

2004

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http://ir.stthomas.edu/cas_phil_pub/19

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SUBSTANCE AND ARTIFACT IN THOMAS AQUINAS

Michael Rota

Introduction

Current interpretations of Aquinas often attribute to him the claim that no artifact is a substance, or, more precisely, the claim that, (A1) No artifact is a substance in virtue of its form.

Robert Pasnau, for example, tells us that “Aquinas is committed to the view that all artifacts are nonsubstances with respect to their form.”¹ And Eleonore Stump writes:

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.²

In fact, however, Aquinas’s position on the metaphysical status of artifacts is more nuanced than these standard interpretations suppose. This paper will examine three hitherto overlooked passages in Aquinas’s writings in an attempt to clarify his position, and to show how it (his actual position) can overcome some of the philosophical problems which pose difficulties for the stronger claims often attributed to him.

I. BACKGROUND

In order to understand St. Thomas’s views on the metaphysical status of substances and artifacts, one must have some understanding of what he means by his Latin analogues of ‘substance’ and ‘artifact.’ Also necessary is some familiarity with his notions of matter and form and the distinction between substantial and accidental forms.

Aquinas thinks of any created living thing, whether angel, animal, or plant, as a substance (*substantia*). As most interpreters read him, Aquinas also holds that any continuous mass of any one of what Aquinas

considered to be the elements (earth, air, fire, and water) is a substance, as is any continuous mass of a mixed body (such as bronze) made up of these elements.³

In contemporary philosophical usage it is common to call things like houses and axes 'artifacts.' Aquinas does sometimes use a Latin analogue of this term, *artificiatum*, which when used substantively means 'a thing wrought by art.' More commonly, though, he uses *res artificialis* (artificial thing) or the substantive adjective *artificialis* when he wants to designate things like houses and axes. His other examples of artifacts include a bed, clothing, a knife, and health.⁴ Aquinas's use of health as an example of an artifact is less puzzling when one recalls that an artifact is just a thing produced by art (for health can be brought about through the art of medicine).

According to Aquinas, every material object is composed of matter and form. On a common interpretation of Aquinas's notion of form, a form is a configuration or arrangement, and a form of a material object is a configuration of matter.⁵ The shape of a marble, for example, is a configuration of the matter composing the marble, and so the shape of the marble is a form of the marble. Shape can be a helpful initial example of form because, as a static arrangement of material parts, it is easily conceptualized. But while some forms are merely such static configurations, in important cases the configuration in question is dynamic. That is, some forms are dynamic configurations, configurations which in some sense include or involve the motion and causal interaction of parts as well as their spatial relationships.⁶

Proximate matter is a matter-form composite that serves as the matter for a higher level composite. For instance, bronze metal, which is matter having a certain form, is itself the matter of a bronze statue. Prime matter is matter with a complete absence of form. But since matter never actually exists without having some form, it's a misunderstanding of Aquinas's thinking to conceive of prime matter as a thing in its own right. Perhaps prime matter is best thought of as an ontological component of a material thing.⁷

Aquinas distinguishes between substantial forms and accidental forms; for our purposes, three differences between them are especially important. First, a substantial form is a form which configures prime matter to be an actually existing substance. An accidental form configures an existing subject (or subjects) to have an accident. That is, a substantial form (like the substantial form of a human) configures prime matter directly, while accidental forms (like the form of whiteness) configure one or more already existing matter-form composites.⁸ Second, a substantial form makes a thing to be a substance (i.e., accounts for the

fact that it is a substance), whereas an accidental form accounts for the fact that the thing (or things) it configures has some quality, quantity, or some other accident. Third, it is due to its substantial form that a substance is the kind of thing it is. The substantial form of a substance is what accounts for its having the quiddity, or whatness, it has. A rabbit, for example, is *what* it is (a rabbit) because it has the substantial form of a rabbit. In contrast, an accidental form does not account for a thing's quiddity.

One can express some of the same points by invoking the notion of a thing's species. A species of a thing, for Aquinas, is a universal which can be predicated of that thing, and which, furthermore, describes *what* that thing is. Socrates belongs to the species human, for example, because (i) human can be predicated of Socrates and (ii) human tells us what Socrates is. It was said above that the substantial form of a substance is responsible for the substance's having the quiddity it does. The same point can be made by saying that a substance belongs to the species it does in virtue of its substantial form.⁹ In Aquinas's terminology, a substance is given its species by its substantial form.

II. A STANDARD INTERPRETATION

Background in place, let us now turn to the interpretation of Aquinas's views on substances and artifacts. Commenting on Aristotle's *Metaphysics*, Aquinas writes,

some things are not substances, as is especially clear in the domain of artifacts, but whatever things are according to nature, with respect to being, and constituted by nature, with respect to becoming, are true substances.¹⁰

Taking this passage in isolation, one might think that Aquinas's position is simply this: no artifacts are substances.

