



Aquinas on Forms, Substances and Artifacts

Anna Marmodoro

University of Oxford, Faculty of Philosophy

anna.marmodoro@philosophy.ox.ac.uk

Ben Page

University of Oxford, Faculty of Theology

ben.page@stcatz.ox.ac.uk

Abstract

Thomas Aquinas sees a sharp metaphysical distinction between artifacts and substances, but does not offer any explicit account of it. We argue that for Aquinas the contribution that an artisan makes to the generation of a product compromises the causal responsibility of the form of that product for what the product is; hence it compromises the metaphysical unity of the product to that of an accidental unity. By contrast, the metaphysical unity of a substance is achieved by a process of generation whereby the substantial form is solely responsible for what each part and the whole of a substance are. This, we submit, is where the metaphysical difference between artifacts and substances lies, for Aquinas. We offer a novel account of the causal process of generation of substances in terms of *descending forms*, and we bring out its explanatory merits by contrasting it to other existing accounts in the literature.

Keywords

Aquinas – substance – artifact – form – hylomorphism – unity

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Thomas Aquinas's views on artifacts have been much debated in recent years. One of the interpretative challenges scholars have concentrated on is how to understand Aquinas's claim that *no artifact is a substance*. Without metaphysical backup, the claim leaves the way open to a host of objections and counter-examples that make it appear uninteresting to say the least.¹ Did Aquinas have an adequate metaphysics to support his stance? This is the question this paper addresses. We offer fresh arguments for the conclusion that it is plausible to attribute to Aquinas a sound and distinctive metaphysics of artifacts, whereby there is a genuine and fundamental difference between artifacts and substances. Aquinas did not flesh out his account enough perhaps, one may concede to his critics; and also he did not present it in a complete way in any of his works. But he did have, via his use of Aristotle, all the required conceptual resources to back up his views.

Along Aristotelian lines, Aquinas holds that the form of material objects is that in virtue of which objects are the type of hylomorphic unities they are. This metaphysical role that the form plays as the source of unity and identity of a given object is, we could say, a common denominator between substances and artifacts. In virtue of their form, substances and artifacts alike fall under sortals, i.e., concepts that determine the identity of the object and the criteria by which it can be counted and distinguished from other objects. Yet there are two types of form in play, as it were: substantial forms and what we may call artifact forms; and their difference grounds a metaphysical difference between the two types of material objects.² This much has been generally noted in the literature. But *what* difference? Merely saying that substances and artifacts differ on account of the former having substantial forms while the latter have artifact forms as their principles provides a *classificatory* criterion, but not a metaphysical account, which is what we are after. In what follows, we will argue that the substantial forms and the forms of artifacts are 'implemented'

1 That for Aquinas no artifact is a substance is generally agreed among contemporary scholars. R. Pasnau, *Thomas Aquinas on Human Nature* (New York, 2002), E. Stump, *Aquinas: Arguments of the Philosophers* (London, 2003), and C. Brown, "Artifacts, Substances, and Transubstantiation: Solving a Puzzle for Aquinas's Views," *The Thomist* 71 (2007), 89–112, among others, state this interpretation, with J. Brower, *Aquinas's Ontology of the Material World* (New York, 2014), 211, commenting that "this interpretation of artifacts appears to represent the majority opinion among Aquinas scholars."

2 Pasnau, *Thomas Aquinas on Human Nature*, 413 (endnote 3), for instance, suggests that "Aquinas is committed to the view that all artifacts are nonsubstances *with respect to their form*," while Stump, *Aquinas*, 39, writes that "An artifact is thus a composite of things configured together into a whole *but not by a substantial form*. Since only something configured by a substantial form is a substance, no artifact is a substance" (our emphasis).

very differently in their respective material substrata in the generation of hylomorphic unities. Substantial forms 'descend' (our term) into substances, thereby giving existence and identity to all parts of the substance and its material substratum. Here lies the difference between artifacts and substances, since artifact forms do not descend into artifacts. Our original contribution in this paper is a novel metaphysical account of this difference.

Part 1: The State of Play in the Recent Literature

A number of alternative interpretations of Aquinas's views on the difference between substances and artifacts have been offered in the literature. We will very briefly review some of the main positions before introducing our own, which builds on the existing debate and yet makes a fresh contribution to it. We reckon that there are three different metaphysical principles that modern scholars have appealed to, on behalf of Aquinas, to differentiate substances and artifacts; we call them a) the emergent whole criterion, b) the natural process criterion, and c) the final cause criterion.

a) *The Emergent Whole Criterion*

Our starting point is the influential proposal made by Eleonore Stump,³ who argues that substances are *emergent wholes* with respect to their material constituents, while artifacts are not; rather, they are just *mereological sums* of their parts, where the sum is nothing over and above the sum of its parts.⁴ Stump defines an emergent whole thus:

W is an emergent thing if and only if the properties and causal powers of W are not simply the sum of the properties and causal powers of the constituents of W when those constituents are taken *singillatim*, outside the configuration of W.⁵

³ Stump, *Aquinas*; eadem, "Substances and Artifacts in Aquinas's Metaphysics," in *Knowledge and Reality: Essays in Honor of Alvin Plantinga*, ed. T. Crisp, M. Davidson, and D. Vander Laan (Dordrecht, 2006), 63-80; eadem, "Emergence, Causal Powers, and Aristotelianism in Metaphysics," in *Powers and Capacities in Philosophy: The New Aristotelianism*, ed. R. Groff and J. Greco (New York, 2013), 48-68.

⁴ Stump, "Substances And Artifacts in Aquinas's Metaphysics," 70, our emphasis.

⁵ Stump, *Aquinas*, 43; eadem, "Substances And Artifacts in Aquinas's Metaphysics," 70.

