or it is true in itself, and then it has no knowable ground, and the categories remain, even after their laborious deduction and schematism, as before, mere forms that can determine no object" (1794: 192).

view, it is just not intelligible *how* the forms of understanding can determine the data of sensibility if form and matter of cognition really stem from two separate faculties that are not reducible to one another. Since Kant cannot show "how […] the understanding [can] subject something (the given object) to its power (to its rules) that is not in its power", for "the Kantian system, namely where sensibility and understanding are two entirely different sources of our cognition, this question is insoluble" (1790: 63–64).

In conclusion, Maimon's criticism of transcendental philosophy intends to show that philosophical *a priori* principles cannot claim objective validity, since they cannot be proven to extend to the particular objects of the senses and thus cannot be said to be constitutive of the objects of empirical science. As a reaction, Maimon sets out to find a scientific method which can resolve these shortcomings of transcendental philosophy. His methodological reflections lead him to the conclusion that if theoretical philosophy should not be reduced to pure logic, it has to "transform its accepted procedure" once again, still without making use of either induction or *a priori* construction. Rather than simply propounding an aporetic or skeptical philosophy,[18] Maimon submits a positive proposal: philosophy has to adopt a scientific method by virtue of which it can ground the possibility of scientific explanation. Now, this method which philosophy ought to adopt in order to become a science proper is nothing other but the "method of fictions": "[t]here is another method, whose reality in philosophy I will assume only problematically, […]. This method I will call the *method of fictions*, of which the mathematician has made use with the greatest success" (1793a: 17).[19] So what *is* the method of fictions?

18. See, for example, Bransen (1991).

19. Some authors have argued that the methods of calculus provide the necessary model of how an intuition-free mathematics is possible and hence, how *a priori* cognition on grounds of non-heterogeneous faculties is possible and the *quid juris* can be resolved, see Franks (2003: 213–214) and Engstler (1990: 154–155). Yet, their accounts overlook Maimon's analysis of the methods which make possible the way in which calculus deals with its objects: the method of fictions (1793a: 51).

3. The Method of Fictions

By the 'method of fictions', Maimon refers to scientific procedures in the mathematical and natural sciences, which employ a specific type of fictions that he identifies as "work[s] of reason" and as thus having scientific value.[20] In continuity to contemporary debates,[21] he thereby understands the methods of those sciences which operate by means of representations (e.g., theories, models, or other theoretical instruments) that somehow deviate from or deliberately distort reality. In contrast to the "science fiction" of faster-than-light travel and endless interstellar war, scientific fictions "serve to determine something real about an object" (1793a: 17). Although they do not represent the world in truthful ways, scientific fictions are useful in arriving at the truth about the world. That is, although scientific fictions fail to adequately represent things as they are in themselves, they can at least be instrumental for scientific inquiry.

Before investigating what makes scientific fictions scientific, let us first ask what makes scientific fictions *fictional*. Maimon's analysis comprises a distinction between two types of fictions because, on his view, fictions of reason fail to represent the world in one of two distinct ways: they either (i) *cannot* because they are self-contradictory, or

20. It is crucial to draw a distinction between Maimon's general theory of fictions and his theory of scientific fictions. As he clarifies in his *Versuch* (1794), while fictions in general are characterized products of the imagination, the special fictions employed by the sciences are to be understood as products of reason: "[t]he invention of fictions for the purpose of extending the sciences and providing them with systematic order is a *work of reason*. To represent these fictions as real object is *a work of the power of imagination*" (1794: XXXV–VI; emphasis added).

21. The discourse thus referred to is the specific discourse of fictions in philosophy of science, which has only very recently been reanimated (e.g., Fine's (1993) article); for a critical collection of essays on the topic of fictions in science, see Suárez (2009). Although it is nowadays usually presented as departing from Vaihinger's *Philosophy of As If* (1935) and its elaborate account of the genesis and function of fictions (e.g., Suárez 2009: 3), I take this debate to result from a much larger historical discourse going back to figures such as Leibniz, Spinoza, or Hume, who all explicitly mention the pragmatic use of fictions for scientific purposes and in whose context we should also locate Maimon's account.

they (ii) *do not* because they are idealizations, abstractions, or models. The first type I refer to as *contradictory fictions*, and the second as *consistent fictions*. As it will turn out, philosophical fictions form a subtype of consistent fictions.

(i) Mathematical fictions, according to Maimon, involve contradictions. For instance, the method of indivisibles "treats a continuous (and hence infinitely divisible) magnitude *as if it was composed of indivisible parts* (a line as composed of points, a plane as composed of lines, a figure as composed of planes)" and uses the known ratio between the indivisible parts to determine the ratio of the magnitudes they compose (1793a: 51; emphasis added). By decomposing geometrical magnitudes into infinitely small elements that are of the same dimension like the magnitudes themselves, this method enables the mathematician to treat a surface as "just *as if* [this] surface was composed of lines" (ibid.). Upon Maimon's analysis, this method of treating geometrical figures (i.e., infinitesimals) involves a contradiction in itself — after all, infinitesimals are *indivisible* (as an infinitely small point) but at the same time constitute the "building blocks" of a magnitude that is infinitely *divisible*. This is why mathematical entities like infinitesimals should be treated as fictions. They provide a method to treat geometrical figures *as if* they were really composed of infinitely small parts: "[t]he method of indivisibles, the infinite series, the differential calculus and such like necessarily lead to contradiction if they are considered to be *more than mere methods*.[…]. [R]eason […] declares them to be what they really are: mere fictions" (1794: 205–206). Although the method of indivisibles is based on a contradictory concept, it can serve to determine mathematical facts such as the surface of a geometrical figure or the continuous rate of change in a curve (that again could help predict the actual growth rate of some bacteria culture).[22]

In contrast, consistent fictions make use of theoretical entities like abstractions, idealizations, or, more generally, models that (at least in theory) can be adjusted or corrected to become adequate representations of the world. Upon achieving this, of course, they would lose the status and function they had as fictions (1793a: 30).[23] Other than mathematical fictions, this type of fictions must not include contradictions.[24] As an example, Maimon mentions "the method of interpolation" (ibid.). By that, he refers to the astronomer's method of positing the location of a celestial body in the absence of an actual observation of its position by inferring the position based on a collection of discrete observations of its previous positions. In the style of Galilean idealization, astronomers for this purpose assume a simplified model to arrive at correct calculations in celestial mechanics. Fictions of this type are posited with the long-term purpose of de-idealization and accurate representation in mind, since — other than the self-contradictory fictions of calculus — these fictional models are consistent with logical laws and, for all we know, could be de-idealized.[25]

Now, what common features characterize these types of fictions as specifically *scientific* fictions? The answer is that scientific fictions are *tools* for scientific inquiry. As purposeful misrepresentations, their function is not to "mirror" or represent the world appropriately. Rather, scientific fictions provide a method for treating an object A as it instantiated some feature F. In that sense, scientific fictions only really misrepresent when "they are considered to be more than mere methods", that is, their function is mistaken to consist in providing accurate representations (Maimon 1794: 206). Scientific fictions as

22. On Maimon's engagement with differential calculus and its use in geometry and physics, see Duffy (2014) and Pringe (2018).

