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Antonio Ponce de Santacruz on Nutrition and the Question of Emergence

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**Abstract**: Theories of emergent properties are built around the idea that, once material composites have reached some level of complexity, causal powers arise that cannot be reduced to the powers of the constituents. This idea can be traced back to ancient Aristotelian and Galenic views, but seems to be absent from early modern natural philosophy. The present article argues that emergentist intuitions play a role in the discussion of nutrition in the early seventeenth-century commentary on the Hippocratic *Aphorismi* by Antonio Ponce de Santacruz, royal physician to the Spanish king Philip IV. Santacruz understands the new causal powers of the substantial forms that arise from nutrition in close analogy with the new causal powers that he ascribes to the substantial forms of mixtures and the substantial forms of elements. Thereby, he complements a theory of material upward causation through a theory of formal downward causation – a kind of causation that modifies the material basis from which new causal powers have emerged. As Santacruz conjectures, these new causal powers involve emanative causation – the type of causation that brings about an effect without undergoing a change in the cause.

1. Introduction

Applying the notion of emergence to any philosophical position before the advent of the British Emergentists in the nineteenth century may seem to be threatened by anachronism. In recent work in the philosophy of science, one certainly finds numerous ways to analyze this notion that have no close parallels in the history of philosophy. For instance, some philosophers understand it as a purely epistemological notion that describes situations where, due to the exceedingly high complexity of a physical system or a mathematical model, we are unable to predict future outcomes.[[1]](#endnote-1) Also, there are formulations of the notion of emergence that essentially involve the analysis of the relation of the laws of different sciences.[[2]](#endnote-2) Evidently, the technical sophistication of the analysis of relations between scientific laws of different domains has no parallels in anything written before the 1970s or so. Things stand differently, however, approaches that are based on the ontological concept of emergent properties. At the heart of these approaches is the view that, once material composites have reached some level of complexity, causal powers arise that cannot be reduced to the powers of the constituents.[[3]](#endnote-3) Emergent properties thus are distinguished from properties of complexes that are nothing other than the summation of the causal powers of the constituents. The concept of non-reduceable causal powers is still widely discussed in the contemporary literature,[[4]](#endnote-4) and it is this concept that could be instructively applied to earlier periods in the history of philosophy.

As Victor Caston has argued, the concept of emergent properties was clearly articulated by some ancient thinkers, including Aristotle, Galen and Alexander of Aphrodisias.[[5]](#endnote-5) Also, Richard Sorabji and Jonardon Ganeri have analyzed a version of this view in John Philoponus.[[6]](#endnote-6) Furthermore, Olaf Pluta has brought to light that this view left traces in medieval and Renaissance thought, often complicated by theories of celestial causation.[[7]](#endnote-7) These ancient and medieval versions of emergentism deviate from most contemporary accounts of emergent properties in that they regarded new causal powers to have been derived from substantial forms that emerged from the potencies of matter. Still, the view that new causal powers come into being through the occurrence of new substance can be found in recent work by Trenton Merricks (although, of course, Merricks would not express this idea in terms of the Aristotelian concept of substantial form).[[8]](#endnote-8) The early moderns used the term “eductio” and its cognates to designate the relation between properties of the constituents of a composite, the newly generated substantial form of the composite, and the causal powers deriving from this substantial form.

Emergentism remained a viable option in sixteenth- and early seventeenth-century natural philosophy. There is a wealth of relevant early modern sources to support this view, and I have explored some of them elsewhere.[[9]](#endnote-9) In the present article, I would like to add a significant piece of evidence to this overall picture by arguing that emergentist intuitions play a role in the discussion of nutrition in the natural philosophy of Antonio Ponce de Santacruz, royal physician to the Spanish king Philip IV. In particular, I will explore how Santacruz in his commentary on the first part of Avicenna’s *Canon* (1624) uses the analogy between nutrition and two other natural processes: the process that takes place when genuine mixtures come into being, and the process that takes place when elements gain their independence after having been part of a genuine mixture. Santacruz analyses the occurrence of genuine mixtures (in contrast to the occurrence of mere aggregates) as involving the coming into being of a substantial form of a composite. Similarly, he analyses the occurrence of independent elements as involving the emergence of elementary forms from qualities that persisted in the mixture. Likewise, Santacruz understands nutrition as a process in which nutriments acquire a new form—the substantial form of a living being. What is more, he understands the new causal powers of the substantial forms that arise from nutrition in close analogy with the new causal powers that he ascribes to the substantial forms of mixtures and the substantial forms of elements—as he conjectures, these new causal powers all involve emanative causation.

To set the stage, I will outline the emergentist aspects of Santacruz’s account of the origin of the forms of elements and the forms of mixtures (section 2). Subsequently, I will investigate the account he gives of the material causes that give rise to the substantial form of a living being in nutrition (section 3). Finally, I will examine how he uses the theory of emanative causation to account for how the substantial form of a living being in turn is capable of modifying the material causes from which it emerges (section 4).

2. Forms of Elements and Forms of Mixtures

The concept of emergence occurs in Santacruz’s discussion of what happens to elementary forms when composites dissolve. Santacruz is a fierce critic of the “syndiacritic” hypothesis, according to which all that happens in laboratory processes is the putting-together and separating of corpuscles that retain their identity throughout these processes. As William Newman has documented, the most important empirical support for this hypothesis came from the possibility of the so-called reduction to the pristine state (*reductio ad pristinum statum*) that was observed in laboratory processes during which chemical substances first undergo chemical reactions that completely change their physical appearance, while at the end undergoing chemical reactions that restore the physical appearance of the initial ingredients.[[10]](#endnote-10) If at the end the same substances can be retrieved, the conjecture was plausible that these substances were there all the time. Santacruz contests that this is the only plausible conjecture. Contrary to the syndiacritic hypothesis, he maintains that the elementary forms cease to exist in genuine mixtures.[[11]](#endnote-11) As he suggests, an alternative explanation of the observable *reductio ad pristinum statum* is that what happens in the dissolution of genuine mixtures is that forms of elements “emerge from the matter of the mixture.”[[12]](#endnote-12)