This criterion for distinguishing between substances and artifacts nevertheless commits Aquinas to being too 'generous' with respect to what counts as a substance. There are plenty of examples of material objects having—on account of their structure or external relations—emergent properties or functions that the parts individually do not have, without such objects *ipso facto* being substances (for instance a computer; or, more apt for Aquinas's times, a compass, an astrolabe, the antikythera mechanism, etc.). Stump herself recognizes the difficulty, for instance when she writes:

[T]he promise of this way of distinguishing substances and artifacts in Aquinas's metaphysics is considerably diminished by considering, say, styrofoam. On the face of it, styrofoam appears to be an artifact insofar as it is the product of human design, but it seems closer to water than to axes as regards emergence.⁶

So while it is plausible to think that Aquinas would consider a computer a humanly created artifact, Stump's criterion makes it a substance on account of its emergent properties. In sum, Stump's account, although pointing in the right direction,⁷ is too generous, for most artifacts will also exhibit emergent features; and this outcome appears to contradict what Aquinas writes, for instance in his commentary on Aristotle's *Metaphysics*, where he appears to agree with Aristotle in having a specific criterion in mind for determining whether something qualifies as a genuine substance:

[Aristotle] therefore says that, because some things are not substances, as is clear especially in the case of artificial things, but all those things that are "according to nature" with respect to their being, and "have been constituted by natural means" with respect to their coming into being, are genuine substances, it will be manifest that this nature that we have been seeking is a substance "in some things," namely in natural things, and not in all things.⁸

6 Stump, *Aquinas*, 44; eadem, "Substances And Artifacts in Aquinas's Metaphysics," 70-71.

7 In that at least organic substances are emergent wholes with irreducible powers (though not *all* natural substances, as we will see below).

8 Thomas Aquinas, *In XII Libros Metaphysicorum Aristotelis Expositio* VII, lec. 17, 1680 (ed. M.-R. Cathala and R.M. Spiazzi, Torino/Rome 1964, 399): "Dicit ergo, quod quia quaedam rerum non sunt substantiae, sicut praecipue patet in articialibus, sed quaecumque sunt 'secundum naturam', quantum ad esse, 'et per naturam constitutae', quantum ad fieri, sunt verae substantiae, manifestabitur quod haec natura quam quaequivimus est substantia 'in quibusdam', scilicet in naturalibus, et non in omnibus."

Things made by humans, e.g., computers, would not qualify as natural and hence not as substances for Aquinas, even if they have emergent properties. We shall argue that our criterion of substance we offer in Part 2 shows that only natural objects are substances.

b) *Natural Processes Criterion*

There is evidence that Aquinas holds a more relaxed distinction between substance and artifact than the presumed strict one, which does not allow any artifacts to be substances. Michael Rota⁹ for instance has pointed to texts where Aquinas holds a more nuanced view:

[N]othing hinders art from making something whose form is not an accident but a substantial form, just as frogs and snakes can be produced by art.¹⁰

This passage shows that for Aquinas, things produced by art may have substantial forms. He recognises that art does not by itself create and impart on matter substantial forms, and yet he sees that art can manipulate natural powers for the generation of substantial forms, and subjugate the forms to the goals of art.¹¹ Rota puts it this way: for Aquinas, “Art working through its own proper power cannot produce a thing that is a substance in virtue of its form. But art working *through the power of natural principles* can, and does. Therefore some artifacts are substances in virtue of their form.”¹² While overall agreeing with Stump on the metaphysical role of the substantial form, Rota contributes an explanation of how art can use nature, which can account for why Stump’s example of styrofoam being an emergent whole does not create problems for

⁹ M. Rota, “Substance and Artifact in Thomas Aquinas,” *History of Philosophy Quarterly* 21 (2004), 241-259.

¹⁰ Thomas Aquinas, *Summa theologiae* III, q. 75, a. 6, ad 1 (*Opera omnia* XII, ed. Leonina, Rome 1906, 173): “... quod nihil prohibet arte fieri aliquid cuius forma non est accidens, sed forma substantialis: sicut arte possunt produci ranae et serpentes.”

¹¹ Thomas Aquinas, *Scriptum super Sententiis* IV, d. 11, q. 1, a. 1, qc. 3, ad 3: “... quamvis ars non possit introducere formam substantialiem per seipsum, potest tamen introducere virtute naturae, potest tamen introducere virtute naturae qua utitur in sua operatione sicut instrumento.” Cf. II, d. 7, q. 3, a. 1. ad 5. Aquinas continues the *Summa* passage in the previous note as follows: “Talem enim formam non producit ars virtute propria, sed virtute naturalium principiorum” General note: all Latin texts of Aquinas, when not available in the Leonine editions, are taken from Corpus Thomisticum: <http://www.corpusthomisticum.org/iopera.html>.

¹² Rota, “Substance and Artifact in Thomas Aquinas,” 256 (our emphasis).

Aquinas.¹³ This is progress in understanding Aquinas's position; nevertheless, to the extent to which Rota, with Stump, accepts emergence as the characteristic of substantial forms, our interpretation diverges from his, as will become clear in part 2.¹⁴

c) *The Final Cause Criterion*

Taking a different line from Stump and Rota, Edward Feser calls attention to the metaphysical difference between the final causes of substances and the final causes of artifacts. He argues that for Aquinas the final cause of substances is intrinsic to them, while for artifacts their final cause is extrinsic to them:

[T]hese objects do not count as natural or as true substances because their specifically watch-like, knife-like, etc. tendencies are extrinsic rather than immanent, the result of externally imposed accidental forms rather than substantial forms. The teleology or final causality of a watch or knife *qua* watch or knife is, accordingly, extrinsic rather than intrinsic.¹⁵

The difficulty, however, with this criterion for the distinction between substances and artifacts is that it is unclear what applies to such cases as the frogs or the snakes produced by art, i.e., by magicians.¹⁶ Are the specifically frog-like tendencies immanent in the frogs, or extrinsic to them, imposed externally on them by the use magicians make of them? Feser's account does not give us a way forward here.

