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Maimon as a Baconian: natural histories, induction and the ladder of certainty

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ABSTRACT

In this article, I address an uncharted topic in the scholarship on Salomon Maimon – the great influence that Bacon's philosophy had on Maimon. I suggest that by considering Maimon as a Baconian, we achieve a better understanding of Maimon's work, especially in three respects: (i) his use of natural histories to achieve philosophical insights, (ii) the employment of induction to find new propositions and establish known ones as certain but not as objectively necessary and (iii) a probabilistic view of science, wherein we acknowledge that we can achieve higher degrees of certainty attributed to propositions but are unable to show that empirical propositions are objectively necessary. It is in this context that I propose to use the term 'ladder of certainty' and discuss how it is connected to Maimon's skeptical stance.

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1. Introduction

Much has been written on the various philosophical influences that helped to shape the thought of Salomon Maimon, mainly the influence that Kant, Leibniz, Spinoza, and Maimonides had on the development of his work.[1] However, scholarship on the impact of Bacon's work on

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[1]To mention just a few examples of studies on how the work of various intellectual figures influenced the development of Maimon's thought: Daniel Elon, *Die Philosophie Salomon Maimons zwischen Spinoza und Kant: Akosmismus und Intellectkonzeption* (Hamburg: Felix Meiner Verlag, 2021); Elhanan Yakira, "From Kant to Leibniz? Salomon Maimon and the Question of Predication," in *Salomon Maimon: Rational Dogmatist, Empirical Skeptic: Critical Assessments,* ed. Gideon Freudenthal (Dordrecht;

Maimon's intellectual development is very thin and no work has been dedicated to the topic. This is despite the fact that Maimon wrote a commentary on the first book of Bacon's *Novum Organum*. In this article, I argue that to better understand Maimon's thought, especially on the relation between empirical knowledge and certainty, we need to consider to what degree he was influenced by Bacon's work. I concentrate on three main aspects: natural histories, induction and skepticism towards empirical knowledge that leads us to search not for absolutely necessary truth, but rather for propositions with varying degrees of certainty only. I believe that these three topics are the major elements of Baconian thought that can be traced in Maimon's work.

I begin my argument that Maimon is a Baconian with a short review of his engagement with Bacon's thought in general and continue with a more detailed discussion of the three main Baconian ideas incorporated in Maimon's work. Section 2 consists of a few examples indicating that Maimon refers to Bacon and his work on different occasions and contexts, alongside a short discussion of the structure and history of Maimon's commentary on Bacon's *Novum Organum*. In Section 3, I claim that three of Maimon's essays should be regarded as natural histories. I portray how they fulfill some of the technical requirements for writing a natural history, such as brevity and order. While Maimon's essays do not introduce tables of discovery as presented in Bacon's *Novum Organum*, they do resemble the natural histories in Bacon's *Sylva Sylvarum*. Moreover, these essays help produce new philosophical knowledge. In Section 4, I discuss how Maimon's thoughts on induction offer insight into his probabilistic view of science, wherein we arrive at greater degrees of certainty, but not apodictic certainty. Furthermore, I present two interconnected aspects of Maimon's skeptical thought that were most likely influenced by similar ideas found in Bacon's work: (a) in empirical inquiry, objective necessity (or 'absolute necessity') is an ideal that cannot be achieved and (b) adopting a probabilistic view of science, wherein a great part of our inquiry is dedicated to showing that we can increase the degree of certainty we can attribute to a proposition, but not to finding objectively necessary propositions. Inspired by Bacon's 'ladder of the intellect,' I propose the term 'ladder of certainty,' to

Boston: Kluwer Academic, 2003), 54–79; Yitzhak Y. Melamed, "Salomon Maimon and the Rise of Spinozism in German Idealism," *Journal of the History of Philosophy* 42, no. 1 (January 2004): 67–96; David Lachterman, "Mathematical Construction, Symbolic Cognition and the Infinite Intellect: Reflections on Maimon and Maimonides," *Journal of the History of Philosophy* 30, no. 4, (October 1992): 497–522. I am very grateful to Stephan Schmid for reading an early version of the article and for his insightful suggestions.

be applied in the context of both Maimon and Bacon. This term is meant to convey the idea that we use induction to achieve higher degrees of certainty attributed to propositions. In both Sections 3 and 4, after showing why Maimon is a Baconian in several respects, I discuss how these Baconian ideas are incorporated into Maimon's philosophy. Since my aim in this article is to instantiate the claim that Maimon is a Baconian, and since an in-depth discussion of each of these issues is outside the scope of this article, my discussion in these philosophical questions is kept brief.

Before exploring how Maimon is a Baconian with regard to the three thematic aspects mentioned above, I turn to examine the structure of Maimon's commentary on Bacon and address the problematic fact that the core of it was never published, nor its manuscript found. We can only hope that a manuscript will 1 day appear, to help us paint a more detailed picture of Maimon's thought on Bacon than what can be achieved with the means at hand.

2. Baconian thought in Maimon's philosophy

Before discussing in detail how Bacon's ideas helped Maimon formulate his philosophical views, I address the more general question of why we should consider Bacon as a source of intellectual influence on Maimon in the first place. The answer has two parts: first and foremost, I consider the effects of Bacon's ideas on the content of Maimon's thought, to which the majority of the article is dedicated. The second indication has to do with textual materials: Maimon dedicated a commentary to Bacon, incorporated citations from Bacon's works, and referred to Bacon by name in writings other than the commentary.

Perhaps the best reason to consider Maimon as a Baconian (alongside other attributions such as 'Leibnizian' or 'Spinozist') is the commentary that he wrote on Bacon's *Novum Organum*. In fact, it was Maimon's idea to publish the first German translation of the text. Already in 1790, 3 years before the publication of the translation and commentary, Maimon offered Bartoldy to take the task of translation upon himself.[2] In the same year, Maimon also published an essay titled 'Baco und Kant,' in which he compares the works of the two philosophers.[3] Maimon wrote several commentaries throughout his life, including a commentary on

[2]Salomon Maimon, *Bacons von Verulam Neues Organon* (Berlin: Gottfried Carl Nauck, 1793), XXXVI.
[3]Salomon Maimon, "Baco und Kant," in *Gesammelte Werke* 2, ed. Valerio Verra (Hildesheim: Georg Olms Verlargsbuchhandlung,1965), 499–522.

Aristotle's *Categories*, a commentary on the first book of Maimonides' *Guide of the Perplexed* and a commentary on Newtonian philosophy.[4] The latter is a commentary and a German translation of Henry Pemberton's (1694–1771) book *A View of Sir Isaac Newton's Philosophy* (1728).[5] Furthermore, Maimon's first published monograph, *Essay on Transcendental Philosophy* (1790), is suggested by Freudenthal to be a commentary on Kant's *Critique of Pure Reason*.[6] Having Bacon as a member of the list of philosophers who engaged Maimon enough for him to dedicate a commentary on their renowned work is not trivial and strongly suggests that Bacon's ideas left a distinguishable mark on Maimon.

