



Nature, Formative Power and Intellect in the Natural Philosophy of Albert the Great

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Abstract

The Dominican theologian Albert the Great (ca. 1200-1280) was one of the first to investigate into the system of the world on the basis of an acquaintance with the entire Aristotelian corpus, which he read under the influence of Islamic philosophers. The present study aims to understand the core of Albert's natural philosophy. Albert's emblematic phrase, "every work of nature is the work of intelligence" (*omne opus naturae est opus intelligentiae*), expresses the conviction that natural things are produced by the intellects that move the celestial bodies, just as houses are made by architects moving their instruments. Albert tried to fathom the secret of generation of natural things with his novel notion of "formative power" (*virtus formativa*), which flows from the celestial intellects into the sublunary elements. His conception of the natural world represents an alternative to the dominant medieval view on the relationship between the artificial and the natural.

Keywords

Albert the Great, medieval cosmology, celestial intellect, formative power, univocal causality, nature and art

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1. Introduction

Many theologians of the later Middle Ages directed their attention to the natural world.¹ Among them, Albert the Great (1200-1280) stands out for his early date, originality and productivity. Although his conception of nature depended mostly on Aristotle, it also betrays the influence of Arabic Neoplatonic traditions, which had modified the Stagirite's original conception of the world system.²

Previous studies on the thought of Albert, the Universal Doctor, can be roughly divided into two groups. The first comprises those who have mainly examined his metaphysics and theology without paying any serious attention to his natural science.³ The analyses produced by this group of studies have doubtlessly yielded a deep understanding of Albert's ontology and epistemology. However, they take little notice of the contribution of his metaphysical doctrines to his perception of the created world. The other group consists of those who have treated of particular aspects of Albert's natural philosophy as subjects of the history of science.⁴ These studies have shown that the Universal Doctor's encyclopedic ventures depended on his reception of Arabic sciences and in several ways contributed to later developments in scientific thought. But these studies have paid very little attention to the metaphysical foundations of Albert's natural philosophy. In order to grasp Albert's perception of the created world, it is therefore of paramount importance to unify these hitherto distinct currents in scholarship.⁵

¹ See the classical discussions of Marie-Dominique Chenu, *La théologie au douzième siècle* (Paris, 1957), 19-51; Pierre Duhem, *Le Système du monde: histoire des doctrines cosmologiques de Platon à Copernic*, 10 vols. (Paris, 1913-1959), vols. 4 and 5.

² On the modification of Aristotle's cosmological doctrines, see Herbert A. Davidson, *Alfarabi, Avicenna, and Averroes, on Intellect: Their Cosmologies, Theories of the Active Intellect, and Theories of Human Intellect* (Oxford, 1992), esp. 220-257; Gad Freudenthal, "The Medieval Astrologization of Aristotle's Biology: Averroes on the Role of the Celestial Bodies in the Generation of Animate Beings," *Arabic Sciences and Philosophy*, 12 (2002), 111-137.

³ Cf. Alain de Libera, *Albert le Grand et la philosophie* (Paris, 1990); id., *Métaphysique et noétique: Albert le Grand* (Paris, 2005).

⁴ See for example the articles collected in James A. Weisheipl (ed.), *Albertus Magnus and the Sciences: Commemorative Essays 1980* (Toronto, 1980).

⁵ This point has already been made by James A. Weisheipl, *The Development of Phys-*

The aim of the present study is to understand the metaphysical and cosmological principles underlying Albert's natural philosophy. To this end, we shall concentrate on a much discussed issue in medieval and early modern science and philosophy, that is, the question of the relationship between nature and art.⁶ For, although it is often suggested that the medieval world view was marked by a sharp division between art and nature, Albert seems constantly to have relied upon an art-nature analogy to understand the physical world. In this connection, he often invoked the role of the "intellect" or "intelligence" of the universe to explain natural phenomena in general. He often compared the natural world to artificial productions made with the help of the human intellect. Of crucial importance in this context is his notion of "formative power" (*virtus formativa*), which Albert used everywhere in his writings to account for natural generation on the model of artificial productions.⁷ In this study, we shall attempt to document this, first, by studying Albert's explanation of the formation of minerals and of

ical Theory in the Middle Ages (Ann Arbor, 1971); id., "Albert's Works on Natural Sciences (*libri naturales*) in Probable Chronological Order," in *Albertus Magnus and the Sciences*, 565–577; id., *Nature and Motion in the Middle Ages* (Washington DC, 1985). See also Edward P. Mahoney, "Metaphysical Foundations of the Hierarchy of Being According to Some Late-Medieval and Renaissance Philosophers," in Parviz Morewedge (ed.), *Philosophies of Existence, Ancient and Medieval* (New York, 1982), 164–257; Henryk Anzulewicz, "Die Denkstruktur des Albertus Magnus: Ihre Dekodierung und ihre Relevanz für die Begrifflichkeit und Terminologie," in Jacqueline Hamesse and Carlos Steel (eds.), *L'élaboration du vocabulaire philosophique au Moyen Âge* (Turnhout, 2000), 369–396.

⁶ Anthony J. Close, "Commonplace Theories of Art and Nature in Classical Antiquity and in the Renaissance," *Journal of the History of Ideas*, 30 (1969), 467–486; id., "Philosophical Theories of Art and Nature in Classical Antiquity," *Journal of the History of Ideas*, 32 (1971), 163–184; William R. Newman, "Technology and Alchemical Debate in the Late Middle Ages," *Isis*, 80 (1989), 423–445; id., *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (Chicago, 2004). For more updated and detailed information on this issue, see William R. Newman and Bernadette Bensaude-Vincent (eds.), *The Artificial and the Natural* (Cambridge, MA, 2007).

⁷ On the notion of formative power, see Hiro Hirai, "Semence, vertu formatrice et intellect agent chez Nicolò Leonicensino entre la tradition arabo-latine et la renaissance des commentateurs grecs," *Early Science and Medicine*, 12 (2007), 134–165; id., "The Invisible Hand of God in Seeds: Jacob Schegk's Theory of Plastic Faculty," *Early*

animals. Next, we shall take a look at some closely related texts such as *On Spirit and Respiration* and *On the Nature and Origin of the Soul*, which further elucidate some of the key concepts. Finally, we shall treat with some brevity the metaphysical and ontological implications of these issues in his *Metaphysics* and *On the Causes and the Procession of the Universe from the First Cause*.⁸

2. The Formation of Minerals

Of Albert's numerous writings, historians of science tend to cite most frequently from his treatise *On Minerals* (before 1256), because it grants a number of insights, not only into medieval mineralogy, but also into later developments of matter theory.⁹ However, the metaphysical dimensions of this work have been much neglected.¹⁰ To fill in this lacuna, we shall examine here especially its theoretical parts in the first and third books. The former treats the causes of stones in general and the latter those of metals.

In the first book, as the material cause of stones, Albert speaks of the mixture of the element of earth with viscous and unctuous moisture. Unless this moisture is viscous, he explains, stones will not possess any coherence. As for transparent stones such as gems and glass, their matter must be more subtle than that of non-trans-

Science and Medicine, 12 (2007), 377-404. Cf. Walter Pagel, *New Light on William Harvey* (Basel, 1974), 74-112.

⁸ For the texts of Albert, we have used, wherever possible, the critical edition *Alberti Magni Opera omnia edenda curavit Institutum Alberti Magni Coloniense* (Münster-Westfalem, 1951-), hereafter indicated as Cologne edition. For some treatises, we have used the standard Borgnet edition, *Alberti Magni Opera omnia* (Paris, 1890-1899). Otherwise, the new edition or translation of each separately published text is indicated in the notes.

⁹ See, for example, Lorraine Daston and Katharine Park, *Wonders and the Order of Nature* (New York, 2001), 109-172; Newman, *Promethean Ambitions*, esp. 46-50; Hiro Hirai, *Le concept de semence dans les théories de la matière à la Renaissance: de Marsile Ficin à Pierre Gassendi* (Turnhout, 2005), *passim*.