Part 2: Our Proposal

The Individuation of Accidental Tropes and Artifacts

We propose a fresh approach to the discussion. For Aquinas (and Aristotle) it is the *internal unity achieved by an entity in virtue of its form* that distinguishes

¹³ Rota, "Substance and Artifact in Thomas Aquinas," 256.

¹⁴ Jeffrey Brower holds Rota's interpretation to be adequate for capturing Aquinas's thought. But Brower suggests that Aquinas is merely concerned with things produced artificially and things produced by nature, rather than discerning two distinct ontological categories, artifacts versus substances. See Brower, *Aquinas's Ontology of the Material World*, 215.

¹⁵ E. Feser, "Between Aristotle and William Paley: Aquinas's Fifth Way," *Nova et Vetera* 11 (2013), 707-749, at 711.

¹⁶ See for instance Thomas Aquinas, *Summa theologiae* III, q. 75, a. 6, ad 1; *De Malo*, q. 16, a. 9, ad 10.

substances from non-substance entities. Are artifacts unified like substances, or do they fall short of substantial unity? And if substantial unity is achieved, is its causal agent the form, or are there additional factors too? Is it in these two factors, namely *substantial unity resulting solely from the form's causal efficacy*, where the metaphysical difference between substances and artifacts lies? To address these questions, we need to turn to Aquinas's metaphysical explanation of the unity of substances.

For Aquinas, substances are the primary kind of being, and they have being *in an unqualified sense*.¹⁷ We shall investigate what this means for Aquinas, and how it illuminates the distinction between substances and artifacts. At first approximation, it indicates that substances do not 'borrow' any aspect of their being from any other entity but themselves. A substance is what it is in virtue of itself, and not in virtue of any entity that has its own distinct being that contributes to the individuation of that substance. (By contrast, this instance of, say, black is a dog-instance; the substantial being of the dog contributes to the individuation of this instance of black.) One can see the relation Aquinas claims between the unqualified being of substances and their having number, when he says, "Therefore the term 'one' in an unqualified sense will apply primarily to substance and secondarily to the other categories."¹⁸

To understand the *unqualified* sense in which the number 'one' applies to a substance we need to examine in virtue of what substances are unified. How can, by way of contrast, the lack of unity of non-substances help us understand the constitution of substances and their difference from artifacts? To that purpose, we will turn to the investigation of the metaphysical role played by the *formal causes* of substances and artifacts. For Aquinas, the substantial form confers unity, identity, and number to things.¹⁹ We can understand his stance

¹⁷ Aquinas, *In XII Libros Metaphysicorum* VII, lec. 1, 1248 (ed. Cathala and Spiazzi, 316): "Sed substantia est ens simpliciter et per seipsam: omnia autem alia genera a substantia sunt entia secundum quid et per substantiam: ergo substantia est prima inter alia entia."

¹⁸ Aquinas, *In XII Libros Metaphysicorum* VII, lec. 4, 1340 (ed. Cathala and Spiazzi, 332): "Ens autem hoc quidem significat hoc aliiquid, aliud quantitatem, aliud qualitatem, et sic de aliis; et tamen per prius substantiam et consequenter alia. Ergo simpliciter unum per prius erit in substantia, et per posterius in aliis."

¹⁹ See for example Thomas Aquinas, *Summa contra gentiles* II, c. 58 (*Opera Omnia* XIII, ed. Leonina, Rome 1918, 409): "Praeterea. Ab eodem aliiquid habet esse et unitatem: *unum* enim consequitur ad *ens*. Cum igitur a forma unaquaque res habeat esse, a forma etiam habebit unitatem." By way of qualification of the overall point we make in the paragraph above: we are not claiming that for Aquinas the form contributes particularity to substances, but rather that it contributes the principle for counting them, which matter by itself does not.

in light of Aristotle's system, which was the original statement of this innovative metaphysical position, and which Aquinas is commenting on, as well as following in his own metaphysics: *the oneness of substances is grounded on their kind, which determines their number*. Metaphysically, this means that a substance is one insofar as it is of a specific kind. The kind dictates the oneness of the substance, synchronically and diachronically, which is a characteristic of substances, in which the formal and the final causes coincide. The kind further gives the principle for counting substances (as sortal concepts do). This is to be contrasted to the kinds and principles of counting of accidents. We can think of the contrast analogically: as sortal concepts are to mass concepts, so substantial forms are to forms of accidents. For instance, the number of a dog is determined by its canine kind; it is one dog. But the number of an instance of the colour black here is determined, not by the accidental kind 'black' alone, but additionally by further factors; e.g., either by the substantial kind 'canine', i.e., as one instance, the black of the dog; or by the kind 'hair', i.e. as many instances of black hair. (Similarly, the number of water is determined by the number of whatever happens to contain it.) Blackness does not provide a count principle. In sum, substances are individuated and counted in virtue of their own substantial form, while non-substances are individuated and counted in virtue of their form being qualified in one way or another by the individuation and count principles of further entities, which are metaphysically related to the non-substances.

But what does this tell us about the *unity* of substances? It tells us that this dog is the same object as this black dog. The black colour does not lend individuality or number to the individuality and number of the dog. Rather, the black colour itself borrows the individuality and number of the dog for the individuation of the instance of black it is. So the blackness of the dog does not give its number to the dog; the dog-ness of the black colour gives its number to this instance of black. This is what it is for a substance to be unified: despite the substance's complexity, *its form determines the possibility of its oneness²⁰ or of plurality, i.e., its being unified into one*. The form of accidents, on the other hand, does not determine their number, as we saw in the case of the instance of black, any more than the form of stuff such as water determines their number. So the entity 'the black colour there' is individuated through borrowed criteria.

