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ROGER BACON WITHIN THE MEDIEVAL SETTING. NEW FINDINGS

Edited by Yael Kedar and Jeremiah Hackett

ÍNDICE / CONTENTS

RESEÑAS DE LIBROS / *BOOK REVIEWS*

PRESENTACIÓN / INTRODUCTION

INTRODUCTION
ROGER BACON WITHIN THE MEDIEVAL SETTING: NEW FINDINGS

Scholarly interest in Roger Bacon's unique place in the history of science and philosophy has been surging in the last decade. As the study of his writings expands, new aspects of his thought come to light, his sources and his relations with his contemporaries are portrayed, and the concepts he used are being refined. The two volumes published in the last few years which focused primarily on Bacon's contribution are both evidence and the products of this surge. The first is *Roger Bacon's Communia naturalium: A 13th Century Philosopher's Workshop*, edited by Paola Bernardini and Anna Rodolfi (Florence: SISMEL, 2014). The second is *The Philosophy and Science of Roger Bacon: Studies in Honour of Jeremiah Hackett*, edited by Nicola Polloni and Yael Kedar (London and New York: Routledge, 2021). Both volumes develop new research on the fundamental scientific and philosophical issues in Bacon's works. During the past two years, the newly established Roger Bacon Research Society has presented regular monthly lectures on Roger Bacon and his place in medieval philosophy, science, and theology. The 2021 series of lectures by prominent scholars focused mainly on the scientific aspects of Bacon's published works. In general, modern research has concentrated on Bacon's scientific work. It has sometimes turned its gaze to his theology, too. Yet much more work is needed in this area of study, especially when it comes to the various branches of his philosophy.

The present volume offers the reader six new studies on Bacon. These studies concern diverse topics of his philosophy, from his theory of language to his theory of mathematical abstraction, his understanding of efficient causality, his political philosophy, s*cientia experimentalis* and his 'new metaphysics'. These studies address various delicate points, such as the internal relation among Bacon's post 1260s writings, new clarifications of some of the pivotal concepts he used, a reconstruction of the way he read his sources, and a novel comprehensive suggestion linking his various theories into a one integrated metaphysics. The common denominator of these studies is that they all engage in an internal analysis of his writings, rather than in assessment of his position in the history of philosophy and science, or his relations with his contemporaries. Although the historical implications of the interpretations suggested in this special issue are often crucial, these are but an effect of the nature of the method employed, namely, a thorough and in-depth textual focus.

The studies are arranged according to the order of themes in the *Opus maius*. We start with language (Rosier-Catach), then move on to the multiplication of *species* and mathematics (Kedar), *perspectiva* and mathematics (Demange), experimental science (Truitt), and moral philosophy (Lambertini). The special issue concludes with an attempt to integrate these domains together into one metaphysics (Hackett).

Irène Rosier-Catach's "Roger Bacon's *De Signis*, a Missing part of the *Opus maius, III,* and the Knowledge of Languages" builds on the new critical edition and commentary of this missing part of *Opus maius III* (Paris: J. Vrin, 2021). It has the great merit of collating all the disparate treatments of the doctrine of signs from Bacon's works of the period 1266-92. The paper accentuates Bacon's work on Hebrew and Greek between 1257 and 1263 and examines his doctrine of natural and conventional signification. Rosier-Catach successfully relates Bacon's doctrine of signs to the persuasion of wisdom, and in so doing relates logic, rhetoric, and poetics to the communicative context of the Christian message, particularly in reference to univocal signification and to divine names. Important here is the central role of grammar in dealing with the literal and spiritual senses of Scripture. A major finding of this study is that Augustine's *De doctrina christiana* is central to Bacon's project, especially for his classification of signs. So too is al-Farabi's theory of language. The big issue is: whose task is it to impose names on things, the metaphysician's or the grammarian's? Bacon opts for the grammarian. He calls for a new kind of grammar, different from that which Donatus and Priscian had taught, which includes what we now call 'semiotics'. This kind of new grammar is based on al-Farabi, with reference also to Augustine. Rosier-Catach argues that the fact that while Bacon's account of language can be seen in the context of the debates at Oxford and Paris in the second half of the thirteenth century, this must not occlude the reality of Bacon's dependence on Augustine.

Yael Kedar's account of the relation of *species* to *virtus* within Bacon's physics of motion is a much-needed precision in the study of the central doctrine of the multiplication of *species*. Her paper, "*Virtus* and *species* in the Philosophy of Nature of Roger Bacon (c. 1220-1293)", is important because Bacon did not present a systematic account of *virtus*. The study covers the characteristics of *virtus* in four areas: the motions of the heavenly bodies, the notion of bodies to their natural place, the force of the magnet, and the restraining activity of universal nature. It finds that, in all these cases, *virtus* is an efficient power, capable of causing local motion and instigating natural processes. *Species* is matter's response to the action of *virtus*. It is a non-efficient power, an 'appetite' internal to matter, expressing matter's inherent inclination to promote and perfect itself. The significance of this study for the possibility of relating the conceptual set-up developed by Bacon with the later doctrine of impetus is to be noted.

Dominique Demange's study of mathematical abstraction in Bacon is a comprehensive review of this issue in the early (1240s) and later (1260s) works of Bacon. It presents a taxonomy of the different uses of abstraction in Bacon, and identifies two different theories of direct intellection. The first, characteristic of his early period of work, is the direct intellection of singulars; and the second, presented in the *Opus maius*, posits the direct intellection of quantity and bodies. Accordingly, the classical ways of abstraction and intellectual illumination are completely absent from Bacon's mature theory of scientific learning. Demange, however, covers much more ground than abstraction alone. He relates abstraction to Bacon's psychology. Significantly, he presents a fine summary of the role of intellect in the perception of space and magnitude in Bacon's

account of *perspectiva*. The final section of the paper is a very careful account of Bacon's understanding of the foundations of geometry and its central role in his science. The most crucial point here – and this is the paper's most significant contribution – is the identification of the idea that geometry is produced at the level of perception, by immersion in the visual field and its universal properties and structures. Bacon was convinced, Demange argues, that to perform geometry, there is no need to escape from the sensible world. The visual experience provides an immediate and intuitive intellectual perception of the mathematical forms intrinsic to bodies. Bacon's doctrine that physics, in fact, performs geometry amounts to a new and early form of mathematical physics. The results of this study may require a reconsideration and perhaps adjustments of the accepted story told by historians of science.

Emily Truitt's "Knowledge and Power: Courtly Science and Political Utility in the Work of Roger Bacon" presents the broader context of Bacon's science, which was influenced by sciences and contexts not studied in the Faculty of Arts at that time. This paper has the merit of relating Bacon's *scientia experimentalis* to matters of prolongation of life, the question of the status of magic and the political utility of science. Truitt's paper links Bacon's experimental science to the political and social aspects of his philosophy. Nevertheless, Truitt also touches on epistemology, and Bacon's conception of the certainty of knowledge. It puts in perspective Bacon's declarations concerning the future, which have been interpreted by some as expressing a belief in the idea of 'progress'. These declarations cannot, Truitt argues, stand on their own. A brighter future based on the increase of knowledge is possible, in Bacon's opinion, only because humans were in the possession of that knowledge in the past. Bacon's aim is to recover past knowledge for future use. Above all, Truitt gives careful treatment to the central role of the Alexander legend, which helps explain the political dimensions of Bacon's science.

An important aspect of Truitt's paper is methodological. She argues that in order to assess correctly the assumptions, practice and achievements of medieval science, there is a pressing need for modern scholars to end the separation between the study of the technical literature and the study of medieval science as perfectly identical with natural philosophy as a university discipline. She presents Bacon as exemplifying the falsity of this dichotomy. Considering the fluid distinctions between the spheres of classroom, cloister, and court, Truitt challenges our dichotomies as applied to Bacon and others. Bacon's absorption and appreciation of the technical work of active experimenters and mathematicians such as Peter of Maricourt and Jordanus de Nemore reinforces this point.

Roberto Lambertini's account of Bacon's practical philosophy is a much-needed qualification. "*Tota familia Aristotelis*: On Some Sources of Bacon's Contribution to Medieval Political Discourse" presents a comprehensive account of how Roger Bacon, in the absence of a Latin translation or indeed the Greek text of the *Politics* of the Stagirite, attempted to create an Aristotelian theory of politics. The paper situates well the *Doctor mirabilis* in the medieval political discourse and sketches the sources that were available at that time. Bacon had no access to Aristotle's *Politics* in Latin, but he tried to reconstruct

its main tenets through the writings of other thinkers, such as Avicenna and al-Farabi. The end result of this attempt is a sketch of a political theory that goes mainly under the name of Aristotle but has little to do with the actual contents of the *Politics.* It is a very good index, however, of the breadth and depth of medieval accounts of social, political and moral life. Important here is the understanding of *scientia civilis - moralis.* Lambertini presents Bacon's important introduction to his *Moralis philosophia (= Opus maius*, Part VII*)* and then provides a very helpful analysis of Part II, the section on social and political life based on Avicenna's *Metaphysics* X, Parts IV and V. A focal point is the central role of the law and the lawgiver in Jewish, Muslim and Christian approaches to social and political life. The lawgiver must be more than a practical lawyer: he must know the moral foundations of the law. This becomes very important in the context of an account of the different religions of the world such as Bacon presents in *Moralis philosophia*, Part IV. The *De scientiis* of al-Farabi is a major source of Bacon's concept of Aristotle's *Politics*. Or rather, it enabled Bacon to think of what the latter text might be. The final section based on the *Opus tertium* and the *Compendium studii philosophiae* presents Bacon's well-known critique of the lay lawyers influenced by the civil law and canon law emanating from Bologna. For Bacon, the lawgiver needed to know the philosophical foundation found in the moral teaching of Aristotle and the theological foundations of the law as found in the sacred Scripture.

Jeremiah Hackett's "Roger Bacon's New Metaphysics (1260-1292): The Integration of Language Study and Natural Science with Metaphysics and Morals" presents a synthesis of the many strands of Bacon's philosophical doctrines concerning the person. It begins with a review of Bacon's concept of method in his metaphysics. It proceeds to identify Bacon's tasks in the Franciscan house of studies at Paris, that is as one who did critical work on the Hebrew, Greek and Latin texts of sacred Scripture. Hackett then takes up Ferdinand M. Delorme's argument that at some time in the 1260s Bacon wrote a new work on metaphysics. Using wider information from the *Communia mathematica* and cross-relating it to the *Opus maius*, Hackett argues that the *Opus maius*, as the sketch for an *Opus principale*, or a *Summa sapientiale,* was designated by Bacon as his new work in metaphysics. Hackett outlines an account of the structure and sources of this new metaphysics conceived by Bacon. From the point of view of scientific method, two authors are prominent: Ptolemy in his *Optics* and especially his *Almagest*, and Augustine in his *De musica*, Book 6, on number, measurement, and vision. Next, the philosophical sources for Bacon's new metaphysics are examined, with close connection to morals as given in *Moralis philosophia,* Part I. Important here are Aristotelian and Stoic sources, but even more so are the various Platonic and Neoplatonic texts. The central role of *perspectiva* for Bacon's understanding of knowledge and the human being is accentuated. Against some modern authors who impute an Avicennian substance dualism to Bacon and other thirteenth-century English Franciscans, Bacon's doctrine of the unity of the human being is defended. The metaphysical portrait of the human being depicted by Bacon is that of a living bodily *perspectivus* whose intellect and cogitative power function as a unity. In the end, Bacon's new metaphysics finds its fulfilment in a metaphysical anthropology which

draws on the diversity of ancient scientific and philosophical sources that are integrated into a theology of Christian wisdom that also draws on Jewish and Islamic sources of wisdom.

In past research, Roger Bacon is often treated as a free-standing individual outside of his scholarly context. The contributions in this special volume present Bacon from within the scholarly context of the Faculty of Arts and the Franciscan school of studies at the University of Paris (ca. 1260-92). As a result, one can see a Roger Bacon who is representative of a culture in which 'all the family of Aristotelians' finds its spokesperson and representative, along, however, with Stoic and Augustinian themes.

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ABBREVIATIONS

Roger Bacon's Works

CM = Communia mathematica

CN = Communia naturalium

CSP = Compendium studii philosophiae

CST = Compendium studii theologiae

De viciis = De viciis contractis in theologia

DS = De signis

DMS = De multiplicatione specierum

Epistola ad Clementem = Epistola ad Clementem

Epistola de secretis = Epistola de secretis operibus artis et naturae et de nullitate magiae

Grammatica graeca = Grammatica graeca

Geometria speculativa = Geometria speculativa

Opus maius = Opus maius

Opus minus = Opus minus

Opus tertium = Opus tertium

Perspectiva = Perspectiva

Q.IV.Phy. = Pseudo-Bacon, *Questiones super libros IV Physicorum Aristotelis*

Q.altere = Pseudo-Bacon, *Questiones altere supra libros Prime philosophie Aristotelis*

MP = Moralis Philosophia (= *Opus maius*, part seven)

Q.causis = Questiones supra librum De causis

Q.Prime.phil = Questiones supra libros Prime philosophie Aristotelis

Q.octo.Phy. = Questiones supra libros octo Physicorum Aristotelis

Secretum secretorum = Secretum secretorum

Summule dialectices = Summule dialectices

ARTÍCULOS / ARTICLES

ROGER BACON'S *DE SIGNIS*, A MISSING PART OF *OPUS MAIUS* III AND THE "KNOWLEDGE OF LANGUAGES"*

EL *DE SIGNIS* DE ROGER BACON, UNA PARTE AUSENTE EN EL *OPUS MAIUS* III, Y EL "CONOCIMIENTO DE LAS LENGUAS"

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Abstract

Roger Bacon's *De signis* is a major contribution in the history of semantics. However, we know from the author's summary given in the *Opus tertium* that it has come down to us in an incomplete form. It belongs to the third part of Bacon's *Opus maius,* devoted to the "knowledge of languages". The three sections of the summary in the *Opus tertium* enable us to understand its organization. The first section presents various arguments in favor of knowledge of languages. The major part of the second section of the summary is related to the "power of words", which was originally present in the section on mathematics and magic (*Opus maius* IV). The third section is not present is the edition of *Opus maius* III: it was devoted to the study of signs and signification, which corresponds to the *De signis*, and circulated independently, and to its application to theology, a section that has not been found. Just as the late *Compendium studii theologiae*, the *De signis* offers an original treatment of semantic and linguistic questions which are fully embedded in the sophisticated debates that took place in the faculties of arts in Paris and Oxford during the second half of the 13th century. Bacon's linguistic analysis can be equally relevant for the study of the Bible and theology.

Keywords

Roger Bacon; Semiotics; Biblical Studies; Language; Medieval Logic

Resumen

El *De signis* de Roger Bacon es una contribución fundamental en la historia de la semántica. Sabemos por el resumen del autor que ha llegado a nosotros de forma incompleta. Era parte de la tercera parte del *Opus maius* de Roger Bacon, dedicada al "conocimiento de las lenguas". Las tres secciones del resumen ayudan a comprender su organización y reorganización. La primera

sección presenta numerosos argumentos a favor de este conocimiento. La mayor parte de la segunda sección del resumen está relacionada con el "poder de las palabras", que originalmente estaba presente en la sección sobre matemáticas y magia (*Opus maius* IV). La tercera sección no está presente en la edición del *Opus maius* III: estaba dedicada al estudio de los signos y la significación, que corresponde al *De signis*, y que circuló de forma independiente, y a su aplicación a la teología, sección que no se ha encontrado. Al igual que el tardío *Compendium studii theologiae*, el *De signis* ofrece un tratamiento original de las cuestiones semánticas y lingüísticas que se insertan plenamente en los sofisticados debates que tienen lugar en las facultades de artes de París y Oxford durante la segunda mitad del siglo XIII, y que al mismo tiempo pueden ser relevantes para el estudio de la Biblia y la teología.

Palabras clave

Roger Bacon; Semiótica; Estudios bíblicos; Lenguaje; Lógica medieval

As acknowledged by the editors of the *De signis*, the manuscript tradition of Roger Bacon's *Opus maius* is very muddled.[1] No manuscript contains all the parts of the work, and some sections have circulated separately or have been kept in different versions.[2] Bacon himself reports of several versions or copies, deplores the lack of care by the copyists in their work, and recounts the difficulties he had in sending corrected copies to Pope Clément IV.[3] He also explains, on several occasions, that he added certain sections,

* This research was presented in the Research Seminar of the Roger Bacon Society, on June, 2, 2020, and is included as a part of the introduction of Irène Rosier-Catach, Laurent Cesalli, Frédéric Goubier, Alain de Libera *Roger Bacon, Des signes,* Introduction, traduction et commentaire (Paris: Vrin, 2022).

[1] Roger Bacon, *Opus maius*, 3 vols, edited by J. H. Bridges (London, Edinburgh and Oxford: Williams & Norgate, 1897-1900) [vol. 1 = part. I-IV, vol. 2 = part. V-VII, vol. 3 = revised edition of parts I-III]; Roger Bacon, *Opus maius. Die Neubegründung der Wissenschaft*, übersetzt von Nikolaus Egel und Katherina Molnar. Mit einer Einleitung und Anmerkungen herausgegeben von N. Egel (Hamburg: Meiner, 2017); Partial German translation by N. Egel, *Kompendium für das Studium der Philosophie*. Übersetzt, mit einer Einleitung und Anmerkungen herausgegeben (Hamburg: Meiner, 2015).

[2] Roger Bacon, *De signis*, edited by K. M. Fredborg, L. Nielsen and J. Pinborg, "An Unedited Part of Roger Bacon's *Opus maius*: *De signis*", *Traditio* 34 (1978): 75-136.

[3] On Roger Bacon's biography, see Thomas Crowley, *Roger Bacon. The Problem of the Soul in his Philosophical Commentaries* (Louvain: Institut Supérieur de Philosophie, 1950), chap. 1; Franco Alessio, *Mito e Scienza in Ruggero Bacone* (Milano: Casa Editrice Ceschina, 1957); Jeremiah Hackett, "Roger Bacon (circa 1214/1220-1292)", in *Medieval Philosophers*, edited by J. Hackett (Dictionary of Literary Biography, 115) (Detroit and London: Gale, 1992): 90-102; Jeremiah Hackett, "Roger Bacon: His Life, Career, and Works", in *Roger Bacon and the Sciences: Commemoratives Essays*, edited by J. Hackett (Leiden: E. J. Brill, 1997): 9-23; Jeremiah Hackett, "From *Sapientes antiqui* at Lincoln to the New *Sapientes moderni* at Paris c. 1260-1280: Roger Bacon's Two Circles of Scholars", in *Robert Grosseteste and the Pursuit of Religious and Scientific Learning in the Middle Ages*, edited by J. P. Cunningham and M. Hocknull (Dordrecht: Springer, 2016): 119-142; Jeremiah Hackett, "Roger Bacon", in *The Stanford*

such as the treatise on Astrology at the end of part IV (on Mathematics) of the *Opus maius*.[4] Several treatises are incomplete, notably the *De signis* and the *Compendium studii theologiae*[5] which are of interest here. Bacon wrote the *Opus maius* in 1267, and shortly later the *Opus minus*,[6] and the *Opus tertium*,[7] which contain both a summary of the *Opus maius* and some additional material.

In what follows, starting from the summary of *Opus maius* III, given in *Opus tertium*, chapters 25-27, my focus will be to try to figure out the organization and reorganization of the material included in the *Opuses* on the knowledge of languages. The summary of *Opus tertium*, chapter 27, shows that, unlike what is preserved in the manuscripts, *Opus maius* was originally made up of three sections, and that the third one was divided in two: it contained a part on signs, the description of which corresponds to the *DS*, followed by another part intending to demonstrate the usefulness of the study of signs for theology. This latter part has not been found. The short summary of *Opus maius* III given in the *Opus minus* mentions the content of this twofold third section in a very abbreviated way: "In the third part < one deals> with signs, and their modes, in words, and sacred <things>, and other things".[8]

Encyclopedia of Philosophy, Summer 2020 Edition, edited by E. N. Zalta, 2020; Amanda Power, *Roger Bacon and the Defence of Christendom* (Cambridge: Cambridge University Press, 2013), chap. 1; Nikolaus Egel, *Roger Bacon, Kompendium für das Studium der Philosophie* (Hamburg: Meiner, 2015), chap. 2; Nikolaus Egel, *Roger Bacon, Opus maius, Die Neubegründung der Wissenschaft* (Hamburg: Meiner, 2017), introduction; Dominik Perler, "Roger Bacon", in *Das 13. Jahrhundert*, edited by A. Brungs, V. Mudroch and P. Schulthess (Grundriss der Geschichte der Philosophie, Die Philosophie des Mittelalters, 4) (Basel: Schwabe, 2020): 780-801.

[4] Andrew G. Little, *Part of the Opus tertium of Roger Bacon* (Aberdeen: University Press, 1912), see introduction, xvii-xviii, xx; Crowley, *Roger Bacon. The Problem of the Soul*, 42-50.

[5] Roger Bacon, *Compendium studii theologiae*, edition and translation by T. S. Maloney (Leiden: E. J. Brill, 1988).

[6] Roger Bacon, *Opus minus*, edited by J. S. Brewer, *Fr. Rogeri Bacon Opera quaedam hactenus inedita* (London: Longman and Roberts, 1859), vol. I, 313-389.

[7] Roger Bacon, *Opus tertium,* edited by N. Egel*, Roger Bacon. Opus tertium. Edition und Übersetzung mit einer Einleitung und Anmerkungen* (Hamburg: Meiner, 2020). In this new edition and German translation of the *Opus tertium*, N. Egel adds to J. H. Brewer 1859 's first edition (*Fr. Rogeri Bacon Opera quaedam hactenus inedita*, vol. I, 3-310 [London: Longman and Roberts, 1859]) the fragments discovered by Pierre Duhem, *Un fragment inédit de l'Opus tertium de Roger Bacon, précédé d'une étude sur ce fragment* (Quaracchi: Ex typographia Collegii S. Bonaventurae, 1909) and by Andrew G. Little, *Part of the Opus tertium of Roger Bacon* (Aberdeen: University Press, 1912). See Egel, *Roger Bacon, Opus tertium*, CXXII-CXXVI.

[8] *OmpMin*, 322: "Et in tertia de signis, et modis eorum, in vocibus, et sacris et aliis". On the relations between *Opus maius, Opus minus*, *Opus tertium*, see Egel, *Roger Bacon, Opus tertium*, XXXII-XLI and on XXXVII-XXXVIII the table of correspondences between *Opus tertium* and *Opus maius* (as well as with other works by Bacon). As we know, we only have fragments for *Opus minus*, and the work must be reconstructed on the basis of *Opus tertium*. In addition, it should be noted that these two works are not mere summaries of *Opus maius*, as Bacon himself acknowledges (*Opus tertium* I, 1, §6, 12), and that

The *Opus maius* has the following plan:[9]
Opus maius I. On the general causes of human ignorance.
Opus maius II. On the relationship between philosophy and theology.
Opus maius III. On the utility of grammar (on the knowledge of languages)[10] (see below).
Opus maius IV. On mathematics.
Opus maius V. On optics.
Opus maius VI. On experimental science.
Opus maius VII. On moral philosophy.

We summarize in the following table the reorganization of the chapters devoted to the knowledge of languages, comparing *Opus maius* III (chapters 1-14) and the summary given in *Opus tertium* (chapters 25-27), with parallels in other works. The summary of *Opus tertium* is organized in three main parts (I, II, III in our table), the third of which has no counterpart in J. H. Bridges' edition.[11] In this context, it should be recalled that the various manuscripts of *Opus maius* III do not correlate, which led J. H. Bridges to propose a revised edition in vol. III (Supplementary volume). Only the oldest manuscript, J (Cottonian ms Jul. D.V.), which is highly corrupt and damaged, contains the entire text as it appears in the revised edition. All the manuscripts have part I of *Opus maius* III, but one ends with chapter 10; mss J and V (Vat. 4086) include chapter 11 (= II.1 in our table) but end after the first lines of chapter 12 (ed., p. 120 after *raro sufficiunt*). Ms. J preserves the rest of chapter 12 (= II.2) as announced, in a section which is not in its place in the manuscript but which has been reintegrated in the edition, as well as chapters 13 (= II.3), and 14 (= II.4). Therefore, only ms J transmits chapters 12-14, and thus the whole of Part II.[12] None of the manuscripts of *Opus maius* include Part III, the *DS* (=III.1) having been kept separately in ms Digby Oxford, Bodleian Library, 55 f. 228r-244r,[13] without part III.2 described in *Opus tertium* (chap. 27). The summary of the

they include differences and sometimes important additions, which testify to modifications and reworkings compared to the *Opus maius*.

[9] For a recent and detailed analysis of *Opus maius* see Power, *Roger Bacon and the Defence*, 96-125; Egel, *Roger Bacon, Opus maius. Die Neubegründung der Wissenschaft*, xx-xxix.

[10] The rubric of one of the manuscripts of *Opus maius* III gives as a title: *Tertia pars hujus persuasionis de utilitate grammaticae* and another one: *Sequitur pars tertia de utilitate sciendi linguas alienas habens tres distinctiones, quarum prima habet quinque capitula; in primo ponuntur tres rationes de necessitate linguarum* (ed. Bridges, vol. III, 80, n. 1). *Opus maius* III is elsewhere referred to in various ways: *tractatus de linguis* (*Opus minus*, 325); *de linguis seu de utilitate grammaticae* (*Opus tertium* I, 25); *scientia linguarum sapientialium* (*CSP,* VI, §85, 82); *grammatica aliarum linguarum* (*CSP*, VI, §95, 92 [B, 438]).

[11] Roger Bacon, *Opus maius* III, revised edition, edited by J. H. Bridges (London-Edinburgh-Oxford: Williams & Norgate, 1897-1900), vol. III, 80-125. The first edition is in vol. I, 66-96.

[12] See Roger Bacon, *Opus maius*, edited by J. H. Bridges, vol. III, introduction, viii, 120 (and notes): 169-170 (additional note 96,16); Fredborg, Nielsen and Pinborg, "An Unedited Part", 75-76.

[13] See the description of the manuscript in Rodney M. Thomson, *Catalogue of Medieval Manuscripts of Latin Commentaries on Aristotle in British Libraries*, t. 1 (Oxford: Turnhout, Brepols, 2011): 125-128, and the analysis given in Patrick Osmond Lewry, "Grammar Logic and Rhetoric 1220-1320", in *The History of the University of Oxford. The Early Oxford Schools*, edited by J. I. Catto (Oxford: Clarendon Press, 1984), vol. 1, 401-434, 420. The manuscript contains philosophical works, works of Aristotle, and commentaries on Aristotle, either anonymous or by different authors (Geoffrey d'Aspall, Albert the

Opus Tertium differs from *Opus maius* III not only by these missing parts III.1 and III.2. As we shall see, there are other differences, concerning Part II, which is evident if we compare chapter 26 of *Opus tertium* and chapters 11-14 of *Opus maius* III, on which, as has been said, the handwritten tradition diverges: the content of sections II.1 and II.2 of *Opus maius* III is not detailed in *Opus tertium*; section II.3 of *Opus maius* III, on persuasion, is not present in the summary of *Opus tertium* but is found, briefly, in other chapters devoted to moral philosophy; finally, section II.4, devoted to the power of words, which occupies almost all of chapter 26 of *Opus tertium*, is barely touched upon in *Opus maius* III, but is treated elsewhere, namely in *Opus maius* IV with magic. All these differences show revisions and reorganizations of Bacon's thought on language that are very instructive, and even more so if one refers to their treatment in other works of the author.

Opus Maius III, ed. Bridges vol. III *De utilitate grammaticae*	Content, *Opus Maius* III	Other parts of *Opus Maius*	*Opus Tertium*	Other works
I. Chap. 1-10, p. 80-114 (present in all mss)	**I.** Utility of the knowledge of languages "for the study of wisdom taken in an absolute way", considered in relation to the three "languages of wisdom": Hebrew, Greek and Latin. Eight reasons justifying the need for knowledge of languages		**I.** Chap. 25, *De linguis seu de utilitate grammaticae* Eight reasons justifying the need for knowledge of languages (in a different order)	- *Fragment,* ed. Gasquet 1897, p. 516 - *Opus minus,* p. 325-328 et 330-359 - *CSP*, c. VI-XII, "scientia linguarum sapientialium" Thirteen reasons - *Greek Grammars* - *Fragment of a Hebrew Grammar*

Great, Siger of Brabant), a modist grammatical commentary from Oxford (*Innata est nobis*), the *Tractatus de grammatica* attributed to a Pseudo-Grosseteste (edited by K. Reichl, *Tractatus de Grammatica. Eine fälschlich Robert Grosseteste zugeschriebene spekulativ Grammatik, Edition und Commentar* [München: Padeborn, 1976]), William of Sherwood's *Syncategoremata* (edited by R. Kirchhoff, *Die 'Syncategoremata' des Wilhelm von Sherwood: Kommentierung und historische Einordnung* [Leiden and Boston: Brill, 2008]), the *De ente et essentia* and the *De fallaciis* wrongly attributed to Thomas Aquinas. The presence of two graduation speeches for bachelors applying for the Bachelor of Arts degree confirms that the content of the collection contained in this manuscript belongs to the Faculty of Arts, see Patrick Osmond Lewry, "Four Graduation Speeches from Oxford Manuscripts (c. 1270-1310)", *Mediaeval Studies* 44 (1982): 138-180.

II. Chap. 11-14, p. 115-125	**II.** Utility of the knowledge of languages "for wisdom, in relation to the Church of God, the Republic of the Faithful, the conversion of the Infidels, and the reprobation of those who cannot be converted" (*Opus Maius* III, chap. 11, p. 115)		**II. (**mere presentation of the content at the beginning of chap. 25 and a single sentence at the beginning of chap. 26)	
(present only in ms. J, and in ms. V and the mss depending on V)	**II.1.** Chap. 11. 1. For the administration of religious services 2. Pour the collation of sacraments 3. To preach every people in their mother language 4. "For Church as a whole from its beginnings to the end of time"			
(present in full only in ms. J)	**II.2.** Chap. 12. Practical reasons concerning the relations of the Church with other people 1. Necessity of trade 2. Legal difficulties encountered by Preachers 3. Negociation of peace treatises			

<table>
<tr><td colspan="2" rowspan="2"></td><td>II.3. Chap. 13. Conversion of the Infidels (on persuasion)</td><td>Opus Maius VII = Moralis philosophia IV, V, VI</td><td>II.3 Chap. 109-110 (summary of Moralis Philosophia IV et V)

Chap. 72-75 on the power of music</td><td colspan="2">Communia mathematica chap. 7</td></tr>
<tr><td>II.4. Chap. 14. Reprobation of those who cannot be converted (on the power of words)</td><td>Opus Maius IV = Geographia, p. 374 and Astrologia, p. 395-399</td><td>II.4. Chap. 26</td><td colspan="2">- Epistola de secretis operibus artis et naturae ... chap. 3
- Tractatus brevis (Secretum secretorum) chap. 2 & 3</td></tr>
<tr><td rowspan="2">III. Missing in all the mss Opus Maius III and from Bridges edition</td><td>Preserved separately in ms Digby 55</td><td>III.1. De signis</td><td rowspan="2"></td><td>III.1. Chap. 27 On signs</td><td rowspan="2">Opus minus, p. 322 : "Et in tertia de signis, et modis eorum, in vocibus, et sacris et aliis"</td><td>- Communia Naturalium p. 119-120
- CST</td></tr>
<tr><td></td><td>III.2. (-)</td><td>III.2. Usefulness of the knowledge of signs for theology</td><td>Cf. CST, §83</td></tr>
</table>

Let us now take a closer look at the contents of this table.

Part I. Part I of the *Opus tertium* summary, chap. 25, in line with *Opus maius* III, chap. 1-10, deals with the utility of grammar for "the study of wisdom taken in an absolute way". It lists eight reasons, in a different order in the two accounts, to demonstrate the need for

the knowledge of foreign languages, namely Hebrew, Greek, and Latin.[14] Arabic has a special place as useful only for philosophy, but a very limited one, as the author points out, for theology. This Part I is the only one transmitted by all the manuscripts of *Opus maius* III, and it alone will have its correspondent in the second section of the *Compendium studii philosophiae*, entitled "Science of the languages of wisdom (*linguae sapientiales*)" (82, §85), where thirteen reasons will then be given (in chap. VI-VIII)[15]. These chapters are the culmination of long preparatory studies Bacon carried out with his brothers when he entered the Franciscan Order. In a very detailed and long article published in 2001, Etienne Anheim, Benoit Grévin and Martin Morard[16] analyzed an important dossier preserved in ms. 402 of the Bibliothèque municipale of Toulouse, first studied by Samuel Berger.[17] These *Notes* contain (1) a *Lexicon* (with linguistic remarks, etymologies concerning the Hebrew and Greek words of the Bible, of the *Glossa ordinaria*, introduced by a description of the Hebrew and Greek alphabets and of the morphology of Greek articles and declensions); (2) a *Correspondence* for which only the answers are given, addressing first and second person interlocutors in a direct manner, dealing in particular with linguistic etymologies and explanations, only belonging to the Old Testament part of the Vulgate; (3) *Questions* addressing similar points, followed by answers of a more general nature, showing that the correspondent to whom the questions were sent had linguistic as well as scientific skills. The authors demonstrate the unity of these three parts and highlight the remarkable kinship between the *Notes* and other works of Roger Bacon (the two Greek grammars, the Hebrew grammar fragment,[18] the *Opus maius* and the *CSP*). They confirm the hypothesis put forward by Berger, namely that the author of the *Notes* is indeed Roger Bacon, and that the compiler is William of la Mare. These *Notes* correspond to Bacon's activity after his entry into the Franciscan order, from 1257 to 1263, and thus to the reading and study of the Bible he carried out during the years preceding the writing of the *Opus maius*.

[14] See Irène Rosier-Catach, "Roger Bacon: Grammar", in *Roger Bacon and the Sciences: Commemorative Essays*, edited by J. Hackett (Leiden: E. J. Brill, 1997): 67-102. Bacon himself remarks, in *Opus tertium*, that he no longer remembers exactly the number and order of the reasons as they were given in *Opus maius* III (*Opus tertium* I, 25, §135, 182). This remark confirms, as Theodor Crowley rightly points out against other interpretations, that the *Opus tertium* is indeed a summary that was written after the *Opus maius* was sent to the Pope (*The problem of the soul*, 43 ff.).

[15] Roger Bacon, *Compendium studii philosophiae*, edition and translation by T. S. Maloney (Leiden: E. J. Brill, 2018).

[16] Etienne Anheim, Benoit Grévin and Martin Morard, "Exégèse judéo-chrétienne, magie et linguistique: un recueil de 'notes' inédites attribuées à Roger Bacon", *Archives d'Histoire Doctrinale et Littéraire du Moyen Age* 68 (2001): 95-154.

[17] Samuel Berger, *Quam notitiam linguae hebraicae habuerint Christiani medii aevi temporibus in Gallia* (Nancy: thèse de la Faculté de lettres de Paris, 1893).

[18] Edited by Edmond Nolan and Samuel A. Hirsch, *The Greek Grammar of Roger Bacon and a Fragment of his Hebrew Grammar* (Cambridge: Cambridge University Press, 1902).

Part II. The program for Part II of *Opus maius* III (chapters 11-14) is given at the beginning of chap. 11:

> Since I have shown how the knowledge of languages is necessary for Latins for the study of wisdom taken in an absolute way, I now want to deal with how it must be acquired for wisdom in its relation to the Church of God (= II.1), to the Republic of the Faithful (= II.2), to the conversion of the Infidels (= II.3), and to the reprobation of those who cannot be converted (= II.4).[19]

These four main objectives, here assigned to the knowledge of languages, were the same ones that the author, at the opening of *Opus maius*, associated with the "light of wisdom", which is a good indication of the importance given to language.[20] The summary of *Opus tertium* gives exactly the same headings and in the same terms at the beginning of chapter 25,[21] but the treatment of each division in chapter 26 will vary: the first three (= II.1-3) include only a few lines, while almost the rest of the chapter is devoted to the last one (= II.4).

II.1. *Opus maius* III, chap. 11 (= II.1) details how knowledge of foreign languages is primarily useful for the administration of religious services, and how ignorance of the correct pronunciation and meaning of prayers has the unfortunate effect that "we speak like magpies, parrots, and certain animals that imitate words" instead of praying correctly (*Opus maius* III, 115-116). Secondly, this knowledge is necessary for the collation of the sacraments. These first two arguments are to be related to the second lost part of the *DS*, as described in *Opus tertium* (chap. 27, see infra), and to the content of the *DS* itself, since one of the objectives of the analysis of signs is to contribute to the correct administration of the sacraments. Those who confer the sacraments should know the correct pronunciation and have the right intention "since intention is necessary for the

[19] *Opus maius* III, chap. 11, 115: "Cum iam manifestavi quomodo cognitio linguarum est necessaria latinis propter studium sapientae absolutum, nunc volo declarare quomodo oporteat eam haberi propter sapientiam comparatam ad Dei Ecclesiam, et rempublicam fidelium, et conversionem infidelium et eorum reprobationem qui converti non possunt". For a detailed discussion of the treatment of these four objectives, and their historical context, see Power, *Roger Bacon and the Defence*, *passim*.

[20] *Opus maius* I, 1.

[21] *Opus tertium* 25, §133, 180: "Nam hujus rei necessitatem manifesto per ea quae pertinent ad studium absolute, et per comparationem ad regimen ecclesiae, et ad directionem reipublicae, et ad conversionem infidelium, et ad reprobationem eorum qui converti non possunt". See also Roger Bacon, *Epistola ad Clementem IV*, edited by F. A. Gasquet, "An Unpublished Fragment of a Work by Roger Bacon", *The English Historical Review* 12/47 (1897): 494-517, 516: "Sed quia sapientia latinorum tanta est ex alienis linguis, nam totus textus sacer et tota philosophia descenderunt a linguis extraneis, ideo grammatica ut est utilis latinis maxima sui utilitate comprehendit orthographiam aliarum linguarum et cetera quae ad gramaticam pertinere noscuntur. Et hoc ostendo per 8 magnas et pulchras considerationes, ut videatur quod minora sunt magis necessaria sicut scribit apostolus. Facile enim ex hiis patet omni sapienti quod hic est porta sapientiae apud latinos et magis theologiae, et *comparo haec non solum sapientiae absolute sed relate ecclesiae et ceteris prenotatis. Inter que duo maxime sunt consideranda, scilicet, correctio sacri textus et conversio infidelium* [...]."

sacraments, as the theologians know" (*Opus maius* III, 116), whereas too often, due to gross and inexcusable ignorance "they do not know what they are saying", which is detrimental to the "full efficacy of the sacramental effects" – laments the author (*Opus maius* III, 117). Moreover, while peoples speaking different languages should be converted, ignorance of languages renders preaching ineffective, since "sincere persuasion" requires that it should be done in their mother tongue (*Opus maius* III, 118).

II.2. Chapter 12 of *Opus maius* (= II.2), corresponds to one single sentence in the summary of *Opus tertium* (chap. 26). It is devoted to the practical and political benefits of the knowledge of languages, especially with regard to commercial relations, which are hampered by the use of interpreters. It also deals with the legal difficulties encountered by the friar preachers, and to the negotiation of peace treaties.

II.3. Chapters 13 and 14 of *Opus maius* III, corresponding to parts II.3 and II.4, are present only in ms J of *Opus maius* III, just as part II.2. These two parts are devoted to the conversion of Infidels and schismatics and to the reprobation of those who cannot be converted. They are closely related, and both show significant reorganizations of the materials.

The theme of section II.3, the conversion of Infidels, is dealt with rather briefly in chapter 13 of *Opus maius* III (120-122). It is developed, however, in the section of *Opus maius* devoted to moral philosophy, the *Moralis Philosophia* (*Opus maius* VII = *MP*), in sections IV, V and VI, which are the most important, says Bacon, since they deal with wisdom as it relates to the "salvation of the human race" (*MP* IV, 187.15-16) through preaching and conversion. These are intended to "bend the soul" so that it can believe and "receive the truths of the sects", in order to "do good and flee from evil" (*MP* V, 249.23-27; VI, 267.4-5). These objectives constitute the different facets of what Bacon calls the "persuasion of sects", mentioned in the introductory section of Part IV of *Moralis philosophia*, and in the introduction to Parts II.3 and II.4.[22] Bacon clearly draws inspiration from the fifth part of al-Farabi's *De scientiis*, in Gerard of Cremona's translation, which associates "civil science" (ethics and politics) with the "art of eloquence".[23] In this chapter, al-Farabi indicated the

[22] *MP* IV, 187: "*Pars quarta moralis philosophiae... est de persuasione sectae...*"; see 195; and *Opus tertium* II, 109, §292, 916.

[23] *De scientiis*, version of Gerard of Cremona, edited by F. Schupp, *Über die Wissenschaften (De scientiis) nach der lateinischen Übersetzung Gerhards von Cremona* (Hamburg: Meiner, 2005), chap. V, 124.7-9 (ed. A. Galonnier, *Le 'De scientiis Alfarabii' de Gérard de Crémone. Contribution aux problèmes de l'acculturation au XII^e siècle* [Turnhout: Brepols, 2016], 58.1-60.5 and 164.44-49): "Ars elocutionis est virtus qua homo potest defendere sententias et actiones determinatas quas secte positor propalauit et reicere totum quod diuersificatur eis cum sermonibus." On the various translations of al-Farabi's *De scientiis* and his influenial divisions of sciences, see Jean-Marc Mandosio, "La place de la logique et ses subdivisions dans l'Énumération des sciences d'al-Fârâbî et chez Dominicus Gundissalinus", in *'Ad notitiam ignoti': L'Organon dans la translatio studiorum à l'époque d'Albert le Grand*, edited by J. Brumberg-Chaumont (Turnhout: Brepols, 2013): 285-310, especially 303 sq and Galonnier, *Le 'De scientiis Alfarabii'*, 36. The expression "*Ars elocutionis*" is used by Gerard of Cremona to translate the art of *kâlam*, which is the art of religious dispute: Gundissalinus only keeps the title of this fifth part, and

various paths that the theologian, in his prophetic mission, should follow in order to defend his religion. Bacon, after having listed and described the various "sects" (he uses this very term to designate "Saracens, Tartars, Pagans, Idolaters, Jews, Christians"; *MP* IV, 188-195), develops at great length the different means that the "*persuasor sectae*" should use. He quotes again the *De scientiis*, testimonies of the prophets and miracles, adding examples taken from the Gospels (*MP* IV, 220-223). Part V of *Moralis Philosophia* is devoted to the different types of arguments that must be used to form a "discourse capable of inclining the mind", with a focus on the rhetorical argument, which is best suited to affect the practical intellect. It can be used both to incite people "to believe the truths ... and to act according to them" (*MP* V, 251.11-13). Various sources should be called upon in order to "instruct, charm, and bend the mind": Cicero, Augustine ("the author and doctor of rhetoric"), Aristotle's *Poetics* (or more precisely Averroes' commentary on the *Poetics*, since the translator, Hermann the German, told him he had not succeeded in translating it ; cf. *MP* V, 255.28-29; 267.19-26), Avicenna and Algazel, al-Farabi both in his *De scientiis* (*MP* V, 255-256; 263, 267) and in his commentary on Aristotle's *Rhetoric*. Bacon again insists that this task of "persuasion" is based on the "roots of eloquence" (*MP* V, 251.25-28), relying, as Cicero teaches, on the three different purposes, namely, "*docere, delectare, permovere*" (*MP* V, 242.11-12; 259.10-11). The ethical, political and rhetorical dimensions of argumentation, and their importance in view of the overall enterprise of persuasion, both doctrinal and religious, are dealt with in *Opus maius* VII. Bacon also explained, in *Opus maius* IV (100-102), that this science of argumentation belongs to logic, and is ultimately subordinate to music, belonging to the section on mathematics.

All these themes, corresponding to part II.3 in our table, are only briefly discussed in chapter 13 of *Opus maius* III but developed at length in parts IV, V and VI of *MP*. It is therefore not surprising that, if they are not summarized in chapter 26 of *Opus tertium*, they are present in several other chapters of *Opus tertium* (I, 75 and II, 109-110)[24], which

uses the expression *scientia eloquendi,* hence a confusion with the generic term used to designate the sciences of language (*scientiae eloquentiae*), and an assimilation to the art of rhetoric. *Civilis scientia* is thus placed by Gundissalinus, in his *De divisione philosophiae*, both as the genus of rhetoric, among the *scientiae eloquentiae,* and as a part of the practical philosophy (Dominicus Gundissalinus, *De divisione philosophiae. Über Die Einteilung Der Philosophie*. Lateinisch-deutsch. Herausgegeben, übersetzt, eingeleitet und mit Anmerkungen versehen von A. Fidora und D. Werner [Freiburg: i.Br., Herder, 2007], see respectively 140-142 and 252).

[24] Chapter II, 109 of *Opus tertium* corresponds to *MP* IV, and chapter II, 110 to *MP* V. See also Gasquet, *Roger Bacon, Epistola ad Clementem IV*, 510. The dependence of the developments on argumentation and persuasion in *Opus tertium* chapter 75, on both *Opus maius* III, chapter 13, and *MP* IV-V is quite explicit in the following passage, *Opus tertium* I, 75, §508, 642-644: "Quod autem Aristoteles fecit duos libros Logicae de hoc genere persuasionis in secta et moribus, manifestavi in tertia parte Operis Majoris, et in septima quoniam non est dubium quin libros fecerit optimos, licet Latini hos ignorent...In illis enim docetur quomodo fiant sermones sublimes, tam in voce quam sententia, secundum omnes ornatus sermonis, tam metrice et rhythmice quam prosaice, ut animus ad id, quod intendit persuasor, rapiatur sine praevisione, et subito cadat in amorem boni et odium mali, secundum quod docet Alpharabius in libro De scientiis."

take up the content of moral philosophy, adding new attention to the power of music (*Opus tertium* I, 72-75). These have no equivalent elsewhere.[25] Bacon once again deplores the fact that the "*radices persuasionis*" are so poorly known to the Latin people, whereas they are known to the "Infidels", and regrets the disastrous effects that this has had on the art and practice of preaching, whether it is addressed the fidels to strengthen them in their faith or the infidels, trying to convert them. In *Opus tertium*, Bacon assigns to the various disciplines (grammar, logic, rhetoric, poetry and music), and to the various ancient authorities, Roman as well as Christian (Cicero, Horace, Seneca, Jerome, Augustine) and Muslim (mentioned above), a precise function in this mission of persuasion. Its ultimate goal is that the soul should be "delighted without realizing it, and immediately fall into the love of good and the detestation of evil, as al-Farabi teaches in *De scientiis*".[26]

II.4. "The reprobation of those who cannot be convinced requires far more the ways of wisdom than warlike efforts (*bellicum laborem*)", writes Bacon at the beginning of this last part (*Opus maius* III, chap. 14 = II.4). The brief development that follows exalts the power of the words, with remarks on the "virtue" of the sacraments, on the intention and desire of the speaker that increase their efficiency, supported by accounts of miraculous healings, exorcisms, and holy words of extraordinary effect. This efficiency, the author insists, owes nothing to demons, contrary to what ignorant people say, because they do not belong to magic – to claim this would be to ignore the fact that "saints have always performed miracles with words" (*Opus maius* III, chap. 14, 124). Since the power of words depends on the arrangement of the celestial constellations, Bacon refers the reader to what will be said later. The long section on the magical power of words will indeed be treated together with astrology, in *Opus maius* IV, devoted to mathematics – "mathematics being the second part of the art of magic" (*Opus maius* IV, 240). It treats the power of charms, magical characters, and contains explanations about the causes of their efficacy.

[25] Music and prosody are treated in the seventh section of *Opus maius* IV, devoted to mathematics (*Op Mai* IV, 236-268), and in the corresponding summaries in the *Opus tertium* (I, chap. 59-64); but the chapters of the *Opus tertium* on the powers of music and harmony, their role in preaching, their links with rhetoric, their great "power of persuasion" (*Opus tertium* I, chap. 72-75) have no corresponding parts in the *Opus maius*; they may have existed at first as a separate treatise, and added later; see Little, *Part of the Opus tertium*, xvi-xvii. On rhetoric and music, see Eugenio Massa, *Ruggero Bacone. Etica e poetica nella storia dell'Opus maius* (Roma: Ed. di Storia e Letteratura, 1955), chap. xi; Jeremiah Hackett, "Roger Bacon on Rhetoric and Poetics", in *Roger Bacon and the Sciences: Commemoratives Essays*, edited by J. Hackett (Leiden: E. J. Brill, 1997): 133-149; Nancy van Deusen, "Roger Bacon on Music", in *Roger Bacon and the Sciences: Commemorative Essays*, edited by J. Hackett (Leiden: E. J. Brill, 1997): 223-241.

[26] *Opus tertium* I 75, §508, 644; I, 75, §511, 648. See Irène Rosier-Catach, "Roger Bacon, al-Farabi et Augustin. Rhétorique, logique et philosophie morale", in *La rhétorique d'Aristote, traditions et commentaires, de l'Antiquité au XVII^e siècle*, edited by G. Dahan and I. Rosier-Catach (Paris: Vrin, 1998): 87-110.

This part on astrology[27] seems to have been added later to *Opus maius* IV from the *Opus minus* and is missing in some manuscripts.[28]

It is remarkable that chapter 26 of *Opus tertium* is devoted almost entirely to these considerations on the power of words (= II.4), whereas only a few lines were reserved for the other parts (= II.1-3). Bacon alludes to such reorganization of the material, explaining that these "roots" of the power of words were first exposed in the section on "celestial things" of *Opus minus*.[29] We can read confirmation of this in a fragment describing the contents of *Opus minus*, which insists on the importance of this part, as well as in a fragment of *Opus tertium* discovered by A.G. Little, which is indeed very close to chapter 26 of *Opus tertium*.[30] This theme of the power of words is also developed in a letter whose authenticity has been questioned but now seems to be accepted, or at least part of it, the *Epistola de secretis operibus artis et naturae et de nullitate magiae*, particularly with its chapter III: *De virtute sermonis et redargutione magiae*.[31] In the oldest manuscript where it is preserved, the *Epistola* is located after a copy of chapter 26 of *Opus tertium*.[32] This theme is also dealt with in the *Tractatus brevis* introducing the *Secretum secretorum*.[33] We have studied these chapters at length elsewhere, as well as the sources that inspire our author, in particular Avicenna, cited by Bacon, who generally accepts that thoughts can act on bodies, and al-Kindi, who, in his *De radiis*, deals with the conditions that determine the power of words.[34] It is clear that Bacon tries to avoid the accusation of determinism, and

[27] *Opus maius* IV, 395-396 and 398-399.

[28] *Opus maius* IV, 395-396 and 398-399; see Little, *Part of the Opus tertium*, xvii.

[29] *Opus tertium* I, 26, §148, 196: "Nunc igitur tangam aliquas radices circa haec quas diligentius exposui in Secundo Opere, ubi de coelestibus egi. Sed considerare debemus quod verba habent maximam potestatem..."

[30] *Opus tertium* II, 79, §42, 698 (first edited by Little, *Part of the Opus tertium*, 18: "Haec autem que iam de locis mundi et alterationibus locorum et rerum per celestia et de iudiciis et operibus secretis tetigi, *non posui omnia in Majori Opere*, sed de locis tantum. Alia posui in *Minori Opere*, quando veni ad declarandum intentionem istius partis Operis Majoris"; cf. Egel, *Roger Bacon, Opus tertium,* introduction, XXI.

[31] Roger Bacon, *Epistola de secretis operibus artis et naturae et de nullitate magiae*, edited by J. S. Brewer (London: Longman and Roberts, 1859), Appendix I, see especially 528-531; German translation in Roger Bacon, *Opus maius. Die Neubegründung der Wissenschaft*, übersetzt von Nikolaus Egel und Katerina Molnar. Mit einer Einleitung und Anmerkungen herausgegeben von N. Egel (Hamburg: Meiner, 2017): 231-261.

[32] Little, *Part of the Opus tertium*, XIV: "(4) Item aliud capitulum ejusdem fratris Rogeri Bacun de ordine minorum de potestate verbi (= *Opus tertium* chap. 26) et illud capitulum est extractum de prima parte maioris operis quod fecit ad mandatum pape Clementis (...) (5) Item aliud capitulum ejusdem fratris Rogeri de eadem materia (= *Epistola*)."

[33] Roger Bacon, *Secretum secretorum*, edited by R. Steele (Oxford: Clarendon Press, 1920) [OHI 5], chap. 2 and 3.

[34] Marie-Thérèse d'Alverny and Françoise Hudry, "Al-Kindi: *De radiis*", *Archives d'Histoire Doctrinale et Littéraire du Moyen Age* 68/41 (1974): 139-260. See Irène Rosier-Catach, *La parole comme acte: sur la grammaire et la sémantique au XIII^e siècle* (Paris: Vrin, 1994), chap. 6 and text 9; Nicolas Weill-Parot, *Les "images astrologiques" au Moyen Âge et à la Renaissance* (Paris: Champion, 2002): 316-339; Benoit Grévin, "Entre magie et sémiotique: Roger Bacon et les caractères chinois", *Recherches de théologie et*

that for this reason he seeks to show that these considerations and related practices are "philosophical" and therefore do not call free will into question.

Between the redaction of *Opus maius* and that of *Opus tertium*, Bacon seems to have wanted to bring together, within his large section on languages, all the relevant questions, including that on the power of words (= II.4), initially studied with astrology and magic. On the other hand, he moved what was related to modes of argumentation to the practical part of the *Philosophia moralis*, together with rhetoric, poetics and music (= II.3).

Part III. The summary of *Opus tertium* (chap. 27) gives us valuable indications on what was to constitute the third part of *Opus maius* III, divided into two sections (= III.1 and III.2 in our table):

> (= III.1) §155. After these matters, I added the study of another part of grammar, which is not yet composed or translated among the Latins; and it is most useful in the sciences, in order to study and know all the speculative truths of philosophy and theology. It concerns the composition of languages, the impositions of vocal sounds in order to signify, the way in which they signify by virtue of imposition and by other means. And since all these things cannot be known unless we know the reasons and modes of signification, I have therefore set out to expose these modes, as Augustine teaches in the second and third books of his *De doctrina Christiana*, namely that among signs some are natural, and some are established by the soul to signify.
>
> §156. And those that are natural are of two kinds; some are according to the concomitance of the things signified, such as for example having large limbs is a sign of strength; others are according to configuration, for example an image of Saint Nicholas, which is a sign configured and formed according to him. And so, all images of things are signs. And each of these modes includes many modes. The sign established by the soul either means naturally, like the groaning of the sick and the barking of dogs; or it is at pleasure, like the circle of wine and bread in a shop window, and all the words of languages. Indeed, a language cannot be composed of naturally signifying vocal sounds, as I have shown in several ways from Avicenna.
>
> §157. And then I am going to consider how a vocal sound is univocally imposed, how it is equivocally imposed, and according to how many modes, whatever they may be; and how it is imposed analogically, and according to which modes. And when it signifies univocally, it can nevertheless signify an infinite number of things, although not by imposition, nor equivocally or analogically, according to the common modes of analogy. And I have explained how a vocal sound is imposed on the Creator, and how it is imposed on a simple creature, and how it is imposed on a compound. And how it is imposed on absolute things,

philosophie médiévales 70/1 (2003): 118-138; Béatrice Delaurenti, *La puissance des mots, "virtus verborum". Débats doctrinaux sur le pouvoir des incantations au Moyen Âge* (Paris: Cerf, 2007): 111-114, 146-150.

> and on relative things. And when it signifies univocally and yet simultaneously signifies several things, I explained that it signifies them naturally and not at pleasure. And that those things that are thus naturally signified are connotations according to the theologians. And I explained how and by how many divine names they can be connoted, both by simple creature names as by compound, absolute, and relative names. And so, through all that has been said so far, I have raised many important doubts, and <demonstrated> many truths, which allow us to know all the things that raise a question or a doubt.[35]

Bacon continues and concludes the chapter by showing the utility of the study of signs and of signification for theology (just as, in the *Opus maius*, he claims the utility of all the other sciences):

> (= III.2) Among other things, I have considered how a vocal sound, in the Sacred Scripture, signifies a spiritual sense with a literal sense, and according to what modes the signs do it; and how the Old Testament is a sign of the New, how the sacraments are signs, inserting many other difficult subjects; I have also dealt with Adam's first language and how he gave names to things; and with the question of whether children raised in the desert would use a language by themselves and how they would manifest their affections to each other if they met; and with many other things which I cannot now develop. So I consider this part of grammar to be highly necessary for theology, philosophy, and the whole of wisdom.

[35] *Opus tertium* I, 27, §155-157, 204-206: "§155. Post haec addidi intentionem alterius partis grammaticae quae non est adhuc composita apud Latinos nec translata; et est utilissima in scientialibus, quantum ad inquirendum et sciendum omnes veritates speculativas philosophiae et theologiae. Et est de compositione linguarum, et de impositionibus vocum ad significandum, et quomodo significant per impositionem et per alias vias. Et quia haec non possunt sciri nisi homo sciat rationes et modos significandi ideo aggressus sum illos modos ostendere, sicut Augustinus docet in libro secundo et tertio *De doctrina Christiana*, quod signa quaedam sunt naturalia, et quaedam data ab anima.
§156. Et Illa quae sunt naturalia sunt dupliciter; quaedam sunt per concomitantiam signatorum, ut habere magnas extremitates est signum fortitudinis; quaedam per configurationem, ut imago Sancti Nicholai est signum eus configuratum et conformatum. Et sic omnes species rerum sunt signa. Et utrumque istorum modorum habet modos multos. Signum autem datum ab anima vel est naturaliter, ut gemitus infirmorum et latratus canum; vel est ad placitum, ut circulus vini et panis in fenestra, et omnes voces linguarum. Nam lingua non potest componi ex vocibus significantibus naturaliter, sicut probo multipliciter per Avicennam.
§157. Et tunc considero quomodo vox imponitur univoce; quomodo aequivoce, et quot modis quantumcunque; et quomodo analogice et quot modis. Et quando univoce significat, et tamen potest significare infinita, licet non per impositionem, nec aequivoce, nec analogice, secundum modos communes analogiae. Et expressi quomodo vox imponitur Creatori, et quomodo creaturae simplici, et quomodo composito. Et qualiter absolutis rebus imponitur, et quomodo relatis. Et quando univoce significat, et tamen simul multa significat, declaravi quod naturaliter et non ad placitum significat illa. Et illa sic significata naturaliter sunt connotata apud theologos. Et expressi quomodo et quot per nomina divina possunt connotari, et per nomina creaturarum simplicium, et compositarum, et absolutarum, ac relatarum. Et sic per omnia jam dicta terminavi multas dubitationes graves, et multas veritates, per quas omnia sciuntur, quae sub quaestione et dubitatione versantur."

> And I prove that it is a part of grammar and not that of another science. I do not, however, take these proofs from Augustine, in the second and third books of *De doctrina christiana*, although he treats these matters in a grammatical mode, as the rest of his treatise shows.[36]

The *Compendium studii theologiae*, the author's latest work, includes chapters on signs and signification close to the *DS*.[37] It consists of two parts, but the author mentions a "third treatise", whose content, although shorter, corresponds to this second part (II.2) of *Opus tertium*, chapter 27:

> Now at the end of this chapter, I alert and summon the reader to consider how a vocal sound signifies many things in figurative expressions, of which the holy text is full, since besides a literal sense a vocal sound can signify three other senses, namely, allegorical, tropological and anagogical. But his consideration is appropriate for the *third treatise which is reserved for the sacred text*; likewise, how sacraments and other signs in the sacred text signify. However, let him who would prudently consider these things be aware and he will discover that the second mode of a natural sign is especially operative in them.[38]

Bacon already mentioned earlier a "third treatise" devoted to "purely theological questions", such as that of "original sin and the natural movements of the rational soul": "In this second treatise I shall explain only philosophical things (*philosophica*) which are of use <in resolving> questions taken from philosophy, granted I indicate concretely just how the things of which I shall treat will be useful for purely theological questions" .[39]

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[36] *Opus tertium* I, 27, §157, 206 (following preceeding note): "Caeterum consideravi quomodo vox in Scriptura Sacra significat sensum spiritualem cum literali, et quibus modis signi; et quomodo sensus literalis significat spiritualem; et quomodo Vetus Testamentum est signum Novi; et quomodo sacramenta sunt signa; et multa intermiscui difficilia; ut de lingua prima Adae et qualiter dedit nomina rebus; et an pueri in deserto nutrito aliqua lingua per se uterentur, et si obviarent sibi invicem quomodo mutuos indicarent affectus; et multa alia quae non possum modo explicare. Unde reputo hanc partem grammaticae summe necessariam theologiae, et philosophiae, et toti sapientiae. Et probo quod sit pars grammaticae et non alterius scientiae. Et tamen non indico probationem ex Augustino de secundo et tertio libro *Doctrinae Christianae*, cum tamen ipse ista tractet grammatice, ut patet ex serie sui tractatus." This section (III.2 in our table) should have been separated from the first (III.1) in the new edition, just as it was in Bridge's first edition.

[37] See the notes and commentaries of Maloney's English translation of the *CST* and the *DS*, as well as the detailed commentary of our French translation.

[38] *CST*, §83: "Nunc in fine istius capituli innuo et excito lectorem, ut consideret qualiter vox significet multa in figurativis locutionibus, quibus maxime sacer textus plenus est, cum praeter sensum literalem potest vox significare tres alios sensus, scilicet, allegoricum et tropologicum et anagogicum. Sed haec consideratio propria est in *tertio tractatu qui appropriatur textui sacro*; similiter quomodo sacramenta significant, et alia signa sacri textus. Advertat tamen prudens considerator et inveniet quod secundus modus signi naturalis in his specialiter operetur" (I reproduce Maloney's translation, 83-85).

[39] *CST*, §40: "Sic arguo ad utramque partem propter motus naturales animae intellectivae. Sed determinari non potest sententia hic, cum difficillimae quaestiones sint de peccato originali et motibus naturalibus animae rationalis, *quae magis ad tertium tractatum pertinent, qui erit de pure theologicis*. In hoc quidem secundo tractatu explicabo solum principaliter philosophica quae sunt in

Such analyses are not present in the *CST*, and, as the editor points out, several other paragraphs likewise refer to passages that are not preserved, the *CST* being abruptly interrupted.[40] This §40 is instructive in that it distinguishes between a "philosophical" and a "theological" treatment of the same questions, to which the second and third treatises of the *CST* would have been dedicated respectively. This corresponds well to the conception of the relationship between philosophy and theology developed in *Opus maius*. The content of the "third treatise" sketched out in §83 of the late *CST* matches the summary of *Opus tertium*, chapter 27, namely that the analysis of signs and language in general (= III.1 in our table) was to be followed by the application of this analysis to different questions relevant for theology (= III.2).

Let us now analyze chapter 27 of *Opus tertium* in detail, comparing it with Opus maius III, in order to understand what his original motivations were in dealing with "the knowledge of languages", and the modifications he subsequently made to them.

1. *Al-Farabi and the "science of language"*. The section on languages is, as Bacon explains, "a part of grammar that has not yet been composed or translated by the Latins". The author insists on the originality of this section. What foreign source could have inspired him here? He himself indicates it in a much earlier text, his commentary to Aristotle's *Metaphysics* V, written around 1240-47. He asks the question, which the Modistae would later discuss, of whether it is the grammarian or the metaphysician who should impose names on things. After first suggesting that the grammarian should simply consider the names already imposed in order to establish the rules of their formation, he mentions the opinion of "others" who claim that there is indeed a "science of languages and idioms", and adds "we do not possess it". He then concludes that it is the grammarian's task to impose names.[41] The parallel with the later reference in the *Opus tertium* is clear. Here Bacon indicates its source, the "*De divisione scientiarum*", which is the title of Gundissalinus' translation-adaptation of al-Farabi's *De scientiis*.[42] In Gerard of Cremona's

usu quaestionum suptarum ex philosophia, licet indico materialiter quomodo haec quae tractabo valeant *ad pura theologicas quaestiones*."

[40] Maloney, *Roger Bacon, Compendium studii theologiae*, 9.

[41] Roger Bacon, *Quaestiones supra libros Primae philosophiae Aristotelis*, edited by R. Steele and F. Delorme (Oxford: Clarendon Press, 1930) [OHI 10], 96-97; see 97.21-28: "Ideo dico quod gramaticus non habet considerare impositiones nominum set solum modum rectificandi et regulandi et formandi illas impositas [impositiones ?]. Alii dicunt quod est alia quae est *scientia linguae et ydyomatum*, et subalternat sibi gramaticam, et subalternatur ei, set *illam non habemus*. Et tunc dicendum quod gramatici, communiter loquendo, est imponere nomina, non metaphysici. Ad argumenta contra dico, quod quantum ad nos illa est prior methaphysica secundum rem. Ad aliud respondeo, quod scientia communis dupliciter, aut via scientiae, aut via doctrinae. Via scientiae dupliciter; aut a parte rei et sic metaphysica, aut a parte modi et sic logica. Si sit scientia communis via doctrinae et disciplinae, sic est illa quae docet imponere nomina, sive sit grammatica sive sit subalternata ei, sicut patet in libro *De divisione scientiarum*, quia illa non imponit nomina set subalternatur grammatice. Set de ista *non audivimus nec vidimus aliquid*."

