This article explores some connections between the medical conception of poison-induced epilepsy and the ontological conception of a plurality of substantial forms in living beings in the work of the Wittenberg physician and philosopher Daniel Sennert (1572–1637). It does so by taking a developmental approach, tracing Sennert’s responses to some of his predecessors such as Jean Fernel, Petrus Severinus, and Julius Caesar Scaliger. Sennert’s responses to Fernel indicate that Sennert does not regard poison-induced epilepsy as a disease that affects the dominant form of a living being. His responses to Severinus indicate that he also does not reduce the agency of epilepsy-inducing poisons to chemical causation. His responses to Scaliger indicate that he assigns to subordinate forms in the human body a central role in explaining the occurrence of auto-generated poisons leading to epileptic fits. At the same time, Sennert substantially goes beyond Scaliger by applying some of Severinus’s insights concerning analogies between species degeneration and the generation of disease to the case of epilepsy.

I. Introduction

As Peter Niebyl has documented, one of the issues in which the Wittenberg-based physician and philosopher Daniel Sennert (1572–1637) departed from Paracelsus and his followers was the concept of disease. Paracelsus and some of his followers regarded diseases as real beings—so-called “disease-entities” (entia morbis) that can enter into the body of a living being and thereafter possess a clearly defined location in the affected organism. For Sennert, such a view is a dangerous confusion between dis-

ease and its causes. According to him, causes of disease can be present in an organism without actually causing a disease (Sennert 1629, p. 253). Moreover, he shares the traditional Christian doctrine according to which all created substances are intrinsically good, such that intrinsically bad “disease-entities” could not be part of creation (p. 259). To be sure, for many contagious diseases Sennert invokes the agency of “seeds,” to which he ascribed a corporeal nature. But he categorizes them as causes of disease, not as diseases themselves. Disease, in his view, is nothing but an impairment of the normal functioning of the organism or, as he puts it, “a praeternatural quality induced in the body, on account of which the body is so disposed that the functions it ought to perform are impaired” (Niebyl 1971, p. 127).

At the same time, Sennert has definite views as to what kinds of beings the causes of disease are and what kinds of beings the organisms affected by these causes are. In this essay, I will explore some of these ontological issues with respect to Sennert’s views on poisons and epilepsy. Sennert shares with other early modern thinkers the view that epilepsy is caused by “an aura or a vapour, or poisonous matter” (aura vel vapor, vel materia venenata) which is either generated in the brain or transmitted there from other parts of the body (Sennert 1656, 2:302). He also shares with other early modern thinkers the view that, while each living being has a single substantial form, its body contains a large number of corpuscles that have their own substantial forms. Thanks to pioneering studies by Emily Michael, the intricate details of Sennert’s theory of a plurality of hierarchically ordered substantial forms in living beings are well known by now that some of Paracelsus’ early followers tried to reconcile Paracelsian and Galenic ideas (see Debus 1991, pp. 19–21). In many respects, if not on the issue of entia morbis, Sennert’s 1619 De chymicorum cum Aristotelicis et Galenicis consensu ac dissensu is another instance of such a conciliatory approach.

2. Sennert follows the theory of contagion developed by Girolamo Fracastoro (1478–1553), when he defines a contagium as “a certain body flowing from a contagious body and capable of causing a similar disease when received by another body” (corpus quoddam e corpore contagioso effluens, & in alio receptum similem morbus in eo excitare valens) (Sennert 1656, 2:146). On Fracastoro’s theory of contagion, see Nutton 1983; Nutton 1990; Pennuto 2008, ch. 8. On Sennert’s relation to Fracastoro, see Newman 2006, pp. 143–144.

3. The quotation is from Sennert 1619, p. 445 (Niebyl’s translation). The concept of disease, of course, is not the only topic on which Sennert disagreed with the Paracelsians. Pagel has emphasized that “the basic error of Paracelsus according to Sennert lies in his rejection of the humors, the very existence of which he sometimes denied” (Pagel 1982, p. 341). Sennert also was critical of the Paracelsian reliance on intuitive insight in medicine (see Eckert 1992).

However, some connections between his ontology of dominant and subordinate forms and other issues in his biological and medical thought have not yet been explored as fully as they deserve to be. This holds especially for Sennert’s responses to predecessors who, in their biological and medical works, also upheld a plurality of forms in living beings, such as the doyen of the Paris medical faculty, Jean Fernel (1497–1558), the Danish royal physician Petrus Severinus (1540/2–1602), and the Agen-based physician and philosopher Julius Caesar Scaliger (1484–1558).