20 For which matter is required too.

On our interpretation, for Aquinas an artifact is in need of borrowing individuation criteria, just like an instance of an accident, such as this black, is.²¹ What is common between the two cases, and of interest to us here, is that although neither of them constitutes a ('true') substance, both of them involve *substantial components* in the individuation of their constitution. This black trope's individuation involves the substance it belongs to and inheres in, the dog; this table's individuation involves the substantial matter that belongs to it, the wood. Neither the trope or the artifact is substantial, but both are kinds of compounds of substantial components and accidental forms.²² Such compounds of substantial and accidental components (as tropes or artifacts are) are not as metaphysically unified by their forms as substances are (the latter are unified through and through by their forms). And in the few cases where artifacts do attain unity that is comparable to the unity of substances, their unity is not conferred upon them by their form alone. These, we submit, will prove the fundamental differences between substances and artifacts for Aquinas.

Where Aquinas Departs from Aristotle

Before proceeding to explain the metaphysics of these differences, we would like to note an important difference in the conception of artifacts between Aquinas and Aristotle, which will help us understand Aquinas's position better. Aquinas writes that

Natural bodies [e.g., a tree trunk], however, appear to be substances more than artificial bodies [e.g., a table made out of the tree trunk], since natural bodies are the principles of artificial bodies.²³

Natural bodies like a tree trunk are more substantial than artifacts like the table made out of the log, because—says Aquinas—both the matter and the form of natural bodies are substantial:

²¹ If we individuated accidental tropes by abstraction, the difference with artifacts would be that accidental tropes like 'this black' are not existentially self-standing, while artifacts are.

²² Thomas Aquinas, *In Aristotelis librum De anima commentarium* II, lec. 1, 218 (ed. A.M. Priotta, Rome 1959, 60): "Ars enim operatur ex materia quam natura ministrat; forma autem quae per artem inducitur, est forma accidentalis, sicut figura vel aliquid huiusmodi."

²³ Aquinas, *In librum De anima* II, lec. 1, 218 (ed. Priotta, 60): "Magis autem videntur substantiae corpora naturalia quam artificialia, quia corpora naturalia sunt principia artificialium."

Natural bodies are substances more than artificial bodies are: for they are substances not only on account of their matter, but on account of their form [too].²⁴

Thus a tree trunk is more substantial than a table, because its matter and its form are natural, whilst the table has natural matter but an artificial form.²⁵ This is crucial because it shows that Aquinas judges the difference between substances and artifacts on the basis of their respective *degrees of substantiality*. This results from allowing artifacts to be partially constituted in various ways by substantial constituents, formal or material.

So Aquinas sees a fundamental divide between natural bodies and artifacts with respect to their constitutional unity, which we will explore in what follows, where the former is constituted only of what is substantially unified, and the latter is constituted in part of what is artificially (accidentally) unified and in part of what is substantially unified. By contrast, for Aristotle, artifacts *are* substances; and they are substances not because their matter is natural (substantially unified by the form), but rather because artifacts are functional unities; and functional unity is comparable, even if inferior, to the substantial unity of the exemplary, organic substances, such as animals and plants. For Aristotle, the functional form of an artifact requires, by hypothetical necessity, certain types of matter in which to be implemented.²⁶ The inferiority of functional unity consists in the fact that the functional form plays no part in the generation or the specification of the precise make-up of the appropriate matter for the artifact. By contrast, a substantial form is responsible for the generation and determination of the matter in which the form is implemented. Nevertheless, the functional unity of artifacts is sufficiently similar to organic unity to classify them as substances. We shall not pursue further here this difference between Aristotle and Aquinas on whether artifacts are to be classified as substances or not; rather we will focus on the distinction between artifacts and substances in Aquinas.

24 Aquinas, *In librum De anima* 11, lec. 1, 218 (ed. Priotta, 60): "Unde corpora naturalia sunt magis substantiae quam corpora artificialia: sunt enim substantiae non solum ex parte materiae, sed etiam ex parte formae."

25 Aquinas, *In librum De anima* 11, lec. 1, 218 (ed. Priotta, 60): "Unde corpora artificialia non sunt in genere substantiae per suam formam, sed solum per suam materiam, quae est naturalis."

26 On hypothetical necessity, see for instance J.M. Cooper, "Hypothetical Necessity," in *Aristotle on Nature and Living Things*, ed. A. Gotthelf (Pittsburgh, 1985), 150-167; reprinted in idem, *Knowledge, Nature and the Good: Essays on Ancient Philosophy* (Princeton, 2004), 130-147.

Aquinas on Completeness of Being

Now, the metaphysical questions of interest to us are these: how do substantial forms achieve the type of unity that natural bodies exhibit, for Aquinas, and what is it that artifact forms do differently, metaphysically, than the substantial forms? What does the substantial unity of a natural individual consist in? A lead that will help us understand Aquinas's position is found in a passage where he claims that substances exist as *complete* beings; and artifacts result from bestowing an artificial form upon being that is already complete. If so, anything that art 'adds' to what is already complete in being is accidental and not essential to that being:

For whatever accrues to a thing after its complete being accrues thereto accidentally, since it is outside its essence. Now every substantial form makes a complete being in the genus of substance, for it makes an actual being and this particular thing. Consequently whatever accrues to a thing after its first substantial form will accrue to it accidentally.²⁷

It is indicative that the *completeness* of being that is attained by an instantiated substantial form is *actual being* and *this particular* thing, namely, the being and number of the substance. As is well known, Aquinas (and Aristotle) holds that substances do not compose further substances—substances are not parts or components of further substances. So, for example, a society is not a substance composed of human beings, because human beings are themselves substances.²⁸ This is Aquinas's (and Aristotle's) way of saying that substances are 'ends in themselves' and cannot be subjugated to further ends. It follows that if a substance is a component of an entity other than itself, that entity cannot be a substance, as in the example of a society. Similarly, for Aquinas, with artifacts: they are composed of substantial components as matter, which, upon entering the composite, as it were, are modified or qualified to become further entities that cannot be substances.