Santacruz presents this idea not only as an alternative to the syndiacritic hypothesis but also as an alternative to Scotus’s theory of eminent containment: according to Scotus, elementary forms are contained in the form of the mixture as the vegetative soul is contained in the sensitive soul.[[13]](#endnote-13) As it was understood in late Scholastic thought, a cause contains its effect eminently when the cause possesses a property that is found in the effect in a more perfect way, which is why the cause is capable of transferring this property in a diminished way to the effect.[[14]](#endnote-14) Evidently, analyzing the relation between the form of a mixture and the forms of elements in terms of eminent containment is opposed to the view that the potentialities of matter could cause something that is *more* perfect than the potentialities of matter are. Eminent containment thus is incompatible with emergentism.

This is why Santacruz is careful to refute the view that elementary forms are contained eminently in the forms of mixtures. As he points out that, according to the proponent of this theory, eminent containment leads to a more perfect realization of the inferior effects. For instance, the sensitive soul leads to more perfect vegetative operations. However, he objects that the form of the mixture does not lead to more perfect operations of the elements; on the contrary, these operations are weakened.[[15]](#endnote-15) Moreover, he notes that the idea of eminent containment cannot be applied to cases where it would lead to contradictions. For instance, the rational soul cannot contain the form of a lion, and the sensitive soul cannot contain the form of fire because predicating “lion” of the rational soul and “fire” of the sensitive soul leads to contradictions. Likewise, “it is contrary to the form of the mixture to contain four contrary forms, or even a single elementary form, because here, too, the predication leads to a contradiction.”[[16]](#endnote-16) The contradiction that Santacruz has in mind derives from the contrariness of substantial forms: As he argues, fire by itself is not ordained towards the form of the mixture but rather destroys it.

By contrast, contrariness is absent from the relation between the temperament of qualities and the forms of the mixture that emerges from it: “The temperament of qualities alone … is ordained as a material disposition towards the form of the mixture because through such a temperament the form is conserved in matter.”[[17]](#endnote-17) Moreover, the relation between the temperament and substantial form is not restricted to conservation dependence. This is so because “by the same dispositions through which a form is conserved in matter, another similar form can be introduced into matter.”[[18]](#endnote-18) Santacruz conjecture that mixtures decay out of themselves, through their internal contraries, even if no extrinsic cause acts upon them.[[19]](#endnote-19) Moreover, he holds that, when mixtures dissolve, celestial causation can increase the intensity of these qualities that were lost in the temperament.[[20]](#endnote-20) When the qualities that previously gave rise to the substantial form of the mixture are reinforced by external influences, they can give rise to the substantial forms of elements: As he puts it, “as far as their entity is concerned, these qualities precisely do not act for the sake of forms other than the forms that are connatural to them, with which they have a connatural connection; and consequently, they prepare matter for them.”[[21]](#endnote-21)

Of course, the notion of temperament itself raises intricate questions concerning emergence. As Santacruz notes, Avicenna understands temperament as “a quality that derives from the mutual action and passion of contrary qualities that are found in elements.”[[22]](#endnote-22) Likewise, he paraphrases what Alexander of Aphrodisias maintains in *De mixtione* as follows: “The fight between elements is carried as far as, once the excesses of contrary qualities have been abolished, through which they were different from each together, they generate a single quality out of all potencies.”[[23]](#endnote-23) Santacruz rejects such a view and adopts Aquinas’s understanding of temperament as an “intermediary quality” that takes up the nature of all contraries.[[24]](#endnote-24) Much of what Santacruz says about the nature of the temperament can be understood as an explication of this enigmatic notion.

To begin with, Santacruz is clear that he accepts a compositional analysis of temperament, according to which the temperament “contains” or is “composed of” primary qualities (hot, cold, wet, dry).[[25]](#endnote-25) However, against Fernel’s view that the temperament is an aggregate of modified primary qualities that has no new causal powers,[[26]](#endnote-26) Santacruz claims that the temperament is not an accidental being like a heap of stones.[[27]](#endnote-27) As he argues, this is for two reasons: (1) The temperament possesses unity with respect to the dependence relations between the primary qualities: Each primary quality is modified by the other primary qualities to such a degree that it could not be what it is independently of the other primary qualities. He holds that, in this sense, the primary qualities that compose the temperament constitute a single, accidental form.[[28]](#endnote-28) (2) The temperament possesses unity with respect to disposition: The primary qualities that compose the temperament constitute a single disposition toward a single form of the mixture.[[29]](#endnote-29) In the case of animals, this “single total disposition” toward the animal soul is called “natural heat.”[[30]](#endnote-30) And a quotation from Aquinas makes clear that what Santacruz has in mind here is *substantial* form: “in this way, the quality of the mixture is the proper disposition for the substantial form of the mixture, for instance of a stone or of whatever soul.”[[31]](#endnote-31)

On first sight, analyzing the unity of the temperament in terms of a unitary disposition seems to be in tension with the idea that, when a mixture dissolves, the elements emerge again. For if there is a single uniform disposition, it is not clear where the diversity of dispositions comes from that can be observed in the emergence of elements.[[32]](#endnote-32) Santacruz responds to this worry that qualitatively different regions in the mixture correspond to what remains of the elements in mixture.[[33]](#endnote-33) This view is closely connected with his analysis of nutrition since nutrition involves a separation of different parts. Therefore, Santacruz concludes that there must have remained something in the mixture that corresponds to this variety of parts.[[34]](#endnote-34) He also points out that these qualitative differences are essential for explaining the properties of mixtures (such as coagulation, fluidity, flexibility, fragility, viscosity, inflammability).[[35]](#endnote-35) What is more, he offers an argument for why different regions in mixtures necessarily must be qualitatively different. He argues that, in order for remission of qualities to take place, elements must come close to each other; but since elements cannot be equally close to each other, also qualitative change is unequal. Hence, there are different primary qualities and different secondary qualities such as tenuity and density throughout any mixture.[[36]](#endnote-36)

