Chapter 11
Mysteries of Living Corpuscles: Atomism and the Origin of Life in Sennert, Gassendi and Kircher

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Abstract This paper aims to spotlight some important, but neglected, aspects of early modern interactions between matter theories and the life sciences. It will trace the ways in which atomistic or corpuscular modes of reasoning were adopted to explain the origin of life. To that end this paper will examine three seventeenth-century natural philosophers: Daniel Sennert (1572–1637), Pierre Gassendi (1592–1655) and Athanasius Kircher (1602–1680). Through the analysis of their discussions on the minute constitutive parts of living beings (plants, animals and human beings) as living corpuscles, it will inquire into the exchange of ideas among those who advocated “non-mechanist” or “vitalistic” types of corpuscular philosophy (Here I am using the term “vitalistic” broadly construed as the currents that emphasized the role of the life principle or vital principle). This paper’s ultimate goal is to shed light on the role of bio-medical ideas in seventeenth-century natural philosophy.

Keywords Atomism • Vital principle • Seminal principle • Spirit • Soul • Matter • Life • Sennert • Gassendi • Kircher • Redi

11.1 Introduction

Despite the alleged empirical proofs and counterarguments against the postulate of ultimate particles, atomistic or corpuscular matter theories triumphed by associating themselves with a mechanistic philosophy of nature in the seventeenth century. This
alliance has often been acknowledged as the foundation of modern science.\(^1\) Atomism, well adopted in such domains as physics, optics and microscopy, however, became too mechanistic to avoid the conventional objections reiterated in medieval university teachings. “Vitalistic” or non-mechanistic types of corpuscular reasoning could circumvent many of these objections, explaining various phenomena especially in biological and medical fields. Recovering and reconstituting their forgotten role will surely help elucidate the evolution of early modern corpuscular philosophy.

This study is only a first step of such an attempt, and, by way of examining some “vitalistic” or non-mechanistic corpuscular ideas, will address seventeenth-century interactions between philosophy and medicine, or more precisely, biological and medical ideas. To this end I will focus on three authors: Daniel Sennert of Wittenberg, French atomist Pierre Gassendi and Jesuit polymath Athanasius Kircher. They addressed the emergence of life in terms of living or “ensouled” corpuscles. This idea might be regarded as contrary to a mechanistic view of nature. Although these figures were highly influential in their own time and their works widely read, their ideas have not attracted their due attention in the traditional narrative of the history of science and philosophy. They do not seem to belong to a single current. By analyzing their divergent ideas, I hope to shed light on their common sources and eventual interactions.

11.2 Sennert, Corpuscles and Spontaneous Generation

A professor of medicine at the University of Wittenberg, Daniel Sennert (1572–1637) has recently drawn renewed interest from scholars. His work encompasses a cluster of issues raised by the intersection of matter theories and the life sciences in the early seventeenth century.\(^2\) In this field, the origin of life was one of the most important questions, and a belief in spontaneous generation (i.e., abiogenesis, or the emergence of life from lifeless matter) played a key role. To address this very issue, Sennert wrote On the Spontaneous Generation of Living Beings (De spontaneo viventium ortu), a treatise published at the end of his philosophical masterpiece, Physical Memories (Hypomnemata physica) (Sennert 1636). In this treatise, important in its own time but unfairly overlooked by historians, he developed a corpuscular interpretation of the emergence of life.\(^3\)

Sennert’s Hypomnemata physica are composed of five books treating, respectively: (1) the principles of natural things; (2) occult qualities; (3) atoms and mix-

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\(^{1}\)On the history of atomism, see among others Lasswitz 1890/1926; Hooykaas 1983[orig. 1933]; van Melsen 1952; Emerton 1984; Clericuzio 2000; Lüthy et al. 2001.