²⁷ Aquinas, *Summa contra gentiles* II, c. 58 (ed. cit., 409-410): "Omne enim quod advenit alicui post esse completum, advenit ei accidentaliter: cum sit extra essentiam eius. Quaelibet autem forma substantialis facit ens completum in genere substantiae: facit enim ens actu et hoc aliquid. Quicquid igitur post primam formam substantialem advenit ei, accidentaliter adveniet." The same stance is also found, e.g., *Summa contra gentiles* IV, c. 40; *De principiis naturae*, c. 1; *In Aristotelis librum De anima commentarium* II, lect. 1, 213.

²⁸ Still, there may be parts of substances that are in this or the other sense substantial.

The contrast, for Aquinas, is between artifact forms being implemented in complete *subjects* and substantial forms being implemented in incomplete *substrata*. Aquinas gives us a sketch of what he means by incomplete being:

[M]atter differs from a subject, inasmuch as a subject does not have being from that which accrues to it [i.e., an accident], but in itself has complete being; for example, a man does not have being from whiteness. But matter [i.e., substratum rather than subject] has being from what accrues to it, because of itself it exists *incompletely*.²⁹

The matter of a substance is the material substratum that is *incomplete* being without the substantial form. But the matter of an artifact is the substantial, natural body that is *complete* being without the artifact form. Whatever form is added to a complete being can only be an accidental form.³⁰ But what is it about completeness that secures this conclusion? The key here is again understanding the unity of substance, for Aquinas:

For, since the body of a man or that of any other animal is a certain natural *whole*, it will be said to be *one* because it has one form whereby it is *perfected*, and not simply because it is an aggregate or a composition, as occurs in the case of a house and other things of this kind.³¹

This is a crucial passage where Aquinas relates the concept of wholeness to single-form-ness/perfection, on the one hand, and to relatedness, on the other. Artifacts and substances are unified in very different ways; this is a metaphysical difference between substances and artifacts, which underpins Aquinas's statements quoted in the beginning, that artifacts are not substances. In the passage above we find the fundamental distinction between substances and artifacts: substances are complete natural wholes, while artifacts are artificial

29 Thomas Aquinas, *De Principiis naturae*, sect. 1 (*Opera Omnia* XLIII, ed Leonina, Rome 1976, 39.27-32): "...differt materia a subiecto, quia subiectum est quod non habet esse ex eo quod aduenit, sed per se habet esse completum, sicut homo non habet esse ab albedine; sed materia habet esse ex eo quod ei advenit, quia de se habet esse incompletum."

30 See for instance Aquinas, *Scriptum super sententiis* I, d. 12, q. 1, a. 4, co., I, d. 17, q. 1, a. 2, co., and II, d. 26, q. 1, a. 2, co.; *Summa theologiae* III, q. 2, a. 6, ad 2; *Compendium theologiae* I, c. 209; *Summa contra gentiles* II, c. 58, n. 6, and IV, c. 40, n. 14.

31 Thomas Aquinas, *Quaestiones disputatae de anima*, a. 10, co.: "Cum enim corpus hominis, aut cuiuslibet alterius animalis, sit quoddam totum naturale, dicetur unum ex eo quod unam formam habeat qua perficitur non solum secundum aggregationem aut compositionem, ut accidit in domo, et in aliis huiusmodi."

aggregates or compositions. Aquinas's language makes it clear that the unity or oneness of artifacts is inferior to that of substances. What makes this more interesting, as well as challenging, is that there are different types of unity that artifacts may have, as there are different factors that enter into their unification. This gives rise to a spectrum of cases in the investigation of the difference between artifacts and substances. One can see the difference immediately in the case of the comparison of a substance to an aggregate. A cat is uncontroversially a single individual. Is an aggregate of grains of sand, or an aggregate of oranges, one? In the case of aggregates we frequently speak of the aggregated items in the plural, e.g., the oranges in the basket, whereas we would not speak in the plural of substance such as an animal or a plant. Thus, even though we speak of an aggregate as a whole, we might be hesitant to attribute oneness to it, and if we do, it will be the oneness of a connected plurality.

The Metaphysical Role of Substantial and Artifact Forms

This leads us now to the more challenging difference between substances and artifacts. Substances are natural wholes, whereas artifacts are composites. *Why* does Aquinas hold that natural wholes are more unified and singular than composites? In the passage above Aquinas states that a substance is a natural whole *because* it has a single form. By contrast, an artifact is 'simply' a composition, with an inferior oneness. The reasoning behind this thought is given by Aquinas in these terms:

Whence from an accident and a subject a *per se* unity does not arise; rather an incidental unity arises. Therefore, an essence does not come from their union, like it does from the union of form and matter.³²

We saw above that artifacts are compositions of natural bodies and accidental forms. Thus a table is wood, which is shaped table-wise; its shape is accidental to the wood. In the case of artifacts, their material constituents are 'complete' independently of whether they receive any form from the craftsman or not; the wood is a natural body. As we saw, for Aquinas natural bodies are more substantial when they retain their natural forms, e.g., when the wood is in the shape of a tree, by comparison to when they acquire artificial forms, e.g., that of a table. But even the natural body that has acquired an artificial form is substantial to a degree, because its material constitution is natural, substantial,