[42] Let us recall that there are four different works: (1) al-Farabi's *De scientiis* in the complete translation of Gerard of Cremona, edited by Schupp, *Über die Wissenschaften (De scientiis)* and

version, as in that of Dominicus Gundissalinus, the *De scientiis* does indeed give, as the first science, the "*scientia linguae*", devoted on the one hand to the consideration of what words signify, and on the other hand to the study of rules, which is divided into seven parts. Certainly, the debate whether to assimilate this science of language with grammar has its origin with Gundissalinus. In his own *De divisione philosophiae*, Gundissalinus first deals with grammar in the same way as the Latins of his time, and with the common definition ("art and science of speaking and writing correctly"[43]); but then he resumes the Farabian exposition, with a first division of the "science of language" in two parts (the science of the meaning of imposed words and the science of their construction), followed by the division into seven parts of "grammar", which he borrows from *De scientiis*.[44] In the *De ortu scientiarum* attributed to him, al-Farabi mentions the "science of language, that is the science of imposing names on things" as the first of the sciences, but here he distinguishes it from "grammar", which deals with the composition of words, as well from logic and poetics.[45] The treatise "*Philosophica disciplina*" (ca. 1245) claims likewise to be inspired by al-Farabi, indicating the "science of language" as the first "science of discourse" (*sermocinalis scientia*), before grammar, poetics, rhetoric and logic, and then noting, like Bacon, the relationship of subalternation that prevails between these sciences and

Galonnier, *Le 'De scientiis Alfarabii' de Gérard de Crémone*; old edition under the name *Catalogo de las ciencias*, edited by A. Gonzalez Palencia (Madrid: Universidad de Madrid, 1932); (2) al-Farabi's *De scientiis* in the translation-adaptation by Dominicus Gundissalinus (the title in the incipit is *Liber Alpharabii de divisione omnium scientiarum*), edited by J. H. Schneider, *De scientiis, secundum versionem Dominici Gundisalvi. Über die Wissenschaften* (Freiburg i.Br.: Herder, 2006); old edition: *Domingo Gundisalvo, De scientiis*, edited by P. M. Alonso Alonso (Madrid: Consejo Superior de Investigaciones Cientificas, 1954); (3) *De ortu scientiarum*, that circulated under the name of al-Farabi, but only known in latin, edited by Clemens Baeumker, *De ortu scientiarum, Über den Ursprung der Wissenschaften* (Münster: Aschendorff, 1916); (4) Dominicus Gundissalinus' *De divisione philosophiae*, edited by Fidora and Werner, *De divisione philosophiae* based on Dominicus Gundissalinus, *De divisione philosophiae*, edited by L. Baur (Münster: Aschendorff 1903).

[43] Dominicus Gundissalinus, *De divisione philosophiae*, edited by Fidora and Werner, 110.

[44] Dominicus Gundissalinus, *De divisione philosophiae*, edited by Fidora and Werner, 112: "Unde ad evitanda haec vitia *scientia linguae*, quae omnium scientiarum naturaliter prima est, primum in duo dividitur, scililcet in scientiam considerandi et observandi, quid unaquaeque dictio significet apud gentem illam, cuius lingua est, et in scientiam observandi regulas illarum dictionum. Illa est scientia intelligendi, ad quid significandum singulae dictiones sint impositae, ista est scientia ordinandi singulas dictiones in oratione"; 114: "Partes igitur *grammaticae* apud omnes gentes sunt septem, scilicet [...]."

[45] Al-Farabi, *De ortu scientiarum*, edited by Baeumker, c. 2, 22.8-10: "(1) primum principium omnium scientiarum est *scientia de lingua, id est de impositione nominum rebus*, scilicet substantiae et accidenti. (2) Secunda vero est *scientia grammaticae*, quae est scientia ordinandi nomina imposita rebus, et componendi orationes et locutiones quae significant dispositiones substantiae et accidentia eius et sequentia. (3) Tertia est scientia logicae, quae est scientia ordinandi propositiones enuntiativas secundum figuras logicas [...]. (4) Quarta vero est scientia poeticae, quae est scientia ordinandi dictiones secundum gravitatem et consequentiam [...]."

"grammar".[46] In the section on grammar, the treatise takes up the bipartite division already encountered, with the first part of grammar dealing with words considered absolutely, either with or without considering the composition and imposition of languages. It specifies, as Bacon will do, that "we do not have this first part", while the second part is the study of the parts of speech according to Priscian.[47]

All these parallels show that the "science of language" mentioned in the *Quaestiones supra libros Primae philosophiae Aristotelis* indeed originates in the divisions proposed or inspired by al-Farabi. It is considered as the first of the sciences and includes the imposition and signification of names. The different sources show some hesitations concerning the relations between this "science of language" and "grammar", especially when the common Latin acceptance of the discipline interferes with these developments, as in Gundissalinus' *De divisione philosophiae*. Bacon is in any case consistent in concluding that this science of the imposition of names belongs to grammar, and, in *Opus tertium*, chap. 27, he claims that it is indeed a "part of grammar" – insisting further that it has not been "translated" and is not yet available to Latins. He very consciously gives the term "grammar" a meaning different from the common usage of the time, namely, that of the discipline inspired by Donatus and Priscian, which he himself had taught in Paris, and within the frame of which he would later write his Greek and Hebrew grammars. The fact that he relies on Farabi to prove that this science of the composition of languages and of imposition is indeed a part of "grammar and not of another science", helps understanding why he needed to add that he did not draw his arguments from *De doctrina christiana*, as he could have done because Augustine also dealt with these questions *grammatice*.[48] Chapter 27 of *Opus tertium* ends as it began, emphasizing the importance and originality of this discipline "which is in the highest degree necessary for theology, philosophy, and wisdom in general". This study of the imposition and signification of names will be the core of the *DS*.

2. *The analysis of signs and language and Augustine's De doctrina christiana.* As we could read in the passage quoted above, the summary of the *Opus tertium* contains, in addition to this concluding sentence, another reference to Augustine, in the context of the division

[46] *Philosophica disciplina*, edited by C. Lafleur, *Quatre introductions à la philosophie au XIII^e siècle: Textes critiques et étude historique* (Montréal and Paris : Institut d'Études Médiévales and Vrin, 1988): 274.317-333: "Modus accidentalis philosophiae, qui est sermocinalis scientia, diuitur in tres secundum aliquos: in gramaticam, rethoricam et logicam; secundum alios, in IIIIor: in tribus dictis et poeticam. Secundum vero Alfarabium additur quinta, *quae est scientia lingue, quae est de impositione nominum*. Set, quia ista et poetica sunt valde annexe gramaticae, ideo communiter loquendo continentur sub grammatica. Distinguuntur tamen ab ea sicut subalternans et subalternata, ut dicit Alpharabius. Nam scientia linguae primo est, secundo gramatica, tertio poetica, quarto rethorica, quinto logica. Istius autem divisionis sic patet sufficientia: quia oportet rebus nomina imponere, et hoc fit per scientiam linguae; secundo, recte ordinare et componere ... et hoc docet gramatica; deinde debet sermo delectare ... et hoc fit per poeticam ... deinde est sermo ad hoc quod persuadeat ... et hoc docet rethorica, quinto fidem debet facere ut proferenti credatur, et hoc fit per logicam."
[47] *Philosophica disciplina*, edited by Lafleur, 275.351-276.365.
[48] *Opus tertium* I, 27, §157, 208, end of the passage quoted above.

of signs. There is no explicit reference to Augustine in the *DS* on this subject, although several elements are clearly borrowed from the *De doctrina christiana*. On the other hand, at the beginning of the section on signs in the *CST*, Bacon states:

> Granted that before I saw the book of blessed Augustine *On Christian Doctrine*, I fell upon a classification of signs by dint of my own discovery – which I later found in the beginning of the second book of *On Christian Doctrine*, I say with his authority, granted I explicate his statements with reasons and examples, that according to him a sign is either from nature or given by a soul.[49]

Thomas Maloney discusses this assertion of Bacon, but seemed at first to accept Bacon's claim, that he did indeed invent the analysis of signs given in the *DS* in an original way and independently of Augustine[50] And while recognizing, in his translation of the *DS*, some knowledge of Augustine, he claimed that he did not see any "sign of Augustine influencing the development of his semiotics".[51] It seems to us, on the contrary, that the Augustinian inspiration for the definition and classification of signs is manifest, and that the relational theory of the sign present in Augustine's definition was essential in the development of his semiotics. What follows is a summary of our main arguments, which will be discussed in more detail in our French translation and commentary, to which I refer the reader.[52]

(a) The definition and division of signs, given in the *DS*, are close to Augustine's, and both are found, with explicit attribution and reference to the *De doctrina christiana*, in *Opus tertium* and later in the *CST*. The term "*signum*", systematically used in the *DS,* is distinct from the Boethian term "*nota*", and clearly marks the Augustinian origin,[53] as does the distinction, repeated several times, between "*signa data*" and "*signa naturalia*".[54]

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[49] *CST*, §25: "Et, licet antequam vidi librum beati Augustini *De doctrina christiana*, cecidi per studium propriae inventionis in divisionem signorum, quam postea inveni in principio secundi libri *De doctrina christiana*, dico eius auctoritate, licet explico dicta eius ratione et exemplis, quod signum secundum <eum> est a natura vel datum ab anima."

[50] Roger Bacon, *Compendium studii theologiae*, 22-24; Thomas S. Maloney, "Is the *De doctrina christiana* the Source for Bacon's Semiotics ?", in *Reading and Wisdom: The 'De doctrina christiana' of Augustine in the Middle Ages*, edited by E. D. English (Notre Dame: University of Notre Dame Press, 1995): 126-142; Gaëlle Jeanmart, "La théorie baconienne du langage est-elle augustinienne ?", *Revue des sciences philosophiques et théologiques* 82/3 (1998): 415-430.

[51] Maloney, *Roger Bacon, On signs*, 22-25.

[52] I indicate bellow the references to the paragraphs in the *DS*, and invite the reader to consult the analytical commentary related to them in our forthcoming French translation and commentary: each paragraph of the *DS* is indicated as §3 and the commentary on the paragraph as *§3.

[53] See for instance Pseudo-Kilwardby, who also mentions the definition, explicitly referring to Augustine and the *De doctrina christiana;* (Pseudo)-Robert Kilwardby, *Super Priscianum maiorem*, edited by K. M. Fredborg, N. J. Green-Pedersen, L. Nielsen and J. Pinborg, "The commentary on 'Priscianus maior' ascribed to Robert Kilwardby", *Cahiers de l'Institut du Moyen Age Grec et Latin* 15 (1975): 1-146, 2; see commentary *§2.

[54] See commentary *§3.

(b) The definition and the divisions are well known and are extensively discussed in the commentaries on Book IV of Peter Lombard's *Sentences*,[55] dealing with the sacraments as signs, with explicit references to Augustine. Bacon expressly referred elsewhere to the "sacraments as signs", as indicated above.

(c) The most original element of the definition of the sign, its dual relational nature (relation to the interpreter and relation to the thing signified), is borrowed from the theologians Richard Fishacre and Bonaventure, who construct it from the famous definition of *De doctrina christiana* – no doubt Bacon was familiar with these discussions, and thus conscious of their Augustinian origin, which was always explicitly mentioned in such a context. Some theologians also proposed to modify and broaden the Augustinian definition to include non-sensible signs, as Bacon does.[56]

(d) That Bacon's analyses are original, make explicit use of other sources (Aristotle, al-Farabi, Avicenna, al-Ghazali etc.), and fit into the context of the debates of the second half of the thirteenth century in Paris and in Oxford is clear.[57] But this cannot be an argument to exclude any dependence on Augustine. The fact that this entire section is centered on signs is a first indication of this influence (cf. the title of book II of *De Doctrina christiana*: *De signis interpretandis in scriptura*). Several other elements of Bacon's analyses can be mentioned, notably the central notion of transference of meaning (*translatio*, *transumptio*), with explicit mention of Augustine's examples from the *De dialectica*, or the key-notion of a renewal (*renovatio*) of meaning that can be freely done by any user of language, present in Augustine's *Contra mendacium* X, 24.[58]

(e) The whole of *Opus maius* III is of Augustinian inspiration: it addresses linguistic questions (= III.1 in our table, corresponding to the *DS*) in so far as they serve theology (= III.2). The often-used expression "*cognitio linguarum*", which qualifies the purpose of this part of the *Opus maius*, is literally borrowed from Augustine.[59] One finds in the *De doctrina christiana* XI, 16 the same remark as Bacon's, concerning the knowledge of languages, which constitutes a "great remedy against ignorance of proper signs" (*Contra ignota signa propria magnum remedium est linguarum cognitio*).

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[55] Peter Lombard, *Sententiae in quatuor libros distinctae*, 3 vols, edited by I. C. Brady (Grottaferrata: Editiones Collegii S. Bonaventurae, 1971-1981), vol. IV, chap. 4, 233. On the analysis of signs by theologians, see Irène Rosier-Catach, *La parole efficace: signe, rituel, sacré* (Paris, Seuil, 2004), chap. 1 and 96-98.

[56] Rosier-Catach, *La parole efficace*, 69-73; see commentary *§1 et *§2.

[57] For a recent synthesis and the relevant bibliography, see Laurent Cesalli and Irène Rosier-Catach, "*Signum est in praedicamento relationis.* Roger Bacon's Semantics Revisited in the Light of His Relational Theory of the Sign", *Oxford Studies in Medieval Philosophy* 6 (2018): 62-99; Alain de Libera and Irène Rosier-Catach, "The Oxford-Paris Split Revisited", in *Modes, Terms and Propositions. Continental versus British Traditions in Medieval Logic*, edited by C. Rode and C. Kann (Leuven: Peeters, 2021).

[58] See *Rosier-Catach, La parole comme acte,* 143 sq; commentary *§154 and *§155.

[59] See for instance *Opus maius* III, 115.

(f) At an even higher level, it is easy to show that the *De doctrina christiana* is a major source for the *Opus maius* as a whole, and it is often explicitly cited. The very purpose of the *Opus majus*, which is to glorify knowledge as it can serve theology, is close to the Augustinian conception of wisdom. Bacon often relies on the *De doctrina christiana* to show the relevance of this or that science and how it applies to divine things.[60] One wonders why Bacon, who often quotes the *De doctrina christiana* in *Opus maius*, including *Opus maius* III (chap. 2, 88), could have suddenly forgotten it when writing the section on signs.

Why then does he not quote this work of Augustine in the *DS*, and why this statement in the *CST*? The latter can be understood from what Bacon already wrote in chapter 27 of *Opus tertium*. There he explained that he wanted both to authorize himself from Augustine and to show the originality and independence of his analysis of signs and of his project, hence the assertion that "this part has never yet been composed among the Latins". It should be remembered that the *DS* is part of the *Opus maius*, written to Pope Clement IV, at his request, in order to obtain subsidies to enable him to carry out his research projects aimed at a general reform of knowledge at the service of Christianity.[61] Such arguments could certainly weigh in, convincing the Pope of the legitimacy of his demands. Just as in these works of an earlier period (1267-68), Bacon, at the end of his life, in the *CST* (1292), still emphasized these two facets of his work, namely, the Augustinian authority alongside originality, at a time when he was still expressing anger towards his contemporaries, especially the theologians.

3. *Signs, language and theology.* The central role that Bacon gave to the *cognitio linguarum* in the service of theology and Bible reading, is well known.[62] The table above shows its various facets. But beyond the knowledge of foreign languages, it is more particularly the study of signs and significations that proves to be important for theology. A whole section was to be devoted to it both in the missing part III-2 of the *DS*, just as later in the missing third treatise of the *CST*. Yet these theological issues are already reflected in the preserved section of the *DS*, echoing questions tackled by contemporary theologians, with often divergent answers. We have already mentioned the analysis of signs, addressed in the commentaries on Book IV of Peter Lombard's *Sentences*, where we find not only the definition and classification of signs, but questions about conventionality and naturality, the permanent or non-permanent nature of signification after imposition, the double relation of the sign (to the speaker and to the thing signified), etc.[63] In the same way, the notion of "semantic transfer" (*translatio, transumptio*),[64] that plays a central role in Bacon's analysis of signification, just like the notion of analogy,[65] is

[60] Rosier-Catach, *La parole comme acte*, 151-152; see *Opus maius* I, 13, vol. III, 30; *Opus tertium* I, 14, §75, 106.
[61] See Power, *Roger Bacon and the Defense*, chap. 2, for the context of the relations between Bacon and Pope Clement IV.
[62] Rosier-Catach, "Roger Bacon: Grammar"; Anheim, Grévin, Morard, "Exégèse judéo-chrétienne".
[63] See Rosier-Catach, *La parole efficace,* chap. 1; and our French commentary *§1, *§2, *§6, *§143, *147.
[64] See commentary *§155.
[65] See commentary *§40.

used by theologians to address the question of divine names. The classical and influential example from Boethius' *De trinitate,* "*Deus est iustus*",[66] is mentioned several times in the *DS*.[67] Here again Bacon will prove original in his analyses, since for him every transfer of meaning produces equivocation. The controversy over the problem of what Alain de Libera calls "la référence vide",[68] namely, whether a name retains its meaning when the thing it signifies has ceased to exist**,** whether it can univocally signify beings and non-beings, and whether predication is possible on empty classes (for instance of *man* when no men exist), which gave rise to Bacon's violent criticism of Richard Rufus of Cornwall, is linked to the theological problem of the humanity of Christ *in triduo mortis*.[69] On the origin of language, Bacon refers, in the summary of the *Opus tertium*, to the famous Psammetic experiment of children raised without any contact in a desert, but also to the episode of the imposition of names by Adam in *Gen* 2:27*,* whereas in the *DS* it is rather the model of the imposition of a name in the baptismal ceremony that is evoked*.*[70] Finally, references to topics mentioned in the summary of the *Opus tertium*, such as exegesis, typology (the way in which the Old Testament is a sign of the New), the different levels of meaning, parables and figures of Scripture, are present in Bacon's other works as well. He often insists that ignorance of languages, but also of the properties of things, prevents one from understanding the literal meaning, and thus the spiritual, allegorical, moral, and anagogical meanings, again with explicit references to the *De doctrina christiana*. [71] The relation between semantic and linguistic questions and the study of the Bible and theology is for Bacon a long lasting concern, just as it is for philosophy: the *Notes* studied by Etienne Anheim, Benoit Grévin and Martin Morard, probably dating from his entrance in the Franciscan order, show their elaboration over several years, before the writing of the *Opus maius*, and are still present in the late *CST*.

The analyses of the *DS*, just as of the later *CST*, thus provides a "technical" foundation to the treatment of the semantic and philological questions relevant for theology, the study of the Bible and exegesis. It is probable that the analysis of signs and signification

[66] Luisa Valente, "*Talia sunt subiecta qualia praedicata permittunt*. Le principe de l'approche contextuelle et sa genèse dans la théologie du XII^e^ siècle", in *La tradition médiévale des* Catégories *(XII^e^-XV^e^ siècles)*, edited by J. Biard and I. Rosier-Catach (Louvain: Peeters, 2003): 289-311.

[67] *DS*, §95, §99, §155 etc.; see commentary *§95, *99.

[68] Alain de Libera, "Roger Bacon et la référence vide. Sur quelques antécédents médiévaux du paradoxe de Meinong", in *Lectionum Varietates: Hommage à Paul Vignaux (1904-1987),* edited by J. Jolivet, Z. Kaluza and A. De Libera (Paris: Vrin, 1991): 85-120; A. de Libera, *La référence vide: théories de la proposition* (Paris: PUF, 2002).

[69] See commentary *§43-45 and *§139-141; for an updated bibliography on this topic, see Libera and Rosier-Catach, "The Oxford-Paris Split Revisited".

[70] *DS* §52 and §154, see commentary. It is worth mentioning in this respect Henri of Ghent's analysis of divine names, which approaches the meaning and the imposition of divine names starting from the texts of Augustine, but also drawing on Gen. 2, 27 as much as on Aristotle, Boethius and Averroes; see Irène Rosier-Catach, "Henri de Gand, le *De Dialectica* d'Augustin, et l'imposition des noms divins", *Documenti e studi sulla tradizione filosofica medievale* 6 (1995): 145-253.

[71] See for instance *Opus minus*, 385, 388-389; *CSP,* VI, §93 etc.

in general, which contains many discussions of interest to logicians (= III.1), had all its place in a collection of works such as the ones gathered in ms Digby 55. This collection contains a majority of texts pertaining to the Faculty of Arts, in particular grammatical and logical texts, and may have been for this very reason separated from the following (= III.2), which seem to be of interest only to theology. Bacon began his career in Paris, teaching grammar and logic as much as philosophy. When he turned to the study of foreign languages, Greek and Hebrew, and to the study of Bible, as the *Notes* testify, he included some of these technical semantic analysis in this new project,[72] and continued doing so to the end of his life. He remained involved in the intense semantic controversies of the Faculty of Arts, in Paris and Oxford.[73] The summary given in the relevant chapters of the *Opus tertium*, its comparison with the various versions of the *Opus maius* III, on the knowledge of languages, the relocation and reorganization of some of the material as that on persuasion or on the power of words, the inclusion of new analysis as those on the power of music, show the extent to which Bacon's diverse interests in language respond to each other. These interests belonged to a vast comprehensive project, carried out over more than fifty years of research.

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[72] Anheim, Grévin and Morard, "Exégèse judéo-chrétienne..." show in particular that he included in the *Correspondance* remarks on equivocity, signification, supposition, imposition, use of sophisms, etc., see 132, 148 and the corresponding passages quoted in the footnotes.

[73] Ana María Mora-Márquez, *The 13th-Century Notion of Signification. The Discussions and Their Origin and Development* (Leiden: E. J. Brill, 2015), chapter 2; Libera and Rosier-Catach, "The Oxford-Paris Split Revisited". See in particular the violent rejection of one of his distinctive theses, in an anonymous sophisma, edited by Alain de Libera and Leone Gazziero, "Le sophisma '*Omnis homo de necessitate est animal*' du Parisinus latinus 16135, f° 99rb-103vb", *Archives d'Histoire Doctrinale et Littéraire du Moyen Age* 75 (2008): 323-368, 342: "sic videtur de ista positione quod sit similis dementiae et ultra omnes dementias, quia nec laicus, nec clericus, nec demens, nec sapiens in tantum egressus et quin nomine rei praeteritae, quam cognovit, si ipsum audiat, moveatur in anima sua"; see commentary *§143. The tone of the anonymous author's criticism, on this crucial problem of the permanence of the signification when the thing signified no longer exists, here analyzed with the same example of the *circulus vini*, is just as violent as the one Roger Bacon often uses; see Sten Ebbesen, "Roger Bacon and the Fools of His Time", *Cahiers de l'Institut du Moyen âge Grec et Latin* 3 (1970): 40-44. On the controversy over the *circulus vini,* see Irène Rosier-Catach, "*Multa vocabula ceciderunt ab usu:* les mots, le cercle de vin et le *beneplacitum* du locuteur", in *Per Enrico Fenzi: Saggi di allievi e amici per i suoi ottant'anni*, edited by P. Borsa & al. (Firenze: Le lettere, 2020): 25-41; commentary *§147.

VIRTUS AND *SPECIES* IN THE PHILOSOPHY OF NATURE OF ROGER BACON (C. 1220-1293)

VIRTUS Y *SPECIES* EN LA FILOSOFÍA DE LA NATURALEZA DE ROGER BACON (C. 1220-1293)

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Abstract

The paper examines Roger Bacon's use of the concept of *virtus* in the *Communia naturalium* and *De multiplication specierum*. It focuses on the roles which *virtus* and *species* play as vehicles of causality in the inanimate realm. It analyses the distinct functions played by *virtus* in the motion of celestial spheres, the power of natural place, the attraction of iron to magnet, and the universal nature. The analysis concludes that *virtus* is an efficient power, a feature of the form, capable of causing local motion and instigating natural processes. *Species* is matter's response to the stimulation made by *virtus* through which every natural action, to the exclusion of local motion, is made. *Species* is a non-efficient power, an 'appetite' internal to matter. It is an expression of matter's inherent inclination to promote and perfect itself, the result of matter's 'active potentiality'.

Keywords

Multiplication of Species; Efficient Causality; Natural Place; Magnet; Active Potentiality

Resumen

El artículo analiza el uso que Roger Bacon hace del concepto de *virtus* en los *Communia naturalium* y *De multiplication specierum*. Nos centramos en el papel que desempeñan la *virtus* y las especies como transmisores de la causalidad en el reino de lo inanimado. Se analizan las distintas funciones que desempeña la *virtus* en el movimiento de las esferas celestes, la fuerza del lugar natural, la atracción del hierro por el imán y la naturaleza universal. El análisis concluye que la *virtus* es un poder eficiente, una característica de la forma capaz de provocar el movimiento local y de instigar los procesos naturales. La especie es la respuesta de la materia a la estimulación realizada por la *virtus* a través de la cual se realiza toda acción natural, con exclusión del movimiento local. La especie es una potencia no eficiente, un "apetito" interno de la materia. Es

una expresión de la inclinación inherente a la materia para promoverse y perfeccionarse, el resultado de la "potencialidad activa" de la materia.

Palabras clave

Multiplicación de especies; Causalidad eficiente; Lugar natural; Imán; Potencialidad activa

Introduction

In his *Physics*, Bk. VIII, Aristotle argued that for an object in motion there needs to exist a mover, which must be distinct from the moving object. The mover is the active party; it transmits a causally relevant property to the passive object. The account of how this relevant property is transmitted from agent to patient, seemed obscure and insufficient to many of the Aristotelian commentators. It is therefore no wonder, that the concrete model of the Aristotelian idea of efficient causality received various interpretations over the long years of its reign. In this paper I reconsider one of the well-known solutions to this obscurity of the Aristotelian account, namely, the theory of the multiplication of *species* of Roger Bacon (c. 1214/1220-1290).

Bacon's most fully developed account of natural action appears in his treatise *De multiplicatione specierum*, in which he explains the physical interactions between agents and patients in terms of *species*. He thought that *species* are issued constantly in all directions by every active nature (*natura activa*), and that they are similitudes of their agents. *Species* are supposed to be produced uniformly and naturally from the "active potentiality of matter (*potentia activa materie*)" of the recipient, and thus render the recipient similar to the agent, "in specific essence, in nature, and in operation (*in essentia specifica et natura et operatione*)." Bacon provided the following examples for this similarity: "if fire is the agent, it produces fire; if heat, heat; if light, light; and so for all things".[1] The "active potentiality" of matter is defined by Bacon as matter's appetite to receive new forms. He explained that the notion of "active potentiality" is meant to replace Aristotle's notion of "privation", which is matter's aptitude to be actualized by a form. Note that this active potentiality is a feature of natural matter (which has the form of the genus, but not that of species), but not of prime matter.[2] "Natural matter"

[1] Roger Bacon, *De multiplicatione specierum* (=*DMS*) 1.1, edited and translated by D.C. Lindberg, *Roger Bacon's Philosophy of Nature: A Critical Edition, with English Translation, Introduction and Notes, of De multiplicatione specierum and De speculis comburentibus* (Oxford: Clarendon Press, 1983), 7.

[2] For the notion of "active potentiality" in Bacon, see Anna Rodolfi, "Dicitur materia propriissime et strictissime. Roger Bacon and the Ontological Status of Matter", in *Roger Bacon's Communia Naturalium: A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Firenze: SISMEL-Edizioni del Galluzzo, 2014), 83-102; Cecilia Panti, "Roger Bacon on Chance in Natural Generation in the *Questiones super octo libros Physicorum Aristotelis*", in *Roger Bacon and Medieval Science*

on Bacon's use, is the substrate of natural change, a hylomorphic composite which is in potency of all natural things. Bacon thought that in the process of natural generation, the proximate genus plays the role of matter which receives its completion thanks to the *species*, acting as form. This "matter having the capacity to receive forms" is "natural matter", which is partly unformed. It is opposed to prime matter which is potency alone.[3] He remarked: "the natural matter in the generation and corruption of a species is the incomplete essence of the proximate genus, which is apt by nature to be completed by the *species*".[4] Natural action consists, then, in the agent's stimulating the recipient to produce *species* out of its own natural matter. The *species* resemble the agent and induce the patient to become similar to it in some respect.[5]

Following Bacon's declarations that "these *species* make every activity in the world (*haec species facit omnem operationem hujus mundi*)",[6] David Lindberg asserts that "it is apparent that Bacon attributes all natural causation to the multiplication of *species*".[7] In this paper I qualify this assertion in two respects. First, I show that physical interactions do not consist only of the phenomena accounted for by *species* which express qualitative change and generation. A considerable part of Aristotelian physics concerns local motions of bodies, their direction, velocity, and rest. The concept of *species*, as developed by Bacon in the *DMS,* does not cover these features of natural bodies, and Bacon invoked the term *virtus* to account for the local motions of bodies. Second, and more importantly, I demonstrate that *species* cannot be considered an efficient cause. *Species*, on Bacon's account, is the first effect of the efficient cause, namely virtus; it is not to be identified with the agent but is rather its effect. Species is indeed the mean by which natural power is transmitted, however, it is not the driving power itself. It is the first response by a material substance to an excitation coming from an agent.

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and Philosophy – Studies in Honour of Jeremiah Hackett, edited by N. Polloni and Y. Kedar (London: Routledge, 2021), 36-53.

[3] For Bacon's notion of "natural matter" see Michela Pereira, "Remarks on materia naturalis", in *Roger Bacon's Communia Naturalium: A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Firenze: SISMEL: Edizioni del Galluzzo, 2014), 103-138; Nicola Polloni, "Roger Bacon on the Conceivability of Matter", in *Roger Bacon and Medieval Science and Philosophy* (London, Routledge, 2021), 76-97; Panti, "Roger Bacon on Chance in Natural Generation", 36-53.

[4] Roger Bacon, *Communia naturalium* (= *CN*), edited by R. Steele, *Opera hactenus inedita II-IV* (Oxford: Clarendon Press, 1910-1913), 1.1.2.1, 15-16: "materia naturalis in generacione specierum et corrupcione est essencia generis proximi incompleta, que nata est compleri per species."

[5] For the full account of natural action in Bacon, see Dominique Demange and Yael Kedar, "Physical action, species and matter: The debate between Roger Bacon and Peter John Olivi", *Journal for the History of Philosophy* 58 (2020): 49-59.

[6] Roger Bacon, *Opus maius* 4.2.1, edited by J. A. Bridges, (Oxford/Edinburgh, 1897-1900, reprint Frankfurt am Main, 1964), vol. 1, 111.

[7] David Lindberg, *Roger Bacon's Philosophy of Nature: A Critical Edition, with English Translation, Introduction and Notes, of De multiplicatione specierum and De speculis comburentibus* (Oxford: Clarendon Press, 1983), lvi.

Unlike the case of *species*, Bacon did not treat *virtus* systematically. Indeed, *virtus* was used by him as a generic term as well. I argue, however, that in matters related to inanimate bodies, this term had a specific meaning, which I wish to disclose. I therefore reconstruct the meaning and function of *virtus* in Bacon's philosophy of nature, drawing on the ways he applied it. I examine Bacon's use of the term *virtus* in the *CN*, and the *DMS*. Bacon's *CN* contains mature expressions of many of his theories. It was written in the 1260s, around the same time as the *DMS* or soon thereafter and was meant to present an exhaustive account of the various branches of knowledge. Apparently, it was not completed.[8]

I gather the meaning of *virtus* in Bacon's mature philosophy of nature by analyzing its various functions. Accordingly, the first section of this paper provides some partial definitions of *virtus*, found in the *CN* and the *DMS*. The subsequent sections consider – in this order – four types of *virtus*: (1) of heavens, (2) of natural place, (3) of the magnet, and (4) of universal nature. I show that common to all these cases are local motion and rest.

Like many other writers of his time, Bacon invoked *virtus* also for the soul's abilities to engage in operations of different kinds. I do not address this usage, since my concern in this paper is with the function of *virtus* regarding efficient causality in the inanimate domain alone.

In the final section I compare the ontological and physical features of *virtus* with those of *species.* I demonstrate that these features are in fact distinct in Bacon's theory of physical action. I further argue that *virtus* can be considered an efficient cause and hence as ontologically prior to *species*, since it is both the power which renders a nature active thus making it capable of producing *species* and the power which controls the *species'* activity, as will be shown below in the case of the law of universal nature.

1. Virtus defined

Bacon did not devote concentrated attention to the concept of *virtus*. Partial definitions, however, can be found. In the beginning of *DMS*, he wrote:

> [E]ssence, substance, nature, power (*potestas*), potency, *virtus*, and force (*vis*) signify the same thing, but differ only in relation. For 'essence' is considered with respect to itself, 'substance' with respect to accident, the others in reference to the eliciting of an action.[9]

[8] See Jeremiah Hackett, "Roger Bacon: His Life, Career and Works", in *Roger Bacon and the Sciences: Commemorative Essays*, edited by J. M. G. Hacked (New York: Leiden, 1997), 9-24.

[9] Bacon, *DMS*, 1.1, 2-3: "essential, substantia, natura, potestas, potentia, virtus, vis significant eandem rem, sed differunt sola comparatione. Nam essentia dicitur secundum se considerate, substantia respectu accidentis, alia respectu operationis eliciende."

Bacon numerates five terms used to signify the power to elicit an action: nature, power, potency, *virtus* and force. How can these terms be further characterized or distinguished? Bacon provides the following answer:

> But 'nature' means an aptitude for acting, apart from any further inclination. 'Potency' and 'power' mean the same thing, and they are commonly applied to either a complete or an incomplete operation. 'Virtue' and 'force' also mean the same thing, but they are applied only to that which completes an operation. And I speak here concerning a potency that elicits an action rather than that which accomplishes an action.[10]

Bacon reserved the term 'nature' for the mere aptitude for acting, without reference to the realization of this aptitude.[11] 'Potency (*potentia*)' and 'power (*potestas*)' on the other hand, could be used regardless of whether that realization occurred, while '"virtue' and 'force (*vis*)' are to be applied to powers that have been realized. He clarified that the realization of the power consists in a stimulation of the natural potency (namely, the active potentiality) of the recipient to elicit action, rather than in imparting an action to the recipient from an external source.

In the next *DMS* paragraph, Bacon again distinguishes two types of *virtutes*, the one (*species*) is the first effect of the other (namely, of *virtus*). At this juncture, Bacon tells us that *virtus* and *species* are similar in essence and operation, since "things of similar essence have similar operations".[12] He fails to give a more specific definition of the difference between the two *virtutes*. We can deduce, however, that the designation of *species* as the first effect of *virtus* means that it is its similitude, namely, its image or likeness. This would explain why the two are similar, according to Bacon, in essence and operation. Moreover, we can presume at this point that there is a primary *virtus* which grounds a secondary *virtus*, namely, *species*.

In the *CN* Bacon adds a significant detail: "*virtus* and *vis* are the utmost of potency or the utmost power of which Aristotle speaks in the first book of *De caelo*".[13] Another statement specifying *virtus* as the highest or greatest potency appears two pages later,

[10] Bacon, *DMS*, 1.1, 2-3: "Sed natura dicit aptitudinem operandi, cetera ulteriorem inclinationem. Sed potentia et potestas sunt idem, et communiter sumuntur respectu operationis complete vel incomplete. Virtus vero et vis sunt idem, sed dicunt solum complementum operationis. Et hic loquor de potentia que elicit actionem, non de illa que expedit."

[11] In an earlier text, Bacon identifies 'nature' with the active potentiality of matter. See Roger Bacon, *Q.octo.Phy.*, edited by R. Steele, *Opera hactenus inedita* XIII (Oxford: Clarendon Press, 1935), 86: "immo potentia activa dicitur natura solum."

[12] Bacon, *DMS*, 1.1, 2-3: "Aliter sumitur virtus pro effectu primo virtutis iam dicte propter similitudinem eius ad hanc virtutem, et in essentia et in operatione, quia similis est ei diffinitione et in essentia specifica; et per conequens est similis in operatione, quia illa quae sunt similis essentie habent similes operationes. Et hec virtus secunda habet multa nomina, vocatur enim similitudo agentis et ymago et species et ydolum et simulacrum et fantasma et forma et intentio et passio et impressio et umbra philosophorum apud auctores de aspectibus."

[13] Bacon, *CN*, 1.2.2.4, 80: "virtus vero et vis est ultimum de potencia, seu potencia ultimata, secundum quod Aristoteles dicit in primo *Celi et mundi*."

in the context of Bacon's distinction between the active and passive potencies of matter. Part of the description of the active potency states that "It is therefore essence, as considered in itself; a potency as it has the appetite to be promoted and perfected, and as being promoted to perfection; and as it is the greatest potency, it is *virtus*".[14] We find more details further on in the text:

> But potency differs from *virtus* like the common differs from the specific. For *virtus* according to the first book of *De caelo et mundi*, is the greatest potency, that is, the utmost power, as he [Aristotle] verifies by an example. If a donkey can carry a hundred pounds and no more, its *virtus* comes to a halt in carrying a hundred pounds [it therefore can carry also] one, two and twenty [pounds], and so on, in any manner, and so is the potency in more things, and *virtus* is the perfect potency. Hence Aristotle said in *Physics* VII that each thing is perfect when it attains its proper *virtus*.[15]

While potency can be realized in various degrees, *virtus* is the power driving to the maximal realization possible for a certain subject, or put otherwise, to its appropriate perfection. In *De Caelo* I.11, Aristotle did not mention a donkey, but what he wrote there is close enough:[16]

> We speak, for instance, of a power to lift a hundred talents or walk a hundred stades – though if it can effects the maximum it can also effect any part of the maximum – since we feel obliged in defining the power to give the limit or maximum. A thing, then, which is capable of a certain amount as maximum, must also be capable of that which lies within it. If, for example, a man can lift a hundred talents, he can also lift two, and if he can walk a hundred stades, he can also walk two.[17]

The context of Aristotle's discussion is the difference between what is possible and what is impossible. For a man whose maximum power is to lift a hundred pounds, lifting ninety-nine is possible, but lifting a hundred and one is impossible. Bacon built on this discussion to develop the idea that while potency is the general term for force or power, *virtus* is the specific term for the strongest potency or the power driving to a full

[14] Bacon, *CN*, 1.2.2.4, 82: "Est ergo essencia in principii materialis et essencia et potencia. Essencia prout in se consideratur, potencia prout appetit promoveri et perfici, et prout est promovenda in perfeccionem, et ut est potencia ultimata, est virtus."

[15] Bacon, *CN*, 1.2.4.3, 118: "Set potencia differt a virtute, sicut commune et speciale. Nam virtus secundum Aristotelem primo *Celi et Mundi* est ultimum de potencia, id est, ultimata potencia, sicut verificat in exemplo, ut si asinus potest ferre centum libras et non plus, ejus virtus consistit in lacione centum librarum, unius, et duarum, et 20, et sic de quocunque modo, et sic potencia est in plus, et virtus est perfecta potencia, propter quod dicit in 7° *Phisicorum* quod unumquodque tunc perfectum est, cum attingit proprie virtuti."

[16] The example of the donkey may have come from another source, such as ps-Aristotle's *De celo et mundo* or the commentary by Averroes.

[17] Aristotle, *On the Heavens* I, 11 281a1, translated by J. Barnes, *The Complete Works of Aristotle – The Revised Oxford Translation* (Princeton: Princeton University Press, 1984), vol. 1, 447-511, 465-466.

realization of a certain capacity to move or to carry something. When a thing can realize its maximal capacity, it is perfect.

Another specification of *virtus* is that it is a feature of the efficient cause, distinct from the material principle:

> [W]e have to consider that *virtus* and *vis* and potency and power (*potestas*) and nature are in one way from the part of the efficient [cause], considering that it effects an action and changes the material principle to the end term of generation. And this nature or potency or *virtus* is never in the material principle. Indeed, the efficient [cause] and matter never coincide, as Aristotle said in *Physics* II. And this is so because one and the same thing is never both in act and in potency and agent and matter in the same respect.[18]

Since the active potentiality of natural matter is entangled with matter, it depends on an external agent, which is the efficient cause, to stimulate it. This external agent is associated in this quotation with *virtus*, which is distinguished, in turn, from the material principle. Bacon defines the material principle in the *Opus tertium* in this way:

> [A]ll that which is in potency to another, and is the foundation of the other, is called the material principle and matter [...] If therefore, we compare all things to their genera, rendering every species to its appropriate genus, then all [species] will be one genus, and therefore matter, because matter and genus are the same.[19]

The material principle is in fact natural matter, which, in natural generation, is the genus waiting to receive a specific form in order to be complete. This genus is not pure matter, since it has the form of the genus. The material principle is therefore a relative concept, which can be applied in any case in which there is a certain potency and a certain power which activates it by providing it with a more specific form. It is the material principle in relation to this specific power, but not absolutely.

The material principle is driven to action upon receiving stimulus from *virtus*. However, that *virtus* does not impart matter with inherent activity of its own, but rather excites it to produce *species*. The next quotation is pivotal in clarifying the relation between *virtus* and *species*:

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[18] Bacon, *CN*, 1.2.2.4, 82: "considerandum quod virtus et vis et potencia et potestas et natura uno modo sunt a parte efficientis considerande quod efficit accionem et transmutat principium materiale in terminum generacionis. Et ista natura vel potencia vel virtus nunquam est in materiali principio. Sic enim efficiens et materia nullo modo coincidunt, ut Aristoteles dicit 2° Phisicorum. Et patet hoc, quia nichil unum et idem est actu et potencia, et agens et materia secundum idem."

[19] Roger Bacon, *Opus tertium*, edited by J. S. Brewer, *Opera quedam hactenus inedita* (London: Longman, Green, Longman and Roberts, 1859) 38,128: "omne illud quod est in potentia ad aliud, et est fundamentum aliorum, vocatur materiale principium et materia, ideo genus vocatur materia... Si igitur comparemus omnia ad genera sua, reddendo singulas species coaequaevas singulis generibus, tunc omnia sunt unum genere, et ideo materia, quia materia et genus idem sunt."

> But even though it was debated before concerning the active principle in matter, and it is determined that in matter there is nothing active in the act of transmuting and effecting, quibblers show that although [matter] does not have the power of action from itself, yet it has it on account of the *virtus* of the agent which stirs it. And when it is stirred by it, it can act to the production of a form, or the end term [of a generation], which is called a form, although it is a composite. But they were deceived first because they imagine that the agent infuses into the patient something cooperative, which transmutes the depth of the patient, so that an effect arises from the power of matter. But this was rejected previously in the treatise *De efficiente*. It is also shown there that that which the agent does in the first part of the patient is incomplete and is called *species*. Subsequently, the continuity of the action performed by the agent is completed. And therefore, since the effect does not actualize itself, it is not active, and consequently does not give the potency of matter any power to act. Indeed, that which is produced by the agent in matter is a part of the generated [thing] and therefore, since matter has that part, it is no other than matter itself having a more complete essence than before, which has a nature of an effect, [namely, it is] made and generated, [and] is still essentially in potency to receive its completion. Therefore, there is no place for the act of causing and making, but [rather] for promoting and receiving. Therefore, matter has nothing except for a passive principle, generally speaking, which excludes efficient action, because the passive principle of matter has only the act of appetizing and desiring.[20]

Bacon clarifies here that in natural action, the agent does not infuse anything into the patient. The so called 'quibblers' are deceived in arguing that the effect arises out of the power of matter. Matter, Bacon holds, cannot be considered active or efficient. By the power of *virtus*, the agent issues a *species* out of the active potentiality of matter, and this *species* generates another one, and so forth all the way to the depth of the

[20] Bacon, *CN*, 1.2.4.2, 113-4: "Set licet disputatum est prius de principio activo in materia, et determinatum sit quod in materia nichil est activum in accione transmutandi et efficiendi, tamen cavillatores ostendunt quod licet non a se habeat potenciam agendi, tamen habet per virtutem agentis que excitat eam, et ipsa excitata per hoc potest agere ad produccionem forme, sive termini ad quem, qui vocatur forma quamvis sit compositum. Set primo decepti sunt, quia ymaginantur quod agens fluat in paciens aliquod cooperativum | quod transmutet profundum pacientis ut de potencia materie ducatur effectus. Hoc enim prius reprobatum est in tractatu De efficiente. Ostensum eciam est ibi quod illud quod agens facit in prima parte pacientis non est nisi effectus quem intendit: set ille effectus primo est incompletus et vocatur species, postea per continuitatem accionis agentis completur, et ideo cum effectus non efficit seipsum, non est activum et per consequens non dabit potencie materie aliquam potestatem agendi. Quod vero fit per agens in materiam est pars generati, et ideo cum materia habet illam partem, non est aliud nisi quod ipsa materia habet esse complecius quam prius, et illud esse habet racionem effectus facti et generati, quod est adhuc in potencia essencialiter ad complementum suum recipiendum, et ideo non est in alico, actu agendi et faciendi, set promovendi et recipiendi. Materia igitur non habet nisi principium passivum, communiter loquendo, ut excludatur accio efficiendi quod principium passivum materie habet solum actum appetendi et desiderandi."

recipient. Bacon denies, however, that a *species* can be ascribed with the power of action. Every natural action made in and from matter can only be considered a passive response, or a part of the inherent inclination of matter to be completed by receiving new forms. Bacon draws here an important distinction between efficient action and the 'appetite' of matter, which in no way can be considered efficient; it is an effect, not a cause. Matter, Bacon concludes, despite having an 'active potentiality', can never be considered an efficient cause. Matter's response to an external excitation is called *species*, but it is a reaction only, lacking inherent activity of its own. While *virtus* is a power external to the material principle, *species* is the power internal to it (again, the matter discussed here is natural matter and not prime matter). As such, it cannot be considered a cause. Indeed, Bacon stressed that *species* are material. In the *Perspectiva* he wrote, for instance, that "a *species* of corporeal and material things will always have material and corporeal existence".[21] Moreover, he devoted a whole chapter of the *DMS* (3.2) to counter the claim raised by Averroes and Avicenna that *species* of material agents have spiritual being *in media*.

Virtus is therefore a power stirring natural matter, driving it to activity and complete operations. It is the driving force leading natural matter into producing *species*, that is, by rendering it active. At this point, the question of where the *virtus* originates is not answered but let us examine what more can be learned from the specific cases in which Bacon appealed to *virtus*.

2. The *virtus* of natural place

In the Aristotelian universe, each element has an internal inclination toward its natural place. Water and earth have an internal inclination toward the center of the universe, while the internal inclination of fire and air drives them toward the periphery. Bacon agrees with this description:

> The elements indeed have internal principles of motion, which move them to their natural places; these internal principles are the heaviness and lightness in them. Therefore, the essence of the heavy and the light [elements] is [their] nature. For they can from themselves be carried to their places when they are not impeded. Whence they do not need another mover, just as fire does not need a mover in order to heat, for it can heat by itself if it has matter. Therefore, heavy and light bodies move by nature and from themselves, and the principle of motion is here not just appetitive as in the case

[21] Roger Bacon, *Perspectiva*, edited and translated by D. C. Londberg, *Roger Bacon and the Origins of Perspectiva in the Middle Ages: A Critical Edition, with English Translation of Bacon's Perspectiva with Introduction and Notes* (Oxford: Clarendon Press, 1996), 1.6.4, 88-89.

> of matter, but rather effective because the heavy [body] divides the medium by itself and makes itself move downwards out of its own *virtus*.[22]

The motion of the elements to their natural place is a special kind of motion in which there is no distinction between the substance of the mover or the efficient cause and the patient receiving the movement. It takes power to divide the medium when ascending or descending, and this power is a *virtus* internal to the substance. This seems like an exception to the maxim that a mobile is always moved by another. But Bacon solved this by distinguishing the *virtus* from the material principle of the mobile, as we have seen in the previous section. The *virtus* of natural place which moves the heavy body from within, ought then to arise out of the form, which is distinct from natural matter, namely, the specific form of the element.

The natural place toward which the heavy body is drawn, has its own *virtus* too. In fact, it is only having a *virtus* that entitles it to the status of a natural place. Bacon debated if the surface ought to be considered as the natural place. The criterion for answering this question is the possession of a *virtus*:

> And now one asks whether the place, in the sense of a surface, is a natural place. Some would argue that this is not the case, because surface, as such, is a mathematical being. Also, the surface does not have some *virtus* that would conserve the located thing in its place, but place is said to have [such *virtus*]; of which the contrary is made clear by Aristotle, in the second book of *Physics*, where he says that lines and surfaces and things of this kind are, according to the truth of their being, natural things, which do not have being except in natural bodies, therefore place can be natural, even though it is a surface. And in this way the first argument is solved, for the same [thing] is a natural thing and mathematical, and it is called mathematical only due to consideration, not on account of being, as was explained before. The rest is solved by the fact that this surface indeed, which is a place, is the limit of a natural thing, namely, of the locating [body] which has in its substance that *virtus*, and therefore this surface can make a natural place, because of the essential relation that it has to the substance to which the *virtus* belongs. The surface is indeed the limit of that substance, and therefore it has a necessary relation to the *virtus* of that substance, on account of which it can be called not only a natural surface but also a natural place, namely, by that natural *virtus*.[23]

[22] Bacon, *CN*, 1.2.4.2, 116: "Elementa enim habent principia motus intra, que movent se ad loca naturalia, que sunt gravitas et levitas eorum, unde ipsa et eorum essencia gravis et levis est hic natura, possunt enim secundum se ferri in loca sua cum non prohibentur, unde non indigent alio motore, sicut nec ignis indiget motore ut calefaciat, per se enim potest hoc facere si materiam habeat, ideo gravia et levia moventur a natura et a se, et non est principium motus hic tantum appetitivum sicut in materia, set effectivum, ipsum enim grave dividit medium, et facit se deorsum ex propria virtute."

[23] Bacon, *CN*, 1.3.2.6, 200: "Et nunc queritur utrum locus secundum quod dictus est superficies sit locus naturalis. Et aliquis argueret quod non, quia superficies in quantum hujusmodi est res mathematica. Item, superficies non habet virtutem aliquam conservandi locatum, set locus dicitur

The conclusion is that the surface can rightly be called a natural place, given the fact that it is the limit of the substance that has the *virtus,* or due to its essential relation to that *virtus*. The *virtus* is the power which draws the element to its place, and on account of which the surface is natural rather than mathematical. However, after further consideration, Bacon decided that the substance, not the surface, should more properly be considered a natural place:

> A natural place is properly called so on account of the natural *virtus* which it has with respect to the located [body]. But the substance of the locating [body] has this *virtus*, not its surface. Therefore, if the surface is the natural place solely on account of a relation to that *virtus*, then much more rightly would the locating [thing] itself be called natural place, because it has that *virtus*.[24]

But if the descending body has its own *virtus*, carrying it downwards, why is there also a need for another *virtus*, that of natural place? Bacon presented two opinions concerning the function that natural place plays in the motion of a body:

> [N]atural motion is stronger at the end. Thus, the heavy [object], the more it approaches the bottom, the more forcefully it moves, as when iron approaches a magnet. But the cause of this strength is the heavy object's approaching the [natural] place. Therefore the place appears to have an influence, insofar as it is the cause of [the motion's] strength [...] But against this [it can be argued] that that which moves another through the influence of *virtus* does not move it, unless the moved thing is in the right distance with respect to what influences it [...] And it must be said that the *virtus* of place moves from a distance [...] but from a distance it does not move like an efficient cause [...] for from its nature it [the moved thing] strives and is moved in whichever distance it is placed, but [when] it has the right distance, it receives the *virtus* of place, by which it is altered to a stronger motion.[25]

habere; cujus contrarium patet per Aristotelem, secundo *Phisicorum*, ubi dicit quod linea et superficies et hujusmodi sunt, secundum veritatem sui esse, res naturales, et non habent esse nisi in corporibus naturalibus, quapropter locus potest esse naturalis, licet sit superficies, et sic solvitur argumentum primum, nam eadem est res naturalis et mathematica, et non dicitur mathematica nisi propter consideracionem, non propter esse, ut prius expositum est. Reliquum vero solvitur per hoc, quod superficies hec, que est locus, est terminus rei naturalis, scilicet, locantis que habet in sua substancia illam virtutem, et ideo superficies hec potest facere locum naturalem propter comparacionem essencialem quam habet ad substanciam, cujus est illa virtus. Superficies enim est terminus illius substancie, et ideo habet comparacionem necessariam ad virtutem illius substancie a qua potest dici non solum superficies naturalis, set locus naturalis, scilicet, ab illa virtute naturali."

[24] Bacon, *CN*, 1.3.2.3, 201: "locus naturalis proprie dicitur propter virtutem naturalem quam habet respectu locati, set locantis substancia habet hanc virtutem et non superficies, ergo, si superficies est locus naturalis propter solam comparacionem ad virtutem hanc, multo forcius ipsum locans, quia habet hanc virtutem, dicetur locus naturalis."

[25] Bacon, *CN*, 1.3.2.3, 204-205: "motus naturalis est forcior in fine, unde grave, quanto magis apropinquat deorsum, tanto forcius movetur, sicut ferrum ad magnetem. Set istius fortitudinis causa est apropinquacio ad locum, ergo, locus videtur aliquid influere, ut sit causa istius fortitudinis.

The motion of the heavy body becomes stronger as it gets closer to its natural place. On the one hand, it seems that the natural place attracts the heavy body since it moves more forcefully when approaching it. According to another opinion, however, the natural place can only exert its influence from a due distance, hence it cannot be the cause of this motion. Bacon's resolution is given at the end of the quotation: the *virtus* of natural place is the cause of the body's motion from any distance, yet up to a certain distance it is not the efficient cause of this motion, but rather its final cause, as will be shown in the following. Although the text does not state this explicitly, it seems reasonable to infer that when the body reaches its due distance, the natural place becomes the efficient cause of its motion, rendering it stronger. When the attracted substance is beyond that distance (that is, beyond the range of the natural place's influence), its internal *virtus*, which is a feature of its particular nature, namely, the form of the specific element, functions as the efficient cause. Bacon concluded that the *virtus* of place is not the first and only cause of motion in this case, but it is the only cause of the strength of motion when in the right distance. In most cases, Bacon continued, what provides matter with perfection is the same thing that sets it in motion, namely the efficient cause, and not the final cause, which is not active. But natural place is a special case, because it is both a final and efficient cause:

> [F]or the generating agent gives matter its complete being, and not the end of generation, which is the desired end, for that end is not active but this end of motion, which is the place, is active, and gives this [matter] being. Because the end of generation is not as yet in the nature of things, nor does it have being, therefore it cannot act or cause alteration. But [natural] place is a substance in actuality having the power to operate and to alter another being.[26]

It is agreed that the natural place is the final cause of the element's motion. Bacon wanted to show here, that it can also be considered the efficient cause of its motion, at least from a certain distance. In most cases of generation, the efficient cause can be clearly distinguished from the final cause, especially since the efficient cause exists, while the final cause is a desired goal yet to be achieved. Natural place, however, which is the final cause of the heavy element's motion, does exist. Hence there is no difficulty in considering it the generating agent, or the efficient cause as well. The consequence is that according to Bacon, natural place is efficient and has the power of setting bodies

[...] Set contra, illud quod movet aliud per influenciam virtutis, non movet illud, nisi cum est in debita distancia respectu influentis. [...] Et dicendum quod hec virtus loci movet a longe [...] set a longe non movet sicut efficiens [...] unde ex natura sua appetit et movetur, in quacunque distancia ponatur, set cum in debita distancia venerit, recipit virtutem loci, per quam alteratur in forciorem motum."

[26] Bacon, *CN*, 1.3.2.3, 206: "nam generans dat materie esse complecius, et non terminus generacionis, qui est finis desideratus, ille enim finis non est activus, sed hic finis motus, qui est locus, est activus, et dat istud esse. Quia terminus generacionis non est adhuc in rerum natura, nec esse habet; et ideo, non potest agere nec alterare. Set locus est substancia in actu habens potestatem operandi et alterandi aliud."

in motion by reason of its *virtus*. This *virtus* is twofold: one is internal to the substance of element, and the other external.

3. The *virtus* of heavens

Bacon used *virtus* to account both for the movement of the celestial bodies and for the influence which the celestial bodies exert on the spheres of the elements. A widespread explanation for the motion of the celestial bodies, originating from Aristotle, was that the orbs had immaterial, spiritual movers, causing motion by will and desire.[27] The idea that an intelligence or angel could move an orb by will alone was condemned in 1277, the rationale being that only God could move things by will alone.[28] Edward Grant argues that a new approach was devised by Richard of Middleton (fl. second half of the 13th century), Godfrey of Fontaines (d. 1306) and Hervaeus Natalis (c. 1260-1323), who added a motive force (*virtus motiva*) to the intelligences, by which they move the orbs. This power was assumed to guarantee direct contact between the angel and the orb. The intelligences, however, still moved the orbs voluntarily and not naturally, according to this view.[29] As we shall see, the idea that the celestial bodies are moved by *virtus* is present in Bacon's *CN* prior to the condemnation of 1277 and the abovementioned writers.[30] His source was the Muslim astronomer Alpetragius (Al-Bitruji, d. 1204), who proposed a non-Ptolemaic astronomical system, and opted for a physical rather than a voluntary cause of celestial motions.[31]

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[27] See Edward Grant, *The Foundations of Modern Science in the Middle Ages – Their Religious, Institutional, and Intellectual Contexts* (Cambridge: Cambridge University Press, 1996), 110-112. Grant notes that there were other explanations as well. For example, John Blund (c. 1175-1248) and Robert Kilwardby (d. 1279) argued that each celestial orb possessed a natural, intrinsic capability of self-motion, thus sparing the need for an angel or a soul as a mover.

[28] See Richard C. Dales, "The De-animation of the Heavens in the Middle Ages", *Journal for the History of Ideas* 41/4 (1980): 531-550.

[29] Edward Grant, "Cosmology", in *The Cambridge History of Science*, 2 (=*Medieval Science*), edited by D. C. Lindberg and M. H. Shank (Cambridge: Cambridge University Press, 2013), 436-455, esp. 449.

[30] Bacon was not the first to use *virtus* and sometimes *virtus motiva* for celestial motions and their influence. Albert the Great (1200-1280) used *virtus formativa* for similar purposes. See Adam Takahashi, "Nature, Formative Power and Intellect in the Natural Philosophy of Albert the Great", *Early Science and Medicine* 13/5 (2008): 451-481.

[31] See Pierre Duhem, *Le système du monde – Histoire des Doctrines cosmologiques de Platon a Copernic* (Paris: Hermann, 1914; repr. 1958), vol. 2, 131. Alpetragius' book *Kitāb fī al-haya* was translated into Latin by Michael Scot around 1220 and was well known among the scholastics. See Francis J. Carmody, *Arabic Astronomical and Astrological Sciences in Latin Translation: A Critical Bibliography* (Berkeley: University of California Press, 1956), 264-267. The text is found in Francis J. Carmody, Al-Bitrūjī, *De motibus celorum. Critical Edition of the Latin Translation of Michael Scot* (Berkeley: University of California Press, 1952), as well as in Bernard R. Goldstein, *Al-Bitrūjī: On the Principles of Astronomy* (New Haven and London: Yale University Press, 1971). For further studies on Alpetragius' astronomy, see Edward S. Kennedy, "Alpetragius's Astronomy", *Journal for the History of Astronomy* 4 (1973): 134-136; Abdelhamid I. Sabra,

Bacon presented the idea (upheld by Alpetragius) that the velocity of an orb is linked to its distance from the *virtus* of the first orb:

> And since the heavens are divided into many orbs, this motion is conformed to the first orb, and thanks to the *virtus* of this heaven, which it receives from its motor, all the inferior orbs are moved, and all the elements except for earth. But because every finite *virtus* derived from a motor is stronger when proximate than when it is remote, and because following a greater remoteness it reverts proportionally, and so a greater velocity of motion is caused by a stronger *virtus*, it is necessary that the orbs nearer to the first orb move faster following this motion, and that the more distant move slower.[32]

This is a pretty accurate description of Alpetragius' theory, according to which the delay becomes progressively more noticeable in the planetary spheres that are further away from the first moved sphere. Alpetragius had used this idea to suggest an explanation for the phenomenon of the tide. Bacon presented Alpetragius's solution in these words:

> In water, he said, the same aforementioned motion is apparent in the flow of the sea, although its motion is that of an incomplete circulation; yet this is because of the [water's] weight. Its motion to the west, which is called flow, is by the said *virtus*, which, due to its weakness, on account of being very remote from its source, and due to the weight of the water, which inclines it to an opposite motion, is not enough to make it complete the circulation. And therefore, before the completion [of the circulation] it is thrown back by the *virtus* of its heaviness. And this motion is called ebb. Yet the motion of water, which it has from the *virtus* of heaven, is slower than the motion of air, and the motion of air [is slower] than the motion of fire. The earth, however, because of its heaviness and the weakness of the said *virtus* remains immobile in the unqualified sense.[33]

"The Andalusian Revolt against Ptolemaic Astronomy: Averroes and al-Biṭrūjī", in *Transformation and Tradition in the Sciences: Essays in Honour of I. Bernard Cohen*, edited by E. Mendelsohn (Cambridge: Cambridge University Press, 1984), 133-153; George Saliba, "Critiques of Ptolemaic Astronomy in Islamic Spain", *Al-Qanṭara* 20 (1999): 3-25.

[32] Bacon, *CN*, 2.5.1.7, 425: "Et cum celum per plures orbes distinguitur, hic motus orbi primo appropriatur, et virtute hujus celi, quam recipit a suo motore, moventur omnes orbes inferiores, et elementa omnia preter terram. Set quoniam omnis virtus finita, a motore derivata, forcior est propinqua quam remota, et eciam secundum remocionem majorem proporcionaliter revertitur a forciori virtute major velocitas motus causatur; necesse est orbes propinquiores orbi primo velocius secundum hunc moveri, et remociores tardius."

[33] Bacon, *CN*, 2.5.1.7, 425-426: "In aqua autem dixit motum predictum apparere, in fluxu scilicet maris, licet motus ejus sit incomplete circulacionis; hoc autem est propter ejus ponderositatem. Motus igitur ejus ad occidentem, qui appellatur fluxus, est a virtute predicta que, pro sui debilitate, cum sit ibi multum remota a sua origine, et propter aque ponderositatem, que inclinat aquam ad motum oppositum, non sufficit ipsam complete circulacione movere. Et ideo, ante complementum virtute sue ponderositatis regiratur. Et hic motus dicitur refluxus. Motus autem aque quem habet a

The first sphere receives its *virtus* from the first mover. It then transmits this *virtus* to the other spheres, and therefore they are moved naturally according to the motion of the first sphere. The inferior orb is moved according to the movements of the first orb and follows its motion as much as it can. The spheres of the elements are the last to receive this *virtus*, and they move more slowly since *virtus* weakens with distance. Water is the most remote element except for earth, which does not move at all. Its motion is slowed down and hindered by two factors: it is heavy, because according to Bacon's account, its internal *virtus* drives it toward the center of the universe, and the *virtus* it receives from above is very weak. Thus, water is set in circular motion, but cannot complete it. Hence the recurring cycle of ebb and flow.

Bacon rejected this theory of the cause of tide and favoured the moon as at least one principal cause of tide.[34] He gathered from Alpetragius' account that the motion of the water following the first heaven is slower and more irregular than that of other bodies of the universe.[35] He argued that this account does not fit with the observation that "the ebb and flow are determined and fixed" and "move as the moon varies in the parts of heavens".[36] He did not deny that the first heaven moves the bodies of the world, but claimed that its power is too far removed and, therefore, that the "proper *virtus* of the water" prevails, striving to remain at rest in its own place.[37]

Bacon held to another idea of Alpetragius, namely, that each *virtus* has a specific direction. When the same body receives two *virtutes* of opposing directions, then if the *virtutes* are equal, they will cancel each other out and the substance will not move at all. If one *virtus* is stronger than the other, the substance will move in the direction of the stronger one, but slower than the case in which the stronger mover would be moving it alone:

> If a certain orb, inferior to the first orb, is moved to the east by the first motion to the west, these motions will be by different *virtutes*. These *virtutes* are either equal or unequal. If they are equal, then the motions on both sides will be equal, and then [the orb] will either rest in its place or be in two places at the same time. If [the powers] are

virtute celi tardior est motu aeris, et motus aeris motu ignis. Terra autem, propter sui ponderacionem et predicte virtutis debilitatem, simpliciter immobilis perseverat."

[34] On Bacon's rejection of Alpetragius' theory of tide, see Yael Kedar, "The Nomological Image of Nature: Explaining the Tide in the Thirteenth Century", *Annals of Science* 73/1 (2016): 68-88.

[35] Alpetragius held that the motion of the heavenly bodies was in fact spiral rather than circular. See Edward Grant, "Celestial Motion in the Late Middle Ages", *Early Science and Medicine* 2/2 (1997): 129-148, 134.

[36] See the Latin in the next footnote.

[37] Bacon, *Opus maius*, 1, 4.4.6, 139-140: "Sed non placet hic, quia fluxus et refluxus sunt determinati et certi, et currunt sicut luna variatur in partibus coeli. Sed motus aquae a motus coeli est confusus et inordinatus et irregularis propter hoc, quod virtus coeli primi nimis elongatur ab ejus origine, quando est in aqua, et ideo praevalet virtus aquae propria, scilicet sua gravitas."

> unequal, then it will move according to the motion of the stronger *virtus*, albeit less rapidly.[38]

This idea was a part of an attempt by Alpetragius to account for the apparent recessions of the planets, without recourse to the Ptolemaic epicycles. In the ensuing discussion, Bacon accepted Alpetragius' analysis of composed motions of celestial bodies, albeit with a significant difference: instead of one motive agent, located exclusively in the prime mobile, he posited two motive agents.[39]

The calculus of the various *virtutes* can become extremely complicated. There is the simple case in which different motive powers (*virtutes motive*) are received in the mobile over a straight line or the two contrary parts of a circle. In this case, if they are equal, they cancel each other out, or the stronger one effects a slower motion in its direction.

> If therefore, several diverse moving *virtutes* are received on one straight line in a mobile, or on the same circle in contrary parts, and if they were equal, then [the body] would not move, but rest. If [the *virtutes*] were unequal, [the body] would move according to the direction of the stronger moving *virtus*, though slower than if [the stronger mover] would move it on its own. But if the motive [powers] act upon different straight lines, or different circles, whether they are equal or unequal, or if they move to the same part, or to different [parts], the mobile will not rest, but will be moved with one motion, as stated; and this motion will be differentiated according to a plurality of motors and their difference and weakness and strength and according to different parts to which they are able to move.[40]

The important point here is the strong link between the *virtus* and the local motion of the orbs. It is clear from these passages that the various *virtutes* are what set the mobile in motion; moreover, the combination of the direction and strength of the *virtutes* determines the direction and velocity of the mobile's motion. It is as if the *virtutes* can be described by vectors.

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[38] Bacon, *CN*, 2.5.1.12, 431: "Si moveatur orbis aliquis inferior primo orbe ad orientem per motum primum ad occidentem, erunt illi motus a diversis virtutibus. Iste igitur virtutes aut sunt equales aut inequales. Si equales, tunc et motus ad utramque partem erunt equales, et ita aut quiescet, aut erit simul in duobus locis. Si inequales, tunc movebitur secundum motum forcioris virtutis, quamvis minus velociter."