But one should be wary of such an interpretation, if for no other reason than because it is quite clearly false. A single stone which has been chipped into the shape of a knife is an artifact (it is the product of human design), but it is also quite clearly a substance (if any stone is a substance). There is no reason to think that what would otherwise count as a substance does not count as a substance merely because it has a particular shape. As it turns out, the bald claim that no artifacts are substances is an oversimplification of Aquinas's view. When speaking more carefully, Aquinas doesn't assert that no artifacts are substances, but that all artificial forms are accidental forms:

all artificial forms are accidental [forms]. For art operates only upon that which is already constituted in complete being by nature.¹¹

Elsewhere, Aquinas clarifies his position by saying that artifacts are not substances in virtue of their form, though they are substances in virtue of their matter:

a man and wood and a stone are natural bodies, a house and an axe are artificial. Natural bodies, however, appear to be substances more than artificial bodies, since natural bodies are the principles of artificial bodies. For art operates upon material which nature provides, and a form which is introduced through art is an accidental form, such as a shape or something of that sort. For this reason artificial bodies are not in the genus of substance in virtue of their form, but only in virtue of their matter, which is natural. That they are substances, therefore, is due to natural bodies. For this reason natural bodies are substances more than artificial bodies are: for they are substances not only on account of their matter, but [also] on account of their form.¹²

Aquinas's idea here is that the artisan works upon one or more natural bodies (which are substances) and brings about in them (or it) a new form. This new form is introduced by the artisan (using the skills and methods of some art), and so it can be called an artificial form. The artificial form makes the thing produced to be the kind of artifact it is. Consider a stone-knife (made from a single stone). Here the artificial form is the accidental form of shape introduced by the artisan. This artificial form makes the product to be a knife, rather than just a stone (although it remains a stone in virtue of its substantial form). The artificial form of a house, to use another example, would consist in the arrangement of its bricks and timbers and the bonds holding those bricks and timbers together.¹³ Aquinas's claim appears to be that all artificial forms (all forms introduced through the working of art) are accidental forms.

When Aquinas speaks of the matter of an artifact, he means to refer to the proximate matter which is the subject (or are the subjects) of the accidental form introduced by the artisan. In the case of the stone-knife, the matter would be the single stone substance. In the case of a house, the matter would consist of numerous substances (individual bricks and beams), all of which would be configured by an accidental form ordering those individual substances into a certain configuration. Since proximate matter is itself either a single substance or an aggregate of substances, Aquinas says that an artifact is a substance in virtue of its matter.

When Aquinas speaks of the form of an artifact, he means to refer to the form introduced by the artisan which makes the artifact to be the kind of artifact it is, not to the substantial form(s) of the proximate matter which makes up the artifact. So Aquinas's claim that the form of

an artifact is not a substantial form should be understood as the claim that the form introduced by art (i.e., by the artisan through the application of his art), which makes the artifact to be the kind of artifact it is, is not a substantial form.

Accordingly, one should understand the claim that

(A1) No artifact is a substance in virtue of its form,

as the claim that

(A2) No artifact is a substance in virtue of the form introduced in it by art, which (form) makes the artifact to be the kind of artifact it is.

And one can understand both these claims better by seeing that they are equivalent to:

(A3) For any artifact X of artifact-type K, it is not the case that the form introduced by art which makes X a K is a substantial form.

The texts cited thus far, then, appear to establish that Aquinas holds (A1), as interpreted above.

III. GROUNDS FOR A MORE NUANCED INTERPRETATION

Three hitherto overlooked passages in Aquinas's writings throw doubt on this standard interpretation, however. In the first such passage Aquinas asserts that

ars virtute sua non potest formam substantialem conferre . . . tamen potest virtute naturalis agentis, sicut patet in hoc quod per artem inducitur forma ignis in lignis.¹⁴

Art is not able to confer a substantial form by its own power . . . [but] it is nevertheless able to do so by the power of natural agents, as is made clear by the fact that the form of fire is induced in wood through art.

In another passage, occurring in the course of Aquinas's discussion of the Eucharist in the *Summa theologiae*, Aquinas explicitly discusses a case in which human art brings about the generation of a substance. According to Aquinas, bread is a substance.¹⁵ But it seems that bread is a product of human art, and therefore an artifact. Stating an objection, he writes:

Videtur quod, facta consecratione, remaneat in hoc sacramento forma substantialis panis.

Dictum est enim quod, facta consecratione, remaneant accidentia. Sed, cum panis sit quiddam artificiale, etiam forma eius est accidens. Ergo remanet, facta consecratione.¹⁶

It seems that the substantial form of bread remains in this sacrament after the consecration.

For, as said above, accidents remain after the consecration. But, since bread is a certain sort of artifact, even its form is an accident. Therefore [the form of bread] remains after the consecration.