I shall argue that certain aspects of Sennert’s responses to different versions of a theory of a plurality of forms in living beings sheds light on three issues central to Sennert’s discussion of poisons and epilepsy. In fact, taken together, these responses tell an interesting developmental story about how Sennert constructed an account of poisons and epilepsy that is closely connected with the ideas of his predecessors but nevertheless diverges substantially from some aspects of the thought of his predecessors. The response to Jean Fernel’s theory of “diseases of the whole substance” in Sennert’s *Institutiones medicinae* (1611) will make clear why Sennert subsumes epilepsy under his concept of disease as an impairment of the normal functioning of the organism rather than an impairment of the substantial forms of the parts of the organism (section 2). The response to Petrus Severinus’s theory of chemically operating “seeds of disease” in Sennert’s *De chymicorum cum Galenicis et Aristotelicis consensu ac dissensu* (1619) will make clear why Sennert assumed that the subordinate forms relevant in causing epilepsy operate not only in the way in which chemical substances work but in other ways as well (section 3). The response to Julius Caesar Scaliger’s discussion of the mutability of biological species in Sennert’s *Practica medicina VI* (1635) will make it clear to what extent Sennert’s explanation of the origin of auto-generated poisonous vapors is modelled on early modern theories of biological reproduction (section 4). Taken together, Sennert’s responses to his predecessors illuminate some ways in which his views on poisons and epilepsy are connected with his biomedical ontology.

**II. Poisons, Epilepsy, and Diseases of the Whole Substance**

As William Newman has brought to light, Fernel’s theory of diseases of the whole substance was the topic of a disputation by Sennert’s academic teacher, Johann Jessenius, which Sennert undertook to defend in 1596.

5. On the plurality of forms in Sennert, see also Emerton 1984, pp. 64–65; Arthur 2006.
While it is clear that Sennert was familiar with this issue from early on, his *Institutiones medicinae* (1611) contains detailed discussions of Jean Fernel’s *De rerum abditis causis* (1548) which indicate that Sennert had become highly critical of some aspects of the theory of the whole substance. While many of Sennert’s later views concerning the causes of epilepsy are not yet fully developed in the *Institutiones medicinae*, the general outlook on epilepsy outlined here remains in place in his later writings, and some of the features that remain constant throughout the following years are connected with his early response to Fernel. In the *Institutiones medicinae*, Sennert adopts Fernel’s arguments that favor a vapor theory of epilepsy over a Galenic obstruction theory. According to the obstruction theory, epilepsy is caused by some solid and tenacious humour (*crassus & viscus humor*) blocking the ventricles (*ventricula*) and pores (*meatus*) of the brain. Thereby, epilepsy is likened to apoplexy—the paralysis of body parts through the obstruction of the corresponding brain regions (Fernel 2005, pp. 637–639). Fernel’s and Sennert’s first objection is: If an obstruction of the ventricles of the brain were the cause of epilepsy, one would expect that every epileptical fit would be followed by apoplexy, or every case of apoplexy be preceded by an epileptical fit, neither of which is the case (pp. 639–641; see Senert 1656, 1:442). Their second objection uses another observation: Sixteenth-century dissections, including those performed by Fernel, did not bring to light any perceptible residue in the brains of patients who had died of epilepsy (p. 643; see Senert 1656, 1:443). Sennert also shares Fernel’s view that living beings are individuated by substantial forms and that their parts are individuated by substantial forms of their own, and that these parts include not only elements but also more complex structures (pp. 155–157). Moreover, Sennert agrees with Fernel that epilepsy belongs to those diseases that are due to the agency of substantial forms. Nevertheless, their views as to the proper subject of such diseases differ profoundly.

Famously, Fernel maintains that there are diseases that are due to the fact that the substantial form of some substance that is inserted into the body is inimical to the substantial forms of some body parts or the substantial form of the entire organism. These are the “diseases of the whole substance,” among which he counts epilepsy and other neurological disorders that he ascribes to the agency of poisonous vapors. He gives the following definitions: “The substance of the whole thing is its perfection and entirety, by means of which each thing exists. As soon as this is changed

7. Fernel refers the reader to Galen, *De locis affectis* III, 5.
and removed from perfection, the whole thing is continuously split up; and the impairment of it is the disease of the whole substance” (Fernel 2005, p. 291).\footnote{“Tota rei substantia perfectio est & integritas, qua res unaqueque consistit. Haec quoties immutatur & de perfectione deceit, res tota continuo perfringitur: ipsaqua illius decessio, morbus est totius substantiae.” On Fernel’s theory of diseases of the total substance, see Deer-Richardson 1985; Siraisi 1997, pp. 158–161.} According to Fernel, vital and animal spirits are a part of the “whole substance” of a living being (pp. 537–539). At the same time, he believes that the vital functions have their origin in the substantial form of the living being and that, in this sense, this substantial form is the highest perfection and essence of the living being. If we understand the “whole substance” of a thing as its perfection or essence, the “whole substance” is the substantial form of the living being (p. 675). For Fernel, the “whole substance” is a complex entity that is composed of a substantial form, from which all vital functions flow, and of vital or animal spirits that are conjoined with this form. Because vital and animal spirits still belong to the substance of a living being, when poisons impair the vital or animal spirits this process amounts to a “splitting up” (dissidium) of the whole substance (pp. 628–630).