In Santacruz’s view, qualitatively different regions are essential for the emergence of plants, zoophytes and animals: “as the other forms of plants and animals require a diversity of parts and as such a form is not educed unless such a varied disposition is given, the same has to be said in mixtures.”[[37]](#endnote-37) In Santacruz’s view, primary qualities are thus the basis from which substantial forms of elements and the substantial forms of inanimate mixtures and the substantial forms of living beings emerge. Santacruz clearly does not regard the causal powers of substantial forms as mere combinations of the powers of primary qualities since he maintains that substantial forms perform actions by means of which something comes into existence anew.[[38]](#endnote-38) Moreover, he characterizes the function of the new causal powers of substantial forms in their tendency of keeping the entities that they inform in their most perfect state.[[39]](#endnote-39) What kind of causation can fulfill this function?

At this juncture, Santacruz adopts the Platonic notion of emanative causation. As it was generally understood, a being that operates by emanative causation brings forth an effect that possesses the same essence as the cause but realizes this essence in a less perfect way; moreover, by bringing about an effect in an emanative way, the cause does not undergo change itself.[[40]](#endnote-40) Santacruz uses this concept when he conjectures that the actions of elementary forms could be regarded as instances of emanative causation.[[41]](#endnote-41) One example that he gives for the new causal powers of elementary substantial forms is their alleged capacity to reduce water to its natural coldness.[[42]](#endnote-42) Similarly, actions of the substantial forms of complex mixtures such as body parts include directing the temperament toward an optimal state, in this case the healthy state of a body part: “The natural temperament alone is … by itself preserved by the substantial form of the body part, and if such a temperament is lost (as happens in diseases), it can emanate from an internal principle, once what is an obstacle for it is removed.”[[43]](#endnote-43) Thus, the substantial form of a body part is described both as emerging from the temperament and as having a causal influence on the temperament. The causation relevant for the first aspect could be characterized as upward causation—the causation that leads from suitably prepared matter to a substantial form with new causal powers. The causation relevant for the second aspect could be characterized as downward causation—the causation that leads from powers that emanate from the substantial form to a modification of the temperament according to the goals defined by the substantial form. As we shall presently see, Santacruz understands the relation between nutrition and animal souls in an analogous way as a kind of causal circle.

3. Nutrition and Upward Causation

As in the case of inanimate mixtures, material upward causation in the case of the nutrition of living beings starts with the temperament. Santacruz maintains that it is not necessary to stipulate the existence of natural powers in addition to the causal role of the temperament (which itself it not an emergent property).[[44]](#endnote-44) He offers two arguments that draw analogies from what happens in inanimate mixture to what happens in animate bodies: (1) The forms of elements are introduced and preserved by the temperament, which shows that the temperament is sufficient for producing substantial forms;[[45]](#endnote-45) (2) If the temperament produces substance, as it does in the case of elements and mixtures, then there is no additional task for any natural powers distinct from the temperament.[[46]](#endnote-46) Consequently, “the soul is conserved in its matter only through the temperament of primary and secondary qualities; hence, the soul is introduced into the matter of nutriment only through the temperament through nutritive action.”[[47]](#endnote-47) More precisely, Santacruz holds that the temperament together with the influence of other body parts suffices to generate a determinate substance.[[48]](#endnote-48)

To clarify how nutrition relates to other bodily processes that have an influence on it, Santacruz draws a distinction between two kinds of power in the body of living beings: supported power (*facultas ministrata*) and supporting power (*facultas ministrans*). A power of the former kind is understood as a power that can bring forth a form and therefore presupposes some previous preparation of matter.[[49]](#endnote-49) A power of the latter kind is understood as a power that only prepares matter for the workings of a supported power.[[50]](#endnote-50) As examples of supporting powers, Santacruz mentions attraction, retention and expulsion, which he regards as powers resulting from the temperament of fibers and the influence that body fluids such as humors have on it.[[51]](#endnote-51)

In Santacruz’s view, what nutrition and growth have in common with generation is that they all belong to the category of supported power:

[A]mong the supported powers, there is a difference, for some make the form of the being in which they are, such as nutrition and growth; for they make form in its own subject, by uniting new matter, or new quantity. But generative power makes form in another subject; for the power of the seed introduces a form into the menstrual blood … Hence, the nutritive power makes numerically the same form, but generating power makes form of the same kind.[[52]](#endnote-52)

Consequently, what nutrition and generation have in common is that they “induce ultimate form into matter.”[[53]](#endnote-53) This raises the question of whether nutrition and generation are distinct powers at all. In many places in Aristotle’s writings, nutrition and generation are treated as a single power, but it turns out to be difficult to find an explication of the sense in which they are one.[[54]](#endnote-54) Still, Santacruz disagrees with thinkers such as Francisco Vallés (1524-1592),[[55]](#endnote-55) who believes that there is only a single power that comprises both generation and nutrition. Vallés uses the phenomenon of regeneration to argue for the view that quantity is not produced by an action distinct from substantial generation. If so, the only difference between generation and nutrition would be a difference between more and less.[[56]](#endnote-56) Since Vallés, at least with a view to the souls of non-human animals and the substantial forms of human body parts, accepts the theory of eduction of forms from the potencies of matter,[[57]](#endnote-57) this is a challenge that Santacruz takes very seriously.