\(^{3}\)I have used the text of Sennert 1650, 132–242.
tures; (4) the generation of living beings; and (5) spontaneous generation. In the fifth and last book, after dismissing the series of causes for spontaneous generation advanced before him, Sennert argues that this phenomenon occurs by an internal principle lying hidden in matter. Living beings, he adds, that do not reproduce themselves through seeds still possess something analogous. He calls this entity “semenal principle” (*principium seminale*) or “soul” (*anima*).4

To describe the presence of this hidden principle in matter, Sennert first tries to explain two modes by which the soul resides in the body: (1) the soul acts as a form in the body; and (2) the soul performs the functions of life through bodily organs. The former corresponds to the first and essential actuality and the latter to the second and accidental actuality. To these Sennert adds a third mode:

But besides these two modes there is yet a third and the soul can be in some matter after yet another way without informing or vivifying this matter or providing the actions proper to this living being. Thus the seeds of plants and animals can reside in water and earth and the soul [can reside] in these [seeds] without informing or vivifying water or earth.5

Thus the soul is contained in a thing as if it were placed in a container. The soul in this state remains dormant without informing or vivifying the container. Once this latent soul is placed under suitable conditions, it starts to execute its functions: informing the body as its form in the first actuality and vivifying it in the second actuality.

As every seed contains a soul or an analogous principle in the eyes of Sennert, the omnipresence of seeds in the world, earth and water, directly signifies that of souls. That is why, he argues, Aristotle taught in his *Generation of Animals*, 3.11: “There is water in earth, and *pneuma* in water, and in all *pneuma* is soul-heat, so that all things are in a sense full of soul.”6 According to Sennert, Aristotle did not mean that all things are animate, but that there is in all things such a hidden entity that becomes manifest and executes the functions of life when it encounters suitable conditions.

Accounting further for the omnipresence of this special entity, Sennert introduces a corpuscular interpretation. According to him, minute corpuscles, coming from the bodies of living beings and their cadavers, are scattered and diffused everywhere in the world by such factors as wind and rain. Each of these corpuscles is endowed with a soul, and their wide diffusion explains the omnipresence of souls in the natural world.7

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4Sennert 1650, 5.2, 214–215.
7Sennert 1650, 5.2, 216. For Sennert this is the real meaning of Aristotle’s words. For other interpretations in the Renaissance, see Hirai 2005, 143, 147; Hirai 2011, 42, 95, 112, 124, 148.
To illustrate the presence of a soul in these corpuscles, Sennert chooses the example of the “chymical” (chemical/alchemical) dissolution of metals by qualifying this phenomenon as the clearest explanation of all. According to him, gold and silver are dissolved into minima, that is, minute corpuscles or atoms, by special acids. Even dissolved, the forms of gold and silver are entirely preserved, although they do not inform the acids in which they swim. These forms exist in the acids and remain dormant as if contained in a vessel. Although gold and silver are divided into atoms or minute corpuscles, they retain entire their essence in these atoms. Sennert applies the same reasoning to the soul of living beings. In his view the seed’s matter, provided as a suitable subject or carrier of the soul, is so well disposed that it can retain the soul within itself even if it is divided into the state of minima. Without being altered in their essence, the souls can reside in these minima and remain dormant. In the case of living beings, concludes Sennert, their seminal force can persist with the soul even down to the level of atoms. As he applies the example taken from the mineral kingdom to that of plants and animals, the traditional clear-cut distinction between living beings and non-living things advanced by the Aristotelians is blurred in his system.

Relying on this account of metallic dissolution, Sennert explains the way spontaneous generation occurs. According to him, whether it is called “seed,” “semen principle” or “soul,” there must first be some special entity that comes from the bodies and cadavers of living beings and lies hidden in the water and the earth. When this entity is placed under suitable conditions and stimulated by ambient heat, it begins to perform the functions of life. This special entity, made of minute corpuscles endowed with a soul, is the real origin of the generation of inferior living beings such as bugs and insects, which were believed to be born spontaneously.

