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Composite Substance, Common Notions, and Kenelm Digby's Theory of Animal Generation

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Argument

This paper argues for two claims. (1) In his biological views, Kenelm Digby tries to reconcile aspects of an Aristotelian theory of composite substance with early modern corpuscularianism. (2) From a methodological point of view, he uses the Stoic-Epicurean epistemology of common notions in order to show the adequacy of his conciliatory approach. The first claim is substantiated by an analysis of Digby's views on the role of mixture and homogeneity in the process of animal generation. The second claim is substantiated by an analysis of Digby's views on the role of the concept of quantity in the evaluation of scientific hypotheses. Both arguments make use of the context of Digby's philosophy: the first argument draws on his background in the work of early modern corpuscularian Aristotelians such as Daniel Sennert; the second argument draws on his background in the epistemology of Pierre Gassendi.

1. Introduction

While Kenelm Digby's matter theory and his research in experimental alchemy are, thanks to the ground-breaking studies of Betty Jo Dobbs (1971; 1973; 1974), well known today, other aspects of his natural philosophy, in particular his views on the life sciences, have received little attention.[1] Nevertheless, the generation of living beings, in particular the generation of animals, plays a significant role in Digby's *Two Treatises*, which were published in Paris in 1644 when Digby was newly appointed Lord Chancellor at the court-in-exile of Charles I.[2] At this time, Digby divided his considerable energies between preparing negotiations with Pope Innocent X concerning Catholic funds for the King' party,[3] meeting leading French philosophers such as Descartes and Gassendi in the Mersenne circle,[4] and exchanging news about

[1] To the best of my knowledge, the projected fourth part of Dobbs' "Studies," about Digby's biological work, has not appeared in print.

[2] In what follows, I refer to this work as "TT." References are to page numbers. In all quotations, I have modernized the use of "u", "v", and "j"; apart from that, I have preserved Digby's spelling. All italics and capitalization by seventeenth-century authors are in the original.

[3] On Digby's missions to Rome, see Gabrieli 1954.

[4] For Digby's contact with the Mersenne circle, see the index to Mersenne 1955–1977.

experimental alchemy.[5] His theory of animal generation deserves attention (at least) for two interconnected reasons, both of which are related, in a direct or indirect way, to his political, philosophical, and alchemical associations.

The first reason is the role that his theory of animal generation plays within the framework of a conciliatory approach to natural philosophy. His contemporaries perceived his natural philosophy as an attempt to reconcile aspects of Aristotelian natural philosophy with aspects of modern corpuscularianism. For example, in a programmatic letter of 1669, the German philosopher Gottfried Wilhelm Leibniz mentions Digby, alongside such thinkers as Julius Caesar Scaliger and Daniel Sennert, as exemplifying a conciliatory approach to natural philosophy akin to his own.[6] Digby himself is keen to create such an understanding of his philosophical project, when, in the Conclusion to the first part of *Two Treatises*, he emphasizes that, for the most part, he has been following Aristotle in his account of the nature of body, but that at the same time what he has been saying does not differ from Democritus, Hippocrates, and Galen, from the natural philosophy of the "moderns," nor from the tradition of corpuscularian Alchemy, in particular the anonymous thirteenth-century author of one of the main alchemical writings of the Middle Ages, the *Summa perfectionis*, known under the pseudonym "Geber" (see TT 343).

Although there are recent studies on corpuscularian Aristotelianism in philosophers such as Scaliger, Sennert, and the early Leibniz (see Lüthy 2001; Michael 1997; Newman 2001b; Mercer 2001; Blank 2005, chap. 3), it seems fair to say that it is still not well understood how such a conciliatory approach to natural philosophy was supposed to work in other sixteenth- and seventeenth-century authors. Obviously, the project of bringing Aristotelian and corpuscularian intuitions together is threatened by inconsistency. For example, the following question arises: how is it possible to hold that the generation of composite bodies reduces to the combination of corpuscles that do not change their nature in the process of composition and at the same time hold the Aristotelian view that composite substances are true unities. Indeed, Digby does hold both that biological reproduction involves the composition of minimal particles and also that animals are true unities. Looking into Digby's strategy of reconciling such claims may give some interesting clues as to how early modern corpuscularian Aristotelianism sought to achieve its conciliatory goal. Moreover, emphasizing the role that Digby's metaphysics of composite substance plays in his theory of animal generation will make it clear why interpretations that place Digby's view on the nature of bodies in a one-sided way into the tradition of corpuscularian alchemy (such as the classical study of Kurd Lasswitz and more recent work by William Newman) miss something important. In section 3, I explore Digby's conciliatory strategy in the context of similar strategies developed by authors such as Scaliger and Sennert.

[5] On the exchange of alchemical ideas and substances during Digby's Paris years, see Dobbs 1973, 150–151.
[6] See Leibniz's letter to Thomasius, 20/ 30 April 1669; Leibniz 1927 – , II, 1, 14.

The second reason why Digby's theory on animal generation deserves some attention derives from the fact that his theory is part of an ecumenical strategy. Digby uses natural philosophy in order to reconcile different Christian denominations on a central doctrinal point, the immortality of the human soul. During the latter part of his life, Digby was engaged in the ecumenical politics of a group of English Catholics, the Blackloists.[7] John Henry holds that Digby adopted elements of Aristotelian matter theory as interpreted by the scholastic tradition for a particular religious and political objective.[8] As Henry argues, choosing an Aristotelian framework for his matter theory should be understood from the perspective of the ecumenical religious-political program of a group of English Catholics led by Digby's mentor, Thomas White (and called, after one of White's pseudonyms, "Blackloists"). According to Henry, Digby's *Two Treatises* contribute to this program by providing an answer to the question of whether the human soul is naturally immortal – a question that divides Catholic dogma from the theology of the Church of England. Catholic dogma holds that human beings – composed of body and soul – are naturally immortal, while theologians of the Church of England tend to ascribe the immortality of both human bodies and human souls to a supernatural Divine intervention (see Henry 1982, 223–227).