Sennert does not agree that substantial forms themselves can be sick. He comments on Fernel:

It is rightly said . . . that health and disease belong not to the essential but accidental constitution, which consists in qualities, and that there is no disease that arises out of the corruption of substance. For the essence of a thing cannot be increased or diminished, and there exists no part of an essence that could be taken away without taking away the whole essence: for the essence of a thing is like a number, which is either there wholly or not at all.

(Sennert 1656, 1:319)\footnote{“Recte... dicitur: sanitatem & morbus non ad essentialem, sed ad accidentalem constitutionem, quae in qualitatisbus consistit, pertinere, nullumque ex corruptione substantiae dari morbus posse. Essentia enim rei intendi atque remitti non potest, & nulla pars essentiae est, qua perempta & sublata, non ipsa tollatur tota: cum rei essentia sit sicut numerus, quae aut tota est, ubi est, aut nulla est. Ideoque nullus morbus dari potest, qui, manente re, formam & substantiam corrupnar; sed forma sublata, ipsum totum corruptur.” See Aristotle, \textit{Met.}, 1043b–1044a.}
instruments of plant or animal souls implies that they derive their activity from the activity of the souls (Sennert 1656, 1:277). Sennert agrees with Fernel that poisonous humors can affect the vital and animal spirits (1:443; 2:494). In particular, he argues that something of this sort happens in epilepsy since without the proper functioning of animal spirits the brain cannot perform its functions (functiones) and actions (actiones). The action of poisonous humors on vital and animal spirits thus explains why, during epileptic fits, mental functions and actions such as memory, imagination, and ratiocination are impaired (1:443). Nevertheless, because spirits could be separated from souls without changing the nature of souls and, hence, do not form a part of the essence of a living being, this process, in Sennert’s view, does not amount to a “splitting up” of whole substance of a living being (1:321).

Something analogous holds for subordinate forms. He agrees with Fernel that not only elements contained in the body of a living being but also single organs such as liver, brain, and heart are individuated by substantial forms of their own (1:319). Nevertheless, he describes their relation to diseases in another way than Fernel: “[F]rom these [forms] diseases of the form do not arise . . . For these forms, too, like the others, cannot be increased and diminished, nor is any disease generated if they are affected while the essence of the thing remains intact.”10 For Sennert, there are no diseases of the whole substance because there are no diseases of substantial forms. Alternatively, Sennert suggests that from subordinate forms flow non-elementary qualities that explain the interaction between poisonous vapors and animal spirits (1:319–320).11 In this way, even if some diseases are caused by subordinate forms, their nature still consists in a disturbance of the natural qualities of an organic body.

III. Poisons, Epilepsy, and Chemical Causation
Sennert’s early response to Fernel did not provide a clear-cut answer to the question of what the nature of the qualities flowing from subordinate forms consists in. In the years following the Institutiones medicinae, Sennert developed a conciliatory approach that tried to reconcile insights from the Aristotelian and Galenic traditions with the newly developing “chymical” thought of the Paracelsians. Pagel regards Sennert’s views that the forms of components persist in mixture and that they can be graded as dominant and subordinate forms as points that support interpreting Sennert as a

10. “[A]b iis morbis formae non sunt, vel dicuntur, quod haee formae immediate afficiantur. Formae enim haee etiam, ut aliae, intendi & remitti non possunt, neque iis affectis, salva rei essentia, ulli morbi generantur” (Sennert 1656, pp. 319–320).
“moderator” with respect to Paracelsianism. Pagel notes that, in connexion with this view “corruption and transformation in its wake were appraised as positive rather than privative in character” by Sennert as well as by thinkers in the Paracelsian tradition (1984, p. 89). While the analogies that Pagel has in mind are those between Sennert and later writings by the Belgian “chymist” Joan Baptista Van Helmont (1577–1644), Newman has drawn attention to parallels between Sennert and the earlier work of the Danish Paracelsian Petrus Severinus. As Newman suggests, “[t]he immediate inspiration for Sennert’s treatment of species degeneration appears to have been Severinus’s doctrine of ‘transplantation’ of species” (2006, p. 145, note 47). In fact, in his 1619 De chymicorum cum Aristotelicis et Galenicis consensu ac dissensu Sennert gives a detailed exposition of Severinus’s medical theory, including his views on subordinate forms and how these relate to questions of biological reproduction. Nevertheless, Sennert’s familiarity with Severinus’s thought and the obvious similarities between Severinus’s and Sennert’s conceptions of dominant and subordinate forms allow for subtle differences that are consequential for their respective understandings of the causes of epilepsy.

In his Institutiones medicinae, Sennert suggests that poisonous vapors have two characteristics, closely matching the observations available at the time: (1) they pervade the entire nervous system, thus accounting for the speed with which epileptic fits occur while also explaining the absence of symptoms of apoplexy; (2) they quickly disappear after an epileptic fit, thus explaining the absence of symptoms of epilepsy between two fits as well as the absence of any residue in the brain detectable by means of dissection (Sennert 1656, 1:442). At this stage of his development, Sennert regards two hypotheses concerning the nature of this vapor as possible candidates without coming out on either side. One possibility is that it possesses a certain chemical quality such as acidity (acrimonia). The other possibility is that it possesses a poisonous quality (qualitas venenata) of another, non-chemical nature (1:443). In subsequent works, the 1619 De chymicorum and the 1635 Practica medicina VI: De morbis occultis, Sennert returns to the topic. In these works, he discusses the role of chemical principles of agency in causing epilepsy in the context of a conciliatory approach.