23. An example for a useful fiction losing its function through being adjusted to a true representation is a city map of New York that is adjusted to a true representation of New York, whereby it ceases to be a map and thus loses its usefulness to orient and navigate through the city.

24. "Thus, so long as fictions contain *no contradiction* they can be employed as rational principles for the purposes of grounding cognition and systematically ordering it" (1794: liv, note u; emphasis added, transl. Breazeale 2018: 11).

25. "Galilean idealizations" is a term by McMullin (1985) which identifies a particular type of idealization that, on his view, characterizes much of the rise of early modern natural science and still impresses philosophers of the 18th century. Essentially, Galilean idealizations differ from other types insofar as they create simplified models of their targets "in order to make [those theories] computationally tractable" and come with an expectation "of future de-idealization and more accurate representation" (Weisberg 2007: 640).

"methods" embody two procedural steps. First, a scientific fiction is modelled to determine A in accordance with the fictional characterization. Through constructing a simplified model-system, it becomes possible to investigate what other F-related features A would instantiate if it really did instantiate F.[26] Secondly, this hypothetical model and its properties are projected onto the target-system, which has to bear some sort of similarity or resemblance to the model-system. As effective means for inquiry, scientific fictions are determined through their *usefulness* or expediency (Maimon 1793a: 31). This leads us to a second essential feature of scientific fictions that not so much concerns *what* they are (i.e., theoretical tools) but *how* they must be employed in scientific reasoning in order for such reasoning to be justified.

Scientific fictions must enter the process of scientific knowledge production as *conscious* misrepresentations of the world. In order for the fictional method to be successful, the scientist has to be aware of the fictionality of the theoretical tools she is employing and not mistake them for true representations of the world. There are several ways to know or become aware of the fictionality of theoretical tools, and Maimon seems to gesture to two in particular: (i) the fiction is in itself contradictory, hence it is impossible for it to be real (e.g., infinitesimals), or (ii) there is no way of proving the objective validity of these theoretical concepts (i.e., interpolation). In that sense, scientific fictions are not simply misrepresentations or errors that are "opposed to truth" (1791: 49). Instead, scientific fictions constitute a class of representations which consciously do not directly aim at truth. Although it is not their function to represent the world, these fictions are nevertheless treated and maintained *as if* this were the case, thereby still using them as a *means* to ultimately arrive at an accurate representation of the world. [27]

Owing to their nature, on most views,[28] scientific fictions cannot explain in themselves. The instances through which Maimon exemplifies scientific fictions include models, theories, and other representations, which although they are instrumental in arriving at true statements about the world, are not themselves veridical statements. Consider a sixteenth-century realist about the Copernican hypothesis who uses the Ptolemaic hypothesis to predict the apparent motions of the planets. While he believes that the Ptolemaic hypothesis can "save the phenomena" through (more or less) adequate predictions, he does not believe that it can explain them, because this hypothesis does not accurately represent the world. Explanations require an actual understanding of how the world really is. In order to explain a target system (*explanandum*), one needs a set of judgments that are true of the world (*explanans*).[29] Scientific fictions, however, only serve an instrumental role within the process of scientific explanation; they function as theoretical tools *on supposition of which* one arrives at the desired *explanans*.

This however seems to create a tension with the project of philosophical science as Maimon envisions it. If philosophy can only become a proper science by virtue of adopting the method of fictions as its primary method, then, at least *prima facie*, it seems to be the case that philosophy cannot be an explanatory science. But this goes against the grain of what philosophy had traditionally been taken to be, namely, if anything at all, an explanatory science that tries to answer "why-questions". Even more, Maimon assigns theoretical philosophy with the role of determining in virtue of what metaphysics as science is possible. So how does his account of scientific fictions fit together with the role and method of a scientific philosophy; how can philosophical fictions "be used for the 'grounding' ('*Begründung*') and

26. Camp (2020: 313–317).

27. This is what distinguishes fictions from *hypotheses*: while hypotheses are tested for their appropriateness to represent target systems, scientific fictions do not "demand verification" because their function is *not* to represent the world (Vaihinger (1935: xlii)). Even though this might point one toward pragmatist readings of Maimon's philosophy (e.g., Kuntze (1912: 376–77) or Vaihinger (1935: xlii)), we will see that Maimon endorses a form of explanatory rationalism and scientific realism that directly stands at odds with such readings.

28. See Fine (1993) or Vaihinger (1935: xv).

29. This is of course exactly what the use of idealization and other fictions in science puts in question. See Cartwright (1983) for an argument of the ideality of physical laws employed in physical explanations, or, more recently, Bokulich (2009) on the explanatory power of scientific fictions in general.

systematic ordering of cognition" (Maimon 1794: LIV, Annotation "u") and function as an "explanatory ground" (Maimon 1793a: 31)?

In order to see how Maimon's account accommodates this initial difficulty, consider the following quotes:

> [Philosophical fictions] have by no means the *utility* that fictions have in mathematics. In mathematics, differential calculus serves for the *discovery of new truths*; in contrast, one can, at most, presuppose that the Monadology provides an *explanatory ground* of natural appearances, without employing itself for that purpose. (1793a: 31)[30]

> If fictions do not contain any *contradictions*, they can be used as *principles of reason* for the *explanation* and *systematic ordering of cognition* [Begründung und systematischer Ordnung der Erkenntnis]. (1794: LIV, Annotation "u")[31]

Maimon's point is not to say that philosophical fictions have no utility or expediency compared to, say, mathematical fictions. Rather, he thinks that they are indeed expedient but for a *different* purpose. In the sciences, scientific fictions are methods to treat phenomena as if they instantiated some feature, because determinations in accordance with this F-characterization allow us to generate regularities that adequately predict properties and behaviors of objects.[32] Philosophical fictions, on the other hand, are not instrumental for generating correct predictions about particular phenomena, but for illuminating *why* natural phenomena have the right structure, are of the right form to be explainable by virtue of the explanatory means employed by the sciences. How can philosophical fictions do so?