Indeed, Digby describes the question of the immortality of the soul as the "main and great question" of his work (TT 342). At the same time, he understands an account of the actions of inanimate and living bodies as the "main hinge, upon which hangeth and moveth" this question (TT 342). In particular, he characterizes the goal of the first part of the *Two Treatises* as giving an account of the actions that bodies are capable of, thereby also indicating what actions bodies are not capable of (see TT 341–342). The task of the second part of the *Two Treatises*, then, is to show that the actions that are specific to rational souls cannot be reduced to the principles governing the bodily world (see TT 342). Delineating the exact extent of the powers of material bodies, thus, is embedded in a project that has the aim of formulating an eschatology that is acceptable for members of both churches. Nevertheless, why did Digby think he could achieve this goal in a situation that was characterized by fundamental disagreements over central issues of Christian doctrine? I will argue that he does not choose components of Aristotelian matter theory in a merely hypothetical way. Rather, he employs the Epicurean-Stoic theory of common notions to limit the range of acceptable Aristotelian concepts. According to his view, the Aristotelian concepts of rarity and density are in accordance with the commonly shared concepts of quantity and substance. Using the concepts of rarity and density, Digby offers a matter theory that is resourceful enough to explain complex phenomena such as biological reproduction and animal behavior,

[7] On the ecumenical program of the Blackloists, see Henry 1982, 215–223. Henry acknowledges his debt to two unpublished dissertations: Bradley 1963 and Lewis 1976. On Thomas White's ecumenical program, see Southgate 1993.

[8] Moreover, Krook has pointed out that throughout the *Two Treatises*, Digby invokes a variety of other Aristotelian themes, such as the principle of identity and nominalism about general terms (see Krook 1993, chap. 3).

but not resourceful enough to explain operations specific to rational souls. Since these concepts are in accordance with concepts shared by all rational beings, he takes them to be acceptable to members of different philosophical traditions and different Christian denominations. Moreover, since they imply that the operations of rational souls cannot be explained by the interaction and configuration of material particles, they lead to the conclusion that rational souls are immaterial and, therefore, naturally immortal. In this way, both Digby's conciliatory approach to natural philosophy and his ecumenical program are founded on a theory of common notions. In section 4, I will examine this dual function of his epistemology of common notions and its historical context in the work of one of Digby's Paris acquaintances, Pierre Gassendi.

2. Rarity, Density, and Animal Generation

Let me begin with an overview of what Digby has to say about the generation of animals. His theory of animal generation is embedded in an account of the constitution of matter based on the Aristotelian notions of rarity and density. Explicitly, he proposes using these notions as an hypothesis, following the example of the use of hypotheses in astronomy. His starting points are the phenomena concerning rare and dense bodies, and the suggested use of the Aristotelian notions of rarity and density is "an hypothesis, or supposition (if it be possible) that may agree with them all" (TT 16). One of the phenomena that have to be accounted for is that "dense bodies have theire partes more close and compacted, then others have, that are more rare and subtile. Secondly they are more heavy, then rare ones. Againe, the rare are more easily divided then the dense bodies" (TT 17). At this juncture, Digby uses a thesis which I will come back to in section 3, namely the thesis that quantity is divisibility. Using the observation that rare bodies are more easily divided – and in this sense "more divisible" –, Digby holds that "we must needes acknowledge that the nature of Quantity is some way more perfectly in thinges that are rare, then in those that are dense" (ibid.). This connection between rarity and divisibility motivates the following account of rarity and density:

> [R]emembering how wee determined that Quantity is Divisibility: it followeth, that if besides Quantity there be a substance or thing which is divisible; that thing, if it be condistinguished from its Quantity or Divisibility, must of it selfe be indivisible . . . This then being so, wee have the ground of more or lesse proportion between substance and quantity . . . (TT 22)

Digby claims that this argument yields the same account of rarity and density as that given by Aristotle: "hee telleth us, that that body is rare whose quantity is more, and its substance lesse; that, contrariwise dense, where the substance is more and the quantity lesse" (TT 23; see Aristotle, *Phys.*, 217a29–31).

In the remainder of the bulky first treatise, Digby attempts to explain a vast number of natural phenomena starting from the assumption that, at the basic level of reality, particles of matter display various proportions of rarity and density, understood in the Aristotelian sense just defined. As Digby puts it: "[W]e deemed it a kind of necessity to straine ourselves to prosecute most of such effects, even to their notionall connexions with rarity and density" (TT 203). His program involves the maxim to explain phenomena that, at first sight, might invite an explanation using the notion of a "vertue spirituall" instead by means of "rarity and density, working by locall motion" (TT 204). In particular, he applies this program to the question of animal generation. Digby shares with other Aristotelian natural philosophers the view that animal seeds arise from the superfluous moisture of the parent. However, he disagrees with the widely held view that this fluid is composed of parts derived from the different parts of the parent's body in a way that the parts of the seed display the same structure as the parts of the living organism from which they arise (see TT 213–214).[9] In Digby's view, such an account of animal generation faces several difficulties. If it is claimed that the superfluous moisture passes through every particle of the parent's body, Digby objects that, for physiological reasons, it seems to be impossible for some fluid to circulate in this way. If it is claimed that the superfluous moisture receives something only "from all similar and great parts" – i.e., if it receives something by means of the chemical process of assimilation – Digby objects that there is no reason why a given portion of moisture should chemically react in a uniform way with all relevant similar parts of an organism, and no reason why each similar part of an organism entering into such a chemical reaction should confer as much of its matter to a given portion of moisture as all the other parts of the organism do. As Digby suggests, only under such an assumption of uniformity could a chemical explanation of the production of a seed explain the proportion in the collection of the parts of seminal fluid necessary for the generation of an animal (see TT 214–215).