¹⁰ Cf. Udo R. Jeck, "Materia, forma substantialis, transmutatio: Frühe Bemerkungen Alberts des Großen zur Naturphilosophie und Alchemie," *Documenti e studi sulla tradizione filosofica medievale*, 5 (1994), 205-240.

parent stones. The formation of these stones requires a higher level of transmutation of elemental qualities. In order to explain himself better, Albert refers to an example taken from the human arts, namely alchemy, which performs the same operation at a lower level of perfection:

And indeed [alchemical] art performs this [kind of formation] with labor and many mistakes, while nature does it without difficulty and labor. And its reason is because the powers existing in the matter of stones and metals were moved by certain and powerful celestial powers [...]. And these powers are the operations of intelligences which do not make errors except accidentally, for instance because of the inequality of matter. But in [alchemical] art, there is nothing of these [powers], but rather some miserable assistance of skill and fire.¹¹

It is evident that Albert's intention here is not at all to establish a division between art and nature in terms of their ways of working, but rather to highlight the difference in their causes and efficacy, which explain the difference in the products' quality: the natural formation of stones is realized with the help of celestial powers that are more powerful than the means of the alchemists' art.

After the material cause of stones, Albert inquires into their efficient cause, which he identifies with the "formative power." However, given that this power acts commonly for all stones and metals, he adds a further explanation:

¹¹⁾ *De mineralibus*, I, tr. 1, c. 3 (ed. Borgnet, 5: 5 = Dorothy Wyckoff, *Albertus Magnus: Book of Minerals* [Oxford, 1967], 17): "Et hoc quidem operatur ars cum labore et erroribus multis: natura vero sine difficultate et labore. Cujus causa est, quia virtutibus caelestibus certis et efficacibus moventur virtutes in materia lapidum et metallorum existentes [...]: et illae virtutes sunt intelligentiarum operationes, quae non errant nisi per accidens, ex inaequalitate scilicet materiae. In arte autem nihil est horum, sed potius mendicata suffragia ingenii et ignis." In the present section, we give Wyckoff's pagination, although the translation is ours. Note that Albert uses *intellectus* and *intelligentia* almost interchangeably. On the division of Greek *nous* or Arabic *aql* into these two Latin words in translation, see Jean Jolivet, "Intellect et intelligence: note sur la tradition arabo-latine des XII^e et XIII^e siècles," in his *Philosophie médiévale arabe et latine* (Paris, 1995), 169–189.

Therefore, we add that the formative [power] of stone exists, although a proper [name] for stone should be given. But since we have no proper name for this power, we should explain by similar things what this power is. Thus, we shall say that, as in the seed of an animal, which is a residue of nutrition, and from the seminal vessels an animal formative power descends, which forms and makes the animal and which lies in the seed in such a way as an artificer lies in his artifact, which he makes by his art; so also, in the matter suitable for stones, there is a power which forms and makes stones, leading it to the form of this or that stone.¹²

Although Albert offered this explanation by way of an analogy, he nevertheless believed in the real existence of the formative power of stones, which he thought to be similar to that of animals. Only the proper name of this power was lacking. It is furthermore noteworthy that Albert qualifies the formative power of both animals and stones as an “artificer in the artifact” (*artifex in artificiatio*). If this power acts like an artificer, it must by necessity also possess some instruments suitable for carrying out its operations, just as an architect uses his peculiar tools. That is why Albert argues that the formative power of stones has two proper instruments, namely heat and watery moisture. Of these two elemental qualities, the first is more important for the formative power. Thus, Albert adds that “this heat for the operation [of producing stones] is controlled by the formative power, just as the heat which digests and transmutes animal semen is controlled by the formative power which exists in the semen.”¹³

But if the analogy between natural generation and the work of a human *artifex* is so close, why does Albert deem the alchemists’

¹² *De mineralibus*, I, tr. 1, c. 5 (Borgnet, 5: 7 = Wyckoff, 22): “Et ideo addimus, quod sit lapidis formativa, ut efficiatur lapidi propria: et quia propria nomina hujus virtutis non habemus, ideo per similia oportet declarare quae sit illa virtus. Dicamus igitur quod sicut in semine animalis quod est superfluum nutrimenti, descendit a vasis seminariis vis formativa animalis, quae format et efficit animal, et est in semine per modum illum quo artifex est in artificiatio quod facit per artem: sic est etiam in materia aptata lapidibus virtus formans et efficiens lapides et producens ad formam lapidis hujus vel illius.”

¹³ *De mineralibus*, I, tr. 1, c. 5 (Borgnet, 5: 7–8 = Wyckoff, 22): “hoc calidum dirigitur in opere a virtute formativa, quemadmodum dirigitur calidum quod digerit et transmutat semen animalis, a virtute formativa quae est in semine.”

art “uncertain” (*incerta*)? If we examine the relationship of the formative power to its principal instrument, heat, closely, this point becomes clear. According to Albert, the heat of the alchemists is inadequate, because they can only use burning heat, which works “very uncertainly” (*incertissime*). The heat employed by the formative power is different, and more adequate to the formation of matter. For this reason, Albert says that “nature is most certain in her operations.”¹⁴ Thus, the secret lies in the nature of this power.

This formative power is in fact further divided into three components:

The power thus determined by stars is poured down into the place of the generation of each thing [...]. For, this power is productive and generative of every element and elemented being. And this power of the place is composed of three powers. The first of them is the power of the mover of the moved sphere. The second is the power of the moved sphere [...]. The third is the power of elements, that is, hot, cold, moist, dry or mixture of these. But, the first of these powers is like the form controlling and forming everything which is generated, as the power of art is related to the matter of its artifact. The second is like the operation of the hand. And the third is like the operation of the instrument which is moved by the hand and directed towards the end conceived by the artificer. For this reason Aristotle has said that every work of nature is the work of intelligence. For, a place receives these powers as a womb receives the formative power of the embryo [...]. As the vivifying power is poured from stars into animals which are generated by putrefaction, the same is done in the matter of stones, because the formative power of stones is poured in the manner already explained.¹⁵

¹⁴) *De mineralibus*, I, tr. 1, c. 5 (Borgnet, 5: 8 = Wyckoff, 23): “certissima est natura in operationibus suis.”

¹⁵) *De mineralibus*, I, tr. 1, c. 8 (Borgnet, 5: 11 = Wyckoff, 30): “Virtus autem sic determinata a stellis infunditur loco generationis unicuique rei [...]. Haec enim virtus et elementi et elementati omnis est productiva et generativa. Et est ista virtus loci ex tribus virtutibus congregata, quarum una est virtus motoris orbis moti. Secunda est virtus orbis moti [...]. Tertia autem est virtus elementaris, quae est calidum, frigidum, humidum et siccum, vel commixtum ex his. Est autem prima harum virtutum ut forma dirigens et formans omne quod generatur, sicut virtus artis ad materiam artificiatu se habet. Et secunda est sicut operatio manus. Et tertia sicut operatio instrumenti quod manu movetur et dirigitur usque ad finem inceptum ab artifice. Et ideo dixit Aristoteles quod omne opus naturae est opus intelligentiae: locus enim recipit has virtutes, sicut matrix recipit virtutem formativam embrionis [...]. Sicut enim in animalibus quae ex putrefactione generantur, infunditur virtus vivificativa ex stellis, sic fit

For Albert, the formative power for stones is thus composed of three distinct powers, which hail from (1) the mover of the spheres, (2) the moved spheres themselves, and (3) the elements. Once again, the order of these three components is modelled on the example of artificial productions: (1) The power of the mover of spheres corresponds to the “form” (*forma*); (2) that of the spheres to the action of artist’s hands; and (3) that of elements to the workings of an artist’s instruments. Note that the power of the mover of the spheres is identified with the “form” possessing a formative power. According to Aristotle, when the architect makes a house, it is the form of this house as conceived in his mind that moves his instruments in the architect’s hands, eventually actualizing the form of the house as the final product.¹⁶ In other words, the form residing in the architect’s mind is a kind of formative power. Similarly, for Albert, the form of the stones-to-be-formed must exist beforehand in the mover of the spheres, which corresponds to the architect’s mind, before it is poured through the celestial bodies into particular chunks of earth. Once this Aristotelian background is recognized, we can grasp Albert’s intention in attributing that very singular phrase to Aristotle: “Every work of nature is the work of intelligence” (*Omne opus naturae est opus intelligentiae*).¹⁷ This emblematic phrase may now be explained as follows: Just as a form conceived in the architect’s mind is considered a formative principle with respect to the actual house, a form conceived by the intelligence of the universe, that is, the mover of the spheres, is the primary formative principle in the natural generation of stones. For Albert, the *virtus formativa* relies thus ultimately on this divine formative principle.

etiam in lapidum materia, quod infunditur per dictum modum virtus lapidum formativa.” Cf. Hirai, *Le concept de semence*, 126-127.

¹⁶ Aristotle, *Metaphysics* Z.7, 1032b11-12 and Z.9, 1034a23-24.