In his response to Vallés, Santacruz draws a distinction between two different kinds of instrumental causes. As he puts it, generation is brought about by a “separate instrument,” which does not receive any continuous causal influence from the genitor, whereas nutrition and regeneration are brought about through the continuous influence of the other parts of a living being.[[58]](#endnote-58) To explicate the different kinds of instrumental causation, Santacruz makes use of the technical notion of an “instrument of direction” that he derives from Gentile da Foligno (d. 1348).[[59]](#endnote-59) Gentile develops this notion in his discussion of supporting powers, which is why it is highly relevant for Santacruz’s analysis of the relation between nutrition and the powers that support it. In particular, the concept of an instrument of direction stems from Gentile’s discussion of animal spirits in the living organism:

[S]pirit transmits potency as a moved instrument transmits the primary moving power; but spirit is of this kind because it is the instrument of the soul … But you will say, what is the mode of this transmission? It has to be said that if the spirit transmits potency, it does not transmit potency itself; since potency and the soul give to the spirit its form; but because the potency gives to this spirit a mode of motion, and when such a spirit reaches the members, the members acquire formal powers in their operations. And it is as when we see that the art that is in the soul of the smith does not give its form to the fire and the hammer; but surely it gives to them a mode of motion by means of which they can lead the form of a small knife from the potentiality that lies in the matter of iron to actuality.[[60]](#endnote-60)

In this passage, spirit is characterized as an instrument of the soul—not in the sense that it transmits motions originating from the soul, for in this case, spirit could not fulfil a causal function when separated from the soul—but rather in the sense that it can modify motions that originate from other causes, external to both the spirit and the soul. In particular, the modification of motion is described as a change of direction. What is more, the potency of the spirit to bring about changes of direction is ascribed to the form of the spirit. In this sense, by conferring to the spirit the capacity of influencing the mode of motion of other bodies, the soul confers form to the spirit. This form differs from the form of the entire organism; on the contrary, it is brought forth from the potencies inherent in the matter of the spirit.

In one important respect, Santacruz departs from Gentile since he does not regard animal spirits as instruments of the *soul* but rather as instruments of the principal organs—the heart and the brain. But as to the role of animal spirits in modifying the motions of other body parts, Santacruz’s view is close to Gentile’s: “as the spirit receives its mode of motion from the heart and the brain, the same spirit afterwards directs the body parts toward motion. In the generation of spirit, its matter receives a form to move, or motion itself, and subsequently in the body part, it communicates this motion.”[[61]](#endnote-61) This raises the question of whether animal spirits are conjoined or separate instruments:

If conjoined, as Gentile’s words seem to suggest, and as the example of the artisan declares, there arise great difficulties. For if spirit acquires its motion in the brain, as the hammer receives its motion from the smith, how can Gentile contend with Averroes that this sprit articulates itself [in the body part] in such a way that it develops its own motions? If this were the case, one would have to say that it is not a conjoined instrument of the brain or the heart, for it does not operate by means of the same form that it received but by means of another, partial form.[[62]](#endnote-62)

The worry articulated here seems to be that the pattern of motion that sprit receives in the brain cannot remain unchanged while it travels from its origin to other body parts. But if spirit initiates motion in body parts by means only of a part of the pattern of internal motions that it received initially, then it would act as a principal agent, not as an instrument of a primary agent. Santacruz argues that Gentile could reply that what matters is not the preservation of motion but rather the “preservation of the mode of motion.” This, of course, sounds enigmatic. What does the concept of the preservation of the mode of motion mean? Santacruz offers the following analogy:

When I receive the influence of the heavens, I do not destroy it but rather receive it according to the mode of the recipient. Similarly, spirit receives this quality from the brain and the heart, namely, motion with a purpose. Again, when it enters single parts, it does not lose this mode but rather confers dispositions to body parts themselves to move in such-and-such a way, although this motion is determined by the temperament and the form of the body part.[[63]](#endnote-63)

This analogy suggests that spirits are not active principles that initiate the motion of other body parts but rather active principles that change the dispositions of other body parts; and these dispositions determine how these body parts move. What has to remain constant, accordingly, is not particular motions of spirits but rather the capacity of spirit to change in other body parts their disposition for motion.

Santacruz gives the following analysis of the relation between efficient and material causation in the eduction of substantial forms:

Even if the agent introduces dispositions into matter through efficient causation, and the qualities that are produced belong to the accidental forms, which are dispositions preceding the existence of form in matter: nevertheless, the whole matter with its dispositions behaves as a subject and purely materially with respect to the principal form. Hence, we concede readily that what produces dispositions produces in the way of efficient causation. Again, the produced dispositions concur as forms of some kind to render matter more perfect. Finally, however, with respect to the action to be brought forth, all these qualities behave as material causes with respect to this form.[[64]](#endnote-64)

For instance, animal spirits modify the dispositions of motion of the body parts involved in nutrition, which in turn give rise to the substantial form of a living being. This is why Santacruz understands the natural qualities of spirits as qualities that do not belong to the efficient aspect of the instrument but rather to its material aspect.[[65]](#endnote-65) These qualities “concur instrumentally, not by bringing about action through efficient causation but by formally perfecting a principle that brings forth actions.”[[66]](#endnote-66)

Animal spirits differ from animal seeds, however, because they require a continuous causal influence from the primary agent. This is so because the mode of motion conferred by them “does not consist in those qualities that can persevere in the absence of an agent.”[[67]](#endnote-67) Santacruz adduced experimental evidence that shows that local motion of body parts ceases as soon as nerves are obstructed. In such an obstruction, two things take place: animal spirits no longer can flow through the nerves, and no mode of motion can be propagated by means of animal spirit. However, the propagation of modes of motion does not coincide with the flow of animal spirits. Spirits flow into body parts after an obstruction bas been removed; this does not happen instantaneously but rather in time. This is why what moved instantaneously are not spirits but rather “a quality that is diffused throughout spirits and nerves in a moment, as if it lacks a contrary.”[[68]](#endnote-68)