12. Pagel notes that “this finds its counterpart in Van Helmont’s later principle of the great necessity . . . and the ‘middle lives’ of entrants which persist in an organic whole” (1984, p. 89). The other points of consilience between Sennert and the Paracelsians that Pagel notes are the theory of object-specific corpuscular effluvia (p. 88) and the importance of laboratory procedures, in which substances are reduced to their previous state (p. 89). On Sennert’s account of redactio in pristinum statum and its influence on Boyle, see Newman 1994.
to Paracelsian chemistry, Galenic medicine, and Aristotelian natural philosophy.

According to Severinus, seeds (*semina*) or “principles of things” (*principia rerum*) are the foundations (*fundamenta*) of the quantities and qualities of bodies and the relations in which bodies stand to each other (1571, p. 214). He analyses the foundation relation as a relation of emanative causation by means of which bodies are produced out of immaterial principles: “We have often said that in the workshop of nature bodies are produced out of spirits” (p. 247). Shackelford has aptly described this process as “reification in which form, soul, or spirit emanates material being” (2004, p. 166). The reifications of immaterial principles, in Severinus’s view, are characterized by chemical qualities. These, in turn, are operative in causing diseases: “I would say that out of the encounter with and use of acids acidity is generated, and acidity impairs actions” (Severinus 1571, p. 246).

Moreover, according to Severinus there are principles of bodies with health-impairing chemical qualities that are internal to living beings themselves.

To explicate the sense in which such principles can be internal to living beings, Severinus uses the concept of “transplantation,” which highlights an analogy between the generation of disease and the transition of a living being from one biological species to another species. For cases of plant degeneration, he offers the following explanation:

[B]ecause there is a very high number of *semina* in plants, in which the essence and predestined gifts of many individuals are conjoined, it is no wonder if they change into new families on the slightest occasion. (1571, p. 141)

According to his view, in the seed of one plant the forms of other plants are present, but as subordinate or “equivocal” forms. When external causes are favorable, one of these subordinate forms can become dominant, such that the whole development of a plant is guided by it (p. 141). Such forms are “equivocal” in the sense that they are active principles that can inform parts of previously existing plants belonging to one species as well as sub-

14. “Saepe enim diximus, in Naturae officina ex spiritibus corpora produci.”
15. “Dicam ego, ex occursu & usu acidorum generari aciditatem, ex aciditate actiones laedi.”
17. “Quapropter in Vegetabilibus cum *semina* sint plurima, in quibus multorum Individuorum . . . Scientiae & praedestinata Dona coniungentur, non mirum est si levi momento in novas familias transeant.”
sequently developing plants belonging to a different species. In this sense, each plant contains the essence of many other plants.

According to Severinus, something analogous takes place in disease: there are in nature seeds of disease (whose origin Severinus ascribes to an act of divine malediction; see Severinus 1571, p. 216); these seeds enter mixtures with other seeds, in such a way that the principles of living beings undergo transplantation (p. 215). This is how he describes the origin of disease:

The seeds and roots of death and disease consist in arsenical, sulphureous, vitriolic, corrosive, or mercurial impurities, or in those that act like nettles, thorns, monkshoods, hemlock, or opium; these impurities are inflammable, unstable, with a tendency towards corruption. (p. 217)\textsuperscript{18}

Thus, one group of causes of disease has to do with clearly identified chemical substances. Another cause of disease—the one that Severinus compares with the action of thorns—seems to have to do with the capacity of damaging body parts in a mechanical way. Still other causes of disease are compared with the action of poisons and, unfortunately, Severinus does not go into greater detail as to the exact relation between the operation of chemical substances and the operation of poisons. But it is clear that he believes that the inherently unstable nature of chemical substances and poisons renders them noxious to the body. Moreover, such seeds of disease can be transferred from parents to offspring, thus accounting for the origin of hereditary diseases (p. 220). Severinus claims that this is how from non-epileptic parents epileptic offspring arise (p. 221). Even if he does not give any detailed account of epilepsy, it is clear enough that he integrates this disease into his overall framework of transplantation.