Following Maimon, philosophy grounds explanations by means of "fictions of systematicity" and therein lies its scientific role as "science of the form of all sciences". Philosophical fictions' function is to "subsume[…] the highest possible manifold under the highest unity of principles by establishing the most complete systematic unity" (Maimon 1793a: 41). At this point, multiple questions arise: how are we to understand the notion of systematic unity, or systematicity here employed by Maimon? How does it relate to philosophy's scientific task of "providing an explanatory ground of natural appearances"? And finally, why should philosophy's scientific activity precisely consist in generating what I earlier referred to as fictions of systematicity?

In order to find answers to these questions, we should turn to Maimon's famous interlocutor Kant. It is uncontroversial amongst Maimon scholars to assert a close connection between the method of fictions and Kant's *doctrine of regulative ideas*.[33] So far, however, interpretations have done little more than simply take note that in some passages, Maimon either compares or even identifies the two concepts with each other (1793a: 18, 45–46n).[34] To deepen our insight into the philosophical method of fictions, I will give an account of regulative ideas that *illuminates* Maimon's notion of philosophical fictions by virtue of identifying its characterizing features in relation *and* difference to Kant's doctrine.

4. Kant and the Regulative Use of Ideas

In the Transcendental Dialectic,[35] Kant introduces a special kind of concepts: the *ideas* of reason. Ideas functions as principles instructing

30. Or:
> It [philosophy] is not interested in the (metaphysical) truth of the principles from which it proceeds or the results at which it finally arrives, but only in the aptness of its principles as principles for obtaining the highest possible unity of reason. Fictions are precisely such principles, which are not real in themselves, yet are nevertheless assumed for the sake of scientific form. (1794: xxxv–xxxvi, noted)

31. Breazeale (2003: 147).

32. Vaihinger (1935: 93).

33. Cf. (Maimon 1791: 88) or (Maimon 1793a: 18, 30).

34. Examples in this respect are Atlas (1964: 14) or Breazeale (2003: 129; 2018: 4f.).

35. For the purposes of this paper, I will focus on Kant's doctrine of regulative ideas that he presents in the *first* Critique, as this is the text Maimon explicitly keeps referring to. Still, we should note that Kant himself develops his understanding of the functions of regulative ideas in the *Critique of Judgment* (1790),

reason in its effort to establish unity amongst its cognitions (A302/B359). This unity is effected by bringing the "greatest manifold of cognition of the understanding to the smallest number of principles" (A305/B361). According to Kant, reason's activity strives to connect and mediate all sorts of judgments by asking for their conditions, thus successively grounding any possible cognition (A396) by establishing a collective unity (i.e., unity between whole and parts) or coherent system organized by a minimal amount of principles valid for all elements integrated in it. Now, these highest principles providing the "condition to all conditioned" (B365), which is ultimately the unconditioned, are exactly what Kant calls 'ideas'. Owing to the sensible nature of human cognition, it is impossible for reason to posit an unconditioned first principle, i.e., a first ground that is not again conditioned through something given. That is why ideas as the concepts of reason should only be assigned *regulative* status (A671/B699).

Contrary to the concepts of understanding — the categories — to which any possible experience must necessarily conform, ideas are not constitutive for the objects of our experience (A643/B671).[36] Instead, regulative ideas instruct reason in its attempt to establish collective unity amongst all judgments, thereby only functioning as *directives* or *maxims* and not as laws for the constitution of objects of experience themselves (A666/B694; A680/B708).[37] As normative standards or demands, they tell reason what it *ought* to look for and what it *should* do. In order to answer to this demand, reason, for pragmatic reasons, has to treat the standard or goal *as if*[38] it were achievable.[39]

Through the regulative use of ideas, reason comes to treat nature as if it were amenable to rational order. Regulative ideas are, so to speak, the methodological apparatus of reason (A648/B676).[40] As "heuristic fictions" (A664/B692), their function is to generate coherent unity amongst the whole of judgments. That is, they provide directives for how one should proceed in scientific inquiry, whereby they become instruments or tools for reason's knowledge-producing activity. Reason's demand for an organized unity amongst all cognitions or judgments, however, "is only a projected unity, which one must regard not as given in itself, but *as a problem*" (A647/B675; my italics). Ideas regulate the production of knowledge in that they set a task for reason, a problem to be solved. For that purpose, ideas not only formulate a problem, but also the *form* of its solution; ideas project a "*focus imaginarius*" necessarily transcending the realm of possible experience (A644/B672).[41] Through the work of the transcendental philosopher, the fictiveness of this imaginary projection is discovered and can then be used effectively as an instrument for scientific inquiry.[42] This brings

where "the idea of systematicity is reassigned to the newly introduced faculty of reflective judgment" (Guyer 1990: 17).

36. See French (1967), Friedman (1991) or, more recently, Everett (2014) on the regulative and constitutive use of concepts in Kant's critical philosophy.

37. It is for this reason that ideas are defined as concepts "transcending the possibility of experience" (A320/B377) — they can never become objects of experience themselves (A327/B384). The elaboration of this point is the goal of the *Dialectic*, which exposes reason's illegitimate attempt at presenting ideas as objective.

38. See Vaihinger's treatment of what he calls "Kant's method of as-if" in his study on scientific fictions (1935: 271–318).

39. "Reason never relates directly to an object, but solely to the understanding and by means of it to reason's own empirical use, hence it does not create any concepts (of objects) but only orders them and gives them that unity which they can have in their greatest possible extension, i.e. in relation to the totality of series […]" (A644/B672).

40. Thus, I here side with what has been called a methodological reading of regulative ideas, see Buchdahl (1969; 1992) and Kitcher (1986). For a criticism on the general direction of such readings, see Abela (2006).