In his solution to the question of how the right proportion of parts in seminal matter comes about, Digby makes use of an analogy between nourishment and generation. He argues:

> [T]he juice which serveth for nourishment of the animal, being more then is requisite for that service; the superfluous part of it, is drained from the rest, and is served in a place fitt for it: where by little and little through digestion, it gaineth strength . . . to it selfe, and becometh an homogeneall body, such as other simple compoundes are; which by other degrees of heate and moisture, is changed into another kind of substance: and that againe; by other temperaments, into an other . . . (TT 215–216)

[9] For example, one of Digby's critics, Nathaniel Highmore, held such a view. According to Highmore, the complete structure of the animal already is contained in the seed, and only has to be "unfolded," in analogy to the "unfolding" of the leaf-like formation found in seeds of plants (see Highmore 1651, especially chap. 3).

Whereas in the theory criticized by Digby, the seed displays the same internal structure as a living organism, in his own theory the seed is a homogenous body in the sense of a "simple compound." Moreover, whereas in the criticized account, the development of a seed into a living being involves only the unfolding of a given structure into a larger scale, such that in each step of this development there is substance of the same internal structure, in his own theory the development from a seed to a living being involves a sequence of different substances. Digby writes that the structure of such "simple compounds" results from "the pure and single mixture of rarity and density" (TT 217). Thus, the structure of simple compounds is due to the proportion of rare and dense parts constituting them. In this way, the proportion between rarity and density internal to the seed accounts for how external factors such as heat and humidity get the chain of transformations started which ultimately results in a living being. Digby describes this chain of transformations as follows:

> In every one of which the thing that was, becometh absolutely a new thing; and is endewed with new properties and qualities different from those it had before, as from their certaine experience, do assure us. And yet every change is such, as in the ordinary and generall course of nature (wherein nothing is to be considered, but the necessary effects following out of such Agents working upon such patients, in such circumstances) it is impossible that any other thing should be made of the precedent, but that which is immediately, subsequent to it. (TT 218)

Thus, thinking about the structure of the seed in terms of rarity and density (rather than in terms of a structural isomorphism between the seed and the parent's organism) implies that the seed is a substance entirely different from each being produced in the course of this chain of transformations. The seed is not an animal in contracted form, nor are any of the substances forming the intermediary members in the chain of transformations. An animal is formed from substances that are not animals, and is formed out of these substances in a chain of steps governed by necessary causal connections.

In this way, Digby defends two claims: (1) the generation of animals is a matter of causal influences on particles displaying a certain proportion of rarity and density, and (2) the generation of animals involves the transformation of composite substances. The first claim places Digby close to corpuscularian matter theories developing in England since the beginning of the seventeenth century. The second claim, however, places Digby close to Aristotelian theories of living beings. How do both claims go together? And how does combining both claims contribute to Digby's ecumenical program? I will try to give answers to these questions by placing Digby's views on animal generation in the wider context of sixteenth- and early seventeenth-century metaphysics of composite substance (section 3) and the context of early seventeenth-century reception of the Stoic-Epicurean epistemology of common notions (section 4).

3. Animal Generation and the Metaphysics of Composite Substance

According to Newman, Digby adopted his metaphysics of the generation of composite bodies from the tradition of corpuscularian alchemy (Newman 2001a, 305–306). A well-known passage from the *Summa perfectionis* suggests that the generation of metals can be analyzed in terms of composition and separation of the smallest parts – "per minima" (Newman 1991, 321–323; 663–664). Moreover, Newman argues that Geber's view of generation also has a theoretical background in the tradition of Latin commentaries on the Fourth book of the Aristotelian *Meteorology* (Newman 2001a, 294–299).

In *De generatione et corruptione*, Aristotle holds that genuine mixture, in contrast to mere composition, occurs when the ingredients of mixture act upon each other to produce a uniform, "homoeomerous" substance, such that every part of the substance is the same as the whole (Aristotle, *De gen. et corr.*, 328a10–b22). By contrast, the *Meteorology* gives a corpuscular account of matter expressed in terms of pores within macroscopic bodies and corpuscles constituting these bodies and capable of passing through their pores. *Meteorology* IV gives an account of the corruption of composite substances in terms of separation (*diakrisis*) of particles (*Meteorology*, 381a4–12), thereby suggesting an account of the generation of composite substances in terms of composition (*synkrisis*) of particles – exactly the conception Aristotle rejects when he discusses Atomism in *De generatione et corruptione* (315b7–10; 317a13–14).

3.1. Digby on Minimal Parts

Digby alludes to Geber's formulation "by means of minimal parts" when he writes in the *Two Treatises*: "Let any man read his [Aristotle's] books of Generation and Corruption, and say whether he doth not expressly teach, that mixtion (which he delivereth to be the generation or making of a mixt body) is done *per minima*; that is in our language and in one word, by atomes . . ." (TT 343). He claims that this is what Hippocrates, Galen, and Democritus had in mind, as well as the "Alchymists, with their master Geber, whose maxime to this purpose, we cited above: the same do all naturall Philosophers, eyther auncient commentatours of Aristotle, or else modern inquirers into naturall effects, in a sensible and understandable way" (TT 343). As Newman suggests, even if Digby understands "atom" not as designating a perfectly indivisible body but only as "the least sort of naturall bodies" (see TT 48), Digby's emphasis on minimal parts in interpreting Aristotle's views on mixture amounts to an acceptance of the account of mixture given by corpuscularian alchemy.