[39] See Grant, "Celestial Motion."

[40] Bacon, *CN*, 2.5.1.12, 433: "Si igitur recipiuntur in mobili alico diverse virtutes motive super unam lineam rectam, vel super eundem circulum in contrarias partes, et fuerint equales, non movebitur, sed quiescet. Si inequales, movebitur ad partem illam ad quam motiva virtus est forcior, tardius tamen quam si sola moveret. Si autem sint motive super diversas lineas rectas, vel diversos circulos, sive virtutes moventes sive sint equales, (sive inequales,) sive ad eandem partem motive, sive ad diversas, non quiescet mobile, set movebitur uno motu, ut dictum est; et ille motus diversificabitur secundum pluralitatem motorum, et eorum diversitatem et debilitatem et fortitudinem et secundum diversitatem parcium ad quas sunt motive."

4. The *virtus* of the magnet

Bacon saw a resemblance between the way iron is attracted to the magnet and the way the elements are drawn to their natural place; in both cases the motion gets stronger the closer the mobile and the attracting bodies are:

> The motion of iron to the magnet is similar to the motion of the located [body] to its place [...], but this motion occurs by the influence of some *virtus*. Likewise, natural motion is stronger at the end, whence a heavy [body] moves more strongly the more it is approaching the bottom, just like iron [when it approaches] the magnet. But the cause of this strength is the body's approaching its [natural] place. Therefore, [natural] place seems to influence something, so that it may be the cause of this strength.[41]

Yet there is also a difference:

> [T]hat which moves another by the influence of *virtus*, does not move it, except when it is in the right distance in respect to the influencing [*virtus*], like the magnet; the iron does not move except when it is in the right distance, so it can receive a certain impression of *virtus* by which it is changed so as to move. But the heavy [body], placed in any given distance, is carried to its place below, even if it were placed in the hollow orb of the moon.[42]

The iron is drawn to the magnet only when it is at a certain distance from it; the heavy (or light, for that matter) body, by contrast, is carried to its natural place from whichever distance. It is also true, however, that when it gets closer to its natural place, its motion intensifies. We have followed the explanation for this phenomenon above. But why is the iron not drawn in the same way to the magnet? Bacon suggested the following explanation:

> But iron does not have such an appetite of itself, but only an aptitude to that appetite, nor does it agree from its nature only with the magnet, as it desires [other things] yet is not moved [by them] but [it] only agrees insofar as it is naturally suited to receive its *virtus*, and then to seek [it] and move.[43]

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[41] Bacon, *CN*, 1.3.2.3, 204: "motus ferri ad magnetem est similis motui locati ad locum [...] set hic motus fit per influenciam alicujus virtutis. Item, motus naturalis est forcior in fine, unde grave, quanto magis apropinquat deorsum, tanto forcius movetur, sicut ferrum ad magnetem. Set istius fortitudinis causa est apropinquacio ad locum, ergo, locus videtur aliquid influere, ut sit causa istius fortitudinis."

[42] Bacon, *CN*, 1.3.2.3, 204-205: "illud quod movet aliud per influenciam virtutis, non movet illud, nisi cum est in debita distancia respectu influentis, sicut de magnete; non enim movet ferrum, nisi quando est in debita distancia ad ipsum, ut, scilicet, possit recipere aliquam virtutis impressionem per quam alteretur ut moveatur. Set grave, in omni distancia positum, fertur in suum locum deorsum, eciam si poneretur in concavitate orbis lune."

[43] Bacon, *CN*, 1.3.2.3, 205: "Set ferrum non habet appetitum talem de se, set solum aptitudinem ad illum appetitum, non enim ex sua natura convenit in tantum cum magnete, ut appetat nec ut

While bodies have an appetite for their natural place (in fact, as we have seen, they have more than an appetite; they have an efficient *virtus*), the iron does not have a natural appetite for the magnet; it only has an aptitude to develop such an appetite when it is the right distance from a magnet. The iron needs to receive the magnet's *virtus*, then the appetite for the magnet appears, and it is drawn to the magnet. It seems that the iron does not have its own *virtus*, directing it to the magnet, hence it is drawn to the magnet by reason of the magnet's *virtus* alone. This is the reason why Bacon writes that it desires other things as well, but since these things do not exert their *virtus* to direct it, it is not moved by them.

It appears then, that there is no uniformity among the *virtutes*; each type has its own characteristics and can move only certain bodies or substances. *Virtus* is specific and acts only on the substances that are suited to receive it. It does not act uniformly on whatever it meets. This can be gathered from another quotation, in which Bacon draws a comparison between the celestial *virtus* and the magnet:

> If you say that the *virtus* of heaven will not pass to the eighth [heaven] except through the ninth [heaven], and that therefore the influence will be received in the ninth and therefore that this straight motion will first occur in the ninth – I say that this does not follow, for we see that iron follows the motion of the magnet, but air and other bodies do not because they are not suited to receive this *virtus* insofar as it is a principle of motion, although they receive it absolutely, insofar as it is an absolute form.[44]

Virtus may pass through all sorts of mediums, such as the ninth heaven or air, without moving them, although it is in them absolutely. *Virtus*, by contrast with *species*, affects only the substances suited to receive its influence, namely, those with an appropriate potency. Bacon held that a *species* interacts also with the media that are not its final recipients by being incorporated in them, namely, by taking on their matter. A *species* takes the matter of the medium not in the same manner as a proper form does, since its existence there is intentional and hence diminished.[45]

moveatur , set in tantum convenit, ut aptum natum sit recipere ejus virtutem, et tunc appetere et moveri."

[44] Bacon, *CN*, 2.4.1.3, 392-393: "Si tu dicas quod virtus celi non transibit ad octavum nisi per nonum, ergo recipietur hec influencia in nono, et ideo motus ille rectus primo fiet in eo; dici potest quod hoc non sequitur, sicut nos videmus quod ferrum sequitur motum magnetis, set aer et alia corpora non sic, quia non sunt nata recipere hanc virtutem in quantum est principium motus, licet recipiant eam absolute in quantum est forma absoluta."

[45] For Bacon's understanding of the intentional being of *species* in the medium, see Katherine H. Tachau, *Vision and Certitude in the Age of Ockham—Optics, Epistemology and the Foundations of Semantics 1250-1345* (Leiden: E. J. Brill, 1988), 12.

5. The universal nature as a *virtus regitiva*

As we have seen in the previous section, *virtus* can both set things in motion toward a certain place and be the cause of their rest when they reach their destination. The *virtus regitiva* of the universal nature is the kind of *virtus* which prevents bodies from motion, and in certain circumstances prevents their motion toward their natural place.[46]

Bacon deemed natural place a particular nature or cause.[47] He defined the particular nature in this way: "a *virtus* reigning over the species with its individuals, and therefore it is twofold, that is, a *virtus* reigning over the species and a *virtus* reigning over the individual".[48] The purpose of this *virtus* is the preservation and well-being of the species (in the Porphyrian sense of a class sharing common features) and the individual. Apart from the particular nature, Bacon referred also to the universal nature, defined as a "*virtus* reigning over the universe (*virtus regitiva universi*)".[49] By using the distinction between particular and universal natures (or *virtutes*) Bacon was able to explain phenomena which seemed to defy natural regularity. Since he considered both the particular and the universal natures to be natural, unusual phenomena such as a man with six fingers or water not descending to its natural place received a natural explanation. In the ordinary course of events, bodies behave in accordance with their particular natures. But sometimes they are forced to obey the universal nature, which overrules the internal inclinations of bodies and restrains the influence of the particular *virtus* in order to maintain the balance and order of nature as a whole.

Take for example the case of water in the clepsydra, a vessel filled with water with small holes at the bottom. As long as the opening at the top is covered, the water remains in the clepsydra and does not follow the *virtus* which directs it downward. The water in the clepsydra remains suspended, Bacon argued, because the universal nature works to prevent the formation of a vacuum so that the order and continuity of matter be preserved.[50]

Another example of a clash between particular and universal *virtutes* is the restraining of the activity of celestial matter. Since celestial matter has a stronger *virtus* than elemental matter, it can transform the elements and render them celestial. But that would destroy all terrestrial corporeal natures and consequently the order of the

[46] An extensive study of the medieval idea of universal nature is found in Nicolas Weill-Parot, *Points aveugles de la nature – la rationalité scientifique médiévale face à l'occulte, l'attraction magnetique et l'horreur du vide (XIII du XV siècle)* (Paris: Les Belles Lettres, 2013).
[47] On this topic see Yael Kedar and Giora Hon, "Roger Bacon (c. 1220-1292) and his System of Laws of Nature: Classification, Hierarchy and Significance", *Perspectives on Science* 26 (2017): 719-745.
[48] Bacon, *CN*, 1.2.3.(1)7, 93: "Natura particularis est virtus regitiva speciei cum suis individuis et ideo hec est duplex, scilicet, virtus regitiva speciei et virtus regitiva individui."
[49] Bacon, *CN*, 1.2.3.(1)7, 92.
[50] Bacon, *CN*, 1.3.2.6, 224.

universe, hence the universal nature prevents that from happening.[51] The universal nature is therefore a *virtus*, which administers the workings of the more particular *virtutes*. Both particular and universal natures are defined as *virtutes* by Bacon. However, the one is weaker than the other, and while the one causes motion, the other can withhold this motion.

The source of Bacon's concept of universal nature was most likely Avicenna (c. 970-1037). However, while as Nicolas Weill-Parot argues, Avicenna held that the universal nature exists as an intention,[52] Bacon endowed it with real existence, and considered it an active power in nature. Indeed, he was not the only one to do so. Albert the Great (c. 1200-1280) defined universal nature as the one force proceeding from the first cause, which spreads among all natural things and becomes their principle of motion and rest.[53] The similarity between Bacon and Albert is in rendering the universal nature real; however, the principle of motion and rest in Bacon is not the universal nature but *virtus*. The universal nature is a kind of *virtus* indeed, but it is not the only such kind.

6. *Virtus* and *species*

In the beginning of this paper, I noted that Bacon distinguished between two types of *virtutes*. The one, properly called *virtus*, is a feature of a form, while the other, properly called *species* is entangled with matter. Hence *virtus* is the power of efficient causality, and *species* is matter's response to that power, formed as a part of the internal inclination of matter to be promoted by the reception of new forms.

There is also an ontological difference between *virtus* and *species*: *virtus* is a real being, and the capacity for the full realization of a potency; a *species* is its first effect, having a deficient being. *Virtus* exists absolutely in the medium; *species* exist there intentionally. Bacon had a unique understanding of the meaning of the 'intentional' existence of the species *in medio*. While among his contemporaries 'intentional' was considered equivalent to 'spiritual' (though not necessarily 'mental') and opposed to 'natural', Bacon thought of 'intentional' as having a weak and incomplete being.[54] A *species*, Bacon wrote, in relation to a 'real' being is so deficient that it cannot be enumerated among the things of this world. It "is not called a thing, but more the similitude of things".[55]

Moreover, it seems that *virtus* is considered as the very capacity to perform work: "for a *species* has active *virtus* (*virtutem activam*) by which it can produce its like along

[51] See Bacon, *DMS*, 1.6, 84-85.
[52] See Weill-Parot, *Points aveugles*, 288.
[53] See Weill-Parot, *Points aveugles*, 295.
[54] For a thorough analysis of the nuances of the Medieval discussions of intentional existence in the medium, sense and intellect, see Robert Pasnau, *Theories of Cognition in the Later Middle Ages* (Cambridge: Cambridge University Press, 1997).
[55] Bacon, *CN*, 1.1.2.2, 23: "non vocantur res, set magis similitudines rerum."

all diameters in the part of the medium immediately adjacent to it".[56] The active power of the production of *species*, which enables it to multiply and regenerate, is *virtus*. Bacon argued that only active natures produce *species*, and what renders a nature active is its *virtus*. The material principle, which Bacon distinguished from *virtus*, does not produce *species* by its own proper nature, since it is passive and receptive.[57] Quantitative properties (such as the natural place's surface) do not produce *species* according to Bacon, since they belong to matter.[58] Hence *virtus* is the power which renders a nature active and capable of producing *species*.

Both *virtus* and *species* are vehicles of natural causality. *Virtus* is the power used by the prime mover to keep the celestial substances in motion, by the natural place to attract its appropriate element, by the magnet to attract iron, and by the universal nature to administer the natural balance. It works by stimulating a natural appetite in the attracted substance, which is always directed toward a specific end. *Species*, in its turn, are the product of this natural appetite (or the 'active potentiality' which all material things share). It is the universal apparatus allowing all material things to be acted upon by *virtus*.[59] Hence, it has the same features and the same mode of activity in all things natural. The *virtutes* may vary, but the reaction of matter will always be the same. In this sense, the activity of *species* is 'blind' or automatic. It receives its direction from the *virtus* which administers it.

A *species* resembles its agent in essence and operation. Bacon followed here the Aristotelian causal synonymy principle, according to which like causes like.[60] *Virtus* need not adhere to this principle, since it does not account directly for generation, but does so by the mediation of *species*. A *species* must be similar to its agent also because "the agent directs its efforts to making the recipient similar to itself".[61] This is a feature of either qualitative change or generation, but irrelevant to locomotion. Indeed, when Aristotle spoke about four kinds of motion and change – those in substance, in quality, in quantity and in place – it seems that his principle of causational synonymy did not

[56] Bacon, *DMS*, 3.1, 185: "sed quia habet virtutem activam qua potest sibi similem producere parte medii coniunctur illi in qua est secundum omnes diametros."
[57] Bacon, *DMS*, 1.2, 33. "sed quia habet virtutem activam qua potest sibi similem producere in parte medii coniuncta illi in qua est secundum omnes diametros [...] Sed species solum requirit medium postquam est in medio iam multiplicata; et potest sibi similem per se facere ex sua potestate activa."
[58] Bacon, *DMS*, 1.2, 37-41. In Bacon's account, the quantitative properties belong to prime matter before it has been specified by a form. Prime matter, in opposition to specific matter (namely, matter compounded with form), does not produce *species*. See also Bacon, *Opus maius*, 4.4.10: "Figuratio vero est passio materiae, et invenitur in rebus ratione materiae, sicut et quantitas."
[59] For the universal and uniform propagation of *species* in Bacon's philosophy of nature, see Kedar and Hon, "Roger Bacon (c. 1220-1292) and his System", 724-729.
[60] Helen S. Lang, *The Order of Nature in Aristotle's Physics: Place and the Elements* (Cambridge: Cambridge University Press, 1998), 71, calls this the "suchlike principle", according to which the actuality of the mover and the potentiality or rather the actuality received in the thing moved must be of the same type.
[61] Bacon, *DMS*, 1.1, 7: "agens intendit assimilare sibi patiens."

include locomotion.[62] One reason for this is that locomotion affects the substance the least; it does not change the being of the moved object.[63]

A *species* does not advance in the medium by locomotion; it regenerates itself in consecutive parts of the medium. The production of a *species*, Bacon explains, involves a true and natural transmutation of the substance of the patient, which is made by true generation (*per veram generacionem*). The patient in this case is any receiver of a *species*, be it the medium or the final recipient.[64] A *virtus*, by contrast, passes through all sorts of mediums without affecting them; it affects only the substances predisposed to receive its influence.

7. Conclusions

In *Physics* VIII, Aristotle declared that locomotion is the primary motion:

> [A] thing is in motion in the strict sense of the term only when its motion is motion in respect of place; if a thing is in process of increase or decrease or is undergoing some alteration while remaining at rest in the same place, we say that it is in motion in some particular respect; we do not say it is in motion without qualification.[65]

Following the analysis of the ways the term *virtus* is treated by Bacon, it would seem that Bacon took Aristotle seriously, and thus made the cause of locomotion, namely *virtus*, the primary physical power. 'Primary physical power' means, in this context, three things: (1) that it is an efficient cause, responsible for all motions of inanimate bodies with respect to place. Bacon explained physical effects other than locomotion by an appeal to the activity of *species*, yet not as efficient causes; (2) that it is first in the order of dependency, namely, that the power called *species* depends on and receives its ability to act from *virtus*, while *virtus* is not equivalently dependent on *species*; (3) that it is an inherent feature of the nature, essence or form of things, and as such it enjoys a firm ontological status, namely, that of a being in the full sense of the term. It has a real being rather than a deficient one.

Virtus appears in Bacon's natural philosophy as a matrix of forces, and there is a play between different intensities of *virtus* coming from different directions and distances: the water is too remote from the first orb, therefore its own *virtus* prevails and it cannot complete a circle; when the internal *virtus* of a substance is joined with

[62] Aristotle, *Physics*, III, 2, 202a9-12, translated by J. Barnes, *The Complete Works of Aristotle – The Revised Oxford Translation* (Princeton: Princeton University Press, 1984), vol. 1, 315-446, 344.
[63] Aristotle, *Physics* VIII, 7, 261a20f, translated by J. Barnes, vol. 1, 436. See Istvan Bodnar, "Aristotle's Natural Philosophy", in *The Stanford Encyclopedia of Philosophy* (Spring 2018 Edition), edited by E. N. Zalta: https://plato.stanford.edu/archives/spr2018/entries/aristotle-natphil/.
[64] Bacon, *DMS*, 1.3, 47.
[65] Aristotle, *Physics* VIII, 9 266a1, translated by J. Barnes, vol. 1, 444.

the *virtus* of a natural place, the motion intensifies; equal *virtutes* coming from opposite directions cancel each other out and slow or annul the orb's rotary motion.

Following the analysis of the role of *virtutes* in moving the celestial orbs, the elements to their natural place and the iron to the magnet, and following their comparison with the function of *species*, we can now safely say that *virtus* has a distinct status as the efficient cause in Bacon's physics, since it is that by which a thing is made active and able to produce *species*. This conclusion is reinforced by the definition of a *species* as the 'first effect' and similitude of *virtus*.

Bacon's theory of *virtus* is not entirely worked out. It leaves some questions unanswered, such as how exactly is *virtus* related to form and what does it mean for it to exist in an intermediary recipient 'absolutely'? Similarly, it is not entirely clear how a *virtus* links to the nature of things. Nevertheless, it seems clear that except for the case of local motion, *virtus* operates through the material production of *species*.

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"…CUPIENS MATHEMATICAM TRACTARE INFRA RADICES METAPHYSICE…" ROGER BACON ON MATHEMATICAL ABSTRACTION[1]

"…CUPIENS MATHEMATICAM TRACTARE INFRA RADICES METAPHYSICE…" ROGER BACON SOBRE LA ABSTRACCIÓN MATEMÁTICA

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Abstract

In some passages of the *Opus maius* and the *Opus tertium*, Roger Bacon holds that mathematical objects are the immediate and adequate objects of human's intellect: in our sensible life, the intellect develops mostly around quantity itself. We comprehend quantities and bodies by a perception of the intellect, because their forms belong to the intellect, namely, an understanding of mathematical truths is almost innate within us. A natural reaction to these sentences is to deduce a strong Pythagorean or Platonic influence in Roger Bacon's theory of mathematical knowledge. However, Bacon has always followed Aristotle's view according to which numbers and figures have no real existence apart the sensible substances, and universal knowledge comes from sensory experience as well. It appears that Bacon's claim that quantity is the first object of human's intellect comes from an original reading of a passage of Aristotle's *On Memory and Reminiscence*. In this paper, we try to clarify Bacon's views about mathematical abstraction and intellectual perception of mathematical forms in his Parisian questions on *Physics* and *Liber De causis*, the *Perspectiva*, *Opus maius*, *Opus tertium*, the *Communia mathematica* and the *Geometria speculativa*. We conclude that Bacon considered mathematical abstraction as a mode of perception of the internal structure of the physical world: mathematical abstraction does not mean for Bacon an act of separation of ideal forms from the sensible matter, but a possibility of intuition of the internal structure of the sensible world itself, a faculty which is necessary for human's perception of space and time.

[1] Many thanks to Yael Kedar for her so useful reading, critical remarks, her generous suggestions and great help for the redaction of this paper.

Keywords

Abstraction; Quantity; Euclidian Geometry; Medieval Visual Theory; Medieval Mathematics; Medieval Physics; Mathematical Physics

Resumen

En algunos pasajes del *Opus maius* y del *Opus tertium*, Roger Bacon sostiene que los objetos matemáticos son los objetos inmediatos y adecuados del intelecto humano: en nuestra vida sensible, el intelecto se desarrolla fundamentalmente en torno a la cantidad. Comprendemos las cantidades y los cuerpos mediante una percepción del intelecto, porque sus formas pertenecen al intelecto, es decir, para nosotros la comprensión de las verdades matemáticas es prácticamente innata. Una reacción natural a estas afirmaciones consistirá en deducir una fuerte influencia pitagórica o platónica en la teoría del conocimiento matemático de Roger Bacon. Sin embargo, Bacon siempre ha seguido el punto de vista de Aristóteles, según el cual los números y las figuras no tienen una existencia real aparte de las sustancias sensibles – y el conocimiento universal proviene también de la experiencia sensorial. Parece que la afirmación de Bacon de que la cantidad es el primer objeto del intelecto humano tiene su origen en una lectura original de un pasaje de *Sobre la memoria y la reminiscencia* de Aristóteles. En este trabajo se intentan aclarar las opiniones de Bacon sobre la abstracción matemática y la percepción intelectual de las formas matemáticas en sus cuestiones parisinas sobre la *Física* y el *Liber de causis*, la *Perspectiva*, el *Opus maius*, el *Opus tertium*, la *Communia mathematica* y la *Geometria speculativa*. Concluimos que Bacon consideraba la abstracción matemática como un modo de percepción de la estructura interna del mundo físico: la abstracción matemática no significa para Bacon un acto de separación de las formas ideales de la materia sensible, sino una posibilidad de intuición de la estructura interna del mundo sensible, facultad que es necesaria para la percepción humana del espacio y del tiempo.

Palabras clave

Abstracción; Cantidad; Geometría euclidiana; Teoría visual medieval; Matemáticas medievales; Física medieval; Física matemática

Part IV of the *Opus maius* is dedicated to mathematics.[2] To all the sciences, mathematics is "the gate and the key".[3] Knowledge of mathematics is required in physics, theology, music, astronomy, logic – in all sciences. The priority of mathematics is proven not only for the logical construction of the sciences, but also in accordance with the order of the acquisition of knowledge. Our understanding of mathematics is immediate, "almost innate" and its knowledge is certain.[4] Certainty is gained in mathematics in two ways: by demonstration through necessary causes and by an

[2] On the topic of this paper, see George Molland, "Roger Bacon's Knowledge of Mathematics", in *Roger Bacon and the Sciences. Commemorative essays*, edited by J. Hackett (Leiden-New York-Köln: Brill, 1997), 151-174; David C. Lindberg, "On the Applicability of Mathematics to Nature: Roger Bacon and his Predecessors", *The British Journal for the History of Science* 15/1 (1982): 3-25; Cecilia Panti, "Natural Continuity and the Mathematical Proofs Against Indivisibilism in Roger Bacon's *De Celestibus* (*Communia Naturalium*, II)" in *Roger Bacon's Communia Naturalium. A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Micrologus Library) (Firenze: SISMEL-Edizioni di Galluzzo, 2014), 159-190. For the works of Roger Bacon, I will refer to the following editions: *Letter to Pope Clement IV*, edited and translated by N. Egel, *Revista Española de Filosofía Medieval,* 27/2 (2020): 143-174; *De viciis contractis in theologia*, edited by R. Steele, *Opera hactenus inedita Rogeri Baconi,* fasc. 1 (Oxford: Clarendon Press, 1905); *Summulae Dialectices*, edited by A. De Libera. "Les *Summulae dialectices* de Roger Bacon", *Archives d'Histoire Doctrinale et Littéraire du Moyen Âge* 53 (1986): 139-289 and 54 (1987): 171-278; *Questiones supra libros prime philosophie Aristotelis*, edited by R. Steele and F. M. Delorme, *Opera hactenus inedita Rogeri Baconi,* fasc. 10. (Oxford: Clarendon Press, 1930); *Questiones supra libros octo physicorum aristotelis*, edited by F. M. Delorme and R. Steele, *Opera hactenus inedita Rogeri Baconi,* fasc. 13. (Oxford: Clarendon Press, 1935); *Questiones supra librum de causis*, edited by R. Steele and F. M. Delorme, *Opera hactenus inedita Rogeri Baconi,* fasc. 12. (Oxford: Clarendon Press, 1935); *Opus maius*, edited by J. H. Bridges, 3 vols. (Oxford and Edinburgh: Clarendon Press, 1897-1900); *Opus maius*, Part IV, English translation by P. W. Dennis, *Roger Bacon's Mathematical Thought: A translation of Part IV of the Opus maius with Introduction and Commentary*, by P. Willard Dennis, Ph Dissertation (Dallas: University of Texas, 2011); *Opus tertium*, edited and translated into German, with notes, by N. Egel (Hamburg: Felix Meiner Verlag, 2019); *De multiplicatione specierum*, edited and translated by D.C. Lindberg, *Roger Bacon's Philosophy* of *Nature* (Oxford: Clarendon Press, 1983); *Communia Naturalium*, edited by R. Steele, *Opera hactenus inedita Rogeri Baconi*, fasc. 2-4 (Oxford: Clarendon Press, 1910-1913); *Communia Mathematica*, edited by R. Steele, *Opera hactenus inedita Rogeri Baconi*, fasc.16. (Oxford: Clarendon Press, 1940); *Perspectiva*, edited and translated into English by D. C. Lindberg, *Roger Bacon and the Origins of Perspectiva in the Middle Ages* (Oxford: Clarendon Press, 1996); *Geometria Speculativa*, edited and translated into English by G. Molland, "Roger Bacon's *Geometria Speculativa*", in *Vestigia Mathematica. Studies in medieval and early modern mathematics in honour of H.L.L. Busard,* edited by M. Folkerts and J. P. Hogendijk (Amsterdam: Rodopi B.V. Editions, 1993), 265-303. I will also refer to the spurious (pseudo-Bacon) *Questiones super Libros IV Physicorum Aristotelis*, edited by F. M. Delorme, *Opera Hactenus Inedita Rogeri Baconi*, fasc. 8 (Oxford: Clarendon Press, 1928) and *Questiones altere supra libros prime philosophie Aristotelis*, edited by R. Steele and F. M. Delorme, *Opera hactenus inedita Rogeri Baconi, fasc.* 11 (Oxford: Clarendon Press, 1932).

[3] *Opus maius* IV, dist.1, chap.1, ed. Bridges I, 97; transl. Dennis, 62.

[4] *Opus maius* IV, dist.1 chap.3, ed. Bridges I, 103: "mathematicarum rerum cognitio est quasi nobis innata"; transl. Dennis, 71: "... an understanding of mathematical truths is almost innate within us." I will give an interpretation of this '*almost* innate' ('*quasi* innata') in part II of this paper.

immediate verification of its conclusion by sensory experience.[5] No other science can reach the same degree of evidence and certainty. Mathematical knowledge is the most clear and certain, its evidence is brought from the very nature of its objects, since mathematical objects (figures, numbers, etc.) are the immediate and adequate objects of human's intellect:

> And, seeing that it has already been demonstrated by its particular property that mathematics is prior to the other sciences, and is useful and necessary to them, it is now to be demonstrated by arguments taken up on the part of its subject. Thus, first, it is natural to proceed from the senses to the intellect, since, by abandoning the senses, one also abandons the knowledge which derives from those senses. In the first book of the *Posterior Analytics*, it is said that as the senses advance, the human intellect advances. However, quantity is particular to the senses, because it involves the common sense and is perceived by the other senses. Nothing can be perceived without quantity; for this reason, the intellect develops most as a result of quantity. Secondly, the very act of understanding itself is not completed without continuous quantity, because Aristotle, in his book *On Memory and Reminiscence*, states that our whole intellect is associated with continuity and time. From this, we comprehend quantities and bodies by the perception of the intellect, because their forms belong to the intellect. The forms of incorporeal things, however, are not apprehended by our intellect; or if they were formed in the intellect, as Avicenna indicates in the third book of the *Metaphysics*, we nevertheless do not perceive these forms, because our intellect is more strongly oriented around bodies and quantities. Therefore, by our way of argumentation and attention to the corporeal and the quantifiable, we seek knowledge of incorporeal things, as Aristotle does in eleventh book of the *Metaphysics.* Therefore, the intellect develops mostly around quantity itself, and it is in this way, according to the common condition of understanding, that quantities and bodies are apprehended by the human intellect.[6]

[5] *Opus maius* IV, dist.1, chap.3, ed. Bridges I, 105-106; transl. Dennis, 74: "In mathematics, we can arrive at complete truth without error, and at certainty free from doubt, since mathematics can provide a demonstration through a proper and necessary cause. And this demonstration makes the truth known. Similarly, mathematics can provide an example sensible to all, and experience perceptible to the senses through the drawing of figures and counting, so that all is made clear to the senses; for this reason, there can be no doubt in this science." The idea that mathematics provide the proper and necessary cause of natural phenomena comes from Grosseteste's reading of *Posterior Analytics*: see Lindberg, "On the Applicability", 10-14; Jeremiah Hackett, "Robert Grosseteste and Roger Bacon on the Posterior Analytics", in *Erkenntnis Und Wissenschaft/ Knowledge and Science: Probleme der Epistemologie in der Philosophie des Mittelalters/ Problems of Epistemology in Medieval Philosophy*, edited by P. Antolic-Piper, A. Fidora and M. Lutz-Bachmann (Berlin and Boston: De Gruyter, 2004), 161-212.

[6] *Opus maius*, IV, dist.1, chap.3, ed. Bridges I, 107-108; transl. Dennis, 77-78: "Et quoniam jam per proprietatem ipsius scientiae ostensum est, quod mathematica est prior aliis, et eis utilis et necessaria, nunc ostenditur hoc per rationes sumptas a parte sui subiecti. Et primo sic, quia nobis est via nata a sensu ad intellectum, quoniam deficiente sensu deficit scientia quae est secundum illum sensum, ut dicitur Primo Posteriorum, quoniam secundum quod proficit sensus, proficit

It would be interesting to know where Roger Bacon found in Aristotle this Cartesian formula: "*quanta et corpora intelligimus intuitu intellectus*" – we understand quantity and extended bodies by direct intuition of the intellect. In addition, one cannot but be intrigued about Bacon's exegesis of Aristotle's *On Memory and Reminiscence*: while Aristotle writes that intellection of the triangle is not without imagination of some concrete triangle, which *accompanies* the intellection, Bacon reads that the act of intellection immediately relates to the extended triangle itself, for "we comprehend quantities and bodies by the perception of the intellect, because their forms belong to the intellect".[7] As we shall see, some passages of the *Opus tertium* clarify Bacon's reading of this source. Obviously, Bacon had good reasons for considering that for Aristotle, the immediate and intuitive object of human's intellect in the present life is quantity – and hence figures, numbers, space and time.

Roger Bacon's exegesis of Aristotle is of course surprising for the modern reader. For us, the question of the intellectual knowledge of mathematical objects in Aristotle's philosophy is an almost insoluble problem.[8] In the scope of Aristotle's psychology,

humanus intellectus. Sed quantitas est maxime sensibilis, quia est sensibile commune, et ab aliis sensibus sensitur, et nihil potest sentiri sine quantitate quapropter maxime potest intellectus proficere circa quantitatem. Secundo, quia ipse actus intelligendi secundum se ipsum non perficitur sine quantitate continua, quia dicit Aristoteles in libro de Memoria and Reminiscentia quod omnis intellectus noster est cum continuo et tempore. Unde quanta et corpora intelligimus intuitu intellectus, quia species eorum apud intellectum sunt. Incorporeum autem species non recipiuntur intellectu nostro; aut si fiant in eo, secundum quod Avicenna dicit tertio Metaphysicorum, non tamen hoc percipimus propter occupationem fortiorem intellectus nostri circa corpora et quanta. Et ideo per viam argumentationis et admirationis corporalium et quantorum investigamus rerum incorporalium notitiam, sicut Aristoteles facit in libro undecimo Metaphysicorum. Quapropter proficiet maxime intellectus circa ipsam quantitatem, eo quod quanta et corpora in quantum huiusmodi appropriantur intellectui humano secundum statum communem intelligendi."

[7] Aristotle, *On Memory and Reminiscence*, 449b30-450a12: "Now, since we have already spoken about imagination in our discussions *On the Soul*, and since it is not possible to think without an image – for the same affection that occurs in drawing a diagram also occurs in thinking: for when drawing a diagram we make no use of the fact that the quantity of the triangle drawn is determinate, but still we draw it as having a determinate quantity; and similarly a person who thinks, even if he does not think about a quantity, he posits a quantity before his eyes, but does not think about it as a quantity; and if the object by nature has quantity, but an indeterminate quantity, he posits a determinate quantity, but thinks about it as quantity only. Now, the reason why it is impossible to think anything without continuity, and impossible to think about things that are timeless without time, belongs to another discussion." Transl. David Bloch, *Aristotle on Memory and Recollection. Text, Translation, Interpretation, and Reception in Western Scholasticism* (Leiden, Boston: Brill, 2007), 27-28.

[8] Emily Katz, "Geometrical Objects as Properties of Sensibles: Aristotle's Philosophy of Geometry", *Phronesis* 64 (2019): 465-513: "According to many, geometry for Aristotle cannot be about sensible things, so that geometrical objects have actual existence only in the mind. For others, some simple geometrical properties are in sensibles, but geometrical objects themselves are fictions. For still others, geometrical objects underlie physical reality, either as potential or actual parts of sensibles, or as entities distinct yet somehow derived from sensibles. There are also many sources of controversy in the details."

quantity (discrete or continuous) is not perceived at the first level of the five exterior senses, but at the secondary level of the internal senses (common sense and imagination), which are parts of the sensitive soul,[9] whereas intellect (*noûs*), dealing with universal concepts, is a 'separate' faculty.[10] If figures and numbers are perceived by the common sense, there is no doubt however that geometry and arithmetic are intellectual sciences, dealing with intelligible (absolutely abstracted) objects. Aristotle himself had recognized that the geometer, while reasoning on a particular triangle of his imagination, was thinking about the triangle in general – the universal concept of triangle.[11] This assumption was necessary for preserving the scientific character of geometry. Alas, this intellectual object could have no place in Aristotle's psychology. If intellectual objects (universals) are completely abstracted from matter, quantity, space and time, the geometer could never demonstrate that the sum of the angles of the triangle in general is equal to two right angles, without integrating in it spatial properties such as continuity and extension. In some places, Aristotle does not hesitate to define the triangle by its integrative parts (lines, angles), thus contradicting his claim that a formal division (which produces the definition) must not be confused with the division of the concrete compound.[12] Adding complexity, Aristotle's appeal to the idea of the intelligible matter of figures was thus inevitable for preserving the consistency of abstractionism: the triangle was abstracted from sensory or individual matter, but not from the intelligible matter which becomes a part of its definition.[13]

The problem of the intelligibility of quantity and its forms (numbers, figures) is therefore anything but simple in the Aristotelian tradition. In the passage of the *Opus maius* quoted above, Roger Bacon does not mention any of these problems; he takes for granted that figures, numbers, and quantity in general are immediate objects of man's intellect. But this was not the common view at that time. In the first half of the

[9] Aristotle, *De anima*, III, c.1, 424a14-21: common properties (movement, rest, figure, magnitude, number, and unity) cannot be perceived by exterior senses alone. Aristotle does not introduce here the concept of abstraction, he says that these properties are perceived by the way of *movement*: "...for all these we perceive by movement, e.g. magnitude by movement, and therefore also figure (for figure is a species of magnitude), what is at rest by the absence of movement: number is perceived by the negation of continuity, and by the special sensibles..."

[10] The intellect cannot function without the products of imagination (and therefore without the sensitive soul) but its operation is not sensitive, and this superior faculty is "not mixed with the body" – *De anima*, III, c.4, 429a25.

[11] Aristotle, *On Memory and Reminiscence*, 449b30-450a12, quoted in footnote 7.

[12] For instance, Aristotle, *Posterior Analytics* I, chap.4, 73a35-36: "Something holds of an item in itself both if it holds of it in what it is – e.g. lines of triangles and points of lines (their essence comes from these items, which inhere in the account which says what they are)", to be compared with *Metaphysics* VII (Z), chap.10, 1034b20-1036a25.

[13] Aristotle, *Metaphysics* VII (Z), chap.10, 1036a9-11: "Some matter is perceptible, e.g. bronze, wood, and all changeable matter, while some is intelligible, namely that which is present in perceptible things but not *qua* perceptible. Such is the matter of the objects of mathematics." On this concept, see Christoph Helmig, "Aristotle's Notion of Intelligible Matter", in *Quaestio* 7 (2007): 53-78.

thirteenth century, it was commonly held that the object of the intellect is the universal, not the singular being – and universal concepts do not integrate the quantitative properties of their objects.[14] Later in the thirteenth century, Peter John Olivi will clarify the question. He will carefully distinguish intellectuality from intelligibility. According to the French Franciscan, the Aristotelian tradition confused intelligibility (the possibility for something to be an object of intellection) and intellectuality (the essences of intellectual beings, which are separated forms). According to Olivi, separation from matter is the condition for intellectuality, not for intelligibility. The object of the intellect is not the intellectual form, but all being in general: everything is intelligible. Therefore, quantity as such, and individual properties of sensible things, are directly intelligible.[15]

This revolution seems to have been prepared by Roger Bacon. Among the various problems involved, we have of course the question of the first object of the intellect (is it the universal or the singular?) and the various theorical aspects of abstraction. Since he tells us that numbers and figures are immediate objects of the intellect, one could imagine that Bacon adopts a Platonic or Pythagorean view: a theory of direct intellection of mathematical ideal essences – but this is not the case. He has always defended the Aristotelian dogma that all our scientific knowledge comes from sensory experience, and that numbers and figures have no real existence apart from the

[14] See the classical study of Camille Bérubé, *La connaissance de l'individuel au Moyen Age* (Paris-Montréal: Presses Universitaires de Montréal, Presses Universitaires de France, 1964); and more recently, Peter King, "Thinking about Things: Singular Thought in the Middle Ages" in *Intentionality, Cognition, and Mental Representation in Medieval Philosophy*, edited by G. Klima (New York: Fordham University Press, 2015), 104-121. About the passage of *On Memory and Reminiscence* (quoted footnote 7): the universal concept of quantity, abstracted from various determinate quantities, has no quantity at all and therefore cannot be the object of any universal geometrical demonstration. If universal propositions of geometry do not posit empirical quantitative properties, they however posit determinate ones (such as the sum of the angles, the ratio of surfaces, etc.). There is therefore no possibility of an intellectual geometrical demonstration without the assumption that determinate quantity can be an object of intellection. This may be one of the reasons for Bacon's original reading of this passage of *On Memory and Reminiscence*. Bacon could have compared this passage with some mathematical texts (such as the famous introduction of Ptolemy's *Almagest*), claiming that mathematical objects are the most intelligible ones. He therefore concluded that Aristotle couldn't have thought differently.

[15] Petrus Iohannis Olivi, O.F.M., *Quaestiones in secundum librum Sententiarum*, edited by B. Jansen, 3 vols., Bibliotheca Franciscana Scholastica Medii Aevi (Quaracchi: Collegium S. Bonaventurae, 1922-1926). Qu.58 (I, 450): "Ad tertiam dicunt quod prima est simpliciter falsa, quod scilicet omne per se obiectum intellectus sit simplex et intellectuale, quia tunc nulla quantitas posset esse per se obiectum intellectus nec conditiones sensibiles et individuales rerum sensibilium, et ita intellectus non haberet totum ens pro obiecto." Qu.72 (III, 50): "non omne intelligibile est intellectuale. Alias nulla quantitativa extensio esset intelligibilis vel intellecta a nobis." On Olivi's theory of quantity and its influence on Ockham, see the classical study of Anneliese Maier, *Metaphysische Hintergründe des Spätscholastischen Philosophie*, Kap. 3 ("Das Problem Der Quantität oder der räumlischen Ausdehnung") (Roma: Edizioni di storia e letteratura, 1955), 143-225.

sensible substances from which they are abstracted. Among various passages which could be presented, we find for instance in the *Geometria speculativa* the definition of figures as entities abstracted from determined matter – and the introduction of the *Communia mathematica*, as we shall see, provides similar definitions.[16]

This is enough therefore, for asking Bacon if he has something more to say about our knowledge of abstract objects. This question is complicated, for several reasons. First, the scope of the concept of abstraction is very wide. 'Abstraction' (*aphairesis*) was Aristotle's response to Plato's theory of ideal figures and numbers, and it was thereafter implicated in the general dispute about the ontological status of universals.[17] In the scholastic tradition, abstraction in general was understood, sometimes confusedly, as the ontological status of immaterial objects, a psychological process, or a logical criterion. While examining the occurrences of the corresponding terms (*abstractio, abstracto, abstractione*, etc.) in Bacon's texts, it appears that we must distinguish:

(1) Logical abstraction: the abstract ('*abstractum*', '*in abstracto*') is understood as the opposite of the concrete ('*concretum*', '*in concreto*'). 'Whiteness' is the abstract name for the concrete term of 'white'. This is a mere logical distinction.[18]

(2) Universal abstraction: the separation of universal properties from the individual determinations – all scientific knowledge is 'abstract' in this sense.[19]

(3) Real abstraction: the real separation (real existence) of a form from its specific matter, of from matter of any kind.[20]

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[16] *Geometria speculativa*, §4, ed. Molland, 270: "geometria speculativa probat conclusiones circa figuras superficiales et lineas absolutas et abstractas a materia determinata, non curans in quo corpore sint nec in qua materia..."

[17] For an extensive study on the subject, see Allan Bäck, *Aristotle's Theory of Abstraction* (Heidelberg New York London: Springer, 2014).

[18] *Summulae dialectices*, I.2 (*De praedicamentis*), §30, ed. A. De Libera, 190: "Dicit igitur Aristoteles quod denominativa sunt quaecumque ab aliquo ut a principali vel abstracto solo casu sunt differentia, id est: in fine, hoc est in extrema parte illorum vocabulorum, ut 'album', 'albedo'." *Q.Primae.phil.*, 278: "...sicut se habet album ad albedinem, sic homo ad humanitatem; set in aliis ita est quod abstracto formatur concretum secundum casum nominis rectum..." See in the same volume the questions pages 130-131: "Quaeritur an differat concretum et abstractum in suspiciendo predicationem generis", pages 169-170: "Quomodo querent sumi species relationis, scilicet in abstractione vel in concretione."

[19] *Q.octo.Phy.*, 94-95: "duplex est abstractio, forme a materia et universalis a particularibus"; "omnis scientia est de universali et de ipso prout est abstractum a singularibus; quare physica, cum sit scientia, erit de universali abstracto a singularibus. " (*ibid.*). *CM*, 59: "Sunt autem quinque modi abstraccionis. Unus est communis omnibus scienciis, scilicet secundum quod universale abstrahitur a singularibus..."

[20] *CM*, 59: "Secunda est abstraccio a motu et materia omnino tam secundum rem quam secundum considerationem, et sic sola causa prima dicitur abstracta et separata. Tertia dicitur abstraccio et

(4) Formal abstraction: the possibility for a property (accidental or essential form) to be considered apart from its subject, or from other properties of the same subject. In this specific sense, the famous *auctoritas aristotelis* "to abstract does not imply to lie" ("astrahentium non est mendacium") was used to justify that geometry or arithmetic could be true sciences thanks to the conceptual separability of spatial figures and numbers from the physical matter.[21]

(5) Psychological abstraction: the psychological mechanism by which the intellect forms universal concepts (such as universal numbers or figures) on the basis of sensory experience.

Bacon's psychology of abstraction has already been studied and discussed.[22] By 'psychology of abstraction', I mean the theory according to which universal objects are extracted from sensory matter by a psychological spontaneous mechanism of separation of the universal characteristics from the individual ones. This idea is derived from an interpretation of Aristotle's *De anima* book III chaps. 4-5, in terms of the abstractive action of the agent intellect, which illuminates the forms of imagination present in the sensitive soul. We find a typical formulation of this theory in the questions on *Physics* attributed to the young Bacon by the editors of the *Opera hactenus inedita,* and another in the *Quaestiones supra librum De causis.*[23] However, in the writings

separatio a materia corporali et motu <...> et sic intelligentie sunt abstracte et separate a materia et motu..."

[21] Aristotle, *Physics* B2, 193b34-35, *Auctoritates Aristotelis* (ed. J. Hamesse) n.57, 145. Roger Bacon, *Q.octo.Phy.*, 95: "Ad argumentum (abstraccio secundum intellectum est impossibile quia sic non respondet rei) respondeo quod illa propositio est duplex: aut quod intellectus intelligat rem ut non se habet, et sic intellectus est falsus, quia non potest hoc facere, sed pro modo solum; vel ut intellectus intelligat rem non prout se habet, et sic est possibile, quia intellectus intelligit lineam que est in materia non prout est in materia, sed aliquo alio modo: ideo dico quod potest esse negatio modi intelligendi vel modus negationis." See Aristotle, *Metaphysics* XIII (M), c.3, 1078a15-22; *De anima* III, c.7, 431b12-16. For a more general view on this subject, see John J. Cleary, *Aristotle in Mathematics. Aporetic Method in Cosmology and Metaphysics* (Leiden-New York-Köln: E. J. Brill 1995) especially Chap.5 ("The Ontological Status of Mathematical Objects"), 268-344.

[22] See Yael Raizman-Kedar, "The Intellect Naturalized: Roger Bacon on the Existence of Corporeal Species within the Intellect", *Early Science and Medecine* 14 (2009): 131-157. For a challenging view, see Jeremiah Hackett, "Roger Bacon on Animal Knowledge in the *Perspectiva*", in *Philosophical Psychology in Arabic Thought and The Latin Aristotelianism of the 13th Century*, edited by L. X. Lòpez-Farjeat and J. A. Tellkamp (Paris: Vrin, 2013), 23-42; and a more general discussion Anselm Oelze, *Animal Rationality*, *Later Medieval Theories 1250-1350* (Leiden-New York-Köln: E. J. Brill, 2018), chap.11, 82-87.

[23] Pseudo-Bacon, *Qu.IV.Phy.*, 31: "Unde sensus particularis primo apprehendit res materiale per suas species, et ulterius depurando ad fantasiam deferuntur, et tunc intellectus agens, cujus creata sunt exemplaria, irradiat supra fantasmata, ipsa a conditionibus materialibus abstrahens in intellectu possibili reponendo." Note that these questions on *Physics* are not Bacon's – see footnote 26. *Q.causis*, 51: "...intelligentia acquirere potest species a rebus corporalibus [...] non tamen antequam denudantur a conditionibus materialibus... species recipiuntur materialiter in organis sentiendi et in inferioribus, et cum sint in una memoria et fantasia tunc illuminatur ab agente irridiante super

of the second period (after 1260), references to psychological abstraction disappear, Bacon adopts a theory of incorporation of species in the soul and its progressive spiritualization by the successive faculties along the path of intromission. The discovery of Alhazen's *Perspectiva* (*De aspectibus*) was one of the major reasons of this change. In the scope of Alhazen's *De aspectibus*, references to an abstractive action of the Intellect on the imaginary forms are not only absent but simply impossible, for the process of perception is intellectualized at the primary level of the perception of individual visible objects.[24] We should therefore conclude that Bacon abandoned the psychology of abstraction in his mature period of work.[25]

This paper will provide confirmation of this view: some passages of the *Opus tertium* and the *Communia naturalium* confirm what we read in the passage of the *Opus maius* quoted at the beginning of this paper. For Bacon (in his mature period), 'abstract' mathematical objects are known by direct intuitive intellection. The absence of the psychology of abstraction is therefore not surprising and even fully consistent with this thesis. Bacon's mature cognitive theory evidently abandons the classical schemes of psychological abstraction and illumination, which are completely absent in the *Perspectiva*. When in the other texts (for instance in the introduction of the *Communia mathematica*), Bacon uses the concept of abstraction (he says for instance that numbers and figures are 'abstracted from the sensory matter'), this is without any implication at the psychological level. He rather reduces abstraction to the three forms of (2) universal abstraction, (3) real abstraction and (4) formal abstraction distinguished above, for the purpose of ontological, logical or epistemological discussions.

However, while examining the texts in greater detail, I wondered if Bacon had *ever* adopted a standard view concerning the psychology of abstraction. I had two major reasons for doubting that. The first comes from the sources. According to a recent study of Silvia Donati, we have to be very cautious with three series of questions on *Physics* and *Metaphysics* from the *Opera hactenus inedita* which do not seem to come from Bacon's teaching.[26] While eliminating these questions from the scope of my study, I also eliminated the most evident passages in favor of the classical psychology of abstraction in the first period of Bacon's career.[27] I also realized that Bacon was already using

huiusmodi species et ita a conditionibus materialibus denudantur..." I will comment on this passage in section I below.

[24] See Abdelhamid I. Sabra, "Sensation and inference in Alhazen's Theory of visual perception", in *Studies in Perception: Interrelations in the History of Philosophy and Science*, edited by P. K. Machamer and R. G. Turnbull, (Columbus: Ohio State University Press, 1978), 160-185 – reprint in Abdelhamid. I. Sabra, *Optics, Astronomy and Logic. Studies in Arabic Science and Philosophy* (Aldershot: Ashgate Variorum, 1994). I will examine this question more in detail in section II.

[25] This is one of Yael Kedar's conclusions, see "The Intellect Naturalized".

[26] Silvia Donati, "Pseudoepigrapha in the *Opera hactenus inedita Rogeri Baconi* ? The Commentaries on the Physics and on the Metaphysics", in *Les débuts de l'enseignement universitaire à Paris (1200-1245 environ)*, edited by O. Weijers and J. Verger (Turnhout: Brepols, 2013), 153-203.

[27] The text of the *Q.IV.Phy.* given in footnote 23.

Alhazen's *Perspectiva* in his discussion of the origin of intellectual knowledge in the 'authentic' Paris questions.[28] Therefore, the idea that Bacon *abandoned* a standard view about psychology of abstraction when he discovered Alhazen's *Perspectiva* had no more solid textual and historical foundations.

The second reason for doubting that Bacon ever adopted a standard view about the psychology of abstraction is his 'extreme realism' about universals.[29] The key aspect of psychological abstractionism (understood in the classical way in the thirteenth century) is that universals are *only* a product of psychological activity. Universal concepts have their origin in the ontological structure of the sensible things (they have a *fundamentum in re*), but they are elaborated and formed by the psychological process *alone*. The universal properties are not received through the senses, but rather psychologically constructed by the soul's powers on the basis of sensory data. It seems, however, that Bacon never adopted this view. From the beginning (from the Paris commentaries), Bacon has always considered that universal properties are given in the exterior thing, and that they act on the senses according to the universal nature of the thing, by means of species multiplying in the medium. How could he therefore imagine the process of 'abstraction' of universal forms from singulars? This is not at all easy to understand. While introducing the classical terminology about abstraction, Bacon could understand it as a mode of reception of the universal properties of exterior things – a reception which can imply some mechanisms of purification or separation, of 'spiritualization', but not of mental construction or reconstruction on the basis of the sensory data.[30]

My first task is therefore to examine the question of abstraction in the Paris questions. In a second part of the paper, I will study the question of the perception and knowledge of visual forms and of spatial relations in the *Perspectiva*. Then, I will comment on a passage of the *Opus tertium*, arguing that quantity is the first object of

[28] *Q.Primae.phil.* (5, 10, 96, 153); *Q.octo.Phy.* (7, 33, 206, 292, 324). In the spurious questions, Alhazen appears in only one place: *Q.altere* (8).

[29] See Theodore Crowley, "Roger Bacon: the Problem of Universals in His Philosophical Commentaries", *Bulletin of the John Ryland's Library* 34 (1951), 264-75; Thomas Maloney, "The Extreme Realism of Roger Bacon", *The Review of Metaphysics* 38 (1985): 807-837; Thomas Maloney, *Three Treatments of Universals by Roger Bacon. A translation with introduction and notes* (State University of New York at Binghamton: Center for Medieval and Early Renaissance Studies, 1989). Notice that Crowley's and Maloney's analysis are unduly complicated by the parasitic presence of the inauthentic *Q. altere* in the field of their studies. See also Jeremiah Hackett, "Roger Bacon (B. CA. 1214/20; D. 1292)", in *Individuation in Scholasticism. The Later Middle Ages and the Counter-Reformation, 1150-1650*, edited by J. E. Gracia (Albany: State University of New York Press, 1994), 117-139; Chiara Crisciani, "Universal and particular in the *Communia Naturalium*: between 'extreme realism' and 'experientia'", in *Roger Bacon's Communia Naturalium. A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Micrologus Library) (Firenze: SISMEL-Edizioni di Galluzzo, 2014), 57-82.

[30] See Raizman-Kedar, "The Intellect Naturalized", 141.

human's intellect. Lastly, I examine the theory of knowledge of abstract objects in the *Communia mathematica* and the *Geometria speculativa*.

I. Abstraction in the Paris questions

In the authentic Paris questions on *Physics* and *Metaphysics*, references to the psychological process of abstraction are rare and vague. We read that universal concepts are immaterial for they are "abstracted from matter" or that mathematical objects are "abstracted from matter" – without any explanation.[31] The discussion concerning the various modes of abstraction in sciences remains at a general level. The metaphysician considers beings in their *esse essentiae*, the mathematician and the physician in their *esse actuale*; therefore, the mathematician abstracts the form of the concrete being from the sensible common matter, whereas the physician considers the forms which depend on sensible matter.[32] According to Bacon's realism, the universal object can be seen from a double point of view: as constitutive part of the thing, or as a mental abstraction. Abstraction is therefore the way the intellect considers the real universal properties apart from the concrete beings: the mental universal concept is a representation, a *similitude* (a species) of the true universal given in the exterior thing.[33]

Bacon's first theory of knowledge is everything but a standard Aristotelian theory. The first pages of the *Questions on Physics* offer a synthetic discussion about the origin of human knowledge which associates innate (concreated) and acquired species, the distinction between distinct and confused knowledge of universals or/and of individuals, and various corresponding species (acquired, innate, confused and distinct).[34] It seems to me that:

(1) This is a theory of the acquisition of knowledge, formulated in terms of change from confused knowledge to a distinct knowledge.

(2) Confusion and distinction are discussed on two levels: (*a*) the natural acquisition of knowledge (with the example of the child who gains more

[31] *Q.Primae.phil.*, 23: "...quod abstrahitur a materia et a partibus per cognitionem, et sic universale est immateriale"; *Qu. prime phil.*, 91: "omnia mathematica sunt abstracta a materia, ideo magis sunt formalia quam alia, et a parte forme est diversitas secundum speciem..."
[32] *Q.octo.Phy.*, 94-98.
[33] *Q.Primae.phil.*, 243: "Et hoc concedo quod universale est quod est vere predicabile de rebus, et est res naturalis et in predicamento, tale est unum in multis et de multis, exclusa omni operatione anime; set aliud est universale quod est similitudo veri universalis, et quod fit per abstractionem intellectus, et tale non est sine operatione anime que est abstractiva, et tale est principium cognoscendi, et de tali procedunt rationes Aristotelis et Algazelis et Avicenne, quia intelligit de universali quod est similitudo expressa veri universalis."
[34] *Q.octo.Phy.*, 6-18.

distinct knowledge by experience and memory),[35] (*b*) the theological difference between the distinct knowledge of man in his perfect state and the confused knowledge he has in the present state (for the union of the soul with the body obscures human's soul).[36] Therefore, due to the weakness of our intellect in the present state, our knowledge begins with the confused universal concept of the individual.[37]

(3) A process of abstraction is never associated to this theory. Bacon is thinking in terms of a direct action of substances and species. The corresponding terms (*abstractio*, *abstractum*, etc.) do not even appear. When talking about the sensory experience, Bacon writes that "our intellection can be obtained by species received from exterior things", without any reference to abstraction.[38] Bacon seems to hold that the intellect *receives* the universal form and matter for he writes that it is more *sensitive* to these elements than the senses themselves.[39]

(4) The concepts of universal/particular natures are widely used in order to discuss the priority of nature concerning the orders of intention (finality) and operation (efficient cause). Bacon is therefore analyzing the psychology of knowledge by taking the point of view of the action of universal and particular natures.[40]

This text of the *Questions in physics* is synthetic and difficult; there are many problems of interpretation concerning the details. However, I don't find in these pages an Aristotelian theory of abstraction.

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[35] *Q.octo.Phy.*, 7: "Nos possumus loqui de anima pueri dupliciter: aut ante exercitium, et sic nihil distinguet, aut post exercitium memorie et experimenti, et sic distinguit aliqua, scilicet illa solum quorum habet memoriam et experimentum. " This point is discussed on the basis of an example taken from Alhazen's *De aspectibus*.

[36] *Q.octo.Phy.*, 11: "...aggeneratur illa confusio per naturam corporis..." See *De viciis contractis in studio theologiae*, 17: "Substancia enim anime, ut dicit, corpus occupat et reddit eam stultam, et facit eam oblivisci sui desiderii proprii, et inquirendi perfeccionem que sibi competit et percipiendi delectacionem perfeccionis sue. Non quod anima sit impressa corpori vel submersa; set quia ligacio est inter illa duo, quod est, desiderium naturale gubernandi corporis, et agitandi affecciones ejus."

[37] *Q.octo.Phy.*, 18: "Ad primam, quia propter debilitatem nostri intellectus est quod non cognoscimus particulare, quia non cognoscit nisi sub confusione, non in propria forma in particulari, quia intellectus noster se habet ad universalia sicut oculus vespertilionis ad lucem diei, ideo non habemus scientiam nec constituimus de particulari, set de universali et confusis, ideo ignata est nobis via a confusis a distincta."

[38] *Q.octo.Phy.*, 10: "intellectus noster potest esse per species acquisitas a rebus extra."

[39] *Q.octo.Phy.*, 6: "Magis sensibile dupliciter: aut quia vehementius et actualius immutat sensum, et sic sensus <est magis sensibilis>, aut quia citius, et sic intellectus est magis sensibilis quia citius immutatur intellectus a materia prima et formis primis quam sensus, et sic dicitur magis sensibilis."

[40] See *Q.octo.Phy.*, 12-18.

The other Paris questions (*Quaestions on Metaphysics* and on the *Librum de causis*) clarify some important points. First, the question of the difference between confused and distinct knowledge at the theological level (see point (2*b*) above) is clarified. The first object of the intellect for separate intelligences (angels) and human's soul in the perfect state is the individual being – not the universal. Separated intelligences (angels) have concreated species of all the corporeal things, and they know all these things as distinct particulars. Their direct cognition of particulars is the basis of their universal knowledge. Admittedly, the first object of human's intellect in the present state is the individual known confusedly, because of the deficiency of man's intellectual soul as linked (*obnubilatus*) to the sensible images in this carnal life; but the normal way of intellection, which will be given in the future life, proceeds from the distinct knowledge of individuals to the knowledge of universals.[41]

Second, the intellect cannot acquire species of corporeal things without separating them from the material conditions. This operation is done by an illumination of the agent intellect. No doubt that we have here a description of the mental process of 'abstraction'; but how does Bacon present it? Abstraction (*abstractio*) is a purification (*depuratio, denudatio*) from specific determinations, such as material and quantitative properties.[42] A purification of the species emitted by the exterior thing is necessary for

[41] *Q.Primae.phil.*, 210: "Set quia non cognoscimus veritates rerum, ideo non diffinimus nec habemus scientiam de hiis, unde scientia non est singularium per defectum nostri intellectus et debilitationem, qui non potest in hac vita cognoscere veritates rerum. Unde sicut unumquodque se habet ad esse, sic ad veritatem et cognitionem aperte. Per hoc patet ad objecta, quia verior est scientia de particulari; set hec erit solum quando complebitur numerus electorum, et cognoscemus tunc universalia per particularia, sicut modo facimus e contrario, quia hoc est secundum possibilitatem nostram, quia modo cognoscimus particularia per universalia. " See also the very interesting discussion about the definition of singulars in *Q.Primae.phil.*, 233-34: "Ideo dicendum quod quantum est a parte rei, [individua] verissime cognoscibilia sunt, a parte nostra non." *Q.causis*, 57-58: "...ideo quia particularia verius habent esse, ideo eorum species sunt apud intellectum intelligentie, unde particulare primo est cognoscibile, universale autem secundo. Set quia nos non intelligimus nisi sub confusione propter obnubilationem intellectus nostri, ideo dicimus quod universale est prius cognoscibile ab intellectu nostro quam particulare [...] omnium causa autem prima in hac vita non <cognoscitur> ab intellectu nostro, et ideo substantiam particularem complete cognoscere non potest in hac vita, set cum erit intellectus in ultima prosperitate, tunc cognoscet particulare primo, universale autem per particulare, modo autem cum est unitus carni econtrario est..." A specific study on the question of confused/distinct knowledge in Bacon would be necessary (and would be quite important for the clarification of some delicate points of Bacon's psychology and epistemology). It seems to me that in his second period, Bacon has not abandoned at all this view about human's knowledge: on the contrary, he has applied it in his *Perspectiva* (and thus completely reinterpreted Alhazen's psychology about our knowledge of individuals).

[42] *Q.causis*, 51: "...intelligentia acquirere potest species a rebus corporalibus [...] non tamen antequam denudantur a conditionibus materialibus... species recipiuntur materialiter in organis sentiendi et in inferioribus, et cum sint in una memoria et fantasia tunc illuminatur ab agente irridiante super huiusmodi species et ita a conditionibus materialibus denudantur..." See also page 59, where Bacon associates abstraction and reception: "...res corporalis immittit speciem sub conditionibus materialibus; set intelligentia sine conditionibus materialibus ita non potest eam sigillare

its *reception* by the spiritual power of the intellect. Nothing therefore contradicts Bacon's realism and the idea of transmission of universal properties through the medium, its final reception by the intellect after some steps of 'purification'. But no doubt that in the *Perspectiva* Bacon will completely abandon this way of presenting the formation of universal concepts (as we shall see in the next section).

Third, sensible properties are immediately intelligible. The same thing which is known and *received* by the senses can be known and *received* by the intellect.[43] Sensible data are the immediate objects of the senses, but since a superior power (*virtus)* can always act on the object of an inferior power, the intelligible power can know the lower objects of the sensation. Therefore, sensory faculties know sensible objects *sub ratione qua sensible*, and the intellect knows the same objects *sub ratione qua intelligible.* The intelligible properties are not abstracted from the sensitive properties. If one wants to use the term of 'abstraction' here, the corresponding concept must be understood as the mode of *reception* of the species of the sensible thing in the intellect. Bacon writes indeed that, after being purified from the corporeal conditions, the "species is received in the intellect" ("*in anima intellectiva recipitur*").[44]

In conclusion: in the *corpus* of texts attributed to the first period of Bacon's career, the classical way of presenting psychological abstraction is abandoned in favour of an original theory based on the mechanism of reception of species, associated with the principle of a direct intellection of the singular being and the sensible data. But this does not mean that Bacon, at that time, takes for granted that quantity and the associated mathematical properties could also be the direct objects of intellection. We don't find in these texts the thesis of the *Opus maius*, according to which we can have direct intellection of quantities and bodies ("*quanta et corpora intelligimus intuitu intellectus*"). On the contrary, Bacon considers that intellection of sensible objects is not possible without removing the concrete dimensions of these objects. A physical being cannot be present in the intellect in a spatial form, but only according to a spiritual mode (*sub esse spirituali*) and without quantitative dimensions. The determinate dimensions of bodies are attached to the quantified matter and cannot multiply their species into the medium nor to the intellect.[45] But if the species do not integrate the

intelligentia [...] Species autem rei corporalis cum sit sub conditionibus materialibus indiget abstractione..."

[43] *Q.causis*, 72: "...idem est sensibile et intelligibile sub alia et alia ratione, ideo potest illud idem quod a sensu cognoscitur et in ipso recipitur ab intellectu intelligi et cognosci sive in ipso recipi, non sub ratione qua sensibile, set sub ratione qua intelligibile."

[44] *Q.causis*, 73 – see the text in the next footnote.

[45] *Q.causis*, 72-73: "Dicendum ergo, quod species rei corporalis habet dimensiones interminatas que sunt sub esse spirituali, et ideo potest recipi in anima. Vel aliter dicendum, quod species rei corporalis potest dici corporalis a corpore quod est substantia, et sic habet conditiones corporales, et hoc sub esse spirituali, vel a corpore quod est quantitas, et sic non habet vel dimensiones sub esse spirituali unde non habet conditiones quantitatis, quia immissio speciei fit via multiplicationis et actionis aliquo modo, et ideo solum debetur virtutis immissio nature active. Quantitas autem, cum

quantitative properties of their objects, how can the dimensions of bodies be transformed into intellectual concepts? The *Perspectiva* will give us the answer.

II. Perception and Intellection of spatial properties in the *Perspectiva*

In the *Questiones supra librum de causis*, in the later *De multiplicatione specierum* and also in the *Perspectiva*, Bacon denies the possibility that a species would have determined dimensions, for two major reasons: (1) a species cannot have proper extension distinct from the medium in which it propagates; (2) matter, which is the source of dimensional properties, does not multiply any species.[46] The result seems to be that we cannot have a perception of quantitative properties, which would be a disaster for Bacon's theory of vision. The question is therefore how Bacon intended to explain the perception of determinate, relative or approximate dimensions of visual objects, and of their spatial relations and distances. One of the main difficulties of the theory of vision by intromission of species is the perception of spatial relations, for there are no species of empty spaces nor of relations, orientations or distances.[47]

Bacon's response to this question in the *Perspectiva* is complex in its construction, but simple and convincing in its principle. Space relations are not seen but estimated and judged on the basis of sensory experience.[48] When seeing a cube of three cubic meters, nobody can know its size by simple visual inspection – at best, one can *estimate* the size if having the *experience* of measuring bodies. Empirical forms and dimensions of bodies are therefore not transmitted to the sensory organ of sight but estimated at the level of the internal senses (common sense and imagination) and constructed as

materie debeatur, non est natura activa, ideo non multiplicat sui speciem, et propter hoc species non est sub dimensionibus quantitativis, set solum refertur ad corpus in quantum substantia est, et ideo in anima intellectiva recipitur."

[46] *DMS*, III chap.1, 181; *Perspectiva* 1.10.2, 151: "it is not given to quantity to act, since quantity is a property of matter to which no activity, but only passivity, belongs..."