41. Ideas are not fictions in the sense of illusions that should be eliminated (see Grier (2005: 276ff, 294ff) for authoritative work in this respect). Rather, ideas generate "necessary illusions" (A645/B673). Due to its demand for complete explanations (arriving at an "unconditioned condition"), scientific knowledge-production has to pragmatically assume the possibility of attaining this goal and use ideas as methodological devices.

42. "[A]lthough the illusions […] are, in each case, 'unavoidable' and 'necessary', the subsequent errors (fallacies) are not" (Grier 2005: 304) — this is what the

us closer to seeing how Maimon's fictions and Kant's regulative ideas could be related: both present imaginary constructs that pretend to but do not represent the world, but nevertheless come to have an instrumental value for scientific inquiry *if treated as fictions*. What, then, is the problem that reason poses to itself, and what solution does it project?

Reason demands systematization and projects the ideal of systematicity. By making regulative use of the ideas, reason "orders" the judgments of understanding and "gives them that unity which they can have in their greatest possible extension" (A643/B671). Further, this "unity of reason always presupposes an idea, namely the form of a whole of cognition" (A645/B673). This specific kind of unity, which reason "quite uniquely prescribes and seeks to bring about […] is the *systematic* in cognition" (ibid.). Thus, what reason does is to employ regulative ideas as methodological tools to put the judgments of understanding into "systematic relation" (A680/B708); it brings cognitions into a coherent whole under "the unity of a system" (A680/B708).

Here, a first tentative notion of a system and the distinctive kind of unity it exhibits can be deduced: the relations between elements of a system and its organizing principle(s) are that of whole and part, as the form of the whole "precedes the determinate cognition of the parts and contains the conditions for determining *a priori* the place of each part and its relation to the others" (A645/B673). Any part or element of a system is determined via its relation to the whole, which is to all other parts, as the whole is nothing else but the organization of all its parts. Serving as reason's instruments to secure the systematic unity of our cognitions, regulative ideas take over two tasks: (i) they set the task of systematizing and, (ii) they project the goal, i.e., the form of systematicity. The next section is dedicated to making sense of these two aspects of Kant's notion of systematic unity.

consciousness of something *as a scientific fiction* does. Ideas can only be put to their rightful use if unveiled as fictions that can only serve a purpose in their regulative use (A687/B715).

5. Systematization and Two Kinds of Systematicity

Systematic unity can either relate to the (i) "activity of systematizing" or to (ii) "systematicity as the property of a system". As stated above, regulative ideas are *both* the task and instruction to bring about systematicity, i.e., the demand for systematizing activity, *and* the projection of this very goal, i.e., the form of systematicity: "[t]he [regulative idea] thus contains the end and the form of the whole that is congruent with it" (A833/B861). To distinguish both functions of the regulative use of ideas, I shall denote by 'systematizing' the activity of organizing the production of knowledge and by 'systematicity' the property of something, e.g., a body of knowledge, nature, etc. Now, within Kant's framework, we can isolate at least two senses in which ideas systematize and project systematicity. These can be mapped onto the distinction between the so-called *logical* and the *transcendental use of ideas*. These two uses of regulative ideas individuate the two functions or roles which regulative ideas fulfil with regard to the systematic unity of knowledge.

In their *logical* use, regulative ideas function within the process of cognitive systematization.[43] They instruct reason to operate on cognitions in order to systematize them, that is, any judgment is to be put into relation with all other judgments and is assigned a position determined through these relations. Through organizing and thus embedding knowledge claims into a systematic whole, each part is defined *in* relation and *through* to the whole and to all other parts. This process of mediation serves the purpose of establishing explanatory relationships amongst judgments: "systematicity provides the channel through which explanatory power can flow" (Rescher 1974: 696). Even more, that a body of knowledge has the property of systematicity is the condition for a specific form of explanation, namely scientific

43. I borrow this term (as well as that of ontological systematization) from Rescher (1974; 1979) to mark the difference between systematization in an *ontological* and in an *epistemic sense* (1974: 695–708).

explanation. The search for scientific explanations is grounded in the projection of a systematic order of knowledge.[44] How so?

Reason has to retreat to the idea of systematicity because explanation cannot begin with a first unconditioned principle (i.e., a transcendental idea). By dissolving the "dialectical illusions" instituted by the transcendental use of ideas, reason disciplines itself by committing to a regulative use of ideas. The idea of systematicity is introduced as consisting of three principles: a) the principle of homogeneity (H), b) the principle of specification (S), and c) the principle of continuity (C) (A658–659/B686–687).[45] Instead of wrongly projecting their objectivity, these principles remain directives or maxims only, i.e., they are methodological "tasks" (B380). In order to systematize the object and events of empirical enquiry, (H) instructs reason to look for sameness, i.e., shared conceptual features in empirical phenomena, thereby setting the task *to unify*; (S) demands a rigorous search for diversity, i.e., *to differentiate*; and (C) issues the demand *to connect* all empirical phenomena into one "single and exhaustive order of unity and manifoldness" (Abela 2006: 412). As methodological instructions, these principles are the directives according to which reason ought to operate on the body of empirical knowledge to bring it into a coherent whole that strives towards explanatory completeness under one idea: the principle of systematicity (A832/B860). By checking what the role of any item of knowledge is within this process of systematization, the same are justified *through* their integration into the systematic whole and thus attain the status as scientific explanations.[46] It is in that sense that ideas as regulative principles provide a ground for explanation, namely as methodological principles that establish a structure on grounds of which scientific explanation becomes so much as possible.

However, there is a second dimension to reason's task of systematization. Namely, systematicity does not only concern our judgments, but also the world they refer to. With regard to the *transcendental use* of regulative ideas, we need to consider to what extent systematicity as the property of a system "is not merely a principle of the economy of reason, but becomes an inner law of nature" (A650/B678). In principle, regulative ideas are theoretical concepts or models. Nevertheless, Kant seems to suggest that they not only bring about cognitive but also *objective* systematicity. That is to say, nature is to be treated as in itself systematic,[47] as amenable to our rational ordering. On his view, in order to study nature as if it was systematic, we must assume that nature indeed does exhibit some sort of systematicity. One way to make sense of this claim is to think about scientific practice and the manner in which scientists treat nature. By approaching nature under the assumption of its systematicity, scientists construct nature systematically; systematicity then becomes something "not merely something subjectively and logically necessary, as method, but objectively necessary" (A648/B676). Scientific practice forces nature to (i) *answer its questions in a systematic way*[48] and (ii) *produce systematic phenomena through experimentation*.