¹⁷ See James A. Weisheipl, “The Axiom ‘Opus naturae est opus intelligentiae’ and its Origins,” in Gerbert Meyer and Albert Zimmermann (eds.), *Albertus Magnus, Doctor universalis: 1280/1980* (Mainz, 1980), 441-464; Ludwig Hödl, “Opus naturae est opus intelligentiae’: Ein neuplatonisches Axiom im aristotelischen Verständnis des Albertus Magnus,” in Friedrich Niewöhner and Loris Sturlese (eds.), *Averroismus* (Zurich, 1994), 132-148.

Let us move on to the third book of *On Minerals*, which discusses the causes of metals in general. Their generation is said to be similar to that of stones. Once again, Albert denies that the efficient cause lies in some elemental quality. Elemental powers such as hot or cold are only “instruments” in the production of the species or form of metals.¹⁸ And again, he compares the process of metallic generation with artificial operations:

Furthermore, we find that many arts have been discovered, where each of them leads the operation to its end by means of a manufactured instrument. Cooks and all others who try to change matters by some digestion are diligent in boiling and roasting. Likewise, therefore, it must be so in nature, which, in her operations, is more certain and more direct than any other art, as she is in all other things. Thus, without doubt, there is in nature a formative power, poured from the stars and heaven, which controls the heat digesting the matter of a metal toward its [proper] species.¹⁹

Thanks to the assistance of the formative power, the operation of nature is thus “more certain and more direct” (*certior et directior*) in generating metals than any human art. For one, it uses its instrument, namely heat, better than any human artificer. The power itself is “poured down” (*influxa*) from the stars and heaven, which, in turn, function as the instruments moved by the supreme principle of nature.²⁰ Albert writes:

[...] it is necessary that the formal power must control and inform this heat that determines [the form]. However, this form is not the same as that which is intro-

¹⁸) The terms “species” (*species*) and “form” (*forma*) are almost synonymous in Albert.

¹⁹) *De mineralibus*, III, tr. 1, c. 5 (Borgnet, 5: 65 = Wyckoff, 166): “Adhuc autem invenimus inventas esse artes plurimas, ut quaelibet earum ad finem ducat operationem per instrumentum factum. Sic student coqui in elixando et assando, et omnes alii qui per aliam digestionem nituntur convertere materias. Similiter igitur oportet quod sit in natura quae in operibus suis omni arte certior est et directior, sicut est in omnibus aliis, ita procul dubio virtus formativa est in natura et stellis et caelo influxa, quae ad speciem dirigit calidum digerens materiam metalli.”

²⁰) On celestial bodies as instrument, see James A. Weisheipl, “The Celestial Movers in Medieval Physics,” *The Thomist*, 24 (1961), 286–326; Thomas Litt, *Les corps célestes dans l’univers de Saint Thomas d’Aquin* (Louvain, 1963), passim.

duced into matter. Thus, it is necessary that the form comes from the prime agent, which gives forms in every natural species. And this [agent] is the mover of the sphere, which unfolds natural forms through the motion of heaven and the qualities of elements, just as an artificer unfolds the forms of his art with his axe and hammer. And for this reason, Aristotle says that in the work of nature it is as [the work of] art, where the house comes from [the form of] a house [in the carpenter's mind], and health from [the form of] health [...] in the soul of the physician.²¹

Thus, it is evident that, for Albert, only when the “formal power” (*virtus formalis*) guides heat as its instrument, matter proper to metallic generation receives metallic forms. The Aristotelian statement that “the house comes from a house, and the health from health in the soul of a physician” (*domus est ex domo, et sanitas ex sanitate in anima medici*) is meant to lend support to this instrumentalist vision. The idea is that, as the forms of artifacts must originate beforehand in the mind of artificer who moves his instruments, the forms of metals must be conceived in the prime agent who directly moves the celestial bodies and indirectly, through the latter, the elemental heat.

3. The Generation of Animals

In his discussion on minerals, Albert takes constant recourse to a singular notion of formative power. This power, which works like an internal artificer, makes mineral productions resemble artificial ones. Similar explanatory strategies are found in Albert's treatment of animal generation, as can be seen from book XVI of his treatise *On Animals* (after 1260), which corresponds to book II of Aristo-

²¹ *De mineralibus*, III, tr. 1, c. 5 (Borgnet, 5: 66 = Wyckoff, 167): “[...] oportet igitur quod virtus formalis dirigat et informet ipsum calidum terminans: forma autem haec non est forma quae inducitur in materiam: oportet igitur quod sit forma primi efficientis quod dat formas in tota specie naturali. Hic autem est motor orbis formas naturales explicans per motum caeli et qualitates elementorum, sicut artifex explicat formas artis securi et malleo: propter quod dicit Aristoteles, quod in opere naturae est sicut in arte, ubi domus est ex domo, et sanitas ex sanitate [...] in anima medici.”

tle's *Generation of Animals*.²² In Albert's treatise on animal generation, the role of the formative power and the artificial character of natural phenomena are amply discussed.²³

Albert presupposes two distinct kinds of substance involved in the generation of an embryo, of which one is divine, eternal and incorruptible, and the other temporary and corruptible. Because although all sublunary things alter through generation and corruption, they are unchangeable in terms of their form and species.

[...] all things desire permanent being. For this reason, this divine thing, which they seek, is also in them the cause of the betterment of their being. For, everything that exists and has the possibility for both being or non-being, is made better in its being only through the divine permanence, in which it participates by form and species.²⁴

In Albert's world, then, everything seeks improvement in its status and condition: "animate being" (*animatum*) is superior and hence

²² In the Arabo-Latin tradition, Aristotle's zoological writings were circulated in the form of the following nineteen books: *De historia animalium* (books I-X); *De partibus animalium* (XI-XIV); *De generatione animalium* (XV-IXX). In his own treatise *On Animals*, Albert first paraphrased these nineteen books, and then added seven original ones. Weisheipl, "Albert's Works," 573, says: "Clearly, Bk XVI contains the key to much of Albert's understanding of Aristotle's doctrine concerning God's creation of the human soul, the operations of intelligences in Nature, and the development of the human embryo." Weisheipl himself unfortunately did not develop this thought further.

²³ For medieval debates on animal generation, see Maaïke van der Lugt's excellent *Le ver, le démon et la vierge: les théories médiévales de la génération extraordinaire* (Paris, 2004). See also Joan Cadden, *Meanings of Sex Difference in the Middle Ages* (Cambridge, 1993); Luke Demaitre and Anthony A. Travill, "Human Embryology and Development in the Works of Albertus Magnus," in *Albertus Magnus and the Sciences*, 405-440.

²⁴ *De animalibus*, XVI, tr. 1, c. 1 (ed. Hermann Stadler, *Beiträge zur Geschichte der Philosophie des Mittelalters*, 15-16 (1916-1920), 1058-1059 = Kenneth F. Kitchell, Jr. and Irven M. Resnick, *Albertus Magnus on Animals* [Baltimore, 1999] 1153): "[...] omnia esse permanens desiderant: propter quod etiam hoc ipsum divinum quod optant, est in eis causa meliorationis esse sui. Omne enim quod est ad utrumlibet habens potentiam ad esse et ad non esse, non melioratur in esse nisi per divinum permanens quo participat secundum formam et speciem."

desirable vis-à-vis “non-animate being” (*inanimatum*), “being” (*ens*) vis-à-vis “non-being” (*non-ens*) and finally “life” (*vita*) vis-à-vis “death” (*mors*). By receiving a particular form, sublunary things, though corruptible, also participate in a “divine permanence” (*divinum permanens*) and are therefore integral parts of the good-oriented order. Since the reception of form is also the cause of goodness and divinity for animals, he thinks that “the effective and formative principle” (*effectivum et formativum principium*), which furnishes their form, is more important than the material principle from which these animals are generated.²⁵

In his book on the generation of animals, Albert therefore goes to seek the identity of the effective and formative principle of semen. After all, Aristotle had spoken of the divine formative principle contained in semen.²⁶ First, Albert denies that this principle is the soul itself, which is defined as the perfection of an organic body, because according to this definition, when bodily organs are not yet formed, the soul cannot operate.²⁷ But since the formative principle produces bodily organs, it must precede the soul’s emergence. Then, after having refused to count this principle among corporeal qualities, he identifies it with the “formative power,” invoking Avicenna’s authority.²⁸ Albert recalls that this Persian philosopher had admitted two stages in the emergence of this power inside semen. First, in the ultimate digestion of food, this power is derived from the sundry members of the animal body and is united inside the semen. At this stage, this power is however not yet complete. Only in the seminal vessels, which digest the semen further, does this power reach its perfection, allowing for the formation of bodily

²⁵ *De animalibus*, XVI, tr. 1, c. 2 (Stadler, 1064 = Kitchell-Resnick, 1158).

