

ELEMENTAL VIRTUAL PRESENCE IN ST. THOMAS

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Perhaps the best-known example of how Aristotle's philosophy of nature is thought to have been superseded by the scientific revolution of the seventeenth and eighteenth centuries is the establishment of the atomic theory. The Stagirite's thoroughgoing opposition to the reduction of substances to aggregates of atoms is evident throughout his physical works and to the modern reader it seems that if there is any point on which Aristotle has been proved wrong it is this. It is therefore natural to think that, because they adopted Aristotle's mistake, the medieval philosophers—most notably St. Thomas Aquinas—are similarly outmoded. However, given the considerable revision of our understanding of the existence of atoms underway in contemporary science (particularly in quantum theory) since the beginning of the twentieth century, one is tempted to reassess the degree to which the Aristotelian abhorrence of atomism is truly obsolete.¹

¹ See Edward MacKinnon, S.J., "Thomism and Atomism," *Modern Schoolman* 38 (1961): 121-41; William A. Wallace, O.P., "Are the Elementary Particles Real?" in *From A Realist Point of View: Essays on the Philosophy of Science* (2d ed.; Lanham, Md.: University Press of America, 1983), 171-83. More recently, see Wolfgang Smith, "From Schrödinger's Cat to Thomistic Ontology," *The Thomist* 63 (1999): 49-63; and *The Quantum Enigma: Finding the Hidden Key* (Peru, Ill.: Sherwood Sugden and Company, 1995), especially chapters 3 and 4. For another recent but more careful exposition of St. Thomas's doctrine, focused on virtual presence and less concerned with the implications of quantum theory than the others are, see Joseph Bobik, *Aquinas on Matter and Form and the Elements: A Translation and Interpretation of the De Principiis Naturae and the De Mixtione Elementorum of St. Thomas Aquinas* (Notre Dame: University of Notre Dame Press, 1998).

While this paper will not offer such a reassessment, it will provide at least part of what must serve as a necessary foundation for it. In the following I will present a critical exposition of St. Thomas's account of the manner in which elemental substances are present in non-elemental substances, referred to as "mixtures."² If this mode of existence, usually referred to as "virtual presence,"³ is not articulated very carefully, it will be not only an obstacle to any attempt at showing the present-day relevance of Aristotelian natural philosophy, but in fact an enigmatic and obscure account of the workings of nature.

Virtual presence has received surprisingly little space in the already sparse literature on Thomas's natural philosophy. One

² The words in Aristotle and St. Thomas are *mixxi*" and *mixtum* (or *mixtio*), respectively. I hesitate in deciding how to translate these words, the main reason being that what modern chemistry refers to as a mixture is something more precise, and probably less substantially united, than that to which Thomas and Aristotle refer.

In chemistry mixtures are divided into two categories: heterogeneous and homogeneous. However, the definition of each is primarily operational. A mixture is heterogeneous if it is an aggregate in which the particles are merely juxtaposed and can be mechanically separated, whether by filtration, distillation, or simply by using a pair of tweezers. It is homogeneous (or a solution) if there is such a thorough blending among the parts that the one dissolves in the other and they cannot be mechanically separated. Such mixtures are opposed to chemical compounds, in which there is a much stronger bond between the parts, one that involves the sharing or transferring of electrons on the atomic level (and such are subdivided into ionic and covalent bonds, each of which can also be further subdivided), and which possess properties radically different from those of their constituents. An example of a heterogeneous mixture would be salt and pepper shaken together in a jar; an example of a homogeneous mixture, salt water; and an example of a chemical compound, table salt (sodium chloride). While it is clear that Thomas would not consider a heterogeneous mixture to be a *mixtum* (in *De Mixtione Elementorum*, ln. 34, he calls such a *confusio* or a *mixtio ad sensum*, as opposed to a *vera mixtio*), the question is more difficult in the case of solutions and compounds.

Hence, while many stand by the cognate (Williams, Fine, Code, and Crombie), other suggested translations vary from "mixed body" (Bobik), to "gel" (Fine), to "compound" (Wallace, Hoenen, and Van Melsen), to "chemical compound" (Phillips, Bittle, and Bogen), to "chemical combination" (Joachim and Gill), while some vacillate between "compound," "mixture," and "combination" (Cohen). Some use the old chemical terminology from the nineteenth century, calling this a "mixt" (Duhem and Needham), while others (Maier) have simply refused to translate the expression at all. While noting that each of these ways of translating has its benefits, rather than choose among them I will simply stand by the traditional cognate "mixture" or "mixed substance."