In making ideas methodological tools that structure scientific practice, science produces systematic observations, descriptions, and explanations, which emerge from experimental settings constructed under this presumption of systematicity. From this perspective, nature, in order to become intelligible (i.e., observable, describable, and

44. In this context, Allison speaks of an ideal of "explanatory completeness" (2004: 381).

45. For a discussion of the three principles, see for example Wartenberg (1992: 233–242) or Guyer (1990: 20–34).

46. This is consistent with Kitcher's view that Kantian scientists only come to attribute law-like status to regularities if such are coherent or integrable into a systematic whole (1986: 209). Other proponents of this view include Buchdahl (1969) or Guyer (1990). On my view, regulative ideas not only systematize *beliefs* but systematize *nature*, which I explain under the notion of "objectifying systematicity".

47. "For the regulative law of systematic unity would have us study nature *as if* systematic and purposive unity together with the greatest manifoldness were to be encountered everywhere […]" (A700/B728).

48. "These concepts of reason [i.e., ideas] are not derived from nature; on the contrary, we interrogate nature in accordance with these ideas, and consider our knowledge as defective so long as it is not adequate to them" (A646–647/B673–674).

explainable), must be structured in a way that makes it amenable to our epistemic or scientific practices. This entails that regulative ideas, though indirectly, also feed into the process of empirical investigation to bring about comprehended natural phenomena, in that they ground systematic relations between any sort of descriptions or observations but also between theoretical models and explanations that are built into experimental settings. "[I]deas actually provide the scientist with specific instructions what to look for when he turns to experience via experimentation" — ideas of reason thus organize the way in which we approach nature and thus what experiences we make, resulting in observations for explaining and predicting the course of nature (Wartenberg 1992: 243). Thus, successful experimentation under the idea of systematicity continuously realizes or increasingly *objectifies systematic unity through its practice*.

Also, we can understand the relation between the systematizing operation of reason and the judgments of understanding along the lines of Cartwright's simulacrum account of explanation (1983: 143–162): rather than finding a covering law (systematicity of nature) which unifies all phenomenological or specific laws of nature into one, science explains phenomena by "constructing models that fit these phenomena into a theory", wherein the covering law is true of the objects of the model but not of the actual phenomena, i.e., is only true of how these phenomena appear as constructed through the model. Transferred to Kant, reason's maxim of the systematicity of nature is not a true description and hence appropriate explanation of the covering law of nature. Instead, the maxim of systematicity instructs understanding in constructing empirical laws, i.e., models of regularities in phenomena that fit those particular events into an overall theory of systematicity.

Systematicity thus becomes an "inner law of nature" through *how* nature is constructed in experimental settings to fit the unifying laws or theories of natures, that is, the "law" of systematicity. "Reason has insight only into that which it produces according to its own design, […] it must require nature to answer its own questions" (Bxiii), hence it creates natural phenomena capable of answering its questions, amenable to its systematizing operations. While "in nature there is only complexity" (Hacking 1983: 226),[49] scientific investigation isolates phenomena in highly artificial experimental settings, enabling scientists to intervene into nature to create regularities that again can only be seen and understood as law-like against the background of a systematic whole. Even though systematicity is only a theoretical maxim, that is, "only indicate[s] the procedure" (A666/B693), doing science under its direction ultimately leads to the (partial and ongoing) objectification of these methodological directives.

So in what respect are regulative ideas similar, and in what respect do they differ from Maimon's philosophical fictions?

6. The Method of Philosophy: Fictions of Systematicity

On Maimon's view, the method of fictions is appropriate to philosophical science because of a Kantian-*spirited* insight into what philosophy can and cannot do: while it cannot provide conceptual tools that are directly constitutive for objects, philosophy can provide concepts, namely scientific fictions, which take on an *instrumental role* for the scientific project.[50] That is because, unlike Kant, Maimon *denies* that

49. See also Hacking (1983: 220–232).

50. One important question one might have in this context is whether we should attribute an *instrumentalist* position to Maimon. Maimon's case is certainly not a straightforward one, as he simultaneously advocates for scientific realism as rationalist, and instrumentalism as sceptic. In order to be explanatory, science must posit complete explicability; this standard of scientific explanation expresses a clear commitment to a conception of science as true representation of reality. For scientific theories to produce intelligible facts and complete explanations, objects of inquiry must be treated *as if* theoretical entities could fully explain them and thus become true representations of reality. This standard of explanation, however, then also gives rise to Maimon's scepticism: scientific practice as the project of finite intellects must stick to providing empirically adequate explanations of the phenomenal world, which it cannot transcend. Hence, although explanation *depends* on explanatory rationalism, such must be aware of its own dogmatism and of the empirical scepticism it is correctly subject to. It is through his commitment to the possibility of rational scientific explanation and the use of scientific fictions that is necessitated by it, that Maimon adopts both the position of a "rational dogmatist" and an "empirical sceptic" (1790: 436).

our *a priori* concepts necessarily apply to any *determinate*, i.e., particular empirical object at all (1792; 1793a; 1793c: 219).[51] From an *a priori* standpoint, transcendental philosophy can determine the conditions constituting an object of experience *in general*, but with regard to particular empirical objects (i.e., any object given in experience *a posteriori*), they cannot be shown to be constitutive. Thus, philosophical principles, which are supposed to determine the form of science as such, only have regulative status when it comes to the particular objects of experience, which themselves constitute the objects of science. Or in Maimon's preferred vocabulary, philosophical principles must be understood as useful fictions [*nützliche Fikzionen*], and in particular, fictions of systematicity.

For the purposes of this study, I shall focus on Maimon's thoughts about why and how Kant's transcendental philosophy can be understood as a fiction of systematicity with regard to the category of causality.[52] As discussed above, Maimon's reasons for this position stem from his criticisms *quid facti* and *quid juris*. Without rehearsing these criticisms again, the important point here is to remember that Maimon claims to have shown that transcendental philosophy cannot demonstrate *that* and *how* the forms of thought have objective validity, since for a thought to have objective validity is for it to apply to a particular object and not only to objects in general.[53] On this view, then, not only the concepts of reason (i.e., the ideas) but also the concepts of understanding (i.e., the categories), and therefore the whole structure of objective experience, can only be accredited regulative status (Maimon 1790: 75–83). As a result, for Maimon, the objective structure of experience *presupposes* rather than produces regulative ideas, or fictions of systematicity. Philosophical fictions of this type are not posited as a consequence of reason's inferential activity, which operates to unify, specify, and connect chains of natural appearances that are already causally structured. Rather, philosophical fictions determine the *a priori* concepts and principles *given* which we would be justified in treating natural appearances as causally structured and hence in treating them as affording systematization according to causal properties.