This objection includes the claim that the form of bread must be an accident because bread is an artifact. In his reply, Aquinas does not deny that bread is an artifact. Rather, after arguing that the substantial form of bread does not remain after the consecration, he writes:

[N]ihil prohibet arte fieri aliquid cuius forma non est accidens, sed forma substantialis, sicut arte possunt produci ranae et serpentes. Talem enim formam non producit ars virtute propria, sed virtute naturalium principiorum. Et hoc modo producit formam substantialem panis, virtute ignis decoquentis materiam ex farina et aqua confectam.¹⁷

[N]othing hinders art from making something whose form is not an accident but a substantial form, just as frogs and serpents can be produced by art. For art does not produce such a form by its own proper power, but by the power of natural principles. And it is in this way that [art] produces the substantial form of bread, by the power of fire baking the matter made up of flour and water.

In this reply Aquinas distinguishes between two ways in which art can produce something: (i) by its own proper power and (ii) by the power of natural principles. When art produces something by the power of natural principles, art can indeed produce something with a substantial form, i.e., a substance. Art can produce bread—and frogs and serpents as well, Aquinas thinks.

This passage calls into question the accuracy of (A1) as a faithful interpretation of Aquinas's views. In the remainder of this paper Aquinas's reasons for his general claim that artifacts are not substances in virtue of their forms will be discussed. (Along the way, possible problems with some of Aquinas's positions will be noted.) Next, the ST III.75.6 passage (just quoted) and a third relevant passage in Thomas's *Sentences* commentary will be examined, with a view toward explaining his distinction between the two ways art can produce something. With this distinction in place, Aquinas's considered position on the relationship between substances and artifacts can be stated. The concluding section of this paper will include an attempt to show how Aquinas's considered position can meet many of the philosophical challenges which face the view commonly attributed to him.

IV. ONE-PIECE ARTIFACTS AND MULTI-PIECE ARTIFACTS

With respect to examining Aquinas's reasons for his general claim that artifacts are nonsubstances with respect to their forms, a few words are in order about the distinction between one-piece artifacts and multi-piece artifacts. Let a one-piece artifact be an artifact whose matter is a single substance, like a stone-knife; let a multi-piece artifact be an artifact whose matter consists of several distinct substances, like an ordinary house. It isn't too hard to see why Aquinas might have thought that a one-piece artifact is not a substance with respect to its form. Take our example of a stone-knife. A stone-knife is not a substance because of the form imposed on it by the artisan, but because it is already a stone. In the case of ordinary one-piece artifacts, the artisan goes to work on a previously existing substance and merely modifies that substance's shape (or perhaps some other accidental property). The artisan imposes a form upon the material involved, but the artifact produced is not a substance because of *that* form, which indicates that the form imposed by the artisan is not a substantial form.¹⁸

Setting one-piece artifacts aside and concentrating on multi-piece artifacts, one wonders why multi-piece artifacts can't be substances (with respect to form). To this question let us now turn.

V. GRADES OF BEING AND GRADES OF UNITY

One can better understand Aquinas's views on artifacts, especially multi-piece artifacts, by focusing on what is perhaps Aquinas's most fundamental reason for distinguishing substances from artifacts: in Aquinas's view, substances have being in the fullest sense, while artifacts do not.

Arguably, the single most fundamental characteristic of substance, for Aquinas, is that it is the primary instance of being. Following Aristotle, Aquinas denies that being is univocal. Substances, accidents, generations and corruptions, and privations and negations are all said to be, but in different senses of 'to be.'¹⁹ In Aquinas's language, substances, accidents, etc. have different modes of being. The "most perfect" mode of being, says St. Thomas, belongs to

that which has real being without any mixture of privation, and has firm and solid being, as [a thing] existing by itself, and thus it is in the case of substances.²⁰

Throughout his commentary on Aristotle's *Metaphysics*, Aquinas repeatedly stresses that substance is the primary kind of being, that substance has being in an unqualified sense.²¹

Now, because of Aquinas's views on the relationship between being and oneness (or unity), his view that substances have being in an unqualified sense implies that substances have oneness in an unqualified sense, which is just to say that, compared to other kinds of things, substances are most fully unified or united. To explain: Aquinas distinguishes between two senses of 'one': (a) one as the principle of number and (b) one as convertible with being.²² By 'one' taken as the principle of number, Aquinas refers to the unit quantity. By 'one' taken in the second sense Aquinas means something like unity or undividedness. Someone might say, for instance, that a person's heart is undivided; in Aquinas's terminology one could say that such a person's heart is one. One in this sense admits of degrees; *this* (e.g., a political party) can be more unified than *that* (some other political party). When Aquinas holds that one (in the second sense) is convertible with being, he means that the more being a thing has, the more unity it has, and vice versa. So, since Aquinas holds that substances have being in an unqualified sense, one would expect him also to hold that substances are unified in an unqualified sense. And, indeed, he states this explicitly:

one in an unqualified sense will be [said] primarily of substance, and derivatively of the other [categories].²³