[47] This is one of the more interesting objections of Peter of John Olivi against theories of vision by intromission of species. Olivi explains that we cannot perceive a distant object without perceiving our distance to this object: one must explain why all the species arranged on the sense organ do not appear on the same plane. See Katherine Tachau, *Vision and Certitude in the Age of Ockham. Optics, Epistemology and the Foundations of Semantics. 1250-1345* (Leiden-New York-Köln: E.J. Brill, 1988), 39-54; Dominique Demange, "Olivi et les Perspectivi. Les sources de la théorie olivienne de la vision" *Oliviana* 5 (2016): http://journals.openedition.org/oliviana/850; Lukáš Lička, "The Visual Process: Immediate or Successive? Approaches to the Extramission Postulate in 13th Century Theories of Vision", in *Medieval Perceptual Puzzles: Theories of Sense-Perception in the 13th and 14th Centuries*, edited by E. Bălțuță (Leiden: E: J. Brill, 2020), 73-110.

[48] A. Mark Smith devoted a detailed article to this specific question of the representation of space relations in medieval optics: "Spatial Representation in Medieval Visual Theory", in *Représentations et conceptions de l'espace dans la culture médiévale. Repräsentationsformen und Konzeptionen des Raums in der Kultur des Mittelalters*, edited by T. Suarez-Nani and M. Rohde (Berlin-Boston: De Gruyter, 2011), 45-66.

geometrical representations by the means of experience. Therefore, the psychological construction of the spatial properties and relations needs a least four levels: (1) The constitution of the visual field at the optical and physiological level, (2) the action of the discriminative faculty and the internal senses for the construction of the imaginary space (construction of space relations such as positions, distances, depth, etc.), (3) the experience of measuring (or at least estimating) dimensions, by which a more determinate knowledge of quantity can be acquired, (4) the formation of the universal concepts, such as the concepts of geometry, by the logical reasoning.

The first step consists of constructing a luminous and colored image of the visual field by the geometrical operations of the optical system – an image produced at the level of the internal sensory organ of vision.[49] The sensory organ is not the eye itself, but the nervous system beginning in the eyes and terminating in the common nerve at the surface of the brain.[50] At this step, specific optical and physiological conditions are required for the realization of a distinct image.[51]

Whatever the concrete ways of constitution of this internal image, the very act of perception of distance and spatial order is not a pure vision. Bacon makes clear that pure vision does not perceive distance nor form. The sensory organ of sight is only affected by the proper sensibles of light and color. Shape, remoteness, size and position belong to the list of the intentions perceived by the interior senses (imagination, common sense). Distance, size or shape are not objects of vision, but are constructed by imagination and estimation. Properly speaking, space is a fictional construct.[52] At this step, the judgement of distance or size is not intellectual; it is the spontaneous operation of imagination and common sense – and this is the reason why some imaginary errors of vision can occur, such as the famous Moon illusion or the apparent magnification of objects in the water.[53]

The third level is obtained by repeated evaluations of various perceptive situations: the perception of the various positions, orientations and apparent sizes of objects, when considered in mutual relations and in relation to the observer's position, at rest

[49] *Perspectiva,* 1.2-4, 20-59.

[50] *Perspectiva,* 1.5.2, 62: "Oportet igitur quod aliud sit sentiens preter oculos, in quo completur visio, cuius instrumenta sunt oculi, qui reddunt ei speciem visibilis. Et hoc est nervus communis in superficie cerebri...", cap.3, 66: "Et sic patet quod non solum oculi iudicant de visibili; sed incipitur iudicium in eis, et completur per ultimum sentiens, quod est virtus visiva frontalis in nervo communi."

[51] *Perspectiva,* 1.6.2-4, 1.7.1, 74-99. Medieval optics ignores the distinction between real and imaginary image – all images in the optical system are virtual. In other words, one must not imagine a projection of a real picture on the surface of the sensitive organ (for instance the retina), but the introduction of the visual species of light and color in a specific order.

[52] *Perspectiva*, 1.1.3, 8-11. Smith, "Spatial Representation", 57: "the Perspectivist account of spatial perception is the idea that space, as visually perceived, is imaginary and, therefore, a sort of fictional construct."

[53] See the detailed descriptions given by A. M. Smith, "Spatial Representation", 53-55.

or in motion, and in general the appropriate interpretation of the telltale signs given of the visual field. For Bacon, this is the place for explaining how the magnitude of an object is perceived.[54] Most of the Perspectivists held that magnitude is grasped solely from the size of the angle formed at the observer's eye. But this doesn't suffice, Bacon argues, since for the certification of the real magnitude of an object more information is required. It is necessary to integrate the size of the visual pyramid having the object at its basis, an estimation which cannot be obtained without some additional information given in the visual field: "Distance is grasped, therefore, when a sequence of bodies is arranged continuously between the eye and the object, provided that the distance is moderate and that the eye will have inspected those bodies and certified their magnitudes". [55]

At the fourth level, visual perception produces universal representations. Bacon distinguishes three modes of universal knowledge by vision.[56]

The first mode of the universal knowledge by vision is the confused apprehension of a quality or form without distinction (for instance, color in general, without any distinction of the kind of color). The second mode of universal knowledge by vision is of the diffused particularity ('*particulare vagum*'), namely, the identification of a kind of blue, which is known as 'a certain color', distinct from others, but without a clear logical distinction between these kinds. The third mode allows the construction of universal types at the logical level. This is obtained by spontaneous reasoning, such as the immediate inference of a transparent medium when we see through a glass of water: "... this cognition ordinarily occurs suddenly, and we do not perceive that we reason, although we do".[57]

The first mode of universal knowledge is produced by 'sense alone' – an expression used to designate sight in the pupil and the common nerve as far as the common sense.[58] The second mode is described in this way: "... the ability to distinguish universals from one another and from particulars, and particulars from each other by comparison of a thing seen to the same thing previously seen, recollecting that it was previously seen and known to the observer, constitutes a second mode of visual comprehension".[59] Therefore, this mode cannot be achieved without the internal senses of imagination and memory: "For unless imagination and memory of prior vision of the thing are present, comprehension in the second mode cannot occur...".[60] The third mode (spontaneous logical reasoning), "is further removed from sense alone, since in it more things are considered than in the second mode, and its method of argumentation brings

[54] *Perspectiva*, 2.3.5-6, 222-233
[55] *Perspectiva,* 2.3.3, 211.
[56] *Perspectiva,* 1.10.3, 154-159.
[57] *Perspectiva,* 1.10.3, 157.
[58] *Perspectiva,* 1.10.3, 159.
[59] *Perspectiva,* 1.10.3, 157.
[60] *Perspectiva,* 1.10.3, 159.

it closer to a work of reason".[61] Quantity, which is one of the twenty-two intentions received by the sense of sight, "cannot be certified except by this third mode of knowledge".[62]

These three modes of "universal knowledge by vision" belong to the sphere of spontaneous and pre-conscious psychological activity structuring our perception. This is true even for the third mode, about which Bacon says that "...we do not perceive that we reason, although we do".[63] But at the end, this spontaneous pre-conscious reasoning by which we distinguish logical types such as degrees of light, kinds of colors and series of forms at the level of perception, is at the basis of the scientific learning by which we consciously identify all these types and classify them by distinct terms and concepts. According to this passage of the *Perspectiva*, this is the case of logic and this is also the way Bacon, in the *Opus maius*, understands the famous Socratic demonstration, in the *Meno*, of our pre-conscious knowledge of geometry:[64]

> Secondly, an understanding of mathematical truths is almost innate within us. As Tullius relates in the first book of the *Tusculan Disputations*, when Socrates questioned a small boy about geometrical truths, he responded as if he had learned geometry. This has been tried in many cases and it does not occur in the other sciences, as will be more clearly demonstrated by what follows. For that reason, since an understanding of mathematics is almost innate and precedes discovery and learning, as it were, or at least requires them less than the other sciences, it will be first among the sciences, preceding the others and disposing us to them since what is innate or virtually so is disposed to acquiring knowledge.[65]

The exact meaning of these passages of the *Perspectiva* and the *Opus maius*, both introducing the idea of an (almost) *innate* logical or geometrical knowledge, seems to be the following. Bacon doesn't say that logic or geometry doesn't teach us anything and that logical or geometrical knowledge is pure reminiscence. Logic teaches us how to reason properly in general, and geometry how to reason rigorously in the specific case of figures. Nevertheless, these sciences do not create (but only increase and develop) in us the *potency*, *ability* or *capability* to reason or geometrize – and this is the

[61] *Perspectiva,* 1.10.3, 159: "... et magis accredit ad opus rationis propter viam arguendi."
[62] *Perspectiva,* 1.10.3, 159.
[63] *Perspectiva,* 1.10.3, 157. On this spontaneous reasoning by perception and its source in Alhazen, see A. Mark Smith, *From Sight to Light*, *The Passage from Ancient to Modern Optics* (Chicago and London: The University of Chicago Press, 2015), 189-192; A. I. Sabra, "Sensation and inference in Alhazen".
[64] *Perspectiva,* 1.10.3, 159: "...by nature we know the science of arguing, which is logic. But to begin with we are ignorant of the proper terminology, which the first writers on logic invented, but which we learn by instruction. And a treatise and discourse on logic exists not to convey the potency of this science (since it is innate in everybody), but to convey its terminology..." ("...non propter ipsius scientie potestatem, quia hec est cuilibet innata...").
[65] *Opus maius* IV, dist.1 chap.3, ed. Bridges I, 103; transl. Dennis 71.

great difference with the other sciences.[66] The sciences of mechanics or astronomy are in no way innate, for the dispositions for mechanical or astronomical concepts and laws have to be created from nothing, whereas learning of logical or geometrical or arithmetical concepts and laws is only a structuration, rationalization and clarification of pre-conscious intuitions. No doubt therefore that these pre-conscious intuitions appear in the *Perspectiva* at the level of the three modes of "universal knowledge by vision".

Indeed, if we extrapolate a little on the basis of the psychological construction of our universal concepts in the *Perspectiva*, no doubt that we have here all the elements of a convincing model for geometrical leaning. Just like all visual forms and characteristics, the geometrical properties are identified by the geometer at the level of visual figures, not as individual characteristics but as universal properties, gathered from a repeated experience of visual forms. While studying geometry, the student learns to identify the visual forms which enter, as universal properties, into logical demonstrations. He first identifies them as diffused particulars (*particulare vagum*, second mode) and later as logically distinct (third mode). When he identifies them sufficiently, he learns to classify and construct them as distinct scientific concepts. He can therefore judge concerning universal geometrical properties derived from 'false' sensible figures, because he identifies these approximate figures as representing the intellectual exact ones. The classical ways of abstraction and intellectual illumination are completely absent from this theory of scientific learning. The geometer does not need to climb up an abstract noetical level, he does not need to escape from the sensible world and be illuminated by the pure concept of the universal triangle, completely abstracted from sensible and extended matter. He does not need to have such an experience, which would be completely useless for any kind of geometrical demonstration. The geometer's intellectual activity is produced at the level of perception, by an immersion of his thought in the visual field and its universal properties and structures.

[66] Cecilia Panti, "Natural Continuity and the Mathematical Proofs", 174, writes: "Bacon remarks in its *Opus tertium* that we do not know mathematics through nature." I would not put it that way. Mathematics, as a specialized learning, is not known by nature, but is nevertheless based on a natural disposition, and is therefore "almost innate". This is the same as for music. The corresponding passage of the *Opus tertium* says: "Et ideo post linguarum necessitatem pono mathematicam esse in secundo loco necessariam, ad hoc ut sciamus quae scienda sunt; quae non est nota nobis per naturam; sed [mathematica] tamen est prope cognitionem naturalem inter omnes scientias quas scimus per inventionem et doctrinam. Nam ejus speculatio facilior est omnibus scientiis, eo quod pueri statim capiunt has scientias, sicut videmus; et Aristoteles hoc dicit septimo Ethicorum; non sic naturales scientias, et metaphysicas, et alias. Et praeterea laici sciunt de facili figurare, et numerare, et cantare, et uti instrumentis musicalibus, et exultare, et gestus facere conformes cantui et sono instrumentorum; et haec omnia sunt opera mathematicae. Quapropter oportet quod sit facilis scientia, et quasi innata, vel prope cognitionem innatam" (Pars 1, cap.29, ed. Egel, 216).

III. The *Opus tertium*: quantity as first object of human's intellect

I opened this article with a quotation of a passage of Part IV of *Opus maius*. In this text, Bacon asserts that for Aristotle, the first object of human's intellect is quantity and its corresponding species. The complete passage is the following:

> Secondly, the very act of understanding itself is not completed without continuous quantity, because Aristotle, in his book On *Memory and Reminiscence*, states that our whole intellect is associated with continuity and time. From this, we comprehend quantities and bodies by the perception of the intellect, because their forms belong to the intellect. The forms of incorporeal things, however, are not apprehended by our intellect; or if they were formed in the intellect, as Avicenna indicates in the third book of the *Metaphysics*, we nevertheless do not perceive these forms, because our intellect is more strongly oriented around bodies and quantities. Therefore, by our way of argumentation and attention to the corporeal and the quantifiable, we seek knowledge of incorporeal things, as Aristotle does in eleventh book of the *Metaphysics.* Therefore, the intellect develops mostly around quantity itself, and it is in this way, according to the common condition of understanding, that quantities and bodies are apprehended by the human intellect.[67]

Bacon distinguishes two forms of human's intellectual knowledge: (1) the intellectual perception of the sensible bodies, by which our intellect apprehends the forms of quantity, space and time by direct intuition; (2) the way of rational argumentation and reasoning by which we can infer some general truths about the objects which transcend our direct experience of bodies, and for which we have no direct perception: 'the incorporeal things'. The classical opposition between physical and *meta*-physical knowledge is formulated in an original manner: it is not only to say that our physical experience is limited to the forms received in the sensitive soul, but also that physical experience provides an immediate intellectual perception of the mathematical forms intrinsic to bodies, namely, quantity, space and time. This is the way Bacon reads the famous passage of Aristotle's *On Memory and Reminiscence*[68] and this reading is surprising for the modern reader. The idea that the forms of quantity "belong to the intellect", associated with a reference to Avicenna's *Metaphysics,* may lead us to suspect a Platonist or Neoplatonist influence somewhere in Bacon's psychology of mathematics; but whatever the exact nature of this influence, the physical section of the *Opus tertium* sheds light on this passage of the *Opus maius*.[69]

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[67] *Opus maius* IV, dist.1, chap.3, ed. Bridges I, 107, transl. Dennis 77. The Latin text is given in footnote 6.

[68] Quoted in footnote 7.

[69] Bacon seems to refer here to the end of chapter 8 of book III of Avicenna's *Metaphysics* (Avicenna Latinus 162-163). I don't read in this passage anything about our direct intellection of mathematical forms, but the only classical division between the two ways of intellection by abstraction and enlightenment.

The physical section of the *Opus tertium* occupies chapters 38-52.[70] The question of the unity of matter, of the possibility of a vacuum, of the spatial and temporal modes of existence of angels are the main topics. These are classical questions of scholastic philosophy and theology, but Bacon doesn't intend to prove that he is a good Parisian philosopher or theologian. On the contrary, his aim is to present ('to recite') the various positions of the philosophers, theologians and of the 'vulgar' on these questions, in order to demonstrate how human's intellect can err on these difficult matters, and how an appropriate, deep and accurate scientific knowledge (especially of mathematics) is the necessary condition for eliminating the false representations which contaminate theology.[71] In chapters 46-49, the various hypothesis concerning the location of angels in heaven or on earth, in indivisible or divisible spaces are examined and successively eliminated, due to their contradictions and inconsistencies. At last, Bacon concludes that all these contradictions, errors and false representations about the nature of angels are almost inevitable given the nature of our intellect, bound as it is to the inferior world:

> But the arguments for the contrary are much more difficult: this is due to the corporeal representations, into which we are absorbed, because all of our intellect is integrated into the continuum, as Aristotle says in the book *On Memory and Reminiscence*. And therefore, by its first intuition, our intellect doesn't overcome continuum, which is corporeal quantity. And for this reason, it forms by itself corporeal representations of the spiritual [substances] – or similar to these. [...] The same goes for angels, because we talk a lot about them by using figures of speech referring to corporeal things, as this way of speaking corresponds to our proper intellect, which doesn't overcome corporeal things by its first sight and mind intuition...[72]

And once more, in the discussion of chapters 51-52 about angels' temporality (*aevum*), Bacon writes:

> Aristotle says that all our intellect is with continuous and time, because we do not conceive anything at first sight except quantities – such as the things which are measured by an intrinsic continuous quantity, which is the three-dimension, and those

[70] *Opus tertium*, I, cap.38-52, ed. N. Egel, 249-417.

[71] *Opus tertium*, I, cap.47, §289 ed. N. Egel, 360: "Sed in hoc loco volo procedere secundum vias inquisitionis et recitationis, magis quam determinationis et diffinitionis alicujus sententiae, et sine praejudicio melioris sententiae. Atque referam opinionem aliquorum theologorum famosam, cui etiam sapientissimi viri concordabant quos vidimus, licet viam universae carnis ingressi sunt."

[72] *Opus tertium*, I, cap.49, §311-313, ed. N. Egel, 374-376: "Sed difficilia sunt argumenta in contrarium, propter imaginationes corporalium, quibus absorpti sumus, quia omnis intellectus noster est cum continuo, ut dicit Aristoteles, libro de *Memoria et Reminiscentia*. Et ideo primo intuitu non transcendit intellectus noster ultra continuum, quod est quantitas corporalis. Et propter hoc de spiritualibus format sibi imaginationes corporales, aut similes eis; [...] Similiter vero est de angelis, quod multa loquimur de eis secundum similitudines loquendi in corporalibus; quia talis modus loquendi est proprius intellectui nostro, qui corporalia non transcendit, primo aspectu et principali mentis intuitu..." See the same text in *CN*, I, 234-235.

> which extend by extrinsic quantity, such as the temporal things, which are submitted to time. Therefore, we do not perceive spiritual and permanent things in their unchangeable being by the first intuition of the mind, nor by another mode, except when our soul will be extracted from corporeal and temporal things, then we will go beyond them. Therefore, regarding the power of our intellect, without a special illumination we cannot have this sort of intellection [of the spiritual substances], except by a privation of the corporeal and temporal [properties], and not by their affirmation. And for this reason, we perceive the existence of spiritual and permanent things, which is measured by the aevum indivisible and inseparable, with the greatest difficulty...[73]

When confronted with the transcendent truths, when trying to grasp the essence (or mode of existence) of God or the angels, man's intelligence is weak and obscure, and his reasoning sounds like the speech of fool or a child. This is a classical theme, nourished by various philosophical and theological classical *loci*.[74] But this development on angelology of the *Opus tertium*, for which there is no corresponding section in the *Opus maius,* sheds a specific light on Bacon's theology.[75] Bacon enters into a deconstruction of our common representations of the transcendent beings, and the method of this deconstruction appears to have been inspired by Maimonides' *Guide of the perplexed*.[76] The criticism of the imaginary representations and formulas of the common language (taken from our everyday experience of corporeal things) when

[73] *Opus tertium*, I, cap.51 §335, ed N. Egel, 400-402: "Quia Aristoteles dicit quod omnis intellectus noster est cum continuo et tempore, quia nihil primo aspectu concipimus nisi quanta, ut quae quantitate continua mensurantur intrinseca, quae est trina dimensio; et quae quantitate extrinseca extenduntur; ut sunt temporalia, quae sub tempore cadunt. Et ideo spiritualia et permanentia in suo esse invariabili non percipimus primo mentis intuitu, nec aliquo modo, nisi quando abstraxerimus animum a corporalibus et temporalibus, et transiverimus haec. Sed tunc quantum est de potestate intellectus nostri, sine speciali illuminatione non possumus intelligere hujusmodi, nisi per privationem corporalium et temporalium, et non per positionem. Et ideo cum summa difficultate percipimus esse spiritualium et permanentium, quod mensuratur aevo indivisibili et impartibili..." See the same text in *CN* I, 175.

[74] See *De viciis*, 36-37.

[75] But the same text (or parts of the same text) can be found in *CN*, I, pars3, dist.1 cap.8 ("De aevo", 173-182) and dist.2 cap.7-8 ("De loco et motu spiritualium substantiarum", 224-239). See Jeremiah Hackett, "Motion, Time and Aevum in Roger Bacon's *Communia Naturalium*: Context and Content", in *Roger Bacon's Communia Naturalium. A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Micrologus Library) (Firenze: SISMEL-Edizioni di Galluzzo, 2014), 191-213 – especially pages 197-198; Cecilia Panti "*Non abest nec distat*. Place and Movement of Angels according to Robert Grosseteste, Adam Marsh and Roger Bacon." In *Lieu, espace, mouvement: physique, métaphysique et cosmologie (XIIe-XVIe siècles). Actes du Colloque international Université de Fribourg (Suisse), 12-14 mars 2015, edited by* T. Suarez-Nani, O. Ribordy, and A. Petagine (Barcelona and Roma: FIDEM, 2017), 57-77.

[76] I will refer below to the classical translation: Moses Maimonides, *Guide of the perplexed*, translated by Sh. Pines, 2 vols. (Chicago: The University of Chicago Press, 1963).

applied to the description of incorporeal substances;[77] the refutation of atomism;[78] the *via negationis* (it is impossible to truly characterize incorporeal substances by positive properties, we can only characterize them by negation of any corporeal property);[79] all these typically Maimonidian themes are integrated in Bacon's criticism of our common language and our usual representations about angels or God, which infect the most sophisticated theories of the Parisian theologians.[80]

Let us try to formulate Bacon's corresponding psychological theory. All our actual intellectual representations are based on the experience of bodies, and our intellect has great familiarity with the corresponding forms of quantity, for it drew all its experience from them. Since incorporeal beings have a completely different essence and completely different possibilities of existence, their being is almost inaccessible to our understanding in the present state of our life. Indeed, it appears that the term '*intellectus*' in these passages would be better translated by the term 'understanding' of classical philosophy – much more than by the term 'intellect' of the peripatetic tradition. We should say, therefore, that man's understanding is limited to the extended forms of its natural and usual experience; man's intellectual power will be extended to the possibility of intuitions of incorporeal beings in the future life, but its actual understanding cannot exceed these limits, except by the limited power of reason, by which man can infer general truths and many difficult hypothesis or questions about the nature of these transcendent beings. Now, how should we therefore understand the reference to the passage of Aristotle's *On Memory and Reminiscence*? It seems that for Bacon, the idea that our understanding is linked to the forms of quantity is simply one of the basic principles of Aristotle's psychology of space and time in the *Physics*. While

[77] Maimonides, *Guide of the perplexed*, I, chap.1-49, vol.1, 1-110; *Opus tertium* I, cap.49, §312-313 ed. N. Egel, 376: "Nam dicimus quod Deus descendit de coelo; sed secundum modum vulgatum apud nos, quod descendit de alto, relinquit locum illum et adquirit novum locum, quem prius non habuit. Sed haec sunt absurda de Deo. Et cum dicitur: 'Misit Deus Filium suum in terris', non est intelligendum sicut homo mittit filium suum a se ad locum distantem, in quo non est mittens, et quem prius non habuit missus. Haec enim in corporalibus locum habent; et sic de infinitis aliis attributis Deo, secundum sermones vulgatos de corporalibus. Quae aliter intelligenda sunt. Similiter vero est de angelis, quod multa loquimur de eis secundum similitudines loquendi in corporalibus..."

[78] Maimonides, *Guide of the perplexed*, I chap.74-76, vol.1, 215-231; see *Opus tertium* I, cap.46, §286 ed. N. Egel, 356-58.

[79] Maimonides, *Guide of the perplexed*, I, chap.58-60, vol.1, 134-147 – *Opus tertium* I, cap. 47, §229, trad. N. Egel, 366: "Quapropter concludi videtur necessario, quod spiritualis substantia nullum locum, nec divisibilem nec indivisibilem, corporalem requirit, nec debeat habere, propter continentiam, sicut neque propter salute." *Opus tertium* I, cap.49, §320, ed. N. Egel, 384: "...nec oportet quod dicamus quod angelus est simul et semel praesens coelo et terrae, sed per negationem, quod non abest nec distat a coelo nec a terra, et cum est praesens coelo non distat a terra, nec abest ab ea; et, e converso, cum consideratur praesens terrae, non abest nec distat a coelo; ut semper aliqua negatio exprimatur, quia nullam habet rationem distantiae corporalis, cum sit spiritus."

[80] *Opus tertium*, I, cap.50, §326, ed. N. Egel, 392: "Vulgus tamen non capit haec, nec ejus capita multa. Aliqui tamen se confricant ad haec, nulla tamen rationum potentia ducti, sed imaginatione sua in hoc, sicut in aliis, magis falsis quam veris gaudentes."

developing the mathematics of motion, space, and time in books IV-VI of *Physics*, Aristotle doesn't only provide the foundations of the science of nature but also a description of human's immediate understanding of the corresponding physical phenomena. After all, Aristotle defines time as the number of motion, counting is obviously a mathematical operation, and therefore he considers the perception of time as a (pre-conscious) mathematical psychological activity. And the same argument can be formulated concerning the schemes by which we spontaneously perceive, distinguish and compare the three-dimension visual forms with their geometrical properties. As we have seen in the previous section, according to the *Perspectiva*, this spontaneous logical activity at work in perception is produced by sight in the third mode of universal knowledge.[81] All these elements put together, present a convincing picture of Bacon's claim that "we perceive quantity at first sight" (*primo aspectu*). The human intellect is immersed in the sensory world in such a way that he apprehends space, time, and the forms of quantity by an immediate pre-conscious intuition.

IV. Abstraction and the essence of mathematical thought in the *Communia Mathematica* and *Geometria speculativa*

The scope of abstraction in the *Communia mathematica* is much wider than in the previous texts we have examined. Bacon presents a complete account of the mathematical science, including its internal structure and relations to the other sciences, and this goal is achieved through a description of the various modes of abstractive knowledge.[82]

We have five modes of abstraction.[83] The first is the abstraction of universals from particulars, and this mode is common to all sciences, since scientific knowledge is universal. The second mode is absolute abstraction of a being from motion and matter of any kind, and this complete separation is only possible to God. The third mode signifies the ontological separation from corporeal matter and corporeal movement, and this is the case of separated intelligences which, nevertheless, have spiritual matter. The fourth mode of abstraction considers corporeal properties without their relation to corporeal matter and motion, and this is the way speculative mathematics and music (*geometria speculativa, musica speculativa)*, and the speculative science of quantity in general considers its objects. Lastly, the fifth mode considers the abstraction from the sublunary matter of qualitative and quantitative change, generation and corruption, and this is the way mathematical astronomy (*astronomia mathematica),* speculative and practical astrology consider the celestial quantities and

[81] See footnote 64.
[82] See Jeremiah Hackett, "Roger Bacon on the classification of the sciences", in *Roger Bacon and the Sciences. Commemorative essays*, edited by J. Hackett (Leiden-New York-Köln: E. J. Brill, 1997), 49-65
[83] *CM* I, dist.5, 58-65

motions, for they do not depend on the inferior matter undergoing transmutations.[84] Natural astronomy (*astronomia naturalis*), on the contrary, is a natural science, for it studies the physical effects of the celestial motions at the level of the matter of alteration, quantitative change, generation and corruption.

By separating the fourth and fifth modes of abstraction, Bacon is clear enough that we need to create a specific place, apart from physics in the strict sense (the science of the sublunary transformations), for a mathematical science of quantity and motion abstracted from sublunary matter. Motion is a property of a substance; thence mathematics of motion is always linked to a specific matter (sublunary matter or celestial matter), but "quantity in its very essence does not depend on natural change" and mathematics of motion is not a part of physics in the Aristotelian sense.[85] Bacon's argument on this point is the following.[86] Numbers and quantities derive from the genus of body which has been created first, so that they determine the essence of the incorruptible celestial bodies and of the incorruptible elements which are the makeup of the structure of the cosmos. Consequently, quantity, by its very essence, is not submitted to the principles of natural transmutation at the lower level. Quantity is not only present in the geometer's mind as an abstract representation extracted from sensible data, but rather exists in the real world as the property of its perfect and incorruptible structure. Therefore, 'abstraction' is for the geometer a form of perception of the real nature of quantity, as realized in the cosmos. For Bacon, mathematical intuitions are not separated from the perception of the word, for mathematical abstraction is a perception of the ideal structure of the physical world itself. This point is (A) explained by an example in the *Geometria speculativa*, (B) demonstrated by a more general analysis in the *Communia mathematica*, (C) and

[84] *CM* I, dist.5, 61: "Nam Astrologia considerat celestia et similiter Astronomia mathematica, sed tamen non considerant nisi quantitatem corporum et motum non generacionem et corrupcionem non alteracionem non augmentum non diminucionem non loci mutacionem in quantum est causa generacionis et corrupcionis et ceterarum transmutacionum, sed considerant motum localem celestium quantum ad quantitatem illius motus, ut quantus est in hora, quantus in die, quantus in mense, quantus in anno uno, quantus in pluribus, et sic de communibus premissis (aliter omnibus practicis) Mathematice. Verum est quod non considerant materiam corporalem ut est subjecta motibus transmutacionum nec per comparacionem ad illas, et ideo dicuntur abstrahi a materia et motu, id est a materia prout est subjecta transmutacionibus naturalibus et comparata ad illas."

[85] *CM* I, dist.5, cap.2, 62: "quantitas quantum ad suam essenciam non dependet a transmutacione naturali." See Michela Pereira, "Roger Bacon on Nature", in *The philosophy of science of Roger Bacon, Studies in Honour of Jeremiah Hackett*, edited by N. Polloni and Y. Kedar (London and New York: Routledge, 2021), 17-35 – on this question, pages 24-25.

[86] *CM* I, dist.5, cap.2, 62-63: "quantitas continua quam sequetur numerus arismetice procedit in esse secundum creacionem in corporibus primis, et nascitur cum primo genere subalterno quod est corpus, et creata est in celo et in elementis ut sunt partes mundi in quantum sunt incorruptibilia naturaliter, et erunt semper et ab eis, tamen sit in omnia generata. Et ideo quantitas quantum ad suam essenciam non dependet a transmutacione naturali, sed omnia alia accidenda concernunt corpus generabile et corruptibile et generantur et corrumpuntur, eciam lux que est accidens inter corruptibilia nobilissimum, nam in celestibus corrumpitur per eclipses et renovatur."

confirmed by a passage of the *Opus maius* dealing with physical and mathematical continuity.

(A) The example is given in the *Geometria speculativa* for the purpose of explaining the origin of Euclid's first postulate: "A straight line segment can be drawn joining any two points".[87] How does the geometer discover this simple law of geometrical construction? He considers the possible ways and modes of operation of nature, and nature shows him that straight line is the most efficient way of action. The laws of geometry are discovered by the experience of optical rays and planetary perfect trajectories, which are described in the sciences of optics and astronomy. Without considering the ideal structure of the physical world, which is revealed in these mathematical sciences, the geometer would have *never* been able to formulate the ideal laws of speculative geometry, for he would have simply followed his imagination and the "tortuous and deformed" empirical lines of his immediate perception. The *only* way for the geometer to discover geometrical laws, is therefore for him to "imitate the ways of nature". What does it mean? What is he imitating? It means that human's technique is limited to an *approximation* of the ideal operations of nature: "on account of the irregularity or tortuosity or deformity of corporeal matter in these inferior things, the first [postulate] cannot be reduced by man to operation, or scarcely and with great difficulty. But it is possible for operative nature..." Man will never be able to produce a perfect line, whereas nature is able to do so, as optics and astronomy show. Therefore, when drawing a line on the blackboard, the geometer is *imitating* the way nature produces perfect lines – he knows that the empirical line he is drawing approximates the perfect intelligible line *really* produced by nature: "the geometer does not speak of the sensible line but of what is understood through it".[88]

[87] *Geometria speculativa*, §48, 298-301 (transl. G. Molland): "And on account of the irregularity or tortuosity or deformity of corporeal matter in these inferior things, the first [postulate] cannot be reduced by man to operation, or scarcely and with great difficulty. But it is possible for operative nature, as in the multiplication of virtue and species in the things of the world, as in the diffusion of light and rays, which is made multiplicatively by straight lines in a single body, and also the perpendiculars to the first bodies are made in a straight fashion. The geometer therefore considers the possible paths of nature, because geometry was first and essentially constituted for the sake of certifying the works of nature, and thereafter for human works. For the authors of perspective show us that lines and figures declare to us the whole operation of nature, its principles and effects. And this is similarly evident by celestial things, which both natural philosophy and astronomy consider. The geometer therefore does not attend to tortuous sensible matter, but he understands regular nature as it is in celestials and as nature knows how to find in its operations in these inferiors, and he imitates the ways of nature. And thus it was not in the imagination of straight lines, as Aristotle says in the *Posterior Analytics* that the geometer does not speak of the sensible line but of what is understood through it."

[88] *Perspectiva* as a science, needs geometry (geometrical laws are applied in optics) but according to the order of acquisition of knowledge, a first experience of natural figures is necessary for understanding geometrical truths. See *Epistola ad Clementem (Letter to Pope Clement IV)*, ed. N. Egel, chap.10, 165: "In a certain sense, mathematics is also needed for this science [of *perspectiva*], which

(B) The general analysis is given in the introduction of the *Communia mathematica*.[89] According to Bacon, the list of definitions, axioms and postulates by which Euclid opens the *Elements* and elaborates the whole system of geometry is highly lacunar, since Euclid has not given the fundamental concepts and definitions for a true and complete foundation of mathematical science.[90] These concepts are *topological*: simultaneity ('simul'), which has specific applications for space and time; term ('terminus'), which indicates the topological limit of a form or a process; contiguity ('contiguitas') which indicates that the terms of two geometrical forms are joined together and continuity ('continuitas') that these terms are identical; succession ('successivum') which indicate an order; dimension ('dimensio') which indicates the possibility of reduction of a spatial body; position ('positio') and movement ('motus'), as the spatial and timely transition which excludes fixed position; etc. These concepts determine the *very* essence of mathematical objects. All these concepts come from Aristotle's *Physics* and *Metaphysics*: this is a list of fundamental definitions by which Aristotle elaborates his description of physical structures and processes, and Bacon holds that these definitions are the primary foundations of Euclidian geometry[91]. These definitions do not appear in mathematical treatises, because the mathematician doesn't need to know them for the study and practice of geometry. They belong to metaphysics – to the *metaphysics of the continuous matter*.[92] This is what Bacon indicates at the beginning of the *Communia mathematica*: he wants to reveal the metaphysical roots of mathematics – "*Cupiens igitur mathematicam tractare infra radices metaphysice...*".[93]

is why it is subordinate to it in the ranking of nature. But because, according to the opinion of all mathematicians, mathematics deals with other things which do not only extend to this science and are even more important than the things dealt with in *perspectiva*, mathematics is dealt with before the science of perspective, but is immediately subordinate to it in the rank of worthiness and comes later in our understanding." Geometrical intuition is 'abstracted' from experience of natural forms.

[89] *CM*, 19-23.

[90] *CM*, 23: "Et tamen omnes auctores hec omiserunt, sicut Euclides qui incipit a diffinitione puncti, omittens omnia que prescripsi, cum tamen hec naturaliter precedant in ordine discipline."

[91] It seems therefore that Roger Bacon was aware (at least by a general intuition) of the incompleteness of Euclidian axiomatics regarding continuity. On this question see Vincenzo de Risi, "Did Euclid Prove Elements I, 1? The Early Modern Debate on Intersections and Continuity", in *Reading Mathematics in the Early Modern Europe. Studies in the Production, Collection, and Use of Mathematical Books*, ed. P. Beeley, Y. Nasifoglu, B. Wardhaugh, London, Routledge 2020, 12-32. I am very grateful to Paolo Mancosu for this remark and reference.

[92] *CM*, 19: "Quantitatis autem species non possunt haberi nisi premittantur quedam diffiniciones communes necessarie ad intellectum diffinicionum quantitatum. Et sumo hic diffinicionem largo modo, prout sub ea comprehenditur descripcio,quia mathematicus non curat semper observare proprietatem diffinicionis – hoc enim magis ad methaphysicum pertinet."

[93] *CM*, 13: "Cupiens igitur mathematicam tractare infra radices methaphysice sicut feci logicam quam immediate sequitur mathematica, volo sicut debeo ut in pluribus abstinere a demonstracione eorum que verificavi in alia sciencia communi, licet multa ibi verificata que mathematice valent, recitabo per modum narracionis secundum quod congruit mathematice, et aliquando, licet raro, afferam probaciones aliquas methaphysicas, scilicet in casibus certis quando magna necessitas erit,

(C) At last, a passage from the *Opus maius* confirms this view. This metaphysical point of view on mathematical knowledge is applied in the specific case of the demonstration of the continuous unity of prime matter. In this passage, Bacon aims at refuting by "the power of geometry" any real distinction between mathematical and physical continuity by "pointing out the false geometric representations".[94]

> ...mathematical quantity and a physical quantity are the same regarding their being and their reality. They differ only in their point of view because a geometrician considers a physical line, but not insofar as it is physical matter; thus, it is called a mathematical line. A natural philosopher considers this same line as physical matter, as with iron, stone, or other natural matter. And because the same thing is physical and mathematical, according to its being and the reality of its existence, if this were thus one line or one body mathematically, then it would be one in the same way physically.[95]

The physical line and the mathematical line are the same: the difference is only of point of view. Therefore, the one who imagines that geometrical properties do not apply in physics, is simply imagining a false geometry, for geometry is nothing else than the science of matter's intrinsic properties. Bacon demonstrates, against the form of Aristotelian atomism imagined by Averroes, that it would simply contradict the fourteenth proposition of the first book of the *Elements*.[96]

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ne novitate nimia aliquid proponam sine sua racione cujus contrarium pro rato communiter celebratur. Sic enim quasi assumam officium methaphysici ut Aristoteles fecit in *Elenchorum* principio et *Physicorum* et alibi..." See *Geometria speculativa*, §32, ed. Molland, 289: "These things are said here for the sake of exposition according to the opinions of the commentators [of Euclid's *Elements*], although they must be treated otherwise in *Metaphysics* and it must be shown what should be held according to pure truth, supposing that, although these things be true, it is still necessary to speak more certainly of the matter."

[94] "The philosophers before Aristotle claimed that the world is a continuous body, as has been mentioned before, and this assumption results from the supposition of the unity of matter. This is why I explain this not by rejecting what has been rejected before, but by pointing out the false geometric representations, which I was able to resolve extremely successfully at this point, and of which I was also able to show how they must be corrected. Because the position of Democritus and Leucippus, who claimed that everything consists of indivisible atoms, confused Aristotle very much and still confuses the natural philosophers by their sophistry, I also completely destroy their view by the power of geometry. But since the arrangement of geometric bodies is a passion of matter, and since both theologians and philosophers carefully examine the geometric figure of the heavens and the fundamental areas of the world, and since this consideration is quite beautiful, I show all that is necessary at this point." *Epistola ad Clementem*, transl. N. Egel, chap.10, 168. On this subject, see Panti, "Natural Continuity and the Mathematical Proofs" (complete reference footnote 2).

[95] *Opus maius* IV, chap.9, transl. Dennis, 144.

[96] "If, however, in those joined bodies two lines are drawn from those points within the bodies, and one line falls to their extremities at right angles, it is necessary that lines extended in bodies would be one continuous line, according to Proposition XIV of the first book of Euclid's *Elements*. And thus it is also for the bodies, for such is the conclusion of that proposition" (*Opus maius* IV, chap.9, transl. Dennis, 144).

These pages of the *Opus maius*, the *Communia mathematica* and the *Geometria speculativa* are of the utmost importance, because they provide strong arguments for refuting the interpretation according to which mathematical physics in Roger Bacon is nothing but a baroque (and sterile) mixture of Euclidian mathematics and Aristotelian physics. Bacon considers speculative geometry as the science of the intrinsic structure of matter in general (without any distinction, at this level, between sublunary or celestial matter). Bacon's claim that all sciences (including theology) require mathematics endows mathematics a metaphysical status. The mathematical (topological, structural, and dynamic) properties of matter are universal. This scheme, presented in the introduction of the *Communia mathematica*, is not Pythagorean nor Platonic. It seems to me (but this question would need extended attention) that the way Bacon identifies mathematical and metaphysical structures of matter fits much more with some views of modern mathematicians on the topological foundations of Aristotle's physics.[97]

Conclusions

Roger Bacon has always taken for granted Aristotle's axiom according to which our universal knowledge comes from sensory experience, and that numbers and figures have no real existence apart from the sensible substances from which they are abstracted. However, in his mature writings (especially in the *Perspectiva*) Bacon completely abandons the classical psychology of abstraction, and it is even doubtful that he ever really adopted such a theory. Instead, the *Perspectiva* presents a convincing model of the formation of perceptual concepts (colors, forms, spatial relations) on the basis of repeated and varied situations and experiences, by the action of the internal senses. At the psychological level, space appears as a fictional construct: The spatial properties (distance, size, depth, etc.) are formed as perceptive representations by the action of common sense, imagination, and memory. Moreover, the spontaneous logical reasoning at work in perception of confused particularities produces a first discrimination of the visual forms, which will be later consciously and clearly distinguished and reconstructed *rationaliter* in the geometrical demonstrations. One can call this complex construction a "theory of abstraction" if he wants to, but it has nothing to do with the schemes usually so labeled in medieval theories.

In the *Opus maius* and the *Opus tertium*, Roger Bacon holds that quantity is the first and natural object of human's intellect. This thesis comes from an original reading of a passage of Aristotle's *On Memory and Reminiscence:* human's intellect in the present state, is immersed in the sensible world, and has a direct intuition of the mathematical forms of time and space, so that the forms of quantity "belong to the intellect" and our

[97] See René Thom, *Esquisse d'une sémiophysique. Physique aristotélicienne et théorie des catastrophes* (Inter Editions, 1988); translated into English by Vendla Meyers, *Semiophysics: A Sketch*, *Aristotelian Physics and Catastrophe Theory* (Redwood City, California: Addison-Wesley, 1990).

intellectual knowledge of these forms is "almost innate". This is not a platonic psychology of knowledge of ideal objects, but an original view about the way human's intellect forms abstract concepts from his intuitive experience of the physical world. The introduction of the *Communia mathematica* presents the metaphysical side of this theory: the reduction of Euclidian geometry to the elementary concepts of physics (continuity, succession, position, movement, etc.). Immersed in the physical world, the intellect is therefore immersed in these intuitive structures as well.

It seems therefore that Bacon considered mathematical understanding as a mode of perception of the structure of the physical world. This universal structure is at the same time also the real nature of the world; this is Bacon's realism. According to the *Geometria speculativa*, nature produces ideal structures. Light produces perfect lines, planetary motions perfect curves. Therefore, 'abstracting' means having the intellectual perception of the ideal (metaphysical) intrinsic structure of the physical world. But the most efficient way for this perception of the 'abstract' structure is experimentation; in the case of optics, the laws of geometry become *visible* for the intellect at the level of sensory experience when an experimental apparatus makes them *appear*.

One of the most evident sources of this idea appears to be Alkindi's introduction to optics in the first pages of his *De aspectibus*.[98] For optics is a physical science, in which geometrical properties are to be *demonstrated* by the physical properties of visual or light rays. This is the reason why Euclid was wrong in his presentation of the laws of optics: he thought he could simply postulate ideal geometrical laws, in a Platonic manner, without demonstrating them at the level of physical experience.[99] But the optician must demonstrate the primary geometrical laws of vision, such as the rectilinear propagation of rays, by the experimental apparatus which make them *appear* at the level of direct observation, so that physics will perform geometry. This way of considering the *verification* and *realization* of geometry by natural experimentation is the key to Alhazen's and Bacon's mathematical physics.

It is clear, therefore, that David Lindberg was right in claiming that Bacon was neither a Platonist nor Aristotelian on the question of applicability of mathematics to nature.[100] The idea of the natural multiplication of forces "according to the laws of

[98] Al-Kindi, *L'optique et la Catoptrique*, edited by R. Rashed (Œuvres Philosophiques et Scientifiques d'Al-Kindi, vol.1; Islamic Philosophy Theology and Science. Texts and Studies. Vol. 29) (Leiden: E. J. Brill, 1997) – *Liber Jacob Alkindi De causis diversitatum aspectus et dandis demonstrationibus geometris super eas*, 439-523.

[99] See David C. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago and London: The University of Chicago Press, 1976), 18-22; Smith, *From Sight to Light*, 166-169.

[100] Lindberg, "On the Applicability of Mathematics to Nature", 24: "Where did Bacon fall on the Platonist-Aristotelian spectrum of opinion regarding the applicability of mathematics to nature, and what did he contribute to the debate? Strictly speaking, Bacon was neither Platonist nor Aristotelian on this question. When we have cut through the rhetoric, it seems clear that Bacon

geometry", which is the most important application of mathematics to physics for Bacon, never appears in Plato nor in Aristotle. It rather comes from Grosseteste and Alkindi. A Platonist would claim that the very essence of things is the ideal figure or ideal number separated as an object of intuition from sensory matter, from movement and real action. An Aristotelian would claim that mathematical forms are mental representations abstracted from sensory matter, real motion and action. Something very different is said by Alkindi, Alhazen, Grosseteste and Bacon, namely, that physical agents *act* according to the laws of geometry. Properly speaking, geometry is not 'applied' in physics; physics performs geometry, and therefore demonstrates its power and efficiency.

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granted mathematics a considerably larger role in physics that did Aristotle, but that he fell short of the Platonic reduction of physics to mathematics."

KNOWLEDGE AND POWER: COURTLY SCIENCE AND POLITICAL UTILITY IN THE WORK OF ROGER BACON*

CONOCIMIENTO Y PODER: CIENCIA EN LA CORTE Y UTILIDAD POLÍTICA EN LA OBRA DE ROGER BACON

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Abstract

In his major works for the pope, as well as several other works from his maturity, Bacon focused on the utility of natural knowledge, both in terms of human know-how and what that know-how could produce. He looked to the courtly sciences (such as medicine, astral science, optics, and material science), which privilege application and knowledge gained through the sensorium, as sources of natural knowledge and as exemplars for the potential of natural knowledge. This essay argues that Roger Bacon's work ought to be understood within the context of the court. Bacon's emphasis on devices in the pursuit of knowledge and utility demonstrates the extent to which the courtly sciences (such as engineering, navigation, alchemy, and divination) were valued alongside traditional natural philosophical frameworks, and need to be understood in that context. Both the courtly sciences and Bacon's theory of *scientia experimentalis* focus on materials, sensory knowledge, and knowledge of particulars in pursuit of applied ends. Bacon drew inspiration from the courtly sciences in theorizing how natural knowledge could serve ruling power. By examining Bacon's major works on *scientia experimentalis* and analyzing his reliance on examples from the history of Alexander the Great, this essay demonstrates the interrelation of political power and erudite knowledge, and how they intersected through the cultivation and application of *experimentum* and technology. Finally, Bacon's interest in the utility of knowledge suggests that courtly settings in this period are significant locations for the development and applications of natural knowledge.

Keywords

Courtly Sciences; *Scientia experimentalis*; Technology; Alexander the Great; Political Power

Resumen

En sus principales trabajos para el Papa, así como en ciertas obras de madurez, Bacon se centró en la utilidad del conocimiento natural, tanto en términos de saber práctico humano como de lo que

ese saber podía producir. Miró a las ciencias practicadas en la corte (como la medicina, la ciencia astral, la óptica y la ciencia de la materia), que privilegian la aplicación y el conocimiento obtenido a través de los sentidos, como fuentes de conocimiento natural y como ejemplos del potencial del conocimiento de la naturaleza. Este ensayo sostiene que la obra de Roger Bacon debe entenderse en el contexto de la corte. El énfasis de Bacon en los dispositivos para la búsqueda del conocimiento y la utilidad demuestra hasta qué punto las ciencias desarrolladas en la corte (la ingeniería, la navegación, la alquimia y la adivinación) se valoraban junto a distintos ámbitos filosóficos tradicionales sobre la naturaleza, y es en este contexto en el que deben ser entendidos. Tanto las ciencias desarrolladas en la corte como la teoría de Bacon sobre la *scientia experimentalis* se centran en los materiales, el conocimiento sensorial y el conocimiento que persigue fines aplicados de hechos concretos. Bacon se inspiró en las ciencias desarrolladas en la corte para teorizar cómo el conocimiento natural podía servir al poder gobernante. Examinando las principales obras de Bacon sobre la *scientia experimentalis* y analizando cómo recurre a ejemplos de la historia de Alejandro Magno, este ensayo demuestra la interrelación entre el poder político y el conocimiento erudito, y cómo se entrecruzan practicando y aplicando el *experimentum* y la tecnología. Por último, el interés de Bacon por la utilidad del conocimiento sugiere que los escenarios cortesanos de este periodo son lugares significativos para el desarrollo y las aplicaciones del conocimiento natural.

Palabras clave

Ciencias desarrolladas en la corte; *Scientia experimentalis*; Tecnología; Alejandro Magno; Poder político

> "The extraordinary advantage in this world from these three sciences, against the enemies of the faithful of the Church, is obvious; her enemies should be completely destroyed by the efforts of enlightened wisdom, rather than engaged with soldiers' weapons".[1]

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[1] Roger Bacon, *Opus Maius*, edited by J. H. Bridges, 3 vols. (Oxford: Clarendon Press, 1897-1900), 6.12, II, 221: "Et jam ex istis scientiis tribus patet mirabilis utilitas in hoc mundo pro ecclesia Dei contra inimicos fidei, destruendos magis per opera sapientiae, quam per arma pugnatorum..."

Roger Bacon (ca. 1214-1292) wrote these words in a treatise he sent to Pope Clement IV on the educational reforms necessary to strengthen and protect Christendom. The "efforts of enlightened wisdom" (*opera sapientiae*) resulting from the three sciences are the forms of knowledge, inventions, and capabilities for discernment made possible by mastery of *scientia experimentalis*, which was Bacon's term for a new branch of knowledge that offered a route to greater knowledge of God and temporal domination.[2] In his major philosophical works for the pope, as well as several other works from his maturity, Bacon focused on the utility of natural knowledge, both in terms of human know-how and what that know-how could produce.[3] He looked to the courtly sciences (such as medicine, astral science, optics, and material science), which privilege application and knowledge gained through the sensorium, as sources of natural knowledge and as exemplars for the potential of *scientia experimentalis*. Bacon argued that sense experience was critical to understanding the natural world, and he articulated a theory of knowledge that relied on experience to affirm theoretical or text-based knowledge, and on instruments or devices to help gain greater insight into natural knowledge.[4] Furthermore, he maintained that

[2] *Scientia experimentalis* has often been misleadingly translated as "experimental science", suggesting a false equivalency between Bacon's theory of knowledge acquisition and the later theory of experimental science that developed in the seventeenth century. Therefore, in order to avoid similar confusion, I prefer to retain the original Latin.

[3] Many of Bacon's works do not exist in critical editions, in part due to his habit of writing multiple drafts and re-purposing his work under multiple titles, which makes manuscripts of his work difficult to organize. See A. G. Little, "Roger Bacon's Works with References to the MSS, and Printed Editions", in *Roger Bacon: Essays Contributed by Various Writers on the Occasion of the Commemoration of the Seventh Centenary of his Birth*, edited by A. G. Little (Oxford: Clarendon Press, 1914), 375-425; Jeremiah Hackett, "Roger Bacon: His Life, Career, and Works", in *Roger Bacon and the Sciences: Commemorative Essays*, edited by J. Hackett (Leiden: E J. Brill, 1997), 9-23; Amanda Power, *Roger Bacon and the Defence of Christendom* (Cambridge: Cambridge University Press, 2011), 11-12. The following editions, however imperfect, are in standard use. Bacon, *Opus maius*, ed. Bridges; *Opus minus*, in *Fr. Rogeri Bacon Opera Quaedam Hactenus Inedita*, edited by J. S. Brewer (London: Longman and Green, 1859), 313-389; *Opus tertium*, in *Fr. Rogeri Bacon Opera*, 3-310; *Opus tertium*, in *Part of the Opus tertium of Roger Bacon, including a fragment now printed for the first time*, edited by A. G. Little (Aberdeen: University Press, 1912), and in *Un fragment inédit de l'Opus tertium précédé d'une étude sur ce fragment*, edited by P. Duhem (Quaracchi: Collegii S. Bonaventurae, 1909), and in *Opus tertium*, edited and translated by N. Egel (Hamburg: Felix Meiner, 2020). The standard English translation of *Opus maius*, by R. B. Burke, 3 vols. (Philadelphia: University of Pennsylvania Press, 1928) can be misleading; he offers "science" for *scientia* and "experimental" for *experimentalis*. More recently (and only partially), see *Ruggero Bacone, Filosofia, scienza, teologia dall'Opus maius*, translated by V. Sorge and F. Seller (Rome: Armando, 2010); *Ruggero Bacone, La scienza sperimentale Lettera a Clemente IV—La scienza sperimentali—I segreti dell'arte e della natura*, translated by F. Bottin (Milan: Rusconi, 1990). Bacon's letter to Pope Clement IV is found in *Epistola Fratris Rogeri Baconi,* edited and translated by E. Bettoni, *Lettera a Clemente IV* (Milan: Biblioteca Francescana Provinciale, 1964).

[4] The importance of sensory knowledge to the development of natural knowledge and technology in slightly later periods is well-documented by a number of excellent studies, among them Pamela O. Long, *Openness, Secrecy, and Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance* (Baltimore: Johns Hopkins University Press, 2001) and Pamela Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2006).

such knowledge was practically useful. The insights into nature gained through mastery of *scientia experimentalis* could allow the pious Christian attain a greater understanding of divine wisdom and, therefore, closer union with God. Not only could *scientia experimentalis* help strengthen Christendom morally (by fostering a deeper connection with God), it could be used to intervene in the natural order to strengthen Christendom politically.

Understood as knowledge gained through the sensorium, *scientia experimentalis* offers a blueprint for how inherent human ingenuity could harness the hidden, untapped potential of nature. *Scientia experimentalis* encompasses three purposes, or prerogatives: first, to test and confirm theoretical knowledge; second, to create instruments or machines to pursue knowledge; and finally, to uncover the secrets of nature and unite all knowledge into a single, comprehensible strand. According Bacon, other than moral philosophy *scientia experimentalis* effectuates the most important step toward *sapientia* (by which he meant both ecstatic communion with God and the state of learned wisdom that could be harnessed to serve Christianity). Furthermore, devices and instruments are equally important to epistemology as to affairs of state. Instruments, devices, and processes are central to *scientia experimentalis*; they are both engine that drives the acquisition of new knowledge and the result of that knowledge. Some, like optical devices, give rise to new information and new knowledge; others, like flying machines or magnetic weapons, enable the pursuit of new knowledge or political utility. Additionally, by fostering a deep and thorough understanding of nature and her capabilities, *scientia experimentalis* could help ratify theoretical knowledge and conclusions reached through logical reasoning (*argumentum*), test received wisdom, explicate Scripture, and banish superstition and error.

Bacon's works on natural philosophy have been the subject of sustained scholarly interest within a number of subfields. Scholarship in the history of science and history of philosophy has established Bacon's capacious interest in natural knowledge, contextualized his ideas in the context of contemporary Latin philosophy, and examined his philosophical methods, including *scientia experimentalis.*[5] As Bacon wrote his most

However, these works are concerned with the development of experimental philosophy in the early modern period, not with experiential knowledge in the medieval period.

[5] The bibliography on this aspect of Bacon's work is vast. For a start, see Hackett, *Roger Bacon and the Sciences*; Jeremiah Hackett, "Roger Bacon's Concept of Experience: A New Beginning in Medieval Philosophy?", *The Modern Schoolman* 86 (2008/09): 123-146; Jeremiah Hackett, "*Ego Expertus Sum*: Roger Bacon's Science and the Origins of Empiricism", in *Expertus sum. L'expèrience par les sens dans la philosophie naturelle médiévale*. Actes du colloque international de Pont-à-Mousson, 5-7 février 2009, edited by T. Bénatouïl and I. Draelants (Florence: SISMEL-Edizioni del Galluzo, 2011), 145-173; *Roger Bacon's Communia Naturalium: A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Florence: SISMEL-Edizioni del Galluzzo, 2014); Yael Kedar, "The Intellect Naturalized: Roger Bacon on the Existence of Corporeal Species within the Intellect", *Early Science and Medicine* 14 (2009): 131-157; *The Philosophy and Science of Roger Bacon: Studies in Honor of Jeremiah Hackett*, edited by N. Polloni and Y. Kedar (London: Routledge, 2021).

important works after he had joined the Franciscan Order, both he and his works have also been appraised within that institutional and intellectual milieu.[6]

Given his intellectual ties to both Oxford and Paris, and later to the Franciscan Order, Bacon has been well established within the contexts of both the classroom and the cloister. I argue here that he ought to be understood also within the context of the court, attentive to matters of rulership and the applications of natural knowledge in the service of Christian leadership. Bacon's emphasis on devices in the pursuit of knowledge and utility demonstrates the extent to which the courtly sciences (such as engineering, navigation, alchemy, and divination) were valued alongside traditional natural philosophical frameworks, and need to be understood in that context. Even though, unlike Alcuin of York or Michael Scot, Bacon was not formally in service of any particular ruler, he was deeply concerned with the educational curriculum and the possibilities that natural knowledge provided. I begin by articulating how *scientia experimentalis* was central to Bacon's agenda of epistemic reform. Both the courtly sciences and *scientia experimentalis* focus on materials, sensory knowledge (*experimentum*), and knowledge of particulars in pursuit of applied ends. I then outline how Bacon drew inspiration from the courtly sciences in his theory of *scientia experimentalis* and also how this theory served ruling power. Bacon's program found expression at the request of Pope Clement IV, who held both spiritual and temporal authority. In his three major works, *Opus maius, Opus minus,* and *Opus tertium* (ca. 1265-68), Bacon outlined the major educational reforms necessary to strengthen Christendom morally and politically. In a shorter work attributed to him from about a decade later, *Letter on the Hidden Powers of Art and Nature, and on the Invalidity of Magic* (*Epistola de secretis operibus*), Bacon elaborated further on the possibilities of creating machines and devices for knowledge-acquisition, defense, and domination that *scientia experimentalis* provides.[7] I then analyze Bacon's reliance on examples from the history of

[6] Zachary Matus, *Franciscans and the Elixir of Life: Religion and Science in the Later Middle Ages* (Philadelphia: University of Pennsylvania Press, 2017); Power, *Roger Bacon*; Amanda Power, "Going among the Infidels: The Medicant Orders and Louis IX's First Mediterranean Campaign", *Mediterranean Historical Review* 25 (2010): 187-202; Amanda Power, "Franciscan Advice to the Papacy in the Middle Ages", *History Compass* 5 (2007): 1550-1575.

[7] Bacon, *Epistola de secretis*, in *Fr. Rogeri Bacon Opera*, ed. Brewer, 523-51; *Frier Bacon: His Discovery of the Miracles of Art, Nature, and Magick. Faithfully translated out of Dr. Dees own Copy, by T. M. and never before in English* (London, 1659). This text has not always been accepted as a genuine work of Bacon's, due largely to the fact that the work, as it exists now, contains material in the later chapters that seem very different from the tenor and style of Bacon's other works. However, more recent scholarship suggests that the first eight chapters of this work, which closely echo some of the material found elsewhere in Bacon's earlier works, are by Roger Bacon, and there is additional compelling evidence to suggest that the final three chapters, the authenticity of which have been called into question, are also by Roger Bacon. See William Newman, "The Philosophers' Egg: Theory and Practice in the Alchemy of Roger Bacon", *Micrologus* 3 (1995): 75-101; Dorothea W. Singer, "Alchemical Writings Attributed to Roger Bacon", *Speculum* 7 (1932): 80-86; Meagan S. Allen, *Roger Bacon's Medical Alchemy: Medieval Pharmacology and the* Prologatio Vitae, Ph.D. dissertation (Indiana University, June 2021), Appendix I.

Alexander the Great to illustrate the potential of learned natural knowledge combined with experience for moral and politically effective leadership. Bacon repeatedly invoked examples from the history of Alexander the Great and his tutor, Aristotle, drawn from the pseudo-Aristotelian *Secret of Secrets* (*Secretum secretorum*) as well as the corpus of Latin and European vernacular literature on Alexander. In doing so, as I demonstrate, he explored the interrelation of political power and erudite knowledge, and how they intersected through the cultivation and application of *experimentum* and technology. Finally, I consider how Bacon's interest in the utility of knowledge suggests that courtly settings in this period are significant locations for the development and applications of natural knowledge. In examining Bacon's work on *scientia experimentalis* it becomes apparent that medieval science was not only, or even mainly, scholastic, and instead encompassed sources of knowledge other than texts and settings beyond the classroom or the cloister, from individuals of different social registers and in settings that privileged use and the exercise of temporal power.

Scientia experimentalis

Bacon articulated *scientia experimentalis* – the branch of learning that involves active participation in the natural world, and the utility of that knowledge – in his major *opera, Opus maius, Opus minus,* and *Opus tertium*. It was in these texts, addressed to Pope Clement IV and written at his request, that Bacon introduced and outlined *scientia experimentalis* in the context of a major educational reform of the university curriculum in the service of buttressing Latin Christianity. Bacon's goal was to convince the pope of the importance of learning foreign languages, natural philosophy, and applied natural knowledge – alongside Christian moral philosophy and ethics – in the service of defending Christendom from external threats, like the Mongols, and internal threats, like heresy.[8]

Scientia experimentalis (knowledge gained from observation or other sensory perception), according to Bacon, could confirm and also correct rationality (reasoning from first principles or knowledge gained from texts) and is necessary to reach a full understanding of natural phenomena. Bacon expressed his frustration that the masters at Paris and Oxford emphasized reasoning from *argumentum* over *experimentum* and argued that this was just one reason that the university curricula needed reform.[9] In the medieval period *experimentum* and *experientia* were often used interchangeably to connote a sense of active participation in knowing the world, one which encompassed proof and trial, but also included experience and knowledge gained through the senses.[10] Medieval

[8] *Epistola Fratris Rogerii Baconi*, ed. Bettoni, 70-72. The Mongol invasions of 1240-42 left many in Latin Christendom shaken and were believed by many, including Bacon, to presage the arrival of the Antichrist; Peter Jackson, *The Mongols and the West, 1221-1410*, 2nd ed. (London: Routledge, 2018), 142-153; Power, *Roger Bacon*, 40-42.

[8] Bacon, *Opus maius* 6.2, ed. Bridges, II, 172.

[10] Although these words were usually used interchangeably, *experientia* was sometimes used to suggest a more limited way of knowing (experience of singular events), while *experimentum* could

writers in many different periods and genres mention the importance of different tests to demonstrate, for example, the purity of a natural substance.[11] As the lynchpin to his proposal of educational reform Bacon argued for a method to natural philosophy that looked to experience equally as to causes and syllogisms, and that would yield useful knowledge. This branch of knowledge could help teach the literal meaning of natural things; next to moral philosophy (the section that concludes *Opus maius* and immediately follows the section on *scientia experimentalis*) it is the most useful for teaching an understanding of theology. It is also a critical step toward *sapientia*, which, within the Franciscan tradition, referred to the prelapsarian state of total communion with God. This state of being could be partially restored through years of careful study and self-mastery and directed in the service of faithful Christians.[12] And, Bacon argued, *scientia experimentals* could be used to forward the goals of Christian nations, as it could both impart useful natural knowledge and enable the creation of engines of war, such as burning mirrors, and engines of statecraft, such as tools for navigation.[13]

The first dignity of *scientia experimentalis* concerns different ways of knowing things. Bacon recognized divine illumination as a source of knowledge, and attributed the wisdom of the first patriarchs and prophets to direct inspiration from God. Echoing pseudo-Ptolemy, Bacon asserted there are two ways of knowing things: experience of philosophy and divine inspiration (the latter is the best and surest way).[14] Leaving aside divine illumination, however, there are two ways of knowing about nature: rationality (*argumentum*) and sense experience (*experimentum*). But relying purely on rationality may still leave room for doubt; *argumentum* does not always provide certainty, nor can it account for particular or irregular phenomena.

> *Argumentum* draws a conclusion and makes us concede the conclusion, but does not make the conclusion certain, nor does it remove doubt so that the mind may rest in the understanding of the truth, unless the mind discovers it by way of experience... For if a man who has never seen fire should prove by a sufficient syllogism that fire burns and

sometimes be used to suggest the grasp of the principle behind particular or singular events. See Hackett, "Roger Bacon's Concept of Experience", 127.

[11] For example, Isidore of Seville on testing balsam for purity, *Etymologiarum*, edited by W. Lindsay, 2 vols. (Oxford: Clarendon Press, 1911), 17.8.14; see also E. R. Truitt, "The Virtues of Balm in Late Medieval Literature", *Early Science and Medicine* 14 (2009): 711-736, esp. 718-724; Michael McVaugh, "Determining a Drug's Properties: Medieval Experimental Protocols", *Bulletin of the History of Medicine* 91 (2017): 183-209.

[12] Bacon, *Opus maius* 6.12, ed. Brewer, II, 219-20. See also Hackett, "Roger Bacon on *Scientia Experimentalis*", 277-316, 310; Power, *Roger Bacon*, 52-56.

[13] Bacon, *Opus maius* 6.12, ed. Bridges, II, 221.

[14] Bacon, *Opus maius* 6.1, ed. Brewer, II, 169-70. This is an echo of the Augustinian doctrine of illumination, as well as al-Kindi's assertion that the search for scientific truth and morality were connected. See Thérèse-Anne Druart, "Al-Kindi's Ethics", *Review of Metaphysics* 47 (1993): 329-57; Hackett, "Roger Bacon on *Scientia Experimentalis*", 285. On Bacon and the concept of *sapientia* and its place within Franciscan attitudes to knowledge and education, see Power, *Roger Bacon*, 55-58; 144-152.