Sennert’s atom is the carrier of a form in the case of minerals and the carrier of a soul in the case of living beings. The soul can be conceived as a higher type of form. Now let us take a closer look at the relationship between the soul and its carrier atom. First of all, in Sennert’s hierarchy of corpuscles, the “atoms” of living beings are corpuscles composed of primordial atoms. In this sense they may correspond better to the particles that would be called “molecules” (moleculae) or “seeds of things” (semina rerum) by Gassendi.

Sennert then argues that although the soul residing in one atom is weak, several atoms can be united, allowing the souls contained therein to gather and become more powerful. He reports this idea under the authority of Fortunio Liceti (1577–1657), a Paduan professor of philosophy and a friend of Galileo Galilei (1564–1642). Although barely known to historians, Liceti was respected and influential in his own time. He was interested not only in natural philosophy, but also in biological and medical issues, especially those related to generation, embryology, and teratology or monstrous births. Among other writings Liceti published a treatise entitled On

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8 I have adopted the term “chymistry” to avoid any arbitrary distinction between chemistry and alchemy which did not exist in Sennert’s time. See Newman and Principe 1998.
9 Sennert 1650, 5.2, 216.
10 On Gassendi’s idea, see Sect. 11.3 below.
11 On Liceti, see Ongaro 2005; Marangio 1973; Blank 2010b; Hirai 2011, 123–150. I have used the following edition: Liceti 1618.
the Spontaneous Generation of Living Beings (De spontaneo viventium ortu) in Vicenza near Padua in 1618. Entirely devoted to the problem of spontaneous generation, this treatise collects and studies the ideas formulated on the phenomenon from antiquity to the sixteenth century, followed by Liceti’s own theory. It can be qualified as an “encyclopedia” of spontaneous generation. Sennert entitled his own treatise after Liceti’s. If we turn to the work of Liceti, we can observe him claiming almost the same point as Sennert, even with the use of the term “atom,” which is not typical for him. Thus these two ideas: (1) the residence of a soul in one atom; and (2) the gathering of the souls of many atoms, are not original to Sennert, but must be attributed to Liceti himself.12

What is more striking comes next. Like Liceti Sennert accepts the idea that the seeds of living beings do not always appear as visible bodies but sometimes as minute corpuscles enclosing a soul and lying hidden in the water and the earth. Although Liceti admitted that these corpuscles act as seeds and correspond by analogy to them, he was not willing to call them “seeds.” By contrast Sennert finds no reason to refuse them this title. Arguing that such an entity, if not “seeds,” can at least be called “seminal principle,” he adds:

Indeed what primarily constitutes a seed is neither its external figure nor its formation in a definite way, but the soul latent in it, with that implanted spirit which is said to correspond to the element of the stars and makes the seeds fertile. Since they, with their subject, can even reside in minute corpuscles, there is no reason why they cannot be called “seeds” in their own way, or “seminal principle.” The soul lying hidden in such corpuscles does not inform the earth or the water which contains it. But lying hidden in these [elements] as in a vessel, it nevertheless informs these corpuscles in which it resides as if it were in its proper subject, and exists in them under the first actuality. It attains the second actuality when it finds a suitable place.13

The part “that implanted spirit which is said to correspond to the element of the stars and makes the seeds fertile” is an allusion to a passage in Aristotle’s Generation of Animals, 2.3, which was repeatedly commented on by embryological writers during the Renaissance. Natural philosophers and physicians fueled the debate, which culminated in the emergence of a new “astral medicine.”14 Thus Sennert is paying attention to this tradition. But what is more important for the purpose of the present study is that, according to Sennert, the soul of one atom of a living being does not inform or animate the earth or the water which surrounds this atom, since they are only its recipients, but rather this same soul well and truly animates the atom which

carries it. Thus Sennert’s atom or molecular corpuscle is not a mere vehicle of the soul. Being itself animated, it provides the basis for living matter. He coins the name of the “seminal principle” for this special soul. Sennert built his philosophical reflection on this particular conception of the soul. For him the soul informs and vivifies its vector corpuscle to guarantee the permanence of the species. This particular conception thus holds the key to understanding Sennert’s notion of the seminal principle. In the mid-seventeenth century, the young Robert Boyle (1627–1691), as an assiduous reader of Sennert, was to be keenly interested in the notion of seminal principle and pay it considerable attention.\(^\text{15}\)