³² Thomas Aquinas, *De esse et essentia*, sect. 6 (*Opera Omnia* XLIII, 380.43-46): "Vnde ex accidente et subiecto non efficitur unum *per se* sed unum *per accidens*. Et ideo ex eorum coniunctione non resultat essentia quaedam sicut ex coniunctione forme ad materiam."

e.g., wood. This is what Aquinas describes as the 'completeness' of the body of an artifact. The artificial form, for example the shape of a table, does not determine that nature of the body, what it is to be wood, but only its use or its function. Hence, there is a degree of independence between the nature of the body of an artifact and the form that is bestowed on it by the artisan:

That is why the supervening accident, by its union with the subject to which it comes, does not cause that being in which the reality subsists, and through which the reality is a being in itself. Rather, it causes a secondary being, without which we can conceive the subsistent reality to exist, as what is primary can be understood without what is secondary.³³

The shape of the wood causes the secondary being of a table to come about, but we can still conceive of the subsistent wood existing as a primary reality that has being in itself. So the material constituents are themselves substantial and they remain such even when they acquire the artifact form, which belongs to them only as an accident:

The form of a house, like other artificial forms, is an accidental one. Hence it does not give to the whole house and to each of its parts their being and species. Indeed, a whole [of this sort] is not a unity in an absolute sense, but a unity by aggregation.³⁴

It is the role of the form in the determination and generation of the nature of the entity in question that distinguishes artifacts from substances. The artifact's form does not fully determine the kind of its parts. It can only place some requirements regarding the parts, but bears no 'responsibility' for their being what they are. Aquinas explains: "The artisan, for instance, for the form of the saw chooses iron adapted for cutting through hard material."³⁵ But, crucially,

33 Aquinas, *De esse et essentia*, sect. 6 (ed. cit., 380.36-43): "Et ideo accidens superueniens ex coniunctione sui cum eo cui aduenit non causat illud esse, in quo res subsistit, per quod res est ens per se; sed causat quoddam esse secundum sine quo res subsistens intelligi potest esse, sicut primum potest intelligi sine secundo."

34 Aquinas, *Quaestiones disputatae de anima*, a. 10, ad 16: "...quod forma domus, sicut et aliae formae artificiales, est forma accidentalis: unde non dat esse et speciem toti et cuilibet parti; neque totum est unum simpliciter, sed unum aggregatione."

35 Aquinas, *Summa theologiae* I, q. 76, a. 5, ad 1 (ed. cit., 228): "Sicut artifex ad formam serrae eligit materiam ferream, aptam ad secundum dura; sed quod dentes serrae hebetari possint et rubiginem contrahere, sequitur ex necessitate materiae."

the form of the saw is not responsible for the hardness of the body that is chosen by the artisan as its matter, to make the saw.

The metaphysics of substances is tellingly different. In the case of substances Aquinas posits that the substantial form determines the kind of the material substratum. Continuing from the passage about the form of a house quoted above, Aquinas contrasts the case of substantial forms to the case of artificial forms: "However, the soul is the substantial form of the body, giving to the whole body and to each of its parts their being and species."³⁶ That is, the substantial form 'imbues' the whole body of a substance, determining its nature and kind. The form is not shaping the body as an accident that qualifies a complete being; rather, it qualifies the body in its essential characteristics and dispositions. It qualifies every part of the body of the substance, shaping them and organising them into the whole. Most importantly, the form is responsible for the unity of a substantial whole by imparting its oneness to the substantial whole, that is, by qualifying the whole according to its own formal features. Aquinas continues in the passage just quoted: "each part of a man and that of an animal must receive its being and species from the soul as its proper form."³⁷ Thus, the substantial form being 'responsible' for what the body of a substance is differentiates the metaphysics of substances from that of artifacts: "the whole constituted of these parts is a substantial unity. Hence there is no similarity [between a house and an ensouled body]."³⁸

Now, claiming that the substantial form is responsible for the nature of the body of a substance explains the substance's difference from artifacts, but it does not yet explain *how* the substantial form achieves this metaphysical 'feat'. Substances have diverse components; they are generated from diverse components; they are sustained by consuming diverse components.³⁹ In what sense does "each part of a man and that of an animal . . . receive its being and species from the soul as its proper form"?⁴⁰ Can Aquinas support this claim with the metaphysical tools at his disposal? To this we will now turn, to show that we do have an account of the metaphysics underpinning Aquinas's claim. We will

³⁶ Aquinas, *Quaestiones disputatae de anima*, a. 10, ad 16: "Anima autem est forma substantialis corporis, dans esse et speciem toti et partibus."

³⁷ Aquinas, *Quaestiones disputatae de anima*, a. 10, co.: "Unde oportet quod quaelibet pars hominis et animalis recipiat esse et speciem ab anima sicut a propria forma."

³⁸ Aquinas, *Quaestiones disputatae de anima*, a. 10, ad 16: "...neque totum est unum simpliciter, sed unum aggregatione. Anima autem est forma substantialis corporis, dans esse et speciem toti et partibus; et totum ex partibus constitutum est unum simpliciter; unde non est simile."

³⁹ As for instance in the case of a living being eating food.

⁴⁰ See note 39.

argue that for Aquinas substantial forms are *descendent* in substances—we introduce this term to contrast it to *emergent* forms, as well as to Stump's emergent form criterion. We will argue that substantial forms *descend* into substances by being responsible for the *existence* of the parts and the whole of a substance, and for *what* each part and the whole of a substance are. The term also helps in distinguishing between substantial wholes and wholes that are connected by relations, where the connecting relations are not responsible for what their relata are.