Sennert comments on Severinus’s \textit{semina} that, when regarded from a general point of view, Severinus did not introduce a new idea but rather reformulated the ancient doctrine of forms or souls of living beings (Sennert 1629, p. 87). Certainly, on this level of generality Sennert shares much with Severinus. However, on a lower level of generality Sennert also has some clear-cut objections. One of them is the following:

\textbf{[T]he generation of plants is far different from the generation of diseases. For the vegetative soul in the seed builds out of attracted}

\textsuperscript{18} “\textit{Dico igitur mortis \& morborum semina radicesque, in impuritatibus consistere arsenicalibus, sulphureis, vitriolatis, aeruginosis, mercurialibus, vel in urticosis, spinosis, nappellosis, cicutosis, opiatis, \&c quae impuritates inflammabiles sunt, instabiles, ad corruptionem festinantes . . .}”
nourishment the entire body of the plant, and out of an egg a chick develops not by means of corruption but of perfection . . . But in the generation of diseases . . . the good humors are changed, inflected and corrupted by the vicious ones as it were by a ferment; and the qualities of corrupted humors hurt and change the body parts and induce praeternatural qualities in them: however, among the causes of disease there is no formative force of the kind found in plant seeds. (Sennert 1629, p. 259)\textsuperscript{19}

Thus, a dissimilarity between vicious humors such as those that cause epilepsy and plant seeds is the different relation in which their substantial forms stand to the surrounding bodies: in the case of the plant soul, some surrounding bodies—those that are suitable as nourishment—are integrated into the body of a composite substance that, in the end, becomes a living being. In the case of the substantial form of a vicious humor, some surrounding bodies—those that bring about the symptoms of a disease—are affected by the poisonous qualities of the humor.

As we will see in the next section, Sennert’s objection by no means implies that there is no illuminating analogy between the mechanisms accounting for changes in species membership and the mechanisms accounting for the generation of diseases. However, Sennert has a further set objections against Severinus and other “chymists.” Sennert notes that in the writings of the chymists two explanations of epilepsy prevail: one pattern ascribes epilepsy to the agency of quicksilver, the other pattern ascribes epilepsy to the agency of salts. With respect to the first explanatory pattern, he remarks in \textit{Practica medicina VI}:

Some chymists claim that they can explain the thing clearer than the Galenists, but I doubt that they really succeed. Paracelsus and most Paracelsians teach that epilepsy is a quicksilver-induced disease. But I do not see how they explain this clearly. For they neither . . . sufficiently explain what quicksilver is, nor how it differs from the remaining principles. Moreover, since they claim that there are many quicksilver-induced diseases, they do not show what the determinate and specific nature of this disease consists in, and how

\textsuperscript{19} “[L]onge alia est plantarum, alio morborum generatio. Anima enim vegetans, quae est in semine, ex attracto alimento totum corpus plantae fabricat, & ex ovo fit pullus, non corruptione, sed perfectione . . . At in morborum generatione longe aliter se res habet, atque a vitiosis humoribus, quasi a fermento, boni alterentur, inficiuntur & corrumpuntur, corruptorumque humorum qualitates ipsas partes laedunt, alterant, ipsisque qualitates praeternaturales inducunt: nulla vero in morborum causis vis formatrix est, qualis in seminibus plantarum reperitur . . .”
this quicksilver-induced disease differs from other quicksilver-induced diseases. (1635, p. 493)²⁰

Hence, Sennert’s objection against the Paracelsian explanation of epilepsy is twofold: first, the Paracelsians fail to specify the nature of the chemical substance that is supposed to induce epilepsy; and second, the Paracelsians fail to explain the difference between epilepsy and other diseases that they attribute to the agency of the same chemical substance. Sennert develops some analogous objections against the second explanatory pattern, the one invoking the agency of salts:

I have doubts concerning the nature of this salt, and whether they sufficiently demonstrate that this salt is vitriolic, and that no vapor can bring forth epilepsy unless it has vitriolic nature and properties. For they maintain that an epileptic fit can be induced when malign, pungent, acid, astringent and corrosive animal spirits are mixed: which can take place not only due to vitriol, but also due to many other salts, such as alum, sal armoniac, and also antimony and arsenic . . . Contraction is also in alum; and corrosive force in all salts . . . And many people expel corrosive humors in fever and other diseases by vomiting, from which without doubt vapors of a similar kind are attracted towards the head, but which nevertheless do not induce epilepsy. (p. 493)²¹

Hence, as is the case with the quicksilver-based explanations, the salt-based explanations present two difficulties: first, they fail to clearly identify the chemical nature of the compounds supposed to bring forth epilepsy; and second, compounds of the same nature as those invoked in the explanation of epilepsy are operative in other diseases without, however,


²¹ “Cuius autem naturae is sit, & an satis demonstrent, salem istum vitriolatum esse, & nullum vaporem Epilepsiam concitare posse, nisi proprietatis & naturae vitriolatae sit, dubito. Cum enim ipsi paroxysmum Epilepticum excitari statuant, cum exhalationes malignae, acres, acidae, adstringentes & corrosivae spiritibus animalibus miscentur: id non solum ex vitriolo, sed & alii pluribus fieri potest, alumine scilicet, & sale Armoniaco, ut & antimonio & arsenico . . . Adstrictio in alumine quoque est; vis corrodendi in omnibus salibus . . . Et multi in febris & aliis morbis aeruginosos humores vomitu reiciunt, a quibus procul dubio etiam vapores congeneres in caput attoolluntur, qui tamen Epilepsiam non excitant.”
causing epileptic fits. These passages indicate that Sennert had an acute sense for the shortcomings of the chemical explanations of epilepsy available at that time.