> injures things and destroys them, his mind would not be satisfied, nor would he avoid fire, until he placed his hand or some combustible substance in the fire, so that through experience he might prove that which reasoning taught. But when he has had actual experience of combustion his mind is made certain and rests in the fullness of truth. Therefore, *argumentum* does not suffice, but *experientia* does.[15]

Bacon here offers a critique of purely syllogistic thinking: without both *argumentum* and *experimentum* certainty is impossible. He then clarifies Aristotle on the importance of knowledge through experience:

> Thus, when Aristotle said that proof is a syllogism that makes us know, this is understood as proof accompanied by experience, and not of the bare proof itself. As he said in the first book of the Metaphysics, it is said that those who know through experience both the reason and the cause are wiser than those who know something through experience and know only the bare truth without the cause. But here I speak of he who knows through trial both reasoning and cause. And these men are perfect in their wisdom...[16]

Bacon drew on the Aristotelian distinction between knowledge of a fact (*quia*) and knowledge of the cause of a fact (*propter quid*); the latter, according to Bacon, is knowledge gained with the additional benefit *per experientiam*.[17] He then went on to use the rainbow as an example: Because it is found in multiple guises and settings in nature it must be investigated via experience, rather than through *argumentum* alone.[18]

Bacon was the only of his contemporaries to devote so much thought and time to theorizing and explicating *scientia experimentalis*, but he was one of many to use

[15] Bacon, *Opus maius* 6.1, ed. Bridges, II, 167-168: "Argumentum concludit et facit nos concedere conclusionem, sed non certificat neque removet dubitationem ut quiescat animus in intuit veritatis, nisi eam inveniat via experientiae [...] Si enim aliquis homo qui nunquam vidit ignem probavit per argumenta sufficientia quod ignis comburit et laedit res et destruit, nunquam propter hoc quiesceret animus audientis, nec ignem vitaret antequam poneret manum vel rem combustibilem ad ignem, ut per experientiam probaret quod argumentum edocebat. Sed assumpta experientia combustionis certificatur animus et quiescit in fulgore veritatis. Ergo argumentum non sufficit, sed experientia."

[16] Bacon, *Opus maius* 6.1, ed. Bridges, II, 168: "Quod ergo dicit Aristoteles quod demonstratio syllogismus est faciens scire, intelligendum est si experientia comietur, et non de nuda demonstratione. Quod etiam dicit sapientiores expertis, loquitur de expertis qui solum noscunt nudam veritatem sine causa. Sed hic loquor de expert, qui rationem et causam novit per experientiam. Et hi sunt perfecti in sapientia."

[17] Bacon, *Opus maius*, 6.1, ed. Bridges, II, 167.

[18] Bacon, *Opus maius*, 6.2, ed. Bridges, II, 172-174, although he continues discussing the rainbow over the next ten chapters, as well. Bacon's discussion of the rainbow has invited significant scholarly examination; in particular, see David Lindberg, "Roger Bacon's Theory of the Rainbow: Progress or Regress?", *Isis* 57 (1966): 236-249; David Lindberg, "Lines of Influence in Thirteenth-Century Optics: Bacon, Witelo, and Pecham", *Speculum* 46 (1971): 66-83.

experimentum/experientia and to argue for its importance.[19] Bacon cited ancient antecedents as well as medieval Latin and Arabic adherents.[20] Furthermore, he was part of a robust community of scholars concentrated around Paris and Oxford that explored the role of marvelous particulars and accumulated experience (*empireia*) in Latin natural philosophy. Bacon found the work of Robert Grosseteste (ca. 1168-1253), generative for his own thinking, particularly the latter's emphasis on *experimentum* in understanding natural phenomena, such as comets and the rainbow.[21] Grosseteste's work circulated in Paris in the 1230s and 1240s while Bacon was living there, and Bacon also drew heavily on Grosseteste's commentary on Aristotle's *Posterior Analytics* when he lectured on the subject as part of the arts curriculum at the university in Paris in the 1240s.[22] Others with ties to Oxford and Paris shared Bacon's interest in *experientia.* William of Auvergne (ca. 1180-1249) was bishop of Paris (and therefore head of the university) while Bacon was there. William, a master of theology before becoming bishop, wrote extensively on natural philosophy and natural particulars, and stressed the importance of *experimentum* in understanding preternatural and non-manifest natural phenomena.[23]

Bacon also read Latin translations of Arabic texts on instruments and experience, and this engagement shaped his thinking about the role of *scientia experimentalis*. In addition to his engagement with al-Kindi's (ca. 800-870 AD/ 185-256 AH, Alkindus in Latin) work on mathematics, optics, and astral science,[24] Bacon was one of the first natural

[19] Much of the scholarship on *scientia experimentalis* within the history of science has focused on how Bacon's ideas relate to the development of experimental philosophy in the seventeenth and eighteenth centuries. See, for example, Alastair C. Crombie, *Robert Grosseteste and the Origins of Experimental Science, 1100-1700* (Oxford: Oxford University Press, 1953). For a clear sense of how Bacon's ideas were very much characteristic of interest in *experimentum* in the Latin Christian West in the second half of the thirteenth, see Lynn Thorndike, Jr., "Roger Bacon and the Experimental Method in the Middle Ages", *Philosophical Review* 23 (1914): 271-298.

[20] Bacon, *Opus maius*, 4.4.16, ed. Bridges, II, 253 (Ptolemy); 5.1.1, II, 419 (Aristotle); 6.1, II, 585 (Pliny); see also Hackett, "*Ego Expertus Sum*"; Steven J. Williams, "Roger Bacon in Context: Empiricism in the High Middle Ages", in *Expertus sum*, 123-144, 131.

[21] Robert Grosseteste, *De cometis*, edited by L. Baur, *Die philosophischen Werke des Robert Grosseteste, Bischofs von Lincoln* (Munster: Aschendorf, 1912); Grosseteste, *Commentarius in Posteriorum Analyticorum Libro*, edited by P. Rossi (Florence: Olschki, 1981); Bacon on Grosseteste, *CSP*, in *Fr. Rogeri Bacon Opera*, ed. Brewer, 394-519, 469; Crombie, *Robert Grosseteste*, 62-74; Hackett, "Roger Bacon and *Scientia Experimentalis*", 287; Williams, "Roger Bacon in Context", 127-128.

[22] Jeremiah Hackett, "*Scientia experimentalis*: from Robert Grosseteste to Roger Bacon", in *Robert Grosseteste: New Perspectives on His Thought and Scholarship*, edited by J. McEvoy (Turnhout: Brepols, 1995), 89-119, 107-109; Cecilia Panti, "The Theological Use of Science in Robert Grosseteste and Adam Marsh According to Roger Bacon: The Case Study of the Rainbow", in *Robert Grosseteste and the Pursuit of Religious and Scientific Learning in the Middle Ages*, edited by J. Cunningham and M. Hocknull (Stuttgart: Springer, 2016), 143-163, esp. 145-151.

[23] William of Auvergne, *De universo*, 2.3.23, edited by P. Aubouin, *Opera omnia*, 2 vols. (Paris, 1674), I, 1065, col. 1. See also Antonella Sannino, "Guillaume d'Auvergne e i *libri experimentorum*", in *Expertus sum*, 67-88.

[24] Two of these works, *De aspectibus* and *De radiis*, are extant only in their Latin versions. Al-Kindi, *De radiis*, edited by M.-T. d'Alverny and F. Hudry (Paris: J. Vrin, 1975); see also Faye Getz, "Roger Bacon

philosophers of the thirteenth century to take up Ibn al-Haytham's (Alhacen) work on optics, *Kitab al-Manaḍir* (ca. 1030 AD/421 AH).[25] In this work, translated into Latin in the first half of the thirteenth century as *De aspectibus*, Ibn al-Haytham posited a theory of visual perception that would stand on mathematical, physical, and physiological grounds. Rather than the long-held theory of extromission (that we perceive objects because of the rays our eyes emit), he advanced a theory of intromission (that we perceive objects because they emit rays to the eye). His theory reconciled existing knowledge of the behavior of rays and angles (geometry) with the physiology of the eye and the perception of visual phenomena. His method proceeded from induction, mathematics, and demonstration, with the latter two methods necessary to confirm conclusions when induction or observation yielded insufficient grounds for certainty.[26] Therefore, he introduced a new concept that diverged from Aristotle's notion of *empeiria* (accumulated experience). *I'tibaar* (in Arabic, in Latin *experimentatio*) is a test to investigate physical properties directly with an apparatus designed for that purpose, in order to arrive at certainty or exactitude by subjecting an observation to artificially variable conditions.[27] For Ibn al-Haytham, *i'tibaar* is a process for confirming or disproving knowledge. Bacon grappled with Ibn al-Haytham's theory of intromission first in a brief work on visual perception and the emanation of force, *The Multiplication of Species* (*De multiplicatione specierum*, ca. 1266), and shortly after on a section of *Opus maius* on optics, which later

and Medicine", in *Roger Bacon and the Sciences: Commemorative Essays*, edited by J. Hackett (Leiden: E. J. Brill, 1997), 337-364, 353; David Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago: University of Chicago Press, 1976), 18-57.

[25] *De aspectibus* was, according to Bacon, taught only at Oxford before 1270, and only twice. Bacon, *Opus tertium*, ed. Brewer, 37: "Haec autem scientia non est adhuc lecta Parisius, nec apud Latinos, nisi bis Oxoniae in Anglia..." On the dating of *De aspectibus* to the 1240s, see A. Mark Smith, "Alhacen's Theory of Visual Perception: A Critical Edition, with English Translation and Commentary, of the First Three Books of Alhacen's 'De aspectibus', the Medieval Latin Version of Ibn al-Haytham's 'Kitāb al-Manāẓir': Volume One", *Transactions of the American Philosophical Society* 91/4 (2001): i-337. On Ibn al-Haytham's influence on the development of medieval Latin optics, see David Lindberg, "The Western Reception of Arabic Optics", in *The Encyclopedia of the History of Arabic Science*, edited by R. Rashed, 3 vols. (London: Routledge, 1996), II, 716-29; Lindberg, *Theories of Vision*, 58-86.

[26] Abdelhamid I. Sabra, "Ibn al-Haytham's Revolutionary Project in Optics: The Achievement and the Obstacle", in *The Enterprise of Science in Islam: New Perspectives*, edited by J. P. Hogendijk and A. I. Sabra (Cambridge, MA: Harvard University Press, 2003), 85-118; Smith, *Alhacen's Theory of Visual Perception*, xxviii-xxxii; Eilhard Wiedemann, "Zu Ibn al Haitams Optik", *Archiv für Geschichte der Naturwissenschaften und der Tecknik* 3 (1910/11): 1-53; Eilhard Wiedemann, "Arabische Studien über den Regenbogen", *Archiv für Geschichte der Naturwissenschaften und der Tecknik* 4 (1912/13): 453-460.

[27] Abdelhamid I. Sabra, *The Optics of Ibn al-Haytham: Books I-III On Direct Vision*, 2 vols. (London: The Warburg Institute, 1989) II, 18-19; Smith, *Alhacen's Theory of Visual Perception*, for example, I, 215. See also Hackett, "Roger Bacon on *Scientia Experimentalis*", 289-90; Graziella Federici Vescovini, "La Fortune de l'Optique d'Ibn Al-Haitham: Le livre *De aspectibus* (*Kitab al-manazir*) dans le moyen âge Latin", *Archives internationales d'histoire des sciences* 40 (1990): 220-238. On the earlier history of "experiment" in Arabic optics, see Elaheh Kheirandish, "Footprints of 'Experiment' in Early Arabic Optics", *Early Science and Medicine* 14 (2009): 79-104.

circulated as a stand-alone work (*Perspectiva*).[28] Bacon echoed Ibn al-Haytham's concept of *experimentatio* both in the idea of using *scientia experimentalis* as a way to confirm theories and the importance of specific instruments to do so. He also built on this concept, suggesting that *experimentatio* could be employed to discover new knowledge, as well.

Scientia experimentalis could also put received wisdom to the test. Bacon mentions several commonly held ideas about the natural world and disproves each, through experience. Diamonds can only be broken by goats' blood? No, "without that blood one can easily break a diamond. For I have seen this with my own eyes, and this is necessary, because gems cannot be carved except with fragments of this stone".[29] The beaver, when hunted for its musk glands, castrates itself in order to save its life? No, "the beaver has these glands under its breast, and both the male and female produce these glands".[30] Hot water in a container freeze more quickly than cold water in a container? No, even though "it is argued that contrary is excited by contrary, just as when enemies face off against each other. But it is certain that cold water freezes more quickly for anyone who makes the experiment".[31] *Scientia experimentalis* does not replace theoretical knowledge or knowledge drawn from first principles; however, it ratifies the knowledge found in authoritative texts and conveyed through syllogism and attests to the veracity of received wisdom.

Bacon wrote of his direct experience in testing commonly held beliefs and of the importance of using specific tests and instruments, but when direct observation and experience were not possible, he recognized the necessity of relying on the testimony of trustworthy and careful eyewitnesses. Aristotle could attest to more than Ptolemy regarding the regions of the world, because "Aristotle, on the authority of Alexander, sent two thousand men throughout different parts of the world to prove through experience

[28] Bacon's theory of *species* basically states that a force emanates from all objects; this emanation of force is what allows for visual perception of those objects. However, Bacon also allowed for extramission, believing that sensory perception is not passive. See David Lindberg, "Roger Bacon on Light, Vision and the Universal Emanation of Force", in *Roger Bacon and the Sciences*, 243-275, esp. 245-250; David Lindberg, *Roger Bacon and the Origins of Perspectiva in the Middle Ages: A Critical Edition and English Translation of Bacon's Perspectiva, with an Introduction and Notes*, edited and translated by D. Lindberg (Chicago: University of Chicago Press, 2006), lxxxiii-lxxxvi.

[29] Bacon, *Opus maius*, 6.1, ed. Bridges, II, 168: "Sed nondum certificatum est de fractione per hujusmodi sanguinem, quanquam elaboratum est ad hoc; est sine illo sanguine potest frangi de facili. Hoc enim vidi oculis meis, et necesse est hoc, quia gemmae non possunt sculpi nisi per fragmenta hujus lapidis."

[30] Bacon, *Opus maius*, 6.1, ed. Bridges, II, 168: "Sed non est ita, quia castor habet ea sub pectore, et tam mas quam femina hujusmodi testes producit."

[31] Bacon, *Opus maius*, 6.1, ed. Bridges, II, 169: "Deinde vulgatum est, quod aqua calida citius congelatur qam frigida in vasis, et arguitur ad hoc quod contrarium excitatur per contrarium, sicut inimici sibi obviantes. Sed certum est quod aquia frigida citius congelatur experienti."

all things that are on the surface of the earth, as Pliny says in his *Natural History*".[32] Because of the need to rely on others' observations and experiences, the character of the experimenter was of paramount importance. But not all testimony is equally valid, because not all eyewitnesses are moral, educated, observant, or trustworthy. In the case of Aristotle, his great wisdom and discernment extended to his ability to choose trustworthy, accurate men to send on this expedition.

The second prerogative of *scientia experimentalis* covers the useful and incredible results from the combination of human ability and natural knowledge. These results include processes to refine metals, such as alchemy, recipes for longevity and rejuvenation, and the creation of new devices.[33] All these are emblematic of the transformative possibilities of *scientia experimentalis*. Bacon's interest in all manner of devices and their potential utility, in both political and philosophical realms, appears in his works from the mid-1260s forward. Although instruments and devices are central to *scientia experimentalis*, Bacon discusses their importance to the enterprise of gaining natural knowledge throughout *Opus maius*. For example, understanding the science of the stars – the positions of planets, the altitudes of heavenly bodies, the appearance of unusual phenomena, like comets – requires the use of special instruments. This knowledge is crucial to being able to form accurate judgements or predictions about all manner of things (weather, the harvest, travel, medicine, horoscopes).[34]

The third prerogative of *scientia experimentalis* enabled understanding the secrets of nature, by which Bacon mainly meant marvelous particular phenomena, and the uses to which this knowledge could be turned. Utility was critically important to Bacon: Natural knowledge for its own sake was less important than how that knowledge could be used to defend Christian kingdoms or be mobilized to attain *sapientia*.[35] *Scientia experimentalis* realized and facilitated knowledge – of particulars, like non-manifest qualities, or of natural forces and phenomena that allowed the construction of devices and instruments – that could be authenticated and used. For example, "when properly prepared, yellow petroleum, which comes forth from rock, burns whatever it meets ... and water will not

[32] Bacon, *Opus maius*, 6.1, ed. Bridges, II, 169: "Aristoteles auctoritate Alexandri misit duo millia hominum per diversa loca mundi ut experientur omnia quae sunt in superficie terrae, sicut Plinius testator in Naturalibus."

[33] See Meagan S. Allen, "Roger Bacon's Medical Alchemy and the Multiplication of Species", in *The Philosophy and Science of Roger Bacon*, 159-74; William Newman, "An Overview of Roger Bacon's Alchemy", in *Roger Bacon and the Sciences*, 317-336; on medicine, see Faye Getz, "Roger Bacon and Medicine: The Paradox of the Forbidden Fruit and the Secrets of Long Life", in same, 337-364; and Agostino Paravincini Bagliani, "Ruggero Bacone, Boniface VIII, e la theoria della *prolongatio vitae*", in *Medicina e scienza della natura, alla corte dei papi nel Ducento*, edited by A. Paravincini Bagliani (Spoleto: Centro Italiano di studi sull'alto medioevo, 1991), 281-326.

[34] Bacon, *Opus maius*, 4.2.1, ed. Bridges, I, 109-10; 4.4.16, ed. Bridges, I, 230-31.

[35] Power, *Roger Bacon*, 164-207.

extinguish it".[36] Explosive compounds of different minerals can produce deafening alarms, so that "neither army nor city can withstand them".[37] Here, and elsewhere, as we shall see later, Bacon argues for the possibility of inventions (and their applications) in the future because of their existence in the past. This line of reasoning subtly echoes another of the fruits of the third prerogative of *scientia experimentalis*: to enable concurrent knowledge of the past and future, in the present.

> [The third dignity of this science] consists in two things; namely, in the knowledge of the future, the past, and the present, and in wonderful works by which it excels in the power of making predictions the ordinary astronomy dealing with predictions... [This] branch of knowledge has discovered the terms and method by which it can easily answer every question, and... it can show us the forms of the celestial forces, and the influences of the heavenly bodies on this world without the difficulty of the ordinary astronomy.[38]

Bacon's comments on this purpose of *scientia experimentalis* are somewhat obscure, but it is similar in outcome to judicial astronomy, but without the need for complex astronomical tables and expensive instruments that astral prediction usually required.

Courtly Science

Astral predictions and new military devices are just two examples Bacon gave of the ways that *scientia experimentalis* could serve political utility and Christendom. He articulated throughout his mature work manifold astonishing possibilities for devices and processes with practical value, and consistently focused on the applied nature of natural knowledge to achieve temporal, material ends alongside *sapientia.* Furthermore, several of the works in which he promoted the potential for *scientia experimentalis* were written specifically for courtly readership, such as the papal curia. Yet Bacon also drew inspiration from the courtly milieu, from people, branches of knowledge, and processes to develop and test his own natural knowledge and theory of knowledge acquisition.

The courtly sciences refer to those branches of natural knowledge and know-how in which the purpose is to intervene in the natural order, either to improve the human condition or to consolidate power (or both). I use the term "courtly" to differentiate this type of knowledge from the learned, text-based, or doctrinally focused knowledge characteristic of the cloister and the classroom. Courtly, or applied, knowledge

[36] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 217-218: "Oleum citrunum petroleum, id est, oriens ex petra, comburit quicquid occurrit, si rite praeparetur [...] eam aqua no extinguit."
[37] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 218: "Nec posset civitas nec exercitus sustinere."
[38] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 215-216: "Et hoc in duobus consistit; scilicet in cognitions futurorum praeteritorum et praesentium, et in operibus admirandis quibus excedit astronomiam judiciariam vulgatam in potestate judicandi [...] Haec autem scientia definitiones et vias adinvenit, per quas expedite ad omnem quaestionem respondeat [...] et per quas ostendat nobis figurationes coelestium virtutum; et impressions coelestium in hoc mundo, sine difficultate astronomiae vulgatae." See also Hackett, "*Ego Expertus Sum*", 309-310.

encompasses the branches of knowledge that were particular to elite concerns and pastimes, such as the mantic arts (chiromancy, geomancy, augury, astral prediction, and other divinatory practices) or knowledge of animal breeding and behavior linked to hunting, as well as non-elite but vital areas of knowledge, such as mining and irrigation. Some types of knowledge, such as astral prediction, might also require text-based, theoretical knowledge. Some, such as animal husbandry, did not. Still others, like medicine, were valued when practiced both with and without engaging *argumentum.* What all have in common is a focus on acquiring natural knowledge through sensory experience, albeit through the kind of repeated experience characteristic of empiricism, rather than the specific test or *experimentum* that Bacon argued was necessary to confer certainty.

Bacon wrote his major works at the request of the pope, who was specifically interested in his ideas about how epistemic reform could be yoked to political and spiritual authority. In 1264, shortly before his elevation to the papacy, Guy of Foulques acted as papal legate to England during the civil war between Henry III and the barons. However, due to the conflict Foulques was unable to reach England and stayed in Paris, where it seems likely that he encountered Bacon.[39] While in Paris in 1265 Foulques was named pope and returned to Rome, but the two men remained in contact.[40] As Clement IV he concerned himself with internal threats, such as heresy (ever more common in the thirteenth century, according the Church), but also external threats, like the Mongols, who had recently established control over southern Russia and the Balkans. Intrigued by what he knew of Bacon and his ideas, he wrote to Bacon in 1266, requesting copies of his work be produced and sent to him in secret. Over a period of months Bacon wrote *Opus maius, Opus minus*, and *Opus tertium* and sent these, in batches, along with his earlier treatises on the emanation of force and burning mirrors, a treatise on celestial divination and judicial astrology, and four separate treatises on alchemy.[41] Clement IV died in

[39] Although not a Franciscan, Foulques was an admirer of St. Francis and a supporter of the friars, and likely that he sought out the Franciscan foundation while in Paris. Power, *Roger Bacon and the Defence of Christendom*, 63-64. It is also possible that the two men met earlier, in 1257; see Norbert Kamp, *Enciclopedia dei Papi*, 3 vols. (Rome: Instituto della Encyclopedia Italiana, 2000), II, 401-411, at 9.

[40] From a letter Clement wrote to Bacon in 1266 we know Bacon had written to him previously, and that he had used William Bonecor, the English royal legate dispatched by Henry III to the pope, to convey his missive. *Fr. Rogeri Bacon Opera*, ed. Brewer, 1. See also Power, *Roger Bacon*, 67-68.

[41] Bacon, *Opus minus*, 322; *Opus tertium*, ed. Little, 61; *Opus tertium*, ed. Brewer, 270. The alchemical treatises were sent separately, and intended only to make sense when read alongside one another. Two were incorporated into the *Opus minus*, one was included with the *Opus tertium*, and one is no longer extant longer extant; see Little. Likewise, the treatise on judicial astrology is no longer extant. The chronology of Bacon's works has been a matter of sustained discussion; see Lindberg, *Roger Bacon's Philosophy,* xxiv-xxv; Franco Alessio, *Mito e scienza in Ruggero Bacone* (Milan: Ceschina, 1957), 295-315. As Power makes perfectly clear, despite the difficulty of producing such an output and the financial constraints on Bacon as a Franciscan, it seems most likely that he had the support of his superiors in the Order. Power, *Roger Bacon*, 72-73.

November 1268, and there is no evidence that he read the works he had requested. However, Bacon's treatises sparked interest within the papal curia.[42]

Bacon tantalized and assured his intended reader – Pope Clement IV and his advisers – of the potential of *scientia experimentalis* to fortify Christendom against the forces of the Antichrist. Bacon urged the pope, "in order to spare Christian blood, the Church ought to consider the use of these inventions against unbelievers and rebels, and it should do so *especially* because of the coming perils in the times of the Antichrist, which (with the grace of God), if prelates and princes fostered inquiry and investigated the secrets of art and nature, it would be easy to face".[43] Demonstrations of the kinds of technological marvels made possible by *scientia experimentalis* could be used to convert non-Christians, by making them believe in what they might not understand.[44] According to Bacon, *scientia experimentalis* made possible devices that could demonstrate and bestow natural knowledge as well as *sapientia.* One such theoretical example is an armillary sphere combined with a magnet. Without knowing through experience that a magnet attracts iron, one could not envision how to put it to use or understand that the attractive and repulsive forces of the magnet might be related to the ebbing and flowing of tides, or other examples of action at a distance. Devices such as this one could in turn yield new information about nature: "This instrument would be worth a king's ransom, and would render useless all other astronomical instruments and clocks, and would be a most beautiful instrument of *sapientia*".[45] And in addition to providing useful devices, *scientia experimentalis*, as a method for knowledge-acquisition, made possible a more complete understanding of the Bible than offered by reasoning (the practice of exegesis), and was "the most useful apart from that of morals".[46]

Slightly later, during the 1270s, Bacon seems to have completed a short text on the potential of *scientia experimentalis* and the natural and technological marvels it could enable, *Letter on the Hidden Powers of Art and Nature, and on the Invalidity of Magic* (*Epistola de secretis*). We know little about the circumstances of its composition or its intended

[42] Power, *Roger Bacon*, 74.

[43] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 222: "Et hoc deberet ecclesia considerare contra infidels et rebelles, ut parcatur sanguine Christiano, et maxime propter future pericula in temporibus Antichristi, quibus cum Dei gratia facile esset obviare, si praelati et principes stadium promoverent et secreta naturae et artis indagarent." Emphasis mine. On the relationship between Bacon's scientific ideas and belief in the Apocalypse, see Zachary Matus, "Reconsidering Roger Bacon's Apocalypticism in Light of His Alchemical and Scientific Thought", *Harvard Theological Review* 105 (2012): 189-222.

[44] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 221.

[45] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 203: "Et tunc thesarum unius regis valeret hoc instrumentum et cessarent instrumenta astronomiae, et horolgia, et esset pulcherrimum spectaculum sapientiae."

[46] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 221: "Quod utilissima est haec scientia post morale."

audience.[47] Judging from its tone, focus, and level of detail, the text seems to be directed to a ruler or courtier, rather than to a natural philosopher. However, it was completed during a period of doctrinal upheaval within the Franciscan Order, and it is also possible that Bacon wrote *Hidden Powers* to clarify the difference between *scientia experimentalis* and magic, which he considered fraudulent and pointless. As Bacon laid out in *Hidden Powers*, not only could *scientia experimentalis* help discern the deceptions practiced by magicians and charlatans, but when yoked to human know-how it also made possible incredible inventions and processes, which could in turn be used to strengthen a Christian realm or Christendom as a whole. The combination of learned and experiential knowledge in the service of the ruling elite – courtly science – is the entire point of *Hidden Powers.*

As is common with Bacon's work, *Hidden Powers* repeats several of the points made elsewhere, especially in the fifth and sixth books of *Opus maius*, on optics and *scientia experimentalis*, respectively. The fifth chapter of *Hidden Powers*, on optical illusions and lenses, is titled "Artificial Optical Experiments" (*De experientiis perspectivis artificialibus*), recalling Ibn al-Haytham's articulation of the importance of using lenses and other visual instruments to measure and investigate optical phenomena. Lenses and other practical knowledge of optics could also be used in the service of further textual education, measurement, and espionage.[48] The following chapter, "On Marvelous Experiments" (*De experimentis mirabilibus*), covers natural marvels like the magnet and Greek fire, making evident the conceptual association between *experimentum* and natural particulars.[49]

Hidden Powers also expands on the possibilities *scientia experimentalis* could afford to explore new terrain and to consolidate political authority. These possibilities fall under the second prerogative of *scientia experimentalis*: to make instruments or machines using natural laws and powers. The effects they produced or the things they could do were not due to demons or to trickery, but purely to natural forces, combined with human ability to understand nature and to make things.

> First, those things achieved through the design and reckoning of skill alone: Now an instrument for sailing without oarsmen can be made such that the largest ships, both riverboats and seagoing vessels, can be moved under the direction of a single man at a greater speed than if they were filled with men. And a chariot can be made that moves at an unimaginable speed without animals; such we think to have been the scythe-bearing chariots with which men fought in ancient times.[50]

[47] In its current form seems to be a hybrid, with the first eight chapters conforming to Bacon's earlier works, and the last three diverging sharply in terms of tone and content. My concern here is with the earlier chapters, which follow his earlier *opera* closely.

[48] Bacon, *Epistola de secretis*, ed. Steele, 534.

[49] Bacon, *Epistola de secretis*, ed. Steele, 536-538.

[50] Bacon, *Epistola de secretis*, ed. Steele, 533: "Et primo per figuram et rationem solius artis. Nam instrumenta navigandi possunt fieri sine hominibus remigantibus, ut naves maxime, fluviales et marinae, ferantur unico homine regente, majori velocitate quam si plenae essent hominibus. Item currus possunt fieri ut sine animali moveantur cum impetus inaestimabili; ut aestimamus currus

Other inventions could be used for civil engineering and civil defense, to lift heavy weights or evade capture.[51] Devices could be made that would render entire armies or civilian populations powerless: "[An] instrument could easily be made by which one man could drag a thousand men against their will toward himself, and attract other things in the same way".[52] Furthermore, the use of lenses and knowledge of perspective could burn an enemy army or town to cinders, or confuse it with illusions. Knowledge of lenses and mirrors – *perspectiva* – could be used in the service of espionage: they could be shaped and placed "so that hidden things appear evident".[53] Elsewhere, Bacon reflected on the past application of knowledge of optics and mathematics: understanding the properties of rays and the phenomenon of reflection, Alexander the Great was able to use a mirror to turn the venomous gaze of a basilisk from his own army, where it was trained, back onto itself, "so that it was killed by its own venom".[54] In fact, "all things of such marvelous utility to the state belong chiefly to [*scientia experimentalis*]".[55] This emphasis on military use echoes Bacon's earlier assertions in his works for Clement IV that *scientia experimentalis* could help defend Christendom from her enemies.

Bacon focused on the applications of *scientia experimentalis* relative to the courtly sciences, and directly addressed issues of political, social, and military domination. He also drew from the courtly sciences and stressed the importance of viewing unlettered experts, such as farmers, as important sources of natural knowledge, especially *experimentum*. Bacon looked outside of the university setting to pursue his interest in *experimentum* beyond what was readily available in the curricula of Oxford and Paris; between roughly 1247 and 1257 he pursued a self-funded career as an independent scholar. He spent some of this time in Oxford and some in Paris, and came into contact with the vibrant circle of experimenters, as well as Latin translations of Arabic texts on instruments and experience. He reflected on this time in his third treatise (*Opus tertium*) for Pope Clement IV (1268),

falcati fuisse, quibus antiquitus pugnabatur." On Bacon and the mechanical arts, see Elspeth Whitney, "The Artes Mechanicae, craftsmanship and moral value of technology", in *Design and Production in Medieval and Early Modern Europe*, edited by N. van Deusen (Ottawa: The Institute of Mediaeval Music, 1998), 75-87.

[51] Bacon, *Epistola de secretis*, ed. Steele, 533.

[52] Bacon, *Epistola de secretis*, ed. Steele, 533: "Posset etiam de facili fieri instrumentum quo unus homo traheret ad se mille homines per violentiam, mala eorum voluntate; et sic de rebus aliis attrahendis."

[53] Bacon, *Epistola de secretis*, ed. Steele, 534-535: "Et occulta videantur manifesta."

[54] Bacon, *Opus maius*, 4.4.7, ed. Bridges, I, 143: "Sicut Alexander docrina Aristotelis ut historiae narrant, basilisci speciem venenosam positi super murum civitatis ad interficiendum exercitum per corpora magna polita retorsit in eandem civitatem, ut per proprium destrueretur venenum."

[55] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 221: "Est tamen considerandum, qod licet aliae scientiae multa mirabilia faciant, ut geometria practica facit specula comburentia omne contumax [...] tamen omnia hujusmodi utilitatis mirificae in republica pertinent princialiter ad hanc scientiam [experimentalis]."

> I have for twenty years labored especially in the pursuit of wisdom, abandoning the opinions of the masses, I have spent more than two thousand pounds on these studies, for books of secrets, various experiments, languages, instruments, tables, and other things; and to seek the friendship of learned people, as well as seeking their close counsel on languages, diagrams, numbers, tables, instruments, and many other things.[56]

In this passage Bacon clearly states his efforts in pursuit of natural knowledge and wisdom: learning foreign languages; studying books, diagrams, and tables (likely astronomical tables); buying and using instruments, carrying out or witnessing experiments; and talking to experts. Knowledge gained first-hand, through sensory experience, and in conjunction with wisdom in books, was so important to Bacon that he spent the fortune of a lifetime in pursuit.

As demonstrated earlier, Bacon's interest in *experimentum* was of a piece with learned culture, especially at Oxford and Paris in the thirteenth century. Yet Bacon found one peer in particular exemplary of the potential for his new educational program, particularly *scientia experimentalis*. Peter of Maricourt, who likely studied at the University of Paris in the middle of the thirteenth century, wrote a treatise on magnetism, *Treatise on the Magnet* (*Epistola de magnete*, 1269), that emphasized the utility of scientific knowledge and the importance of experience.[57] He also, in this work and in others, applied his knowledge in the creation of new instruments and devices, such as a new kind of compass needle, a universal astrolabe, and a perpetual motion-machine.[58] Bacon worked with Peter in Paris, and considered him a source of inspiration.[59] In the *Opus Tertium,*

[56] Bacon, *Opus tertium* 17, ed. Brewer, 59: "Nam per viginti annos quibus specialiter laboravi in studio sapientiae, neglecto sensu vulgi, plus quam duo millia librarum ego posui in his, propter libros secretos, et experientias varias, et linguas, et instrumenta, et tabulas, et alia; tum ad quaerendum amicitias sapientum, tum propter instruendos adjutores in linguis, in figuris, in numeris, in tabulis, et instrumentis, et multis aliis." Presumably, in this statement Bacon is referring to the period before he entered the Franciscan Order, as he would have had to take a strict vow of poverty upon joining.

[57] Peter Peregrinus of Maricourt, *Epistola de magnete*, edited by L. Sturlese and R. Thomson, *Petrus Peregrinus de Maricourt, Opera* (Pisa: Scuola Normale Superiore, 1995); in English, *The Letter of Petrus Peregrinus on the Magnet, c. 1269*, translated by Fr. Arnold (New York: McGraw, 1904). Little is known about his life; he may have been a pilgrim (hence "Peregrinus") and he was at the siege of Lucera, in the Kingdom of Sicily, in 1268-69, likely as an engineer.

[58] J. Luis Rivera, "Pierre de Maricourt", in *A Companion to Philosophy in the Middle Ages*, edited by J. E. Garcia and T. B. Noone (Oxford: Oxford University Press, 2003), 538-539; Amelia Carolina Sparavigna, "Peter Peregrinus of Maricourt and the Medieval Magnetism", *Mechanics, Materials Science, and Engineering* 12 (2016): 1-8; Andreas Kleinert, "Le moteur magnéto-mécanique de Pierre de Maricourt. Comptes-rendus du séminaire: Origine des idées scientifiques, ruptures et continuités", *Centre Commun d'Histoire des Sciences et d'Epistémologie de Lille* 1 (2005): 22-34; Robert J. Halleux, "Entre philosophie naturelle et savoir d'ingénieur: *L'Epistola de magnete* de Pierre de Maricourt", *Archives internationals d'histoire des sciences* 50 (2006): 3-17; Silvia Nagel, "Pietro Peregrino: il sapiens-simplex eccelente di Ruggero Bacone", in *Francescani e le scienze* (Spoleto: Centro Italiano Di Studi Sull'Alto Medioevo, 2012), 19-47.

[59] Williams, "Roger Bacon in Context", 129-132.

written perhaps a year before *Treatise on the Magnet,* Bacon lauded Peter's erudition, his natural knowledge gained from both texts and practice, and his dedication to the pursuit of wisdom:

> I know of only one person who deserves praise for his work in [*scientia experimentalis*], for he does not care for discourses and aggressive debates, but diligently pursues the works of *sapientia*; in these he is at peace. Therefore, what others blindly struggle to see, as bats in the twilight, this man apprehends in the full light of day because he is a master of *experimentum*. He knows about nature through experience [*per experientiam*], and medicine or alchemy, and all things terrestrial and celestial. Indeed, he would be ashamed if some layman, or a little old lady, or a soldier, or a rube from the countryside would know something of which he himself was ignorant. He has carefully investigated the smelting of metal ore and how to work gold, and silver and other metals and minerals; he has mastered all sorts of arms used in military service and in hunting, besides which he has carefully investigated all matters relating agriculture and surveying and all matters pertaining to the countryside; and he has even closely examined the experiments [*experimenta*], incantations, and devices of old women and sorcerers; and likewise [examined] all the illusions and devices of conjurers so that nothing that is to be known might escape his notice, and he knows more than enough to condemn magic and all deceitful things.[60]

Bacon's praise of Peter reveals his own views about what investigating the natural world using *scientia experimentalis* required: mastery of traditional university subjects, like astral science, alongside subjects that combine text and practice, like alchemy and medicine; direct experience in metallurgy and mining, important subjects not covered in an arts education, as well as the military arts of ballistics and other weaponry; willingness to test received wisdom; and the use of one's erudition and discernment to identify and repudiate magic and deception.

Bacon also expressed the view that people from different registers, with kinds of experience, could be a source of knowledge for the natural philosopher. Soldiers could offer insight into weaponry, ballistics, and mining; folk remedies and "old wives' tales"

[60] Bacon, *Opus tertium* 13, ed. Brewer, 46-47: "Non enim cognosco nisi unum, qui laudem potest habere in operibus hujus scientiae; nam ipse non curat de sermonibus et pugnis verborum, sed persequitur opera sapientiae, et in illis quiescit. Ed ideo quod alii caecutientes nituntur videre, ut vespertilio lucem solis in crepusculo, ipse in pleno fulgore contemplator, propter hoc quod est dominus experimentorum; et ideo scit naturalia per experientiam, et medicinalia, et alkimistica, et omnia tam coelestia quam inferior; immo verecundatur si aliquis laicus, vel vetula, vel miles, vel rusticus de rure sciat quae ipse ignorant. Unde omnia opera fundentium metalla, et quae operantur auro, et argento, et ceteris metallis, et omnibus mineralibus, ipse rimatus est; et omnia quae ad militiam, et ad arma, et ad venationes ipse novit; omnia quae ad agriculturam, et ad mensuras terrarium et opera rusticorum, examinavit; etiam experimenta vetularum et sortilegia, et carmina earum et omnium magicorum consideravit; et similiter omnium joculatorum illusions et ingenia; ut nihil quod sciri debeat lateat ipsum, et quatenus omnia falsa et magica sciat reprobare." Peter is mentioned twice in marginal glosses of different manuscripts, and Bacon mentions Peter by name elsewhere.

[*vetula, vetularum*] might provide information into medicine or botany; and the rustic who toiled in the fields had experiential knowledge of meteorology, astral observation, and agronomy. When practical experience and empirical knowledge are valued and even weighed on par with book knowledge, the ranks of who can be considered authoritative and knowledgeable expand, requiring scholars to engage with a wider range of "knowledge holders" than if considering only textual authorities. Yet Bacon is not promoting an egalitarian view of knowledge; his use of "ashamed" (*verecundus*) in this passage is as revealing as it is condescending. He makes it clear that full investigation into nature should draw from people in different registers and walks of life, but still marks this endeavor as one invested in authority and hierarchy. Authoritative texts may be mistaken, due to ignorance of particulars, lack of attention to *experimentum*, or poor translation, but Bacon strongly believes in the divide between the ignorant masses (*vulgus*) and the wise few (*sapientes*).[61] His condescension rests on the belief that he (and Peter of Maricourt) are distinct from the rustics and old women, more learned and, ultimately, more capable of making natural knowledge.

Alexander the Great: Experience and Invention

Natural knowledge appeared in texts that circulated outside of the university curriculum, in genres that emphasized useful knowledge alongside exploration, and in the literature of entertainment. These texts were intended for elite lay audiences, although they might include knowledge gained from non-elite sources. One such example is the avian hunting treatise by king and Holy Roman Emperor Frederick II (1194-1250), *The Art of Hunting with Birds* (*De arte venandi cum avibus*), which draws on both the Aristotelian textual tradition and empirical knowledge of raptor behavior and care.[62]

Frederick's court was also an avenue of transmission of the complete Latin translation of the ruling handbook *The Secret of Secrets* (*Secretum Secretorum*), which captivated Bacon.[63] He spent decades studying it and produced his own edition of it, with copious marginal glosses, in the 1270s. This text, a translation of the Arabic *Kitab sirr al-asrar*, circulated as a letter that Aristotle, at the end of his life, sent to his pupil, Alexander the Great.[64] In it, he confided to Alexander those secrets of nature he had withheld from

[61] Bacon, *Opus maius*, 1.4, ed. Bridges, I, 9-10.
[62] Frederick II, *De arte venandi avibus*, Prologue: https://www.hsaugsburg.de/~harsch/Chronologia/Lspost13/FridericusII/fri_arsp.html [accessed February 2, 2018]; Thomas T. Allsen, *The Royal Hunt in Eurasian History* (Philadelphia: University of Pennsylvania Press, 2006).
[63] Steven J. Williams, "The Early Circulation of the Pseudo-Aristotelian *Secret of Secrets* in the West: The Papal and Imperial Courts", *Micrologus* 2 (1994): 127-144; Steven J. Williams, "Roger Bacon and His Edition of the Pseudo-Aristotelian *Secretum secretorum*", *Speculum* 69 (1994): 57-73; Steven J. Williams, "Roger Bacon and the *Secret of Secrets*", in *Roger Bacon and the Sciences*, 365-394.
[64] On the emergence of the text through accretion, see Mahmoud Manzaloui, "The Pseudo-Aristotelian *Kitab Sirr al-asrar*: Facts and Problems", *Oriens* 23-24 (1974): 147-257; Mario Grignaschi, "L'origine et les metamorphoses du *Sirr al-'asrar*", *Archives d'histoire doctrinale et littéraire du moyen âge*

his earlier works out of care not to squander knowledge on a populace that was not prepared to receive it, but that Alexander – the great conqueror and empire builder – would need in order to be a powerful, canny, and just ruler. Translated in full for the first time around 1230, it promotes the utility of natural knowledge in the service of worldly power. *The Secret of Secrets* shares with the historical literature on Alexander the Great a focus on rulership, natural knowledge, and exploration for knowledge-acquisition.[65] The prologue of *The Secret of Secrets* puts the work into the context of an existing and robust epistolary relationship between Alexander and Aristotle, and in many instances *The Secret of Secrets* appears bound together with Latin works on Alexander or vernacular texts on the Alexander tradition.[66] Furthermore, episodes and examples drawn from the life of Alexander and *The Secret of Secrets* appear in *Hidden Powers*.

Although there are many variations on the legends of Alexander, in virtually all of them his interest in first-hand experience going beyond ordinary human knowledge and his ingenuity are his defining characteristics. *Ingenium* and *engin*, in Latin and Old French respectively, are the terms that refer to this kind of innate, inventive spirit. But these terms and their cognates also encompass other meanings, such as intellectual wit, invention, chicanery, deception, stratagem, and extraordinary technical knowledge.[67] In the Anglo-Norman *Roman de Toute Chevalerie* (ca. 1180), written at the sophisticated court of Henry II Plantagenet and based in part on the *Letter from Alexander the Great to Aristotle* (*Epistola Alexandri Magni ad Aristotelem*), the narrator ends his introduction to Alexander with this summation: "He was brave and victorious, wise and ingenious".[68] In the

43 (1976): 9-112; Mario Grignaschi, "Remarques sur la formation et l'interprétation du *Sirr al-'asrar*", in *Pseudo-Aristotle, The Secret of Secrets: Sources and Influences*, edited by W. F. Ryan and C. B. Schmitt (London: Warburg Institute, 1982), 3-33.

[65] Steven J. Williams, "Two Independent Textual Traditions? The Pseudo-Aristotelian *Secret of Secrets* and the Alexander Legend", in *Trajectoires européenes du* Secretum secretorum *du Pseudo-Aristote (XIIIe-XVIe siècle)*, edited by C. Gaullier-Bougassas, M. Bridges, and J.-Y. Tilliette (Turnhout: Brepols, 2015), 27-54.

[66] A late antique text that purported to be a copy of a letter that Alexander had sent to Aristotle, describing the marvels he had seen and the novel experiences he had had, circulated widely from the fourth century onward. See *Epistola Alexandri Macedonis ad Aristotelem magistrum suum de itinere suo et de situ Indiae*, edited by W. Walther Boer, Beiträge zur Klassischen Philologie (Meisenheim am Glan: Hain, 1980); this work has been edited and translated into English by Lloyd L. Gunderson (Meisenheim am Glan: Hain, 1980); Williams, "Two Independent Textual Traditions?", 29, 33-49.

[67] *Dictionnaire historique de la langue française*, s.v.v. "ingénieur", "engin"; *Glossarum mediae et infimae latinitatis*, edited by C. DuCange, 10 vols. (Paris: Librarie des Sciences et des Arts, 1937-38), s.v. "ingenium"; *Dictionnaire de l'ancienne langue française*, edited by Godefroy, s.v. "engignart", "engigne", "engigneor". See *OED*, s.v.v. "engine", "ingenious".

[68] "Hardiz estoit e conqueranz, sages e enginus." Thomas of Kent, *The Anglo-Norman Alexander* (*Le Roman de Toute Chevalerie*), edited by B. Foster with I. Short, 2 vols. (London: Anglo-Norman Text Society, 1976), I, 7,30. This text is available with a modern French facing page translation, *Le Roman d'Alexandre ou Le Roman de Toute Chevalerie*, translated by C. Gaullier-Bougassas and L. Harf-Lancner (Paris: H. Champion, 2003). On the intellectual culture of the Plantagenet court, see Francine Mora-Lebrun, '*Mettre en romanz*': *Les romans d'antiquité du XIIème siècle et leur postérité (XIIIème-XIVème siècles)*

contemporary *Roman d'Alexandre* (ca. 1185) by Alexander of Paris, Alexander the Great's extensive knowledge of the natural world and his technological ingenuity are two of his essential qualities.[69] Alexander's conquest of new territory extends to new geographical realms and new frontiers of knowledge, from the farthest reaches of India, to the deep sea, to the dizzying heights. In multiple versions of his biography, he devises a flying machine, powered by griffins, and a glass diving bell to explore rivers and oceans. Both inventions enable Alexander to gain new knowledge through experience and to explore nature's secrets beyond what was at that time known. Perched on his flying machine he could experience the world as no human before him, able to view the terrain as a synoptic whole as it unfurled beneath him. From the safety of his diving bell, he could observe the creatures at the bottom of the ocean that were otherwise invisible to humans. Moreover, in several of the Alexander-texts from this period his endeavors are discussed in terms (either by the narrator or Alexander himself) of experience and proof: "*experimentum*" and "*esprover*".[70] And he employs his know-how for conquest, as well as exploration: In *Roman d'Alexandre*, Alexander's successful campaigns against several cities hinge on the inventions he devises, such as the floating siege towers that he designed and built, which allowed him to capture the city of Tyre.[71]

Alexander embodies the ruler enlightened by traditional education, first-hand experience, *and* technical knowledge. His education from Aristotle, his tutor and interlocutor, included philosophy, astral science, geography, as well as the secrets of nature. In the *Historia de preliis*, the tenth-century Latin prose re-telling of the late antique Greek version by pseudo-Callisthenes, Alexander recounts how he designed a flying contraption that used winged animals to see the earth in a new way. "I planned with my friends that I should build a device [*ingenium*], so that I might ascend into the sky and see what may be seen from the sky. I designed and built the device [*ingenium*], where I would sit, and caught gryphons and bound them with chains and I put a pole in front of them at whose end was food for them, and they began to take off into the sky".[72] In *Roman*

(Paris: H. Champion, 2008), 53-86; *La fascination pour Alexandre le Grand dans les littératures européenes (Xème-XVIème siècle)*, edited by C. Gaullier-Bougassas, 4 vols. (Turnhout: Brepols, 2004), II, 794-798 and III, 1334-1345.

[69] Alexander of Paris, *The Medieval French Roman d'Alexandre*, vol. 2: *Alexandre de Paris*, edited by E. C. Armstrong, D. L. Buffum, B. Edwards, and L. F. H. Lowe (Princeton: Princeton University Press, 1937), 3,400. Available with facing page translation into Modern French, although lacking part of the second *branche*, Alexandre de Paris, *Le Roman d'Alexandre*, translated by L. Harf-Lancner (Paris: H. Champion, 1994). See also Catherine Gaullier-Bougassas, "Savoir scientifique et 'roman historique:' l'Alexandre anglo-normand de Thomas de Kent", in *Savoirs et fiction au Moyen Âge et à la Renaissance*, edited by D. Boutet and J. Ducos (Paris: H. Champion, 2015), 143-159.

[70] *Roman d'Alexandre*, 3,396-398.

[71] *Roman d'Alexandre*, 1,2189-2378, 2895-2901; 2,1904-2006.

[72] Leo, *Historia de preliis* 3.27, edited by F. Pfister (Heidelberg: Sammlung Mittellateinischer Texte, 1913), 126: "Cogitavi cum amicis meis, ut instruerem tale ingeium, quatenus ascenderem caelum et viderem, si est hot caelum, quod videmus. Preparavi ingenium, ubi sederem, et apprehendi grifas et

d'Alexandre Alexander's adventure explicitly links experiential knowledge to the confirmation of text-based learning, via measurement. "Alexander forged the path up to the sky when his golden chair, attached to four gryphons, was carried up; and his thought [having been] was enlightened by astral science such that he knew the compass of all the stars".[73] Speculative, imaginary, or legendary machines and devices appear frequently in literary texts in romance in the twelfth and thirteenth centuries, and literary texts were conceived of as spaces to stage thought experiments, and to engage with different kinds of experience.[74]

Bacon was clearly familiar with these legends, as he cited a few of them in *Hidden Powers*. He insisted that "an instrument for flying can be made, such that a man sits in the middle of it, turning some sort of engine [*ingenium*] by which artificially constructed wings beat the air in the way a flying bird does".[75] Alexander's diving bell also appears in *Hidden Powers*. "And instruments can be made for walking in seas and rivers, right down to the bottom, without bodily danger... For Alexander the Great used these to see the secrets of the sea, according to what Ethicus the astronomer says".[76] *Hidden Powers*, *The Secret of Secrets*, and multiple versions of the medieval Alexander-legend all present Alexander's reign as a dynamic blend of invention and expansion.

For Bacon, Alexander's association with Aristotle was crucial to his political and military success. Alexander received from his tutor not only a traditional education, but also an education in nature's secrets and how to use them, and it was from this education that he was able to conquer his empire. Bacon emphasized the importance of Aristotle, the learned counselor, to Alexander's success in his works to the pope. "Aristotle stands out as the primary [teacher], and it is perfectly clear from what has been said how by the paths of *sapientiae* Aristotle was able to deliver the world to Alexander".[77] In both his works for the pope and in his edition of *The Secret of Secrets* (likely intended for a secular

liquid eas cum catenas, et psui vectes ante eos et in summitate eorum cibaria illorum et ceperunt ascendere celum."

[73] *Roman d'Alexandre*, 1,71-77: "Et la voie du ciel refu par lui tentee/ Quant la chaiere d'or en fu lassu portee/ Par les quatre grifons, a qui fu acouplee;/ Et fu d'astronomie sa pensee enluminee,/ Que de toutes estoiles connut la compassee."

[74] Patricia Clare Ingham, *The Medieval New* (Philadelphia: University of Pennsylvania Press, 2015), 50-55; E. R. Truitt, "'Trei poëte, sages dotors, qui mout sorent di nigromance': Knowledge and Automata in Twelfth-Century French Literature", *Configurations* 12 (2005): 167-193; Brian Stock, "The Self and Literary Experience in Late Antiquity and the Middle Ages", *New Literary History* 25 (1994): 839-852.

[75] Bacon, *Epistola de secretis*, ed. Steele, 533: "Item possunt fieri instrumenta volandi, ut homo sedeat in medio instruenti revolvens aliquod ingenium, per quod alae artificialiter compositae aerem verberent, ad modum avis volantis."

[76] Bacon, *Epistola de secretis*, ed. Steele, 533: "Possunt etiam instrumenta fiere ambulandi in mari, vel fluminibus, usque ad fundum absque periculo corporali. Nam Alexander magnus his usus est, ut secreta maris videret, secundum quod Ethicus narrat astronomus."

[77] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 222: "Sed Aristoteles extitit principalis; et facile patet per praedicta quomodo per vias sapientiae potuit Aristoteles mundum tradere Alexandro."

ruler), Bacon presented Alexander's reign as the outcome of a thorough education in both *argumentum* and *experimentum*.[78]

Conclusion

Bacon looked to the past, in part, to conjure the future. By relying on Alexander as an exemplar for the possibilities of *scientia experimentalis*, Bacon grounded his epistemological reform in ancient precedent and suggested that the possibilities of *scientia experimentalis* are credible *because* of that precedent. As he wrote in *Hidden Powers*, "And a chariot can be made that moves at an unimaginable speed without animals; such we think to have been the scythe-bearing chariots with which men fought *in ancient times*".[79] Elsewhere, in the same text, he cited another ancient example of military and political subjugation made possible by the fruits of *scientia experimentalis*. "Thus, it is thought Julius Caesar, using huge mirrors on the shores of Gaul, apprehended the dispositions and locations of the forts and cities of Great Britain".[80] These inventions and instruments used to exist, but do not any longer. Yet the knowledge that they *have existed* is what allows Bacon to make claims about how they could be made and used in the future. The accounts of past devices prove that their presence in the future is not theoretical or speculative. The third prerogative of *scientia experimentalis* includes the unification of past, present, and future knowledge. In this case, Bacon argues here that his new science can recover past knowledge for future use. Additionally, these objects highlight Bacon's point about the need for experience to work in tandem with textual knowledge. Bacon and his contemporaries only know of the flying machine, submarine, optical devices, and other instruments through texts, which is why Bacon cannot describe how to make them.

Bacon drew on multiple sources for his concept of *scientia experimentalis* and the kinds of devices and processes that it facilitated and warranted. He read newly translated Latin versions of Arabic texts in optics, secrets, and astral science alongside contemporary treatises on natural particulars and *experimentum*, and ancient history to articulate the possibilities of *scientia experimentalis*. He drew from the academic register of natural philosophy to literary expressions of the possibilities of human art, and review of his influences demonstrates the widespread interest in knowledge through sense experience. Bacon combined his influences with his own ideas about the purpose of technology to enable new knowledge, improve the human condition, and be used in the exercise of power, especially through the creation of devices or inventions. Additionally, it is clear that Bacon viewed experimental knowledge as vital to political success. He

[78] Bacon, *Opus maius*, 6.12, ed. Bridges, II, 217. On the likely intended audience for Bacon's edition of *The Secret of Secrets*, see Williams, "Roger Bacon and the *Secret of Secrets*", 378-80.
[79] See note 48. Emphasis mine.
[80] Bacon, *Epistola de secretis*, ed. Steele, 534: "Sic enim aestimatur Julius Caesar super littus maris in Galliis, deprehendisse per ingentia specula dispositionem et situm castrorum et civitatum Britanniae majoris."

viewed the knowledge that *scientia experimentalis* provided as important personally – it could help convert people to Christianity, develop their intellect in accordance with Christian morality, and protect people from falling prey to the deceptions of magicians and other charlatans – and politically – it could be used to protect and fortify Christian kingdoms and to conquer.

In Roger Bacon's work we find a more complicated picture of medieval science than the partial but persistent narrative of medieval science that privileges natural philosophy and university disciplines.[81] Bacon participated in the intellectual communities of thirteenth-century Paris and Oxford, in which interest in *experimentum* was prevalent, but he went beyond his contemporaries to carry out and to champion *experimenta*, and he asserted the importance of gathering knowledge from multiple social registers. Bacon's emphasis on the importance of sensory knowledge, as well as natural knowledge gained from unlettered experts (albeit within a hierarchical structure) suggests a crossover between natural philosophy and the workshop or the home long before the fifteenth century.[82] Additionally, his insistence on subjecting theories to confirmation by *experimentum* – careful observation and contrived tests – and his interest in experience as an epistemic method has implications for understanding the role of experience in the narrative of the development of "Western science".[83] Finally, Bacon's assertion of the courtly sciences as intellectually and practically vital and his focus on the utility of natural knowledge to pursue political ends attest to the fluid distinctions between the spheres of classroom, cloister, and court in thirteenth century Latin Christendom.

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[81] See David Lindberg's textbook, *The Beginnings of Western Science*, 2nd ed. (Chicago: University of Chicago Press, 2008), which still dominates the field.

[82] In the historiography of science, cooperation and collaboration between artisans and natural philosophers in the late fifteenth and sixteenth centuries is considered to be one of the conditions that fostered the experimental science of the seventeenth century. See, for example, William Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (Chicago: University of Chicago Press, 2004); Deborah Harkness, *The Jewel House: Elizabethan London and the Scientific Revolution* (New Haven: Yale University Press, 2008); Pamela O. Long, *Artisan-Practitioners and the Rise of the New Sciences, 1400-1600* (Corvallis, Ore.: Oregon State University Press, 2011).

[83] See Hackett, "Roger Bacon on *Scientia experimentalis*", 314-315, on this point.

TOTA FAMILIA ARISTOTELIS: ON SOME SOURCES OF BACON'S CONTRIBUTION TO MEDIEVAL POLITICAL DISCOURSE*

TOTA FAMILIA ARISTOTELIS: SOBRE ALGUNAS FUENTES DE LA CONTRIBUCIÓN DE BACON AL DISCURSO POLÍTICO MEDIEVAL

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Abstract

Writing his *Moralis philosophia*, Roger Bacon discussed issues relevant to medieval political discourse. He felt the need to appeal to the authority of Aristotle, but having no access to Aristotle's *Politica*, he tried to reconstruct its main tenets through the writings of other thinkers, such as Avicenna and Alfarabi. The result of this attempt is a sketch of a political theory that goes mainly under the name of Aristotle but has little to do with the actual contents of the *Politica*. In the following years, Bacon remained faithful to his first reconstruction. The author suggests that, with all probability, Bacon, never read the actual text of the *Politica*. the result is that Bacon's contribution in this field was not influenced by Aristotle's political masterpiece, but by other texts, in particular by Avicenna's *Philosophia prima*. Such an assessment should not imply a negative judgement on Bacon. Rather, we should consider him among those authors who contributed to the rich diversity of medieval political thought independent of Aristotle's *Politica*.

Keywords

Roger Bacon; Moral Science; Medieval Political Discourse; Aristotle's *Politics*; Avicenna

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Resumen

Al escribir su *Moralis philosophia*, Roger Bacon trató temas relevantes para el discurso político medieval. Sintió la necesidad de apelar a la autoridad de Aristóteles, pero al no tener acceso a la *Política* de Aristóteles, intentó reconstruir sus principios fundamentales a través de los escritos de otros pensadores, como Avicena y Alfarabi. El resultado de esta tentativa fue un esbozo de teoría política que se presenta principalmente bajo el nombre de Aristóteles, pero que tiene poco que ver con el contenido real de la *Política*. En los años siguientes, Bacon se mantuvo fiel a su primera reconstrucción. El autor sugiere que, con toda probabilidad, Bacon nunca leyó el texto real de la *Política*. El resultado fue que la contribución de Bacon a este campo no estuvo influida por la obra maestra de la política de Aristóteles, sino por otros textos, en particular por la *Philosophia prima* de Avicena. Esta valoración no debe implicar un juicio negativo sobre Bacon. Por el contrario, debemos considerarlo entre los autores que contribuyeron a la rica diversidad del pensamiento político medieval independientemente de la *Politica* de Aristóteles.

Palabras clave

Roger Bacon; Ciencias morales; Discurso político medieval; *Política* de Aristóteles; Avicena

The Epilogue of the commemorative volume *Roger Bacon and the Sciences,* penned by Jeremiah Hackett, bears the subtitle '*Roger Bacon's Moral Science*' and occupies six pages out of more than four hundred.[1] This state of affairs can be taken as symbolic of the paradox of Bacon's contribution to medieval practical philosophy. The English Franciscan repeats time and again that moral philosophy is the most noble of all branches of knowledge, since human learning culminates in *scientia moralis*.[2] His contribution to ethics and political thought, however, is not the field of scholarly production to which he devoted most of his efforts. Other aspects of his outstanding intellectual output - such as his semiotics and philosophy of language, his approach to the science of perspective, his theory of knowledge, his concept of experimental science, for example, have captured

[1] Jeremiah Hackett, "Epilogue: Roger Bacon's Moral Science" in *Roger Bacon and the Sciences. Commemorative Essays,* edited by J. Hackett (Leiden, New York and Cologne: E. J. Brill, 1997), 405-410.
[2] About this well-known principle of Bacon's cultural agenda, see, for example, Jeremiah Hackett, "Philosophy and Theology in Roger Bacon's *Opus Maius*", in *Philosophy and the God of Abraham. Essays in Memory of James. A. Weisheipl, O.P.*, edited by R. James Long (Toronto: Pontifical Institute of Mediaeval Studies, 1991), 55-69; Catherine König-Pralong, *Le bon usage des savoirs. Scolastique, philosophie et politique culturelle* (Paris: Vrin, 2011), 128-165; Jeremiah Hackett, "Roger Bacon and the Moralization of Science: From Perspectiva through Scientia experimentalis to Moralis Philosophia", in *I Francescani e le scienze. Atti del XXXIX Convegno internazionale* (Assisi, 6-8 ottobre 2011) (Spoleto: CISAM, 2012), 369-392.

much more the attention of scholars.[3] A visit to the site of the Roger Bacon Research Society, under the heading 'studies', lists over nine hundred entries, which confirms such an observation,[4] although there are some noteworthy exceptions.[5] This is particularly true for Bacon's contribution to political thought, which is, according to him, an integral part of moral philosophy. Some interesting contributions concern the use of rhetoric in moral persuasion,[6] but important remarks about his political ideas tend to be scattered in publications that deal with Bacon's works in the context of more comprehensive issues, such as the reception of Aristotle's *Politica,*[7] or Bacon's views on mission and conversion of the 'infidels'.[8] This situation does not seem to be accidental. If one takes into consideration the *Opus maius*, for example, the extreme conciseness of Part II of the *Moralis philosophia* (where Bacon deals with political issues) stands out in comparison to the rest of the work. "Part II is an outline of social order taken from Avicenna. It is very brief." This remark by Hackett in the aforementioned Epilogue is correct but could understandably betray a kind of disappointment as well.[9]

The present paper does not claim to substantially modify previous assessments concerning Bacon's ethical and political thought, but limits itself, rather, to a closer scrutiny of some passages that can help situate the *Doctor mirabilis* in medieval political discourse. In particular, I will focus on Bacon's understanding of the *philosophi* – and

[3] Similar remarks already in Georg Wieland, "Ethik und Metaphysik. Bemerkungen zur Moralphilosophie Roger Bacons", in *Virtus Politica. Festgabe zum 75. Geburtstag von Alfons Hufnagel* (Stuttgart-Bad Cannstatt: Formmann - Holzboog, 1974), 147-173.

[4] See https://rogerbaconresearchsociety.com/studies/, last visited 15 July 2021.

[5] For example, see Franco Alessio, *Introduzione a Ruggero Bacone* (Roma and Bari: Laterza, 1985), where almost a tenth of the book (107-118) is devoted to the *Moralis philosophia*. Günther Mensching, *Roger Bacon* (Munster: Aschendorff, 2009) is more generous: more than twenty pages (101-123) of his introductory booklet deal with this work of Bacon.

[6] Jeremiah Hackett, "Roger Bacon on Magnanimity and Virtue", in *Les philosophies morales et politiques au Moyen Age / Moral and Political Philosophies in the Middle Ages,* edited by B. Carlos Bazán, E. Andújar, and L. G. Sbrocchi (New York: LEGAS, 1995), 367-377; Jeremiah Hackett, "Practical Wisdom and Happiness in the Moral Philosophy of Roger Bacon", *Medioevo* 12 (1986): 55-110; Jeremiah Hackett, "Moral Philosophy and Rhetoric in Roger Bacon", *Philosophy & Rhetoric* 20 (1987): 18-40. See also Astrid Schilling, *Ethik im Kontext erfahrungsbezogener Wissenschaft. Die Moralphilosophie des Roger Bacon (ca. 1214-1292) vor dem Hintergrund der scholastischen Theologie sowie der Einflüsse der griechischen und arabischen Philosophie* (Münster: Aschendorff, 2016), in particular, 152-187, where the author offers a description of the *Moralis philosophia* in the framework of a comparison with the ethical parts of Aquinas's *Summa theologiae.*

[7] Gianfranco Fioravanti, "Politiae Orientalium et Aegyptiorum: Alberto Magno e la *Politica* aristotelica", *Annali della Scuola Normale Superiore di Pisa*, 3rd ser., 9 (1979): 195-246, in part. 209-212; Gianfranco Fioravanti, "La *Politica* aristotelica nel Medioevo: linee di una ricezione", *Rivista di storia della filosofia*, n.s., 52 (1997): 17-29, in part. 20.

[8] See, for example, Davide Bigalli, *I Tartari e l'Apocalisse. Ricerche sull'escatologia in Adamo Marsh e Ruggero Bacone* (Florence: la Nuova Italia, 1971); Amanda Power, *Roger Bacon and the Defence of Christendom* (Cambridge: Cambridge University Press, 2013); Paolo Evangelisti, *Dopo Francesco, oltre il mito. I frati Minori fra Terra Santa ed Europa (XIII-XV secolo)* (Rome: Viella, 2020), 154-170.

[9] Hackett, "Epilogue", 407.

especially of Aristotle – as sources for political ideas. In this respect, my contribution can be placed in the wake of Gianfranco Fioravanti's seminal article, '*Politiae Orientalium et Aegyptiorum*,' where he emphasises the gap between Bacon's expectations concerning Aristotle's *Politica* and the actual structure and contents of the text made available to the Latin West thanks to William of Moerbeke's translation.[10] In the following pages, I will show, in the first place, that Bacon's division of 'moral philosophy', its originality notwithstanding, should be situated within the context of the Parisian Arts Faculty in the mid-thirteenth century, where different interpretations of the structure of practical philosophy were circulating. Second, I will show how Bacon attributes to Aristotle's *Politica* claims and remarks which he finds in other authors, such as Alfarabi and Avicenna. He is, in fact, persuaded that Alfarabi, Avicenna and Averroes also follow Aristotle's teachings as far as political thought is concerned. Third, turning my attention to Bacon's later writings, it will become evident that over the years Bacon remains faithful to his own interpretation of Aristotle's political thought, even at a time when Aristotle's *Politica* had become available in Latin translation.