²⁶ Aristotle, *Generation of Animals*, II.3, 736b29-737a7. A useful and detailed survey for the previous discussions on this passage is found in A. P. Bos, *The Soul and Its Instrumental Body: A Reinterpretation of Aristotle’s Philosophy of Living Nature* (Leiden, 2003), 146-181.

²⁷ *De animalibus*, XVI, tr. 1, c. 3 (Stadler, 1068-1069 = Kitchell-Resnick, 1163).

²⁸ Avicenna, *De animalibus*, XVI, c.1 (ed. Venice, 1508; repr. Louvain, 1961, f. 61va); id, *Canon*, III, fen, 20, tr. 1, c. 3; fen 21, tr. 1, c. 2 (ed. Giunta, Venice, 1555, ff. 372r; 380v). See also Van der Lugt, *Le ver, le démon et la vierge*, 79-87; Hirai, “Leonico.”

members and introducing the spirit, which has the power of the soul. Albert points out that, for Avicenna, the formative power cannot be reduced to elemental qualities. It is the soul that introduces this power into seminal spirit. Following Avicenna, Albert says:

But the powers of hot, moist and other [qualities], which are in semen, are the instruments of the power that has been poured into the spirit of the semen by the soul [and] which we call the “formative power.” This [power] leads those instrumental qualities to the end which it intends, that is, to the formation of the members.²⁹

The formative power possesses thus its own instruments for the production of the bodily members of animals, namely the four elemental qualities. Among them, heat in the semen, controlled by the formative power, digests and changes the seminal matter. Albert specifies that this power “is something of the soul, and its subject is the spirit, which exists in semen, being held in it by its thickness and viscosity.”³⁰ That is why, for him, thin watery semen is incapable of generation, since it easily releases its spirit, which encloses the formative power in itself. We may notice here that the spirit is conceived as the vehicle of this seminal power.

To explain the workings of the formative power, Albert compares its operations with artificial productions. Here, we should recall the fact that Aristotle himself had recourse to the model of artificial productions in his discussion on the generation of living beings. For him, when the artificer works on matter by manipulating his own instruments, the guiding principle of these instruments is the artifact’s form, which is conceived beforehand in the artificer’s mind. Thus, the Stagirite insisted that natural generation share the same

²⁹ *De animalibus*, XVI, tr. 1, c. 4 (Stadler, 1073 = Kitchell-Resnick, 1167): “Sed virtutes calidi et humidi et aliae quae sunt in semine, sunt instrumenta illius virtutis quae in spiritum seminis influxa est ab anima quam virtutem vocamus formativam: et ipsa dirigit illas qualitates instrumentales ad finem a se intentum, hoc est ad membrorum formationem.”

³⁰ *De animalibus*, XVI, tr. 1, c. 4 (Stadler, 1073 = Kitchell-Resnick, 1168): “est aliquid animae et subiectum eius est spiritus qui est in semine retentus intra ipsum per spissitudinem et viscositatem ipsius.”

mode with artificial productions.³¹ Following this view, Albert affirms, using the example of the architect, that the formative power in semen is similar to the “form” poured from the architect’s mind into the instruments.³²

Just like the formative power in minerals, the power in semen is composed of several distinct components. Albert asserts that the ultimate digestion of semen cannot be realized only by simple elemental heat. Besides that, two other powers are required: the power of celestial bodies and that of the soul, whereby the latter “informs” (*informare*) the first two powers (elemental and celestial). These three powers are united in the semen.

Having described the composite nature of the formative power, Albert defines its status:

[...] and this is what the more clever Peripatetics said, namely, that the soul is in the semen not as the entelechy of the body possessing life in potency, but rather as both the artificer and art are in the instruments by which an artificial product is produced.³³

The Aristotelian background to this argument regarding the “artificer in the artifact” has already been mentioned. Now, to these three components (elemental, celestial and soul powers), Albert adds a further one: the power of the prime intellect or intelligence, that is, of the prime mover of the universe. Invoking his favorite axiom, he declares:

But to these statements we should add that every work of nature is a work of intelligence [...]. For, that is especially the work of intelligence in which the power of the intelligence determines the work of nature to the form nearer and more similar to itself. For, although the work of nature and of intelligence are one and the same, insofar as nature acts through intelligence and intelligence acts in nature,

³¹ See James G. Lennox, “Teleology, Chance, and Aristotle’s Theory of Spontaneous Generation,” *Journal of the History of Philosophy*, 20 (1982), 219-238.

³² *De animalibus*, XVI, tr. 1, c. 6 (Stadler, 1081 = Kitchell-Resnick, 1175).

³³ *De animalibus*, XVI, tr. 1, c. 7 (Stadler, 1082 = Kitchell-Resnick, 1176): “[...] et hoc est quod dixerunt peritiores Peripatheticorum quod anima est in semine non ut entelechia corporis potentiam vitae habentis, sed potius sicut artifex et ars sunt in instrumentis in quibus fit artificatum.”

still, the end of the work is sometimes closer to nature and at other times closer to intelligence.³⁴

This, then, is the foundation of Albert's world system: the works of nature and of intelligence are clearly "one and the same" (*unum et idem*). Animal generation is therefore no mere natural phenomenon, since the superior power of the intelligence necessarily intervenes into this process and supervises it.³⁵ Although the three components of the formative power in the semen are all active, if the most important power, that of the ultimate intelligence is lacking, animal generation cannot take place. Indeed, "the ultimate and the most simple of powers in semen is the power of intelligence, which is most formal and simple and the first in moving, and informs both the celestial and elemental power of both the soul and the members."³⁶

4. Spirit

From Antiquity to the early modern period, the notion of "spirit" (*spiritus* or *pneuma*) played a significant role in psychological and biological thought.³⁷ Scholars have discussed Albert's treatise *On*

³⁴ *De animalibus*, XVI, tr. 1, c. 7 (Stadler, 1082 = Kitchell-Resnick, 1176): "Est autem hiis adhuc addendum quod cum omne opus naturae sit opus intelligentiae [...], quod istud maxime est opus intelligentiae in quo virtus intelligentiae opus naturae terminat ad formam sibi propinquoem et similioem. Cum enim unum et idem sit opus naturae et intelligentiae eo quo natura per intelligentiam et intelligentia in natura operatur: terminus tamen operis aliquando propinquior est naturae et aliquando propinquior est intelligentiae."

³⁵ Avicenna and Averroes conceived natural operations like spontaneous generation as evidence of God's marvelous wisdom and craftsmanship. See Remke Kruk, "A Frothy Bubble: Spontaneous Generation in the Medieval Islamic Tradition," *Journal of Semitic Studies*, 35 (1990), 265-310; ead., "Ibn Sina *On Animals*: Between the First Teacher and the Physician," in Jules Janssens and Daniel de Smet (eds.), *Avicenna and His Heritage* (Louvain, 2002), 325-341; Freudenthal, "Medieval Astrologization."

³⁶ *De animalibus*, XVI, tr. 1, c. 7 (Stadler, 1083 = Kitchell-Resnick, 1177): "in spermate ultima et simplicissima virtutum est illa, quae est intelligentiae virtus quae formalissima et simplicissima est et prima in movendo et informat et animae virtutem et membrorum et caelestem et elementalem."

³⁷ See among others Gérard Verbeke, *L'évolution de la doctrine du pneuma du stoïcisme*

Spirit and Respiration (1258?) as a typical late medieval treatment of the notion of spirit.³⁸ They have shown that Albert does not only depend on Aristotle for his doctrine of spirit, but also on Hunayn ibn Ishaq, Costa ben Luca, Isaac Israeli, Alfred of Sareshel and Avicenna. Because of his division into three distinct kinds—"vital" (*vitalis*), "animal" (*animalis*) and "natural" (*naturalis*)—we may assume that he is the heir to a Greco-Arabic medical tradition that can ultimately be traced to Galen.³⁹ Previous studies have, however, failed to connect Albert's notion of "spirit" with his views of generation, discussed above. In *On Animals*, Albert argues that several powers, poured into semen, are united into one single formative power, which resides in the spirit. He furthermore argues that "the spirit is a divine thing, insofar as it has a divine power of forming and procreating."⁴⁰ It is therefore evident that the spirit has a close connection to the formative power. It is therefore profitable to examine more closely the spirit's relationship to this power in his work *On Spirit and Respiration*.