Having unity in the fullest sense, then, is a fundamental characteristic of substance. Therefore whatever lacks, in some significant sense, a full degree of unity should not count as a substance. But as Thomas sees things, artifacts *do* lack a full degree of unity in a significant sense.²⁴

VI. SUBSTANTIAL FORM AND THE UNITY OF ARTIFACTS

At least one fairly strong argument can be given for the conclusion that multi-piece artifacts lack a full degree of unity (and are therefore not to be counted as substances). This argument hinges on the claim that multiple substantial forms are present in an ordinary multi-piece artifact. The general structure of the argument is as follows:

- (1) A multi-piece artifact is an aggregate of many substances, each with its own substantial form.

Therefore, (2) A multi-piece artifact is an aggregate of two or more actual substances.

But, (3) Whatever is two (or more) actual things cannot be one actual thing, in the fullest sense of *one*.

Therefore, (4) A multi-piece artifact is not one thing in the fullest sense. That is, a multi-piece artifact is not fully unified.

As regards (3), Aquinas frequently asserts or presupposes that one actually existing thing cannot be made up of several actually existing things.²⁵ To get an idea of Aquinas's point here, imagine cramming one hundred grapes into a small container, without breaking the skin of a single one. Even if the grapes were completely contiguous with each other, forming one grape-ish mass uninterrupted by gaps of air, one still wouldn't want to say that the mass of grapes was a fully unified thing. One wouldn't want to say that it was one actually existing thing in any robust sense of 'one.' If you mashed the grapes together, breaking their skins and creating a relatively uniform liquid, then you might have a thing which was *one* thing in a more robust sense. But so long as each of the individual grapes continued to actually exist as its own thing (without a rupture of its skin), the mass of grapes would just be a very closely-fitted collection of many individual things.

To understand why one might have reason to accept (1), a further examination of Aquinas's notion of substantial form is required. First in order, though, is the notion of an integral part. Stump distinguishes between integral parts and metaphysical parts.²⁶ An integral part is a part which contributes to the spatial extension of the whole of which it is a part (e.g., the hand of a human). A metaphysical part, by contrast, does not contribute to the spatial extension of its whole (e.g., a human soul or the form of redness).

Now, according to Aquinas, a substance's substantial form is not only the form of the whole substance, it is also the form of each of the substance's integral parts.²⁷ Since the substantial form of a substance configures prime matter directly, every integral part of the substance will be informed by its one substantial form.

So the substantial form of an integral part is just the substantial form of the whole of which it is a part. Recall that a thing with a substantial form is given its species by that form. It seems to follow that the integral parts of a substance are given their species by their substantial form, which is the substantial form of the whole.

As an illustration, consider an individual human. Aquinas's claim is that the integral parts of a human, e.g., an eye, are configured by the substantial form of the whole human, i.e., the human soul. A human eye, Aquinas thinks, is what it is and has the species it has because it is informed by the human soul. Therefore if an eye is separated from a living body, one would expect it to lose its species, to cease being what it is when a part of a living body. And indeed this is precisely Aquinas's position: "the eye of a corpse, and its flesh, are so-called only equivocally."²⁸

Aquinas's reason for holding this has to do with the proper operations or functions of the integral parts of the body. That which retains its spe-

cies retains the proper function of its species, according to Aquinas.²⁹ So an eye, for instance, would retain its proper function (sight) apart from the body if it retained its species when separated from the body. That the eye does not retain its proper function when separated from the body indicates that it loses its species when so separated.

It follows from all this that if a multi-piece artifact had just one substantial form, its integral parts would be given their species by that one substantial form. But this does not seem to be the case. For if the integral parts of a multi-piece artifact were given their species by the form of the whole artifact, one would expect them to lose their species when separated from the artifact. In actuality, however, the integral parts of a multi-piece artifact do not lose their species when so separated. A brick remains a brick, whether or not it is part of a house. Wood remains wood, whether or not it is part of an axe. So a multi-piece artifact apparently does not have just one substantial form; rather, each of the several integral parts of a multi-piece artifact must have its own substantial form, with the result that a multi-piece artifact is an aggregate of many substances, as (1) asserts.

With this argument in mind, one can see that the distinction Aquinas so frequently draws between substances and artifacts does not stand unconnected from his broader metaphysical views. On the contrary, it follows (at least in the case of ordinary multi-piece artifacts) from his views that (i) substances are the primary instances of being, and, as such, are unified to the highest degree, and (ii) ordinary multi-piece artifacts are composed of multiple actually existing substances, each with its own substantial form.