Things, however, are more complicated than Newman suggests. Geber's corpuscularian alchemy is mentioned earlier in the *Two Treatises*, when Digby counters an objection against his critique of chemical theories of animal generation:

> But peradventure the Reader will tell us, that such a specificall vertue can not be gotten by concoction of the bloud, or by any pretended impression in it; unlesse some little particles

> of the nourished part do remaine in the bloud, and returne backe with it according to that maxime of Geber: *Quod non ingreditur, non immutat*;[10] no body can change an other, unlesse it enter into it, and mixing it selfe with it do become one with it. (TT 222)

The objection addressed here is that by ascribing to the circulation of blood a constitutive role in the formation of seed, Digby is explaining the structural isomorphism between the seed and the parent's organism by means of the chemical theory he previously rejected. According to such a theory, the process of assimilation involves the transmission of particles from the parent's organism into the superfluous moisture, which eventually forms the seed. In this sense, particles of the parent's organism would become ingredients of the seed. Digby emphasizes the differences between the chemical account of the formation of the seed and his own account. First, the supporters of the chemical account "affirme that a living creature is made merely by the assembling together of similar partes, which were hidden in those bodies from whence they are extracted in generation: whereas we say that bloud coming to a part to irrigate it, is by its passage through it, and some little stay in it . . . transmuted into the nature of that part" (TT 222). Secondly, the supporters of the chemical account "say that the embryon is actually formed in the seede, though in such little partes as it can not be discerned . . . But we say, that there is one homogeneall substance . . . though it have in it the vertues of all the partes it hath often runne through" (TT 223). Digby explicates his conception of a "specifike vertue" as follows: "[I]t is such degrees and such numbers, of rare and dense partes mingled together, as constitute a mixed body of such a temper and nature: which degrees and proportions of rare and dense partes and their mixture together, and incorporating into one homogeneall substance" (TT 223). Homogeneity, for Digby, does not imply the absence of internal structure. Rather, it implies that internal structure – the proportion of rarity and density – is realized in homogenous matter, such that structure is not explained by means of the presence of different material principles. He holds that seeds display structured but homogenous matter, which then is transformed into a chain of dissimilar and less homogeneous substances.

However, why does he hold that the generation of a living being is not only a matter of assembling particles of various rarity and density? And how does this view fit with his claim that mixture "is done *per minima*" (see TT 343)? To be sure, it is possible that Digby simply held inconsistent views. Nevertheless, there is a reading that makes sense of what Digby says about Geber. As Newman points out, already in the *Summa perfectionis* the passage concerning mixture by means of minimal parts is far from being unambiguous. Geber writes:

> [E]ach of these [principles of metals, i.e. sulfur and mercury] is of very strong composition and uniform substance. This is so because the particles of earth are united through the

[10] See Newman 1991, 317.

> smallest particles [*per minima*] to the aerial, watery, and fiery particles in such a way that none of them can separate from the other during their resolution. But each is resolved with the other on account of the strong union that they mutually have received through the smallest [*per minima*].[11]

Lasswitz ascribes to Geber the view that, in mixture, minimal parts are conjoined such that their surfaces touch each other (Lasswitz 1890, 1:224–228).[12] According to such a reading, Geber does not have a strong concept of the union of minimal parts. However, Newman convincingly argues that Geber might also have in mind a quite different view of the nature of mixture, a view according to which mixture requires minimal parts but, under this condition, produces Aristotelian compound unities (Newman 1991, 147–148). Thus, there are two plausible interpretations of Geber's view of the role of minimal parts: an atomistic interpretation and an Aristotelian interpretation. Which of the two interpretations provides the relevant background of Digby's view of the generation of composite substances? In what follows, I will suggest that it is the Aristotelian rather than the atomistic reading of Geber that gives the clue as to Digby's characterization of the role of minimal parts in mixture.

3.2. Minimal Parts: The Aristotelian Background

Indeed, an Aristotelian interpretation of Geber's notion of minimal parts can be found in the work of the influential early seventeenth-century physician and philosopher Daniel Sennert. Newman holds that, under the influence of alchemical corpuscular theory, Sennert explicitly promoted the Aristotelianism of *Meteorology* IV in favor of the more abstract works of Aristotle (Newman 2001b, 150–152). Recent commentators agree that in his earliest work, the 1600 version of the *Epitome naturalis scientiae*, Sennert is an uncompromising defender of Aristotelian matter theory (see Michael 1997, 275–286; Newman 2001a, 317–319). However, as Newman has pointed out, in subsequent years, Sennert became closely acquainted with the *Summa perfectionis* and other alchemical writings, as documented by numerous quotes from Geber and other "chymists" in the discussion of pharmacy in Sennert's *Institutiones medicinae* (1611) (Newman 2001a, 320–321).

Yet, can Sennert's later view of the generation of composite entities be reduced to his account of laboratory processes? In *De chymicorum cum Aristotelicis et Galenicis consensu ac dissensu* (1619), Sennert draws heavily on the work of the Renaissance physicist and philosopher Julius Caesar Scaliger. Famously, Scaliger coined the definition of mixture as the "motion of minimal bodies towards mutual contact, such that a union arises"

[11] Newman's revised translation; see Newman 2001a, 294.

[12] Similarly, Lasswitz understands Digby's philosophy of matter as a version of atomism (see Lasswitz 1890, 2:188–207).

(Scaliger 1557, Exercitatio 101). Although the notion of union, taken in isolation, could be understood as a relation between discontinuous minimal bodies, Scaliger explains that what he has in mind involves the generation of a unitary, continuous body (ibid.).[13] Sennert explicitly refers to this way of explicating Scaliger's slogan and accepts the reading that, in genuine mixture, there arises a continuous body and a unity with a form of its own (a "unum ens formaliter") (Sennert [1619] (1629), 210). Moreover, he holds that this view, as applied to minimal parts, coincides with "the opinion of the most ancient philosophers about mixture, and even that of Democritus, who stated that all things are composed of atoms & that generation is nothing but composition (*synkrisis*) and separation (*diakrisis*)" (ibid., 211). Some commentators have taken this statement as indicating a radical change in Sennert's view of matter – something that, as Emily Michael has suggested, could be described as a "sea change" (Michael 2001, 348–350; see also Newman 2001a, 321–325). Indeed, Sennert points out that a passage from the First book of the *Meteorology* favors an account of mixture in terms of associating and dissociating particles (Sennert [1619] (1629), 211–212; see *Meteorology* I, 346b21–22). Moreover, he describes laboratory processes in terms of the association and separation of minimal parts (Sennert [1619] (1629), 212–214). In particular, he takes these laboratory processes to provide evidence for the existence of mixture without a change of the constituents. He puts it thus: "[T]he corpuscles that are reduced to minimal parts . . . do not always lose their previous form (which someone may usurp as the opinion of Democritus when saying that atoms do not suffer anything), as we see in the chymical operations" (ibid., 212).