Another type of 'textual evidence' indicating how significant Bacon's work was to Maimon consists of citations and mentions of the former incorporated in works of the latter. For instance, Maimon begins his article 'The Genius and the Methodical Inventor' (1795), in which he presents an outline for a theory of invention, with a citation from Bacon. He quotes the following passage (in the original Latin), which is the opening sentence of the preface to *Great Instauration*, also known as *The Great Renewal*, of which the *Novum Organum* is the second volume: 'Men seem to me to have no good sense of either their resources or their power; but to exaggerate the former and underrate the latter' (362).[7] In the same text, there appears an example by Bacon to which Maimon alludes in his article on the genius: the compass is a human invention that enabled seamen to discover new continents.[8] Moreover, in 'Bacon and Kant,' Maimon cites the full paragraph from which the above-mentioned quote appearing in the article on genius is

[4]Salomon Maimon, *Die Kathegorien des Aristoteles* (Berlin: Ernst Felisch, 1794); Salomon Maimon, *Giv'at Hamore,* ed. Samuel Hugo Bergman & Nathan Rotenstreich (Jerusalem: The Israeli Academy of Sciences and Humanities, 1966) [in Hebrew]; Salomon Maimon, "Anfangsgründe der Newtonischen Philosophie von Dr. Pemberton," in *Gesammelte Werke* 4, ed. Valerio Verra (Hildesheim: G. Olms Verlagsbuchhandlung, 1970), 531–582.

Pemberton was the editor of the third edition of Newton's *Principia Mathematica*.

[5]To the list of commentaries, we may add Maimon's essay on theodicy, which he wrote in response to Leibniz' famous text. Seeing that Maimon cites only from Maimonides' *Guide of the Perplexed* and not from Leibniz' essay, I leave the question open whether it is a commentary on Leibniz or rather on Maimonides' work. See: Salomon Maimon, "Über die Theodicee," in *Gesammelte Werke* 3, ed. Valerio Verra (Hildesheim: Georg Olms Verlargsbuchhandlung, 1970), 299–331.

[6]Gideon Freudenthal, "Interkulturelle Kommentar als Methode systematischen Philosophierens bei Salomon Maimon," *Aschkenas – Zeitschrift für Geschichte und Kultur der Juden* 18/19, no. 2 (2008/2009): 531.

[7]"Videntur nobis homines nec opes nec vires suas bene nosse; verum de illis majora quam par est, de his minora, credere." See: Salomon Maimon, "Das Genie und der methodische Erfinder," in: *Gesammelte Werke* 6, ed. Valerio Verra (Hildesheim: G. Olms Verlagsbuchhandlung, 1971), 362.

The English translation is taken from the Preface of Bacon's *Great Instauration* (also known as *The Great Renewal*). See: Francis Bacon, "The Great Renewal: Preface," in *The New Organon*, ed. Lisa Jardin & Michael Silverthrone (Cambridge, New York & Port Melbourne: Cambridge University Press, 2000), 6.

[8]Bacon, "The Great Renewal: Preface," 10; Maimon, "Das Genie und der methodische Erfinder," 367.

taken.[9] In this article, Maimon quotes very long passages from Bacon's *Novum Organum*, which in total constitute about seven pages, almost a third of Maimon's text.

Maimon mentions Bacon on many occasions. For instance, he dedicates a paragraph to Bacon in the short essay 'The History of Philosophy,' which is included in *Giv'at Hamore* (1791), his commentary on Maimonides' first book of *Guide of the Perplexed*.[10] While Maimon mentions Bacon, he does not mention other philosophers who are known to influence his intellectual development, such as Spinoza and Hume. In his book *Controversies in the Fields of Philosophy* (1793), Maimon refers to Bacon several times, including in the context of his notion of general axioms and in the context of induction as a tool that aids us in bringing methods of invention closer to perfection.[11] Moreover, Maimon mentions Bacon in his commentary on Newtonian philosophy on several occasions.[12] In his preface, Maimon asserts that although Bacon advanced scientific knowledge by introducing his methods employing experience, observations, and trials in a purposeful manner and not arbitrarily, his aphorisms are not in the form of science and therefore further development of scientific methods and theory is required.[13] An important mention appears in the beginning of the article 'Bacon and Kant,' where Maimon states that he considers Bacon as a dear friend and that he is 'endlessly connected' to his *Novum Organum* (99). It is after reading this book that Maimon came up with the idea to compare the works of Bacon and Kant.[14]

Any analysis of Maimon's commentary on the *Novum Organum* should begin by mentioning that the core of the text was never published. Alas, a manuscript of the entire commentary is yet to be found as well. Since no scholarly work has been dedicated to the study of this text, it is seldom acknowledged that the more extensive part of the commentary is missing. This fact was mentioned briefly by Kuntze, and in an anonymous review from 1796 on the published part of the

[9]Maimon, "Baco und Kant," 112–113.

[10]Apart from dedicating a whole paragraph to Bacon's achievements, Maimon also mentions him when portraying the contribution of Arabic mathematicians to the study of nature. Bacon is depicted as a thinker who rightly points out that arithmetic and geometry are applied to natural sciences, but the first do not derive the latter. See: Maimon, *Giv'at Hamore*, 9, 13.

[11]Salomon Maimon,"Streitereien im Gebiete der Philosophie," in *Gesammelte Werke* 4, ed. Valerio Verra (Hildesheim: G. Olms Verlagsbuchhandlung, 1970), 14,17.

[12]For instance, see: Maimon, "Anfangsgründe der Newtonischen Philosophie," 8, 12, 31.
Bacon's name also appears several times in Pemberton's text, on the basis of which Maimon wrote his commentary on Newtonian philosophy. See: Henry Pemberton, *A View of Sir Isaac Newton's Philosophy* (London: S. Palmer, 1728), 5, 12, 25.

[13]Maimon, "Anfangsgründe der Newtonischen Philosophie," VIII.

[14]Maimon, "Baco und Kant," 102.

commentary.[15] Only the first volume was published, while the second planned volume, which includes the balk of Maimon's commentary on the *Novum Organum,* never appeared in print. Maimon's commentary is published alongside Georg Wilhelm Bartoldy's German translation of the first book of *Novum Organum*, which is the first translation of Bacon's text into German. It is Bartoldy who mentions that, due to a lack of space in the first volume, it was planned that the core of Maimon's commentary would be printed in the second volume.[16] In the 1793 edition of the text, which is also the only edition, it is stated on the title page that there are two volumes to the work. Moreover, the last page of this edition explicitly states that it is the end of the first volume.[17] Recognizing that the second volume is missing means that we should consider the parts of Maimon's commentary that we have at hand as only a small portion of a greater unknown oeuvre.

The existing parts of Maimon's commentary are a preface and two essays. The preface, titled 'Preface of the Editor,' appears after a preface by the translator Bartoldy. Maimon is credited as the editor and is mentioned by Bartoldy as taking an active part in the translation as well. He assisted Bartoldy together with a third contributor, Treichel, who is mentioned only by his last name in Bartoldy's preface, and does not receive credit on the title page of the book (unfortunately, I was unable to locate more details regarding his identity and his role in the Enlightenment movement). Bartoldy also acknowledges the great contribution that Maimon and Treichel made in the challenging task of finding German expressions to facilitate the reading of Bacon's text.[18] The two essays composing the majority of Maimon's published commentary are 'A Short Exposition of Philosophical Systems' [*Kurze Darstellung Philosophischer Systeme*] and 'A Short Exposition of Mathematical Inventions' [*Kurze Darstellung Mathematischer Erfindungen*]. They are described together on a title page as 'A Short Overview of Philosophical Systems and Mathematical Inventions until Bacon of Verulam' ['Kurzer Überblick philosophischer Systeme, und mathematischer Erfindungen bis auf

[15]Friedrich Kuntze, *Die Philosophie Salomon Maimons* (Heidelberg: C. Winter, 1912), 3; Anonymous, "Bacon F.: Bacons von Verulam neues Organon. Bd. 1. A. d. Lat. v. G. W. Bartholdy. Mit Anm. v. Salomon Maimon," *Allgemeine Literatur-Zeitung* 395 (December 1796): 700.

The anonymous author of the critique found Maimon's commentary to be only remotely related to Bacon's philosophy. Unfortunately, not much more can be said on this, since the author does not elaborate on his critique of Maimon's text and blames this on the lack of space. See: Anonimus, "Bacon F.," 702.