In a previous study, I showed that Sennert was well informed of the theory of the invisible and spiritual seeds of things, advanced by the Danish Paracelsian Petrus Severinus (1540/42–1602).\(^\text{16}\) In his treatise On the Agreement and Disagreement of the Chymists with the Aristotelians and the Galenists (De chymicorum cum Aristotelicis et Galenicis consensu ac dissensu) (Sennert 1619), Sennert rejected this theory by identifying these spiritual seeds as substantial forms or souls themselves.\(^\text{17}\) To his eyes, Severinus and the other chymists who followed him unnecessarily multiplied terms to refer to the same thing. It is true that Sennert’s conceptions of the seminal principle and living corpuscles hint at certain ideas of Severinus. As we have seen, however, the fundamental inspiration for his corpuscular interpretation of the origin of life derived from his reading of Liceti’s work.

11.3 Gassendi and Seminal Molecules

Like Sennert, Pierre Gassendi (1592–1655) was one of the most fervent defenders of the newly revived atomism.\(^\text{18}\) He was also quite familiar with the chymical philosophy of his time. In his masterpiece Syntagma philosophicum (Lyon 1658), he supports the idea that minerals and metals result from “seeds” (semina) created and disseminated in the earth by God at the moment of Creation. To explain the nature of these seeds, he acknowledges the existence of a certain internal power, called a “seminal force” (vis seminalis). According to him, this force, residing in the seeds of minerals and metals, guarantees the regularity of their structure, figures, colors and geographical distribution. Gassendi then introduces the notion of an “elaborator spirit” (spiritus elaborator) as the vector of this force. The formation of minerals and metals is thus explained in a similar way to living beings by the invisible seeds conceived in the form of a spirit. He further integrates an atomistic interpretation for the structure of these seeds.


\[16\] On Severinus, see Shackelford 2004; Hirai 2005, 217–265 (and 401–403 on Sennert’s debt to Severinus).

\[17\] I have used the following edition: Sennert 1633, here 1.9, 88.

\[18\] On Gassendi, see among others Bloch 1971; Osler 1994; Murr 1997; Fisher 2005; LoLordo 2006; Taussig 2009. The present section is based on Hirai 2003 and 2005, 463–491. I have used the text of Gassendi 1658. His Syntagma philosophicum is found in its first and second volumes (hereafter SP I and SP II, followed by the page number with column a or b).
In the field of biology, the determined geographic distribution of plants leads Gassendi to appeal again to the idea of a seminal force carried by invisible seeds, just as in the case of minerals and metals. The visible seeds of plants are, according to him, constructed through the union of these invisible seeds. Gassendi then argues that plants and their visible seeds are endowed with a soul. For him this soul is nothing but a corporeal substance diffused in the whole body of a plant. He compares it to a “spirit” (*spiritus*) or “miniature flame” (*flammula*), which is, to him, extremely subtle, pure and active. Because of their perfection, visible seeds can preserve this special substance for a long period. Gassendi then refers back to the idea of seminal force:

Certainly, you will not consider that the grain of wheat, when it is preserved in a storehouse, is deprived of this kind of substance or soul as well as life (it is rather called “seminal force,” but it is almost the same thing). For it lies dormant as long as there is no heat or humidity outside [...].

The seminal force is conceived here as almost synonymous to the soul, which is for Gassendi a corporeal substance in the form of spirit or miniature flame. He adds that the soul of a new plant is already present in the visible seed. This soul, called “miniature soul” (*animula*), stems from the soul of the parent plant. The French atomist likens the departure of the *animula* from the parent soul as the emancipation of a daughter from her family.