His views about formal unities suggest that Sennert holds an account of mixture in terms of *synkrisis* and *diakrisis* to be compatible with the Aristotelian view that, in mixture, a formal unity is produced. According to Sennert, Democritus does not exclude mixture but only wants "either that elements do not penetrate each, or that in mixture one does not always have to recur to elements & prime matter" (ibid., 211). Thinking about mixture in terms of a formal unity that allows for the persistence of parts fits well with Sennert's hierarchical account of the relation between subordinate forms of parts and the dominant form of composite substances. For example, with respect to living beings, he holds that their parts are "peculiar mixed bodies" (*peculiaria mixta*), having their own forms, while the dominating, "specific" form of the living being is everywhere the same (ibid., 104–105; see also 199; 204–205). Discussing mixture, Sennert comes back to his views on dominating and subordinate forms:

> I hold it to be more plausible that, in mixture, the ingredients are reduced to their minimal parts, and that they act on each other by means of contrary qualities: but that they do not loose their forms entirely (otherwise, if forms would be entirely annihilated, it would not be the mixture of mutable ingredients but rather the corruption of ingredients), but from all of them arises a single form, or rather all mixed &, as it were, brought together

[13] On diverging strands in Scaliger's views on mixture, see Lüthy 2001, 549–553.

> into one, remain under the domination of some higher form, from which a specific unity arises. (Ibid., 210)[14]

This dominating form accounts for the formal unity of a mixed substance, while allowing for the persistence of the forms of the ingredients. On the level of the parts, Sennert can describe mixture in terms of *synkrisis* and *diakrisis*, while on the level of the composite substance there is one specific form common to each part. In this way, Sennert's conciliatory approach to mixture is based on the idea of the compatibility of the chymists' view of mixture with the Aristotelian intuition that the form of a mixed body is everywhere the same.

3.3. Digby on Mixture and Organic Unities

Sennert's views on the role of minimal parts in mixture may give a clue as to what Digby may have had in mind when he claims that the views of Aristotle and the Atomists on mixture are equivalent and when he relates them both to the work of Geber. Two aspects of the way he uses the quotation from Geber deserve notice here. First, he mentions it as a maxim that could be invoked by the supporters of an alternative view of the role of homogeneity in animal generation. The fact that he rejects this alternative view of homogeneity does not imply that he rejects the maxim of Geber. Thus, using the quotation in this way is compatible with the affirmative attitude taken towards the end of the *Two Treatises*. Second, Digby explicates the quotation in a particular way. He says that it means not only that "no body can change an other, unlesse it enter into it" but adds: "and mixing it selfe with it do become one with it" (TT 222). Thus, rejecting one reading of the quotation – a reading associated with an atomistic conception of homogeneity – is compatible with a different reading – the reading that allows for Aristotelian compound unities arising from the mixture of minimal parts. If this is indeed Digby's view, his reference to Geber should not be understood as expressing a commitment to a corpuscularian theory of mixture. Rather, it can plausibly be understood as expressing the view, similar to Sennert's, that some aspects of experimental alchemical theory are compatible with an Aristotelian theory of composite substances.

Digby embraces a theory of composite substances, according to which a nascent organism is a true, individual unity and not only an aggregate of particles of varying rarity and density. He holds that parts of an organism are subordinated under other parts and that, moreover, the parts of the organism are mutually dependent on each

[14] At this place, Sennert leaves it open whether forms remain in a modified, "refracted" way (the view he takes in the 1618 edition of the *Epitome naturalis scientiae*) or integrally (the view he takes in the 1633 edition of the *Epitome* and the *Hypomnemata physica* of 1636). On this change in Sennert's view of the nature of subordinate forms, see Michael 1997, 289–290.

other, such that they are destroyed by their separation (see TT 204–205). Due to the existential dependence between the parts, the "compound of all these severall partes must needes be one individuall thing" (TT 205). Moreover, Digby writes about sensible living creatures:

> [I]n them, though every part and member, be as it were a complete thing of it selfe, yet every one, requireth to be directed and putt on in its motion by an other; and they must all of them (though of very different natures and kindes of motion) conspire together to effect any thing that may be, for the use and service of the whole. And thus we find in them perfectly the nature of a mover and a moveable . . . And now because these partes (the movers, and the moved) are partes of one whole; we call the entire thing *Automatum* or *se movens*; or a living creature. (TT 208)

According to the view of living beings articulated in this passage, the effect in one part of the organism is caused by another part of the same organism; thus, the effect is brought about by a cause that is external to the part where the effect occurs. Nevertheless, the effect is brought about by a cause that, due to the mutual dependence of the parts of the organism, is internal to a composite substance forming a genuine individual. In this way, the mutual dependence between the parts of an animal provides Digby with an account of animal self-motion without invoking an immaterial principle of agency. In his view, animal self-motion reduces to causal relations between mutually dependent parts of an organic whole.