To understand the substantial form's *descent* into all the parts of a substance, we can begin by considering a given substance and investigating its constitution down to its fundamental elements. There are two ways in which we can perform the investigation. We can proceed by abstracting the form of the substance, layer by layer. This takes us from the operational abilities of the substance, down to the structural abilities, and further to the level of the properties of the physical stuff the substance is made of (e.g., flesh or pulp), all the way to its elemental constitution. Let us call this the *constituents analysis* of a substance, performed by abstraction. When considering the constitution of a substance, there is also an alternative way to investigate it, which we can call the *historical analysis*, tracing backwards in time the building stages of its generation, e.g., for a cat, an account of its procreation and embryology, taking us back to the embryo's original matter, i.e., the katamenial fluids. The constituents analysis and the historical analysis both lead to elements that are 'foreign' to the substance and yet constitutionally linked to it.⁴¹ Do these further analyses mark the limits of the operational-scope of the substantial form in the substance, and hence, of the completed, perfected unity of the substance? We will argue that they do not, and explain why not; and this will enable to see how the substantial form descends all the way in the substance in question.

We should start by emphasising that the substantial form is not an efficient cause, but a formal cause of the parts and the whole of the substance. Furthermore, that it is responsible for the existence and the being of the parts and the whole of a substance does not require generation *ex nihilo*, but simply generation. What this means is that there must be a mechanism by which the original matter that goes into the generation of a substance comes to be of the kind that is specified in the substantial form. Thus, there must be a process by which, for instance in the case of the generation of a cat, the katamenial fluids contributed by the mother are transformed into flesh, by the action

⁴¹ Earth for instance is foreign to organic matter and yet it is constitutionally linked to a human being as a component, in potentiality, of a mixture that produced the flesh in the human being.

of the 'virtus formativa' of the sperm, in accordance with the cat form that is bequeathed by the father to the offspring.⁴² Thus the original matter transforms into the appropriate stuff in accordance with the substantial form of the individual that is being generated. The generated flesh exists, and is of a kind that is different from the katamenial fluids, in virtue of the substantial form of the new substance that is embodied in the generation mechanism. It is similar with all the parts of the new substance and with their organisation, which is in accordance with the form of the new substance. The same explanation applies also to all ingested food, throughout the life span of the substance; it is transformed into flesh, blood, bone, etc., by processes governed by principles that ensure that the resulting products are of the appropriate kinds according to the substantial form of the individual. More generally, propagation and nutrition are the natural mechanisms by which the substantial form becomes responsible for the generated substance being what the form specifies. In this sense, every part of the substance and the whole substance is generated and continues in existence conforming to the specification of its substantial form.

But now, what of the elemental matter? Does anything of it survive in flesh and blood? (And is this a difficulty for the claim that the substantial form descends all the way into the substance?) Or does only prime matter survive, namely the particular quantity of matter without its qualities? John Wippel, commenting on *De principiis naturae*, explains that for Aquinas in substantial generation the substantial form qualifies prime matter.⁴³ In this case, nothing of the original elements survives. Stump on the other hand points out that in the *Compendium theologiae* 1, ch. 211, Aquinas talks of elements coming together to form a complete inanimate thing "which is an individual in the genus of substance."⁴⁴ In such a case what is it that survives of the constituent elements? We submit that it is impossible to exclude the circumstance in which some properties of the original matter survive in some manner in the generated substance. The reason for this is Aquinas's theory of mixing, which we will look into here, below. But even so, the manner in which such properties can survive is thoroughly compatible with the claim that the substantial form

⁴² Aquinas, *Summa theologiae* 1, q. 118, a. 1, ad 3 (*Opera Omnia* XII, ed. Leonina, Rome 1889, 564): "...vis activa... sed fundatur in ipso spiritu inclusa in semine, quod est spumosum, ut attestatur eius albedo."

⁴³ J.F. Wippel, "Thomas Aquinas and the Unity of Substantial Form," in *Philosophy and Theology in the Long Middle Ages: A Tribute to Stephen F. Brown*, ed. K. Emery Jr., R. Friedman, and A. Speer (Leiden, 2011), p. 118.

⁴⁴ Stump, "Substances And Artifacts in Aquinas's Metaphysics," 77.

of the new substance is responsible for the existence and kind of every part and the whole of the substance.

Although substantial generation is importantly different from mixture, nevertheless, mixture gives us the mechanism with which different kinds of stuff can interact to form further kinds of stuff. Aquinas's theory of mixing allows for the mixture to have a form that is different from the form of any of its mixants, but *without* the mixants being destroyed.⁴⁵ Thus, any of the generated mixtures has a form that is different from the forms of its mixants, but its generation does not require the corruption of the mixants. The mixants remain *in potentiality*: "the truth of mixtures is preserved and yet the elements are not totally corrupted but, in some way, remain in the mixtures."⁴⁶ In substantial generation the elements that are brought together do not remain in potentiality but are destroyed by their mutual interaction. But the mechanism of interaction is through the interaction of their respective properties. The elements interact and their powers compromise each other:

[B]y remitting the greatest qualities of the elements, there is constituted from out of these qualities some medium quality that is the proper quality of the blended body, differing nevertheless in diverse things according to the diverse proportion of the blend... Therefore, just as the extremes are found in the mean, which partakes of the nature of both, so the qualities of the simple bodies are found in the proper quality of the blended body.⁴⁷

In this way too then, a substantial form that requires mixtures in its substantial bodies utilises the powers of the original mixants to generate the requisite constituents out of their interaction. Thus the qualities of the original mixants are in a sense found in the resulting qualitative mean of the generated body.

45 Aquinas, *Summa contra gentiles* II, c. 56 (ed. cit., 403): "Quae miscentur, mixtione iam facta, non manent actu, sed virtute tantum: nam si actu manerent, non esset mixtio, sed confusio tantum; unde corpus mixtum ex elementis nullum eorum est."

46 Thomas Aquinas, *De mixtione elementorum* (*Opera Omnia* XLIII, 156.119-122): "... quo et ueritas mixtionis saluetur, et tamen elementa non totaliter corrumpantur, sed aliqualiter in mixto remaneant."