As for the soul of animals, Gassendi also conceives it as a corporeal substance like “a flame composed of very fine, mobile and active corpuscles.” As in the case of plants, the visible seeds of beasts are animated by their internal *animula* conceived as a “lighted torch.” Calling upon the image of the soul as burning particles, depicted by Democritus, Gassendi explains that these particles go here and there to produce “molecules” (*moleculae*), which are the invisible “seeds of things” (*semina rerum*). These seeds are further united to form the visible seeds in the generation of animals. In Gassendi the spontaneous generation of plants and animals also occurs because of these invisible seeds or their internal *animulae*. To conclude his discussion, he reveals what is contained in these invisible seeds:

[We must] confess that nothing has been done to produce the true knowledge of that internal and invisible economy and to expose to our mind’s eye that artist or craftsman, so to speak, who skillfully serves tiny instruments so sophisticated in elaborating matter into so proportionate a work [...]. That is why there remains to us, having admired works inimitable and exceeding all human understanding, to sing a hymn to that divine and incomparable Architect who created and established these craftsmen, so to speak, endowed with such great providence, diligence and faculty in the seeds of things [...].

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19 Gassendi 1658, *SP* II, 172b. “Ne putes certe tritici granum, cum asservatur in horreo esse orbatum tali substantia, sive anima, atque vita (vim seminalem potius vocant, sed perinde est) ea quippe duntaxat consopita manet, donec deest, humor, calorque exterior [...].”


21 Gassendi 1658, *SP* II, 267a. “[...] fatendumque est nihil esse actum, quod germanam notitiam creet internae illius, occultaeque economiae, quod obiciat mentis obtutui artificem illum, sive quasi fabrum scite organulis adeo exquisitis utentem ad elaborandum materiam in opificium adeo concinnum [...]. Quare superest, ut mirati opera inimitabilia, captumque omnem superantia hymnum canamus divino illi, ac incomparabili Architecto, qui intra rerum semina creavit, constituitaque hosce quasi fabros tanta providentia, industria, atque facultate instructos.”

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In Gassendi these invisible seeds possess a corpuscular structure within the framework of a mechanistic system. But they are endowed with striking properties that guarantee the regularity and stability of each species. These properties exceed the limit of pure and simple mechanism. They result from the contents of the invisible seeds: internal craftsmen and their “knowledge” or “science” (scientia). Gassendi explains that there is nothing more admirable than this kind of scientia assigned to invisible seeds for the careful and constant elaboration of the bodies of natural things. According to him, God the Creator imprinted this scientia on these invisible seeds. What does Gassendi mean by this special scientia?

In a lesser-known passage in his discussion devoted to the chymical principles, Gassendi tries to show that the extraordinary regularity of natural things does not result from the simple combination of the four traditional elements (fire, air, water and earth) of the Aristotelians or the three principles (Sulfur, Mercury and Salt) of the Paracelsian chymical philosophers. He insists on the existence of a seminal power that disposes these elements and principles, and discloses the source of his ideas:

Only that famous Severinus clearly perceived the truth, and the others like Quercetanus who followed him, when he posited numerous invisible seeds beyond the four elements and the three principles. These seeds can also be called “principles” and “elements” while the grosser elements are, so to speak, just their vestments, matrices and receptacles, so that everything receives from them not only its vigor and action but also its art and scientia by which the mechanical spirits contained in these seeds have a power to form the body of minerals, plants and animals as well as their parts. Let us consider them those elaborator spirits […]. Severinus would also say, as he will, that these principles are the mechanical spirits endowed with the scientia and vigor to act. When he said, he said at once everything that he would never repeat. For he would never tell in general how this idea or scientia elaborating the work can settle in a certain spirit which is a thing so thin, invisible and impalpable; the consideration of the goal to which [the spirit] prepares the work; the knowledge of matter and necessary conditions, by which matter is made appropriate; the distinction of the ratio or mode, by which [matter] must be reduced, turned, returned, mixed, separated, fashioned and perfected; and how settles the vigor or energy now to use convenient instruments and now to execute everything prescribed by this scientia.23