³ Thomas never uses this actual expression. I will say more on the significance of this below.

can only speculate as to the reason for this, as the doctrine itself is not exactly transparent.⁴ However, insofar as Thomas's doctrine is really just an interpretation of Aristotle's words in *De Generatione et Corruptione*, 1.10, it is noteworthy that Aristotle himself, at least in recent years, has not been similarly neglected.⁵ Indeed, the recent deluge in Aristotelian studies being made by those who are principally of the analytic tradition has made Thomas's work all the more relevant. To put it simply, these neo-Aristotelians are in some respects reinventing the wheel with their careful studies of Aristotle on mixtures; many of them, after detailed analysis of Aristotle's works, are reaching conclusions that Thomas reached over seven hundred years before them. Because few of them seem to notice that they might have saved time by reading Thomas's commentaries and related opuscula,⁶

⁴ The only study produced in almost a generation is Bobik, *Aquinas on Matter and Form and the Elements*. This work goes a long way both toward explaining Thomas's doctrine and toward showing its congeniality to contemporary particle physics. Indeed, aside from Bobik the most recent work done on virtual presence is acerbically critical of it, namely that of Marius G. Schneider, O.F.M., "The Anachronism of Certain Neothomistic Physical Doctrines," *Studies in Philosophy and the History of Philosophy*, vol. 4, ed. John K. Ryan (Washington, D.C.: The Catholic University of America Press, 1969), 142-73.

⁵ For example, *Pacific Philosophical Quarterly* devoted its September and December issues to "Form, Matter, and Mixture in Aristotle" (vol. 76 [1995]). Other recent work includes Mary Louise Gill, "Matter Against Substance," *Synthese* 96 (1993): 379-97; Paul Needham, "Aristotelian Chemistry: A Prelude to Duhemian Metaphysics," *Studies in the History and Philosophy of Science* 27 (1996): 251-69; Sheldon M. Cohen, *Aristotle on Nature and Incomplete Substance* (Cambridge: Cambridge University Press, 1996), 55-100. Strangely, Anneliese Maier thinks that this matter is really a non-issue in Aristotle; see her *On the Threshold of Exact Science*, ed. and trans. Steven D. Sargent (Philadelphia: University of Pennsylvania Press, 1982), 131-32.

⁶ The only exception to this that I have seen is Cohen, who makes some reference to St. Thomas's account, comparing it to that of Gill (see Cohen, *Aristotle on Nature and Incomplete Substance*, 90 and 98 n. 69). Cohen thinks St. Thomas's doctrine and arguments directed against Averroës are also opposed to his own position; however, I am not sure that Cohen's position is really that similar to Averroës's, so I suspect that he did not give Thomas a careful reading. It should also be noted that Kit Fine gives a nod to the medieval commentaries on *De Generatione et Corruptione*, 1.10. In an endnote he admits that there are "many points of contact" between his discussion and the medieval debates on the subject (Kit Fine, "The Problem of Mixture," *Pacific Philosophical Quarterly* 76 [1995]: 366 n. 12). This is not to say, of course, that these fresh studies have nothing to add to what Thomas says. Indeed, their additions often can serve to make Thomas's interpretation of Aristotle more precise.

this may be something of which both disciples of St. Thomas and these neo-Aristotelians should take note.⁷

I. THE AMBIGUITY OF THE DOCTRINE

St. Thomas presents the notion of virtual presence in response to a question: “in what manner are elements in a mixture?”⁸ The dilemma that provokes his answer can be formulated in the two ways one can stress this question. On the one hand, in what manner do the elements exist in *a mixture*, a being that is substantially one, possessing its own nature? On the other hand, in what manner do the elements exist *in* a mixture, that is, how are they constituents of and present within the mix? Even before Thomas offers his account—which is merely his interpretation of Aristotle, *De Generatione et Corruptione*, 1.10⁹—one expects a