Problems

While worthy of consideration, this argument is not without its problems. For the argument depends on the claim that the integral parts of an artifact retain their species when separated from the artifact. But this is far from evident. The fact that an eye loses its proper function when it is no longer part of a living body, Thomas argued, indicates that the eye loses its species when no longer part of a living body. But the same point, it seems, can be made about certain integral parts of certain artifacts. Consider the seals in an air-conditioning system: when taken out of the system they no longer actually perform their function, and, what is more, they dry up and eventually lose even their capacity to perform their function. If it is said that eyes lose their species when separated from a living body, shouldn't it also be said that air-conditioning seals lose their species when separated from the artifact of which they are parts?

Even if this sort of objection can be answered, a larger problem remains. There seems to be no theoretical reason why new living substances couldn't be produced by human design. A microbiologist who significantly modifies the DNA of a bacterium seems to produce a new living thing. Since this new bacterium is a product of human design, it seems that it should be counted as an artifact. But since it is a single living thing, it should also count as a substance. And so it appears that some artifacts are substances with respect to their form, *contra* (A1).

A project called the Minimum Genome Project raises the possibility of other such counter-examples. As Pasnau summarizes, the aim of the project is to "determine the minimal configuration of genes required for a living substance."³⁰ This knowledge might in turn allow scientists to create entirely new organisms "from scratch," so to speak. If so, these new organisms would provide additional counter-examples to (A1).

VII. ARTIFACTS AND EMERGENT WHOLES

The previous section sketched one possible way that Aquinas could ground the distinction between substances and multi-piece artifacts, namely, by way of the claim that some of the integral parts of a multi-piece artifact have their own separate substantial forms (with the consequence that a multi-piece artifact is not fully unified). A somewhat different way to ground the substance-artifact distinction rests on the claim that substances are emergent wholes with respect to their material constituents, while artifacts are not.³¹

Consider the following rough description of an emergent whole (adapted from Stump):³²

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

Some examples may help clarify this description. If one were to tie a bundle of sticks together with a cord, the bundle would have certain properties and causal powers not had by any of the sticks taken by itself, e.g., the property of weighing over five pounds, the property of taking up more than one cubic foot of space, and the causal power of being able to ignite a large log when lit. But the bundle would not be an emergent whole, since such properties are accounted for simply by summing the properties and causal powers of its material constituents (the sticks) when considered separately from the bundle. Each stick, separately from the bundle, has a certain weight, and the weight of the whole bundle is just the sum of these separate weights. Each stick, when existing

separately, has the causal power to ignite a certain amount of wood, and the causal power of the bundle is a simple aggregate of these powers. So too for the volume of the bundle. What *would* be an example of an emergent whole? Perhaps a quantity of water. Consider, for example, water's capacity to form ice crystals at 32 degrees Fahrenheit. Even if this capacity in some sense results from the properties of hydrogen atoms and oxygen atoms, taken singillatim, the capacity doesn't seem to be a simple aggregate of any of those properties. Water has this capacity due in part to the way in which hydrogen and oxygen atoms share electrons when they are configured so as to make up water—due in part, that is, to the configuration of water's material constituents. So it seems that a quantity of water should count as an emergent whole.

With this understanding of an emergent whole in mind, one might be able to distinguish substances and artifacts in this manner:

(5) Substances are emergent wholes, artifacts are not.

Why think (5) is true? An empirical examination of ordinary artifacts lends support to (5)—there seems to be little reason to think of a house or an axe as an emergent whole. An axe can be used to cut wood, but this is just because the blade is sharp (a property it has apart from the axe as a whole), and because the handle can be grasped (a property it has apart from the axe as a whole). Again, an empirical examination of things universally recognized to be substances lends some support to (5). Living things seem to be emergent with respect to their material constituents. And, as gestured at above, a case can be made that water is an emergent whole—so too, perhaps, for other inanimate compounds.

One might wonder how this way of distinguishing substances and artifacts relates to our earlier considerations concerning substantial forms and unity. They are related in at least one important way: Aquinas's account of substances and artifacts provides us with a theoretical explanation of why (5) should, in general, hold true. The essential properties and causal powers of a substance follow upon its characteristic configuration, i.e., its substantial form. (Water has the essential properties and causal powers it does because of the way in which the prime matter of water is configured.) If an ordinary artifact does not have one substantial form which makes it the kind of artifact it is, then it has constituent parts which have their own substantial forms. In other words, an ordinary artifact has constituents that are themselves actually existing substances, and the artifact is simply an aggregate of these constituent substances. Now, one would expect that the properties and causal powers of the artifact as a whole will be some sort of simple function of the properties and powers of the constituent substances, considered as parts of the whole (i.e., as they are when

incorporated into the whole). But since the artifact's constituents have the same substantial forms whether incorporated into or apart from the artifact, they (the constituents) will have the same essential properties and causal powers whether or not they are incorporated into the artifact. And this implies that the properties and causal powers of the artifact as a whole will be some sort of simple function of the properties and powers of the constituents taken apart from the whole. By our description of an emergent whole, it follows that ordinary artifacts will not be emergent wholes.