In the beginning of this treatise, Albert asserts that the soul is the principle of "life" (*vita*). But he adds that life itself differs from those other psychic operations described by Aristotle, such as vegetative life, sense-perception and reasoning, because it precedes them. The proper vehicle of life, which is the foundation of all these operations, is the spirit. After examining the theories of his predecessors on its nature, Albert defines spirit as "a body composed from elements, having the form of air, serving organically the soul for all

à s. Augustin (Louvain, 1945); Daniel P. Walker, "The Astral Body in Renaissance Medicine," *Journal of the Warburg and Courtauld Institutes*, 21 (1958), 119-133; Hiro Hirai, "Alter Galenus: Jean Fernel et son interprétation platonico-chrétienne de Galien," *Early Science and Medicine*, 10 (2005), 1-35, esp. 22-25.

³⁸ James J. Bono, "Medical Spirits and the Medieval Language of Life," *Traditio*, 40 (1984), 91-130; Jacqueline Hamesse, "*Spiritus* chez les auteurs philosophiques des XII^e et XIII^e siècles," in Marta Fattori and Massio L. Bianchi (eds.), *Spiritus: IV^o Colloquio internazionale del Lessico Intellettuale Europeo* (Rome, 1984), 157-190.

³⁹ See Bono, "Medical Spirits," 112-128; Hamesse, "*Spiritus*," 180-181. Cf. Owsei Temkin, "On Galen's Pneumatology," *Gesnerus*, 8 (1951), 180-189.

⁴⁰ *De animalibus*, XVI, tr. 1, c. 13 (Stadler, 1098 = Kitchell-Resnick, 1193): "spiritus est res divina per hoc quod habet virtutem divinam in formando et creando."

actions of life.”⁴¹ But Albert sometimes uses the word “instrumentally” (*instrumentaliter*) to replace the term “organically” (*organice*). This emphasis on the instrumentality of spirit seems to be very much in keeping with Aristotle’s own ideas.⁴² This instrumentality is once again understood quite strongly in terms of an analogy with actual machinery. Thus Albert compares the spirit with the hammer of a smith as follows:

[...] as a smith has one instrument, which is the hammer, by which he introduces into iron all the forms of his art, so this single instrument is connected to the soul, by which it universally introduces in the whole body all the forms and operations of life.⁴³

However, Albert goes further than Aristotle in his explanation of the formation of animals. If the spirit, moved by the soul, works like the smith’s hammer, one may rightly ask how this single instrument can form the various parts of the animal body. Albert answers that the spirit receives “in the testicles the formative power, which is called ‘divine’ by philosophers.”⁴⁴ It is thus not the spirit itself, but the formative power conveyed by the spirit that brings about the various bodily organs and members. In other words, this power is so divine because of the divine mind that is at work behind the instrument, just as the smith’s mind guides the hammer in his hand in producing diverse products.

⁴¹ *De spiritu et respiratione*, I, tr. 1, c. 4 (ed. Borgnet, 9: 219): “compositum corpus ex elementis, habens formam aeris, animae organice deserviens ad omnes vitae actus.”

⁴² See Verbeke, *L’évolution de la doctrine du pneuma*, 20. Cf. Bos, *The Soul and Its Instrumental Body*. The idea of spirit as the soul’s instrument played a significant role until the early modern period. Pagel, *New Light*, 74–112, suggests Albert as a primary source for the biological works of prominent Aristotelians such as Daniel Sennert (1572–1637) and Jacob Schegk (1511–1587). Cf. Hirai, “Jacob Schegk.”

⁴³ *De spiritu et respiratione*, I, tr. 1, c. 4 (Borgnet, 9: 220): “[...] sicut enim unum instrumentum quod est malleus, habet faber ferrarius, per quod omnes inducat in ferrum formas artis suae: ita hoc unum instrumentum junctum est animae, per quod in toto corpore inducit omnes universaliter formas et operationes vitae.”

⁴⁴ *De spiritu et respiratione*, I, tr. 1, c. 4 (Borgnet, 9: 221): “in testiculis virtutem formativam quae a Philosophis vocatur divina.”

Albert then divides the workings of the formative power into two stages. First, he tells us, a certain moisture contained in the semen evaporates, stimulated by the heat of genital organs. Next, the formative power in the semen acts upon this vapor, so that spirit begins to “respire” (*spirans*) inside the semen. It is in this way that the spirit is produced from seminal moisture with the help of the formative power. Albert affirms that “the respiring spirit begins to pulsate, carrying a forming artificer, which is the formative power.”⁴⁵ We cannot stress enough here the fact that this power is described as a “forming artificer” (*artifex formans*). This corresponds to the idea of “artificer in the artifact,” which we have already encountered at work in the formation of minerals.

Later in the same treatise, Albert provides us a crucial key to the understanding of the principles guiding his world system. This is when he argues that, just as a form conceived in the artificer’s mind is “reiterated by a certain flux and procession” (*iteratur fluxu quodam et processu*) in the artifact by means of his instrument, so the form of life is introduced into a body through the instrumental spirit.⁴⁶ This analogy between art and nature allows us to grasp that the fundamental principle shared by the macrocosm and the microcosm is the “flux” of forms, which originates from the prime principle (the prime intellect in nature or the heart in animal bodies) through its “instruments” (celestial bodies or spirits) into inferior beings or bodily members. We shall encounter a further development of this central doctrine below.

5. The Nature and Origin of Souls

The generation of minerals and animals always requires a formative power, which ultimately has its origin from the prime intellect. Albert claims that, without this power, vegetative and sensitive souls cannot come into being. To understand the relationship of the formative power to the soul further, we shall now turn to his treatise

⁴⁵ *De spiritu et respiratione*, I, tr. 1, c. 5 (Borgnet, 9: 221): “spirans spiritus ille primo pulsare incipit, vehens artificem formantem, qui est virtus formativa.”

⁴⁶ *De spiritu et respiratione*, I, tr. 1, c. 8 (Borgnet, 9: 226).

On the Nature and Origin of the Soul, which seems to have been written immediately after *On Animals*. This treatise is divided into two tracts. The first concerns the soul as united with the body, the other the soul in separation from the body. We shall here focus upon the generation of souls explained in the first tract.⁴⁷

We find Albert invoking once more his favorite axiom, “every work of nature is the work of the intelligence,” which he then reformulates as follows: “Every work of nature is due to a form of the intelligence, which is the prime and universal mover in all nature.”⁴⁸ As we have seen above, for Albert, this implies that the forms of natural things are already conceived in the prime intellect, just as the form of the artifact is preconceived as an intellectual form in the artificer’s mind. These words reflect the fact that Albert divides forms into two types, namely those conceived either in the artisan’s mind or in the prime intellect of the universe, and those of artifacts or generated natural things. With regard to this division, he tries to reconcile the Platonists with the Aristotelians. According to him, the Platonists defined the first kind of forms as the “form before the thing” (*forma ante rem*) and the second kind as the “form in the thing” (*forma in re*).⁴⁹ On the first, he says:

⁴⁷ See Bruno Nardi, *Studi di filosofia medievale* (Rome, 1960), passim; Katharine Park, “Albert’s Influence on Late Medieval Psychology,” in *Albertus Magnus and the Sciences*, 501–535, esp. 504–505; Henryk Anzulewicz, “Zur Theorie des menschlichen Lebens nach Albertus Magnus,” *Studia Mediewistyczne*, 33 (1998), 35–49; Dag N. Hasse, *Avicenna’s De Anima in the Latin West* (London, 2000), esp. 60–69 and Index locorum.

⁴⁸ *De natura et origine animae*, tr. 1, c. 1 (ed. Cologne, 12: 3 = Henryk Anzulewicz, *Albert der Große: Über die Natur und den Ursprung der Seele* [Freiburg, 2006], 40–41): “omne opus naturae est ad aliquam formam intelligentiae, quae primus et universalis motor est in tota natura.” In this section, we indicate the pagination of Anzulewicz’s German translation, although the English translation is ours.

⁴⁹ On the Platonic division of forms, see de Libera, *Albert le Grand*, 179–213; id., *Métaphysique et noétique*, 211–264; id., “Albert le Grand et le platonisme: de la doctrine des idées à la théorie des trois états de l’universel,” in Egbert P. Bos and Pieter A. Meijer (eds.), *On Proclus and His Influence in Medieval Philosophy* (Leiden, 1992), 89–119.