[16]George Wilhelm Bartoldy, 'Vorrede des Übersetzers,' in *Bacons von Verulam Neues Organon*, by Salomon Maimon, XLI–XL.

[17]Maimon, *Bacons von Verulam Neues Organon*, 305.

[18]Maimon, *Bacons von Verulam Neues Organon*, XXXVIII.

Baco von Verulam']. [19] Even though the joint title page of the two essays mentions that they end with Bacon's work, this is in fact not the case. The essay concerning philosophy ends with an entry on Pyrrho and includes several of Kant's claims. Maimon does not dedicate an entry to Bacon and mentions his name only in the context of Aristotle, stating that Bacon often referred to him. [20] The essay on mathematics ends with Newton, whereas Bacon is not mentioned at all. [21]

Bartoldy sent Kant a copy of his translation of *Novum Organum* together with Maimon's commentary on 18 September 1793. In his letter, Bartoldy comments that he was requested by Maimon to send the text, and mentions that Maimon himself avoided sending it to Kant for fear of polemicizing. [22] Indeed, in the commentary on Bacon, Maimon disputes Kantian arguments. However, mentioning these disputes as the reason for not sending the letter directly from Maimon seems quite odd, since only 3 months later Maimon sent Kant a letter asking him to read his manuscript on logic. In his book on logic, he often disagrees with Kantian ideas, such as the notions of space and time. [23] Kant's response to Bartoldy's letter is lost, but a short description of its content appears in a book on Maimon's life written by Sabattia Joseff Wolff in 1813, wherein Wolff states namely that Kant received the copy of the book. Kant complemented Maimon's work, yet it is unclear to what extent Kant read and was affected by the commentary and translation. [24] What we do know is that Bacon's work was so dear to Kant that he chose to quote from Bacon's preface of *Great Instaurations* in the beginning of the second edition of *Critique of Pure Reason*. In this citation, Bacon maintains that we should not aim at any knowledge that is in the realm of the infinite, but rather calls us to remain within the limits of the mortal. Otherwise, we are facing infinite errors. [25] This skeptical approach stating that we, as human beings, cannot have

[19] Maimon, *Bacons von Verulam Neues Organon,* 165.
[20] Maimon, *Bacons von Verulam Neues Organon,* 214.
[21] In the essay on mathematical inventions, Maimon does not mention Francis Bacon, but only Roger Bacon, stating that he was a great mechanist. See: Maimon, *Bacons von Verulam Neues Organon*, 269.
[22] Georg Wilhelm Bartoldy, "589. 18. September 1793. Von Georg Wilhelm Bartoldy," in *Kants Gesammelte Schriften* XI, by Immanuel Kant, (Berlin and Leipzig: Walter de Gruyter, 1922), 448.
[23] Salomon Maimon, "606. 2. December 1793. Von Salomon Maimon," in *Kants Gesammelte Schriften* XI, 470-471; Salomon Maimon, "Versuch einer neuen Logik oder Theorie des Denkens, Nebst angeängten Briefen des Philaletes an Aenesidemus," in *Gesammelte Werke* 5, ed. Valerio Verra (Hildesheim: G. Olms Verlagsbuchhandlung, 1970), 142.
[24] Sabattia Joseph Wolff, *Maimoniana, oder Rhapsodien zur Charakteristik Salomon Maimons* (Berlin: S. Hayn, 1813), 199.
[25] Immanuel Kant, *Critique of Pure Reason,* tr. and ed. Paul Guyer and Allen W. Wood (Cambridge: Cambridge University Press, 1998), 9, §BII. See also: Bacon, *The New Organon,* Book II, §X 109.

knowledge of the infinite, is not foreign to Maimon either. As will be discussed later on, Maimon expresses doubt regarding our ability to reach complete inductions, i.e. that we can have knowledge of all the instances in an infinite enumerative induction.

3. Natural histories

The first philosophical method which I propose was adopted by Maimon from Bacon is the method of writing natural histories. Maimon's commentary on Bacon's *Novum Organum* includes two essays which, as I show in what follows, should be regarded as natural histories. The first essay, 'A Short Exposition of Philosophical Systems,' was written based on Bayle's *Historical and Critical Dictionary* (1697) and Johann Jakob Brucker's *Historia critica Philosophiae* (1742–1744). The second essay, 'A Short Exposition of Mathematical Inventions,' is based on Montucla's *History of Mathematics* (1758).[26] Maimon's essay is a fulfillment of Bacon's own suggestion: 'Histories should also be written of pure mathematics, though they are rather observations than experiments' (Bacon, 'Catalogue of Particular Histories by Titles,' in *The New Organon*, 238). An explanation as to why Maimon's essays on philosophy and mathematics are printed together, and even share a title page, is found in Maimon's statement in the preface, asserting that philosophical truths and mathematical inventions should be examined together in order to shed a brighter light on each of these fields.[27] To these two essays I wish to add a third that should also be regarded as a natural history: the short essay 'The History of Philosophy' [קורות הפילוסופיאה], which is written in Hebrew and included in *Giv'at Hamore*, published in 1791.[28] Although the title of the essay mentions philosophy, the text is better described as a short history of scientific inventions and discoveries, since more than philosophical systems, it portrays an array of inventions dating from the time of the Ancient Greeks to the Modern Era and ending with Maimon himself. I begin by showing that Maimon's essays comply with Bacon's technical requirement of writing natural histories and continue by discussing how Maimon is employing these essays to achieve new philosophical insights.

[26]Maimon, *Bacons von Verulam Neues Organon,* XCI.
[27]Maimon, *Bacons von Verulam Neues Organon,* XCII.
[28]Maimon, *Giv'at Hamore*, 6–18.

3.1. Writing natural histories

The three essays, which I consider as natural histories, comply with three technical requirements for writing natural histories. First, Maimon presents a written history. According to Bacon, it is important to have a written history for the intellect to be able to perform at its best. The importance of this requirement for Bacon is evident when he states that 'no written experience has yet been developed, though we should not approve any discovery unless it is in writing' (Bacon, *The New Organon*, Book I, §CI, 82). Maimon's essay 'The History of Philosophy' portrays many mathematical and scientific inventions and discoveries, such as the printing press, the telescope, the air pump and the compass.[29] Maimon also dedicates a paragraph to briefly describing Bacon's work, where he asserts that the tower of knowledge built by Bacon has *historia naturalis* as its foundations. In the same paragraph, Maimon mentions the inventions of the barometer and the air pump, two empirical inventions that are the result of considering how the powers of nature, geometry, and philosophy are connected.[30] In 'A Short Exposition of Mathematical Inventions,' the importance of writing down discoveries (and inventions) is evident already in the title. Although the title of the essay on mathematical inventions speaks only of mathematics, the text also includes numerous empirical inventions and discoveries, e.g. Newton's invention of the reflecting telescope, Kepler's discovery of the properties of crystalline objects, and Huyghens' discovery of Saturn's ring.[31] In the last paragraph of the essay, Maimon expresses the more general aim of his account, which goes beyond a mere presentation of a written history: the synopsis on mathematical inventions can help advance scientific knowledge and provide methods for a universal theory of invention.[32] The essay 'A Short Exposition of Philosophical Systems' depicts ancient and early modern philosophical ideas under titles of entries that mention only ancient names such as 'Anaximander' and 'Parmenides'.[33] The last entry titled 'Pyrrho as a rational skeptic' stretches over 30 pages and contains namely Maimon's views on various philosophical issues, such as the possibility of synthetic *a priori* judgments and a critique on the necessity attributed by Kant to judgments of experience. In this essay, the requirement of

[29]Maimon, *Giv'at Hamore*, 10, 12, 13.
[30]Maimon, *Giv'at Hamore*, 13.
[31]Maimon, *Bacons von Verulam Neues Organon,* 291, 303, 305.
[32]Maimon, *Bacons von Verulam Neues Organon,* 305.
[33]Maimon, *Bacons von Verulam Neues Organon,* 174, 188.

writing down discoveries is extended to philosophical innovations, not only to empirical and mathematical inventions and discoveries.