"Civilis scientia" in Bacon's division of the *Moralis philosophia*

It can be useful to recall that Bacon's *MP* is the seventh and last part of his *Opus maius*.[11] Begun at the invitation of Clement IV in 1266, the *Opus maius* is a gigantic effort to outline a complete renewal of scientific knowledge, though clearly dissenting with the mainstream academic trends of his times. One of the leading principles of Bacon's reform is that practical sciences are the final goal of all human knowledge.[12] According to the *Doctor mirabilis*, the seventh and final part of his *Opus maius* deals, therefore, with the best and most noble of all sciences - moral philosophy - and represents, so to speak, the culmination of the whole work. In turn, this seventh part of the *Opus maius* is divided into six parts. Part I concerns the relationship of human beings to God and deals, therefore, with the ultimate *finis hominis.* Part II examines relationships between human beings. Part III concerns virtues of the individual person. In Part III, divided into seven distinctions, the reader finds not only a classification of virtues, but also a large collection of excerpts from Latin authors, in particular from Seneca. The following parts, which Bacon sees as applied knowledge, are devoted to the art of persuasion. Part IV, divided into three distinctions, is devoted to the means that can be used to convince the truth of the Christian religion. In comparison to previous sections, Parts V and VI are rather brief. Part V deals with rhetorical arguments which encourage virtue, in particular the virtue of justice. Finally, Bacon limits himself to indicate that the subject matter of Part VI should

[10] Fioravanti, "Politiae Orientalium", 209-215.
[11] In what follows, with the abbreviation *MP* I will refer to Eugenio Massa's critical edition: Roger Bacon, *Moralis philosophia*, after Ferdinand Delorme edited by E. Massa (Zürich: Thesaurus Mundi, 1953).
[12] Cf. for example, Hackett, "Practical Wisdom and Happiness"; and Schilling, *Ethik im Kontext*, 126-151.

be 'forensic rhetoric', arguing that the *Opus maius* is already too lengthy and that the pertinent sources were not yet correctly translated.[13] The first chapter of this present paper will focus mainly, albeit not exclusively, on Part II, which, as already mentioned, deals with relations between human beings and comes closer to our understanding of political thought.

In the opening section of the *MP* (called *prohemium* by its critical editor, Eugenio Massa), Bacon does not distinguish between *scientia moralis* and *scientia civilis*,[14] but uses the two adjectives as synonyms, attributing this identification in the first place to Aristotle. According to him, the Stagirite and others call this science '*civilis'* because it demonstrates and constructs the laws (*iura*) of the citizens (*cives)* and of the body politic (*civitas)*. Explaining that he takes the meaning of *'civitas'* literally, Bacon shows that this depends on the fact that in the past, cities ruled over vast regions, as was the case for Rome.[15] For this reason, it is called 'civic,' although it concerns the laws (*iura*) of the kingdom and the empire.[16] Most probably, referring to Aristotle, Bacon has in mind book I, chapter I of the *Nicomachean Ethics*, where already Burgundio had rendered the Greek *'politiké'* with *'civilis'*.[17] As Irene Zavattero remarked, Bacon shares this identification of *moralis* and *civilis* with early commentators on the *Ethics*, such as Pseudo-Peckham and Robert Kilwardby.[18] This circumstance brings him closer to the first stages of the reception of *Nicomachean Ethics*, which occurred in the milieu where he himself had been active before entering the Order of Friars Minor: namely, the Parisian Arts Faculty.

[13] For former debates among scholars about part VI of the *Moralis philosophia*, see E. Massa, *Ruggero Bacone. Etica e politica nella storia dell'* "Opus Maius" (Rome: Edizioni di storia e letteratura, 1955), 7-55; an updated and reliable assessment can be found in Hackett, "Moral Philosophy and Rhetoric".

[14] Bacon, *MP*, I, 4: "hec vero practica vocatur moralis et civilis sciencia."

[15] The interpretation of '*civitas*' as meaning a concrete urban reality and not an abstract concept of 'political' community will also be one of the typical features of the first stages in the reception of the *Politica;* see e. g. Ulrich Maier, *Mensch und Bürger: Die Stadt im Denken spätmittelalterlicher Theologen, Philosophen und Juristen* (Munich: Oldenbourg, 1994), 69-70.

[16] Bacon, *MP*, I, 5-6: "Hec vero scientia moralis vocatur ab Aristotile et aliis civilis scientia, quia iura civium et civitatum demonstrat. Et quoniam solebant civitates dominari regionibus, ut Roma imperabat mundo, ideo hec scientia civilis denominatur a civitate, iura tamen regni et imperii construendo."

[17]Aristotle, "*Ethica nova*", in *Ethica Nicomachea. Translatio antiquissima, libri. II-III sive 'Ethica Vetus', Translationis Antiquioris quae supersunt sive 'Ethica Nova', 'Hoferiana', 'Borghesiana'*, edited by R.-A. Gauthier, Aristoteles Latinus, XXVI/1-3, fasc. 1 (Leiden: E. J. Brill; Bruxelles: Desclée de Brouwer, 1972), 66 (1194a27-28): "Videtur autem utique principalissime et maxime architectonice. Talis autem et que civilis videtur"; for the attribution to Burgundio, see Fernand Bossier, "L'élaboration du vocabulaire philosophique chez Burgundio de Pise", in *Aux origines du lexique philosophique européen: l'influence de* la Latinitas, edited by J. Hamesse (Louvain-la-Neuve: Brepols, 1997), 81-116; Riccardo Saccenti, *Un nuovo lessico morale medievale. Il contributo di Burgundio da Pisa* (Canterano [Roma]: Aracne, 2016), 63-69.

[18] Irene Zavattero, "Éthique et politique à la Faculté des arts de Paris dans la première moitié du XIIIe siècle", in *Les débuts de l'enseignement universitaire à Paris (1200-1245 environ)*, edited by J. Verger and O. Weijers (Turnhout: Brepols Publishers, 2013), 205-245, here in part. 229-234.

Bacon's stress on *iura* and *leges* as the principal objects of *civilis scientia,* however, points to an influential literary genre issuing from the same environment: the 'introductions to philosophy'. With the expression "introductions to philosophy" (or, in French, 'introductions à la philosophie'; or, in German, 'Einführungen in die Philosophie'), scholars generally refer to texts which, in the first decades of the thirteenth century, played a relevant role in the definition of philosophy, of its various branches and of their mutual relationships.[19] Adopting a threefold division of practical philosophy in ethics, *oeconomica* (identified with the government of the *oikos* or 'household') and politics,[20] many of such introductions, in fact, identify the object of political science with laws.[21] Written before the diffusion of the Latin translation of Aristotle's *Politics* and the pseudo-Aristotelian *Oeconomica*, such introductory texts encounter some difficulties in identifying authoritative textbooks for the second and third branches of moral philosophy. Aristotle's *Nicomachean Ethics* is, in fact, acknowledged (with a broad consensus) to be the textbook for the first branch, called not only *ethica*, but often also *monostica*.[22] For *oeconomica*, the most frequent choice is Cicero's *De officiis*, while the object of *politica* is described as *'leges et decreta'* where the two substantives refer respectively to civil law and canon law.[23] This reference has obvious philosophical implications, since it implies that the main concern of politics coincides with the object of legal studies.

Bacon's agreement with this tradition is only partial. On the one hand, as we shall see, he interprets the identification of the object of *scientia civilis* with laws in a way that differs from what most introductions to philosophy seem to imply, that is, that civil science deals with positive laws. On the other hand, he adopts a division of moral/civic science that is at variance with the accepted and more widely spread distinction between ethics, *oeconomica* and politics. According to Bacon, in fact, in its first articulation, moral or civil

[19] For a ground-breaking study of the literary genre called 'introductions to philosophy' see Claude Lafleur, *Quatre introductions à la philosophie au XIIIe siècle. Textes critiques et étude historique* (Montréal: Institut d'Études Médiévales, Paris: Vrin, 1988); Claude Lafleur and Joanne Carrier, "L'enseignement philosophique à la Faculté des arts de l'Université de Paris en la première moitié du XIIIe siècle dans le miroir des textes didascaliques", *Laval théologique et philosophique* 60 (2004): 409-448; For the use of the concept, see also Alexander Fidora, "The Arabic Influence on the Classification of Philosophy in the Latin West: The Case of the Introductions to Philosophy", *Micrologus: Natura, Scienze e Società Medievali* 28 (2020): 191-209.

[20] For examples of the division in *solitaria*, *oeconomica*, and *politica* going back to the XIIth century, for example to Hugh of Saint-Victor's *Didascalicon*, see Gian Carlo Alessio, "Sul De ortu scientiarum di Robert Kilwardby", in *La divisione della filosofia e le sue ragioni. Letture di testi medievali (VI-XIII secolo)*, edited by G. D'Onofrio (Cava de' Tirreni, Salerno: Avagliano 2001), 107-135, in part. 124-126.

[21] Zavattero, "Éthique et politique", 210-211; see also Gilbert Dahan, "Théologie et politique aux XII^{e} et XIII^{e} siècles. Quelques réflexions", *Revue d'histoire et de philosophie religieuses* 91 (2011): 507-523.

[22] For an example of the use of 'monostica', see the introductory texts edited in Claude Lafleur and Joanne Carrier, "La 'philosophia' d'Hervé le Breton (alias Henri le Breton) et le recueil d'introductions à la philosophie du ms. Oxford, Corpus Christi College 283 (deuxième partie)", *Archives d'Histoire Doctrinale et Littéraire du Moyen Âge* 62 (1995): 359-442, in part. 384.

[23] See, e. g. the witness by Arnulfus Provincialis, *Divisio Scientiarum*, in Lafleur, *Quatre introductions*, 295-355, in part. 334: "et hanc dicunt quidam haberi per leges et decreta."

science is divided in three: first comes the orientation to God, then to our neighbour, and lastly to ourselves.[24] The third member of this division corresponds roughly to a virtue ethics, while the first concerns theological truths that can be grasped by philosophical means alone. Pia Antolic-Piper has pointed out that this structure strongly recalls what we can find in the introductory text known as the 'guide de l'étudiant' but now referred to also as *Nos gravamen*.[25] As a matter of fact, the anonymous author of this 'guide' divides moral philosophy according to different aspects of the life of the soul. First, the soul lives in the divine good; second, in the good of the others (*in bono aliorum*); and third in itself, governing the sensitive powers of the soul. The second term of the division is, in turn, distinguished in two parts: the first, rather enigmatic, is called *'ipotica'* and consists in governing one's subjects.[26] The second part, *politica*, is concerned with life according to the *lex communis*.[27] Although the coincidence between the position upheld in *Nos gravamen* and the division of moral philosophy adopted by Bacon is far from being complete, three points do stand out: the inclusion of the orientation to God (understood loosely) as part of moral philosophy (although *Nos gravamen* does not go into detail, dealing in reality only with *Ethica nova* and *vetus*). Second is the precedence of the discipline concerned with life in community over individual ethics.[28] And third, the identification of the object of *politica* with *leges* (although Bacon does not mention *decreta* in this context).

[24] For a synthetic presentation of the structure of practical philosophy according to Bacon, see Nikolaus Egel, "Einleitung" in Roger Bacon, *Opus tertium*, Lateinisch-Deutsch, (Hamburg: Meiner, 2020), cxii-cxiii.

[25] Pia Antolic-Piper, "Einleitung" in Roger Bacon, *Opus Maius. Eine moralphilosophische Auswahl*, edited, introduced and translated by P. Antolic-Piper (Freiburg, Basel and Wien: Herder, 2008), 45-46; a rich literature has been devoted to the study of *Nos gravamen*, starting from various contributions by its critical editor, Claude Lafleur, for example, *L'einsegnement de la philosophie au XIII^e siècle. Autour du 'Guide de l'etudiant' du ms. Ripoll 109*, edited by C. Lafleur (Turnhout: Brepols, 1997).

[26] On this issue, see Francisco Bertelloni, "Politologische Ansichten bei den Artisten um 1230/1240: Zur Deutung des anonymen Studienplans Hs Ripoll 109", *Theologie und Philosophie* 69 (1994): 34-73; critical remarks in Zavattero, "Éthique et politique", 221-223, who a provides a clue to the understanding of what is meant by *ypotica,* referring to the reception of Algazel (see 212, footnote 31). Attention to Zavattero's remarks is very useful when reading Francisco Bertelloni's ground-breaking contributions to the definition of *politica* in XIII century introductions to philosophy, such as, "Presupuestos de la recepción de la 'Politica' de Aristóteles" in *Aristotelica et Lulliana: magistro doctissimo Charles H. Lohr septuagesimum annum feliciter agenti dedicata*, edited by F. Dominguez Riboira *et alii* (Steenbrugge-The Hague: Nijhoff 1995), 35-54 or the later "Les schèmes de la philosophia practica antérieurs à 1265: leur vocabulaire concernant la Politique et leur rôle dans la réception de la Politique d'Aristote", in *L'élaboration du vocabulaire philosophique au Moyen Age: Actes du Colloque international de Louvain-la-Neuve et Leuven*, 12-14 septembre 1998, edited by J. Hamesse and C. Steel (Brepols: Turnhout 2000), 171-202.

[27] Anonymus, *Compendium Nos Gravamen*, in *La "Guide de l'étudiant" d'un maître anonyme de la faculté des arts de Paris au XIIIe siècle*, edited by C. Lafleur and J. Carrier (Québec: Faculté de philosophie, Université Laval, 1992), 53: "Item, anima uiuit in bono omnium communiter secundum legem communem, et secundum hoc est scientia que traditur in legibus et decretis."

[28] I can't agree with Astrid Schilling's attempt to downplay the philosophical relevance of this priority on the basis of the limited extension of *Moralis philosophia*, part II, see Schilling, *Ethik im*

We may conclude that Bacon's classification of moral/civic knowledge shows several points of contact with the proposals circulating in the Parisian Faculty of Arts in the decades preceding his main work, the *Opus maius* (1266-67). On the other hand, it is not surprising that he is aware of the peculiarities of his own position. He defends it at the beginning of the *MP*, Part III arguing that the worship of God has precedence and that the common good precedes the private good, in the same way as virtues (such as *caritas*) concerning the community, are superior to the *mores* of the individual.[29] It might be that Bacon's decision to place political concerns before individual ethics is influenced by the well-known passage of the *Nicomachean Ethics,* Book I - "Amabile quidem enim et uni soli, melius vero et divinius genti et civitatibus" as it is rendered in Grosseteste's *recensio recognita*.[30] As a matter of fact, in this context, the *Doctor mirabilis* does not quote Aristotle's *Ethics*, but other authors, such as Avicenna. According to him, Bacon writes, "homo est animal sociale" and, therefore, the laws regulating social life receive priority with respect to individual virtue.[31] The eremitical life - which was going to represent a stimulating case for later commentators on Aristotle's *Politica* - is here excluded by Bacon from the discussion on the basis of Aristotle's and Averroes' sharp judgement: the hermit, who is not part of the *civitas*, can be neither good nor bad.[32] In reality, this statement, as Eugenio Massa rightly remarks in his *apparatus fontium*, can be read only in Averroes' commentary

Kontext, 175-176: "Wäre Bacon die Politik bzw. die öffentliche Ethik wirklich so wichtig gewesen, hätte er ihr mit Sicherheit einen grösseren Platz eingeräumt."

[29] Bacon, *MP*, III, 45: "Et quod hec debeat esse tercia, patet evidenter: quoniam illa pars, que continet cultum Dei, planum est quod est prima, sicut declaratum est. Bonum autem commune preponitur bono privato ...; sed pars precedens bonum habet commune, pars ista bonum exhortatur privatum. Caritas enim maxima virtus est; et hec ordinatur ad bonum commune, et concordia et pax et iusticia eam comitantur; que virtutes excedunt mores singularium personarum." About the concept of "bonum commune" see Matthew S. Kempshall, *The Common Good in Late Medieval Political Thought* (Oxford: Oxford University Press, 1999).

[30] Aristotle, *Ethica Nicomachea*, *Translatio Roberti Grosseteste Lincolnienis sive 'Liber Ethicorum' B. Recensio recognita*, I, edited by R.-A. Gauthier, Aristoteles latinus, XXVI/1-3, fasc. IV (Leiden: E. J. Brill; Bruxelles: Desclée de Brouwer, 1973), 376 (1094b10). The former translation known as *Ethica nova* has the reading 'divinum' instead of 'divinius', cf. Aristotle, *Ethica nova* (edition as in footnote 17, above), 66. For an English rendering of the passage, see Aristotle, *The Nicomachean Ethics*, translated by J. A. K. Thomson, revised by H. Tredennick, introduction by J. Barnes (London *et alibi*: Penguin, 2004), 4-5: "For while it is desirable to secure what is good in the case of an individual, to do so in the case of people or a states is something finer and more sublime."

[31] Bacon, *MP*, III, 45: "Nam homo est animal sociale, et de sua proprietate est, ut dicit Avicenna quinto de anima et in Radicibus moralis phylosophie, ut non vivat solus sicut brutum animal, quod sibi soli in vita sua sufficit. Et ideo leges, que ordinant homines ad proximum, sunt maiores." For a similar standpoint, by the anonymous author of the introduction *Dicit Aristotiles*, see Zavattero, "Éthique et politique", 215; the edition of the passage is in Lafleur and Carrier, "La 'philosophia'", 384.

[32] Cf. Marco Toste, "The Naturalness of Human Association in Medieval Political Thought Revisited", in *La nature comme source de la morale au Moyen Âge,* edited by M. van der Lugt (Florence: SISMEL-Edizioni del Galluzzo, 2014), 113-188. From a philosophical point of view, see Juhana Toivanen, *The Political Animal in Medieval Philosophy. A Philosophical Study of the Commentary Traditions c. 1260-c. 1410* (Leiden and Boston: E. J. Brill, 2021): 281-354.

on the *Metaphysics*.[33] Bacon is persuaded of the priority of common laws with respect to moral individual perfection and wants to show that he is not in contradiction with the Philosopher, although the latter follows a different order in his writings. According to Bacon's explanation, in fact, the two approaches differ only because, in his investigation, Aristotle takes his point of departure from what is more known to us rather than from what is more known by nature.[34] Bacon's acquaintance with the division of moral science in ethics, *oeconomica*, politics, does not necessarily mean, of course, that he had direct access to all Aristotelian works (with the notable exception of the *Nicomachean Ethics*). For example (as far as the relationship between ethics and politics is concerned), such an assertion could have been grasped from the concluding remarks of the *Nicomachean Ethics* itself.[35] Prologues to commentaries on Porphyry, such as *Sicut dicit Ysaac*, and the afore mentioned Arnoul de Provence (dated before 1246-1247) already witness that some authors shared the conviction that Aristotle had indeed dealt with *oeconomica* and *politica,* but in books which had not yet been translated into Latin.[36]

Bacon's definition of *moralis philosophia* and its divisions can, therefore, be situated in the fluidity of the context in the Arts Faculty at the beginning of the reception process of Aristotelian practical philosophy, where diverging approaches were in circulation. To the best of my knowledge, it does not seem that his position can be traced back to a single source; rather he seems to be combining different elements. Without a doubt, Bacon attaches importance to the possibility of attributing some tenets of his own position to Aristotle's teaching: this is true for the identification of *moralis* with *civilis*, but also for his judgement concerning eremitical life, although it is not present in the Stagirite, but only in his Commentator.

Avicenna and Aristotle in Part II of the *Moralis Philosophia*

As seen above, Bacon argues in favour of the 'ontological' priority of the community over the individual, referring to both Aristotle and Avicenna. When it comes to deal with "laws and statutes regulating the relations among human beings" in Part II, his mentor is

[33] Bacon, *MP*, III, 45-46: "Et secundum eundem Aristotilem et Averroym, decimo Metaphisice, vir heremita, qui non est pars civitatis, sed sibi soli vacat, neque est bonus neque malus"; see Averroes, in Aristotle, *Metaphysicorum libri XIIII, cum Averrois Cordubensis in eosdem commentariis*, X. 6 (Venice: Apud Iunctas, 1572), 264: "...vt quedam habeant medium v. g. quoniam homo eremita qui non eft pars ciuitatis, non est bonus aut malus et est medius"; for the same reference in the anonymous introduction to philosophy *Dicit Aristotiles*, see Lafleur and Carrier, "La 'philosophia'", 384; the editors rightly refer to *Opus maius* for the presence of the same quotation.

[34] Bacon, *MP*, III, 46: "Et hoc est verum secundum ordinem dignitatis nature et simpliciter loquendo, licet Aristotiles hunc modum non teneat in libris suis, quia procedit secundum viam inquisitionis et ideo ab eis, que notiora sunt nobis, non nature."

[35] Aristotle, *Ethica Nicomachea*, *Translatio Roberti Grosseteste* (edition as above, footnote 30), X, 586-588 (1180b29-1181b23).

[36] Zavattero, "Éthique et politique", 212-213.

almost exclusively Avicenna.[37] In fact, the *MP*, part II, can be seen as a sort of commented collection of excerpts from Avicenna's *Philosophia prima*, Book X, parts 4 and 5, which Bacon often refers to under the title *Radices moralis philosophiae*.[38] This choice is not unprecedented. Explicitly referring to Avicenna, Gundissalinus's *De divisione philosophiae* distinguishes different parts of practical philosophy, treating *politica* or *civilis ratio* first.[39] Moreover, a branch of this science is called *scientia legis*: in his treatment of the subject, Gundissalinus tacitly inserts a long quotation from Avicenna's *Philosophia prima*, which coincides - although only in part - with the text that Bacon uses as a main source for the *MP*, part II.[40] It is worth underscoring that Bacon is selective in his use of Avicenna. Unlike Avicenna, who starts from the division of the *civitas* in three parts, for Bacon the laws of marriage come first.[41] *Inter alia*, these laws should forbid fornication and sodomy.[42] After this first literal quotation from Avicenna - from which Bacon leaves out the long digression on polygamy and divorce - he inserts his own considerations on other laws, namely, those regulating relations between subjects and prelates and princes, and between servants and masters.[43] In this wide spectrum of power relations, Bacon includes

[37] Bacon, *MP*, II, 39: "Secunda pars descendit ad leges et statuta hominum inter se."

[38] Avicenna, *Liber de Philosophia Prima sive scientia divina, Partes V-X*, edited by S. Van Riet (Louvain: Peeters, Leiden: E. J. Brill, 1980); Bacon, *MP*, I, 9 provides a sort of explanation of this title: "Et per hec continuatur methaphisica cum morali et descendit in eam, sicut in finem suum, sicut Avicenna pulcre coniungit eas in fine Methaphisice."

[39] Dominicus Gundissalinus, *De divisione philosophiae*, edited and translated to German by A. Fidora and D. Werner (Freiburg, Basel and Wien: Herder, 2007), 252-262. For an updated source of information and materials about Dominicus Gundissalinus, see Nicola Polloni, *Potestas essendi*: https://potestas-essendi.com/ (accessed 31 January 2022).

[40] Gundissalinus, *De divisione*, 256-260; Zavattero "Éthique et politique", 219 draws attention on this implicit quotation; about his moral philosophy Alexander Fidora, "A tripartição da filosofia práctica na obra 'De divisione philosophiae' de Domingos Gundisalvo", in *Idade Média: Tempo do mundo, tempo dos homens, tempo de deus*, edited by J. A. de C. R. De Souza (Porto Alegre: Est Edições, 2006), 417-428. Concerning the relationship between Gundissalinus and Avicenna in general, see Nicola Polloni, "Gundissalinus and Avicenna: Some Remarks on an Intricate Philosophical Connection", *Documenti e Studi sulla Tradizione Filosofica Medievale* 28 (2017): 515-552.

[41] Avicenna, *Liber de Philosophia*, X, 4, 542. The commented translation from Arabic into Italian, which contains the Latin version too, is an extremely useful tool, although its main interest is devoted to the original Arabic, while for the present research the Latin text is decisive; see Avicenna, *Metafisica*, testo arabo a fronte, testo latino in nota, edited by O. Lizzini and P. Porro (Milano: Bompiani 2006), in part. 1273-1277 for explicative footnotes.

[42] Bacon, *MP*, II, 39: "Et ideo dantur leges coniugii; et statuunt quomodo habent fieri et qualiter impedimenta amoveantur, et precipue quod a civitatibus excludantur fornicatores et sodomite…"; see Avicenna, *Liber de Philosophia*, X, 4, 544: "ut prohibeat etiam actiones quae, si negliguntur, inducunt contrarium constructioni civitatis, sicut fornicatio et sodomia quae retrahunt homines ab eo quod melius est in civitate, scilicet coniugio."

[43] Bacon, *MP*, II, 39: "Deinde dantur leges secundum quas ordinantur subditi ad prelatos et principes, et e converso, et servi ad dominos, secundum omne genus dominii et servicii, et secundum quas paterfamilias debet vivere in regimine prolis et familie, et magister ad discipulos." It is worth noting that Bacon does not quote Avicenna here, most probably because there is no pertinent passage in his source.

the relation between a paterfamilias and his offspring which, according to a more widespread division of practical philosophy already mentioned, would belong to the *oeconomica*.[44] Bacon adds, however, the relationship between teacher and pupils and the structure of the craft guild, where experienced craftsmen instruct the young, to which Bacon significantly assimilates doctors, that is, teachers of a science.[45]

A second quotation from Avicenna supports the idea of a hierarchically ordered society, where everybody has a direct superior and a specific role that contributes to the common good (*utilitas*) of the whole community. In the Latin translation of Avicenna's *Philosophia prima,* the three essential constitutive parts of the political community are named as "*dispositores*", "*ministri*" and "*legis periti*".[46] Instead of explaining what is exactly meant by the first two expressions, Bacon refers to an opinion which he attributes to Plato but derives, in fact, from a *dictum* of the *Decretum Gratiani*: "in Plato where it is described that the most justly organised *civitas* is where everybody ignores his own affections".[47] In such a highly structured society, inspired by the superiority of the whole over the parts, there is no place for idleness. Those who cannot be restrained should be expelled from the city, unless they are ill or too old to fulfil their duties. Bacon skips here Avicenna's refusal to allow euthanasia but quotes the long passage where the Persian philosopher describes how a sort of 'national treasury' should be established and used, among other purposes, to fund the assistance to those who cannot take care of themselves because of sickness and - Bacon adds – old age.[48] As an additional task of the lawgiver, Bacon indicates the regulation of patrimonies, contracts, and the like. Unsurprisingly, the aim of such regulations are peace and justice. Consistently, activities that lead to the loss of property should be forbidden. Quoting Avicenna, Bacon mentions wrestling and gambling.[49] As 'doctrines' contrary to what is advantageous for the whole community, he mentions the "doctrina furandi et rapiendi"; these should be prohibited as well.[50]

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[44] For the rich literature concerning medieval *oeconomica* see Pavel Blažek, *Die mittelalterliche Rezeption der aristotelischen Philosophie der Ehe. Von Robert Grosseteste bis Bartholomäus von Brügge* (Leiden and Boston: E. J. Brill, 2007).

[45] This is not surprising, if one recalls the early origins of the University: see e. g. Nathalie Gorochov, *Naissance de l'université. Les écoles de Paris d'Innocent III à Thomas d'Aquin (v.1200-v.1245)* (Paris: Champion 2012).

[46] Bacon, *MP*, II, 39; see Avicenna, *Liber de Philosophia*, X, 4, 542.

[47] Bacon, *MP*, II 40; Eugenio Massa fails to mention this source, but the correspondence is literal: *Corpus Iuris canonici*, I, *Decretum magistri Gratiani*, dist. VIII, dictum ante, edited by E. Friedberg (Leipzig: Tauchnitz, 1879), 12. On this passage see Stephan Kuttner, "Gratian and Plato", in *Church and Government in the Middle Ages: Essays presented to Christopher R. Cheney*, edited by C.N.L. Brooke *et alii* (Cambridge *et alibi:* Cambridge University Press, 1976), 93-111.

[48] Bacon, *MP*, II, 40; see Avicenna, *Liber de Philosophia*, X, 4, 542-543.

[49] Bacon, *MP*, II 40-41; see Avicenna, *Liber de Philosophia*, X, 4, 544. Concerning the medieval discussions on the admissibility of gambling, see Giovanni Ceccarelli, *Il gioco e il peccato. Economia e rischio nel Tardo Medioevo* (Bologna: Il Mulino, 2003).

[50] For a summary description of the well-organized society according to Bacon, see Bigalli, *I Tartari*, 155-158.

The last paragraph of the first section of Part II regards – so to speak – 'foreign relations': the members of the community should be ready to defend it and to fight against enemies of the law. One cannot miss the shift, in this passage taken from Avicenna, from the plural 'laws,' (concerning, as seen above, marriage, contracts and illicit activities) to the singular 'law.' There cannot be much doubt that Bacon's source - Avicenna - refers to the Islamic religion.[51] This is the case in the following sentence too, where he states that the existence of another city or kingdom founded on good constitutions and laws (plural) is not in itself incompatible with the one established by the lawgiver, until the time comes in which only one law (singular) - the best one - should rule the whole world.[52] Bacon reads Avicenna as referring to the Christian religion.[53] The paragraph ends with a further quotation from the *Philosophia prima,* according to which, those who - after being admonished - continue to dissent from the law, should be killed.[54]

Part II of the *MP* contains a second, brief section, dealing with the succession of the lawgiver. Bacon again quotes Avicenna, albeit tacitly modifying the Latin translation; for he substitutes *'propheta'* with legislator and he omits the specification that his successor should be "de genere suo".[55] According to this excerpt from Avicenna's *Philosophia prima*,

[51] Meryem Sebti, "Le gouvernement selon Avicenne. Providence divine et statut de la politique dans la Métaphysique du Šifā'", *Archives de Philosophie* 82 (2019): 719-728.

[52] Bacon, *MP,* II, 41; see Avicenna, *Liber de Philosophia*, X, 4, 550-551: "Si autem alia civitas fuerit bonarum constitutionum, hoc non adversatur ei, nisi tempus fecerit debere non esse aliam legem nisi illam quae descendit, cuius institutio, quoniam optima est, tunc dilatanda est per totum mundum."

[53] Bacon, *MP*, II, 41: "Et in hoc verbo lex christiana innuitur." Bacon is projecting on Avicenna his persuasion of the final victory of the Christian faith, that he believes to prove on the basis of Albumasar's historical astrology. See Roger Bacon, *Opus Maius*, IV, edited by J. H. Bridges, vol. 1 (Oxford: Clarendon Press, 1899), 254-269. In *Moralis philosophia*, IV, 193-195, Bacon refers to the astrological section of *Opus maius*. The whole issue is obviously connected to Bacon's eschatology and his project of the diffusion of the Christian faith. About this interesting issue, which, after seminal research by Bigalli, *I Tartari*, is now receiving renewed interest, see e. g. Timothy J. Johnson, "That They May Love the Faith: Roger Bacon on Culture, Language, and Religion", in *From La Florida to La California: Franciscan Evangelization in the Spanish Borderlands*, edited by T. J. Johnson and G. Melville (San Francisco: Academy of American Franciscan History, 2013), 23-33; see also above, footnote 8.

[54] Avicenna, *Liber de Philosophia*, X, 5, 551: "Si autem aliqui fuerint inter eos qui in aliquo a lege discordent, prius corrigantur ut resipiscant; quod si facere noluerint, occidantur."

[55] Bacon, *MP*, II, 41: "Et ultimum, quod hic exigitur, est quod legis lator 'sibi constituat successorem'. Et hoc fit, secundum Avicennam, per hunc modum. Debet enim hoc facere 'cum consensu maiorum et vulgi et talem eligat qui bene regere possit'..." See Avicenna, *Liber de Philosophia*, X, 5, 548: "Post hoc, oportet ut propheta constituat sibi successorem de genere suo, sed cum consensu maiorum et vulgi, et ut talem eligat qui bene regere possit." The issue of the successor of the prophet/lawgiver plays a key-role in Avicenna: see e. g. Miriam, Galston, "Realism and Idealism in Avicenna's Political Philosophy", *The Review of Politics* 41/4 (1979): 561-77; James W. Morris, "The Philosopher-Prophet in Avicenna's Political Philosophy", in *The Political Aspects of Islamic Philosophy Essays in Honor of M. S Mahdi*, edited by Ch. Butterworth (Cambridge Mass.: Harvard University Press, 1992), 142-188. Bacon's attitude to Avicenna theological-political assumptions (so to speak) deserves an investigation of its own, since in

the legislator chooses his successor with the consensus of the most important figures (the *maiores*) and of the people, He should be the best available expert of the law and possess the virtues necessary to rule. Opposition to this choice and attempts to elect another person amount to denying God, in such a way that the members of the community have the duty to fight against such an intruder and kill him. However, Avicenna does leave open the possibility of arguing that the one elected is, in fact, unworthy. In this case, he can be replaced by another.[56] Bacon then closes his treatment of the issue, remarking that civil law (*ius civile*) now in force among Latins belongs to this part of the *MP*. This is not surprising, since – as seen above – many divisions of philosophy considered *leges* (that is, civil law) to be the object of the *Politics*. Bacon insists, however, on the philosophical origins of legal wisdom, claiming that the Latins received their laws from the Greeks, that is, from the books of Aristotle and Theophrastus.[57]

In sum, in the *MP,* part II, Roger Bacon has carefully extracted from Avicenna's *Philosophia prima,* X, 4 and 5 some basic tenets of political thought, leaving aside all aspects that link that section to the Islamic tradition (for example, by substituting the word *'propheta'* with *'legis lator',* or omitting passages regarding polygamy). In another passage in the *MP*, part I, Bacon quotes Avicenna speaking of the "Deus humanus, quem licet adorare post deum", but, unlike Avicenna, he avoids using terms connected to prophecy.[58] One possible explanation of such omissions on the part of Bacon could be that he wants to present Avicenna first and foremost as a philosopher who has access, to use Hackett's words, "to a more general universal revelation of truth to all wise philosophers and wise persons".[59] The label 'Avicennian' can, therefore, be consistent with Bacon's contribution to medieval political thought, but not without some qualifications. In the first place, 'Avicennian' should be interpreted not as referring to the 'political philosophy of Avicenna in itself,' but as the choice of a text by Avicenna in Latin translation as a leading

this passage he avoids overtly speaking of the religious character of the lawgiver, but in other passages acknowledges it: *MP*, I, 8-9: "decimoseptimo, quod uni tantum debeat fieri revelatio, quod iste debeat esse mediator Dei et hominum, et vicarius Dei in terra, cui subiciatur totum genus humanum... et iste est legis lator et summus sacerdos, qui in temporalibus et spiritualibus habet plenitudinem potestatis, tamquam 'Deus humanus, ut dicit Avicenna in decimo Metaphisice, quem licet adorare post Deum'." Bacon's language ("temporalia", "spiritualia", "plenitudo potestatis") is clearly reminiscent of the debates about the relationship between Pope and secular rulers, see Bigalli, *I Tartari*, 141-167.

[56] Bacon, *MP*, II, 42; see Avicenna, *Liber de Philosophia*, X, 5, 549.

[57] Bacon, *MP*, II, 42: "Et certum est quod Latini a Grecis habuerunt iura et leges, scilicet a libris Aristotelis ac Theophrasti, eius successoris, preter leges duodecim tabularum, quas primo transtulerunt de legibus Solonis Atheniensis." The source of this last claim could be the *Decretum Gratiani*: see *Corpus Iuris canonici, I, Decretum magistri Gratiani,* dist. VII, ch 1., 12.

[58] Bacon, *MP*, I, 8; Avicenna, *Liber de Philosophia*, X, 5, 553.

[59] Jeremiah Hackett, "Roger Bacon and Peter John Olivi on the 'status' of the Philosophers", in *Edizioni, traduzioni e tradizioni filosofiche (secoli XII-XVI). Studi per Pietro B. Rossi*, edited by L. Bianchi, O. Grassi and C. Panti, vol. II, (Canterano, Roma: Aracne, 2018), 557-571, here 559. A "philosophical" (as opposed to "theological") reading of Avicenna's is supported by scholars such as Olga Lizzini, "Le thèologico-politique à la lumière de la philosophie. Prophète, Halifa et espèce humaine selon Avicenne", in *Le théologico-politique au Moyen Âge*, edited by D. Poirel (Paris, Vrin: 2020), 71-86.

auctoritas in treating political issues. From this perspective, based on textual evidence, it is possible to highlight at least three important issues in which Bacon draws inspiration from Avicenna's *Philosophia prima*. First, Bacon finds that the architecture of this work, where the treatment of political matters occupies the last section of the last book, expresses a fundamental philosophical option which he makes his own: namely, that moral philosophy is not an adjunct to metaphysics, but rather its fulfilment. The *Doctor mirabilis* is consistent with this interpretation of Avicenna - something which is not uncontroversial among nowadays interpreters of the Persian philosopher.[60] Second, he concurs with Avicenna in supporting the concentration of power in the hands of one person: he speaks of the lawgiver in the singular and writes about the way he should provide for a successor. In another passage, Bacon writes again in the singular, of *princeps civitatis*, while no mention is made of the possibility of a collective government.[61] The monarchical form of government is, so to speak, taken for granted. This is probably not the case for a hereditary monarchy since Bacon omits Avicenna's "de genere suo". The consent of the *maiores* (and of the *vulgus*, for that matter) seems to play a role only in the moment of succession and, in Bacon's medieval eyes, could be understood, I think, as a practice belonging to what scholarship now calls *'konsensuale Herrschaft.'* This phrase, coined by Bernd Schneidmüller, refers to a sort of implicit but very influential assumption that the ruler, even the emperor, should act in agreement with the leading noble exponents of his kingdom. According to this view, even though there is no institutional procedure limiting the power of the sovereign, listening to the *maiores regni* and making consensual decisions belong to the moral duties of a just ruler.[62] And third, Bacon shares with Avicenna the idea that political power coincides mainly with law-making, and enacting rules encompassing the whole life of society, from family to the division of labour, from economic exchange to welfare institutions. Consistently, one of the qualities the successor of the lawgiver must possess is knowledge of the law at the highest level.[63]

It seems difficult to deny that adhesion to such principles also influences Bacon's expectations regarding Aristotle's *Politica*. While he was working on his *Opus maius*, the Latin translation of the *Politics* had just started circulating.[64] Bacon knew that Aristotle had written a book called *Politica*, but many clues point to the conclusion that he had no direct acquaintance with it yet. His claim that Aristotle's *Politica* is a *liber legum* has already been interpreted by specialists, such as Fioravanti and Flüeler, as a sign that at that time,

[60] Lizzini, "Le thèologico-politique", in part. 72.
[61] Bacon, *MP*, II, 40.
[62] Bernd Schneidmüller, "Konsensuale Herrschaft. Ein Essay über Formen und Konzepte politischer Ordnung im Mittelalter", in *Reich, Regionen und Europa in Mittelalter und Neuzeit. Festschrift für Peter Moraw*, edited by P.-J. Heibig *et alii* (Berlin: Duncker & Humblot, 2000), 53-87.
[63] Bacon, *Moralis philosophia*, II, 42: "...'peritus legis, quo nullus sit peritior'..."
[64] For a thorough discussion of evidence supporting a dating of Moerbeke's complete translation around 1265 see Christoph Flüeler, *Rezeption und Interpretation der Aristotelischen Politica im späten Mittelalter*, 2 vols. (Amsterdam-Philadelphia: B. R. Grüner, 1992), 1, 15-19; Jürgen Miethke, *Politiktheorie im Mittelalter. Von Thomas von Aquin bis Wilhelm von Ockham* (Tübingen: Mohr Siebeck, 2008), 27 accepts this dating.

he had no access to the text.[65] In fact, Bacon's definition of *Politica* seems to derive not from an actual reading of the Latin translation, but rather from the convergence of an established tradition mirrored in the 'introductions to philosophy' mentioned above, of Avicenna's insistence on the law-giver, and perhaps, of the closing remarks of the *Liber Ethicorum* (the title attributed to Grosseteste's translation of the *Nicomachean Ethics*): "...et qualis policia optima, et qualiter unaqueque ordinat, et quibus legibus et consuetudibus utens."[66]

In a further passage of the *MP,* Bacon writes that, in his *Politica,* the Stagirite analyses different species of *sectae* and *leges*, differentiating simple (which cannot be more than four or five) and composite ones according to the ends they pursue. According to Bacon, Aristotle would even prove which *sectae* and *leges* corrupt cities and kingdoms.[67] One could be tempted to try to figure out which parts of the *Politica* the English friar is referring to; but such speculation would be in vain, since Bacon himself gives the decisive clue, stating that Alfarabi, in his *De scientiis*, explains Aristotle's opinion about *sectae.*[68] The *Doctor mirabilis* is, therefore, not referring to any book of the *Politics*, but rather to Gerard of Cremona's translation of *De scientiis*, chapter five.[69] In this context, Alfarabi mentions Aristotle's *Politica* as source for the *scientia civilis*.[70] This 'science' examines many aspects of the political sphere and distinguishes between customs which are appropriate to the

[65] Fioravanti, "Politiae Orientalium", 209; Flüeler, *Rezeption und Interpretation*, I, 12-13.

[66] Aristotle, *Ethica Nicomachea, Translatio Roberti Grosseteste* (edition as above, footnote 30), X, 588 (1181b21-23). I owe this suggestion to an anonymous reader of a previous version of this paper: this reference to *Nicomachean Ethics* alone, however, would hardly account for Bacon's position. For an English version: Aristotle, *The Nicomachean Ethics,* 284: "...what kind of constitution is best and the best system of laws and customs for it to use."

[67] Bacon, *MP*, IV, 188: "Aristotiles autem in sua Politica descendit ad species sectarum, et dicit quod ipse vult considerare de sectis et legibus civitatum quatuor vel quinque simplicium et videre que leges corrumpunt civitates et regna, et que non. Et dicit quatuor esse vel quinque simplices sectas corruptas, intendens quod secta dicitur 'simplex' propter finem semplicem..."

[68] Bacon, *MP*, IV, 188-189: "ut docet Alfarabius, in libro De scienciis, sentenciam Aristotelis circa sectas exponens."

[69] Eugenio Massa refers here to Alfarabi, *Catálogo de la ciencias*, edited by Á. González Palencia (Madrid: Maestre, 1932), 172-174. I am using Alfarabi, *Über die Wissenschaften. De scientiis. Nach der lateinischen Übersetzung Gerhards von Cremona*. Mit einer Einleitung und kommentierenden Anmerkungen herausgegeben und übersetzt von F. Schupp (Hamburg: Meiner 2005), 112-135 (Latin text with parallel German translation). For interesting remarks on this subject, see Massimo Campanini, "L'ordinamento delle scienze in Al-Farabi, tra epistemologia e politica", *Rivista di Filosofia Neo-Scolastica* 108 (2016): 207-213.

[70] This information is available also in Gundissalinus's translation: Gundissalinus's version of *De scientiis*; see Alfarabi, *De scientiis secundum versionem Dominici Gundisalvi*, Lateinisch-Deutsch, edited by J. H. J. Schneider (Freiburg, Basel and Wien: Herder, 2006), 196. The rest, however, in contained only in Gerard of Cremona's translation, which adds Plato as a source for *scientia civilis*. See Alfarabi, *Über die Wissenschaften. De scientiis*, 118. About Alfarabi as source for Bacon in the *Moralis philosophia,* see also Francesco Bottin, "Introduzione" in *La classificazione delle scienze (De scientiis)*, translation and notes by A. Pozzobon (Padova: il Poligrafo, 2013), 48-51.

"*civitates bonae*".[71] In the same chapter, Alfarabi introduces an *ars legis* and an *ars elocutionis*. The first consists in deriving further norms from the law established by the *legis positor*. The second is described as an apology of the teachings of the lawgiver and, therefore, of his *secta* in comparison with other *sectae*.[72] Although we do not find in the *De scientiis* neither a distinction between simple and composite nor a list of the four or five *sectae corruptae*,[73] it seems evident that Bacon is elaborating on Alfarabi and not on Aristotle's *Politica*. He is, rather, reconstructing the contents of a book not available to him, working on the witness of the commentators he holds for the most part reliable. Avicenna, *precipuus Aristotilis expositor*,[74] plays a pivotal role, but Alfarabi's *De scientiis* is also extremely influential. Together with Averroes, whose judgement about the eremitical life is attributed to the Stagirite as well, they all belong to the *domus Aristotelis*.[75] In the opening passages of the *PM*, albeit discussing a more general issue, Bacon seems to hint at the hermeneutical strategy which he has followed. He maintains that philosophers have included moral teachings into their speculative works as well because they knew that moral philosophy – the mistress of human wisdom – is the ultimate goal of human knowledge. For this reason, it is not inappropriate to insert in the *philosophia moralis auctoritates* taken from texts which do not belong to this discipline.[76] On the other hand, Bacon adds, we cannot deny that such claims are not contained in books pertinent to *scientia moralis*, since the philosophy of Aristotle, Avicenna and Averroes has been only partially translated into Latin.[77] In the case of Aristotle's *Politica,* the *Doctor Mirabilis* seems to have applied an analogous approach. On the basis of what is found in other works, he feels entitled to assume that some statements must be contained therein.

[71] Alfarabi, *Über die Wissenschaften. De scientiis*, 118: "Deinde demonstrat quod ille operationes, et consuetudines et habitus omnes sunt egritudines civitatibus bonis."
[72] Alfarabi, *Über die Wissenschaften. De scientiis*, 122-124.
[73] It seems to me that here Bacon is somehow superimposing the astrology of religions he has already expounded in *Opus maius* IV, edited by J. H.Bridges, vol. I (Oxford: Clarendon Press, 1897), 253-269; on Alfarabi, and through him on Aristotle. Bacon resumes the discussion in *Moralis philosophia* IV, 188-195. On this issue, see Jole Agrimi and Chiara Crisciani, "Albumazar nell'astrologia di Ruggero Bacone", *Acme* 25 (1972): 315-338; Charles Burnett, "The Astrological Categorization of Religions in Abū Ma'shar, the *De vetula* and Roger Bacon", in *Language of Religion – Language of the People. Medieval Judaism, Christianity and Islam*, edited by E. Bremer *et alii* (Munich: Fink, 2007), 127-138.
[74] Bacon, *MP*, I, 12.
[75] Bacon, *MP*, I, 23. For Averroes, see above, footnote 33.
[76] Bacon, *MP*, I, 5: "Et ideo, si allegem auctoritates de aliis locis quam eas, que in libris moralibus continentur, considerari oportet quod he in hac scientia debent proprie collocari."
[77] Bacon, *MP*, I, 5: "Nec possumus negare ea esse scripta in libris huius scientie, quia non nisi secundum partes in latino habemus phylosophiam Aristotelis et Avicenne et Averroys, qui sunt autores in huiusmodi principales."

Opus tertium and *Compendium studii philosophiae*

As its critical editor, Nikolaus Egel, could ascertain, the *Opus tertium* is not a mere abridgment of the *Opus maius*.[78] Although they obviously do not represent a radical change with respect to the *Opus maius*, the summary expositions of the *Moralis philosophia* contained in the *Opus tertium* add some qualifications with respect to the more expanded version. As far as politics is concerned, Bacon's task becomes somewhat easier, because he does not feel the need to literally quote Avicenna. The starting point is the same: part II of moral science concerns laws, or better, public laws, which manage worship, marriage and the way to secure justice and peace for *cives* and kingdoms.[79] The introduction concerning worship entails a modification in the list of the essential parts of the *civitas*. In the *Opus maius,* one finds three parts, their titles taken directly from Avicenna: *dispositores*, *ministros* and *legis peritos*.[80] In the *Opus tertium,* Bacon distinguishes four main groups, describing them in more detail: those responsible for divine worship; those with administrative and jurisdictional competences (the *sapientes*); those with law enforcement functions (*milites*); and, finally, *populus*.[81] In the following section, Bacon repeats his assertion from the *Opus maius* that the *ius civile* is contained in part II of *scientia moralis*, not as positive law, but rather in the form of the principles from which legislation descends. He offers a similitude. The relationship between this part of philosophy and positive law is analogous to that obtaining between a geometer and a carpenter.[82] In this way, what was implicit in the *Opus maius* (where Bacon had claimed that the Latins had received their laws from the Greeks) becomes clearer.[83] Moral philosophy explains the causes of law, while legal learning deals with existing laws as something given, *absolute*, without investigating their *rationes*. In comparison to the *MP*, Bacon introduces here a distinction between *laicale* and *sapientiale*. The approach of legal learning is considered a task of lay people, who content themselves with positive law, while wise men (*sapientes*) investigate the origins of norms. Bacon complains that among the Latins this part of philosophy is treated only *laicaliter*, that is, studying what was established by emperors

[78] Nikolaus Egel, "Einleitung", in Roger Bacon *Opus tertium*, edited by N. Egel (Hamburg: Meiner Verlag, 2020), xxxiii-xxxiv.
[79] Roger Bacon, *Opus tertium*, II, 107 edited by N. Egel (Hamburg: Meiner Verlag, 2020), 900.
[80] See above, footnote 46.
[81] Bacon, *Opus tertium*, II, 107, 902: "Et ideo docet hec pars quod civitas dividatur principaliter in 4 partes: scilicet in eos qui divino cultui vacare debent; et secundo in sapientes qui de omnibus temporalibus ordinare debent et judicare; et 3° sunt milites, qui exsequantur edicta publica per potestatem, et observent pacem et justitiam, refrenando malos et discolos qui pertubant bonum commune; et 4° est populus, qui distribuatur secundum officia et artes diversas rei publice utiles." Here one cannot miss the echoes of late medieval distinctions between the secular sphere (*temporalia*) and divine worship.
[82] Bacon, *Opus tertium*, II, 107, 902: "Sicut enim carpentator utitur figuris, et angulis et lineationibus, et causas ac rationes eorum non assignat, sed geometer; sic est de jure civili laicorum, quod fundatur super sapientiam traditam in libris philosophorum de hoc eodem jure. Nam philosophia habet causas omnium et rationes sufficienter dare."
[83] See above, footnote 57.

and kings. Aristotle and Theophrastus, who dealt *philosophice* with this subject matter, are not in use.[84] As Gianfranco Fioravanti has shown, with this claim, Bacon is in line with many other masters, artists and theologians, who questioned the 'monopoly' of jurists in the sphere of political thought.[85] With respect to the *Opus maius*, Bacon has, therefore, added relevant specifications concerning the relationship between philosophy and legal learning; on the other hand, he omits the law-giver, who played such an important role in the former account. In the *Opus tertium*, the first promulgation of law lies more generically with the *sapientes*, while the populace acts according to the existing laws. Despite this relevant divergence, the two works agree on the identification of this part of *scientia moralis* with law-making. The existence of the community depends on rules that somebody, on the basis of his superior knowledge, dictates to the others. Aristotle's *Politica* is mentioned in the *Opus tertium* as the book where the Philosopher, carefully examining the laws of different cities and regions, singles out the best one.[86] Aristotle's judgement is confirmed by Alfarabi in his *De scientiis*, by Avicenna in the *Radices moralis philosophie* and by "tota familia Aristotelis". The *Opus tertium* also reiterates the claim that Aristotle's *Politica* examines simple and composite *leges* or *sectae*, criticising the corrupt ones and proving which one might be perfect.[87]

The *Opus tertium* is dated to 1267 (or 1268 at the latest, since the dedicatee, pope Clemens IV, died on the 29th of November of the same year);[88] approximately five years later, Bacon came back to the discussion of the object of moral science in his *Compendium studii philosophiae*.[89] In chapter IV of this work, we find a sweeping indictment against the

[84] Bacon, *Opus tertium*, I, 14, 102: "sed dolendum est quod haec pars philosophiae non est apud Latinorum usum nisi laicaliter, secundum quod imperatores et reges statuerunt; nam philosophice, secundum quod tradita est ab Aristotele et Theophrasto, non est haec pars in usu Latinorum." Bigalli, *I Tartari*, 147-149 interprets such passages by Bacon mainly as a negation of the autonomy of human law with respect to divine law. This is in part true, although the term 'laicaliter' is here opposed to 'philosophice' and implies an epistemological distinction and a vindication of the superiority of philosophy. See Dahan, "Théologie et politique", 507-509.

[85] Gianfranco Fioravanti, "Filosofi contro legistae. un momento dell'autoaffermazione della filosofia nel Medioevo", in *Was ist Philosophie im Mittelalter?*, edited by J. A. Aertsen and A. Speer (Berlin-New York: Walter de Gruyter, 1998), 421- 427.

[86] Bacon, *Opus tertium*, II, 109, 910-912: "Et ad hanc sectam inveniendam Aristoteles in libro suo de Politica descendit, revolvens leges singularum civitatum et regionum et fines illarum legum, ut per honestatem et utilitatem legum et sublimitatem finis eligat legem que excellat omnes ... Et nos Christiani credimus quod nostra lex sit illa sola que hominis continet finalem salutem."

[87] Bacon, *Opus tertium*, II, 109, 920: "et Aristoteles in Politica sua i. e. in scientia civili, revolvit has leges simplices et compositas, ut destruat eas que male sunt, et unam, que perfecta est, certificet. Et Alpharabius, in libro de Scientiis, et Avicenna, in Radicibus Moralis Philosophie et tota familia Aristotelis eum exponit et confirmat in hujus legis certificatione."

[88] Egel, "Einleitung", xxi, footnote 26 rightly remarks that the year 1267 is mentioned explicitly in part I of the *Opus tertium*. One cannot rule out, however, that the completion of the work took some more time.

[89] Thomas S. Maloney, "Introduction", in Roger Bacon, *CSP*, edited and translated by T. S. Maloney (Oxford: British Academy, 2018), xvi-xvii.

errors caused by the overvaluing of civil law. In the *Opus maius,* civil law had been defined as "Latinorum".[90] In the *CSP, ius civile* is labelled in a rather specious way as specifically 'Italian', for the very understandable reason that Bologna, in the thirteenth century, was acknowledged to be the main centre of legal learning. To the Bolognese civil lawyers, Bacon reproaches their appropriation of the title of *magistri,* even though they are laymen and in fact deal with laws enacted by lay rulers for their lay subjects.[91] Furthermore, the English Franciscan objects that it is absurd to export Italian laws (Bacon uses this polemical label to refer to *ius commune*) to other kingdoms, such as England or France, and to subject clergy to legal regulation pertaining to the secular sphere.[92] That which in the *Opus tertium* could sound as a methodological distinction, becomes here a polemical weapon. Civil law and moral philosophy are related to each other in the same way as the art of building and geometry are related to each other. This implies, according to Bacon, that *ius civile* is a 'mechanical' (*mechanica*) discipline devoid of any philosophical feature.[93] In this way, the *Doctor mirabilis* not only defends the privileges of the clergy but reaffirms, in more dismissive terms, the issue of the superiority of moral philosophy over civil law that had already surfaced in the *Opus tertium*.[94] Few chapters of Aristotle's political philosophy contain more than the whole corpus of Italian laws.[95] Aristotle and his followers (*sequentes*) have taught who should be the legislator and how to provide for his

[90] See above, footnote 57.

[91] Roger Bacon, *CSP*, IV, 56: "Quod est manifestum si consideremus quod hoc ius et a laicis principibus statutum est et pro laico populo dirigendo. Atque domini legum Bononiae et per totam Italiam volunt vocari magistri vel clerici, nec coronam sicut clerici habent. Uxores ducunt et omnino sicut laici familiam regunt et consortio et consuetudinibus laicalibus sunt subiecti."

[92] Roger Bacon, *CSP* IV, 56: "Praeterea omne regnum habet sua iura quibus laici reguntur, ut iura Angliae et Franciae. Et ita fit iustitia in aliis regnis per constitutiones quas habent, sicut in Italia per suas. Quapropter, cum iura Angliae non competant statui clericorum, nec Franciae nec Hispaniae nec Alemanniae, similiter nec iura Italiae conveniunt ullo modo, quia, si debeant clerici uti legibus patriae, tunc minus est inconveniens ut clerici Angliae utantur legibus Angliae, et clerici Franciae legibus Franciae, et sic de aliis, quam clerici Angliae et Franciae utantur legibus Italiae."

[93] Roger Bacon, *CSP*, IV, 56-58: "Nam scire debemus quod omnia quae sunt in usu laicorum sunt mechanica respectu philosophiae, ut ars aedificatoria est mechanica geometriae et non est pars philosophiae, et ars aurifabri est mechanica respectu alkimiae, et sic de omnibus artibus quae sunt in usu laicorum. Quapropter, ars iuris civilis laicorum est mechanica respectu iuris civilis philosophiae, et non est pars philosophiae, quia Aristoteles docet primo Metaphysicae differentiam inter artes mechanicas et scientias philosophiae, dicens quod isti mechanici operantur sine causae cognitione et ratione examinandi, sicut bruta animalia et sicut inanimata, velut ignis comburit, ut ait."

[94] One recalls the disparaging label 'legisti idiotae politici', used by Giles of Rome and later authors, cf. Jacques Krynen, "Les légistes 'idiots politiques'. Sur l'hostilité des théologiens à l'égard des juristes, en France, au temps de Charles V" in *Théologie et droit dans la science politique de l'État moderne*. Actes de la table ronde de Rome (12-14 novembre 1987) (Rome: École Française de Rome, 1991), 171-198.

[95] Bacon, *CSP*, IV, 62: "Certe maiora sunt hic in paucis capitulis quam in toto corpore iuris Italici."

successor.[96] In his passionate plea for Aristotle, the *Doctor mirabilis* drafts a kind of table of contents of the *Politica*: in the beginning, one would find there the foundations of divine worship, the laws for cities and kingdoms, and rules to be followed in legal disputes.[97]

In one passage of chapter IV, Bacon recalls that he has already written about this issue to the late Pope Clement.[98] In his *CSP,* he indeed remains faithful to the main tenets of *scientia civilis* which he had already exposed in the *MP*. Over the years, his understanding of *leges* as object of this science has been clarified thanks to a sharper distinction between the approach towards laws typical of legal science and that of philosophy. On the other hand, his reconstruction of the contents of Aristotle's *Politica* does not reveal substantial changes. This can be surprising, if one takes into consideration the fact that in 1272, Moerbeke's translation had been circulating for some years, while some authors had already started using it and, most probably, two important commentaries on the *Politica* had already been written. A slight uncertainty could remain for Aquinas's commentary, which is by common consent dated to the second Parisian stay of the Dominican Master and, therefore, could have been written at almost the same time. Since Albert the Great's commentary pre-dates that of Aquinas and could even go as far back as 1265, at least one commentary on the *Politica* was without doubt already available in 1272.[99] In search of an explanation, Gianfranco Fioravanti interpreted Bacon's attitude either as a "cultural lag", or as an "obstinate fidelity to an old pattern" or as an "audacious and extreme (un po' piratesca) reduction of Aristotle's complexity to his own agenda of cultural politics".[100] One could try to go beyond the alternatives put forward by the latter Italian scholar.[101] As

[96]Bacon, *CSP*, IV, 62: "Nam Aristoteles et sui sequentes docent quod haec lex, Deo revelante, haberi debet, et quis erit legislator, et quomodo probetur quod legem a Deo recepit, ut tandem credatur ei omnino; et qualiter ipse habet legem promulgare, et quomodo ordinare debeat de suo successore..." Here Bacon clearly echoes the contents of the *MP*, part II, drawn from Avicenna. See above, footnotes 42-55.

[97] Bacon, *CSP*, IV, 62: "Et primo statuit quod homines vivant in omni virtute, ut in decem libris constituit qui vocantur libri Ethicorum, quibus iungit libros Politicae in quibus primo statuit cultum divinum, in quo magnificat se adorare Deum unum et trinum eminentem proprietate rerum creatarum, investigans quamdam trinitatem in omnibus rebus creatis quae primo reperitur in creatore.[...] Deinde specialiter constituit sacrificia tria et orationes tres in honore trium personarum et postea reliqua quae ad cultum Dei pertinent, secundum quod philosophia potuit edocere. Et postea leges civitatum et regnorum instituit et oratoricas et rhetoricas constitutiones, quibus causae discindantur sine strepitu litis."

[98] Bacon, *CSP*, IV, 64: "Haec autem sub compendio collegi et misi domino Clementi apostolicae recordationis sicut multa alia..."

[99] See Flüeler, *Rezeption und Interpretation*, I, 15-29; François Cheneval, "Considérations presque philosophiques sur les commentaires de la Politique d'Albert le Grand et de Thomas d'Aquin", *Freiburger Zeitschrift für Philosophie und Theologie* 45 (1998): 56-82; Toivanen, *The Political Animal*, 27-28.

[100] Fioravanti, "Politiae Orientalium", 214-215: "Si tratta ormai o di ritardo culturale o di una ostinata fedeltà o di un'audace e un po' piratesca riduzione della complessità del testo aristotelico ai propri programmi di politica culturale."

[101] I would like to express my gratitude to an anonymous reader, whose critical remarks about a previous version of this paper convinced me to modify my position on this point.

I have tried to show, Bacon has 'reconstructed' – so to speak – a political Aristotle based on his own expectations and on the assumption that what he called the *familia Aristotelis* had followed the Stagirite in political philosophy as well. Such a reconstruction of the Stagirite as a political thinker is very coherent with his comprehensive project of reform, so that it would have been difficult for Bacon to change it dramatically. He continued to maintain the position expressed in the *MP*, where the identification of politics with the legislative action of a virtuous and wise monarch is placed under the aegis of the Stagirite and his *sequentes*. Did Bacon cling to his reconstruction also after having access to the actual text of Aristotle's *Politica*? A positive answer would most probably imply the "audacious" attitude of Fioravanti's third hypothesis. Although it sounds unlikely, given the lively cultural exchanges in the second half of the thirteenth century, I came to the conviction that the *Doctor mirabilis* had no opportunity of carefully reading Moerbeke's translation. If he had received additional information, it must have not been detailed and structured enough to revise a position that had become well integrated into his whole cultural programme. Bacon's failure to have Aristotle's *Politica* in his hands can be a matter of happenstance; but it is also possible that over time he lost interest in looking for a book whose contents he was convinced he knew before reading it. In the latter case, fidelity to his own former assessments could well have played a role. The fact that Bacon fails to take into consideration the actual contents of a book he refers to time and again as a pillar of political science remains puzzling. My suggestion rests admittedly on speculation. To corroborate it I can put forward only one argument, which is *e silentio* and, therefore, not decisive. In his *Compendium studii theologiae,* written near the end of his life, in 1292, complaining that Aristotle's works were translated too late, he mentions, in the last place, the *Ethica*, which was – according to him – made available to European scholars even later (*tardius*).[102] Reference to the *Ethica* is immediately followed by a rather typical complaint on his part about the huge quantity of books written by Aristotle, which have not yet been translated into Latin, with the effect of putting serious limits to our knowledge of his thought.[103]

Conclusions

It would be naively pretentious to claim that the present contribution deals with all aspects of Bacon's contribution to medieval political discourse. Among the issues which

[102] Roger Bacon, *CST*, II, edited by T. S. Maloney (Leiden *et alibi*: E. J. Brill, 1988), 47: "Et tardius communicata est Ethica et nuper a magistris lecta et raro."

[103] Roger Bacon, *CST*, II, 47; see above footnote 102. About Bacon's attitude to translators and translations into Latin see Richard Lemay, "Roger Bacon's Attitude Toward the Latin Translations and Translators of the Twelfth and Thirteenth Centuries", in *Roger Bacon and the Sciences. Commemorative Essays*, edited by J. Hackett (Leiden, New York and Cologne: E. J. Brill, 1997), 25-47 and Nicola Polloni, "Disentangling Roger Bacon's Criticism of Medieval Translations" in *Early Thirteenth-Century English Franciscan Thought*, edited by L. Schumacher (Berlin and Boston: De Gruyter, 2021), 261-282.

deserve further investigation, I would mention, first, Bacon's edition of the *Secretum secretorum*, to which he also refers with the title *De regimine regnorum*.[104] The *Secretum* was considered, at least in part, a Mirror of Princes.[105] Mainly for this reason, I think, in his entry in the *Stanford Encyclopedia* on Roger Bacon, Jeremiah Hackett deals almost exclusively with this work under the heading *Bacon's Political Philosophy*.[106] Examining Bacon's edition of the *Secretum* would be necessary in order to attain a more comprehensive picture of Bacon's contribution in this field, but it raises so many questions that a separate study seems to be unavoidable.[107] A second, more general subject could be the relationship existing between what we could call - for simplicity's sake - his 'political philosophy' (which is the main focus of the present paper) and his 'political theology' (also including his ecclesiology).

If the present contribution succeeds in persuading specialists in the field, the desired further developments, just sketched above, can benefit from its conclusions. Roger Bacon's division of moral science can be considered a product of the intellectual milieu of the Parisian Arts Faculty of the mid-thirteenth century. It shows important resemblances to the didactic literature known as 'introductions to philosophy', which is, in turn, an expression of a fluid situation, open to different interpretations of the structure of practical philosophy. The process of the reception of Aristotle's works was still in progress during Bacon's lifetime. Writing the last part of his *Opus maius*, Bacon felt the need to appeal to the authority of the Stagirite; but having no access to Aristotle's *Politica* in Latin, he tried to reconstruct its main tenets through the writings of other thinkers, such as Avicenna and Alfarabi. The result of this attempt is a sketch of a political theory that goes mainly under the name of Aristotle but has little to do with the actual contents of the *Politica*. In the following years, Bacon remained faithful to his first reconstruction, not only in the *Opus tertium*, which was finished shortly after the *Opus maius*, but also in his

[104] Bacon, *MP*, I, 17: "Aristotiles quidem, in libro De regimine regnorum, expresse ponit et nominat Adam et Enoch..."; see Steven J. Williams, "Roger Bacon and His Edition of the Pseudo-Aristotelian Secretum Secretorum", *Speculum* 69 (1994): 57-73. For the wider context of the receptions of the *Secretum Secretorum*, Steven J. Williams, *The Secret of Secrets. The Scholarly Career of a Pseudo-Aristotelian Text in the Latin Middle Ages* (Ann Arbor: The University of Michigan Press, 2003).