IV. Poisons, Epilepsy, and Species Mutability
Subordinate forms, then, in Sennert’s view, do not operate only in a chemical way. But what would an explanation of epilepsy inducing vapors that does not invoke chemical causation look like? More than once, Sennert refers the reader back to Julius Caesar Scaliger’s views on subordinate forms. Like Scaliger, he believes that, if such is true with respect to the bodies of dead animals and plants, there is no reason why there should not exist in animals and plants that are still alive actions and accidents that do not derive from the animal or plant souls (Sennert 1629, p. 120). Moreover, Sennert accepts Scaliger’s teleological analysis of the subordination relation (1656, 1:218). According to Scaliger, some material objects and some forms are less “noble” than others because they are made for the sake of other material objects and other forms. Bodily organs such as a nose or an eye, as well as their respective forms, are less “noble” than the entire body of the living being and its soul because these bodily organs are made for the sake of the entire body of the living being and its soul (Scaliger 1557, fol. 144v). And Sennert shares Scaliger’s view that in living beings there are subordinate forms that are the “seminal matter” (materia seminalis) of spontaneously generated animals or “natural rudiments” (rudimenta naturales) of spontaneously generated plants (Sennert 1656, 1:218; see Scaliger 1557, exercitatio 59, 2).

Scaliger believes that cases of reversible plant degeneration can be explained through a change of the relations between the different “natural rudiments” of plants belonging to different species contained in a plant seed. In such cases, the substantial forms contained in the seeds of a degenerated plant are the same as in the plant from which they originated (Scaliger 1566, pp. 230, 279; see Sennert 1656, 1:205). However, Scaliger also believes that there are cases in which a previously subordinate form can develop into a dominant form without belonging to a seed that contains all the substantial forms contained in the seed of the plant from which it originated. These cases occur when the substantial form of a living being ceases to inform a portion of matter that previously belonged to its organic body (Scaliger 1556, fol. 178r; 1557, fol. 319v; see Sennert

22. “Non tamen omnes actiones, quae elementis nobiliores sunt, ab anima proveniunt, ut etiam Scaliger monuit (Scaliger 1557, exercitatio 101, 8; exercitatio 102, 5) . . . [P]artes animalium emortuae, & plantae vita jam destitutae, nihilominus eas vires habent, & operationes, quae ad elementa nullo modo reduci possunt. Quidni ergo & in ipsis viventiibus dentur actiones & accidentia, quae ab anima non proveniunt?”
1656, 1:214). Obviously, in such cases the previously dominating form cannot be a constituent of the seed of the newly generated plant. This is why, for Scaliger, spontaneously generated living beings, in contrast to living beings arising in species degeneration, are not informed by the same set of substantial forms as the living being from which they originated. Sennert applies this insight in his 1636 Hypomnemata physica when he maintains that spontaneous generation (for example of mushrooms out of a tree) only occurs when the soul of the tree has ceased animating all or part of the tree (1656, 1:224).

Thinking about spontaneous generation along Scaligerian lines sets Sennert’s conception of the role of subordinate forms in biological change apart from Severinus’s theory of transplantation. To be sure, in De chymicorum Sennert points out that the theory of transplantation is not to be rejected entirely because Severinus has seen that in plant and animal seeds there are forms of other living beings (1629, p. 199). However, Severinus describes the relation between the elements and principles of bodies relevant for transplantation as “composition” (compositio) and the relation between them and the resulting seed as “constitution” (constitutio). For example, when he explains why some animals are incapable of reproduction, he writes: “The elements . . . and principles of bodies, whose mixture makes the first composition in their generation are not bound to each other through a stable law that would allow them to persist for the constitution of a seed.” (Severinus 1571, p. 139).

Expressing what is lacking in cases of living beings incapable of producing fertile seeds in this way implies that, in cases of living beings capable of producing fertile seeds, elements and principles are to be regarded as constituents of seeds. For Severinus, transplantation can be explained through a change of the relations between such constituents.

Something analogous holds with respect to the relation between subordinate forms and the causes of disease. If Severinus believes that diseases arise by means of transplantation and that, in transplantation, subordinate forms remain constituents of seeds of the living being that becomes ill, the forms that cause diseases are always constituents of the active principle governing the development of a living being. For Severinus, the living being becomes ill because principles of disease belong to the constituents of the seeds from which it arises. Sennert disagrees with Severinus’s view that “seeds of disease” become causally efficient because they belong to the constituents of the seeds of organic bodies. Already in the Institutiones medi-

23. “Elementa . . . & corporum Principia, quae permixta primam compositionem fecerunt in eorum Generatione, non tam stabi li lege ligantur, ut durare possint ad seminis constitutionem . . .”
Sennert is unambiguous about the view that “vicious humors, and similar things in the body, do not constitute our body” (Sennert 1656, 1:342). This seems to be a straightforward consequence of his account of the production of auto-generated poisons: if this process involves a change of relations of domination and subordination between various substantial forms contained in a living being, the forms informing the poisonous humors are no longer subordinate to the dominant form of the organism. Hence, the living being becomes ill because poisonous humors or vapors do not belong to its constituents.