Bacon's second requirement states that a natural history should be short in order for the mind to be able to easily act upon the information and draw new axioms from the particulars using a 'sure method and rule' (Bacon, *The New Organon*, Book II, §X, 109; Book I, §CIII, 83). Maimon's natural histories are short and are even described as such in the titles of the essays: 'The History of Philosophy' is 13 pages long, 'A Short Exposition of Mathematical Inventions' is 61 pages long and 'A Short Exposition of Philosophical Systems' is 77 pages long. The two longer texts contain parts of short histories on one topic. For instance, the text on mathematical inventions incorporates four pages on developments in astronomy in Germany between the sixteenth and eighteenth centuries.[34] In the text on philosophical systems, Maimon dedicates six pages to Pythagoras, divided by the subtitles 'Pythagoras as a rationalist' and 'Pythagoras as a transcendental thinker.'[35]

The third requirement is that the written history be organized in a systematic manner, inducing the production of new knowledge by writing down the accumulated known knowledge in a specific order.[36] Indeed, Maimon does not present proper 'tables of discovery of things relevant to the subject of investigation' so that our mind can more easily engage in the analysis of these 'summaries of facts' as suggested by Bacon.[37] He does, however, present accumulated knowledge on a given topic (either mathematics, sciences or philosophy) in an organized manner, with the aim of producing in the reader an effect similar to that of Bacon's tables of discovery: drawing general conclusions from the particular instances. In Maimon's case, his essays end with his conclusions on topics previously discussed in the essay. The guiding organizing line we witness in 'A Short Exposition of Philosophical Systems' is the descriptions of Greek philosophers as holding early modern views. For instance, Thales is described as a critical philosopher and as a transcendental thinker, whereas Xenophanes and Parmenides are portrayed as Spinozists and Leibnizians.[38] These connections between ancient

[34]Maimon, *Bacons von Verulam Neues Organon,* 274–277.
[35]Maimon, *Bacons von Verulam Neues Organon,* 178–184.
[36]Bacon's natural histories present specific topics which are organized according to more general themes. For instance, 'History of Fire and of Burning Things' is one example of 'Histories of the Major Masses' while 'History of Human Birth' is a part of 'Histories of Man.' However, not all natural histories appear under a more general description. Such is the case for 'History of Rainbows.' See: Bacon, 'Catalogue of Particular Histories by Titles,' in *The New Organon,* 234–235.
[37]Bacon, *The New Organon*, Book I, §CII, 82.
[38]Maimon, *Bacons von Verulam Neues Organon,* 173, 181, 184, 186, 188, 191.

philosophers and more contemporary philosophical approaches culminate in the last entry, titled 'Pyrrho as a rational skeptic,' where Maimon discusses his position on issues such as the mathematical antinomy and the question 'How is natural science *a priori* possible?'.[39] An explanation for presenting ancient philosophers as holding early modern opinions is found in Maimon's preface to the commentary, where he states that philosophy progresses in circles so that ideas held by modern philosophers are not necessarily better just because they follow ancient ideas in time. This is in contradistinction to mathematics, where the direction of progress is linear, since when we invent something, it then serves as a source of several new inventions.[40] The essay 'The History of Philosophy' is written in a chronological order, with the last sections dedicated to Leibniz's and Kant's approaches to the relations between phenomena and concepts (or ideas) followed by Maimon's own stance on the topic. Maimon concludes the essay by stating that the objects of philosophy are not the phenomena themselves but rather their foundations, and it is to these foundations (which are concepts of the understanding) that we attribute logical forms.[41] 'A Short Exposition of Mathematical Inventions' is organized in a chronological order, going from ancient to early modern mathematics, yet it is very much thematic as well. In the preface to the commentary, Maimon states that he chose to organize this essay according to people and inventions rather than chronological order, since he does not wish to write a history of mathematics per se.[42] The text begins with Egyptian and Chaldean mathematics and ends with Newton, yet the work of some scientists and mathematicians is presented in several contexts. For instance, an entry titled with Kepler's name is dedicated to his contribution to unknown infinite quantities. Then, his name reappears as an important figure in astronomy, in the contexts of the theory of telescopic optics described in light of Galilieo's and Scheiner's developments in the field, as well as in the context of the elliptic form of planetary orbits and the law explaining their movements.[43] Other scholars whose works are organized in a thematic rather than chronological order are Descartes, Newton, Bernoulli, Huygens and Galileo.

[39]Maimon, *Bacons von Verulam Neues Organon,* 222, 226.
[40]Maimon, *Bacons von Verulam Neues Organon,* XC–XCI.
[41]Maimon, *Giv'at Hamore*, 18.
[42]Maimon, *Bacons von Verulam Neues Organon,* XCII.
[43]Maimon, *Bacons von Verulam Neues Organon,* 280, 291–291, 303.

Maimon's essays comply with the requirements for writing a natural history in its broader sense, in the form of a short, organized, written essay presenting existing knowledge in such a manner that it helps us reflect and compose new philosophical ideas on its basis. Maimon's essays do not, however, comply with the notion of natural histories in the narrow, stricter sense, which stipulates that '[n]atural history contains nothing that has been researched in the proper ways, nothing verified, nothing counted, nothing weighed, deceiving and unreliable as information' (Bacon, *The New Organon*, Book I, §XCVIII, 2000, 80). This strict sense of the notion is not always adhered to by Bacon himself, who also wrote natural histories in the form of essays presenting existing organized knowledge rather than tables of discovery, and a wide range of topics.[44] Such are the natural histories in Bacon's *Sylva Sylvarum, or A Natural History, in Ten Centuries* (1627), published posthumously. For instance, 'Natural History, Century VI' focuses on plants, from seeds to trees, describing curiosities such as how Gillyflower seeds can turn into flowers of different colors and how trees that fruit later in the year blossom sooner than trees that fruit earlier.[45] Therefore, when claiming that Maimon is a Baconian in regards to writing natural histories, it should be acknowledged that this is true only when we consider the notion of 'natural history' in its broader sense, as an essay presenting existing processed knowledge rather than tables of discovery including 'raw' facts.

3.2. Maimon's thought on the laws of nature based on his natural histories

I believe that Maimon is following Bacon's intellectual footsteps not only in composing texts that comply with the formal requirements of writing natural histories but also in using them to produce new philosophical knowledge. Applying natural histories for the sake of natural philosophy is the most significant part of Bacon's third requirement. He considers achieving new insights in natural philosophy as the important outcome

[44] As mentioned by Corneanu, Giglioni, and Jalobeanu, the notion of 'natural history' underwent several changes between the sixteenth and eighteenth centuries, and therefore it is difficult to present a concise definition of the term. See: Sorana Corneanu, Guido Giglioni and Dana Jalobeanu, "Introduction: The Place of Natural History in Francis Bacon's Philosophy," *Early Science and Medicine* 17, no. 1 /2 (2012): 4.