[105] On the reception of the *Secretum* as a mirror for princes: Steven J. Williams, "Giving Advice and Taking it: The Reception by Rulers of the Pseudo-Aristotelian Secretum Secretorum as a Speculum Principis", in *Consilium. Teorie e pratiche del consigliare nella cultura medievale*, edited by C. Casagrande, C. Crisciani, and S. Vecchio (Florence: SISMEL-Edizioni del Galluzzo, 2004), 139-180. See also Chiara Crisciani, "Ruggero Bacone e l'Aristotele del Secretum secretorum", in *Christian Readings of Aristotle from the Middle Ages to the Renaissance*, edited by L. Bianchi (Turnhout: Brepols, 2011), 37-64; in particular 46-49.

[106] Jeremiah Hackett, "Roger Bacon", *The Stanford Encyclopedia of Philosophy* (Summer 2020 Edition), edited by E. N. Zalta: https://plato.stanford.edu/archives/sum2020/entries/roger-bacon/. Accessed 25 Apr. 2021.

[107] One of the preliminary questions is the biographical setting of Bacon's work on *Secretum secretorum*; see Williams, "Roger Bacon and His Edition", 63, and Jeremiah Hackett, "Roger Bacon". I think that, in principle, the idea of "editing" a mirror for princes attributed to Aristotle is consistent with Bacon's political theory. To argue in favour of this persuasion, however, would require further investigation.

CSP. As scholars agree on the fact that the *CSP* was written in 1271 or 1272, when Aristotle's *Politica* had already been translated and commented on, it can be surprising that Bacon does not make any relevant modifications in his account of the contents of this work. I suggest therefore that, with all probability, for a variety of reasons, he never read the actual text of the *Politica*. Whatever the explanation of this relatively paradoxical situation might be, the result is that, in spite of his own claims, Bacon's contribution in this field was not influenced by Aristotle's political masterpiece, but by other texts, in particular by Avicenna's *Philosophia prima*.

From the point of view of an intellectual historian, such an assessment should not in any way imply a negative judgement on Bacon. Rather, it suggests that we should consider him among those authors who contributed to the rich diversity of medieval political thought independent of Aristotle's *Politica*.[108]

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[108] Among Bacon's almost contemporaries, one could mention Guibert of Tournai, Roberto Lambertini, "Francescani e teorie politiche a metà Duecento: il caso di Guiberto di Tournai", in *Arbor Ramosa. Studi per Antonio Rigon da allievi amici colleghi*, edited by L. Bertazzo *et alii* (Padova: Centro Studi Antoniani, 2011), 183-194; Alexander Horowski, "Opere e manoscritti di Gilberto di Tournai (Nota bibliografica integrativa)", *Collectanea Franciscana* 85 (2015): 693-720.

ROGER BACON'S NEW METAPHYSICS (1260-1292): THE INTEGRATION OF LANGUAGE STUDY AND NATURAL SCIENCE WITH METAPHYSICS AND MORALS

LA NUEVA METAFÍSICA DE ROGER BACON: LA INTEGRACIÓN DEL ESTUDIO DEL LENGUAJE Y LA CIENCIA NATURAL CON LA METAFÍSICA Y LA MORAL

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Abstract

The paper presents evidence that Roger Bacon was endeavouring to structure what he considered as a "new metaphysics". Moreover, it identifies the *Opus maius* as Bacon's new preliminary text in metaphysics and morals. The evidence is found in the *Communia naturalium* and in the *Communia mathematica*, in which one finds a reference to the *Opus maius* as a sketch for a new metaphysics. From part seven of the latter work, namely, the *Moralis philosophia*, one can see that Bacon views the latter work as closely connected to his new metaphysics. In fact, the material in the *Communia mathematica* connects his studies on languages to the communication of his moral vision. I present a review of the sources for the different parts of the *Opus maius.* This is followed by an account of Bacon's philosophical sources. It becomes clear that Bacon was acquainted with Plato's *Meno, Phaedo* and part of the *Timaeus* with Calcidius's Commentary. The variety and significante of his Neo-Platonic sources is outlined. It turns out that Bacon was not an Avicennian substance-dualist. Moreover, the paper demonstrates the extent to which Bacon's criticism of Averroes was based on his natural philosophy. Bacon presents an account of human intellectual knowledge which is clearly based on and refers to his account of human perceptual knowledge in his *Perspectiva.* He uses his account of an integrated perceptual and intellectual human individual being to question the Latin Averroist's claim that there is one possible intellect for all human beings.

Keywords

Averroes; Intellectual Knowledge; Substance Dualism; The Unity of the Person; Platonic Sources

Resumen

El artículo aporta pruebas de que Roger Bacon se esforzaba por estructurar lo que consideraba una "nueva metafísica". Se identifica el *Opus maius* como un texto preliminar de Bacon en metafísica y moral. Las pruebas se encuentran en la *Communia naturalium* y en la *Communia mathematica*, en las que se encuentra una referencia al *Opus maius* como esbozo de una nueva metafísica. De la séptima parte de la *Moralis philosophia* se desprende que Bacon la consideraba estrechamente relacionada con su nueva metafísica. De hecho, el material de la *Communia mathematica* conecta sus estudios sobre las lenguas con la comunicación de su visión moral. Tras presentar una revisión de las fuentes de las diferentes partes del *Opus maius*, se exponen las fuentes filosóficas de Bacon. Queda claro que Bacon conocía el *Menón* de Platón, el *Fedón* y parte del *Timeo* con el Comentario de Calcidio. También se esboza la variedad y el significado de sus fuentes neoplatónicas. Da la impresión de que Bacon no era un dualista de la sustancia de caracter avicenista. Además, se demuestra hasta qué punto la crítica de Bacon a Averroes se basaba en su filosofía natural. Bacon presenta un relato del conocimiento intelectual humano claramente fundamentado y referido a su descripción en torno al conocimiento perceptivo humano en su *Perspectiva*. Utiliza su descripción de un ser humano individual que integra percepción e intelecto para cuestionar la afirmación del averroísmo latino de que hay un intelecto posible para todos los seres humanos.

Palabras clave

Averroes; Conocimiento intelectual; Dualismo de la sustancia; La unidad de la persona; Fuentes platónicas

Introduction

In the early 1260's, Cardinal Guy le Gros de Foulques, who had presided at the Franciscan General Chapter at Narbonne in 1260, instructed Roger Bacon to send him his writings on Philosophy. Bacon set out to write a major work, an *Opus principale*. It is clear that by at least 1267-68 Bacon did not have the institutional support for his major project. Instead, in answer to the mandate of June 22, 1266, from the Cardinal (now Pope Clement IV), Bacon wrote a persuasive *Opus preambulatum*, namely, the *Opus maius*.[1] He did, however, between 1266 and 1268 also produce other works related to the latter which we will examine below.

The scope of Bacon's plan for the *Opus principale* can be glimpsed from his claim in the introduction to the *Communia naturalium* that he wrote four volumes on different parts of philosophy. He claims that he presented a volume on Grammar and Logic

[1] See Roger Bacon, *Opus tertium*, edited by J. S. Brewer (London: Rerum Brirtannicarum Medii Aevi Scriptores -Rolls Series-Vol. 15, 1859; Kraus Reprint, 1965), 13-17. See new edition: Roger Bacon, *Opus Tertium*, edited by N. Egel (Hamburg: Felix Meiner Verlag, 2020; Philosophische Bibliothek 718), 26-34.

necessary for the Latins, and that he had written a second volume on Mathematics (presumably, the *Communia mathematica*).[2] He wrote a third volume on the common teaching on natural philosophy, the *Communia naturalium*, and he claimed that a fourth volume was written by him on metaphysics as it relates to moral philosophy.[3] How then does this body of work by Bacon relates to the *Opus preambulatum,* the *Opus maius*? I will attempt to answer this question by demonstrating the extent to which Bacon's studies of the sciences, linguistic and natural, are integrated with his teaching on metaphysics and morals.

In dealing with Bacon's metaphysics and morals, I will argue for a close continuity between Bacon's scientific works and his account of metaphysics as it is related to morals. Bacon, did not write a formal treatise on metaphysics in itself, that is, on Being and its attributes. Yet, there are elements of metaphysics present in part of the *CN* dealing with universals, individuals, causation and generation, and in the *De multiplicatione specierum* and in parts of the *Opus maius* and the *Opus tertium*, dealing with agency, spiritual and material being. He did, however, write a work which integrates the linguistic and mathematical sciences with an account of metaphysics specifically as it relates to morals. That work which was written in the mid-1260's is the *Opus preambulatum,* namely, the seven-parts work known to us as the *Opus maius*. In the seventh part of that work, the *Moralis philosophia*, Bacon explicitly addresses metaphysical themes as they relate to moral and civil life. These include brief accounts of metahpysics of God (infinite being), angels, the immortality of the soul, the unity of the human person, the role of religion in public life, and an extended account of ancient Latin texts on the virtues, mainly from Seneca. These sections of the *Moralis philosophia* are related to corresponding sections of the *Opus majus*, namely, the account of error in *Opus maius*, Part One, the account of truth and its history in Part Two, the account of language in Part Three, the account of the applications of mathematics on natural philosophy in Parts four, five and six. The principles from these parts are thus taken up and used in the different parts of the *MP* (=*Opus maius,* Part Seven).

In section one of this paper, I will present an account of Bacon's new method. In section two, I examine Ferdinand M. Delorme's claims about Bacon's new method and new metaphysics which he based on the Prologue to the *De influentiis agentium/De multiplicatione specierum* and some short cross-references in *CN*. I will draw on Bacon's lengthier references to the new metaphysics in the *CM* in order to identify the volume in which Bacon presents his new metaphysics. In section three I will outline philosophical and scientific sources from the world of Islam that Bacon uses to structure the parts of the *Opus maius*, and I will also present the full range of Bacon's Platonic sources as he outlines them in the *MP*. In section four, I will use a brief but

[2] For brevity, in the body of the text but not in the citations I will designate the *Communia mathematica* as *CM*.

[3] *Communia naturalium Fratris Rogeri*, edited by R. Steele, Liber Primus; Opera hactenus inedita Rogeri Baconi, Fasc. II, (Oxford: Clarendon Press, 1911), 1.

central example from Bacon's *Perspectiva* to illustrate how Bacon uses Ptolemy and Augustine to correct Alhazen, Avicenna, and Averroes on the important issues of intromission and extramission of species in perception. As I will show, even this scientific example has metaphysical and theological implications. Section five examines Bacon's summary sketch of the unity of the human being, spiritual species and intellectual knowledge from the *MP* and from the *CN*. I argue there that Bacon overcomes the substance dualism of Avicenna. Further, Bacon presents a metaphysics of a unified but complex individual human cognizer, whose intellectual knowledge is firmly grounded in Bacon's mathematical and physical-experiential account of perception. Bacon explicitly uses the teaching of his *De multiplicatione specierum* and the *Perspectiva* to correct Averroes' teaching on the unity of the possible intellect. This account of the metaphysics of intellectual knowledge shows that there is no human knowing without a reference back to experience and especially to the experience as mediated by the species of the cogitative sense. And so Bacon's scientific works can be seen as forming the basis for his sketch of a theory of intellectual knowledge and to his concept of a unified human person.

1. Method and Metaphysics

When he sent out the *Opus majus* to Pope Clement IV, Bacon has also his student John to convey the true meaning of his works. Bacon was rightly worried about mixed vocabularies and systematically misleading statements in philosophy and in public life:

> And because of this I have concerned myself with one young student whom for about five or six years I have instructed in languages, mathematics and *perspectiva*, in which study is found all the difficulties of those writings I send to you, and freely (without a fee) I have instructed him orally after I received your mandate (first one, ca. 1262)...For without a doubt, there is no scholar among the Latins who can respond in such a manner in all the things that I write, because of the method that I use, and because I have instructed him (with this method). Not even that great master nor any of the others whom I have mentioned above can respond in this way, *because they do not know my method* as does the one whom I myself have taught orally, and who has been instructed by my counsel.[4]

[4] Roger Bacon, *Opus tertium*, edited by J. S. Brewer (London, 1859, Rolls Series, 15; reprint Nedeln, Lichtenstein: Krauss, 1965), 61: "Et propter hoc consideravi unum adolescentem quem a quinque vel sex annis feci instrui in linguis, mathematicis, et perspectivis, in quibus est tota difficultas earum que mitto; et gratis eo ore meo instruxi, postquam recepi mandatum vestrum [...] Nam procul dubio nullus est inter Latinos, qui in omnibus quae scribe possit ad tot respondere propter *modum quem teneo,* et qui eum instruxi, nec illa Magister magnus, qui nesciunt modum meum, nec aliquis eorum de quibus superius feci mentionem, quia nesciunt *modum meum*, sicut iste qui ore meo didicit, et qui consilio meo est instructus." See new edition, *Opus tertium*, edited by N. Egel (Hamburg: Felix Meiner Verlag), 124-126. The reference to the unnamed master has been thought to be a reference to

What were Bacon's duties in the Franciscan Studium circa 1262-68? Bacon had complained much about the preoccupations of his life in the Franciscan house which prevented him from writing an *Opus principale,* a *Summa sapientialis*. In his *Opus minus*, Bacon provides some hints about these duties. This information places Bacon's criticisms of the Masters of the *Sentences* in the context of the scholarly practices in the Franciscan studium in Paris. He complains that the Book of the *Sentences* of Alexander of Hales has the weight of one horse. What follows is significant. It shows that Bacon objects to the lack of good teaching hours for the Biblical Scholars and the consequent removal of attention from the Sacred Text.

> For the one among the religious Orders who teaches the [book] of the *Sentences* has as he wishes the important teaching hours and has his own lecture-room and his own assistants. But those who teach the biblical text lacks this [right] and need to beg for [good] teaching hours depending on what pleases the teachers of the book of the *Sentences.* In other universities, those who teach the *Sentences* are allowed to hold disputations and are [honored] as masters. The others who teach the biblical text cannot hold disputations as was the case this year at Bologna. And yet, the (ancient) Holy Doctors used only the biblical text. Indeed, the ancient wise teachers, some of whom we have seen such as the Lord Robert Bishop of Lincoln and brother Adam Marsh and other great teachers used the biblical text [alone]...But [the teachers of the *Sentences*] do not stick with the text [of *Scripture*] but speculate beyond the textual meaning by means of the methods of invention...And so, on account of the abuse of the book of the *Sentences,* it is impossible that the text of God can be known.[5]

In contemporary Bacon scholarship, there is now a consensus that between 1257 and 1263, Bacon was still an active scholar, although he was not one who held a magisterial positing in teaching the *Sentences*. A careful and critical study of Toulouse, Bibl. Mun., MS 402 and Florence, Biblioteca Laurenziana, MS Laur. PL XXV cod. 4 has proved that they contain a Latin, Greek and Hebrew glossary which includes teaching

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Albertus Magnus. See Jeremiah Hackett, "The Attitude of Roger Bacon to the *Scientia* of Albertus Magnus", in *Albertus Magnus and the Sciences: Commemorative Essays 1980*, edited by J. A. Weisheipl, O.P. (Toronto: PIMS, 1980), 53-72. The great master in this latter text is certainly Albertus Magnus. See *Opus tertium*, ed. Brewer, 14 and *Opus tertium*, ed. Egel, 28. For a qualification of Hackett's position, see H. Darrell Rutkin, *Sapientia Astrologica: Astrology, Magic and Natural Knowledge, ca. 1250-1800, 1. Medieval Structures (1250-1500): Conceptual, Institutional, Socio-Political, Tehologico-Religious and Cultural* (Cham: Springer Nature, 2019), 42-43.

[5] *Opus minus*, edited by J. S. Brewer (London: Rolls Series, 15, London, 1859; Reprint, Nedeln, Lichtenstein: Krauss, 1965), 328-30: "Nam ille qui legit *Sententias* habet principalem horum legendi secundum suam voluntatem, habet et socium et cameram apud religiosos. Sed qui legit *Bibliam*, caret his et mendicant horum legendi, secundum quod placet lectori *Sententiarum.* Alibi qui legit *Sententias* disputant et pro magistro habetur. Reliquus qui textum legit, non potest disputare, sicut hoc anno Bononiae [...] Deinde sacti doctores non usi sunt nisi hoc textu, neque sapientes antiqui, quorum aliquos vidimus, ut fuit Dominus Robertus episcopus Linconiensis, et frater Adam de Marisco, et alii maximi viri [...] Et liber Sententiarum non adhaeret textui, sed vagatur extra textum per viam inquisitionis [...] Item, impossibile est quod textus Dei sciatur propter abusum libri Sententiarum."

on the meaning of biblical words. These teachings are closely related to Bacon's treatment of such matters in his *Opus tertium* (ca. 1268) and his *Compendium studii philosophiae* (ca. 1271-72). These notes are, therefore, attributed to Bacon and are dated to between ca. 1257-1263 by Étienne Anheim, Benoit Grévin and Martin Morard. They argue that Bacon worked on the Franciscan correction of the biblical text in the Franciscan studium in Paris with William of Mare, and that the material has a connection with the work of Gerard of Huy.[6]

We can see Bacon's involvement with the critical correction of the biblical text as the central context in the 1260's for his attack on the Masters of the Sentences and for his general criticism of the common teachers of philosophy and theology (the *vulgus philosophantium*).[7]

Bacon objected strongly to non-semiotic metaphysical essentialism that ignored the context of human communication. Hence, in a manner non typical of scholasticism, he insisted on the primacy of gammar.[8] In his account of equivocation and analogy, he objected to the theory of essential meanings adopted by numerous scholastics from the work of Averroes.[9] In methodic terms, he objected strongly to long drawn out series of chains of arguments. He believed that more concise and careful summaries should replace these long chains.This would in turn lead to clearer pedagogical presentation. This was part of his objection to the length of the work on the *Sentences* by Alexander of Hales. Bacon had a keen sense for the rhetoric of persuasion, and since he could not complete an *Opus principale*, he opted instead to write a Franciscan sapiential work in the form of a persuasive argument.[10] Even in his scientific works such as the *De*

[6] See Étienne Anheim, Benoit Grévin and Martin Morard, "Éxégè Judéo-Chrétienne, Magie et Linguistique: Un Recueil De 'Notes' Inédit Attribuée a Roger Bacon", *Archives Histoire Doctrinale literaraire Du Moyes Âge* 66 (2001): 95-154. See also Cornelia Linde, *How to Correct the Sacra Scriptura: Textual Criticism of the Latin Bible Between the Twelfth and Fifteenth Century* (Oxford: The Society for the Study of Medieval Languages and Literature, 2012), for Roger Bacon, see especially, 17-20, 1-63, 101-104, 138-53, 223-25.

[7] See Timothy J. Johnson, "Preaching Precedes Theology: Roger Bacon and the Failure of Mendicant Education", *Franciscan Studies* 68 (2010): 83-95; Timothy J. Johnson, "Roger Bacon's Critique of Franciscan Preaching", in *Institution and Charisma: Festschrift für Gert Melville*, edited by F. J. Felten, A. Kehnel, and S. Weinfurter (Köln: Böhlau, 2009), 541-48.

[8] For Bacon on Grammar, see Irène Rosier-Catach, "Roger Bacon and Grammar", in *Roger Bacon on the Sciences: Commemorative Essays*, edited by J. Hackett (Leiden-New York-Köln: E: J. Brill, 1997), 67-102; see idem, 2020 Roger Bacon Research Society Lecture, "The Diversity and Coherence of Roger Bacon' Interests in Language", Video section of the Roger Bacon Research Society WebPage. For a careful presentation of the relation of Grammar and signs to species and *Perspectiva* in Bacon's Philosophy, see Yael Raizman-Kedar, *Species as Signs: Roger Bacon (1220-1292) on Perspectiva and Grammatica* (University of Haifa Ph.D. Dissertation, 2009).

[9] See Roger Bacon, *Compendium of the Study of Theology*, edited and translated with Introduction and Notes by T. S. Maloney (Leiden-New York-København-Köln: E. J. Brill, 1988).

[10] See Timothy J. Johnson, "Wisdom has built her house; she has set up seven pillars: Roger Bacon, Franciscan Wisdom and Conversion to the Sciences", in *The English Province of the Franciscans* (1224-c.1350), edited by M. Robson (Leiden: E: J. Brill, 2017), 296-315.

multiplication specierum and the *Perspectiva,* Bacon makes it clear that he wishes to focus his attention on careful summaries of argumentative points. Still, Bacon is not satisfied with "bare argument alone". That is, for him the results of demonstrative argumentation which begin from experience must be verified by means of carefully observed experiential facts.

2. Bacon's Own Claims for his New Metaphysics (1260-92)

In his account of the prologue to the *De influentiis agentium/De multiplicatione specierum* of Bacon, Ferdinand M. Delorme used some references from the *Communia naturalium* to argue that Bacon had written a 'new' metaphysics in the 1260's. Was Delorme's argument correct?[11] There is further evidence in the *CM* for the claim that Baocn in the 1260's did write a new metaphysics, one quite different in method and content from his earlier metaphysics from the 1240's. The older metaphysics was a school commentary on Aristotle, Avicenna and Averroes with very limited reference to Christian philosophers. The new metaphysics as is demonstrated below, involved wholescale use of multiple authors from Jewish, Arabic and Christian traditions.[12]

Delorme notes that Bacon conceived a work divided into four parts. The first part was on grammar and logic as it related to the needs of the Latins; the second part was on the applications of mathematics; the third part was the work on natural philosophy (*Communia naturalium*). Delorme saw the Prologue to the *De influentiis agentium/De multiplicatione specierum* as providing the evidence that the new metaphysics included a special section on species, called *'De aspectibus metaphysico.'*[13] For a scientific approach to physics as a starting point for metaphysics, one has need of strict mathematics. For Bacon, such scientific works are found in Ptolemy's *Optics*, Alhazen's *Optics*, Jacobus Alkindi's *Optics*, "the expert on the books of mirrors through which reflected vision

[11] Ferdinand M. Delorme, "Le Prologue de Roger Bacon à son traité De influentiis agentium", *Antonianum* 18 (1943): 81-90. Delorme uses the few references to Bacon's *metaphysica mea* from the *Communia naturalium*. See p. 88: Dans les *Communia naturalium*, où il parle encore *de influentia agentium in patinetia*, sujet ici abordé*ex professo*, je remarque maints renvois de Bacon à ce traitéde lui sur la Métaphysique, don't il se contente de donner un résumé dans les p remiers chapitres. C'est ainsi qu'il écrit, p. 16: *Metaphysica habet certificare ad plenum, ut in Metaphysicis edocetur;* p. 17: *ut in Metaphysicis demonstravi*; p. 18: *sicut in Metaphysica mea potest cuilibet patere*; p. 25: *ut ex Metaphysica Melius innotescit*; p. 44: *horum profunda certification ex Metaphysica requiratur*; p. 51: *in Metaphysicis plenius scripsi*. Henceforth, in the body of the text I will designate *De multiplicatione specierum* as DMS.

[12] For the status questionis of Bacon's metaphysics (1240's), see Sylvia Donati, "Pseudoepigrapha in the Opera hactenus inedita Rogeri Baconi: The Commentaries on the Physics and Metaphysics", in *Les debuts de l'enseignement universitaire a Paris (1200-1245 environ)*, edited by O. Weijers and J. Verger (Turnhout: Brepols, 2013), 153-203.

[13] See Roger Bacon, *CN*, I, Ch. 2, 38: "Sed complete destruccio harum opinionum et aliarum consimilium patet in tractatu meo De speciebus metaphysico cum certificatione istius dubitationis et aliarum."

occurs" and also Euclid's *Optics* and *On Mirrors*, Euclid's *Elements*, Theodosius' *On Spheres* and Appolonius' *On Conic Sections*.[14]

This list of authorities raises some interesting questions. It is evident that Bacon saw the *De influentiis agentium/DMS* as the presupposition for his *Perspectiva.* It sets out the mathematical sources for any interpretation of issues in natural philosophy. And for Bacon, mathematics with its focus on the category of quantity was closely related to metaphysics. Indeed, as Bacon makes clear in the Prologue, the natural philosophies of Aristotle, Avicenna and Averroes were lacking in both theoretical and practical mathematics, and in experiential certification.[15] They lacked the applications of the mathematical texts cited above from the Prologue to *De influentiis agentium/DMS*. I will demonstrate in part seven below that Bacon's metaphysics and moral philosophy of the human cognizer and agent is based solidly on materials from the *De influentiis agentium/DMS* and the *Perspectiva.* But there is more evidence from Bacon on the nature of his new metaphysics, to which I will now turn.

(1) In the *CM*, Bacon writes the following concerning the new *Metaphysica mea*:[16]

"And each special science presupposes that the principles of [science already] exist. And they cannot on their own proper power investigate those principles, and *I have demonstrated this in my Metaphysics.*"[17]

(2) In his *MP*, part one, Bacon had argued that "moral philosophy is the end (*finis*) of all the parts of philosophy" as he clearly proved in parts one to six of the *Opus maius* and "as is clear from metaphysics".[18] Again Bacon states: "I have stated in the

[14] See Delorme, "Le Prologue", 86: "Unde Ptolomeus in libris *De opticis sive de aspectibus,* est principaliter imitandus, quia hic dividit omnes radices aspectuum cum ramis qui sunt de necessitate Perspective. Omnes alii exposuerunt eum et addiderunt ea que sunt de bene esse seu de bonitate artis et pulchritudine; inter quo longe precipuus aliis Halacen *De aspectibus*, deinde Jacobus Alkindi *De aspectibus,* et auctor libri *De speculis per que fiat visus reflexus*, et Euclides *De aspectibus* et idem *De speculis,* et Trocus *De aspectibus*, et auctor librfi *De speculis comburentibus*, Et Euclides *De libris elementorum* et Theodosius *De speris,* et Apollonius *De Pyramidibus*, quorum sentencias in *3a parte* hujus Operis pertractabo ut mihi videbitur expediré."

[15] Delorme, "Le Prologue", 86-87: "Quia vero non habemus in latino libros Aristotelis et Avicenne et Averrois et al-Farabi de ista influentia, scilicet librum eorum *De aspectibus* [et] ideo que hic recitari habent non possunt principaliter verificari per vias Aristotelis, Avicenne et Averrois, oportet uti sententiis istorum in naturalibus libris [...] propter quod philosophans in sententia naturali et rerum naturalium generatione secundum libros Aristotelis, Avicenne et Averrois et Senece non poterit hec ut oportet scire, nisi sciat uti sentencias auctorum predictorum."

[16] Roger Bacon, *Communia mathematica Fratris Rogeri*, edited by R. Steele (Oxford: Clarendon Press; London: Humphrey Milford, 1940). [I will designate this work as *CM*, ed. Steele, followed by Part, Distinction, Chapter, Page number].

[17] *CM*, ed. Steele, I. 1. 1. p. 1-2: "Et omnis scientia specialis supponit sua principia esse et non potest ex sua virtute propria investigare ut Aristoteles docet et hoc manefestavi in *Metaphysica mea.*"

[18] Roger Bacon, *Moralis philosophia*, edited by E. Massa (Zurich: Thesaurus Mundi, 1953), 4-5: "Et quoniam moralis philosophia est finis omnium parcium [...] ut sint in precedentibus bene probate et certificate [...] secundum quod ex metaphysicis patens est."

Metaphysics that mathematics is spoken of in two ways...But these matters have been verified in the *Metaphysics* in so far as it is relevant."[19]

(3) Again, he indicates his *Metaphysica mea* and refers the reader to part one of his *Opus maius* on the causes of error:

> The order however of [the sciences] with sure proof from my *Metaphysics* requires a teacher/reader, and so in this first book I will give a summary... And so in the first part of [my] *Metaphysics* which orders all of science, I have demonstrated the wickedness of those causes of error by means of authority, reason, and examples copiously drawing on the wise [Philosophers]. And as a consequence, I show how these [false authorities] destroy all things and all study. [20]

It should be noted that this reference to part one of his *new Metaphysics* is in fact a reference to part one of the *Opus maius*. There, Bacon presents the causes of errors, criticizes false authorities and draws on many wise ancient philosophers.[21] Thus, we must see the *Opus maius* as the first draft of Bacon's new metaphysics.

(4) Further in *CM*, Bacon names these ancient wise philosophers. They are the *philosophantes,* that is, those theologians such as Cassiodorus and Boethius who make use of mathematics.[22]

> For just like the wise Christian Boethius and great theologians, as is apparent from his books *On the Trinity and the Two Natures and One Person of Christ* and his other works, so I introduce authorities which he has written from philosophy. And so I am able, I wish and I ought through the authorities of Cassiodorus and the teachings of the *wise (philosophantis)* go through mathematics on account of the divine praise, especially since (mathematics) is gloriously taught in their philosophical books. For I have demonstrated in [my] *Metaphysics* that the Christian wise thinkers (*philosophantes*) ought to hold philosophy higher than do the unbelieving people.[23]

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[19] *CM*, ed. Steele, I, 1.1., p 2-3: "Declaravi quidem in *Metaphysica* , quod mathematica dicitur dupliciter [...] Sed de his in *Metaphysica* certificatum est quantum ad eam pertinet."

[20] *CM* ed. Steele, I.1.1. p. 4- I. 1. 2, 4: "Ordinem autem hunc cum certa probacione ex *Metaphysica* mea requirit lector, et tamen in isto libro aliquid exponetur [...] Et ideo in principio *Metaphysice* que ordinat totam sapienciam demonstravi maliciam istarum causarum auctoritates raciones et exempla sapientum copiosus ingerendo, et ostendi quod hec totum studium et per consequens omnia confundunt."

[21] See Roger Bacon, *Opus maius*, 3 Vols., ed. J. H. Bridges (Oxford and Edinburgh, Vols. 1 and 2; Oxford, 1897; vol. 3 with corrections, Edinburgh, 1900; Reprint, Frankfurt: Minerva, 1964).

[22] On the meaning of the term *philosophantes*, see Étienne Gilson, "Philosophantes", *Archives d'histoire doctrinale littéraire du Moyen Âge* 19 (1952): 135-140; Pierre Michaud-Quantin and Michel Lemoine, "Pour Dossier des 'Philosophantes'", *Archives d'histoire doctrinale littéraire du Moyen Âge* 35 (1968): 17-22.

[23] *CM*, ed. Steele, I. 1. 4., p. 8-9: "Sicut vero Boethii philosophantis Christiani et theologi magni, ut patet in libris suis *de Trinitate et de duabus naturis et una persona Christi* et aliis opera ejus, induxi auctoritates quas philosophice scripsit, sic possum et volo et debeo per auctoritates Cassiodori et sentencias philosophantis propter divina laudes mathematice revolvere, precipue cum illas in suis

Bacon claims that he has demonstrated in his *Metaphysics* that the *philosophantes Christiani* ought to hold philosophy in higher esteem than do the non-Christian peoples.[24]

(5) In the *CM*, Bacon argues that the Christian thinkers can know more than did the ancient wise philosophers such as "Avicenna, Democritus, Plato, and Cicero who treat of such matters as resurrection of the body and the pains of hell."[25] Again, Bacon indicates that since metaphysics is common to all the sciences, he will focus on the praise and utility of mathematics in philosophy, law, and theology.[26] For Bacon, this very important book has an essential connection to mathematics, poetics, and music, since arguments and logic find their completion in poetics.

(6) Regarding the issue of the goal of logic, Bacon, as he will do in parts three and seven of the *Opus maius*, presents his 'authorities' for the nature of the poetic argument and its connection to logic. They are al-Farabi [*De scientiis*], the *Logica* of Avicenna and Al-Ghazali and Averroes on the poetic argument as translated by Hermannus Alemannus:

> For I have demonstrated in [my] *Metaphysics* that this kind of argument is necessary and is found in logic. Such logical argument is for all thinking since it deals with the salvation of the soul, the virtues and happiness so that vices can be refused. This kind of argument is properly found in moral philosophy... And I have [already] composed a treatise on this in my logical writings.[27]

libris philosophicis edoceant gloriose. Manifestavi enim in *Metaphysica* quod philosophantes Christiani debent extollere philosophiam quam homines infidels."

[24] This is clearly a reference to part two but especially part seven of the *Opus maius.* See Roger Bacon, *Moralis philosophia*, ed. Massa, part one, 22-23.

[25] *CN*, ed. Steele, I, Part 3, dist. 1, 161; See also *Opus maius*, part seven = *Moralis philosophia*, part one, 22-23.

[26] See *Opus maius*, Vol. I, Part Four, 98-99: "Et in particulari ostenditur [Pythagoras] per Ptolemaeum et ipsum Boetium. Cum enim sint modi tres philosophiae essentiales ut dicit Aristoteles in sexto *Metaphysicae*, mathematicus, naturalis, et divinus, non parum valet mathematicus ad reliquorum duorum modorum scientiae comprehensionem, ut docet Ptolemaeus in capitulo primo *Almagesti* quod et ipse ibidem ostendit. Et cum divinus sit dupliciter , ut patet ex primo *Metaphysicae*, scilicet *Philosophia prima*, quae Deum esse ostendit, cuius proprietates excelsas investigat, et civilis scientia quae cultum divinum statuit, multaque de eo secundum possibilitatem hominis exponit, ad utramque istarum multum valere mathematicam idem Ptolemaeus asserrit et declarant. Unde Boethius in fine *Arithmeticae* mathematicas medietates asserit in rebus civilibus inveniri." [I discuss Ptolemy below, see section six] See also p. 102 on the primacy of the Category of Quantity, which cannot be known without mathematics, and which is essential for an understanding of time and place. See Bacon's explicit account of the importance of the *Posterior Analytics* in *CM,* ed. Steele, 14-16.

[27] *CM*, ed. Steele, I. 1. 7, p. 16-17: "Nam certum est per Alpharabium in libro *de scientiis* et per *logicam* Avicenne et Algaselis, et per commentum Averroys super librum *de argumento poetico* translatum [Hermannus Alemannus]...Ceterum demonstravi in *Metaphysicis* quod hoc genus arguendo est necessarium, et quod sciencia debet de eo constituti in logica, et quod argumentum hoc est utilis omni argumento cum feratur in anime salute et circa virtutes et felicitatem, et ut vicia declinentur. Quod argumentum proprium est in textu *Moralis Philosophie* et in ejus usu et similiter in theologicis

This aforementioned treatise on logic can be found in *Opus maius,* part three, including *De signis* and part seven (=MP, part five), and in the *Compendium studii theologiae* on equivocation and analogy.

Again, in *CM,* in his discussion on abstraction in grammar and logic, Bacon mentions Aristotle's three modes of philosophy: Physics, Mathematics, Metaphysics (*Divinus*), and makes a closed connection between metaphysics and morals. Bacon continues:

> And the Rhetoric which uses this argument is part of *Moralis philosophia* as I have demonstrated in [my] *Metaphysics* and *Moral Philosophy*, and so the common teachers of philosophy err when they posit rhetoric in a division with logic and grammar. In a similar manner, poetics, which teaches a poetic argument, is a part of logic, and the topics which uses such argument are part of moral philosophy as I have demonstrated in their proper places.[28]

Bacon provides an important definition of metaphysics in the *CN*:

> And in a like manner he [Avicenna] teaches that Metaphysics follows Physics since according to him the conclusions of the other sciences are principles in Metaphysics. And this is certain from Aristotle since through the conclusions of Astrology he teaches the unity of the first cause and the multiplicity of the intelligences, although in another way the metaphysician can prove the principles of all the sciences as ought to be explained in that science, namely, Metaphysics. Moral Philosophy, however, is the goal of all other sciences. And so, the goal or end holds [primacy] in philosophical thinking. For all the other sciences are concerned with seeking the truth; this science [moral science] however, is concerned with doing the good, that is, it is an operative or practical science. Because of this it follows the other sciences in the order of nature. For knowledge of truth is directed towards the love of the good and its activity.[29]

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probacionibus et doctrinis, et plus potest hoc argumentum movere sine omni comparacione quam demonstracio quantumcumque potissima habetur. Et jam composui de eo tractatum in *logicalibus*, et extendi quod ei proprium est."

[28] *CM*, ed., Steele, I. 4. 3, 64: "Et Rhetorica utens hoc argumento est pars Moralis Philosophia, ut in Metaphysica et Moralibus demonstravi; et ideo multum errat vulgus quando point Rhetoricam in divisione contra Logicam et Grammaticam. Similiter Poetica, docens argumentum poeticum, est pars Logice, et ea que utitur tali argumento est pars Moralis Philosophie, ut demonstravi suis loci." See Irène Rosier-Catach, "Roger Bacon, al-Farabi et Augustin. Rhétorique, logique et philosophie morale", in *La Rhétorique D'Aristote. Traditions et Commentaires De L'AntiquitéAu XVIIe Siècle*, edited by G. Dahan and I. Rosier-Catach (Paris: Vrin, 1998), 87-110.

[29] *CN*, ed. Steele, ed. cit., I. 1. 1., 1-2: "Similiterque ibidem docet quod Metaphysicalia sequuntur Naturalia, quia secundum eum, conclusions aliarum scienciarum sunt principia in Metaphysicis. Et hoc est certum ex Aristotele, cum per conclusions Astrologie doceat unitatem cause prime et multitudinem intelligenciarum, licet alia via metaphysicus habet probare principia omnium scienciarum, ut debet in illa sciencia edoceri."

Moralis autem philosophia est finis omnium scienciarum aliarum, et ideo finem in consideracione philosophica optinebit; quia omnes alie sunt speculative Veritatis, hec autem est practica boni, id

We can see from these two quotations that first, Bacon links a new concept of grammar and his new semiotic logic directly to rhetoric and poetics, while setting aside the rigid school division of grammar, logic, rhetoric. Then, he argues that the principles of the natural sciences should be taken up into metaphysics, which would prove the reliability of the principles of natural science. But these metaphysically verified principles must in turn be linked to morals, that is, to bringing about the practices of goodness.

Ferdinand Delorme is correct in seeing the Prologue to the *Opus maius* and related works as a key to Bacon's new methodology. Bacon found that Aristotle, Avicenna and Averroes had serious methodological deficits in their physics and metaphysics. They did not use the mathematical methods of the scientists listed above beginning with Ptolemy and ending with Apollonius. Further, Delorme recognized that Bacon's *DMS* and the *CN* were not just works in physics but had significant metaphysical elements. As will become apparent in the next sections of this paper, the *Perspectiva* also has metaphysical implications. We demonstrated from the *CM* that Bacon intended the *Opus maius* to be a work in metaphysics conjoined with morals. It was not intended to be a formal treatise on Being and the attributes of Being. We showed how Bacon in various parts of the *Opus maius* coordinated logic with the study of rhetoric and poetics. For Bacon, the formal study of the latter was a task of logic; rhetoric and poetics in practice was the task of moral philosophy.

It remains for us then, to review the scientific texts from the Islamic world that helped Bacon structure the various parts of the *Opus maius* and to disclose his main sources for his metaphysics in relation to morals as outlined in his *MP*, part one.

3a.The Structure of the *Opus maius*, Parts Three to Seven: Bacon's Islamic Sources

It is important to note that the teleology of the sciences, linguistic and natural, in the *Opus maius* is borrowed from the *De scientiis* of al-Farabi.[30] Parts three to seven, all dealing in some sense with the study of languages and the applications of mathematics, all depend on the work of important Muslim thinkers. In part three, on languages, Bacon draws from al-Farabi's *De scientiis*. In part four, the physics section makes use of Alhazen, Ibn Gebirol and Avicenna as mediated by Gundisalinus; the discussion of astrology and statecraft depends on Abu Ma'shar. Avicenna, al-Farabi, al-Gazali, and Averroes are central for Bacon's theory of communication of true religion. In parts Part Five and Six, the *Perspectiva* and *Scientia experimentalis* are influenced by Alhazen's (Ibn al-Haytham) *Optics*. Part six uses the *Centiloquium commentary* of Pseudo-Ptolemy (Ahmed Ibn Yusuf) on knowledge and revelation. Further, Bacon uses al-Gazali for his

est, operativa, propter quod sequitur alias ordine naturali. Nam veritas cognitio ad amorem boni et ejust operacionem ordinatur."

[30] See Alain Galonnier, *Le De scientiis Alfarabii de Gérard de Crémone: Contribution aux problèmes de l'acculturation au xiie siècle* (Turnhout: Brepols, 2016).

understanding of spiritual experience. And in part seven Avicenna is central to parts one and two of the *MP*. Of course, these authors are linked with important Greek and Latin authors on the relevant topics and are re-interpreted to form the Baconian synthesis of wisdom. Therefore, Bacon's sketch for a new metaphysics reflects the still open cultural borders of the time of the Crusades up until 1292.[31] Bacon's search for a universal wisdom would, in my view, still find its renewal and true completion not only in the English Franciscan school but also in a more comprehensive manner in the universal wisdom based on mathematical philosophy and an openness to world-cultures as found in the works of Nicholas of Cusa in the 15th century.[32]

3b. Bacon's Greek and Latin Philosophical Sources: Bacon's Neoplatonism

In part one of his *MP*, Bacon provides his account of the positive contributions of the ancient Greek and Latin philosophers. The extended treatment of the "Philosophers" in *Opus maius,* parts one, two and seven of the *MP* is very positive indeed. In part one of the *MP* he offers an important rationale for his strong praise for the ancient philosophers and this later Christian followers. He states,

> This is a wonderful teaching and wholly favorable to the Christian; it contains nothing unworthy either in the letter or in the literal sense. Indeed, we clearly see that it contains well-known articles belonging to the faith. Nor should a philosopher find fault, since it obviously contains nothing except that which, in a wonderful way, is consistent with truth. *I make this statement because some others try to obscure our Catholic teachings found in the books of the Philosophers. But we should gladly receive them in testimony of our faith, especially since it is certain that these men learned these (teachings) through a revelation made to them and to the holy Patriarchs and Philosophers as was shown above.*[33]

Bacon treats the ancient philosophers and the muslim philosophers as persons of wisdom. He bases much of his account of the Platonists on Porphyry as presented in Augustine, *De civitate dei,* on Apuleius, *De deo Socratis,* and especially the *De platone*, Book 3, the very useful summary of the major works of Plato. Bacon had access to and used three authentic Platonic texts in Latin: the *Meno, Phaedo* and part of the *Timaeus* with the Commentary by Calcidius.[34] These are supplemented by accounts of other ancient

[31] See J.R.S. Phillips, *The Medieval Expansion of Europe*, 2nd edition (Oxford: Clarendon Press, 1998); R. W. Southern, *Western Views of Islam in the Middle Ages* (Cambridge and London: Harvard University Press, 1962).

[32] See David Albertson, *Mathematical Theologies: Nicholas of Cusa and the Legacy of Thierry of Chartres* (Oxford University Press, 2014). It would not be anachronistic to speak also of Roger Bacon's Mathematical Philosophical Theology.

[33] Roger Bacon, *MP*, ed. Massa, 20. Translation: Thomas S. Maloney and Jeremiah Hackett, *The Moral Philosophy of Roger Bacon* (Olean, NY: Franciscan Institute, Forthcoming 2022).

[34] For the references to Augustine, Apuleius, Plato and Calcidius, see below the Bibliography of Other Primary Sources.

philosophers such as Seneca, Cicero, Hermes Trismegistus, Aethicus Ister, and others.[35] Among the others, one finds brief references to two important ancient sources, Greek, and Hebrew. The first is a brief reference to Pseudo-Dionysius.[36] The second is the following about the sons of Noe and Abraham who were the first expert Astronomers: "...as Josephus relates and is [stated by] Isidore [of Seville] in his third book [of the *Etymologies*] and as Clement relates in the first book of [*The Stromata*]. And according to Augustine these [sons of Noe and Abraham] lived when Moses was born...."[37]

This latter work by Clement of Alexandria is so important in that it shows how Bacon has appropriated an ancient Platonist understanding of science and philosophy that can be useful for a Christian. It takes up and transcends the other two traditions, the Aristotelian, and the Stoic.

We turn now to a brief review of one example from the *Perspectiva* in which Bacon used the teaching of mathematics to correct the teaching of Avicenna, Averroes and Alhazen.

4. Re-Reading Alhazen, Avicenna, and Averroes through the lens of Ptolemy and Augustine

In the context of Bacon's *Perspectiva*, however, two other ancient sources matter greatly. One is a pagan philosopher, Ptolemy and the other is a Christian philosopher and theologian, Augustine. Both enable Bacon to "correct" the teaching of Alhazen, Avicenna and Averroes on the primacy of intromission of species in vision. They enable Bacon to construct his own individual synthesis of perspectival human knowledge. And as made clear by the research of Cecilia Panti, the key to this move for Bacon is the work on science and optics by Robert Grosseteste.[38] It is well-known that Bacon considers

[35] One should note that part three of the *MP* is a digest of text and comment on and from the Moral Essays of Seneca which has its own distinctive natural philosophy and moral psychology.

[36] See Roger Bacon, *MP*, ed. Massa, 231 and 261.

[37] Roger Bacon, *Opus maius*, part two, vol. 3, ed. Bridges, 57: "...ut Josephus narrat , et Isidorus libro tertio, et Clemens libro primo, hoc idem de Abraham confitentur." See also 55.

[38] Cecilia Panti, "The Oxford-Paris connection of optics and the Rainbow: Grosseteste's *De iride*, Pseudo-Oresme's *Inter omnes impressions* and Bacon's *Perspectiva* in Paris, BNF, lat. 7434", in *Les Sciences au Moyen Âge (XIIIe-XVe siècle). Autour de Micrologus, 251-280*, edited by D. Jacquart and A. Paravicini Bagliani. See also Greti Dinkova-Bruun and Cecilia Panti, "Robert Groseteste's *De iride* and its *addendum* in the Vatican Manuscript Barb. Lat. 165: Transmission, Reception and Meaning", in *Manuscripts in the Making: Art and Science*, vol. II, edited by S. Panauotova and P. Ricciardi (London and Turnhout: Brepols/Harvey Millar Publishers, 2018), 23-31. These studies are important as indicators of the continuity between Bacon and Grosseteste and Bacon on *De iride* as the central reference point for the applications of *Perspectiva.* See also Cecilia Panti, "The Theological Use of Science in Robert Grosseteste and Adam Marsh According to Roger Bacon: The Case Study of the Rainbow", in *Robert Grosseteste and the pursuit of Religious and Scientific Learning in the Middle Ages*, edited by J. P. Cunningham and M. Hocknull (Cham: Springer Nature, 2016) 143-64.

Ptolemy to be the foundation for optics. While Bacon takes over the mathematical teaching of Alhazen, he re-interprets that teaching, especially on intromission and extramission of species through the *Optics* of Ptolemy.[39]

Bacon uses Aristotle, Ptolemy, Tideus, Alkindi, and Augustine (*De musica, Book 6*) "who asserts that the species of the eye is engendered in the air as far as the object" with the expressed intention of correcting Alhazen, Avicenna and Averroes.[40] Thus, the inanimate medium will not become animate but will be assimilated to animate things by virtue of its reception of the similitude of an animate thing. However, Bacon's visual species are not the Platonic emanation of visual fire from the eye to the object and back. The visual power is not only a recipient; it is also an agent. Therefore, visible species from the eye are needed to ennoble the material physical species to be assimilated to human perception. Lindberg continues:

> Bacon was acute enough to notice that Alhazen, Avicenna and Averroes had never disproved the existence of visual radiation; they had according to him merely demonstrated the absurdity of maintaining that something material passed from the eye to the visible object, seizes the species of the visible object and returns it to the eye.[41]

Mark Smith, comments: "For another thing, in the absence of visual radiation, sight would be reduced to pure passivity. Having the eye cooperate actively in the visual process makes the process intentional – or as Augustine would have it, willfully 'attentional'".[42] And since Alhazen took his optics from the arch-extramissionist Ptolemy, Bacon will read Alhazen through the lens of Ptolemy, as it were.

What then are "visual rays" for Bacon? They are extensions of the perceiving perspectival knowing subject. Two of Bacon's sources, Ptolemy, *Introduction to the Almagest* and Augustine, *De musica,* Book VI provide the explanation. Commenting in the *Communia mathematica* on Aristotle's division of the essential parts of speculative philosophy, namely, physics, mathematics and metaphysics, Bacon comments that Ptolemy in his preface to the *Almagest* states that Aristotle does not sufficiently use

[39] David C. Lindberg, *Theories of Vision from Al-Kindi to Kepler* (Chicago: Chicago University Press, 1978), 109-113: "The essentials of Bacon's theory of vision are all drawn from Alhazen [...] But Bacon was more than a follower of Alhazen, he was also, as he saw it, a follower of almost everyone else [...] The resulting doctrine is Neoplatonic in its metaphysical basis." See David C. Lindberg, *Roger Bacon and the Origins of PERSPECTIVA in the Middle Ages: A Critical Edition and English Translation of Bacon's PERSPECTIVA with Introduction and Notes* (Oxford: Clarendon Press, 1996), 100-101; hereafter cited as Bacon, *Perspectiva*, ed. Lindberg.

[40] Augustine, *De musica*, edited by M. Jacobsson (Berlin-Boston: De Gruyter, 2017), 209, l.23-24.

[41] Lindberg, *Theories of Vision*, 116.

[42] A. Mark Smith, *From Sight to Light: The Passage from Ancient to Modern Optics* (Chicago and London: University of Chicago Press, 2015), 264.

mathematics in either physics or metaphysics (Divinity).[43] Aristotle's lack is made up from Augustine, *De musica, B*ook 6.8.21: "And the diffusion of rays shining out from the small pupils of our eyes assist us in [measuring] the spaces of places".[44] It is important to note that Bacon's insistence on a the method of a careful combination of logical-mathematical reasoning and discrete experiential observation is derived from the introduction to Ptolemy's preface to the *Almagest*.

In the light of these sources, what then for Bacon are these visual rays? They are geometrical measuring lines that enable us to visually certify the object and its proper location.

The certification comprises the complete perceptual process, namely, visus, comparison, and syllogism (as defined by Alhazen, an instantaneous intuition of the object based on very fast and imperceptible inferences). In this way, the rational perceiver, using a combination of experience and reason can accurately measure the location, magnitude and distance of objects.

Still, one question remains. Why did Bacon think it necessary to advocate for a combination of intromission and extramission of species? Was it just a matter for the physics and psychology of vision? Bacon himself answers the question in part three of the *Perspectiva*. There, he argues that the combination of intromission and extramission of species provides a natural analogue for the metaphysical and theological doctrine of the cooperation of divine Grace and Freedom of the Will.[45] In order, however, to get an account of how Bacon relates the theories of species and vision to his metaphysical concerns, one must examine his understanding of the unity of the human being as presented in his *Moral Philosophy*, part one. One must also examine Bacons summary sketch of spiritual species and intellectual knowledge as found in his short summary in the *CN*. There, Bacon explicitly connects the physics of species and vision as found in *DMS* and the *Perspectiva* with the metaphysics of intellectual knowledge and the unity of the human cognizer. For Bacon, there is no pure intellectual intuition or knowledge without a return to the physical and perspectival account of vision. The metaphysics of human knowledge must be based on an adequate scientific account of physical action and vision.

[43] See *CM*, ed. Steele, 8, l. 2-23. This is a repetition of the text from *Opus maius*, Part Four on mathematics cited above in Note 15. See G. J. Toomer, *Ptolemy's Almagest* (Princeton: Princeton University Press, 1998), 35-37 (Bk. I-Preface).

[44] Augustine, *De Musica*, 209, l. 21-24: "Ut igitur nos ad capienda spatia locorum diffusio radiorum iuuvat, qui e brevibus pupilis in aperta emicant et adeo sunt nosri corporis, ut quamquam in procul positis rebus, quas videmus, a nostra anima vegetentur, ut ergo ergo eorum effusione adiuvamur ad capienda spatiorum locorum..."

[45] See Bacon, *Perspectiva*, Pars 3, Dist. 3, Cap. 1, ed. Lindberg, 324-25: "Et dictum est quod ad visionem exigitur non solum ut fiat intus suscipiendo, sed extramittendo et cooperando per virtutem et speciem propriam. Similiter et visio spiritualis non solum requiritur ut anima recipiat ab extra, scilicet a Deo gratias et virtutes, sed cooperetur per virtutem propriam. Nam motus liberi arbitrii et consensus requiruntur cum gratia Dei ad hoc ut videamus et consequamur statum salutis."

5. Bacon's account of the metaphysical unity of the individual human being, spiritual species and intellectual knowledge

In the *MP*, when Bacon comes to present an account of the immortality of the soul, he stresses the essential unity of soul and body. For him, the human being is a unity, although a complex unity. He does not posit the substance-dualism attributed to him by some modern writers, and which one might expect from his praise of Avicenna. Bacon states:

> This is necessary, since they derive [it] from the source of philosophy, because according to them virtue belongs to a whole composed of soul and body, that is, a man, not to the soul only nor to the soul in a man, but to a man through a soul, just as understanding and building do, as Aristotle says in Book One of *On the Soul*. And so, they have assumed that happiness belongs to something conjoined. Hence, they have not assumed that a man is a soul in a body but in reality is something composed of a soul and a body, such that the essence of a man is constituted from a soul and a body, and not that his essence is the soul alone in the body.[46]

Bacon did not provide a formal account of the essence of the human being. Citing the authority of Aristotle, he simply stated his own position on the unity of the human being as a composite of soul and body. He was more focused on proving that without a true scientific account of the human perceiver one could not provide the basis for a mature understanding of human intellectual knowledge. In his view, they had ignored the role of mathematics and observation in the act of perception.

Bacon in his criticism of the common teachers in philosophy, demands that one produce a natural philosophy of perception based on the application of mathematics as practiced in *DMS* and the *Perspectiva*. He did this to provide a secure scientific basis for metaphysical claims about human perception. He wished to avoid the argumentative folk-psychology of his contemporaries that lacked a foundation in the sciences. Bacon's metaphysical account of the human being in the *CN* already presupposes the fact that he has given a mathematical, medical, and natural philosophical account of vision and perception in his central treatises *DMS* and *Perspectiva*.[47]

Having dealt with the natural multiplication of species to the particular senses, the common sense and imagination, Bacon notes that one needs "A far more powerful and noble power of the sensitive soul" for judgment of the insensate species resulting from sensible matter. He designates the middle cell of the brain, called Cogitation, to take the place of reason in brute animals allowing them geometrical reality and perception. Men have the exact same faculty as well:

[46] Bacon, *MP*, ed. E. Massa, 23. Translation by Maloney and Hackett (forthcoming).

[47] See Bacon, *CN*, I.4.6, 297: "Partes vero sensitive virtutis ego posui cum omni diligencia in principio *Perspective*, quod capitulum est in quo tantum vulgus errat medicorum, naturalium et theologorum, et est unum de dignioribus capitulis que misi, continens sapiencie potestatem."

> For the species that are in the imagination multiply themselves in the cognitive faculty... but the cogitative power possesses those species in a nobler way, and the species of the estimative power and memory exist in the cogitative power according to a nobler way of being than in the estimative power and memory. And therefore, the cogitative power uses all the other powers as its instruments.[48]

What follows is important for Bacon's psychology of the human knowledge.

> And in humans a rational soul is added from without by an act of creation, and the rational soul is united primarily and immediately with the cogitative faculty, which it puts to use mainly as its own special instrument; and species are produced in the rational soul by the cogitative faculty. Consequently, when the cogitative faculty is injured, the judgment of reason is thoroughly corrupted; and when it is healthy, the intellect functions well and rationally.[49]

David Lindberg translates the part of the text as: "And species are produced in the rational soul by the cogitative faculty (et ab ea fiunt species in anima rationali)." I would prefer the following: "And from [or on the basis of] the cogitative power as its instrument, [spiritual] species are produced in the rational soul." The work of producing species in the rational soul of the human being is not just the cogitative sense working alone but it is the rational soul intervening and using the *vis cogitativa* as its special instrument. In this mortal life, the human intellect does not produce pure spiritual species nor is it given species by the *Dator formarum*. Spiritual species cannot be formed in the intellect without the incorporation of the purified sensible species from the cogitative sense. We will see below that Bacon makes use of his optics and multiplication of species when he addresses the issue of spiritual species.

The important point to note here is that with the supervenience of the rational soul on the cogitative power in the human being, we have a fully united rational human being exercising administrative judgment while being intimately united to the cogitative sense. There is no substance dualism here. There is one human being with the unity of the composite. And it is an intimate unity. But while the rational soul cannot have its species without the cooperation of the cogitative sense, the latter has been united with rational soul and acts as its instrument, forming with it one substantial intellectual-corporeal human being. Thus, for all his praise of Avicenna as the leader of the philosophers after Aristotle, Bacon transformed Avicenna's substance dualism into a non-dualist unified human incarnate rational being.[50] There is a gradual

[48] Bacon, *Perspectiva*, Pars I, Dist. 1, Cap. 4, ed. Lindberg, 16-17.
[49] Bacon, *Perspectiva*, Pars I, Dist. 1, Cap. 4, ed. Lindberg, 16-17.
[50] See Thérèse-Anne Druart, "Roger Bacon and His 'Arabic' Sources in the *Moralis Philosophia*", in *Pre-Modern Philosophi in Greek, Hebrew, Arabic and Latin Traditions*, edited by L. Farjeat, K. Krause and N. Oschman (forthcoming). Druart comments on how Bacon interprets Avicenna in an idiocyncratic way, as he ignores Avicenna's substance dualism and focuses his attention mostly on book ten, the moral section of the *Philosophia prima*. [I thank Professor Druart for allowing me to use and cite this forthcoming study].

purification of the initial physical-material species given by the multiplication of species. But even after the optic nerve and curvature, the process is "spiritual" in the medical sense. With estimation, memory and especially cogitation, there is a higher purification.[51] Then, the rational soul united with the cogitative sense understands things in the world with intimate reference to the species of the cogitative sense. With the human rational soul, the in-built geometric reality of the cogitative sense becomes an explicit formulated logic and mathematics. But the human perceiver is no mere non-rational observer, but a *Perspectivus*. And so, when we talk about the emission of rays, we must include the projection of geometrical measuring to the object via the visual powers in order to measure and estimate the location and distance of objects in space. I turn now to Bacon's explicit remarks on spiritual species.

In his discussion of spiritual and celestial activity and their effects, Bacon notes that "For since corporeal matter has nowhere near the active virtue of spiritual substance (and the same relationship holds between non-celestial body and celestial substance), if the species of spiritual substances should be completed, all things would become spiritual."[52] Again, in his discussion of the nature of species in the medium and in sense, Bacon attacks those philosophers who talk about spiritual being of the species in the medium.[53] Bacon writes explicitly of the superiority of spirit over body. He remarks:

> And what is more, spirit in body and united with it as its form and perfection (as, for example, the rational soul) does not give up the spiritual being that it owes to its essence; rather, that spiritual being is more apt to flow into the body than the converse; and virtually the whole of a man becomes in a certain way spiritual since the soul is more important (almost beyond comparison) than the body. Therefore, a corporeal thing existing in body is far less apt to give up the being which, according to the law of body, is due it....Later we will investigate the species of corporeal things as they exist in the soul and intellect, and the first cause of their being there.[54]

In the *De anima* section of *CN* Bacon provides a summary sketch of his teaching on some aspects of spiritual species. He correlates them closely with his treatment of physical-material species in his *DMS* and his *Perspectiva*. In what follows, I will give an outline of his teaching on this matter as it arises in his defense of the individual human intellectual cognizer against the position of Averroes on the unity of the possible intellect.

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[51] See Bacon, *Perspectiva*, Part I, Dist.1, Chs. 1-5, ed. Lindberg, 1-20. See also David C. Lindberg, *Roger Bacon's Philosophy of Nature: A Critical Edition, with English Translation, Introduction and Notes, of De multiplication specierum and De speculis comburentibus* (Oxford: Clarendon Press, 1983; reprint: South Bend, Indiana: St. Augustine's Press, 1998), Part II, Ch. 2, 190-94 on material and spiritual species.
[52] Bacon, *DMS*, ed. Lindberg, Part I, Ch. 6, 82-83.
[53] Bacon, *DMS*, ed. Lindberg, Part III, Ch. 2, 187-95.
[54] Bacon, *DMS*, ed. Lindberg, Part III, Ch. 2, 188-93. Lindberg notes that Bacon never gets to this subject, referencing Do Nascimento, 19-21. As we will see in the next section, in the *CN* Bacon provides a summary account of the soul and intellect and their relationship to corporeal species.

Bacon constructs his criticism of Averroes and his Latin readers on natural and scientific analogies from his *DMS* and his *Perspectiva.* In part three of this latter work, Bacon argues that all spiritual analogies must be based on a sound knowledge of natural behaviors and structures. Averroes, as interpreted by the Latin philosophers, had posited one common possible intellect for all humans such that it is not this individual person that thinks. Bacon comments:

> When indeed Averroes argues to the contrary stating 'if the intellect were multiple in number and numbered according to the diverse number of humans, then the thing understood would be multiple in number.' But this is insane, nor does he verify this consequence. From his statements in the same chapter and elsewhere a fantasy is conjectured in order to verify this consequence, that is, that from an intellect and by an intellect one true thing is made which is truer than from matter and form. And so if the intellect is numbered in humans, then the same intellect or the same understood things will be numbered (multiple) since it will be understood by many. But many [philosopohers] explain this in multiple ways, [making a distinction between] the thing understood and the species of the thing before the soul... For when it is argued that the species in the soul will be multiplied, I concede that diverse species of the same thing can be present before diverse knowers, because the thing produces its species in all directions, as was proved in the treatise *On the Multiplication of Species.* And so, just as in diverse parts of the air there are diverse species of the same thing, and diverse species come the eyes of diverse humans, it is the same in the case [of representation] for the diverse intellects.[55]

Bacon continues and in the case of complex truths, the agent intellect accounts for the interior cause of knowing while the teacher is the cause of our knowledge of exterior things. Further, in the case of in-complex truths, the object of knowledge (the thing) can be visually presented and exemplified by the teacher.

The species (representation) of the thing arrive at the intellect by means of the senses, is enlightened by the agent intellect and as a result a cognitive habit is born in the soul. Through these processesses it is possible for science to come about in the student such that it is not the case that knowledge (automatically) generates itself.[56]

[55] Bacon, *CN*, ed. Steele, Book One, Part four, dist. 3, Ch. 3, 288-89. Translation, Hackett.

[56] Bacon, *CN*, ed. Steele, Book One, Part four, dist. 3, Ch. 3, 290. Both Yael Kedar and Chiara Crisciani argue for a theory of the direct incorporation of corporeal species in the rational soul. See Yael Kedar, "The Intellect Naturalized: Roger Bacon on the Existence of Corporeal Species within the Intellect", *Early Science and Medicine* 14 (2009): 131-57; Ciara Crisciani, "Universal and Parrticular in the *Communia naturalium*: Between <Extreme Realism> and <Experientia>", in *Roger Bacon's Communia Naturalium: A 13th Century Philosopher's Workshop*, edited by P. Bernardini and A. Rodolfi (Firenze: SISMEL-Edizioni del Galuzzo, 2014), 57-82. Clearly, Bacon did not develop a formal theory of agent intellect such as one finds in Thomas Aquinas and John Peckham. But his theory of spiritual being as outlined here implies the existence of spiritual processing of the incorporated material species.

Bacon concludes Chapter three with the claim that he is certain that the soul is composed from matter and form just like the Angels.

In Chapter four, Bacon presents a developmental understanding of the human being and ties his understanding of the rational soul to the normal development of the embryo of the human being who is a composite of body and soul. The soul too must be a composite such that "its form perfects the form of the embryo and its matter perfects the matter of the embryo." And in this manner, one can defeat "the great error" and weak arguments of those who conjecture "the simplicity of the rational soul".[57] There is little doubt that Bacon is polemically distancing himself from the new position of Thomas Aquinas.

In Chapter seven, Bacon examines the properties of the intellectual soul. He begins by stating that it is his understanding that "there is one human substance that has diverse activities, names and relationships. This substance first knows and desires what is known..."[58] Once again, when Bacon turns to a consideration of the nature of intellectual memory, he immediately correlates it with the account of physical memory processing in his *Perspectiva*, drawing especially on Avicenna's psychology. Bacon offers his own correction of Avicenna, who according to him, holds that estimation takes the place of intellect in brute animals, and that reminiscence will differ from intellect just as memory differs from estimation. Bacon overcomes Avicenna's substance dualism by claiming that there is one human substance, and that memory and estimation are one human power according to substance but have diverse activities in the final part of the brain cavity. Analogously, reminiscence is not a power different in kind from the intellect. Indeed, it is less so than is memory different from estimation since intellect and reminiscence do not require diverse subjects or diverse instruments as do memory and estimation in the brain. Bacon seeks to link up this concern with the diverse instruments of perception in the brain with the supervenience of the intellect. This includes the high point of intellect that arises from intellectual memory. Bacon's aim is to argue that perception and intellect work together in the act of achieving certified knowledge.

> This is because intellect is not bound to [a particular physical] organ. If Augustine and the theologians posit [separate] parts for imagination, memory, intelligence and will, it should be stated that this separation is not according to parts, but in terms of act and habit. And in this they agree when they say that intelligence is formed from memory, which would not occur if there they were diverse powers, because such diversity of powers would be according to nature, essence and species just as is the case with *Vision* and *Hearing*. Whence, when the high point of intelligence is formed from memory, this

[57] Bacon, *CN*, ed. Steele, Book One, Part four, distinction 3, Ch. 3, 294. Translation, Hackett.
[58] Bacon, *CN*, ed. Steele, Book One, Part four, distinction 3, Ch. 3, 299: "Et dominabitur intencioni mee ad presens quod una est substantia, habens diversas operaciones et diversa nomina et diversas comparaciones, que primo cognoscit et eadem appetit cognita..."; I will not address Bacon's teaching on the practical intellect here; instead I deal with his account of the speculative intellect.

> is nothing other than the same power of the soul, that is, the intellect or the intellectual soul...[59]

Here, we have Bacon's expression of his unitary but complex understanding of human knowledge where the work of the *Perspectiva* provides the natural perceptual basis for his understanding of the thinking and willing human being. Just as the *Perspectiva* at the end of part III provided a natural analogue for the eight beatitudes using the structure of the eye, and also the basis for a cooperation of human freedom and Grace, so we see Bacon mining the *Perspectiva* for natural analogues to solve discussions on the nature of the intellect, and on the nature of the soul. We also need to ask: Did Bacon's own Franciscan Christian Theological understanding affect the way he read the ancient Greek, Latin, and Muslim texts on Optics? I believe that it did. We notice however, that his position is directed against a famous one who held to the simplicity of the human intellect, one who taught in Bacon's view an *error pessimus*. And this places Bacon's concerns in the context of the teaching debates on the soul at the University of Paris in the mid to late 1260's.