Santacruz compares the propagation of modes of motion in spirits with the behavior of sensible species in a medium.[[69]](#endnote-69) As he describes them, sensible species are information-carrying structures that are not corrupted by other sensible species and, in this respect, do not possess contraries; however, they cease to exist in the moment in which their source ceases to exist.[[70]](#endnote-70) Santacruz’s use of the analogy between how sensible species transport information through a medium and how sprits propagate modes of motion from the principal organs to another body indicates that his view is not that a portion of spirit receives a pattern of motion in the brain and subsequently travels through the nerves to a body part; in this case, it would in fact be difficult to imagine how the original pattern of motion could remain intact all the way along. Rather, he takes spirits to form a continuum that forms a medium through which patterns of motion originating from the brain and the heart are propagated; what remains intact is not the structure of a particular portion of spirit that moves from one place in the body to another place but rather the patterns of motion that are propagated in a continuous medium. It is these patterns of motion that function as “modes” of motion because they are capable of modifying dispositions inherent in body parts. The motions of spirits, one could say, are efficient causes of the modification of the dispositions inherent in body parts. And these dispositions, together with the motions of surrounding bodies, are the efficient causes of motions of body parts.

Surprisingly, as to the nature of instrumental causation involved in the workings of spirits there is an analogy with how Santacruz believes that animal seeds operate. He holds that the structure of the material parts of the seed modifies the motions of particles external to the seed.[[71]](#endnote-71) This is so because the capacity of modifying the motions of other particles in this way does not presuppose any continued influence of the parent’s soul on the seed; all that is needed is that the parent’s soul previously conferred a certain structure to the constituents of the seed.[[72]](#endnote-72) What is more, Santacruz expands the concept of an instrument of direction in a way that goes beyond Gentile’s analysis of spirit by including the notion of qualitative change into his analysis of instrumental causes. The primary qualities of the material parts of the seed modify the primary qualities of the parts that are added during the process of nutrition and growth.[[73]](#endnote-73) Again, the causal powers of primary qualities are independent of a continued causal influence from the parent’s soul;[[74]](#endnote-74) all that is needed is that the parent’s soul has previously tempered these qualities in a suitable way.[[75]](#endnote-75) Moreover, since the potencies of local and qualitative modification inherent in seeds are the outcome of the agency of the parents’ souls and since these potencies realize the reproductive goals of the parents, seeds function as instruments of the parents.[[76]](#endnote-76) Thus, both animal spirits and animal seeds operate as instrumental causes because they modify the motions of bodies with which they come into contact according to the goals of their primary agents. In this way, what nutrition and generation have in common with all other body functions that involve supporting natural powers is the role that instrumental causes play in the emergence of substantial forms—be it the forms of body parts or the forms of living beings.

4. Nutrition and Downward Causation

Santacruz’s theory of instrumental causes thus offers an analysis of the role that material causation plays in the emergence of the substantial forms of living beings and at the same time serves to explicate both the analogies and the differences between nutrition and generation. Still, this raises the question of what the new causal powers of the substantial forms of living beings are supposed to consist in. As in the case of the substantial forms of complex mixtures such as body parts, Santacruz understands animal souls to be embedded in a causal circle: “[A]s the ultimate disposition is preserved by the form, so is the vegetative grade preserved by the sensitive grade, … in the same way as a single form preserves its disposition and conversely is preserved by it, albeit in different kinds of causation.”[[77]](#endnote-77) As will become clear presently, the two kinds of causation relevant here are the emergence of an animal soul from the potencies of matter and the emanation of faculties from the animal soul, which direct the animal toward its optimal state.

The quality that emanates from the soul, by means of potency, is something added to the temperament in the mode of a more perfect actuality and form. And it is not necessary that it is of the same specific nature as the first qualities, but stands in a more eminent relation that regards the temperament united as such, and preserves and confirms this unity.[[78]](#endnote-78)

Does it make sense to ascribe to qualities emanating from the soul a function in preserving the unity of the temperament? Recall that Santacruz accepts Avicenna’s view that mixtures, due to the contrary nature of the qualities of their constituents, have an internal tendency toward decay. In this sense, preventing this internal tendency is a genuine task that the qualities emanating from the soul could fulfil. Moreover, it is evidently a task that cannot be fulfilled by the primary qualities themselves since the tendency toward decay results from their contrariness. This is why Santacruz takes the qualities emanating from the soul to be “something added to the temperament itself by means of a more perfect actuality and form.”[[79]](#endnote-79)

This is the crucial point where Santacruz diverges from Galen. As Santacruz diagnoses it, Galen did not know anything about “the emanation of faculties from the soul.”[[80]](#endnote-80) Unlike Galen, Santacruz understands a process such as nutrition to be a single total effect of the two distinct agents—the temperament of various body parts and the vegetative powers of the soul—without distinguishable aspects in the effect.[[81]](#endnote-81) Still, the question remains why one should accept the reality of vegetative powers emanating from the form. Santacruz offers the following argument:

[M]ore is required to change matter than to preserve form in matter. For to preserve the form, no passive resistance has to be overcome; but to change matter, there intervenes some passive resistance; and hence a greater power is required for transforming matter. And this is the reason why inanimate bodies, such as stones, do not transmute their proximate matter, because they have power limited to self-preservation only. Therefore, living bodies have faculties in order to augment the power of their primary qualities.[[82]](#endnote-82)

Hence, it is the capacity for self-change characteristic of living beings that speaks in favor the existence of vegetative powers emanating from souls. While temperament, together with the influence of animal spirits, is capable of bringing forth a substantial form, the development and improvement of organs is something that requires additional powers that do not reduce to combinations of primary qualities. This is why the soul plays a role in downward causation by means of which powers that emanate from the soul change bodily structures.