Thus, if transcendental philosophy should provide science with an "explanatory ground of natural appearances" (Maimon 1793a: 31), this explanatory ground can only be posited as a theoretical tool that informs us on how to treat natural appearances in general, e.g., as falling under the category of causality. If the structure of experience and thereby the structure of objectivity can only claim regulative status, Maimon argues, scientific inquiry as a whole has to be reconceived of as "complete induction": "[A]ccording to this mode of representation, thus, the concept of cause is not a category, but an idea, which can be approximated [*sich nähern*] through ever more complete induction but never reached" (1793c: 221).[54] With regard to the particular objects

51. Maimon nicely summarizes this point in the following quote:

> How, from the principle that everything that appears does so according to the law of causality, can I derive, through the given objects of determinate propositions, that the sun's rays necessarily melt the ice? From this principle it only follows that objects of experience in general must be thought of as causally related to one another, but in no way that it must be just these objects that stand in this relation. [Kant's] answer to this question then fails, according to me: *we know synthetic judgments merely in relation to an object of possible experience in general, but nothing of synthetic judgments that relate to determinate objects of real experience*. (1794: 489–90, emphasis added)

52. It is my tentative view that Maimon, at least sometimes, argues for the possibility of showing the constitutiveness of some categories for some particular objects, namely that the category of substance and attribute is constitutive for mathematical objects (e.g., 1794: 194). This hangs together with his idea that only a fact can prove the actual application of categories to particular objects and only a fact of a specific kind, i.e., a mathematical fact, can serve this purpose because we can know the rules for its production. Having shown the constitutiveness of this category, Maimon then calls for revising natural sciences such as to not explain change without introducing a further category of causality, see (1793d).

53. See Thielke (2001) for a detailed discussion of this point in relation to Kant's Second Analogy. With respect to this problem, Maimon writes, Kant's critical philosophy faces the same shortcomings as dogmatic philosophy, as both cannot show how their *a priori* principles apply to particular objects of nature (1793d: XIV).

54. Or:

> I claim, however, together with my skeptical friend D. Hume against

that we encounter in experience, the category of causality can only have regulative character. On Maimon's view, conjunctions of natural events are equally well explained by either *a priori* principles of cognition or by psychological laws of association. Concepts like causality therein serve as "ideas" which must be treated as fictional ideals that "are not real objects of experience but merely ideas that one can approach ever closer to in experience" (Maimon 1790: 239) but which each judgment of empirical regularities verifies to a fuller degree (Maimon 1793c: 221).

In comparison to the original account, Maimon's version of Kant's philosophy does not project systematicity in order to unify already objective judgments, but to project an order of formal, i.e., ideal principles, according to which highly probable judgments can be organized into coherent wholes (Maimon 1793c: 221). Thus understood, the continued process of scientific inquiry and explanation can only infinitely increase the probability of complexes of empirical judgments and thereby infinitely increase the probability of their being actual expressions of an objective order of nature. Thus, science is also a continuous process of verification of the *a priori* laws of theoretical philosophy. However, since this process is an infinite one and our cognition finite, it will never be possible to prove the fact, i.e., the objective validity of philosophical principles. On Maimon's view, theoretical philosophy cannot resolve the *quid facti* problem[55] because it would have to produce a complete induction, that is to say, it would have to determine *all* possible objects of experience.

Does this make Maimon's employment of regulative ideas or useful fictions a mere expression of his skepticism? On the contrary, I argue that we should understand his adoption of the method of fictions as a direct consequence of his underlying rationalism. As Franks and others have argued, it "is only *because* he is a rational dogmatist that [Maimon] can be — or perhaps, can only be — an empirical skeptic" (2003: 201).[56] Maimon identifies his position with that of a rational dogmatist because he proposes an unlimited version of the principle of sufficient reason as explanatory standard. To provide a genuine explanation of a fact, cause, or thing is to know its sufficient reason and that is to give a complete explanation. It is in line with this reading that we come to understand Maimon's methodological twist: his method of fictions should be conceived as the appropriate methodological means to systematically investigate the rationalistic demands that condition the possibility of *a priori* cognition and thus genuine scientific explanation.[57]

Hence, it is due to the standard of what can count as rational scientific explanation, i.e., a complete and unified explanation of the world, that we find our cognitive and scientific resources to be limited to a degree that makes the use of fictions *indispensable* for the scientific project. The fiction of systematicity does not emerge "from the bottom-up"[58] to stop the regress of grounds but rather from the "top-down" as a demand for complete explanation, from which any rational inquiry must begin. Fictions of systematicity are then the methodological means by virtue of which theoretical philosophy can produce hypothetical models of meta-epistemological frameworks that investigate the conditions under which explanations would be justified, i.e., under which complete explanation is possible.

This is where Maimon's alternative account of *a priori* cognition comes in. In a nutshell, Maimon offers a new account of cognition that explains the form and content of cognition as homogenous and which thus opens a possibility to understand the application of *a priori* forms to cognitive matter as rule-governed. On grounds of this solution to

> critical dogmatism, that these logical forms of thinking […] also do not have immediate use of sensible objects of nature, but can only achieve objective reality by virtue of a complete induction (which we can always approach, but never reach), through which their subjective necessity approaches objective necessity, until they unite […]. (Maimon 1793c: 227)

55. Cf. Maimon (1792: 75–83).

56. See also Thielke (2008).

57. It is in this sense that my reading disagrees with that Breazeale's (2002; 2003; 2018), who, by interpreting Maimon's method of fictions as expression of his skepticism (e.g., 2018: 2), misses its underlying rationalist motivation.

58. I am indebted to Peter Thielke for discussion of this point.

the *quid juris* problem, he then proposes to conceive of scientific explanation as the continuous attempt to render all things intelligible to the fullest degree by explicating their rules of production (1790: 63).[59] Yet we cannot determine the rules of generation for empirical objects to the fullest extent because as finite cognizers, we are never in possession of the complete concepts or representations of objects — this is actually why *quid juris* does arise as a problem for finite cognition at all.