Something analogous holds for the question of internal and external causes in animal generation. On the one hand, Digby is clear about his view that internal causes cannot be a matter of an immaterial vital principle, "a specificall worker within." Rather, he holds that at the initial stages of the generation of an animal, circumstances external to the seed are sufficient to transform the seed into a different substance (see TT 219). On the other hand, he acknowledges that the structure of composite substances becomes more complex at a later stage in the chain of transformations. The appearance of a *punctum saliens* – a pulsating red spot on the membrane of the yolk of a fertilized egg – during the development of a chick provides an example:

> [T]he part in which heate doth most abound; and which is the interiour fountaine of it, from whence . . . all the other partes derive theirs; must be formed first and the others successively after it, according as they partake more or lesse, of this heate; which is the Architect that mouldeth and frameth them all. Undoubtedly this can be none other, but the hart: whose motion and manner of working, evidently appeareth in the twinckling of the first red spotte . . . Yet I do not intend to say, that the hart is perfectly framed . . . with all its partes and instruments, before any other part be begunne to be made: but only the most virtuous part; . . . which serveth as a shoppe or a hoat forge, to mould spirits in: from whence they are dispersed abroad to forme and nourish other parts that stand in neede of them to that effect. (TT 225–226)

To be sure, this passage is opaque. Nevertheless, it seems to suggest the view that after the development of the *punctum saliens*, the formation of an embryo is no longer only the effect of external heat (e.g., the heat of the hen breeding over the egg). Rather, it displays a structure analogous to the structure of the action of one part of a developed organism on another part of the same organism. The action of the *punctum saliens* is a cause that is external to other parts of the developing embryo. However, because other parts of the developing embryo could not exist without the agency of the *punctum saliens*, the parts of the embryo form a composite whole. This composite whole is not yet an animal; however, it displays the hierarchical structure and existential dependency between parts constitutive of individual things. This is why, in Digby's view, the interaction between the parts of an organism are not interactions between the parts of a mere aggregate. Understanding an organism as an aggregate (or as a mere mereological sum of parts) would make the distinction between internal and external causes meaningless. There would be no individual relative to which causation could be described as internal. Things are different if nascent organisms are understood as true unities. In this case, the causal interaction between parts or such an organic unity can be described as internal relative to an individual. According to Digby, the agency of the *punctum saliens* in the process of the formation of a chick is internal to a composite substance in the sense that the *punctum saliens* is part of an organic individual.

One might conclude that Digby's theory of animal generation is indeed part of a conciliatory approach to natural philosophy. As far as his conception of rarity and density and of the development of compound unities is concerned, Digby's theory of animal generation incorporates Aristotelian components.[15] However, it also departs markedly from the biological views of other Aristotelians in the sixteenth and seventeenth centuries because it does not invoke the agency of a vegetative and sensitive soul in the generation of animals.[16] Instead of an immaterial principle of activity, Digby explains animal generation and animal self-motion as the interaction of mutually dependent parts of an organic individual. According to his view, this interaction in the last analysis reduces to the interaction of particles displaying various proportions of rarity and density. Although the composite substance of which they are a part changes as a whole, the minimal particles can remain unchanged during the process of animal generation. This is how Digby combines an Aristotelian theory of

[15] Indeed, the central role of rarity and density in the explanation of natural phenomena rendered Digby's philosophy of nature sufficiently Aristotelian for Thomas White's putting his more accessible exposition of the doctrines of the *Two Treatises* under the heading of a textbook in Peripatetic philosophy. See White 1646.

[16] For example, the Paduan Aristotelian, Fortunio Liceti, holds that vegetative and sensitive souls emerge from the combination of the forms of elements, and are true unities that function as the formative principles of the embryo. See Liceti 1602, book II, chapter 1. Sennert, the Wittenberg Protestant, holds that animal souls, in the processes of nutrition and augmentation, have the capacity to communicate their form on new portions of matter, and thereby are the active principles governing the development of the embryo. See Sennert 1636, Hypomnema IV, chapter 4. On Sennert's theory of animal generation, see Arthur 2006.

composite substances with a corpuscularian account of the ultimate constituents of organic bodies.

Moreover, embedding his theory of animal generation in such a conciliatory approach to the metaphysics of composite substance serves Digby's overall ecumenical goal. On the one hand, it provides rich explanatory resources for the complexity of the phenomena involved in animal generation and animal behavior. In explanatory power it is thus superior to a purely corpuscularian account of animal generation and animal behavior. At the same time, it allows Digby to exclude the phenomena characteristic of the intellective soul from the realm of what can be explained by means of the complex interaction of material particles. In particular, his theory of animal generation involves a conception of animal self-motion that is independent of the supposition of an immaterial principle of agency in animals, such as vegetative or sensitive souls. Because Digby's theory of animal generation involves such a "thin" conception of animal self-motion, it fulfils the aim of the first part of the *Two Treatises*: to delineate the powers of matter in way such that the intellectual capacities of the human beings discussed in the second part of the work necessarily come out as being inexplicable by means of the powers of matter, thereby presupposing an immaterial, and hence naturally immortal soul.

4. Animal Generation and the Epistemology of Common Notions

Nevertheless, characterizing Digby's strategy in this way leaves us with the question why he thought exactly this way of combining elements from different philosophical traditions to be a convincing one and, in particular, a convincing one for the opponents caught in religious dispute. As I pointed out in section 2, Digby regards the concepts of rarity and density as part of a hypothetical strategy. To be sure, explanatory power may play a role in evaluating such a hypothesis. Nevertheless, Digby held a stronger view concerning the evaluation of hypotheses. Indeed, in the Conclusion to the first part of the *Two Treatises* he writes: "I have not yet seene any piece upon this subject, made up with this methode; beginning from the simplest and plainest notions, and composing them orderly: till all the principal variety which their nature is capable of, be gone through" (TT 341). He goes on to make it clear that he is aware of the sketchy nature of his work. But he thinks that, in principle, it should be possible to fill out the framework outlined in the first part of the *Two Treatises*, so as to reach a full demonstration of the phenomena of the bodily world. As he thinks, out of these demonstrations "do spring much higher and nobler effects, for mans use and life, then out of any Mathematical ones; especially when they extend themselves to the government of *Man* as he is *Man*: which is an art, as fare beyond all the rules of Physicke, or other government of our body, or temporall goodes" (TT 341). He points out:

> In our proceeding, we have the precedency of nature: for laying for our ground, the naturall conceptions which mankind maketh of quantity; we find that a body is a meere

> passive thing, consisting of divers partes, which by motion may be diversely ordered; and consequently, that it is capable of no other change or operation, then such a motion may produce. (TT 342)

More technically, his views on the evaluation of hypotheses employ the Stoic-Epicurean epistemology of common notions. Interestingly, this epistemology was also championed by one of Digby's Paris acquaintances, the French Philosopher Pierre Gassendi. As John Henry has pointed out, Digby discusses an atomist argument of Gassendi's, which was unpublished at the time (Henry 1982, 215, n. 22; see TT 154–155). Likewise, it seems plausible to assume that Digby's view of the role of common notions is influenced by the role of common notions in Gassendi's epistemology, also unpublished at the time of the *Two Treatises*.