[45] Francis Bacon and William Rawley, *Sylva Sylvarum; or, A natural history, in ten centuries. Whereunto is newly added the History natural and experimental of life and death, or of the prolongation of life* (London: J. R. for William Lee, 1670), Century VI, §510, 109; §577, 119.

of writing natural histories. According to him,[46] '[…] we have our best hope of natural philosophy once natural history (which is its base and foundation) has been better organized; but not before' (Bacon, *The New Organon,* Book I, §XCVIII, 81). Similarly, I wish to claim, Maimon's natural histories served him in formulating new philosophical insights. I present two examples of how the natural histories helped generate new philosophical knowledge: the first is based on an explicit statement by Maimon that one of the essays should serve as the basis for a theory of invention. The second example is not based on a similar declaration, but is rather implicit. Nonetheless, I believe that it is central to understanding Maimon's thoughts on natural philosophy.

The first example has to do with invention: at the end of the essay on mathematical inventions, Maimon comments that the synopsis on mathematical inventions can help advance scientific knowledge and provide methods for a universal theory of invention.[47] Two years later, in 1795, Maimon published outlines for a theory of invention which is largely based on known mathematical inventions. He clarifies that he is utilizing actual inventions because it helps us avoid asking whether invention is even possible.[48] It is thus more than plausible that Maimon formulated his ideas of how to advance invention in mathematics based on the historical inventions he reviewed earlier as part of his commentary on Bacon's work. That is, by reviewing mathematical inventions that already existed, Maimon was able to identify more easily which methods had previously been used by mathematicians to advance knowledge, methods that inspired him when he formulated his own.[49]

The next example, which is not explicitly stated but still stands out clearly from Maimon's texts, has to do with the laws of nature. I argue that Maimon's three essays, which are natural histories, serve one central theme in his thought on natural science: the laws of nature are relations between phenomena and, as such, are pure thought of the

[46]There is a debate about the type of relationship between natural history and natural philosophy. For instance, while Sloan considers natural history as distinct from natural philosophy proper, Anstey claims that they should not be regarded as discrete enterprises but rather as closely connected to one another, with a substantial overlap between them. See: Phillip R. Sloan, "Natural History, 1670–1802," in *Companion to the History of Modern Science*, ed. by Robert Olby, Geoffrey Cantor, John Christie and Jonathan Hodge (London, New York: Routledge, 1990), 295–296; Peter Anstey, "Francis Bacon and the Classification of Natural History," *Early Science and Medicine* 17, no. 1/2 (2012): 13.

[47]Maimon, *Bacons von Verulam Neues Organon,* 305.

[48]Idit Chikurel, *Salomon Maimon's Theory of Invention* (Berlin, Boston: de Gruyter, 2020), 37–38.

[49]For instance, I suggest that Proclus' commentary on Euclid's *Elements* had a great impact on Maimon's formulation of his own methods of invention. This is due to similarities found between the works of both philosophers. See: Chikurel, *Salomon Maimon's Theory of Invention*, 82.

understanding, expressing rules about relations between empirical objects. Maimon often refers to this topic in his natural histories.[50] In addition, when Maimon formulates suggestions for advancing our knowledge of the natural sciences, they all involve the laws of nature, i.e. relations between phenomena which are themselves pure concepts. Examples of such instances in which scientific progress was achieved by one of these suggestions appear throughout his natural histories. I believe that these examples helped him contemplate the advancement of scientific knowledge. In the preface to the commentary on *Novum Organum*, Maimon mentions that the three ways to advance our knowledge in the natural sciences involve the laws of nature. The first way is to arrive at a more accurate definition of known laws of nature and, when possible, to reduce their number so that a greater theoretical unity is achieved. The second is to discover new laws of nature, and the third is to correctly apply these laws by determining and explaining the specific cases that are subsumed under them.[51] Examples of these three ways to advance natural philosophy appear throughout his natural histories, without explicitly mentioning them as ways of advancing knowledge. To mention just a few instances, one example of Maimon's guideline to search for a more accurate definition of known laws appears in the entry on Pythagoras, in the essay on philosophical systems. There, Maimon mentions that Pythagoras' 'music of the spheres' [*Die Musik der Sphären*] was further developed into Kepler's and Newton's harmony of the relations between the planets. Maimon refers to it as a better articulation of the laws of nature, and comments that it is achieved through induction and determination of relations between empirical objects using mathematics.[52] The second way to advance our knowledge, discovering new laws, is often discussed by Maimon as well. For instance, in 'The History of Philosophy,' Maimon mentions Descartes' first law of nature, commenting that the motion of a body remains the same unless it encounters other bodies that

[50]For instance, in "The History of Philosophy" it is clearly the central theme of the essay. Before Maimon presents his own views on the topic, he mentions other connected philosophical contemplations, e.g., presocratic thought on atoms and whether powers belong to matter or are abstracted from it; Descartes' three laws of motion; and the contribution of Arabic mathematicians to the study of nature by advancing geometric knowledge. On this last idea, Maimon mentions Bacon as a thinker who rightly points out that arithmetic and geometry are applied to the natural sciences, but the first do not derive the latter. Moreover, Maimon mentions several empirical inventions and discoveries based on relations between empirical objects, such as the discoveries of the relation between the length of musical strings and their tone, as well as the law of reflection of light in convex and concave glass. See: Maimon, *Giv'at Hamore*, 6, 8–10, 12, 14.

[51]Maimon, *Bacons von Verulam Neues Organon,* LXXXIV–LXXXV.

[52]Maimon, *Bacons von Verulam Neues Organon,* 178–179.

cause a change.[53] An example of the third way of advancing scientific knowledge, namely by applying laws of nature to new cases and thus making them more accurate and better able to predict future observations, is found in the essay on mathematical inventions. There, Maimon mentions how Halley's observations of the transit of Mercury across the sun helped better determine distances between planets.[54] Although Maimon's first and third ways of advancing science seem similar as they are both based on improving on given knowledge, they are distinguishable in their aims: the first suggestion is more theoretical, since its goal is a better organization of knowledge by reducing the numbers of laws, whereas the third suggestion emphasizes the empirical means for advancing knowledge, such as observation and experimentation.

Despite the fact that two out of the three guidelines for advancing natural science are based on known laws of nature, that is, on given knowledge, Maimon's thought on laws of nature is more symbolic. When he presents his own philosophical contribution in 'The History of Philosophy,' he states that when we think laws of nature it is not the relations between the empirical objects that are thought, but rather the relations between their foundations. For Maimon, these 'foundations' are infinitely small pure units.[55] While treating relations between empirical objects in abstract mathematical forms of ratios and proportions is a common practice in both science and natural philosophy, the idea that the foundations of empirical objects are infinitely small pure units (i.e. they are not given in experience, nor in intuition) demands a clarification. It is outside the scope of this article to consider this problem further. I wish only to point out two things: first, Maimon moves from empirical objects to pure symbolic units without much clarification, and this move demands to be further explained. It is a good example of how he considers one topic in scientific, mathematical and philosophical terms. This clarifies why he treats these three fields of knowledge in his commentary on Bacon and not on separate occasions. Second, any discussion in the matter should consider not only how we, as finite understanding, think the relations between the foundations, but also what justifications can we present for the claim that we can think these relations yet are unable to generate empirical rules (only the infinite

[53]Maimon, *Giv'at Hamore*, 14.
[54]Maimon refers to it as the "theory of the moon" [*Mondestheorie*]. See: Maimon, *Bacons von Verulam Neues Organon*, 304.
[55]Maimon, *Giv'at Hamore*, 18.

understanding can).[56] At this point, I turn to discuss how Maimon was influenced by Bacon in thinking that with induction we can approximate knowledge of the relations between objects and phenomena, but can never achieve true knowledge of it with absolute certainty. We can only consider it as a subjectively necessary truth.