One of these [forms] exists before the thing, is like a model and paradigm of the thing, and is a form of the intellect [which is the] mover in nature; this form is universally, immaterially and simply, possessing all the differences of forms beforehand.⁵⁰

According to Albert, the Platonists also called these forms “the forms [capable] of forming” (*formae formandi*), in contradistinction to those of the second kind, which were “the images of those true forms” (*illarum formarum verarum imagines*).⁵¹ Thus, among all forms, some have the capacity of generating things, whereas the others lack that capacity. At this stage in his argument, Albert introduces the Peripatetics, according to whom forms are educed from matter by the formative power. On this power, he says:

[...] but the formative power of each formed thing does not come from matter, because the mover and the thing moved cannot be the same, any more than the former and the thing formed. Rather the formative power comes from the efficient prime mover.⁵²

Albert thus attempts to argue that in the same way in which the Platonists posited model-like forms in the “the intellect which is the mover in nature” (*intellectus movens in natura*), the Peripatetics likewise suggested that the formative powers resided in the prime intellect prior to the generation of beings. For Albert, what is truly “formative” must be a prior form, conceived in the prime intellect. He even goes as far as to argue that it is the same archetypal form that is called “model” by the Platonists and “formative power” by the Peripatetics. In his eyes, these two schools only differ in their mode of expression.

⁵⁰ *De natura et origine animae*, tr. 1, c. 2 (Cologne, 12: 4, Anzulewicz, 44-45): “Quarum una est ante rem, quae est sicut rei exemplar et paradigma, quae est forma intellectus moventis in natura, quae forma est universaliter et immaterialiter et simpliciter praehabens omnes formarum differentias [...]”

⁵¹ *De natura et origine animae*, tr. 1, c. 2 (Cologne, 12: 4, Anzulewicz, 44-45).

⁵² *De natura et origine animae*, tr. 1, c. 2 (Cologne, 12: 4, Anzulewicz, 44-47): “[...] tamen virtus formativa uniuscuiusque rei formatae non est ex materia, eo quod non idem potest esse movens et motum neque formans et formatum, sed potius formativa virtus ex efficiente et movente est primo.”

Having defined the general character of forms in the universe, Albert explains the origin of the souls according to the status of each form in the order of nature. He begins with the forms of non-animate beings, which he divides into three kinds: (1) the forms of elements; (2) those of mixed elements such as coagulation and liquefaction; and (3) the substantial forms of stones or metals. After these non-animate corporeal forms comes the vegetative soul, a form that is already closer to the prime mover and superior to the forms of non-animate beings. The superiority of plants is documented, for example, by their ability to reproduce. In this context, Albert returns once more to the notion of the formative power contained in seed. Arguing that a plant “can only be generated from that which has formative power” he adds:

It is also evident that this vegetative soul is educed from the interior power of seed. Because of this, we have proved in the sixteenth book *On Animals* that [this power] is in the seed, as the form of an artificer exists in the artifact, which then begins to take on the form of art.⁵³

This confirms how in this treatise, too, Albert maintains his usual stance. It is moreover important to see how he places the generation of animals in the larger context of a general theory on the origin of natural forms. Whereas *On Animals* had remained within an overall Aristotelian framework, this work amply stresses the role of the prime intellect as the ultimate origin of all natural forms.

This contrast becomes even clearer in his discussions of the generation of rational souls. For Albert, the rational soul differs from the other forms in that it cannot be generated from matter. To elucidate its true generation, Albert first explains that three powers operate together in the formation of embryos, namely the powers of (1) the elements, (2) the soul, and (3) the prime intellect of the universe. However, these three powers do not contribute in an equal

⁵³ *De natura et origine animae*, tr. 1, c. 3 (Cologne, 12: 8-9, Anzulewicz, 64-67): “[...] non generatur nisi ex eo quod virtutem habet formativam. [...] Patet etiam, quod haec vegetabilis anima educitur ab interiori virtute seminis. Propter quod in sexto decimo libro de animalibus probavimus, quod est in semine, sicut artificis forma est in artificio, quod iam formam artis incipit induere.”

way. Obviously, the power of the prime intellect is the most important one, because this intellect is the “informer” (*informans*) of all things. After all, it is in its similitude to this prime intellect that the human rational soul is produced. Albert adds:

Since this [prime cause] is the intellect pure, active and productive of natural things, as the intellect of an artist produces artificial things, some persons said that the rational soul is made by the intelligence. And they said the truth, if the intelligence means the prime, separated and unmixed intellect [...]. Then others, seeing that form, which is called “the rational soul,” is in the image and similitude of the prime intellect, which is the prime author and maker in the entire work of nature, said that this [rational soul] is the copy of the prime cause.⁵⁴

In this context, Albert asks his readers to reconsider the famous passage of Aristotle’s *Generation of Animals*, which declares that the intellect comes into the embryo from outside.⁵⁵ For the Universal Doctor, Aristotle does not mean to say that the cause of the human intellect exists outside the work of nature, but that the prime intellect of the universe educes the human intellect from its own light and not from any material principle. In conclusion, Albert gives his own opinion on the origin of the soul and its relationship to the prime intellect:

[...] this formative [power] educes these [vegetative and sensitive souls] in this way, when they are the potencies of a rational and intellectual form and sub-

⁵⁴ *De natura et origine animae*, tr. 1, c. 5 (Cologne, 12: 13, Anzulewicz, 84-87): “Et cum ipse sit intellectus purus activus et productivus naturalium, sicut intellectus artificis producit artificialia, dixerunt quidam animam rationalem ab intelligentia fieri; et verum dixerunt, si intelligentia dicatur intellectus primus separatus et immixtus, [...]. Alii autem videntes formam hanc quae anima rationalis vocatur, esse ad imaginem et similitudinem intellectus primi, qui auctor est et opifex primus in toto naturae opere, dixerunt eam esse exemplum causae primae.”

⁵⁵ Aristotle, *Generation of Animals*, II.3, 736b27-29. See also Paul Moraux, “À propos du νοῦς θύραθεν chez Aristote,” in Augustin Mansion (ed.), *Autour d’Aristote: recueil d’études offert à A. Mansion* (Louvain, 1955), 255-295; Bos, *The Soul and Its Instrumental Body*, 224-226; Joachim R. Söder, “Νοῦς θύραθεν: Über Natur und Vernunft im Ausgang von Aristoteles,” in Ludger Honnefelder et al. (eds.), *Albertus Magnus und die Anfänge der Aristoteles-Rezeption im lateinischen Mittelalter* (Münster, 2005), 375-398.

stance, only insofar as this formative [power] is moved, being informed by the intellect, which universally acts in the work of generation. And therefore, the pure and unmixed intellect of the prime cause introduces the ultimate complement, which belongs to an intellectual form, not through an instrument nor from matter, but through its own light.⁵⁶

Albert clearly argues that the formative power, “informed” by the prime intellect, generates the two inferior kinds of souls (vegetative and sensitive). For him, even the rational soul does not come from outside the realm of natural operation, since the prime intellect of the universe is the author of all natural things. With his favorite axiom, “every work of nature is the work of intelligence,” Albert aims to explain the origin of the forms of all natural things comprehensively, concluding that all forms are ultimately poured from the prime intellect.

6. Metaphysics

In his *Metaphysics* (1263–ca. 1267), Albert undertakes a further attempt to elucidate the relationship between the prior forms, conceived in the intellect, and the posterior forms of generated beings. We shall briefly examine this point here.⁵⁷

When Albert explains the generation of natural species, including minerals, he often has recourse to the axiom, “a house [is pro-

⁵⁶ *De natura et origine animae*, tr. 1, c. 5 (Cologne, 12: 14, Anzulewicz, 90-91): “[...] haec formativa non educeret eas hoc modo, prout sunt potentiae rationalis et intellectualis formae et substantiae, nisi secundum quod ipsa formativa movetur informata ab intellectu universaliter movente in opere generationis. Et ideo complementum ultimum, quod est intellectualis formae, non per instrumentum neque ex materia, sed per suam lucem influit intellectus primae causae purus et immixtus.” Cf. Hirai, “Leonico,” 151-158.