In the *Animadversiones in decimum librum Diogenis Laertii* (1649), Gassendi writes about the nature of common notions or "anticipations": "[A]n anticipation is at first some singular thing, or, so to speak, the idea of a singular thing, in so far as it is impressed by a singular thing and represents the singular thing by which it is created; but subsequently it is a universal, insofar as not only the thing by which it is created but also by means of its imitation several similar ones are imagined by the mind" (Gassendi [1649] 1675, 1:80).[17] Moreover, he gives to his view of the nature of anticipations the following canonical formulation: "All anticipation or precognition, which is in the mind, depends on the senses, and this either by means of incursion, or proportion, or similitude, or composition" (ibid., 1:90). Interestingly, he deals with the issue of anticipations under the general heading of criteria of truth, and he explains that a criterion is "an organon or an instrument of judging" (ibid., 1:71). Moreover, he explicitly identifies the Epicurean *prolepsis* with the Stoic "common notions," with Aristotle's "pre-existent cognition," and with Cicero's "presumption" and "information anticipated in the mind" (ibid., 1:79).[18] Especially using the juridical term "presumption" to characterize the nature of anticipations makes it clear that what Gassendi has in mind is not something like an empirical *justification* of common notions. Gassendi's theory of common notions is not a form of empiricism. Rather, he sees the relation of sense perception to common notions as initially a purely causal one. Nevertheless, these concepts subsequently acquire a new function as criteria for judgments about the truth of propositions.

Digby, too, uses common notions as a criterion for the evaluation of hypotheses of natural philosophy. In particular, he argues that our common notions speak in favor of the Aristotelian conception of rarity and density. He suggests that "we should acquiesce and be content with that naturall and plaine notion, which springeth immediately and

[17] On Epicurus' theory of "proleptical" notions and Gassendi's adaptation of this theory, see Detel 1978, 33–38; 52–55. On the role of the reception of the theory of common notions in the theory of animal generation of Digby's contemporary, Walter Charleton, see Blank 2006.

[18] Gassendi refers the reader to Aristotle, *An. post.* 1, 1, and to Cicero, *De divin.* 2.

primarily from the thing it selfe: which when we do not, the more we seeme to excel in subtility, the further we goe from reality and truth" (TT 4–5). Common concepts belong to the natural impressions the thing makes on us, and for this reason are as close to the nature of the thing as we can get. Of course, Digby faces the difficulty of how to make such natural notions relevant to philosophy. Indeed, he distinguishes between two kinds of languages. The one "belongeth in generall to all mankind, and the simplest person, that can but apprehend and speake sense, is as much judge of it"; the other language "is understood onely by those that in a particular and expresse manner have beene trained up unto it" (TT 5). Digby associates this second kind of language in particular with the "Doctours of the Schoole" (TT 5) as well as with "Geometricians, Astronomers, Carpenters, Masons, and such persons as converse familiarly and frequently with those thinges" (TT 5–6). However, in a move typical of early modern Aristotelianism,[19] he dissociates Aristotle's conception of the categories from the realm of technical and scholarly languages:

> Of the first kind, are those tenne generall heads, which Aristotle calleth Praedicaments: under which he (who was the most judicious orderer of notions, and directour of mens conceptions that ever lived) hath comprised whatsoever hath, or can have a being in nature . . . Of the second sort, are the particular wordes of art by which learned men use to expresse what they meane in sciences . . . (TT 5–6)

Thus, according to Digby, categorial concepts such as "quantity" do not belong to the technical vocabulary of specialists but rather are part of ordinary language. And, as he points out, "to understand the other kind of plaine language, we must observe how the wordes that compose it are apprehended, used, and applied by mankind in generall" (TT 6)

He illustrates this conception of common concepts with the concept of being in a place. As he claims, this concept is "the same in all men living" (TT 6). "[A]ske any simple artisan; Where such a man, such a howse . . . is; . . . he will tell you, the man you aske for, is in such a church, sitting in such piew, and in such a corner of it; that the howse you enquire after, is in such a streete, and next to such two buildings on each side of it" (TT 6). Digby takes these answers to indicate that the concept of being in a place, for all human beings, naturally is the concept of "a bodies being environed and enclosed by some one, or severall others that are immediate unto it" (TT 6). To put it differently: according to Digby, a relational concept of place is the natural concept common to all human beings. And, as he points out, deviating in the construction of philosophical theories from the original sense of concepts in which all mankind agrees is "the cause of greate errors in discourse" (TT 6).

Because categorial concepts can be understood by means of an analysis of the use of everyday language, they can, according to Digby, function as criteria in the evaluation

[19] On this strategy, see Mercer 1993.