4. Induction and the ladder of certainty

Two key aspects in Maimon's skeptical stance should be considered as directly influenced by ideas appearing in Bacon's work, especially in the employment of induction. These two aspects are interconnected: the first states that in empirical inquiry, objective necessity (or as Bacon calls it, 'absolute necessity') is an ideal we strive to achieve but never will arrive at. The second aspect involves adopting a probabilistic view of science, wherein the advancement of knowledge entails not just discovering or inventing new knowledge but also taking given propositions and attempting to show that the degree of certainty we can attribute to them can increase. In other words, one of the means to progress in the advancement of knowledge is to advance up the ladder of certainty. I consider the ladder of certainty as part of Maimon's skepticism because it leaves room to maintain a doubtful position towards the status of the propositions that we acquire and consider them as beliefs rather than objective truths.

4.1. Two skeptical elements in the application of induction

Maimon regards Bacon's method of induction to be a very successful one. In the article 'Bacon and Kant,' he comments that the method presented by Bacon in his *Novum Organum* is the true method that must be applied by the understanding when it wishes to study nature.[57] When Maimon refers to induction, he often refers to observing a phenomenon that occurs numerous times in the same way, i.e. simple enumeration, rather than to induction as a method that makes exclusions and rejections.[58] Although Bacon describes induction based on simple enumeration as 'poor',[59] he

[56] As already mentioned by Pringe, only the infinite understanding can generate empirical rules while we can only approximate their generation. See: Hernán Pringe: "Maimon's Criticism of Kant's Doctrine of Mathematical Cognition and the Possibility of Metaphysics as a Science," *Studies in History and Philosophy of Science* 71 (2018): 35–44.
[57] Maimon, "Baco und Kant," 108.
[58] Bacon, *The New Organon*, Book I, §CV, 83.
[59] Bacon, *The New Organon*, Book I, §LXIX, 5.

does not refer to the same type of induction used by Maimon, but rather to the one used by logicians as a formal form of generalization. Maimon agrees with Bacon that induction should be conducted through means such as observation and trial and error.[60] Another idea he endorses is that, with induction, we can arrive at new knowledge about nature which is more certain than the knowledge we had at hand prior to our employment of this method. Unlike Bacon, who often speaks of induction as it is applied to one phenomenon (e.g. 'heat'), Maimon focuses on induction applied to a phenomenon that expresses a relation between two objects (e.g. 'the magnet attracts the iron'). This application is in accordance with Maimon's approach to natural science as 'the science of real relations' (Maimon, *Bacons von Verulam Neues Organon,* LXXI).

In the 'Plan of "The Great Renewal",' Bacon expresses his wish that induction serve as a means to analyze experience and arrive at necessary conclusions.[61] However, as I show later on, this ambition makes room for the more modest and practical aim to arrive at certain conclusions, but not absolutely necessary ones.[62] Similarly, Maimon mostly employs induction to find subjectively necessary, not objectively necessary knowledge. He refers to *comparative necessity* [*comparative Nothwendigkeit*] in the sense of *subjective necessity* and to *absolute necessity* [*absoluten Nothwendigkeit*] as meaning *objective necessity*.[63] Maimon suggests employing induction to raise the degree of certainty of a given proposition. Objectively necessary propositions are only those whose negation involves a logical contradiction and, accordingly, for Maimon objective truths are propositions that are thought the same by human beings and by any other thinking being as such. This is in contradistinction to subjective truths, which are propositions that are grounded in intuition and therefore may be perceived differently by other beings with other forms of

[60]Maimon, *Bacons von Verulam Neues Organon,* LXXI, LXXXVIII.
[61]Bacon, "Plan of 'The Great Renewal'," in *The New Organon*, 17.
[62]I refer to absolute necessity as Bacon refers to it in his essay "Scaling Ladder of the Intellect," as "universally indispensable and inviolable." Absolutely necessary conclusions are different from necessary conclusions, which we reach using induction and are 'most agreeable to truth'. In 'Plan of "The Great Renewal",' Bacon mentions the term 'necessary conclusions' to mean intermediate conclusions found using induction through the method of exclusions and rejections. Since these conclusions are not 'inviolable' but can rather be refuted (as they are the product of induction and are not necessary in the sense that their negation is a contradiction), I assume that what he meant by the term 'necessary conclusions' in this context is 'conclusions certain to a degree', which can be regarded as certain unless refuted. See: Francis Bacon, "Scaling Ladder of the Intellect; Or, Thread of the Labyrinth," in *The Works of Francis Bacon*, Vol. 3 (Esquire, Parry & McMillan: Philadelphia, 1859), 520; Bacon, "Plan of 'The Great Renewal'," in *The New Organon*, 17.
[63]Maimon, *Bacons von Verulam Neues Organon,* LXXVIII.

intuition than ours.[64] As a result of Maimon's strict notion of objectively necessary knowledge, we cannot assign objective necessity to propositions produced through the method of induction, and we should remain skeptical regarding whether they are true to any thinking being as such. It is at this point that Maimon's thoughts on induction coincide with his skeptical stance towards any knowledge that is not grounded in the principle of contradiction alone, especially empirical knowledge and even non-empirical knowledge that is grounded in intuition.

I suggest that induction is important in understanding Maimon's skepticism because it points out the ability to achieve higher degree of certainty while highlighting the difficulty of showing that a proposition is objectively necessary. I propose to use Maimon's terminology of 'probability' used in his discussion on doubt in the entry "Belief" [*Glaube*] in the *Philosophical Dictionary* (1791) to explain how induction and skepticism are connected. According to Maimon, our belief that the magnet attracts iron is based on the fact that we witness this phenomenon over and over again. Since it is always the case that the magnet attracts iron, we attribute subjective necessity to this belief. Only if we are able to show the ground for the connection between magnet and iron can we attribute to it objective necessity. The more complete the induction is, the higher the probability is that we are approaching the truth.[65] If we rephrase Maimon's claim, then induction is a tool for increasing the degree of probability that an event will occur, or for increasing the degree of certainty that a proposition is true. At the same time, induction is insufficient to show that this probability is one and that the event will always occur (or zero, since we can also not show without a doubt that when one phenomenon occurs another never occurs). Moreover, Maimon maintains that judgments produced by induction, such as 'the fire is warm', are merely subjectively necessary since the connection between fire and warmth is made by the faculty of imagination, not merely the faculty of understanding. Only if we arrive at a complete induction and are able to present how the two phenomena are conceptually connected can we claim objective necessity. Unfortunately, we are unable to arrive at a complete induction. Therefore, achieving objective necessity is only an idea [*Idee*]. What we can aspire to is the strengthening of the connection

[64]Salomon Maimon, *Essay on Transcendental Philosophy*, tr. Nick Midgley, Henry Somers-Hall, Alistair Welchman, Merten Reglitz (London, New York: Continuum International Publishing Group, 2010) 151–153.