As Santacruz notes, his conjecture concerning downward causation raises the question of whether the way in which powers “result from” the soul is a kind of efficient causation.[[83]](#endnote-83) The problem is that not all instances of “resulting from” are causal relations, and not all qualities that “result from” something else have causal potencies. For example, relations cannot produce anything new because they do not possess activity by themselves. This is so because they do not add anything to the foundations from which they result (the things or qualities that stand in a relation to each other). Hence, they can be active only in virtue of the activity of their foundations. Likewise, relations cannot cause relations because relations result whenever their foundations are given. By contrast, the soul stands in a dual causal relation to powers. One relation is a relation of final causation: “those faculties that relate to the whole, insofar as they are ordained towards the good of the entire substance (for body and soul sense, vegetate and generate as a whole of some kind) nevertheless because through these operations and powers the soul perfects its matter, these powers ultimately are directed towards the soul as their goal.”[[84]](#endnote-84)

At the same time, he also maintains that the soul is an efficient cause of the powers that emanate from it, a view that he defends against three objections raised by Domingo de Báñez (1528–1604).[[85]](#endnote-85) First, Báñez argues that the relation of resulting from something cannot be an instance of efficient causation, since otherwise accidents would be produced immediately by substances, not mediated through powers; but only God can produce something immediately.[[86]](#endnote-86) Second, Báñez argues that if the soul acts by means of efficient causation, it would initiate alteration, which consists in motion towards some quality. Such motion would take time, which is contrary to the understanding of emanation as something that takes place instantaneously.[[87]](#endnote-87) Third, Báñez argues that efficient causes precede temporally their effects, while the soul is generated in the same instant as its powers.[[88]](#endnote-88) As to the first objection, Santacruz argues that accidents that follow from the essence of the soul emanate immediately; but accidents that do not follow from the essence of the soul require another accident. In this sense, some powers can emanate immediately, by means of another accident.[[89]](#endnote-89) As to the second objection, Santacruz maintains that not all emanation is alteration but rather an action through which something new arises; but he does not see any problems with the claim that some qualities that arise by means of emanation lead to alteration that takes place in time.[[90]](#endnote-90) As to the third objection, Santacruz denies that it is necessary that the efficient cause precedes temporally. As an example, he mentions the relation between the sun and the light that it produces—a relation that in the Platonic tradition has often been used as an example for emanative causation.[[91]](#endnote-91) This is why he takes neither the supposed immediacy nor the supposed instantaneous character of emanation to be an obstacle for the claim that powers emanating from the soul can fulfill a role as efficient causes of changes in the bodily organs from whose temperament the soul emerges.

5. Conclusion

Santacruz’s theory of nutrition thus is embedded in a comprehensive emergentist worldview that regards the substantial forms of elements, the substantial forms of mixtures, the substantial forms of body parts and the substantial forms of living beings as emergent phenomena with novel causal powers. The use that Santacruz makes of the notion of an instrument of direction establishes a close analogy between nutrition and generation without, however, confounding the two processes since generation involves instrumental causes that are separate from the principal agents, while nutrition involves instrumental causes that are continuously influenced by the principal agents. What both processes share is the function of instruments of direction: material beings that modify the motion and the qualities of material objects external to them. The emergence of animal souls, in Santacruz’s view, is based on such material changes whose structure is common to nutrition and generation. Santacruz analyses the new causal powers of substantial forms in terms of emanative causation. The substantial forms of elements, the substantial forms of mixtures and the souls of living beings have in common that they emanate powers that direct the entity that they inform toward its most perfects state. This holds for the forms of elements (which direct elements toward their natural degrees of primary qualities and their natural places); it holds for the forms of body parts (which direct body parts toward the temperament that defines health); and it holds for animal souls (which govern the development of organs during the life cycle of an animal). Nutrition thereby is embedded in a causal circle: nutritive powers initially arise from complexes of primary qualities that constitute a unitary disposition toward the substantial form of the living being; and the substantial form of the living being is what preserves the temperament of its body parts and modifies it according to the goals defined by the substantial form. In this way, the soul itself modifies the material basis from which it emerges, thereby leading to a dynamic interaction between the natural powers inherent in the temperament of body parts and the powers emanating from the soul.