47 Aquinas, *De mixtione elementorum* (ed. cit., 156.130-134, 137-140): "... remissis excellentiis qualitatum elementarium, constituitur ex hiis quedam qualitas media que est propria qualitas corporis mixti, differens tamen in diuersis secundum diuersam mixtionis proportionem;... Sic igitur extrema inueniuntur in medio quod participat naturam utriusque, sic qualitates simplicium corporum inueniuntur in propria qualitate corporis mixti."

In conclusion, the substantial form *descends* in substances in the ways described above. Both the constituents analysis and the historical analysis of the constitution of a substance reveal that *every part* of the substance is generated in accordance with the form, even if there are survivors in potentiality in the constitution of the substance from its origins. Substantial forms are distinctive not because they are emergent, which artificial forms can be too (e.g., in the case of the form of a sundial signifying the time), but because they *descend* through and through the substance. We submit that this existential and qualitative suffusion of the substance by its substantial form is the distinguishing mark of substances. This, in particular, marks substances apart from artifacts, whose artificial forms are not the *principles* of generation, nor do they *suffuse* the artifacts' constitution, nor determine what exists and what kind it is in each artifact.

Part 3: Deficient Substances

Aquinas makes an interesting reference to the status of bread,⁴⁸ which we need to examine to conclude the examination of the metaphysical difference between substances and artifacts:

[T]hrough the mixture of flour and water and the burning of fire, there can follow a substantial form, which is the substantial form by which bread is bread.⁴⁹

Aquinas is here explaining how art can master the powers of nature to give rise to substantial generation, but he is also thereby telling us where the difference between a substance like bread and one like a cat lies.

Bread has a substantial form, as we see in the last quotation. On our analysis this means that the form of bread descends into all the parts of bread. But bread's form is the result of a process of generation facilitated by the external *intervention of an artisan* who puts to use the necessary powers of nature. (It is the oven of the artisan that turns the mixture of flour and water into bread, by applying heat to it.) Bread is produced by a *natural power*, but *not by*

48 Analogous cases may be found in the generation of glass or wine for instance, which Aquinas's predecessors and successors were concerned with.

49 Aquinas, *Scriptum super Sententiis* IV, d. 11, q. 1, a. 1, qc. 3, ad 3: "... etiam per commixtionem farinae et aquae et ustionem ignis potest consequi forma aliqua substantialis quae sit forma substantialis per quam panis est panis."

a natural process. In this sense the substantial form of bread is a ‘deficient’ one, in its functionality. It is not responsible for the generation of bread, but only for the qualification of bread. There is no organic natural process of development leading to the generation of bread; rather, the form of bread is itself the outcome of the work of an artisan putting natural powers to use. The resulting substance, bread, is thus a ‘deficient’ one.⁵⁰ Aquinas is explicit about what distinguishes ‘genuine’ substances from this type of ‘deficient’ substance: “all those things that are ‘according to nature’ with respect to their being, and ‘have been constituted by natural means’ with respect to their coming into being, are genuine substances.”⁵¹ Bread is not constituted by nature with respect to its becoming.

Although it is necessary in the theological context of transsubstantiation to consider bread a substance, there are two philosophical reasons concerning the nature of bread why this would have been acceptable to Aquinas. First, one thing that is distinctive about bread (by contrast for instance with a bundle of sticks) is that, although it is produced by art, it is *uniform*: every part of bread is bread. Second, its uniformity indicates that every part of bread is what it is in virtue of having the form of bread. So the form of bread is *suffused* in it. Nevertheless, the form of bread has a different role in bread than, e.g., the form of cat has in cats. Aquinas has told us that “the soul is the substantial form of the body, giving to the whole body and to each of its parts their being and species,”⁵² and that “each part of a man and that of an animal must receive its being and species from the soul as its proper form.”⁵³ This is to say that the role of the descending form in a substance is *causal*. The form, through some physical mechanism, e.g., procreation, causes each part of the entity to come to be and be qualified by the form. This is the sense in which descending forms are responsible for each and every part of what they descend into. By contrast, Aquinas insists that the forms of artifacts, such as a table, are not responsible for what the parts of the artifacts are: “the supervening accident . . . does not cause that being [e.g., of wood in a table] . . . through which the reality is a being in itself.”⁵⁴ But deficient substantial forms such as the form of bread do not play a metaphysical causal role; on the other hand, they are responsible for the

⁵⁰ Rota, “Substance and Artifact in Thomas Aquinas,” 245–246, helpfully points out that even deficient substances such as bread are substances for Aquinas, although Rota does not articulate why substances like bread are deficient, and does not use this terminology.

⁵¹ See above, note 9.

⁵² See above, note 35.

⁵³ See above, note 38.

⁵⁴ See above, note 34.

qualities that characterise the bodies they enform, and they are all pervasive in them; in this sense they have a *constitutive* role. But note that this constitutive role is imparted upon the deficient form by an agent external to it, in the case of bread, the baker (using natural powers).⁵⁵

Conclusions

We can capture Aquinas's position on artifacts as follows. The generation of an artifact always involves the contribution of an artisan, distinguishing it from natural processes. The contribution of the artisan to the generation of the product compromises the causal responsibility of the form of the product for what the product is; hence it compromises the metaphysical unity of the product to that of an accidental unity involving causal factors eternal to the product, by contrast to substantial self-generation. The metaphysical unity of a substance, for Aquinas, is achieved by a process of generation where the substantial form is the 'author' of its own descent into the substance's constituents, generating and determining what each part and the whole of a substance are.

55 Interestingly, frogs and snakes (like bread) lack self-generating forms; but they have their respective forms suffusing them thoroughly (every bit of a living frog is a frog).