[65]Salomon Maimon, *Philosophisches Wörterbuch* (Berlin: Johann Friedrich Unger, 1791), 1. Maimon uses the term 'probability' [*Wahrscheinlichkeit*] in the context of truths, yet a more accurate description is that we arrive at the probability that an event (described in a proposition) will occur or that we arrive at a degree of certainty that a proposition is true.

between the two phenomena through induction, so that we can assign a higher degree of certainty to the connection between fire and warmth.[66]

The two aspects of skepticism which are shared by Bacon and Maimon appear together in the short essay 'Scaling Ladder of the Intellect; Or, Thread of the Labyrinth', which is the fourth part of Bacon's *Great Instauration*.[67] Bacon states that the advancement of our knowledge is not achieved by reaching absolute necessity, that is, propositions that are 'universally indispensable and inviolable', but rather in treating the knowledge at hand as 'most agreeable to truth' (520). Moreover, Bacon differentiates himself from Pyrrhonian skeptics who declared that 'nothing is known' and 'nothing can be perfectly known by any method whatever', by asserting that 'nothing can be perfectly known by the methods which mankind have hitherto pursued' (519). While the ancients deny the certainty of the senses, Bacon suggests that by using his methods we can correct some of the defects of our imperfect human intellect and senses.[68] Similar ideas appear in Maimon's entry on Pyrrho, where he mentions that when we ask how natural science is *a priori* possible, we should consider that we cannot arrive at a complete induction and objectively necessary truths, but we can approximate them.[69] In both Bacon's and Maimon's works, the method of induction allows us to break free from a skeptical stance that claims that 'nothing is known' and at the same time, remain skeptical regarding the objective necessity we can attribute to the knowledge we attain. It appears that the skeptical elements of Bacon's thought are not insignificant. He was called by Mersenne 'an imitator of the Pyrrhonists', and lately it was suggested by Manzo that Bacon saw himself as more of a sceptic than as belonging to any other ancient or early modern philosophical movement.[70] According to Granada and Shapiro, he was influenced not only by ancient skepticism but also by works of Renaissance skeptics, such as Agrippa of Nettesheim and Montaigne.[71] Having said that, we should remember that when Bacon uses the expression 'suspension of judgment' he

[66]Maimon, *Bacons von Verulam Neues Organon,* 215–216; 229–230.
[67]Francis Bacon, "Scaling Ladder," 519–520.
[68]Bacon, "Scaling Ladder," 519–520.
[69]Maimon, *Bacons von Verulam Neues Organon,* 226–227.
[70]Richard H. Popkin, *The History of Scepticism: From Savonarola to Bayle* (Oxford, New York: Oxford University Press, 2003), 110; Silvia Manzo, "Reading Scepticism Historically. Scepticism, Acatalepsia and the Fall of Adam in Francis Bacon," in *Academic Scepticism in the Development of Early Modern Philosophy*, ed. Plínio Junqueira Smith & Sébastien Charles (Cham: Springer, 2017), 82.
[71]Miguel Angel Granada, "Bacon and Scepticism," *Nouvelles de la République des Lettres* 2 (2006): 95; Barbara J. Shapiro, *Probability and Certainty in Seventeenth-Century England* (Princeton, NJ: Princeton University Press, 1983), 61.

employs it differently than the Pyrrhonian skeptics did. The reason is that he uses it only as a temporary stage in scientific inquiry, when we collect data, rather than as a permanent intellectual position.[72] That is, for Bacon, suspension of judgment is only a temporary means in the greater scheme of the advancement of knowledge, whereas Pyrrhonian skeptics consider suspension of knowledge as the last stage in our inquiry, resulting in the tranquility of the mind.[73]

4.2. Degrees of certainty

The idea that an important part of scientific advancement is to arrive at higher levels of certainty appears also in *Novum Organum*, where Bacon uses the phrase 'degrees of certainty'. For instance, in the preface Bacon states that his method aims to establish degrees of certainty by constructing 'a new and certain road for the mind from the actual perceptions of the senses' (Bacon, 'Preface', *The New Organon*, 28). This idea that we should aim at achieving certain knowledge with growing degrees of certainty rather than knowledge with apodictic certainty reappears also in the statement that our inquiry is a continuous process, wherein the mind should be 'content with an appropriate degree of certainty' (Bacon, *The New Organon,* Book II, §XIX, 130).

Following Bacon's metaphors of degrees of certainty and the ladder of the intellect, I propose to use the metaphor of the 'ladder of certainty' to convey both Bacon's and Maimon's ideas that a significant part of scientific advancement consists in finding the means to attribute a higher degree of certainty to a proposition stating empirical facts. That is, scientific progress (if I may use a modern term) is accomplished not only via the invention and discovery of new knowledge but also through establishing what is already found as certain with a higher degree of probability than was formerly known. As trivial as this idea may sound, it is still very much relevant today, being that many scientists spend considerable time attempting to reproduce experimental results of scientific works previously published in leading journals to validate and confirm them. In too many cases, the reproduction fails and consequently we are more doubtful in regards to the certitude of the initial results.[74] As suggested

[72]Bacon, "Scaling Ladder," 520. See also: Bacon, "Plan of 'The Great Renewal'," 23; Bacon, *The New Organon* Book I, §CXXVI, 97.

[73]Sextus Empiricus, *Outlines of Scepticism*, eds. Julia Annas & Jonathan Barner (Cambridge, New York and all: Cambridge University Press, 2000), Book I, VI.8-9, VI.12, XII.25.

[74]For instance, a recent survey conducted by the journal *Nature* shows that more than 70% of researchers were unsuccessful in reproducing experiments conducted by other scientists and more than 50% were

by Manzo, Bacon's probabilistic view of science is found in Bacon's natural histories as well, since many facts are characterized as 'less certain' or 'probable'.[75] The same tension appears in Maimon's work, as we previously saw in the discussion on induction, in which our empirical inquiry is guided by the wish to achieve objectively necessary knowledge but, at the same time, we know that we cannot achieve this goal and that it is only an idea. What we can achieve through induction is the attribution of a higher degree of certainty to propositions than the degree previously attributed.

4.3. Probability and empirical knowledge in Maimon's thought

In this section, it is my intention to show that considering Maimon's probabilistic view of science helps us better understand not only his thoughts on empirical knowledge but also his thoughts on knowledge as such. So far, this topic has not been discussed, despite its importance for Maimon's notion of truth. I assert that understanding (a) how Maimon employs induction to arrive ever more closely at an objectively necessary proposition and (b) that any knowledge achieved in the process is certain to a degree but not apodictic, clarifies that a metaphysical truth is only an idea that we aim to achieve but never do. According to Maimon, metaphysical truths are the limit of the phenomena themselves. Thus, for him, metaphysics is not disconnected from our inquiry into phenomena. In fact, he states that '[…] the knowledge of the thing in itself is nothing other than the complete knowledge of phenomena'.[76] Moreover, when Maimon discusses the term *Probability* [*Wahrscheinlichkeit*] in his philosophical dictionary, he does more than illustrate probabilistic knowledge with the example of throwing a dice and calculating the probability that the outcome will be a side with the letter *a* or *b*. Rather, he refers to the problem of induction as it is presented in Hume's example of 'The sun will rise tomorrow'.[77] This indicates that we should think in terms of probability not only in the context of games of chance or even scientific inquiry, but also, in the context of metaphysics, due to the connection between phenomena and metaphysical objects. This, in turn,

unable to reproduce their experiments. See: Monya Baker, "1,500 scientists lift the lid on reproducibility," *Nature* 533 (May 2016): 452.

[75]Silvia Manzo, "Probability, Certainty, and Facts in Francis Bacon's Natural Histories. A Double Attitude towards Skepticism," in *Skepticism in the Modern Age*, eds. José Maia Neto, Gianni Paganini & John Christian Laursen (Leiden & Boston: Brill, 2009), 137.

[76]Maimon, *Philosophisches Wörterbuch*, 176–177.

[77]Maimon, *Philosophisches Wörterbuch*, 177.

emphasizes the fact that by *truth* Maimon usually refers to a logical truth, based on the principle of identity.[78] A metaphysical truth, however, does not comply with the logical standard and is only an idea to which we can get closer, either by arriving at a higher probability that an event connected to the metaphysical object will occur, or by achieving a higher degree of certainty that a proposition is true.

Maimon's views on induction are illustrated in examples found in his natural histories. To mention one such example, in the essay on philosophical systems Maimon mentions that Pythagoras rightly identified that the first cause is only a regulative idea, not a normative one. It is meant to offer systematic unity to our knowledge, but we can never have knowledge of it as a determined object. It is only an idea to which we can get closer through induction.[79] Thus the metaphysical idea of first cause remains a speculation, but one which we can still inquire after in some manner by applying induction to objects given in experience.