22 On French Paracelsian Joseph Du Chesne (1546–1609), alias Quercetanus, see Hirai 2010.

23 Gassendi 1658, SP II, 558b–559a. “Unus praecclare rem agnovit membratus iam Severinus, et qui illum sunt, ut Quercetanus, aliqua sequiti, cum praeter quatuor elementa, et tria principia, innumera posuit invisibilia semina, quae etiam principia, elementaque valeant, quorumque haec crassiora sint solum quasi vestimenta, matrices receptacula; idque ut ipsis ommin non modo vigorem, actionemque acceptam ferat, sed etiam artem, et scientiam, qua contenti in ipsis mechanici spiritus polleant ad efformandum, ut mineralium, sic vegetabilium, animaliumque corpora, ipso- rumque partes, ut puta elaboratores isti […]. Et dicat Severinus, ut volet, esse haec principia mechanicos spiritus scientia, et vigore agendi pollenteis; cum id dixerit, semel dixerit quicquid dicturus unquam est. Neque enim unquam praeandrae universe manifestabit, quemadmodum cuiquam spiritui, rei tum tenui, rei tam inuisae, tamque intactili insidere possit idea, ac scientia elaborandi operis; consideratio finis, ad quem comparare illud debeat; perspectio materiae, conditionumque necessariorum, ob quas idonea efficitur; dignootio rationis, seu modi, quo eam subigere, versare, reversare, concernere, deligere, fingere, perficere, oporteat: quomodo item possit insidere vigor, ac energia tum usurpandi instrumenta congrua, tum exsequendi omnia, quae talis scientia praescripsit.”
This is the true source of Gassendi’s theory of the *scientia* imprinted on the invisible seeds by God the Creator. It is the doctrine of the invisible and spiritual seeds of things advanced by Severinus. However, Gassendi himself is not satisfied with simply reproducing the Danish Paracelsian’s ideas but tries to interpret them further from an atomistic perspective.

Before concluding this section, let us briefly note an echo of Gassendi’s theory in Italian natural philosopher Francesco Redi (1626–1697). At the beginning of his treatise, *Esperienze intorno alla generazione degli insetti* (Florence 1668), he takes up Gassendi’s opinion about spontaneous generation without mentioning his name and introduces the idea of the invisible seeds of things:

> There is still another group of wise people who held and hold as true that this generation derives from certain small groups or aggregates of atoms, such aggregates being the seeds of all things, and all things being full of these seeds. That [all things] are full of them, many others admit it by saying that God created these [seeds] at the beginning of the world and scattered them everywhere to render the elements fertile, not of a momentary nor incomplete fertility but as durable as [the elements] themselves. One must understand, they say, in this manner what is written in the Holy Scripture: “God created all things together.”

Surprisingly enough, Redi links this argument with the theory of William Harvey (1578–1657), according to which every generation takes place through a seed, conceived as an egg, which encloses a motive principle. He argues that Harvey regards these invisible seeds as atoms that fly through the air and are distributed here and there by winds. Thus Redi closely connects Gassendi’s idea with the famous theory of *omne vivum ex ovo*. Harvey’s egg is most strikingly interpreted in terms of atoms and corpuscles.

Later Redi explicitly refers to Gassendi and refutes his idea of the invisible seeds. What is important in his discussion is, as he acknowledges, that Gassendi’s opinion was popular and widely diffused in his time. It was exactly the period when the theory of the preexistence of germs was spreading in embryology, but the true role played by Gassendi’s ideas in this field still remains to be explored thoroughly.

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24 On Redi, see especially Findlen 1993; Bernardi and Guerrini 1999; Hirai 2003, 220–221; Duris 2010, 1–25. I have used the text of Redi 1996.