The situation is different for substances, in which those constituent parts which have their own substantial forms outside of the substance lose their substantial forms when incorporated into the substance. Suppose some substance S1 (e.g., water) is generated when substances S2 and S3 (hydrogen gas and oxygen gas) come together under favorable conditions. The substantial forms of S2 and S3 do not remain in S1, on Aquinas's theory, so one would not expect the properties and causal powers of S1 to be a simple function of the properties and powers of S2 and S3. The fact that the substantial forms of S2 and S3 are lost, and replaced by the substantial form of S1, explains why water is an emergent whole with respect to hydrogen and oxygen.

An interesting point emerges from these considerations. It appears that the empirical question of whether or not something is an emergent whole provides us with a criterion to determine whether a given thing should count as one single substance rather than as an aggregate of many substances. If something appears to be an emergent whole, perhaps this is good evidence that the several substantial forms of its constituent parts have been replaced by a single substantial form, which accounts for the new properties and causal powers of the whole.

But after suggesting that the notion of emergence might ground the substance-artifact distinction, Stump raises a doubt:

the promise of this way of distinguishing substance and artifact 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.³³

Artifacts, by definition, are things wrought by human art or skill. So Styrofoam is an artifact. But Styrofoam seems to be as different from its atomic constituents in its properties and causal powers as does water from hydrogen and oxygen. Thus it does not seem that no artifacts are emergent wholes.

VIII. ART WORKING THROUGH THE POWER OF NATURAL PRINCIPLES

To sum up, there are at least two major problems for the position commonly attributed to Aquinas. First, it seems that new living things could be produced by art, and therefore that some artifacts could be substances with respect to their form, *contra* (A1). Second, it seems that some artifacts are emergent with respect to their parts, which means that one cannot distinguish substances and artifacts in terms of emergent wholes. This in turn calls into question the hard and fast distinction between artifacts and substances that is often attributed to Aquinas (or at least calls it into question in the absence of another good way to make that distinction).

One way of trying to salvage (A1) is to deny that such things as genetically engineered bacteria and Styrofoam are really artifacts. Whatever its philosophical merits (or defects), this proposal wouldn't be accepted by Aquinas. The etymology of 'artifact' implies that 'artifact' is just another name for a thing wrought by art, skill, or design—and Aquinas accepts this definition. In several places he uses 'artificial things' (*artificialia*) and 'artifacts' (*artificiata*) simply as synonyms for 'things which are by art' (*quae sunt ab arte*) or 'things which come to be by art' (*illa fiunt ab arte*).³⁴ So, for Aquinas, artifacts are just things which come to be by human art or skill.

This conclusion is confirmed by ST III.75.6. The first objection includes the claim that bread is an artifact. If Aquinas were going to take the position that not all things produced by art should be counted as artifacts, one would expect him to go on to deny the claim that bread is an artifact. But rather than denying this claim, he presupposes it, saying that *art* "produces the substantial form of bread" by means of the power of natural principles. So Aquinas accepts the claim that bread is an artifact.

Since Aquinas thinks that bread, as well as certain frogs and serpents, are at the same time substances with respect to form *and* artifacts, it is clear that Aquinas would reject (A1) as a hard and fast rule. What then is Aquinas's position? To answer this question, it will be helpful to examine further Aquinas's distinction between the two ways in which art can produce something. As noted, Aquinas employs this distinction at ST III.75.6. A parallel passage from Aquinas's earliest major work provides additional light on his thinking here:

Praeterea. Panis est quoddam artificiale. Sed formae artificialium sunt accidentia, ut patet in 2 *Phys.* Cum ergo accidentia maneat, videtur quod forma panis secundum quam est panis, maneat.³⁵

Ad tertium dicendum quod quamvis ars non possit introducere formam substantialem per seipsam, potest tamen introducere virtute naturae qua utitur in sua operatione sicut instrumento: sicut patet in hoc quod aquam in vaporem convertit, et aerem in ignem igne mediante. Et similiter cum occiditur animal recedente anima, alia forma substantialis succedit, sicut generatio unius est corruptio alterius. Ita etiam per commixtionem farinae et aquae et ustionem ignis potest consequi forma aliqua substantialis quae sit forma substantialis per quam panis est panis.³⁶

Further, bread is an artifact of a certain sort. But the forms of artifacts are accidents, as is shown in Book II of the *Physics*. Therefore, since the accidents [of bread] remain [after the consecration], it seems that the form of bread on account of which it is bread remains.