Yet, while this dissimilarity between Severinus and Sennert is substantial, it should not obscure another, no less substantial, analogy. As we have seen, Severinus holds that there is a strong similarity between what is going on in plant degeneration and what is going on in the generation of diseases. Likewise, Sennert holds that there is a strong similarity between what is going on in spontaneous generation and what is going on in the generation of poisons and epilepsy. In extending some aspects of the structure of biological reproduction to the generation of diseases, he follows the strategy laid out by Severinus and thereby goes beyond the use made of the theory of spontaneous generation in Scaliger’s published writings.

To be sure, Sennert acknowledges some differences between spontaneous generation and the generation of diseases. Most importantly, he does not ascribe formative virtues to the substantial forms informing poisons and vapors. In this respect, these substantial forms differ from the substantial forms informing spontaneously generated living beings. Nevertheless, he believes that spontaneous generation and the generation of humors and vapors that induce epilepsy have much in common, even though the former typically takes place outside the body of a previously living being and the latter typically takes place inside the body of a still-living organism. This is how in Practica medicina VI he describes the origin of auto-generated poisonous humors:

I believe that most frequently the poisonous humors are generated in our body due to its matter. For when in the single concoctions new mixtures are produced, neither do all the other subordinate forms perish when one form is taken away, nor . . . does a resolution up to primary matter take place in every change and corruption of a thing; rather, when something corrupts, only the form, and the determination of the form that is said to corrupt, [that is] the temperament or subject with its accidents perishes; but all the other subordinate forms with their own accidents can remain intact. It

24. “humores viriosi, ac similia in corpore, corpus nostrum non constituunt . . .”
happens that often some form, that was latent before, manifests itself and begins to become active. (1635, p. 72)²⁵

Sennert ascribes to such subordinate forms characteristics that he similarly ascribes to the specific forms of living beings: subordinate forms were created at the beginning of the world; from that time on, they informed portions of matter that belong to them; from the beginning, these composite beings mixed with other composite beings; and like specific forms of living beings, these forms had the capacity of propagating themselves (1629, p. 126).²⁶ Later in the text, Sennert indicates that the “subject” of forms is the “internal spirit, and radical humidity, which taken together is commonly called ‘innate heat’” (p. 530).²⁷ And in the *Institutiones medicinae*, he characterizes “radical humidity” as an oily and warm substrate of the more subtle “vital spirits” (1656, 1:273).

Thus, in Sennert’s view, the causal history of every given subordinate form and its proper portion of subtle matter reaches back to creation.²⁸ Moreover, it may be a causal history in which this form never before performed the role of a specific form. As long as such composite beings are constituents of a living being, they are innocuous for the organism because then the goals of the subordinate forms are directed towards the goals of the dominant form. Things change, however, as soon as the domination relation breaks down due to some external or internal factor. Sennert is somewhat evasive about the exact nature of such factors, but in the *Institutiones medicinae* he counts external factors such as heat and cold as well as

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²⁵. “Frequentissime vero venenatos humores in corpore nostro generari puto materiae ratione. Cum enim in singulis coctionibus novae mistiones ªant, neque forma una sublata, omnes subordinatae percant, neque . . . in qualibet rei mutatione & corruptione fiat resolutio ad materiam primam, verum quando aliquid corrumpitur, forma tantum, determinandumque illius formae, quae corrupmi dicitur, temperamentum seu subjectum cum sui accidentibus pereat; aliae vero formae subordinatae cum propriis quoque suis accidentibus integrae manere possint: accidit, ut saepe aliqua forma manifestetur & sese exserere incipiat, quae ante latebar.”

²⁶. “[F]ormae & animae rerum e prima creatione primam suam habent originem, & hinc propagantur: ita & hoc corpus & quinta ista essentia. Creator enim rerum generationis fundamentum posuit seminium cujusque rei, per quod generabilia propagantur, ac ipse primitum totum miscuit; atque ita in rerum generatione hoc, quod ab initio rebus inditum corpus, in generatione propagatur . . .”


internal factors such as fatigue and sadness among the “primary causes” (causae primariae) that activate previously latent “proximate causes” (causae proximae) (1656, 1:341). Moreover, in the Hypomnemata physica, he ascribes to external heat the function of changing the structure of the portion of matter informed by a subordinate form. Before the occurrence of this external factor, the structure of this portion of matter was just sufficient to maintain certain un-actualized potencies of the subordinate form. After the occurrence of this external factor, the structure of this portion of matter is changed in such a way as to be sufficient to realize some of the previously un-actualized potencies of the subordinate form (1:216). Whatever the exact nature of these mechanisms may be, it seems clear that Sennert believes that once the previously dominant form ceases to inform the portion of matter associated with a subordinate form, the subordinate forms can follow goals of their own, and these goals may be contrary to what is beneficial to the organism.