⁵⁷ For the intimate relationship between the generation of sublunary things and *Metaphysics* in the Arabo-Latin tradition, see Charles Genequand’s introduction to his *Ibn Rushd’s Metaphysics: A Translation with Introduction of Ibn Rushd’s Commentary on Aristotle’s Metaphysics, Book Lām* (Leiden, 1984), 1-58; Davidson, *On Intellect*, 220-257; Jean Jolivet, “Divergences entre les métaphysiques d’Ibn Rušd et d’Aristote,” in his *Philosophie médiévale arabe et latine* (Paris, 1995), 133-153; Freudenthal, “Medieval Astrologization.”

duced] from a house.” One of its sources is Aristotle’s *Metaphysics*, Zeta.⁵⁸ There, the Stagirite invoked it in his explanation of the principle that “everything is produced from the what is univocal” (*omnia fiunt ex univoco*).⁵⁹ According to the Commentator, Averroes, by “univocal,” Aristotle meant that the form in the artisan’s mind is “similar in terms of name” (*conveniens in nomine*) to the form of the artifact that he makes.⁶⁰ Importantly, Aristotle thought that the same principle also applied to animal generation. It was thus the Stagirite himself who compared natural reproduction with artificial production. In the same analogical vein, he argued that animal seed is productive, because “the semen potentially has the form” (*sperma habet potestate speciem*) of the animal.⁶¹

Albert however developed this analogy further than Aristotle had done. He first argued that “the process of everything which is generated and made comes from a similar thing in terms of form, which is of the same substance as that which is generated.”⁶² We must stress here that Albert intentionally interprets the term “univocal,” not as “similar in terms of name,” but as “similar in terms of form.” Then, on the idea that “semen has potentially the form” of the animal, he continues:

For, semen makes [an animal] by its formative species, as those [things] that are made by art are made by their formative and generative species. For, semen has species potentially, that is, not materially, but effectively [...]. [...] For, semen is not a small animal as Plato said, but it is an animal thanks to a productive and

⁵⁸ Aristotle, *Metaphysics* Z.7, 1032b11-12; Z.9, 1034a23-24. In this section, we have used the Latin translation of Aristotle’s *Metaphysics*, so-called *translatio media*, printed along with Albert’s *Metaphysica* in ed. Cologne, 2/16.

⁵⁹ Aristotle, *Metaphysics*, Z.8, 1034a22-23.

⁶⁰ Averroes, *Long Commentary on Aristotle’s Metaphysics*, VII, 30 (ed. Giunta, Venice, 1552, VIII, f. 179G-180L = Ahmed Elsakhawi, *Étude du livre Zây de la Métaphysique d’Aristote dans sa version arabe et son commentaire par Averroès* (Lille, 1994), 109-110).

⁶¹ Aristotle, *Metaphysics*, Z.9, 1034a34-b1.

⁶² *Metaphysica*, VII, tr. 2, c. 11 (ed. Cologne, 2/16: 354): “processus omnis eius quod generatur et fit, est a convenienti secundum formam, quae est ipsa eius quod fit, substantia.”

generative power, just as a form of art is not an artifact, but is generated thanks to a productive power.⁶³

For Albert, then, the form or species, which has in itself a productive and generative power, must exist prior to the formation of something, in the realm of both natural generation and artificial productions. For him, as for Averroes, this potential form in seed, which possesses the productive capacity, is the real identity of the formative power. It is important to understand that Albert supposes forms in the architect's mind or in semen to be similar to those of products and generated beings. Since the form, poured from the artisan's mind into his instruments, produces an artifact of a similar form, the formative power in semen, called "artificer in the artifact," procreates the offspring of a form similar to the genitor.⁶⁴

Concerning a passage of Aristotle's *Metaphysics*, Lambda 3, Albert advances the same idea:

It is evident from these [points] that everything which is generated is made by a univocal generator, because in univocal generation, man generates man according to himself [...]. Similarly, it is in the case of the arts. For, the medical art in the intellect of a doctor is the univocal reason of health, which is in the humors. All others that are generating 'spontaneously' (*aequivoce*) are reduced to univocal [generators]. And the formative power, which is in their matters, is like an art in the artisan's intellect, because it is evident, that heat, which is in the semen of man, receives divine powers from heaven and [also] the soul, by which it informs; and therefore [the formative power] is called "intellect" and "artificer" by the Peripatetics.⁶⁵

⁶³ *Metaphysica*, VII, tr. 2, c. 11 (Cologne, 2/16: 354): "*Sperma enim facit a formativa specie, sicut ea quae fiunt ab arte, fiunt a formativa et faciente specie. Sperma enim habet speciem potestate non materiali, sed effectiva [...]. [...] non enim est sperma parvum animal, sicut dixit Plato, sed est virtute factiva et generativa animal, sicut forma artis non est artificiatum, sed virtute factiva est generatum [...].*"

⁶⁴ *Metaphysica*, XI, tr. 1, c. 6 (Cologne, 2/16: 466).

⁶⁵ *Metaphysica*, XI, tr. 1, c. 9 (Cologne, 2/16: 473): "*Ex his etiam patet [...] quod omne quod generatur, fiat ab univoco generante, quia in generatione univoca homo generat hominem secundum se [...]. Similiter autem est etiam in artibus. Ars enim medicinalis in intellectu medici ratio est univoca sanitatis, quae est in umoribus. Alia autem quaecumque sunt generantia aequivoce, ad univoca reducuntur. Et virtus formativa, quae est in materiis eorum, est sicut ars in intellectu artificis, sicut patet, quia*

The most fundamental rule of generation in Albert is the fact that everything is generated from some univocal being, that is, from something possessing a similar form. According to this rule, there is nothing but univocal generation in the world. That is why even spontaneous generation, traditionally considered 'equivocal', not 'univocal', must ultimately be univocal. Animal generation forms no exception to this rule. From the celestial bodies, the forms in the prime intellect are poured into semen, where the power of the soul already subsists. This power, informed by the divine powers, produces the eternal species of animals. This species must be univocal with respect to the form that pre-exists in the prime intellect. It is by the authority of the Peripatetics that Albert compares this power to an 'intellect' and 'artificer'. This 'univocal causality' is crucial for our understanding his Platonization of Peripatetic metaphysics.⁶⁶ Indeed, we may claim that this notion is most emphatically developed in his discussions of the generation of sublunary things.

There remains one point to be noted: Albert expressly claims that his theory differs from the Platonists' theory of "the Giver of Forms" (*dator formarum*).⁶⁷ Indeed, following Averroes, he rejects this theory, although it is evidently not too far removed from his own theory of the generative role of the prime intellect of the universe.⁶⁸

calor, qui est in semine hominis, virtutes divinas accipit a caelo et anima, quibus format, et ideo dicitur intellectus et artifex a Peripateticis." Cf. Aristotle, *Metaphysics*, A.3, 1070a26-30.

⁶⁶ de Libera, *Albert le Grand*, 117-177; id., *Métaphysique et noétique*, 143-209.

⁶⁷ On the Giver of Forms, see Hasse, *Avicenna's De Anima*, 188-189; id., "Plato Arabico-Latinus: Philosophy, Wisdom Literature, Occult Sciences," in Stephen Gersh (ed.), *The Platonic Tradition in the Middle Ages: A Doxographical Approach* (Berlin, 2002), 31-65, esp. 42-44; de Libera, *Albert le Grand*, 121-131; id., *Métaphysique et noétique*, 156-168; Henryk Anzulewicz, "Pseudo-Dionysius Areopagita und das Strukturprinzip des Denkens von Albert dem Großen," in Tzotcho Boiadjiev *et al.* (eds.), *Die Dionysius-Rezeption im Mittelalter* (Turnhout, 2000), 251-295, esp. 258.

⁶⁸ For his criticism of Plato's and Avicenna's theories, see *Metaphysica*, XI, tr. 1, c. 8 (Cologne, 2/16: 468-471).