of hypotheses in natural philosophy. As I mentioned in section 2, Digby uses a particular conception of quantity – the conception of quantity as divisibility – to argue for the adequacy of the Aristotelian concepts of rarity and density (see TT 17). Concerning quantity, he writes that "if we ayme at right understanding the true nature of it, we must examine, what apprehension all kindes of people (that is mankind in generall) maketh of it" (TT 8). As he qualifies, the aim of applying common notions is not to make people without a scientific background judge physical principles concerning quantity, such as the principle of the conservation of quantity. Rather, the aim is to make them judge "the naturall notion which serveth learned men for a basis and foundation to build scientificall superstructures upon" (TT 8). Digby formulates the assertion that common notions function as a basis for scientific theories as a claim about how scientific concepts acquire content. According to his view, "[i]t is the indisciplined multitude that must furnish learned men with naturall apprehensions and notions to exercise theire wittes about" (TT 8). Because they confer content to theoretical concepts, common notions also function as criteria for adequate theory formation – as Digby points out, they function as the "norm of discourse" (*norma loquendi*) (see TT 8). Digby applies this strategy from the very beginning of the *Two Treatises*, when he opens the first chapter as follows: "In delivering any science; the cleerest and smoothest methode, and most agreeable to nature; is to begin with the consideration of those things, that are most common and obvious" (TT 1). In particular, he points out that when thinking about body, "the first thing which occurreth to our sense in the perusal of it, is its *Quantity*, bulke, or magnitude: and this seemeth by all mankind, to be conceived . . . inseparable from a body" (TT 1). Moreover, Digby ascribes an analogous methodological outlook to Lucretius, "who studying nature in a familiar and rationall manner telleth us" that except for bodies no other things are capable of touching and being touched (TT 1). Subsequently, Digby applies his normative conception of common notions to the concept of quantity. He writes:

> If then any one be asked; what Quantity there is in such a thing, or how greate it is; he will presently in his understanding compare it with some other thing, (equally known by both parties) that may serve for a measure unto it; and the answere, that it is as bigge as it, or twice as bigge, or not half so bigge, or the like . . . Which answere, every man living will at the instant, without study, make to this question; and with it every man that shall aske, will be fully appayed and satisfyed: so that it is most evident, it fully expresseth the notions of them both, and of all mankind, in this particular. (TT 9)

Digby holds that the common notion of quantity is nothing but the extension of a thing, "expressed by a determinate number of lesser extensions of the same nature," such that "the whole by comprehending those partes, is a meere capacity to be divided into them" (TT 9). He concludes that quantity is nothing but divisibility (TT 9). In this sense, the conception of quantity as divisibility is meant as an explication of our everyday concept of quantity. Moreover, Digby argues that the distinction between substance and quantity is also present in our "familiar discourse," when we, e.g., say

that Socrates was bigger as a man than as a boy, or that boiling milk runs over the pot it is in (TT 25).

Finally, Digby argues that quantity may be changed while substance remains unchanged. The cases of boiling milk or boiling water provide him with striking examples of a change of quantity in an unchanged substance (TT 25). Thus, in Digby's view, not only the concept of quantity as divisibility belongs to the realm of common notions, but also the distinction between substance and quantity as well as the independent variability of substance and quantity. This conceptual framework leads Digby to the view that using the Aristotelian concepts of rarity and density amounts to a good hypothesis. It is a hypothesis that is compatible with what he regards as the common conceptual equipment of rational beings. Rarity and density can be used as starting points in an account of the nature of matter and the generation of living beings because they are compatible with common notions – with notions which every rational being should be able to agree.

In this way, using the concepts of rarity and density as starting points in forming hypotheses about the material world and the generation of living beings is part of an epistemologically grounded conciliatory approach to natural philosophy. At the same time, it is part of an epistemologically grounded ecumenical program. For if matter is characterized using the concepts of rarity and density, there are, as Digby argues at length in the first part of the *Two Treatises*, physical explanations for the generation of inanimate and animate bodies as well as for animal behavior. But, as he aims to show in the second of the *Two Treatises*, there is no physical explanation for many operations of rational souls. And, as he holds, if souls are immaterial, they are naturally immortal – a view to which, according to him, all rational beings sharing the same common notions are compelled to concur.

5. Conclusion

In his account of animal generation, Digby uses the Aristotelian conception of rarity and density to explain how, by means of the agency of external causes on animal seeds, and subsequently by the joint agency of external and internal causes on the parts of an organic whole, the homogenous matter of the seed gradually gets transformed into a living being. According to his view, this transformation involves a large number of very small transformations. In the first step, the proportion of rarity and density in the matter of the seed accounts for the less homogenous structure of a composite substance produced by environmental factors. Moreover, each step in the chain of gradual transformations is described as a new composite substance rather than as an aggregate of particles. To be sure, Digby claims that his account of composite substance is both Aristotelian and compatible with corpuscularian conceptions of minimal particles. Nevertheless, his claims about substantial change in the process of the generation of living beings indicate his adherence to the view that, in genuine mixture, a new substantial unity is produced. As I suggested, Digby's attitude towards the tradition of

corpuscularian alchemy should be seen from the perspective of the role of minimal parts in early modern Aristotelian theories of mixture, as exemplified in the work of Scaliger and Sennert. Having the role of true composite entities in Digby's theory of animal generation in mind makes it clear why his philosophy of nature cannot be reduced to his corpuscularian views. Rather, it is part of a strategy that is genuinely conciliatory.

Moreover, Digby does not choose Aristotelian concepts simply on the grounds that he expects them to be acceptable to all parties in the ongoing religious-political conflict between Catholics and members of the Church of England. Rather, he bases his choice on a theory of common notions as applied to categorial concepts such as "quantity" and "substance." In this way, the very concepts upon which Digby's theory of animal generation is built – the concepts of rarity and density – are part of a hypothetical strategy, the adequacy of which is demonstrated by means of its agreement with concepts generally accepted by all rational users of everyday language. His account of animal generation is meant to demonstrate the explanatory power of the concepts of rarity and density with respect to the phenomena of life. At the same time, it forms part of a strategy that aims at limiting the range of phenomena that can be explained physically. Although Digby holds that complex phenomena such as the generation of living beings and animal behavior can be explained by means of the interaction and arrangement of particles of various rarity and density, he thinks that this is not the case for the operations of rational souls. His account of animal generation fulfills a dual function: first, to show that there is no need for postulating occult vital forces for the explanation of the phenomena of life; and second, to make clear that the interaction and arrangement of particles of various rarity and density does not go further than explaining the phenomena of life. As he argues, embracing a conception of matter that is in accordance with the common notions of quantity and substance entails that the operations of the intellect can only be explained by means of an immaterial, and hence naturally immortal rational soul. And this is what he describes as the "main, and great question" of the *Two Treatises* (TT 342).

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