To the third point it should be said that although art is not able to introduce a substantial form just by itself, it nevertheless is able to introduce [a substantial form] by the power of nature, which it uses as an instrument in its own operation. This is shown in the fact that, by means of fire, [art] converts water into vapor, and air into fire. And similarly, when an animal is killed and its soul withdraws, another substantial form takes its place, for the generation of one thing is the destruction of another. And in this way, through 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.³⁷

To understand what Thomas is getting at, in the above passage and in ST III.75.6, one should begin by noting that natural things have certain causal powers to interact in such a way as to yield new substances.³⁸ To return to our earlier example, hydrogen gas and oxygen gas have causal powers to combine to form a new substance, water, when they are brought together in appropriate circumstances. Natural things have natural potencies³⁹ for substantial change.

Second, consider that if a human artisan arranges natural things appropriately, he can bring it about that they do interact and yield new substances. This is what Aquinas thinks is going on when: (i) someone applies fire to water and vapor is produced, (ii) someone applies fire to air and produces fire, (iii) someone kills an animal, the animal ceases to exist, and a new substantial form begins to inform the corpse, (iv) a baker applies fire to flour and water, and bread (a new substance) is produced, and (v) magicians use magic to produce frogs and serpents.⁴⁰

Third, distinguish between two ways that art can work. Call a case where art makes use of the natural potencies of natural things for substantial change a case of (i) art working through the power of natural principles. In such cases, the artisan arranges the conditions appropriately and lets nature take its course. As Aquinas notes, the artisan

uses natural things as instruments. Call a case where art produces something, but doesn't make use of natural potencies for substantial change a case of (ii) art working through its own proper power. We have a case of art working through its own proper power whenever art works in such a way as not to bring about the actualization of the potencies for substantial change of the materials involved.

It follows from the above, finally, that when art works through the power of natural principles, it produces a substance, and when it works through its own proper power, it doesn't.

Interesting questions remain about how Aquinas's more careful statements (considered in this section) fit with the more typical statements cited in section II, but these questions must fall to another occasion.⁴¹

CONCLUSION

From all this it appears that Aquinas's considered view about substances and artifacts is not (A1), but,

(A4) Any thing produced by art is an artifact. 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.

This more nuanced interpretation allows us to deal with the two problems that plagued (A1), the position commonly attributed to Aquinas. The first problem involved a class of counter-examples to (A1), namely artificially produced living things. While an artificially produced living thing would provide a counter-example to (A1), it would not provide a counter-example to (A4), since (A4) concedes that those artifacts produced by art working through nature will be substances (with respect to form). The generation of new living things through the modification of DNA would seem to take advantage of the natural potencies of certain matter to be configured into a living thing, and so would constitute a case of art working through nature.

The second problem called into question the hard and fast distinction between artifacts and substances commonly attributed to Aquinas, insofar as the existence of artifacts like Styrofoam suggest that one cannot distinguish substances and artifacts in terms of emergent wholes. But it now appears that Aquinas doesn't intend to make this hard and fast distinction, and so the fact that Styrofoam seems to be an emergent thing doesn't falsify any principle of Aquinas's.⁴²

NOTES

1. Robert Pasnau, *Thomas Aquinas on Human Nature: A Philosophical Study of Summa theologiae Ia 75–89* (New York: Cambridge University Press, 2002), p. 415 (endnote 3). Cf. p. 88.

2. Eleonore Stump, *Aquinas* (London: Routledge, 2003), p. 39. Lest Stump be misrepresented by this quotation, it should be observed that the quoted passage follows a discussion of “[a]ny ordinary artifact.” This suggests that Stump may not be making the strong claim that, for Aquinas, no artifact whatsoever is a substance, but only the weaker claim that, for Aquinas, no ordinary artifact is a substance.

3. For an exception, see Pasnau, p. 85ff.

4. See Aquinas’s commentary on Aristotle’s *De anima* (In DA), L. II, lect. 2, 237; his *Physics* commentary (In Phy), L. II, lect. 1, 142; and his *Metaphysics* commentary (In Met), L. VII, lect. 6, 1406.

5. See, e.g., Stump, p. 36.

6. Ibid.

7. See *De principiis naturae* (DPN) c. 2, (346–9), and In Met L. VII, lect. 2, 1289–1292.

8. See DPN c. 1 (339).

9. Better: a substance belongs in all of the species it does (e.g., human, animal, etc.) in virtue of its substantial form.

10. In Met, L. VII, lect. 17, 1680. All translations of Aquinas are my own. The Latin text is from the Leonine commission’s critical editions in all cases except Aquinas’s *Metaphysics* and *Sentences* commentaries, where I have used *In duodecim libros metaphysicorum Aristotelis expositio*, ed. R. M. Spiazzi (Turin: Marietti, 1950); *Scriptum super libros Sententiarum*, vols. 1 and 2, ed. P. Mandonnet (Paris: P. Lethielleux, 1929); and *Scriptum super Sententiis*, vols. 3 and 4, ed. M. F. Moos (Paris: P. Lethielleux, 1947).

11. DPN c. 1.

12. In DA, L. II, lect. 1, 218. See also In DA, L. II, lect. 2, 235 & 237; In Met, L. V, lect. 5, 818; In Met L. VII, lect. 2, 1277; L. VIII, lect. 3, 1719; QQ 11.6 ad 3.