Now, if philosophers want to explain how complete explanation should be conceived, Maimon suggests, they have to posit the fiction of infinite intellect.[60] Only if we treat the objects of science *as if* we were in a position to provide the complete chain of their conditions can we claim to be truly seeking their explanation. And the only perspective from which this possibility is truly intelligible is that of an infinite intellect: "the question is not, how far we can get in this endeavour but just *from which perspective we should to treat the object* (of inquiry), in order to be able to judge about it in appropriate manner" (Maimon 1793b: 222).[61] Since taking this perspective presupposes the *a priori* determination of objects that are "impossible" as objects of finite, i.e., spatiotemporal cognition, it demands adopting a particular practice of idealization. Maimon's new philosophical model only works if philosophy can make justified use of scientific fictions.

The important point then is that even though philosophy cannot demonstrate the constitutive principles of that which can become an object of science, it can *methodologically ground* scientific explanation by virtue of employing scientific fictions. Thus, while theoretical philosophy is not and cannot be in possession of a fact that proves the legitimate application of *a priori* forms to cognitive matter, it is in possession of a model of cognition that shows under what conditions we would be justified in applying *a priori* forms to cognitive matter. It thereby radicalizes the Kantian insight that reason must instruct scientific inquiry from an exclusively normative standpoint. While in Kant's view, regulative ideas operate on phenomena, that is, empirical objects for which the forms of understanding are constitutive, Maimon's philosophical science must understand itself as a purely *methodological* science. Philosophy's principles guide and constrain scientific practice to achieve systematicity by virtue of scientific fictions, which help generate a structure within which genuine scientific explanation becomes possible. As methods, they commit scientists to treat every object, event, or fact *as if* it were completely explicable — it commits science to treat its object as if it were completely intelligible.

Philosophical fictions are "formal inventions" (Maimon 1795: 16) — they constitute model-systems which are manipulated and investigated to get clear about the possibilities and limits of genuine scientific explanation. As hypothetical models of *a priori* cognition that ground a unified and complete scientific world view, philosophical fictions should become obligatory methodological tools for organizing science as a whole. Fictions of systematicity function to establish the "form of all science", i.e., systematic form, which they set up as a normative goal to be achieved by the empirical scientific practices of all other sciences. Therefore, philosophical fictions are of formal nature, including "forms, systems, methods" (Maimon 1793a: 9; 1795: 16) that never directly concern the constitution of real objects, but provide the methodological tools that regulate the ways in which scientists approach,

59. Maimon calls these rules of production of an object its *Entstehungsart* ("manner of generation"): "the sufficient ground for a thing is the complete concept of the way it *arises*" (1790: 392; emphasis added).

60. Maimon never calls the infinite intellect a fiction but he does call it an idea, e.g., "[W]e assume an infinite understanding (*at least as idea*), for which the forms are at the same time objects of thought, or that produces out of himself all possible kinds of connections and relations of things (the ideas)" (1790: 64–65). For other examples, see (1790: 265) or *Giv'at ha-Moreh* (Maimon 2000: 53, 81). Although it's fairly safe to assume that Maimon would never have called God a scientific fiction, he does employ the idea of infinite mind in a functionally equivalent way. The point is not that "God is a fiction", but that positing an infinite intellect is a method of proceeding *as if* the world could be cognized from a divine perspective, namely as completely explicable.

61. Only by virtue of positing the idea of an "understanding [that can] produce objects out of itself according to its self-prescribed rules and conditions without needing to be given something from elsewhere" (Maimon 1790: 63) do we get a perspective on the object as something completely intelligible. As Maimon says, he "merely ask[s]: what sort of hypothesis must I adopt for it [*a priori* cognition of objects] to be comprehensible?" (1790: 363).

treat, and investigate these objects to form hypotheses, explanations, and experimental procedures contributing to a coherent, systematic scientific program. Science under the systematizing power of philosophical fictions can therefore coherently legitimize its demand for rational and complete explanation, while at the same time doing justice to the absence of something like categorical laws of nature that constituted through metaphysical principles or the *a priori* forms of our cognition. How do the theoretical tools provided through philosophical fictions generate systematicity on Maimon's framework?

Although any explanation in natural sciences relies on particular observed phenomena, it has to infer to the universal principles that explain their production (Maimon 1793c: X–XI). Instead of constitutive principles, theoretical philosophy must proceed by producing model-systems in order to investigate which fundamental structures appearances must have in order to fit with the kinds of explanations that the sciences employ. While Kant subscribes to the view that the natural sciences depend on philosophy because the latter's principles constitute the possibility of experience and hence the possibility of any epistemic practice, Maimon thinks natural sciences depend on philosophy exactly in the *absence* of such a constitutive relationship. In delivering consistent conceptions of objectivity, philosophy delivers systems of principles that provide the conditions given which we would be justified in assuming that, e.g., necessary and universal connections obtain between sensible appearances. Thereby, philosophical model-systems yield different possible descriptions of how it is that science can explain one thing in terms of another.

To conclude, then, fictions of systematicity instruct scientific practice to bring about a unified system of science. On grounds of a methodological employment of PSR, they direct science to determine its objects towards explanatory completeness, as only through "subsuming the highest possible manifold under the highest unity of principles by establishing the most complete systematic unity" (Maimon 1793a: 41) can science treat its objects as integral parts of a coherent and systematic whole of completely intelligible determinations. Philosophical fictions guide science to produce systems of this kind, which justify knowledge claims by virtue of integrating them into systematic wholes and thereby continually approach an objectification of systematicity as they further instruct the sciences to construct a systematically ordered nature through their systematic treatment of phenomena.[62] Fictions of systematicity can be realized in multiple ways, for example through Kant's fiction of objective experience (Maimon 1793a: 51), Leibniz' fiction of monads (ibid.: 17), or Maimon's own tentative fiction of an infinite intellect that produces completely intelligible objects. Thereby, Maimon not only applies the discussed metaphilosophical conception to his own philosophy, but he also reconceives the history of philosophy as history of useful fictions. What distinguishes all these fictions from his own is obviously that their authors did not consider them to be fictions, plus some of these fictions do not resolve the problem *quid juris* (e.g., Kant's transcendental philosophy).[63] What unites them, however, is their systematic form. Systematicity is the formal feature identifying all philosophical fictions that qualify as *scientific* fictions.