Conclusion

I have presented Roger Bacon (1257-92) as a scholar who worked on the correction of the Bible and one who sketched out a new metaphysics closely linked to morals. One must see Bacon as the voice of the Biblical Scholars who had been subordinated to the practice and ideology of the Masters of the Sentences, who had adapted the metaphysics of Aristotle, Avicenna and Averroes. Bacon, however, was driven to construct a new metaphysics, a new Christian philosophy in which all ancient traditions of science and philosophy would be integrated. It was Bacon's view that Masters of the Sentences did not do justice to the natural sciences. This paper has demonstratred the extent to which Bacon formed his own new synthesis of wisdom, and it has added much new evidence to the brief references set out by Delorme to identify the mathematical and scientific pre-requisites for a new metaphysics. Further, it identified the *Opus maius* as Bacon's new preliminary text in metaphysics and morals. In particular,it argued that Bacon was not an Avicennian substance-dualist. Moreover, the paper showed the extent to which Bacon's criticism of Averroes was based on his natural philosophy. And likewise, his doctrine of spiritual species and intellectual knowledge was tightly integrated with his natural science of perception.

Bacon's unique synthesis in this work was programmatic. Bacon's ideas would be taken up and significantly developed in the English Franciscan tradition up to and including Duns Scotus and William of Ockham. And as is clear from his uses of Avicenna, Bacon is doing the work of a philosopher and theologian, and not that of an historian of philosophy. With not a little 'deconstruction' and 'creative misreading', Bacon is

[59] Bacon, *CN*, ed. Steele, Book One, Part four, distinction 3, Ch. 3, 301. Translaltion, Hackett.

creatively (poetically) re-writing what he thought Avicenna should have said or meant to say had he had access to the resources provided by Christianity and had he had a better knowledge of the ancient philosophers and scientists.

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RESEÑAS DE LIBROS/BOOK REVIEWS

Marco Tulio Cicerón. *Sobre las leyes*. Traducido por Laura E. Corso de Estrada. Colihue clásica CXXXII. Buenos Aires: Ediciones Colihue, 2019. 432 pp. ISBN 9789505630387. Cloth: ARS 1100

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Se trata de una edición bilingüe, con un aparato crítico muy esclarecedor del texto, del tratado ciceroniano *De legibus*, precedida de una amplia introducción a la obra y a la filosofía ciceroniana, con un apéndice sobre su acogida en la Edad Media. La autora, Laura E. Corso de Estrada, es una estudiosa de Cicerón, reconocida internacionalmente y que presenta ahora, con esta edición, la relevancia de ciertos conceptos filosóficos que tendrán su influjo en todo el período del medievo.

La autora presenta el *De legibus* como un escrito filosófico, en consonancia con el temprano, también ciceroniano, *De inventione Rhetorica*, donde ya se sostiene la existencia del derecho natural (*ius naturae*) "como una *fuerza* (*vis*) directiva del obrar humano" (p. ix), que precisamente tiene su origen en la propia naturaleza humana. Esta tesis atraviesa la obra que ahora se edita, en consonancia con el *De divinatione*, exponiendo las bases del derecho universal. El propósito de Cicerón es visto como una propuesta de una mirada filosófica acerca de la vida humana en su conjunto, su sentido, "la jerarquía de los bienes, las vías para aceptar el dolor y las perturbaciones del alma, sobre la naturaleza de la culpa y su génesis, la definición de virtud y la clasificación de sus especies, los efectos del obrar, el acceso humano a la divinidad (...) la naturaleza misma de lo divino" (p. x). En consonancia con otras obras también, la filosofía queda definida como el arte de la vida.

Desde lo anterior, se entiende que la razón se debe al cultivo de la filosofía, y tiene una "función educadora de la juventud romana en crisis" (p. xii). La autora expone en este respecto las diferentes interpretaciones que se han dado a los escritos ciceronianos en cuanto filosóficos; concluyendo que la actividad jurídica de Cicerón pone de manifiesto su convicción acerca de la unidad de la vida práctica y la teorética. La filosofía se presenta como un acceso a la vida práctica y a la *humanitas*, que, "en lenguaje de nuestro autor es propio de aquel que ha cultivado el alma" (p. xvi).

Laura E. Corso de Estrada, realiza un estudio erudito sobre la datación del *De legibus*, y su lugar en el itinerario intelectual de Cicerón, redacción que habría iniciado en el año 52 y teniendo en cuenta el marco de descomposición de la ciudad (p. xxxv).

Resulta interesante la presentación del *De legibus* como diálogo, y, a su vez, el diálogo como vía expresiva para la presentación de las ideas filosóficas; por lo cual se lo une a la Academia platónica y presentando de este modo "una razón de ser universal del derecho y

de las leyes" (p. xlix). Corso de estrada describe con precisión el diálogo que se desarrolla en la obra (pp. lii-liv).

Quizá la mayor originalidad de la obra se encuentre en la lectura filosófica que se hace de la naturaleza en el diálogo y la incorporación de la temática acerca del binomio naturaleza-racionalidad, que ha de atravesar las etapas posteriores del filosofar (p. lix). La autora realiza un extenso y profundo estudio sobre la relación entre la razón y la ley. El estudio de Marco Tulio Cicerón es transfenoménico y traspasa los límites y concreciones de a vida práctica concreta, para definirse en un campo universal. Llega incluso a presentar una cosmología teológica, por la que se entiende que toda naturaleza es regida por los dioses. Esta tesis sin duda ha de tener su eco en el medievo metafísico y político.

Habría una Razón divina inmanente que regula los acontecimientos, y de este modo se entiende la racionalidad ínsita en la naturaleza; lo que podríamos denominar la inteligibilidad de lo real, tesis que atraviesa la Edad Media desde Agustín de Hipona. Por su parte, la "*lex naturae* se manifiesta a través de inclinaciones ínsitas en la naturaleza de los seres del mundo" (p. civ); inclinaciones que en el hombre superan las meramente biológicas.

En todo este trayecto, Laura Corso estudia con profundidad las fases de la filosofía ciceroniana en el contexto de la naturaleza, la razón y la ley en ser humano. Esto hace que la obra editada, con su amplia introducción, cupe un lugar en las bibliotecas filosóficas. Además, la traducción con notas críticas, la investigación llevada a cabo sobre la estructura temática del *De legibus*, la exacta cronología expuesta y la recopilación de la bibliografía sobre el tema, el autor y la obra, hacen que ocupe un lugar destacado entre los estudios filológicos.

El libro concluye con un Apéndice sobre las proyecciones de la tradición ciceroniana sobre la ley natural. Se estudian ahí las fases medievales y de la modernidad temprana. Se hace claro el lazo entre la Antigüedad y la primera fase de la patrística, en donde se encuentra la tradición ciceroniana sobre la ley natural. De Agustín a Rabano Mauro, se ve con claridad el influjo ciceroniano; este último autor cita a Cicerón como un teólogo, en cuanto que considera que sus escritos hablan sobre Dios (p. 265). También en el siglo XII Alanus de Insulis recoge la tradición ciceroniana sobre la ley. Además, la vinculación con el término *natura* se encuentra en Felipe el Canciller, quien la concibe como una suerte de "derecho natural" (p. 273). Del mismo modo Guillermo de Auxerre, recogerá una comprensión del *ius* como comprehensiva del mundo. Lauro Corso estudia asimismo el influjo de Cicerón en Alberto Magno y Tomás de Aquino. Para concluir con el influjo ciceroniano en la modernidad temprana (pp. 280-287).

Erik Kwakkel and Francis Netwon. *Medicine at Monte Cassino: Constantine the African and the Oldest Manuscript of his Pantegni.* Speculum Sanitatis 1. Turnhout: Brepols, 2019. XXXVI+255. ISBN 9782503579214. Cloth: £80

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Lo studio, in inglese, è pubblicato nello *Speculum Sanitatis* – un'interessante collana di recente creazione consacrata alla cultura medica fra VI e XIX sec. – ed è interamente dedicato al codice L'Aja, Koninklijke Bibliotheek, MS 73 J 6. Questo esemplare è infatti singolare per due motivi, ovvero al fatto che è la più antica copia conosciuta della *Pantegni* di Costantino l'Africano – la traduzione latina dell'enciclopedia medica *Kitab Kamil as Sina'a at tibbiya* di Ali ibn al Abbas al'Magusi (morto nel 982) –, e perché tale esemplare venne realizzato verso il 1080 a Monte Cassino, e cioè nel monastero in cui Costantino fu attivo fra il 1077 e la sua morte, avvenuta nel 1099.

Il trattato, diviso in cinque capitoli più un'introduzione biografica, si apre con una lista delle illustrazioni (p. vii-xiii), una serie di immagini a colori riguardanti particolari di alcuni dei manoscritti discussi (p. xvii-xxiii), i ringraziamenti e la prefazione degli editori (pp. xv-xvi e pp. xxix-xxxiii), e una lista delle abbreviazioni usate (p. xxxv). La prefazione è seguita da una rappresentazione di Costantino l'Africano ricavata dal manoscritto Erfurt, Universitäts-und Forschungsbibliothek, Cod. Amplon. 4° 184. Il volume è concluso da una bibliografia delle opere citate (pp. 225-240), un indice dei manoscritti menzionati (p. 241-245), un indice generale (p. 247-255), e sei utili *addenda* rispettivamente dedicati a: una descrizione del manoscritto L'Aja, Koninklijke Bibliotheek, MS 73 J 6 (Appendix A, p. 191-194); le biografie del traduttore di Monte Cassino (Appendix B, p. 195-203); il testo latino e la traduzione inglese del prologo del *Pantegni* (Appendix C, p. 205-209); il testo latino e la traduzione inglese della vita miracolosa di Teodemaro, dodicesimo abate di Montecassino (Appendice D, p. 211-215); una breve lista di manoscritti in formato "holster" (Appendice E, pp. 216-221); e, infine, un glossario dei copisti che parteciparono alla composizione dell'opera (Appendice F, pp. 223-224).

A differenza delle altre sezioni del libro, scritte da Erik Kwakkel e Francis Newton, l'introduzione (pp. 1-29) è realizzata da Eliza Glaze, ed è, di fatto, un approfondito inquadramento storiografico sulla vita di Costantino. Esso è ricavato da tre fonti quasi coeve al monaco, ovvero la *Chronica monasterii Casiniensis*, una vita scritta dal medico Matteo Ferrario di Salerno, e la biografia conosciuta come "Cordoba-Montpellier". In questa interessante sezione, la Prof.ssa Glaze indaga con dovizia di dettagli il motivo per cui il medico-traduttore sarebbe venuto in Italia, il suo periodo a Salerno, il legame con alcune delle più potenti figure politiche del Sud Italia, l'arrivo a Monte Cassino e l'attività di traduzione (con un importante, ovvio, focus sul *Pantegni*).

Il primo capitolo (pp. 31-58) rivela l'identità del copista principale del manoscritto esaminato, ovvero Geraldo, monaco e presbitero a Monte Cassino sotto gli abati Desiderio (1058-1087) e Oderisio (1087-1105). Questa indagine è condotta tramite l'attenta ed avvincente comparazione di codici e documenti (6) che, al pari de L'Aja, Koninklijke Bibliotheek, MS 73 J 6, vennero scritti in minuscola carolina a Monte Cassino alla fine dell'XI secolo. La particolare mano di Geraldus – inizialmente addestrata alla scrittura carolina e poi a quella beneventana – è poi esaminata attentamente e contestualizzata nello *scriptorium* dell'abbazia benedettina.

Il secondo capitolo (pp. 59-84) esamina gli aspetti codicologici del ms. L'Aja, Koninklijke Bibliotheek, MS 73 J 6 e mostra il metodo di lavoro di Costantino. La prima parte della sezione fornisce sia un inquadramento generale allo *scriptorium* di Monte Cassino alla fine dell'XI sec., sia un'attenta escrizione dell'esemplare considerato (una copia di lavoro chiaramente destinata ad un uso quotidiano). Particolare attenzione è inoltre dedicata a due avvincenti aspetti distintivi di questo esemplare, ovvero (1) al gran numero di copisti che sono intervenuti sul testo dopo Geraldus – e che, tramite l'aggiunta di ricette ed elementi pratici, ne hanno in qualche modo cambiato l'originario contenuto teorico in qualcosa di più utile nella quotidianità –, e (2) alle sue lacune e al metodo di revisione "in due tempi" messo in atto da Geraldo e – probabilmente – dallo stesso Costantino. La parte finale anticipa il contenuto del capitolo successivo, introducendo la discussione sui collaboratori del traduttore africano.

Il terzo, interessante capitolo (pp. 95-120) descrive il "Team Costantino", ovvero quel gruppo di copisti e studiosi che aiutarono il traduttore africano nella sua monumentale opera intellettuale. Oltre alla discussione su Giovanni, un allievo di Costantino, ben approfondita è anche l'indagine su Atto/Teodemaro, prima cappellano dell'imperatrice Agnese, e poi monaco a Monte Cassino e revisore stilistico dell'opera di Costantino (che – a quanto ci viene detto – non sembra essere stato formato nella retorica!).

Il quarto capitolo (pp. 121-148) si focalizza sulle particolari proporzioni del ms. L'Aja, Koninklijke Bibliotheek, MS 73 J 6. Essendo infatti molto stretto (235 mm in altezza, e solo 128 mm in larghezza), tale codice va collocato nella particolare categoria dei manoscritti "holster", ovvero libri che – grazie al peculiare rapporto fra altezza e larghezza, e al fatto che contenevano meno pagine di un manoscritto tipo – potevano essere facilmente maneggiati da un maestro mentre spiegava, gesticolava e si muoveva in classe.

Il quinto e ultimo capitolo (pp. 149-189) contestualizza i risultati delle altre sezioni e aiuta a comprendere in senso più generale il lavoro di Costantino. La prima domanda a cui questa porzione di testo risponde è quindi come avveniva in maniera pratica – e con tutti i problemi correlati – il lavoro di composizione di un'opera nell'XI secolo. Tramite alcuni azzeccati esempi, è così mostrato come un autore medievale realizzava la sua opera: essa veniva originariamente dettata ad un segretario, che lo registrava su tavolette di cera e poi su stralci di pergamena (*schedule*); tali porzioni di testo venivano poi revisionati dall'autore in vista dell'edizione finale. Questa procedura viene poi riadattata alle opere costantiniane, anche con l'osservazione dei *modi operandi*, spesso coordinati, dei membri del "Team

Costantino", e cioè – oltre ai già menzionati Geraldo e Atto/Teodemaro –, i cosiddetti "Scriba del Giovenale bodleiano", "Rubricatore di Apuleio" e "Rubricatore de L'Aia". Il capitolo si conclude con una discussione su come sia probabile che Costantino abbia cominciato la traduzione del *Pantegni* e di altre sue opere (il *De urina* e il *De febribus*) mentre era ancora a Salerno. Questa analisi è effettuata anche tramite lo studio del già menzionato ms. Erfurt, Universitäts-und Forschungsbibliothek, Cod. Amplon. 4° 184 e di alcune sue peculiarità (ad es., il fatto che Costantino è identificato nell'*incipit* come "domnus" e non come monaco).

Sebbene non risponda ad alcune interessanti questioni (il lettore che si aspetta qualche indizio sul rapporto ecdotico-filologico fra i testimoni menzionati rimane a bocca asciutta), lo studio di Erik Kwakkel e Francis Newton è un lavoro superbo, interessante e scientificamente impeccabile. Per quanto riguarda innanzitutto i suoi contenuti, il testo è infatti una vera miniera di esempi e dati specialistici su manoscritti e copisti legati a Monte Cassino, ma mostra anche come eventi e personaggi legati ad un'opera letteraria possano essere ricostruiti tramite l'incrocio attento e puntiglioso di codicologia e analisi storiografica. In secondo luogo, da un punto di vista prettamente tecnico, il volume è inoltre scritto in modo logico e avvincente, e ciò ne facilita enormemente la lettura: questo valore aggiunto – *ça va sans dire* – non è infatti qualcosa facile da trovare in volumi altamente specialistici. Per concludere, l'opera risulta interessante sia per chi studia la medicina dell'Occidente latino medievale, sia per lo studioso che vuole capire l'enorme, intricato lavoro che stava alla base di un'opera manoscritta.

Toivo J. Holopainen. *A Historical Study of Anselm's* Proslogion*: Argument, Devotion and Rhetoric*. Leiden: Brill, 2020. 238 pp. ISBN 9789004423206. Cloth: €111

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Los estudios sobre san Anselmo y su *Proslogion* copan las estanterías (físicas y virtuales) de quienes se dedican a la historia del pensamiento medieval. Éstos abarcan desde el análisis más minucioso del famoso "argumento anselmiano" hasta la caracterización más general de toda su obra, siento el teólogo de Aosta una fuente para "analíticos y continentales". Ante este panorama, el texto de Toivo J. Holopainen se presenta como un soplo de aire fresco, mediador entre dos corrientes contrapuestas.

A Historical Study of Anselm's Proslogion cumple las expectativas tanto de quienes buscan una certera caracterización del argumento anselmiano como de quienes tratan de conocer el trasfondo de la propia obra. Sin duda, este texto debe ser tenido en consideración por neófitos y estudiantes, así como por investigadores versados en la materia, puesto que todos hallarán en él datos más que sugerentes para una lectura (o relectura) de la producción de san Anselmo.

El nuevo libro de Toivo Holopainen está dividido en tres partes bien diferenciadas, que pasan del estudio del principal (o único) argumento del *Proslogion* al análisis de su contexto originario e intención primigenia. En la primera sección, que abarca los capítulos primero a cuarto, Holopainen rastrea tanto las bases históricas como el núcleo del argumento anselmiano, hallando las primeras en la dialéctica boeciana y el segundo en la vinculación de Dios con "aquello lo cual nada mayor puede pensarse". Según Holopainen, la intención del *Proslogion* anselmiano era la de justificar los atributos esenciales de Dios y no su existencia; esta tesis, que para muchos estudiosos de san Anselmo será controvertida, es justificada por el autor en un punto clave que procede del análisis textual e histórico: el *Proslogion* está dirigido a creyentes (cristianos), es decir, fieles que ya confían en la existencia del Ente divino. He aquí parte del interés que posee el texto de Holopainen y el nexo que une la primera con la segunda parte de su obra: el análisis contextual del *Proslogion*.

Si en los primeros cuatro capítulos Holopainen sienta las bases para la correcta intelección del argumento anselmiano, en los tres siguientes (que ocupan la segunda parte de su obra) nos ayuda a situar el *Proslogion* dentro de la producción de san Anselmo y de la misma historia de la filosofía y la teología. Esta sección es, a nuestro entender, la más rica y beneficiosa de la obra, aunque quienes sólo busquen el análisis lógico-argumentativo no estarán en absoluto de acuerdo. Es en la segunda sección de *A Historical Study of Anselm's* Proslogion donde descubrimos el hilo conductor entre el *Monologion* y el *Proslogion*, a la vez que conocemos sus profundas raíces en las disputas teológicas del momento (concretamente en las eucarísticas). Holopainen localiza la verdadera y última intención de las citadas obras de san

Anselmo en el intento por hacer de la razón humana un *locus theologicus*, esto es, un punto de argumentación válido para la disciplina teológica, que en su época se encontraba dominada por el Magisterio. Así, *A Historical Study of Anselm's* Proslogion ahonda en el contexto de la obra anselmiana mostrando no sólo el vínculo entre el "argumento ontológico" y la dialéctica de Boecio, sino también entre la génesis de la obra y el panorama teológico en el que nace. De esta forma, tanto el *Monologion* como el *Proslogion* son concebidos como dos intentos de cambiar la Teología del siglo XI, tratando de abrir un hueco para la razón en una disciplina que la tenía bajo sospecha.

La segunda parte, que profundiza en la relación entre Lanfranco de Canterbury y san Anselmo y otorga a la obra *De corpore et sanguine Domini* del primero la causa de la suspicacia de la Teología contra la razón, presenta, a la vez, el punto clave que justifica los capítulos finales de la obra (octavo y noveno): el intento anselmiano de cambiar la argumentación teológica no pasa por la oposición entre fe y razón, sino por su enlace. El apoyo de Anselmo en la obra madura de san Agustín para conseguir su objetivo es más que evidente, aportando a la labor del benedictino el respaldo de autoridad que necesitaba. Como todos sabemos, el *Proslogion* fue una creación posterior al *Monologion* pero, según Holopainen, su objetivo fue hacerle el camino más fácil a este último, puesto que el *Proslogion*, al presentarse de una forma devocional y mezclar la plegaria con la razón, predispone al creyente a no rechazar de entrada los argumentos puramente racionales, tales como los que se hallan en el *Monologion*.

Sin duda, *A Historical Study of Anselm's* Proslogion posee un inigualable atractivo tanto para quienes estudian la figura de san Anselmo como para los interesados en la historia de la filosofía en general, ya que aporta numerosa información sobre el Doctor de la Iglesia y su obra, ayudándonos a profundizar en su contexto histórico-doctrinal. El libro de Toivo J. Holopainen representa, desde nuestro punto de vista, una renovación de los estudios sobre el *Proslogion*, que hasta el día de hoy parecían estancados en ciertas líneas más que conocidas. El estilo del texto, combinando el análisis exhaustivo de los argumentos con la contextualización y justificación de los mismos, hace de *A Historical Study of Anselm's* Proslogion una obra más que recomendable para todos los interesados en la filosofía y teología medieval. Quizá algunos encuentren débil la justificación y explicación de la relación entre san Anselmo y Lanfranco, pero ello no obsta para que desde ahí puedan abrirse nuevos caminos en la investigación contemporánea.

El acertado análisis histórico, contextual y filosófico-teológico del *Proslogion* y del pensamiento anselmiano hace que la obra de Toivo J. Holopainen se erija como fundamental para todo amante y profesional de la filosofía, puesto que representa acertadamente cuál es el camino que debe recorrer toda certera investigación en dicho campo.

Andreas Lammer. *The Elements of Avicenna's Physics*. Scientia Graeco-Arabica 20. Berlin/Boston: Walter de Gruyter, 2018. 594 pp. ISBN 9783110543582. Cloth: €133.95

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In this book, Andreas Lammer analyses the central concepts and core issues of Avicenna's physics. Although Lammer draws on all the primary sources relating to Avicenna, his main focus is *al-Samāʿ al-tabīʿī* of *al-Šifā*, and its central concepts: matter and form, nature, motion, place and time. These concepts, as defined in *al-Samāʿ al-tabīʿī*, represent the foundation of Avicenna's physics, which Lammer intends to explain in its entirety. Overall, *The Elements of Avicenna's Physics* describes Avicenna not only as a genuine follower of Aristotle, but also as an innovative developer of Aristotelian thought.

This rich work provides an invaluable interpretation and summary of Avicenna's view on the science of physics as the foundation of natural philosophy. The book is divided into six parts, of which every part represents an extensive study on its own.

The first part, "The Arabic Fate of Aristotle's *Physics*", explains the transmission of Aristotle's *Physics* into Arabic language and civilisation. Here Lammer introduces the importance of analysis of the Arabic translation of Aristotle's physics, as well as the translations of Aristotle's commentators up to the time of Avicenna. Thus, this study is invaluable not only to those interested in Islamic philosophy, but also to those interested in the commentary tradition of Late Antiquity, as it takes into consideration the interpretations of Theophrastus, Galen, Alexander of Aphrodisias, Plotinus, Porphyry, Themistius, Proclus, John Philoponus and Simplicius.

Before anything else, Lammer reminds us of the importance to keep in mind that we do not know Avicenna's source for Aristotle's physics (p. 18), yet that we can be certain that he was aware of the most important translations of that time (p. 19), and certainly developed his understanding of natural philosophy through critical examination of the works of Philoponus and Alexander of Aphrodisias (p. 32). Once we are aware that Avicenna did not rely on only one translation but many in formulating his natural philosophy, whilst also forming his own independent ideas about the world (pp. 40-41), we can understand why various works and contributions of the pre-Avicennian commentators should be examined and compared in the context of the presented study.

At the beginning of the second part of his book, under the title "The Methodology of Teaching and Learning", Lammer highlights certain discrepancies in the methodological approach to the science of physics between Aristotle and Avicenna: while for Aristotle induction represents the approach to grasp "primitives", for Avicenna it simply does not yield certainty – i.e. does not provide necessary knowledge – and thus he develops the concept of "methodic experience" (*taǧriba*) as conditionally universal (pp. 45-49). Yet if

knowledge is conditional in any way, it cannot provide certainty of principles. This is the reason Avicenna introduces the concept of the "Active Intellect" (pp. 49-50).

After extensive examination and analysis of the Commentators' idea regarding the method of physics, the author concludes that in his approach to this science Avicenna follows Philoponus' interpretation of Aristotle, according to which science proceeds from what is universally common as better known to the intellect towards more particular concerns; for this reason physics precedes other branches of natural philosophy (pp. 51-70). In this sense physics deals with the common principles of the sensible body insofar as it is subject to change (p. 71), yet not in a way of scientific demonstration; according to Lammer, "*al-Samā' al-tabī'ī* is no book of research and inquiry but a book of teaching and learning" (p. 71) – it is a book that explains, elaborates and defends what is already established in the science of physics. This simply means that Avicenna explains principles of nature instead of arriving at them; he goes from universals to particulars in the form of a demonstrative deduction (pp. 75-78). For Lammer, with this approach Avicenna anticipated Barnes and Wieland's view of the method of Aristotle's *Posterior Analytics* as didactic (p. 79). In other words, regarding physics Avicenna postulates and defends what Aristotle demonstrated.

The third part, entitled "The Subject-Matter of Physics" identifies the starting point of Avicenna's natural philosophy. This is "the sensible body insofar as it is subject to change" (p. 111). Lammer notices that Avicenna does not start his elaboration from the analysis of the phenomenon of motion and change, but from corporeality (p. 113). This further supports his identification of *al-Samā' al-tabī'ī* as a didactic work. Avicenna divides his analysis into that of the essential constituents of the natural body, and that of the body's engagement with motion and change (p. 114). For him the most common thing to every body is extension: bodies are essentially extended (pp. 128-132), i.e., something which is essentially continuous in three dimensions (p. 136). Also, as corporeal reality a natural body is constituted of two principles: matter and form: matter as the underlying principle is in itself non-extended, pure potency receptive of form; the corporeal form on the other hand is the source and principle of corporeality (pp. 153-154). In addition, Avicenna identifies privation as a principle of change inasmuch as it explains change, but not as a principle of causing change (p. 209). Privation does not cause change, but without it change is unintelligible. From this we can see that in *al-Samā' al-tabī'ī* Avicenna begins with what is most common and proceeds towards what is more particular (p. 114) and does not discuss the principles of natural things on the basis of an analysis of change, like Aristotle, but through examination of the notion of corporeality (p. 201).

The fourth part, "Nature and Power", deals with these two concepts, and presents Avicenna's critique of the Aristotelian commentators, as well as his own defence of Aristotle. Avicenna criticises both the entire Greek commentary tradition and the Arabic tradition of his time. In order to identify Avicenna's position and elaborate upon his criticism, Lammer once again offers an extensive comparison of the commentary tradition. He argues that the main problem with the teachings of Avicenna's predecessors was aligning the Aristotelian soul with nature. The problem starts with Philoponus whose interests were to highlight the

inner coherence of Aristotle's work (pp. 218-225) mixing it with his own Neoplatonic elements (pp. 220-222).

Lammer shows that Avicenna was clearly influenced by the ancient Aristotelian commentators, but also successfully distanced himself from the preceding tradition by providing a clear distinction between philosophical concepts such as "nature", "inclination" and "motion" (p. 252). According to Avicenna, nature is a simple principle for motion and rest (p. 228). Nature is what always acts according to a single course and cannot be altered nor transformed (p. 230), as it is an internal efficient principle which causes motion from within. Nature causes inclination in things, and the inclination then manifests itself in motion (p. 247).

The main problem of Neoplatonism is their view of nature as a universal entity (*ḏāt*) that is independent from beings in motion which are moved by it; thus nature is regarded as a cosmic self-sufficient substance (p. 278). Contrary to this idea, in *al-Samāʿ al-ṭabīʿī* I.5 Avicenna sees nature as a single universal and common principle of motion, which governs all things in the world (p. 269-271). He rejects the universal notion of nature that exists outside of conception; instead, all natural things have their own nature, just as they have their own matter and form (p. 279). In accordance with their natures things are acting and resting (p. 280), and moving along a rectilinear line, as it is in accordance to a natural inclination that a thing moves along the shortest distance (p. 283). For this reason a circular motion of the heavens is not natural, but due to the soul, or volition (pp. 284-285). Only inanimate bodies move due to their natures in the strict sense. Living beings, on the contrary, move by their souls: celestial, animal or vegetative (pp. 287-290). Therefore, there is no universal nature; nature is a general principle that belongs to every natural body individually insofar as it is subject to change (p. 306).

The fifth part "Putting Surface Back into Place" deals with Avicenna's revival of Aristotle's idea of space against Philoponus' objections. The two rival theories were extensively analysed by Avicenna. Regarding this issue Lammer says: "if Philoponus' *Corollarium de loco* constitutes the greatest attack on Aristotle's account, Avicenna's *al-Samāʿ al-ṭabīʿī* contains its greatest defence" (p. 308). Having this in mind the author is very critical of the fact that Avicenna's account of place is so underrated and not adequately understood in current scholarship. For this reason, his main intention in this part of the book is to show that "Avicenna's discussion of place remains by all means the most comprehensive, the most rigorous, and the most ingenious vindication of the Aristotelian position" (p. 310).

Avicenna's revival of Aristotle's theory rests on the statement that "place is the surface which is the limit of the containing body and nothing else" (p. 346). It is the combination of all the surfaces that are in contact with the body (p. 348). Having a place entails being a body (p. 352), and through its surface the body as a whole is in contact with place (p. 354). However, there is one important point where Avicenna abandons Aristotle's account: place itself can be in motion while the body is in a state of rest, because rest is only a privation of motion (pp. 362-363). Lammer argues that in this way Avicenna improves upon Aristotle's physics by following his definitions and conception (p. 366). The place of a body depends on

two bodies: one which is in place and the one which provides the place (p. 367). Such a conception allows Avicenna to maintain that extension always belongs to the contained body – and this is the main reason why the existence of void is impossible (pp. 398-401). Besides, if void exists in any sense, it would be something that can be defined – this means that it would have a specific difference which would distinguish it within the assumed genus in the form of a positive statement; no such statement about the void is possible (p. 402).

In the sixth part, "Time and Temporality in the Physical World", Lammer moves on to explain Avicenna's theory of time, stating that time is his "least Aristotelian concept" (p. 427). While according to the Aristotelian account time is that which measures motion, Platonists view motion as something that measures time. It was the Platonist account that was followed by some Peripatetics like Boethius, Alexander and Ibn ʿAdī (pp. 455-456).

The starting point of Lammer's analysis is that time cannot be identified with motion (p. 439). For Avicenna, time is a magnitude of a non-integral disposition which is the motion from place to place (p. 440). It is the disposition which is never fully realised as a whole in the thing of which it is a disposition. Time is the magnitude of motion (p. 441). It is the measure of what is prior and posterior in the motion, or number of motion when it is differentiated into what is prior and what is posterior (p. 442). Up to this point Avicenna follows Aristotle's account: time is a name for measure which describes the size of motion (pp. 443-449).

Avicenna certainly put emphasis on Aristotle's view, but his notion of time as magnitude allows for the partial inclusion of the Neoplatonic conception as well: as the magnitude of motion time numbers that motion, but time is also numbered by motion in the sense of motion's essential differentiation into what is prior and what is posterior (p. 460). In other words, motion provides the units for measuring time when differentiated by the prior and posterior (p. 461). Essentially time is "the before and after" from which other things derive their temporality – their "beforeness and afterness" in the magnitude of motion (pp. 474-476).

Lammer argues that in Avicenna's system the existence of time is proven ontologically, from the time's essence. States of existence and non-existence are individually characterised as "before and after" thus ordered as prior and posterior to one another (p. 487). In other words, things associated with the states of existence and non-existence "derive their beforeness and afterness through these states' relation to time" (p. 488). We cannot explain beforeness and afterness nor priority and posteriority without a thing that is essentially before and after (p. 488). Thus the fact of temporality implies the existence of time (p. 491).

We should keep in mind that from the motion of the outermost heavenly sphere we derive the conception of days, hours, months and years due to the correspondence between motion, distance and time (p. 461). Only through motion time exists as having the before and after through itself – the before and after is a relation of temporal states as the result of a concrete thing undergoing motion (p. 480). Thus the existence of time depends on motion,

but it is through itself divisible into the before and after (p. 481). The before and after belong to concrete things only through time (p. 482). Motion causes time, but time has its own essence. Without circular motion there would be no motion at all, thus the magnitude of motion would not exist. But as in Avicenna, as well as in the whole Aristotelian tradition before him, the circular motion is caused by the celestial soul, then without soul there would be no time (pp. 492-497). Thus time exists due to the circular motion (pp. 502-506).

If we keep this in mind we understand why according to Lammer "the most remarkable achievement of Avicenna's temporal theory is that it gets the best of both worlds, Neoplatonic and the Aristotelian" (p. 512). This is the author's last major point, by which he shows that Avicenna is both a philosopher who synthesizes all main ideas before him as well as an original thinker who produces the all-encompassing philosophical system. In the particular case of his *al-Samā' al-tabī'ī*, Avicenna firmly advocates that time depends on motion ontologically. However, as time is the result of the motion of the outermost sphere, all motions depend on time in terms of their temporality; the motion of the outermost sphere is due to the soul, thus the soul produces time – this is the most important Neoplatonic element upon which every particular motion depends (pp. 513-514).

Lammer's study as a whole provides us with a deep understanding of the role of the main problems in Avicenna's physics, as well as with comparisons and references to all main works (and possible sources) which he used in constructing his theories. It gives us, as much as the sources allow, the most complete picture we can obtain so far regarding the relation between Avicenna and his predecessors in the context of natural philosophy. In short, it is the most comprehensive philosophical and philological analysis of the mentioned problems that we have so far. I highly recommend this great work to all who wish to expand their knowledge and understanding of not only Avicenna's physics, but also of ancient and medieval natural philosophy in general.

Heymerici de Campo. *Centheologicon*. Editado por Giovanna Bagnasco. Corpus Christianorum Continuatio Mediaevalis 292. Turnhout: Brepols, 2020. 336 pp. ISBN: 9782503584645. Cloth: €235

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La publicación del primer volumen de las *Obras* de Heymericus de Campo en el *Corpus Christianorum* es motivo de doble satisfacción: por un lado, porque – por fin – este importante pensador tardomedieval tiene el lugar que merecía en tan reputada colección; por otro, porque la obra que contiene es muy interesante.

Recordemos que Heymericus, Maestro en Artes y Teología, profesor en Colonia y Lovaina durante la primera mitad del siglo XV, es un autor que ha recibido el interés de la historiografía filosófica y teológica de los últimos cien años: su relevancia ha sido puesta por estudiosos como Meersseman, Colomer, Korolec, Cavigioli, Kaluza, Imbach y Hoenen, y en nuestros días por Bagnasco, Meliadò, Rusconi, Barenstein, Calma, Micali y otros, quienes han insistido – ante todo – en el análisis de los motivos albertistas y lulianos que se hallan en las diversas obras, así como sobre las relaciones personales e intelectuales de este autor flamenco con el Cusano.

El libro que nos ocupa es el *Centheologicon*, una obra verdaderamente extraña y compleja del siempre enigmático Heymeric van de Velde. El trabajo de Giovanna Bagnasco, Doctora en Filosofía medieval por las Universidades de Paris I y de Pavía, permite conocer mejor esta obra, conservada en un solo manuscrito (Bibliothèque Royale de Bruxelles, ms. 11571-75, ff. 1va-74vb), del que hasta ahora solo se habían publicado unos pocos capítulos. Este trabajo constituye la primera edición completa de un texto especialmente complejo desde un punto de vista intelectual y filológico, que constituyó la tesis doctoral de Bagnasco, titulada *Per l'edizione del Centheologicon di Eimerico di Campo. Studio sulle fonti e saggio sulla forma del testo*, defendida en 2013.

En *Centheologicon*, Heymericus hace una presentación de diferentes formas de exponer la teología y de los diversos modos de conocer a Dios. Los ciento un capítulos muestran estas distintas maneras de "hacer teología": analizando las teologías naturales propuestas por las escuelas paganas, así como las doctrinas de autores del siglo XII y XIII y finalmente, la docta teología del Cusano. No solamente se centra en la teología humana, sino en la divina (es decir, del conocimiento perfectísimo que Dios tiene de sí mismo), así como en la angélica.

Según Bagnasco, el objetivo de esta obra era ofrecer una visión teológica completa e unitaria a través de la exposición de las diversas aproximaciones racionales sobre Dios y su valoración a la luz de la verdad católica (p. xx). La editora indica que, para entender la síntesis de Heymericus, puede seguirse a grandes trazos el esquema *exitus-reditus* de las *Sentencias* de Pedro Lombardo o de la *Summa* de Tomás de Aquino, si bien la disposición de los

capítulos no sigue el de estas obras. Asimismo, escribe – en una muy acertada síntesis – que "il primo capitolo, intitolato *Theologia diuina sapiencie Dei eterne propria*, rappresenta il paradigma della conoscenza perfetta di Dio, che degrada, nei capitoli successivi, alla conoscenza che di Dio possono avere gli angeli e l'uomo, prima e dopo il peccato; a seguire, le *theologie* delle scuole filosofiche antiche, secondo lo schema dossografico tradizionale, mostrano la ricerca del divino attraverso la filosofia naturale" (p. xxi).

Bagnasco divide la obra en cuatro partes: la primera (capítulos 1-34) se refieren a la teología antes de la revelación de Cristo; la segunda (capítulos 35-56) trata la revelación de Cristo a través de San Pablo y San Juan; la tercera (capítulos 57-83), estrechamente ligada a la anterior, analiza la revelación figurada a partir de las alegorías del Antiguo Testamento a partir del *Liber exceptionum* de Ricardo de San Víctor; y la cuarta (capítulos 84-101) estudia el camino que retorna a Dios a partir de la inspiración del Espíritu Santo y sus dones (pp. xxii-xxiii).

Aunque la división sea muy acertada por lo general, creo que el motivo de la primera parte no solamente es la teología antes de la revelación, sino también algunas expresiones especiales de algunos teólogos cristianos, como puede verse en "Theologia Raymundi Lulli memoriter epylogata" (cap. 11) o "Theologia Alani armonica" (cap. 12). Por lo tanto, como subraya Bagnasco, es una división de carácter formal, pensada para facilitar la comprensión de la obra por parte del lector, y que no entra en algunas particularidades del contenido.

La síntesis (*epilogare*, *summare*, *colligere*...), como indica la editora, es el método propio del libro, que condensa maneras diversas de entender y expresar la teología positiva, pagana, racional e incluso escolástica. El estilo es difícil y las frases son interminables, con una sintaxis muy compleja: ello retrae al lector, que se ve obligado a concentrarse mucho para seguir el hilo expositivo. Hay que decir que la puntuación y las observaciones de Bagnasco ayudan mucho y que la *emendatio* textual puede considerarse definitiva.

En cuanto a las fuentes, junto con San Alberto, Santo Tomás, Ramon Llull y el Cusano hay una acusada predilección por Nicolas de Amiens y Ricardo de San Victor. No es fácil identificar las fuentes ocultas, por lo que el trabajo de la editora resulta muy útil. No deja de ser curioso que no se citen las principales escuelas teológicas del momento, así como el escaso reconocimiento al escotismo y al nominalismo como formas de entender la teología.

Concuerdo plenamente con la interpretación filosófica del *Centheologicon* que se defiende en la introducción: se trata claramente de una apuesta por sortear los enfrentamientos de escuelas en que había degenerado la enseñanza del siglo XIV y parte del XV (pp. xxxvi-xxxvii). El remedio, como indica Bagnasco, era volver a la teología humana y poética del siglo XII, combinada, eso sí, con Alberto, Tomás y Llull. Esa conexión entre el siglo XII y el siglo XV podía reconducir la teología por otros senderos, ante la exhausta escolástica, que había degenerado en una lucha inútil y estéril.

Heymericus no era un escolástico al uso, sino un profesor que lograba su síntesis anudando el pensamiento de autores – muy diferentes entre sí – de los siglos XII y XIII. Una sabia

combinación entre la teología poética y humana, la escolástica dominica y el *Ars* luliana podía ser el camino correcto para pensar lo divino.

Cabe señalar que la edición es muy correcta y que Bagnasco consigue que el lector pueda recorrer la obra con cierta soltura, un mérito que hay que ponderar. Espero que en breve se publique la edición que ha llevado a cabo Luciano Micali del *Millelogicon*, que se contiene a continuación del mismo códice de la Bibliothèque Royale de Bruxelles, así como las partes restantes del *Colliget principiorum iuris naturalis, divini et humani philosophice doctrinalium*, que Dragos Calma y Ruedi Imbach tienen en preparación. Con estos materiales a disposición de los investigadores, no hay duda de que el análisis global de la obra de Heymericus de Campo podrá dar numerosos frutos en la próxima década.

En fin, tras unos años de laboriosa preparación – y de diversos artículos de Bagnasco que prolongan el estudio preliminar en diversas direcciones (el papel de la teología natural o las conexiones con la teología del siglo XII) –, ha aparecido esta bella edición. Esperemos que sea la primera de varias y que el resultado sea igualmente satisfactorio.

Marialucrezia Leone. *Sinderesi: La conoscenza immediata dei principî morali tra Medioevo e prima età Moderna*. Flumen Sapientiae: Studi sul pensiero medievale 13. Roma: Aracne Editrice, 2020. 304 pp. ISBN: 9788825532432. Cloth: €24

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Me complace reseñar este libro de Marialucrezia Leone, investigadora actualmente del Thomas-Institut de Colonia, tras haber pasado por las Universidades de Bari, Berlín, Lecce, Lovaina y Roma. Se trata de un estudio excelente, que contiene las mejores trazas de la actual investigación medievalística en Europa que, sin duda, llevan a cabo los estudiosos italianos. En efecto, al tiempo que muchos países occidentales recortan el estudio del latín y de la historia de la Filosofía, en Italia, afortunadamente, preservan aún ese tesoro cultural y sus investigadores, en conexión con universidades extranjeras, pueden trabajar cómodamente con los textos, en ediciones críticas y estudios de amplio calado. No es la primera vez que tengo ocasión de ponderar los méritos de una generación de profesores procedentes de Italia, que tiene ocasión de seguir sus carreras en diversas universidades del mundo occidental. Gracias a su finura filológica, a la sensibilidad histórica, a la profundidad especulativa y al dominio de las lenguas pueden hacer un trabajo sólido, a base de un riguroso acopio bibliográfico que, con raras excepciones, ya no está al alcance de los estudiosos de otros países.

Estas virtudes son las que adornan el presente libro de Marialucrezia Leone, un ejemplo de la buena factura de esta diáspora italiana que enriquece las universidades europeas. El concepto de sindéresis, pese a tener una amplia bibliografía, no tenía ningún estudio sistemático, que lo abordase con tanto esmero filosófico, claridad y orden. En efecto, la autora contribuye, en un libro no excesivamente largo, a clarificar la historia de esta importante noción.

El itinerario comienza, en el primer capítulo, con la Glosa de San Jerónimo a Ezequiel y en la recepción de esta en las obras de Pedro Lombardo, Guillaume de Auxerre, Roldando de Cremona y Guillaume d'Auvergne, autor – este último – que puso las bases de una interpretación laica de la sindéresis (p. 48), iniciada por Felipe el Canciller. Con este pensador, la noción de sindéresis no vino analizada desde la óptica de la teología moral, sino con categorías filosóficas, a saber: examinando si se debía considerar una potencia o un hábito, cuál era su lugar en el alma (si pertenecía a la esfera racional o volitiva), así como la relación entre sindéresis y libre albedrío. Para Felipe, la sindéresis (o *scintilla* de la conciencia) era una *vis* de un hábito innato, de carácter racional, y que formaba parte de la sustancia del alma. Era potencia de un hábito innato, conservado después de la Caída, en virtud del cual el hombre retenía la posibilidad de hacer el bien. La sindéresis, para este autor, tenía que ver tanto con la parte afectiva como con la intelectiva. Así como la conciencia se atenía a lo particular y podía errar, la sindéresis se dirigía a lo universal y no podía errar (pp. 66-67).

El segundo capítulo explica la lectura voluntarista de la sindéresis. San Buenaventura situó la sindéresis en la esfera volitiva. En cuanto a la relación entre sindéresis, conciencia y ley natural, la autora indica que, para el Doctor Seráfico, "il modo appropiato di difinire la sinderesis è quello di considerarla come una *potentia*, mentre la coscienza è un *habitus* e la legge naturale un *obiectum*. La sinderesi è però anche un abito rispetto al bene o al male considerati a livello universale, mentre la coscienza è un abito nei confronti del bene e del male in referimento al particolare, e la legge naturale, infine, un abito indifferente ad entrambi i piani, universale e particolare" (pp. 78-79). La autora explica la dinámica moral bonaventuriana: la conciencia, colocada en la esfera cognitiva, aplica los principios ejecutivos de la razón práctica al objeto de la elección. Por la excitación de la sindéresis, y a la luz de la ley natural, la conciencia dirige la voluntad deliberativa hacia el bien (p. 86).

A diferencia de San Buenaventura, Enrique de Gante interpretó los primeros principios de la moralidad en una clave aún más voluntarista, pues colocó la sindéresis y la conciencia en la facultad volitiva del alma, considerada esta superior a la intelectiva porque su *habitus* era la caridad, preferible al *habitus* del intelecto, que era la sabiduría (pp. 90-91). Para Enrique, en fin, la sindéresis devenía una *electio naturalis*, un motor universal, que no tenía función deliberativa.

El tercer capítulo estudia la interpretación intelectualista, comenzando con Alberto Magno, quien consideraba la sindéresis como una *vis* del intelecto práctico, que conservaba un vínculo muy estrecho con los *universalia iuris*, puesto que el intelecto práctico al cual pertenecía la sindéresis, de hecho, era la sede estas leyes universales naturales (p. 105). La sindéresis era *scintilla rationis* y operaba en el marco de un silogismo práctico deductivo: la sindéresis era la premisa mayor, la razón era la premisa menor, y la conciencia, la conclusión (p. 111). Para San Alberto, la sindéresis derivaba del *ius naturale*, la *ratio superior* del *ius divinum*, y la *ratio inferius* del *ius humanum*. Se identificaba, en fin, con los primeros principios de la razón práctica, no se exinguía nunca y seguía en la humanidad después del pecado de Adán (p. 117-118).

Santo Tomás desarrolló la idea albertiana del silogismo práctico deductivo. Para el Angélico, la ley natural contenía los principios universales del derecho, la sindéresis era un hábito (lo que contenía estos principios), y la conciencia era la responsable de la aplicación conclusiva (pp. 123-124). La sindéresis era un hábito de la parte superior de la razón, que empujaba al bien y evitaba el mal, y que podía extinguirse por problemas físicos (es decir, por una enfermedad alienante). La mayor diferencia con San Alberto radicaba en que – para Tomás – la sindéresis era un hábito innato del intelecto práctico, y no la facultad del intelecto práctico en sí misma. Para Godefroid de Fontaines, la sindéresis era el hábito del intelecto natural en el que se hallaba el juicio racional de los primeros principios innatos (p. 139). Era un principio de la acción y tenía un carácter innato. Como comenta Leone, Godefroid se hallaba en un punto intermedio entre Buenaventura y Enrique de Gante, por un lado, y Alberto y Tomás, por otro, de modo que acabó por asumir un valor "laico" de la sindéresis (p. 158).

Quizás lo más curioso y original de este tercer capítulo sea colocar a Escoto entre los intelectualistas. Sin embargo, la autora lo argumenta muy bien. Duns Scoto trató muy poco la sindéresis: en todo caso, tanto esta como la conciencia, para el Doctor Sutil, debían hallarse en el intelecto, puesto que no podían ser un límite para la voluntad (p. 163). Por lo tanto, como en Santo Tomás, para Escoto la sindéresis era un hábito de los principios rectos del intelecto, si bien "il ruolo della coscienza e della sinderesi è connesso all'esercizio della virtù, nella misura in cui la coscienza, muovendosi nel campo del particolare (a partire delle norme generali della sinderesi), permette all'essere umano di realizzare un atto che la volontà trasforma quindi in un atto virtuoso" (p. 169).

En el capítulo cuarto se estudia el progresivo olvido de la sindéresis a partir del siglo XIV: en esta época perdió el carácter regulativo y ejecutivo de la conducta humana, para devenir exclusivamente aquella dimensión del alma en la que se realizaba la beatitud (p. 174). Leone trata el caso de Ockham, quien no se refirió a la sindéresis, pues su rol era estimado como algo inútil, dado que el comportamiento humano hallaba sus fundamentos no en su principio natural infalible, sino en Dios mismo. Ockham minusvaloró la sindéresis, y se refirió solamente a la conciencia, ligada a la razón y a la voluntad, vinculada a los actos éticos interiores regulados por Dios.

En cambio, en el maestro Eckhart hallamos todavía los ecos del magisterio dominico de Alberto y Tomás, puesto que – aunque no era una facultad del alma –, no perdía su naturaleza racional. Hay que apuntar que, a diferencia de Ockham, Eckhart se refirió muy poco a la conciencia. Otra postura es la del joven Gerson, para quien la sindéresis era una *vis naturalis*, que se realizaba por la *vis afectiva*, y era accesible por parte de todos (p. 213). En efecto, en su obra de juventud consideró que la sindéresis era la suprema facultad apetitiva, que permitía la unión mística (p. 217), mientras que el último Gerson examinó la sindéresis como algo inútil (p. 219). Con Gerson, Ockham y Eckhart se dejó, así pues, el aristotelismo y se buscó una dimensión íntima del hombre con el fin de favorecer un encuentro con Dios.

En el capítulo quinto se muestra cómo, de forma algo sorprendente, Gabriel Biel recuperó la sindéresis como *scintilla rationis*. Con rasgos marcadamente intelectualistas, para Biel la sindéresis no era un hábito del intelecto, aunque coincidía con esta facultad, y tenía un carácter inextinguible (p. 231). En cambio, la sindéresis, en el joven Lutero, era la parte que permanecía intacta en el hombre después del pecado original y que le permitía comprender su estatus de criatura caída (p. 235). Y para el Lutero maduro devenía un principio para los casos particulares, aunque la conciencia fuese la única autoridad en el alma (p. 244).

Leone, sentado lo anterior, hace un rapidísimo repaso de la noción de sindéresis en los autores modernos, desde Suárez hasta Ratzinger, para mostrar el lugar marginal que ha ocupado. Las conclusiones muestran la evolución histórica desde la idea teológica hasta la noción filosófica del siglo XIII, y su decadencia a partir del siglo XIV, sustituida prácticamente en todas sus funciones por la conciencia.

Empezaba esta reseña indicando que la obra era modélica por el exquisito acopio bibliográfico, algo que no sucede en muchos otros trabajos, especialmente en el ámbito anglosa-

jón. La reciente tesis doctoral de Gustav Zamore, *The Term Synderesis and its Transformations: A Conceptual History of Synderesis, ca. 1150-1450*, Oxford, 2016, es un trabajo de gran interés que, sin embargo, no tiene en cuenta la bibliografía sobre el tema en español y en italiano, y no posee tanta ambición especulativa. En todo caso, el lector debe tener en cuenta la tesis de Zamore – de un alcance más histórico-cultural – y este libro de Leone, pues con ello puede lograr una explicación muy satisfactoria de la evolución histórica de este concepto.

Aunque la noción de sindéresis entrara en crisis en la época moderna, hace falta un estudio del alcance de esta noción desde 1500 hasta 1700, pues fue tratada por muchos escolásticos, a veces con algunos ribetes de originalidad. Es una tarea, muy necesaria, que espera a un estudioso paciente.

En definitiva, cabe alabar el buen hacer de Marialucrezia Leone por sus virtudes, patentes en este libro claro, bien pensado y escrito con soltura y elegancia. Deseamos que continúe por esta senda de estudio, en el marco de la colección "Flumen sapientiae", que tanta alegría procura a los estudiosos de la filosofía medieval.

Pierre Hadot. *The Selected Writings of Pierre Hadot: Philosophy as Practice*. Translated by Federico Testa and Matthew Sharpe. London/New York: Bloomsbury Academic, 2020. 320 pp. ISBN: 9781474272971. Cloth: €63

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Al igual que todos los libros de Pierre Hadot, el presente texto tiene el peculiar poder de reavivar en quien lee la conciencia de que existe una tensión en el fondo del ejercicio actual de la filosofía. Una disciplina que, aunque sea ejercida casi exclusivamente dentro de ámbitos académicos, no obstante, no debe renunciar a incidir sobre la vida y a modificar al sujeto. En la propia teoría hadotiana se advierte esta tensión, pues, como subraya Matthew Sharpe en la introducción, el punto de partida del pensador francés fue una inquietud erudita, concerniente a la interpretación de textos. Aunque los pensadores de la Antigüedad – añadamos nosotros a los medievales – acostumbraron a expresarse en géneros literarios muy diversos, casi nunca presentaron sus filosofías en forma de sistema; por otra parte, sus textos presentan a menudo largos pasajes, que al lector contemporáneo suelen resultarle redundantes y excesivamente retóricos (p. 1). La obra de Hadot representa un esfuerzo tremendamente riguroso por mostrar que la filosofía no debe ser reducida a mera erudición, ni en la Antigüedad ni en ningún otro momento de su historia. Vale la pena rescatar unas líneas de la introducción: "reconsiderar la filosofía occidental como una práctica encarnada, intersubjetiva y social caracterizada por dimensiones pedagógicas y protrépticas, como así también doctrinales, que desarrolla conjuntos de convenciones literarias, retóricas y argumentativas, y la prescripción de ejercicios espirituales a fin de transformar el completo psiquismo de los aspirantes" (p. 17).

El libro reúne la traducción inglesa de catorce artículos de Hadot (además de un prefacio y una extensa introducción), extraídos en su mayoría de *Études de philosophie ancienne*. Uno de sus mayores aciertos es haber agrupado los artículos en cinco apartados. Esta estructura nos induce a evitar la lectura aislada y a buscar en cada uno de estos apartados los conceptos que emergen como ejes transversales.

Cuando se desea sintetizar el aporte de Hadot, se lo resume en una tesis parecida a la siguiente: las filosofías antiguas o tardoantiguas fueron no solo teorías sino también (y principalmente) formas de vida, de modo que sus elaboraciones conceptuales no fueron producidas por sí mismas sino en vista de la consolidación de una determinada forma de vida. Por tanto, el problema pareciera reducirse a una disyuntiva: ¿la filosofía antigua consistió sobre todo en una teoría *o bien* en una forma de vida? Sin embargo, la lectura atenta de este libro – y ahora me refiero sobre todo a los artículos de la primera parte – nos obliga a reformular esta tesis con mayor exactitud o profundidad. En efecto, no se trata de inclinarse por una u otra de estas alternativas sino de reivindicar la posibilidad de una franja de indistinción entre teoría y praxis, y de explorar las consecuencias que esa indistinción conllevaría tanto

para la praxis como para la teoría. De acuerdo con un punto central de la investigación de Hadot (p. 39), fue el cristianismo el que efectuó la separación entre discurso filosófico y práctica espiritual. En este mismo sentido, la noción de "ejercicio espiritual": debe ser comprendida en toda su profundidad. No consiste en una práctica destinada a favorecer la comprensión intelectual de unos conceptos. Por el contrario, esas prácticas que Hadot denominó "ejercicios espirituales", en el caso del estoicismo y del epicureísmo no se circunscribían a la dimensión ética sino que involucraban a tal punto la dimensión lógica y física, que daban lugar a una lógica y a una física "vividas" (pp. 65-6). A favor de esta indistinción también puede aducirse la noción aristotélica de contemplación, que es de naturaleza teorética mas no meramente teórica, pues es en sí misma una práctica vivida (p. 73).

Los artículos de la segunda parte del libro contribuyen a criticar la idea de "sistema", pues esta supone la ilusión de que la filosofía puede dársenos íntegramente, de una vez por todas. Por el contrario, la filosofía solo se realiza en discursos o explicaciones concretas, es decir, en una dimensión inevitablemente temporal que comprende por un lado el tiempo lógico de las ideas, y por el otro el tiempo psicológico exigido por la formación del discípulo (p. 118). Esta idea fundamental del pensamiento hadotiano, se despliega en tres direcciones. En primer lugar, las filosofías de la Antigüedad no fueron meros sistemas abstractos sino que aspiraban a operar algo que el pensador francés denomina "conversión" (capítulo 5), es decir, un apartarse enérgicamente de la alienación a fin de retornar al yo (siempre concebido en un sentido que trasciende lo meramente individual (que es el punto que Hadot le objetó a Michel Foucault, ver capítulo 12). En segundo lugar, tenemos la tesis de que la filosofía puede dividirse no solo en partes sistemáticas (como lo quisieron el aristotelismo o el estoicismo) sino también en partes "pedagógicas", es decir, en función del nivel espiritual en el que se encuentra el discípulo que recibe la enseñanza (capítulo 6). Finalmente, la forma más adecuada de comprender una determinada tesis filosófica no es leerla como parte de un sistema estático sino reintegrándola a la totalidad dialéctica del esquema pregunta-respuesta. La referencia al destinatario juega aquí un papel fundamental, ya que "en la filosofía antigua, una doctrina nunca está completamente separada de la preocupación pedagógica y la filosofía en gran medida está identificada con su enseñanza" (p. 155).

El plan elaborado por el propio Hadot para reunir sus principales artículos y contribuciones comprendía tres volúmenes: uno sobre filosofía antigua en general, otro sobre neoplatonismo y el último sobre patrística. Los tres fueron publicados por Les Belles Lettres: *Études de philosophie ancienne* (1998), *Plotin, Porphyre: Etudes néoplatoniciennes* (1999) y *Études de patristique et d'histoire des concepts* (2010). Como dijimos, la selección de Testa y Sharpe reúne catorce artículos: diez tomados del primer volumen de esta trilogía y otros cuatro tomados de *Exercises spirituels et philosophie antique* (Albin Michel, 2003; traducción española: Siruela, 2006). A su vez, de los catorce artículos antologados solo seis fueron traducidos al español. Para concluir, señalemos que a los hispanohablantes la lectura de este libro nos recuerda una deuda con Hadot: varios libros suyos fueron traducidos a nuestra lengua pero todavía no ha ocurrido lo mismo con sus artículos.

Ruedi Imbach. *Minima Mediaevalia. Saggi di filosofia medievale*. Flumen sapientiae: Studi sul pensiero medievale 10. Roma: Aracne, 2019. 356 pp. ISBN: 9788825523386. Cloth: €21

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The volume collects the Italian translation of ten essays by Ruedi Imbach, already published or in way of publication at the time of printing (but all revised for the occasion), complemented by a bibliography of primary and secondary sources and an index of names. A good starting point to understand the purpose of the collection is its title. While "*Minima Mediaevalia*" is an obvious reminiscence of Adorno's "*Minima Moralia*" (explicitly acknowledged on p. 9), this expression is best understood as a declaration of modesty on the part of Imbach, one not dissimilar to that uttered by Dante at the beginning of his other-worldly journey: "Io non Enëa, io non Paulo sono" (*Inf.* II, 32, a passage to which Imbach refers twice in the book, on pp. 37-38 and p. 216). As in the case of Dante, however, Imbach's journey through (a part of) the texts and authors he cultivated in decades of research is certainly much more significant than the title would allow.

Even though there is no overarching theme running through the essays, written on different occasions and for different purposes, some important threads can be easily recognised. Imbach himself, in the brief introduction to the collection, identifies five of them. The first and most important one is the relationship between master and student, which is placed at the centre of the volume, in Chapter VI. The chapter, dedicated to Imbach's students, reflects on Dante as a pivotal example of both a "student" (of Brunetto Latini, Vergil and Beatrice) and a "master" (of his readers). In an original comparison, Imbach interprets Dante's three successive examinations by the Apostles Peter, James and John in *Par.* XXIV-XXVI as leading him to symbolically acquire the degree of a "magister theologiae". This episode, where Dante displays the knowledge that he has acquired through a *personal* journey of discovery guided by his masters, is taken by Imbach as an effective illustration of Thomas Aquinas' claim, in *Quaestiones disputatae de veritate*, q. 11, art. 1, that a master can "cause knowledge" (*causare scientiam*) in the student only if he elicits the student's ability to discover the truth autonomously. This conception, it should be noted, also grounds Imbach's constant dialogue, throughout the essays, with his own 'masters' and friends, such as Francis Cheneval, Kurt Flasch, Burkhard Mojsisch, Peter von Moos, Thomas Ricklin, Andrea Aldo Robiglio and Irène Rosier-Catach, among many others.

Chapter VI also serves as the juncture between the individual dimension of philosophy, which is at the centre of the former part of the book, and the collective dimension, which is especially prominent in the latter part. More specifically, Chapters I and II are dedicated to the second topic identified by Imbach, namely, the polysemy of the medieval notion of "philosophy" and the ensuing variety of philosophical practices. Chapter I analyses a series

of metaphors of philosophy, while Chapter II focuses on one of these metaphors specifically. The first metaphor of Chapter I is that of philosophy as a hunt for knowledge, which Imbach follows from its origins in Plato to its reception in Ramon Llull, Nicholas of Cusa and Giordano Bruno. The second is that of philosophy as the ascension of a mountain. This image, developed more fully in Chapter II, is best exemplified by Petrarch's ascension to the Mont Ventoux (see *Familiares* IV, 1), where the poet-philosopher finally recognises (with the help of Augustine's admonition from *Conf.* X) that the only landscape worth contemplating is one's own interiority. This is also the reason why the image of the *ascensus* turns, in Chapter I, to that of the mirror, especially prominent in Bernard of Clairvaux (see *De consideratione* II, 5), where self-contemplation becomes a *meditatio mortis*. The third image, that of navigation, sees Ulysses of *Inf.* XXVI as the protagonist. Imbach's most original contribution to the interpretation of the episode is his claim that, ultimately, Ulysses' shipwreck is due to the refusal to put his knowledge and wisdom at the service of his people, rather than to the mere trespassing of the limits to human reason set by God. The last image (prepared by a reflection on medieval readings of the anecdote of Thales' fall into a well) is the myth of the cave or, more precisely, its medieval transpositions in terms of the constant tension between a (Christian) refusal of the world and the unavoidable attraction of its pleasures, as best exemplified by Boccaccio's Introduction to *Decameron*'s Fourth Day.

All the images just mentioned have one aspect in common: the philosopher is always represented as a lonely figure. When compared to this solitary quest, Chapter X (prepared for by Chapters VII and IX) represents a perfect counterbalance: here Imbach insists on the collective dimension of philosophical practice and reason more generally in the Latin Middle Ages, the fifth theme in his list. Chapter VII considers the expression "gratiosum lumen rationis", used by Dante in *De vulgari eloquentia* I, xviii, 5 to refer to the rational soul as the noblest faculty in man, undercovering the Thomistic roots of Dante's understanding of *ratio*. The collective dimension becomes more prominent in Chapter IX, where Imbach focuses on the "rational" interpretation of the myth of Babel in *De vulgari eloquentia*, thus ushering in a wider reflection on the sharing of reason allowed by language, according to Dante and Aquinas. It is only in Chapter X, then, that the problem of the human genus as a single (and rational) community is taken on explicitly in the context of a study of Dante's political thought. Here Imbach's main focus is on *De monarchia* I, iii, 8, where Dante claims that the proper operation of the human genus as a whole is the actualisation of the potential intellect, thus founding an independent ontological characterisation of the human genus based on the use of reason.

Nevertheless, the dialectic between individuality and collectivity cannot account for two of the main topics of the essays identified by Imbach. This is, I believe, one of the very few weaknesses of the book, since locating all the texts on this clearly recognisable axis would have greatly added to the consistency of the volume, without depriving the reader of the possibility to get a sense of the variety and depth of Imbach's work.

The fourth theme of the essays (the third in Imbach's list) is that of love in the Latin Middle Ages, as resulting from the conjunction of the Greek and the Judeo-Christian

traditions. Chapter V presents a series of important Medieval analyses of love, from Aquinas' conception of *appetitus*, as discussed in *Summa theologiae* I-II, q. 26, art. 1, to the cosmological role of love in Bernard of Clairvaux's *Liber de diligendo Deo*. Chapter VIII more specifically tackles the role of love in Dante's *Commedia*, as, again, influenced by Aquinas. Here Imbach discusses at length the conception of the free choice of the object (and the degree) of love as the main criterion to determine the other-worldly destination of souls according to Dante. It is this inherent freedom of human beings, and the responsibility associated with it, which is, according to Imbach, at the centre of the ethical project of the *Commedia*.

The last theme of the essays (the fourth in Imbach's list) is the influence that Biblical exegesis had on philosophical practice during the Middle Ages. Chapter III, in particular, discusses Medieval philosophical interpretations of a set of Biblical passages: Paul's speech in the Aeropagus in *Acts* 17, 16-34, which poses the question of the possibility and the limits of a rational *intellectus fidei*, the interpretation of *Cant* 1, 7, "Si ignoras te", as the rendering of the Greek "Gnothi seauton", and the possibility of entertaining the proposition "non est Deus", in *Ps* 13, 1 and 52, 1 (which gives Imbach the opportunity to insert an important caveat concerning studies on medieval 'atheism': see pp. 121-127). Chapter IV, instead, deals with the philosophical interpretations of the Prologue of John's Gospel according to Augustine, Aquinas, and Meister Eckhart (whose hermeneutical techniques Imbach reveals with particular skill).

Without doubt, the depth of knowledge and the acute interpretations that Imbach provides, together with his ability to cross chronological, cultural, and disciplinary boundaries, make the book particularly valuable to scholars working not only on medieval philosophy but also on medieval intellectual history *tout court*. Nevertheless, given the scope of the essays, the issues at stake are sometimes addressed too briefly. This is the case, for instance, in Chapter X, where the theoretical and textual tensions inherent in the separation between religious and political power proposed by Dante are left unexplored. Rather than diminishing the value of the book, however, this should be taken as an invitation to further explore the vast sea of Imbach's scholarship.