13. ST I.104.1c.

14. *Scriptum super Sententiis* (In Sent) 2.7.3.1 ad 5. I thank Lawrence Dewan, O.P., for bringing this passage to my attention.

15. At ST III.75.6, Aquinas affirms that the substantial form of bread doesn’t remain after the consecration (at which point the bread is transubstantiated into the Body and Blood of Christ). Aquinas’s discussion presupposes that bread has a substantial form before the consecration, which implies that bread is a substance.

16. ST III.75.6 obj. 1. I thank Christopher Brown for alerting me to this passage.

17. ST III.75.6 ad 1.

18. There are examples of one-piece artifacts that do not fit the general characterization just given—bread, for example. The issues raised by such artifacts can be passed over, though, since they don't constitute counter-examples to Aquinas's considered position on artifacts (as will become apparent below).

19. See *In Met*, L. IV, lect. 1, 539ff.

20. *In Met*, L. IV, lect. 1, 543.

21. See, e.g., *In Met*, L. VII, lect. 1, 1248; L. III, lect. 5, 391; lect. 6, 394; L. IX, lect. 1, 1768; L. XII, lect. 1, 2416ff.

22. See ST I.11.1–2.

23. *In Met*, L. VII, lect. 4, 1340.

24. Aquinas explicitly asserts that artifacts lack unity in regards to a particular type of unity, the unity of continuity. He writes, "those things which are continuous by nature are more unified [magis unum] than those which are continuous by art [e.g., a bundle of sticks bound by a cord]. . . . And thus those things which are joined naturally are most similar to those things which are continuous essentially, which are unified to the highest degree." [*In Met*, L. V, lect. 7, 851] What follows in this paper will explicate Aquinas's views on the ways in which artifacts lack unity in general (not just with respect to the unity of continuity).

25. See *In Met*, L. VII, lect. 13, 1588; SCG II.56 [4]; ST III.2.1c.

26. See Stump, p. 42.

27. See SCG II.72 [3].

28. SCG II.72 [3].

29. ST I.76.8c.

30. Pasnau, p. 415, endnote 3.

31. This idea is due to Stump, pp. 43–44.

32. See Stump, p. 43.

33. *Ibid.*, p. 44.

34. See *In Met*, L. VII, lect. 6 and lect. 8, especially 1437 and 1404.

35. *In Sent*, 4.11.1.1 qc. 3 arg 3.

36. *Ibid.*, ad 3.

37. Immediately after this passage Aquinas mentions the possibility that the form through which bread is bread is not a substantial form. But the grammar and the context both indicate that Aquinas is merely entertaining a counterfactual for the purposes of argument. The context of the passage concerns the question of whether the substantial form of bread remains after the consecration; Thomas argues for the negative. Most likely, Thomas's point in mentioning the

aforesaid possibility is merely to establish his main conclusion: he supposes for the sake of argument that the form through which bread is bread isn't a substantial form in order to make the point that, even so, it would still be the case that a substantial form (that of flour) exists before the consecration and is removed after.

38. Why are these cases cases that yield new substances rather than cases that don't? Because a substance is that which has unity to the highest degree, and these are cases that yield a thing with a very high degree of unity.

39. The potency of hydrogen gas for uniting with oxygen gas is called a *natural* potency because it belongs to hydrogen in virtue of hydrogen's nature. Hydrogen *qua* hydrogen has this potency, and is never without it. Contrast this to the potency of some particular amount of heated hydrogen to burn some other thing. Heated hydrogen has the power to burn, not insofar as it is hydrogen, but insofar as it is hot. The potency to burn of some particular amount of hydrogen is not natural to that hydrogen because it is not a potency which belongs to it by reason of what hydrogen is, but only a potency that belongs to it by reason of some accidental feature that it has but might not have.

40. Aquinas's frog example is a reference to the magicians of Exodus 8:7. I thank Eleonore Stump and *HPQ*'s anonymous referee for this observation.

41. One possibility concerns the distinction between *per se* and *per accidens* causes: perhaps Aquinas would say that art is never a *per se* cause of the generation of a substance, and so perhaps he can say, without contradiction, both that (i) the forms introduced by art are always accidental forms (meaning, introduced by art *per se*), and (ii) the forms introduced by art are sometimes substantial forms (meaning, introduced *per accidens*). Alternatively, this might be merely a case of Aquinas speaking carefully in some places and loosely elsewhere.

42. I am grateful to Eleonore Stump, John Doyle, and James Brent, here at Saint Louis University, for their extensive and insightful comments on earlier drafts of this paper. In addition, I wish to express my thanks to Lawrence Dewan, O.P., and an anonymous referee for *HPQ*, each of whom provided extremely helpful suggestions and criticisms.