7. Conclusion: Systematicity and the Scientific Role of Philosophy

Finally, this also suggests an answer to question of "why systematicity", more precisely, of what it is that the property of systematicity adds to a body of knowledge to make it a scientific body of knowledge: fictions of systematicity establish a rational standard of explanation for science to treat its object as if it were completely intelligible. By virtue

62. Still, we should keep in mind that Maimon does not think that science can ever *achieve* this goal. For example, with regard to explanation of some natural event, he states that "[i]f I notice this again and again, so that these two appearances are ever more strongly connected in me, then at last (through complete induction) this subjective connection reaches its highest degree, and becomes equivalent to the objective" (1790: 72). Yet this does not mean that we can actually carry out a complete induction, but only that, from an explanatory standpoint, scientists must understand their work in such terms.

63. Some of Maimon's remarks suggest that he also considered Leibniz' philosophy as an expression of rational dogmatism and empirical skepticism, which suggests that the latter's philosophy, "if it is understood correctly", might have the necessary resources to provide an answer to *quid juris* (Maimon 1790: 436–437).

of their being *methods* for bringing about systematicity by treating *X as if it were Y*, they secure the possibility of genuine scientific explanation without constitutive principles that determine the structure of natural appearances and the explanatory completeness guaranteed by rationalist frameworks.

Despite their differences as to how systematicity is generated, Kant and Maimon agree that systematicity functions as a *demarcation criterion*: scientific knowledge is demarcated from other types of knowledge through its having systematic unity, or, the property of systematicity. Per Kant,"[S]ystematic unity is that which first makes ordinary cognition into science, i.e., makes a system out of a mere aggregate of it. I understand by a system, however, the unity of the manifold cognitions *under one idea*" (A833/B861). Maimon writes:

> The most universal form of any science is the form by virtue of which it is a science at all, namely the highest possible degree of unity of principles, and a systematic order of the subsumed manifold (…). This form is a demand of reason with regard to *any object to be treated as object of science in general*. (1792: 42–43)

Systematicity as demarcation criterion states that cognitions count as scientific only if they stand in systematic relation to other cognitions. How is systematic unity characterized?

First, systematic unity denotes a kind of non-compositional unity — the systematic whole is "articulated (*articulatio*) and not heaped together (*coacervatio*)" (A833/B860). Secondly, the relations between the parts and the whole are of a non-compositional nature because they are not arbitrarily determined but in virtue of one principle that *is* the idea of the whole and as such mediates all parts with each other.[64] Consequently, the idea of the whole must be prior to its parts, as every part is determined through and grounded in its relation to the whole. This makes Kant analogize the systematic whole with an "animal body" that "grows internally but not externally", that is, "whose growth does not add a limb but rather makes each limp stronger and fitter for its end without alteration of proportion" (A835/B862). In similar vein, Maimon proposes systematic unity "subsumes the highest possible manifold under the highest unity of principles" (1792: 43; 1793a: 41). For him, too, systematic unity is non-compositional, i.e., the different parts (the manifold of cognitions) are determined through a small number of unifying principles (highest unity of principles), which are prior to the parts they determine, as a principle "is nothing other than a universal cognition, to which any particular cognition subsumed under it, must be reducible, if it is to be grounded at all" (1793a: 54). By virtue of having these features, systematic unity will provide a solution to the problem of arriving at genuine explanation but without having to postulate an unconditioned or first ground. Rather, by being integrated into the systematic whole, individual cognitions are explained in relation to all other cognitions and their relation to the whole system of knowledge, thereby giving an explanation that is *as complete as possible*.[65]

On this view, theoretical philosophy as science of scientificity is *normative*. Its fictions generate a demarcation criterion for science that does not primarily qualify something as science by virtue of descriptive analysis of actual scientific practice(s), but by virtue of a normative analysis into what science ought to be: systematic unity of cognitions. Generally, science can be demarcated from other epistemic practices by way of its method or procedures, or alternatively, be qualified through a distinctive property. According to Maimon's model, individual sciences are characterized as sciences through their employment of scientific methods. Yet his research program calls for revision of the sciences, in fact "[e]ach science, as such, has to philosophize about its object" (1793: LXIII) — philosophy of science has to concern

64. "The unity of the end, *to which all parts are related and in the idea of which they are also related to each other*, allows the absence of any part to be noticed in our knowledge of the rest, and there can be no contingent addition or undetermined magnitude of perfection that does not have its boundaries determined *a priori*" (A832–833/B860–861; emphasis added).

65. Maimon explicitly expresses this view in (1793a; 1795; 1797).

all individual sciences with the goal of generating systematic unity. As he writes in his *Announcement* (1792), any science, despite its having already developed its own scientific method, ought to be examined with regard to its most universal form, "which is that through which it is a *science at all*" (1792: 42).

Through the generation of fictions of systematicity, philosophy goes one step further: it not only imposes systematic order on its own domain of knowledge, but as being the "science of the form of all sciences", it confers systematic form onto all other sciences, thereby systematizing all the individual sciences into one *unified science*.[66] Different knowledges produced by a variety of sciences can be united into a whole of science that, although containing bodies of knowledge distinct in terms of scientific method and object, are unified under this property.[67] Although the scientific enterprise can be divided into many individual sciences, which might secure their scientific status through a diversity of scientific methods, there exists a property that distinguishes scientific knowledge as a unified whole and that is the property of systematicity. Philosophy is the "science of the form of all sciences" because it confers systematicity onto all other science and because knowledge only acquires the status of science proper if it is "brought into a system" (Maimon 1792: 42); by virtue of generating systematicity, philosophy becomes the science of scientificity.[68]

66. From this perspective, Maimon's revisionary program for science shares analogous ambitions with the program of unified science as put forward by the Vienna circle, e.g., Carnap (1928). Even the slogan of their early *Manifesto* (Carnap et al.: 1929), "unity of science without metaphysics", resonates with Maimon's definition of philosophy as a *methodological* science that should proceed through the method of fictions and thereby unify science instead of through founding the sciences through a metaphysics.

67. This view on scientificity was recently argued for by Hoyningen-Huene (2013).

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