7. The First Principle

For Albert, as all forms originate in the prime intellect, every natural phenomenon is the “work” (*opus*) of this intellect, which sustains all operations of nature. This eminent role is made clear in Albert’s mature work *On the Causes and the Procession of the Universe from the Prime Cause* (after 1263), which is closely tied to his *Metaphysics* and is the last work of his Aristotelian project. This treatise examines the nature of the prime intellect as the cause of all beings in the world.⁶⁹

In the second tract of the first book of this work, Albert tries to show what the “prime principle” (*primum principium*) is. For him, it is not a power engaged in the body, such as the vegetative or sensitive power, but the “intellect” (*intellectus*). But there exist various kinds of intellect. Albert rejects those that require a body as their subject. He also excludes the potential intellect, because what he seeks is a principle that is active in itself and does not depend on any other being. He therefore concludes that the prime principle is the “universally active intellect” (*intellectus agens universaliter*).⁷⁰ This active intellect knows everything that comes into being. Crucially, however, this knowledge is not only concerned with the perception of beings, but also with their production, as it is the forms or species known by and held in this principle that produce by themselves all entities—once again, just as a form conceived in the artisan’s mind is the formative cause of artifacts.⁷¹ Throughout this discussion, Albert relies anew on the Aristotelian axiom that “the house

⁶⁹ Besides de Libera’s works, see Charles Lohr, “The Pseudo-Aristotelian *Liber de Causis* and Latin Theories of Science in the Twelfth and Thirteenth Centuries,” in Jill Kraye et al. (eds.), *Pseudo-Aristotle in the Middle Ages* (London, 1986), 53–62; Paul Hoßfeld, “Der *Liber de causis*: Kommentar Alberts und seine naturphilosophischen Kommentare,” *Documenti e studi sulla tradizione filosofica medievale*, 5 (1995), 39–105; Thérèse Bonin, *Creation as Emanation: The Origin of Diversity in Albert the Great’s On the Causes and the Procession of the Universe* (Notre Dame, IN, 2001).

⁷⁰ *De causis*, I, tr. 2, c. 1 (ed. Cologne, 2/17: 25 = Henryk Anzulewicz et al., *Albertus Magnus: Buch über die Ursachen und den Hervorgang von allem aus der ersten Ursache* [Hamburg, 2006] 100–101). Although we give the pagination of Anzulewicz’s German translation in this section, the English translation is ours.

⁷¹ *De causis*, I, tr. 2, c. 5 (Cologne, 2/17: 31 = Anzulewicz, 132–133).

[as an artifact] is produced from a house [in the architect's mind]" in order to define the role of the prime principle.

In the last part of this tract, Albert discusses how the diversity of natural phenomena is caused by the prime intellect. He argues that to the extent that the knowledge contained in this prime principle is productive of all beings, it is the cause of being and of the order of all entities including natural things. That is why he affirms that the prime principle is "the source for the being of all existences" (*fontale ad esse existentium omnium*).⁷² Although Albert admits both nature and the prime intellect as principles, he says that, since the agent principle cannot be plural, nature must be subordinate to the prime intellect. The cause of the diversity of natural phenomena is thus ultimately reduced to this prime principle.

As we have seen, for the generation of natural things, Albert has recourse to the notion of formative power, which is responsible for the various parts of plants and animals and also for minerals. This formative power thus has the potency to determine matter into various parts, because it contains in itself the divine power of the prime intellect. With this view, we have arrived at the very core of Albert's natural philosophy: he clearly argues that it is this formative power that relates the natural world to the prime principle, that is, to the universally active intellect:

For, this power, which is called "formative," can [establish the diversity of natural things], not insofar as it is form or nature, but insofar as it is the copy of the intelligence and contains in itself the power of the intelligence. For this reason, in the sixteenth book of *On Animals*, the intelligence is said to be in semen, and the whole work of nature is said to be the work of the intelligence.⁷³

⁷² *De causis*, I, tr. 2, c. 8 (Cologne, 2/17: 33 = Anzulewicz, 146-147).

⁷³ *De causis*, I, tr. 2, c. 8 (Cologne, 2/17: 34 = Anzulewicz, 148-151): "Haec enim virtus, quae formativa dicitur, non habet hoc in quantum forma est vel natura, sed in quantum exemplum est intelligentiae in se continens intelligentiae virtutem. Propter quod in XVI de animalibus intelligentia dicitur esse in semine, et totum opus naturae dicitur esse opus intelligentiae."

8. Conclusions

In this essay, we have analyzed some key ideas of Albert's natural philosophy. We have seen that, in his explanation of the generation of natural things, he constantly takes recourse to the notion of 'formative power'. In his treatise *On Minerals*, he argues that minerals cannot come into being through a simple combination of elements, but require the assistance of the formative power deriving from the prime universal mover. In his *On Animals*, he explains that, before the emergence of souls, a divine formative power introduces itself into semen, making use of the semen's heat as its instrument so as to form bodily organs. In animal bodies, the formative power is carried by its vehicle, the spirit. Indeed, Albert thinks that this power is a 'potential form' hidden in seed, but once again ultimately poured down from the prime intellect of the universe through the intermediary services of the celestial bodies.

Regarding the origin and workings of this power, we have seen that Albert introduces two fundamental elements into his Aristotelian framework. First, he frequently cites his master's adage that "a house is produced from a house and health from health." By this phrase, Aristotle had wished to explain that when an architect builds a house by means of his tools, he must first conceive the form of the house in his mind; and likewise with the doctor prescribing a cure for some illness. The Stagirite had applied this idea primarily to animal generation. By globalizing its application to the whole natural realm, and by ascribing to God the role of the ultimate mind, Albert, going beyond his master's intentions, claimed that the forms of all natural things take their origin from the prime intellect of the universe.⁷⁴ Furthermore, so as to explain how intellectual forms are tied to natural forms, he took recourse to the Neoplatonic 'metaphysics of flux'. He described this natural process as a sequential 'flux' of forms reaching inferior beings from the higher, superior intellect. In his commentary on Aristotle's *Meta-*

⁷⁴) The framework of the present paper does not permit to delve into an analysis of Averroes' shadow discernable in Albert's conception of natural operation as intellectual activity. On this issue, we are currently preparing another study. Cf. Freudenthal, "Astrologization"; Hirai, "Leoniceno."

physics, Albert went even further than that, considering all types of natural generation as 'univocal', including spontaneous generation, which had traditionally been viewed as 'equivocal'. This idea could impossibly have been the result of a simple interpretation of Aristotle's work. Rather, it was the result of Albert's reception of the Arabic Neoplatonization of Aristotelian thought.

Once all of these points are clarified, we can grasp the real intention behind Albert's statement that "every work of nature is the work of intelligence": it emphatically states the idea that all natural things are 'univocally' produced by the formative power coming from the prime universal intellect.

This conclusion demands that we reconsider some significant issues in the study of medieval science and philosophy. First, our analysis requires a revision of the standard view on the relationship between nature and art, the artificial and the natural, in medieval thought. We have seen that for Albert, all natural phenomena necessarily imply the intervention of a superior intellect, in the same way in which artificial productions require the artist's intellectual activity. Indeed, we have seen that he almost identified natural operations with artificial ones. This analogy between nature and art is no mere rhetoric or metaphor, but partakes in the core of Albert's understanding of the created world.⁷⁵ Second, our discussion sheds new light on Albert's reception of the doctrine of 'flux'. Although most scholars who study the metaphysical or theological dimensions of this doctrine pay little attention to the issue of the generation of natural things, our survey has shown that this Neoplatonic doctrine is, at least for Albert, intimately tied to this phenomenon. Finally, our analysis of Albert's natural philosophy demands a reconsidera-

⁷⁵ On the identification of natural phenomena with intellectual art or artist, in addition to Freudenthal's and Hirai's works mentioned above, see also Joseph Moreau, *L'âme du monde de Platon aux Stoïciens* (Paris, 1939); André J. Festugière, "Le Dieu cosmique," in *La révélation d'Hermès Trismégiste*, 4 vols. (Paris, 1942-1950), vol. 2; Friedrich Solmsen, "Nature as Craftsman in Greek Thought," *Journal of the History of Ideas*, 24 (1963), 473-496; Paula Findlen, "Jokes of Nature and Jokes of Knowledge: The Playfulness of Scientific Discourse in Early Modern Europe," *Renaissance Quarterly*, 43 (1990), 292-331; Nancy Siraisi, "Vesalius and the Reading of Galen's Teleology," *Renaissance Quarterly*, 50 (1997), 1-37.

tion of the medieval reception of Peripatetic and Neoplatonic philosophy. For, we have seen that when Albert comments on the Aristotelian corpus, he clearly develops the active and teleological character of natural operations beyond Aristotle's original intentions. This teleological understanding of nature's work is fundamental for Albert and was to persist uninterruptedly into the early modern period.⁷⁶

⁷⁶ On the teleological understanding of nature in early modern period, Pagel's works are still worth reading. Walter Pagel, *William Harvey's Biological Ideas: Selected Aspects and Historical Background* (Basel, 1967); id., *Joan Baptista Van Helmont: Reformer of Science and Medicine* (Cambridge, 1982).

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