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1. See, e.g., Bedau (1997). [↑](#endnote-ref-1)
2. See, e.g., Batterman (2001). [↑](#endnote-ref-2)
3. See, e.g., Broad (1925). [↑](#endnote-ref-3)
4. For an overview, see Macdonald and Macdonald (2010). [↑](#endnote-ref-4)
5. Caston (1997). [↑](#endnote-ref-5)
6. Sorabji (2010); Ganeri (2011). [↑](#endnote-ref-6)
7. Pluta (2007). [↑](#endnote-ref-7)
8. Merricks (2001). [↑](#endnote-ref-8)
9. Blank (2014); Blank (2016); Blank (2017); Blank (2018). [↑](#endnote-ref-9)
10. Newman (2006), 41–43, 98–100, 112–115. [↑](#endnote-ref-10)
11. Santacruz (1624), 8. [↑](#endnote-ref-11)
12. Santacruz (1624), 12. [↑](#endnote-ref-12)
13. Santacruz (1624), 9; see Scotus (1620), 2. Sent., dist. 25, q. 1, nu. 13–15. [↑](#endnote-ref-13)
14. See, e.g., Suárez (1866), disp. 29, sect. 2, nu. 16. On this concept and its reception in Descartes, see Gorham (2003). [↑](#endnote-ref-14)
15. Santacruz (1624), 10. [↑](#endnote-ref-15)
16. Santacruz (1624), 10: “repugnat naturae sensitivae [animae] continere formam ignis, quia & ipsa praedicatio repugnat: repugnat formae mixti continere quatuor formas contrarias, aut unam solam elementarem, quia repugnat etiam praedicatio.” [↑](#endnote-ref-16)
17. Santacruz (1624), 10: “Sola … temperies qualitatum oriatur ut dispositio materialis ad forma mixti, quia per talem temperiem conservatur forma in materia.” [↑](#endnote-ref-17)
18. Santacruz (1624), 228: “[E]isdem dispositionibus quibus una forma conservatur in materia, potest alia similis forma introduci de novo in sua materia.” [↑](#endnote-ref-18)
19. Santacruz (1624), 12. [↑](#endnote-ref-19)
20. Santacruz (1624), 228. [↑](#endnote-ref-20)
21. Santacruz (1624), 12: “praedictae qualitates, quantum attinet ad suam entitatem, praecise non agunt propter alias formas, nisi propter suas connaturales, cum quibus dicunt naturalem connexionem; & ex consequenti disponunt materiam ad illas.” [↑](#endnote-ref-21)
22. Santacruz (1624), 14: “qualitas, quae provenit ex mutua actione & passione contrariarum qualitatum in elementis inventarum.” See Avicenna (1595), liber 1, fen 1, doctrina 3, cap. 1. [↑](#endnote-ref-22)
23. Santacruz (1624), 14; see Todd (1976), 158 (*De mixtione* 233.2–5). [↑](#endnote-ref-23)
24. Santacruz (1624), 14; see Aquinas (1889), I, q. 76, a. 4, ad 4. [↑](#endnote-ref-24)
25. Santacruz (1624), 17. [↑](#endnote-ref-25)
26. See Fernel (2005), 404. [↑](#endnote-ref-26)
27. Santacruz (1624), 19. [↑](#endnote-ref-27)
28. Santacruz (1624), 20. [↑](#endnote-ref-28)
29. Santacruz (1624), 20. [↑](#endnote-ref-29)
30. Santacruz (1624), 20. [↑](#endnote-ref-30)
31. Santacruz (1624), 20, citing Aquinas (1889), q. 76, a. 4, ad 4: “huiusmodi qualitas mixtionis est propria dispositio ad formam substantialem mixti, puta lapidis, vel animae cuiuscumque.” [↑](#endnote-ref-31)
32. Santacruz (1624), 22. [↑](#endnote-ref-32)
33. Santacruz (1624), 23. [↑](#endnote-ref-33)
34. Santacruz (1624), 23. [↑](#endnote-ref-34)
35. Santacruz (1624), 24. [↑](#endnote-ref-35)
36. Santacruz (1624), 24. [↑](#endnote-ref-36)
37. Santacruz (1624), 25: “ut reliquae formae plantarum & animalium requirunt diversitatem partium, & non educitur talis forma, nisi supposita tali dispositione varia: ita dicendum in mixto.” [↑](#endnote-ref-37)
38. Santacruz (1624), 196. [↑](#endnote-ref-38)
39. Santacruz (1624), 195. [↑](#endnote-ref-39)
40. See, e.g., Piccolomini (1611), 447. [↑](#endnote-ref-40)
41. Santacruz (1624), 195. [↑](#endnote-ref-41)
42. Santacruz (1624), 196. [↑](#endnote-ref-42)
43. Santacruz (1624), 10: “Sola … temperies naturalis conservatur a forma substantiali membri per se: & si amittitur talis temperies (ut per morbos fit) potest a principio interno emanare, semoto prohibente.” [↑](#endnote-ref-43)
44. Santacruz (1624), 228. [↑](#endnote-ref-44)
45. Santacruz (1624), 228. [↑](#endnote-ref-45)
46. Santacruz (1624), 228. [↑](#endnote-ref-46)
47. Santacruz (1624), 228: “anima conservatur in sua materia per solam temperiem primarum, & secundarum qualitatum; ergo per solam temperiem inducetur in materia nutrimenti per actionem nutritivam.” [↑](#endnote-ref-47)
48. Santacruz (1624), 229. [↑](#endnote-ref-48)
49. Santacruz (1624), 229. [↑](#endnote-ref-49)
50. Santacruz (1624), 227. [↑](#endnote-ref-50)
51. Santacruz (1624), 239–240. [↑](#endnote-ref-51)
52. Santacruz (1624), 227: “[I]nter ministratas [facultates] est differentia, nam aliquae sunt factivae formae eius in quo est, quales sunt nutritiva, & crescitiva: istae enim faciunt formam in proprio subiecto, uniendo novam materiam, vel novam quantiatem. At vero generativa est factiva formae in alio: nam facultas seminis in menstruo sanguine inducit formam … Unde facultas nutritiva est factiva formae eiusdem numeri: at facultas generativa est factiva formae eiusdem speciei.” [↑](#endnote-ref-52)
53. Santacruz (1624), 227. [↑](#endnote-ref-53)
54. See James G. Lennox’s contribution to this volume. [↑](#endnote-ref-54)
55. On Valles’s natural philosophy, see Martin (2002). [↑](#endnote-ref-55)
56. Valles ([1564] 1606), 74–75. [↑](#endnote-ref-56)
57. Valles (1600), 16–17, 45, 69, 221. This does not imply that Valles is an emergentist about inanimate mixtures. On the reductionist aspects of his pharmacological views, see Blank (2018). [↑](#endnote-ref-57)
58. Santacruz (1624), 239. [↑](#endnote-ref-58)
59. On Gentile, see French (2001). [↑](#endnote-ref-59)