25 Redi 1996, 78. “Egli c’è ancora un’altra maniera di savie genti, le quali tennero e tengono per vero che tal generazione derivi da certi minimi gruppetti ed aggregamenti di atomi, i quali aggregamenti sieno i semi di tutte quante le cose, e di essi semi le cose tutte sien piene. E che ne sieno piene lo confessano ancora molti altri dicendo che si fatte semenze nel principio del mondo furono create da Dio, e da lui per tutto disseminate e sparse, per render gli elementi fecondi, non già d’una fecondità momentanea e mancante, ma bensì durevole al pari degli elementi stessi; ed in questa maniera dicono potersi intendere quello che ne’ Sacri Libri si legge, avere Iddio create tutte le cose insieme.” Cf. Ecclesiasticus (Sirach), 18.1.


28 On the preexistence of germs, see Roger 1963, 325–384; Bowler 1971, 221–244; Duchesneau 1997, 229–237. On the influence of Gassendi’s biology, where the concept of seeds as “living atoms” or “living molecules” played an important role, see Rey 1997.
11.4 Kircher and the Corpuscular Origin of Life

A friend of Gassendi, Athanasius Kircher (1602–1680) amassed considerable fame for his intellectual activity carried out during several decades at the Jesuit Collegio Romano. To support his arguments, he constantly appealed to the experiments that, he claims, were performed by him or were reported by others. His work was the object of both admiration and suspicion among his contemporaries and provoked passionate debates all over Europe. The question of spontaneous generation attracted the particular attention of those who tried to reproduce the experiments reported by Kircher. In England Royal Society members such as Robert Boyle and Henry Oldenburg (1615?–1677) inquired into the issue. In Italy the work of Redi publicly accused the Jesuit Father. Many historians have interpreted these reactions as manifestations of the new culture of experimental science. However, very few of them seem to have examined what Kircher really taught and what stimulated the scientific activity of his admirers and adversaries.

In Kircher the problem of spontaneous generation, or more precisely, the origin of life, was intimately connected to diverse important and difficult issues debated among scholars: the Creation of the world, the origin of contagious diseases, the formation of figures and colors in minerals, plants and animals, the origin of fossils and so on. Although Kircher repeatedly addressed these matters in his entire corpus, a good example can be found in the twelfth and last book of his famous geocosmic encyclopedia, *Mundus subterraneus* (Amsterdam, 1664–1665).

As for the generation of living beings, which seems to occur spontaneously from putrefied materials, Kircher first argues that the four elements themselves cannot produce living beings. For him there must be something that plays the role of seeds. He calls these seeds “separated seeds” (*semina decisa*). In his view, when one part of the body of a living being or its corpse is separated from the body, the invisible seeds residing in this part are separated and diffused everywhere in nature. For Kircher these seeds can produce inferior beings that are considerably degenerated from the original living beings; the cause of this degeneration is the weakening of the heat that supports the seminal power of these seeds.

In this context Kircher addresses the emergence of life. Following Thomas Aquinas, the intellectual guide of the Society, he first argues that the substantial form of living beings is drawn from the potentiality of matter. However, he regards these forms or souls as being “material” and divisible because they are drawn from the bosom of matter. Kircher then affirms that there is something formal lying hidden in the body parts of living beings and their cadavers. He identifies this entity with a spirit which resides in the “saline-sulfurous-mercurial” core of the visible

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29 On Kircher, see among others Kangro 1973; Leinkauf 1993; Findlen 2004; Fletcher 2012.
32 I have used the text of Kircher 1664–1665. See also Strasser 1996; Hirai 2007a.
seed and which vivifies matter. This spirit is the real identity of his invisible seeds for Kircher. Thus the secret of the origin of life is intimately linked to the notion of this material spirit, which he certainly borrowed from the tradition of chymical philosophy.