This leads us to another element appearing in the commentary on *Novum Organum*, which clarifies Maimon's position towards metaphysical knowledge: we should focus on 'what is' rather than 'what should be' known.[80] By relying on the given, we avoid the question of whether or not something is possible and thus begin our inquiry on a firmer basis. This aspect of Maimon's work is usually neglected in Maimonian scholarship and deserves further exploration. Within the scope of this article, I only mention that in his autobiography Maimon refers to metaphysics as a 'figment of the imagination' [*Gehirngeburt*] due to our inability to have knowledge about its objects.[81] This description is another way to say that metaphysical objects have the status of ideas and we cannot attribute to them reality. Furthermore, when Maimon speaks of how Esau and Jacob divided all the goods of the world between them so that Esau received the existing goods of this world and Jacob the goods of the future, Maimon comments that 'With some disdain, I replied that Jacob shouldn't have been such a fool; he should have chosen the goods of this world' (Maimon, *The Autobiography*, Book I, 31–32). This is a minor example pointing at a larger issue: knowledge based on 'what is', or rather, on experience is far more valuable to consider and contemplate on than more canonical philosophical issues that

[78]Maimon, *Philosophisches Wörterbuch*, 158.
[79]Maimon, *Bacons von Verulam Neues Organon,* 178.
[80]Maimon, *Bacons von Verulam Neues Organon,* LXXXVIII–LXXXIX.
[81]Salomon Maimon, *The Autobiography of Salomon Maimon*, ed. Yitzhak Melamed & Abraham P. Socher, tr. Paul Ritter (Princeton, Oxford: Princeton University Press, 2018) Book II, 283.

are speculative, such as what the first cause is. If we do want to contemplate metaphysical issues, then, assuming we adopt Maimon's viewpoint, their investigation cannot be disconnected from examining physical objects.

Maimon is known to have defined himself as the first rational dogmatist and empirical skeptic. In this philosophical approach, only propositions grounded in the principle of contradiction alone are objectively necessary knowledge. This means that propositions grounded on sensibility or experience can be subjectively necessary, but not objectively. This strict requirement for what can be considered as objectively necessary knowledge leads Maimon to adopt a skeptical stance towards any knowledge that does not withstand this definition of objective necessity.[82] This, however, does not mean that we should remain idle in regard to advancing our knowledge of the empirical world. On the contrary, as I have just mentioned, Maimon favors an empirical inquiry over a speculative one. We can attribute to empirical knowledge various degrees of certainty, even if we remain skeptical regarding our ability to achieve objective necessity. While we aspire to find objectively necessary truths, if none are to be found with the means at hand, or if we cannot justify why we should attribute objective necessity to given propositions, then it is better to remain with beliefs and attempt to make those as certain as possible by means of induction. These two philosophical motivations – the ideal of reaching for objectively necessary knowledge and the practice of achieving higher degrees of certainty using induction, thus reaching beliefs but not objective truths – are the two motivations that we find in Bacon's thought, as shown in this article.

5. Conclusion

The consequences of my analysis of how Bacon's thought influenced Maimon's intellectual development can be divided into three. The first, to which the majority of this article is dedicated, is a better understanding of three elements in Maimon's philosophy, namely understanding (a) how Maimon's natural histories serve his philosophy; (b) why the method of induction is employed to strengthen the connections between phenomena, but not to show that their connection is objectively necessary and (c) the idea that through induction we can attribute to propositions higher degrees of certainty originates in the skeptical stance towards

[82]Maimon, *Essay on Transcendental Philosophy,* 436–437.

propositions that are not shown to be grounded in the principle of contradiction (and accordingly cannot be considered as objectively necessary, only subjectively). That is, through scientific inquiry we can achieve a higher degree of certainty that can be attributed to a proposition, but not to substantiate that a proposition is an objective truth.

The second consequence is the recognition that scholarship on Maimon's philosophy should pay more attention to the advantages that empirical knowledge has, rather than only considering the disadvantages of empirical knowledge in comparison to conceptual knowledge or knowledge grounded in intuition. Indeed, discussions on these disadvantages, leading to empirical skepticism, are a direct outcome of Maimon's strict requirements for what can be considered as objectively necessary and rigorous.[83] What I suggest is that, alongside our reflection on empirical skepticism, it is worthwhile to consider how Maimon employs his guideline of starting our inquiry with 'what is, not what should be known'[84] to advance scientific as well as philosophical knowledge. This can be done by identifying where Maimon chooses to construct his arguments on the basis of actual and empirical objects rather than fictions and speculative ideas, as well as analyzing his justifications for working with actual and empirical knowledge over symbolic knowledge. Even in cases where Maimon goes from empirical to symbolic thought, as shown in the example of the foundations of empirical objects in Section 3, the demand is that any metaphysical idea be accounted for by showing its connection to the physical world.

This brings us to the third consequence: a better understanding of Maimon's arguments is to be achieved if we consider his philosophical claims in the context of the scientific and mathematical examples he presents. One of the reasons to conduct philosophical inquiry within the scientific and mathematical context is Maimon's claim that philosophical truths are connected to mathematical knowledge, and therefore studying one can shed more light on the other.[85] When our contemplation starts from the given (either empirically or only in the forms of intuition, space, and time), we are not required to account for the possibility of a thing (because its possibility is proven by its actuality). Moreover, we avoid some of the intellectual risks

[83]See: Gideon Freudenthal, "Maimon's Subversion of Kant's *Critique of Pure Reason*: There Are No Synthetic *a priori* Judgments in Physics," in *Salomon Maimon: Rational Dogmatist, Empirical Skeptic: Critical Assessments,* ed. Gideon Freudenthal (Dordrecht; Boston: Kluwer Academic, 2003), 144–175; Paul Franks, 2003, "What Should Kantians Learn From Maimon's Skepticism?" in: *Salomon Maimon: Rational Dogmatist, Empirical Skeptic,* 200–232.

[84]Maimon, *Bacons von Verulam Neues Organon,* LXXXVIII–LXXXIX.

[85]Maimon, *Bacons von Verulam Neues Organon,* CXII.

that come with pure symbolic knowledge, wherein our claims may be well constructed but with no real ground. For this reason, Maimon suggests obtaining insights about what he calls 'foundations' (which are conceptual pure units similar to differentials or monads) from the laws of nature and the relations between empirical objects. He does not, however, suggest conducting a metaphysical inquiry in order to reach a better understanding of the world. Beginning contemplation with 'what is' corresponds well with the method of writing natural histories. It also corresponds with Bacon's idea that philosophical contemplation should begin with doubt and move towards certainty: '[…] So it is in contemplation: if a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties' (Bacon, *Of the Advancement of Learning*, Book I, §8, 34; 1930). In Maimon's thought, this suggestion is fulfilled both in avoiding metaphysical contemplation that is not closely connected to the empirical world and in the view that in scientific inquiry we can only arrive at certain knowledge, but not objectively necessary knowledge.

Current scholarship on Maimon does not mention him as a Baconian. My hope is that this article will help change this view. I do not claim that Maimon is only a Baconian, but it should be acknowledged that much of his work draws from Bacon's ideas. In regard to the natural sciences, Maimon considers Bacon to be the greatest philosopher of all, as someone who has understood all parts of human cognition like no other philosopher before or after him.[86] Hence, when we discuss Maimon's philosophy in the context of natural science, we should contemplate it in light of Bacon's own great contributions in the field.

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[86]Maimon, *Bacons von Verulam Neues Organon,* LXXXVIII.

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