60. Gentile (1520), fol. 83v: “[D]ico quod spiritus defert virtutem sicut instrumentum motum defert principale movens: sed spiritus est huiusmodi, est enim animae instrumentum … Sed tu dices quis modus delationis est iste? Dicendum quod si spiritus defert virtutem, non defert ipsam: quia virtus & anima spiritui dat suam formam: sed quia virtus dat illi spiritui modum motus per quem spiritus ad membra perveniens possunt membra formaliter in eorum operationes: et est sicut videmus quod ars que est in anima fabri non dat suam formam igni & malleo; sed bene dat illi modum motus per quem possunt ad actum deducere formam cultelli de potentia materie ferri.” [↑](#endnote-ref-60)
61. Santacruz (1624), 285: “sicut spiritus recepit modum motus a corde & cerebro, ita ipse spiritus postea active dirigit ipsa membra ad motum. In generatione spiritus illius materia suscepit formam ad movendum, seu ipsam motionem, postea vero in membris ipsis communicavit illam.” [↑](#endnote-ref-61)
62. Santacruz (1624), 285: “si coniunctum, ut verba Gentilis explicare videntur, & exempla artificis declarant, magnae oriuntur difficultates: nam si spiritus in cerebro acquirit istam motionem, ut malleus a fabro, quo pacto ipsemet Gentilis cum Avicenna contendit spiritum in partibus dearticulari ad proprios motus obeundos? Ita enim dicendum est, non esse instrumentum cerebri coniunctum, vel cordis, siquidem non operatur per illamet formam, quam recepit, sed per aliam partialem.” [↑](#endnote-ref-62)
63. Santacruz (1624), 285: “ego, qui nunc recipio influxum caeli, non illum destruo, sed ad modum recipientis recipio. Ita similiter spiritus qualitatem istam recepit a cerebro, & corde, motionem, scilicet ad opera. Rursus cum in partes singulares inciderit, non amittit modum illum, sed in talem motionem membra ipsa disponit; quantumvis determinetur a temperie, & forma partis.” [↑](#endnote-ref-63)
64. Santacruz (1624), 290: “Licet enim agens disponat materiam efficienter, & qualitates productae sint quaedam formae accidentales, quae disponunt praevie ad esse formae in materia: tota tamen materia disposita habet se subiective, & mere materialiter respectu formae principalis: Itaque concedimus libenter, quod producens dispositiones, producit efficienter: Rursus dispositiones productae, ut formae quaedam concurrunt ad ornandam materiam. Ultimo tamen respectu actionis eliciendae, respectu ipsius formae materialiter se habent omnes istae qualitates.” [↑](#endnote-ref-64)
65. Santacruz (1624), 291. [↑](#endnote-ref-65)
66. Santacruz (1624), 291: “possit dici instrumentaliter concurrere qualitates, non efficiendo actionem, sed formaliter perficiendo principium elicitivum actionis.” [↑](#endnote-ref-66)
67. Santacruz (1624), 286. [↑](#endnote-ref-67)
68. Santacruz (1624), 293. [↑](#endnote-ref-68)
69. On the medieval background of this theory, see Maier (1963). [↑](#endnote-ref-69)
70. Santacruz (1624), 293. [↑](#endnote-ref-70)
71. Santacruz (1624), 72; 284–285. [↑](#endnote-ref-71)
72. Santacruz (1624), 71–72; 285. [↑](#endnote-ref-72)
73. Santacruz (1624), 72. [↑](#endnote-ref-73)
74. Santacruz (1624), 69. [↑](#endnote-ref-74)
75. Santacruz (1624), 74; 290. [↑](#endnote-ref-75)
76. Santacruz (1624), 284. [↑](#endnote-ref-76)
77. Santacruz (1624), 10: “Et sicut ultima dispositio conservatur a forma, ita gradus vegetativus a sensitivo … ut una forma conservat suam dispositionem; & e converso conservatur ab illo in diverso genere causae.” [↑](#endnote-ref-77)
78. Santacruz (1624), 231: “Illa autem qualitas, quae dimanat ab anima, media potentia, est aliquid superadditum ipsi temperamento per modum actus & formae perfectioris, Neque est necessarium, ut sit eiusdem specificae naturae cum primis, sed eminentialis cuiusdam rationis, quae respicat temperamentum unitum ut sic, & illam unionem conservet & confirmet.” [↑](#endnote-ref-78)
79. Santacruz (1624), 231. [↑](#endnote-ref-79)
80. Santacruz (1624), 231. [↑](#endnote-ref-80)
81. Santacruz (1624), 231. [↑](#endnote-ref-81)
82. Santacruz (1624), 232: “magis … requiritur ad conservandam formam in materia. Nam ad conservandam formam nulla advertitur resistentia passi; ad transmutandam vero materiam intervenit aliqua resistentia passi: & sic maior virtus requiritur ad transmutandum. Et haec est ratio quare corpora inanimata, ut lapides, &c. non transmutent materiam sibi proximam, quia limitatam habent virtutem ad se conservanda tantummodo. Quare corpora viventia habent facultates, ut augeantur virtus suarum primarum qualitatum.” [↑](#endnote-ref-82)
83. Santacruz (1624), 189. [↑](#endnote-ref-83)
84. Santacruz (1624), 192: “illae facultates, quae respiciunt coniunctum, licet in bonum totius suppositi ordinentur (nam corpus & anima sentiunt ut totum quoddam, vegetantur & generant) tamen quia per tales operationes, & facultates anima perficit suam materiam, inde est, quod ultimate, potentiae ordinentur in animam tanquam in finem.” [↑](#endnote-ref-84)
85. Santacruz also ascribes these arguments to Cajetan’s commentary on *Summa theologiae* I, q. 54, a. 3, where I have not found them. [↑](#endnote-ref-85)
86. Báñez (1591), commentary on *Summa theologiae* I, q. 77, a. 6, dub. 3. [↑](#endnote-ref-86)
87. Báñez (1591), commentary on *Summa theologiae* I, q. 77, a. 6, dub. 3. [↑](#endnote-ref-87)
88. Báñez (1591), commentary on *Summa theologiae* I, q. 77, a. 6, dub. 3. [↑](#endnote-ref-88)
89. Santacruz (1624), 196. [↑](#endnote-ref-89)
90. Santacruz (1624), 196. [↑](#endnote-ref-90)
91. Santacruz (1624), 196; see Lindberg (1976), 96–98. [↑](#endnote-ref-91)