Like Sennert and Gassendi before him, Kircher goes even further to formulate a corpuscular interpretation of the invisible seeds by identifying them as minute corpuscles. These corpuscles can be easily transported by winds and rains and dispersed everywhere in the world. When these corpuscles find an appropriate matrix, thanks to their internal seminal power, they form a “web of life” (tela vitae) which provides the basis of a new living being. To reinforce his theory, Kircher argues that living beings cannot be born spontaneously but only from materials which have previously been alive and animated. For him something of the soul, which once resided in a living being, can survive with its seminal power after the death of that living being. Thus he says:

That is why the most immediate matter of the generation of beings born spontaneously is that seed of ours, in which lies hidden a spirit, so to speak, a certain soul separated from a living being (as Fortunio Liceti teaches skillfully) and remaining in its cadaver, not as a form but as spirituous corpuscles of this living being. A soul lies in these [corpuscles], as if it were placed in a vessel, after the death of the living being.

Kircher clearly connects the origin of life with a certain material spirit that lies hidden in the cadaver of living beings. This spirit is conceived almost as a soul under the form of spirituous corpuscles. Because of this spirit, certain living beings are born from cadavers. But these newly born beings will not be of the same species as the cadavers. According to Kircher, at the death of a living being, the nature of its soul is weakened by the loss of original heat and degenerates into an inferior essence.

Kircher explains the emergence of life with these seminal corpuscles dispersed in the world. When these corpuscles are united under the form of a viscous mass and digested by ambient heat, they acquire an appropriate mixture and heat which allow the material soul, lying hidden in them as if they were placed in a vessel, to manifest itself in the form of life. Kircher argues that these corpuscles play the role of seeds only by analogy since they are not the seeds properly speaking, but certain “envelopes of the seminal reason-principles” (involucra seminalium rationum). Coming from the body of beings that once lived, these corpuscles retain within themselves a

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33 Kircher 1664–1665, 12.1.6, 336–337.
34 On the quest for a material spirit of life in chymical philosophy, see Debus 1984; Clericuzio 1994. On Kircher and chymical philosophy, see Baldwin 1990 and Baldwin 1993.
35 Kircher 1664–1665, 12.1.6, 337.
36 Kircher 1664–1665, 12.1.6, 337. “Quare materia proxima sponte nascentium generationis est semen illud nostrum, in quo spiritus latet, veluti anima quaedam a vivente decisa (uti Fortunius Licetus scite docet) et in cadavere remanens, non ut forma, sed veluti corpuscula spirituosa istius uiuentis, in quibus anima consistit, veluti in vaso post mortem viventis relictia.”
37 On the doctrine of the seminal reason-principle in the Renaissance, see Hirai 2002; Hirai 2005, passim.
small, weakened part of the material soul. This soul, which is clearly identified with
a certain spirit, comes to act as a substantial form which vivifies the mass. In this
way, according to Kircher, living beings that seem to be born spontaneously are
produced. The birth of such beings is not really spontaneous, nor abiogenetic; in
other words, their life is not generated from a purely lifeless matter.  

11.5 A Brief Conclusion

Kircher’s idea of seminal spirituous corpuscles carrying a material soul seems to
come close to Gassendi’s theory: seminal molecules are endowed with a “miniature
soul” (animula), identified with a “miniature flame” (flammula), which is explicitly
construed as a corporeal substance, namely a material spirit of life. Both authors
thus defended kinds of living corpuscles or ensouled particles. This is not surpris-
ing, since Kircher was well informed of the contents of his friend’s work. But a
very similar idea can also be found in Sennert. As we have seen, Sennert was
inspired by the work of Paduan natural philosopher Fortunio Liceti, and Kircher
himself once refers to this name. As I have shown elsewhere, Kircher actually
absorbed the text of Liceti at length in the course of his discussion on the corpus-
cular interpretation of spontaneous generation. The fame of Kircher overshadowed
that of Liceti in this regard.  

One of the most striking observations set forth in this study of Sennert, Gassendi
and Kircher is the gradually increasing importance of a material spirit of life and its
identification with the soul or the seminal principle. Corpuscular interpretations
played a crucial role in this evolution of identification. All three figures explained
the origin of life, and especially spontaneous generation, in terms of living corpus-
cles which are internally animated by this material spirit of life.

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