Something analogous holds for poisonous substances taken in with food and drink and made innocuous in the organism for a certain period of time. This is so because

[a] human being feeds on animals and plants, and plants attract a juice by which they are nourished from the earth that is fertilized by the excrements of animals and the rain and the overflowing of rivers; and things that are adverse to our body can be found everywhere in dirt and excrements of animals, in the earth, in rain, and in water. When these things get with the aliment into our body, they are not always completely expelled but are often entirely placed into our body together with the aliment, and retain their forces . . . When [plants and animals] use these things as food, this poisonous substance . . . which is part of the aliment of plants and animals, even if it is changed by concoction into various forms, finally happens to be part of the aliments of humans, and mixed with other substances is often not hurtful for a long time; but when it is separated from them and exists in isolation, it begins to hurt humans and becomes poison. (Sennert 1635, p. 73)²⁹

²⁹. “[H]omo vescatur animalibus & plantis, plantae e terra, quae fimo excrementis animalium & pluvia foecundatur, vel fluviorum inundationibus, succum, a quo nutriuntur, attrahent; res corpori nostro adversas ubique repertiæ in fimo & excrementis animalium, in terra, in pluvias, in aquis est. Quae quando cum alimento in corpus nostrum veniunt, non semper tota excernuntur, sed cum eo saepe in corpus sese penitus insinuant, & vires suas retinent . . . His ergo omnibus cum rursum cibi loco utatur homo, venenata illa substantia . . . quae in plantarum & animalium alimentum subiit, etsi per varias coctiones in varias formas mutata, tandem in hominis alimentum cedit, & aliis mista saepe longo tempore
Poisonous substances taken in from outside the organism, hence, can become innocuous because they undergo mixture. They are changed “into various forms” most plausibly in the same way as other constituents of the organic body are changed in mixture: their substantial forms get under the domination of the substantial form of the organism. Once the domination relation breaks down, however, their forms exert their previous causal powers and bring forth poisonous qualities.

V. Conclusion

By now it should be clear how closely related Sennert’s views on poisons and epilepsy are with his ontology of dominant and subordinate substantial forms. Because his ontology of dominant and subordinate forms modifies ideas found in some of his predecessors, Sennert’s account of poison and epilepsy stands in intricate connections with the medical and biological thought of Fernel, Severinus, and Scaliger. As is the case with Fernel, Severinus, and Scaliger, Sennert’s medical and biological views are shaped by ontological considerations. Like Fernel, Sennert acknowledges a group of diseases that is caused by subordinate forms, but unlike Fernel, Sennert does not regard substantial forms, no matter whether dominant or subordinate, as the suitable bearers of diseases. Like Scaliger, Sennert uses a teleological account of the subordination relation, and applies the apparatus of a plurality of forms in living beings to the issue of spontaneous generation. But unlike Scaliger, Sennert follows Severinus in expanding explanatory patterns from species mutability to the origin of diseases. To be sure, in contrast to Severinus, Sennert believes that living beings do not become sick as long as seeds of disease are constituents of the living being. As long as they serve the goals of the dominant form, subordinate forms do not impair the functions of a living being. Things change when the subordination relation breaks down: then it can occur that the previously subordinate forms individuate entities such as poisonous humors and vapors that are not constituents of a living being even if they are contained in it. As we have seen, a similar explanatory pattern underlies both Scaliger’s and Sennert’s accounts of spontaneous generation. Thus, even if Sennert’s account of the origin of poisons and epilepsy diverges from Severinus’s, Sennert evidently has learnt something from Severinus. Like Severinus, Sennert uses an account of composite unities to explain both biological mutability and the origin of disease. Even if Sennert’s epilepsy inducing vapors do not operate only chemically, he has opted for an ex-

non nocet: at ubi ab illis secreta fuerit, & sola extiterit, tum homini nocere incipit, & venenum evadit . . ."
planatory unification that brings together late Aristotelian concepts with insights from the early modern chemical tradition. And the insights drawn from the tradition of “chymistry” do not only reduce to views on the nature and operation of chemical substances, but also include applications of the metaphysics of composite substances as a tool of explanatory unification.\textsuperscript{30}

\textbf{References}


\textsuperscript{30} On the influence of the “chymical” tradition on the metaphysics of composite substances in Sennert and Leibniz, see Arthur 2006 and Blank Forthcoming. Research for the present paper has been conducted during my time as a Senior Research Fellow at the Jacques Loeb Center for the History and Philosophy of the Life Sciences at Ben-Gurion University, Be‘er-Sheva, Israel, in the summer of 2009. I would like to express heartfelt thanks to Ute Deichmann and Tony Travis for having invited me to the Loeb Center. An earlier version of this paper greatly profited from Silvana d’Alessio’s critical comments.
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