⁷ There is a slight difference in motivation and spirit behind the study of the Aristotelian-Thomistic account. Many of the neo-Aristotelians seem to take it for granted that Aristotle is wholly and manifestly obsolete in this matter, and hence are interested in Aristotle simply for the sake of giving an historically accurate exegesis; see, for example, Fine, “The Problem of Mixture,” 266-67, and 309; and Harold H. Joachim, “Aristotle’s Conception of Chemical Combination,” *Journal of Philology* 29 (1904): 77 n. 1. The majority of Thomists, however, are interested in whether or not the doctrine is *true*. Some even wish not only to understand but also to defend the doctrine (e.g., Hoenen, Philips, Bobik, Duhem, and Wallace). Even those neo-Scholastics that think that Thomas’s account is no longer viable still feel the need to argue their position; see, for example, Schneider, “The Anachronism of Certain Neothomistic Physical Doctrines”; Virgil G. Michel, O.S.B., “On the Theory of Matter and Form,” *Ecclesiastical Review* 73 (1925); and Celestine N. Bittle, O.F.M., *From Aether to Cosmos* (Milwaukee: Bruce Publishing, 1941), 334-40.

⁸ St. Thomas’s opusculum *De Mixtione Elementorum ad Magistrum Phippum de Castro Caeli* begins with this question: “Dubium apud multos esse solet quomodo elementa sint in mixto.” I will translate from the Leonine edition, *Opera Omnia*, vol. 43 (Rome: Santa Sabina, 1976). For the sake of giving special care to accuracy, all translations of St. Thomas and Aristotle will be my own except when otherwise noted.

⁹ I say that the idea of virtual presence is merely Thomas’s reading of *De Generatione et Corruptione*, 1.10, because whenever he discusses virtual presence he references it. It is unfortunate that Thomas never completed his commentary on *De Generatione et Corruptione*; he commented only on 1.1-5, while one of his disciples, probably Thomas of Sutton, finished the commentary. It is clear that St. Thomas was intent upon finishing the document but was interrupted by his fateful call to Lyons (see Jean-Pierre Torrell, O.P., *Saint Thomas Aquinas: The Person and His Work*, vol. 1, trans. Robert Royal [Washington, D.C.: The Catholic University of America Press, 1996], 235). In any case, a few years earlier Thomas wrote *De Mixtione Elementorum*, and this is certainly his most articulate explanation of virtual presence. A comparison of texts makes it clear that Thomas of Sutton made

distinction: in a way they *are* in a mixture, and in a way they *are not*. Indeed, following Aristotle, Thomas says that the elements are present potentially, but not actually.¹⁰ However, he is still more specific.

Thomas summarizes his doctrine by saying that the substantial forms of the elements are present in a mixed substance *virtute*, that is, “by power.” However, the exact meaning of this idea of presence “by power” is ambiguous not only because Thomas applies it in various ways among radically diverse beings (from putrefying matter to God),¹¹ but even more so because it seems to suggest a modality of existence that is in some sense “between” potency and actuality.¹²

The rather natural English translation of the ablative noun *virtute* by the adverb “virtually” only exacerbates the difficulty.¹³ In modern English the word “virtually” means “more or less,” or “practically,” or “pretty much but not quite.” If we were to stand by this translation of *virtute*, then Thomas’s answer to the question of how the elements are present in a mixture would be equivalent to saying that they are “pretty much there but not

extensive use of it while completing the commentary for *De Generatione et Corruptione*, 1.10, often simply transcribing whole paragraphs, but the commentary on this chapter is also based heavily upon tract. 6 of St. Albert’s commentary on *De Generatione et Corruptione*.

¹⁰ Whether one is commenting on Aristotle or on St. Thomas, it is generally agreed that they do not think the elements are actual in a mixture. The only exception that I have seen is Sharvy, who is focused on Aristotle, not Thomas (R. Sharvy, “Aristotle on Mixtures,” *Journal of Philosophy* 80 (1983): 439-57; see especially 445-56). For a straightforward refutation of Sharvy, see Fine, “The Problem of Mixture,” 279-85.

¹¹ Thomas says both that maggots exist “by power” in putrefying matter (*Summa Theologiae* I, q. 73, a. 1, ad 3), and that all things created by God are in Him inasmuch as “the effect preexists by power in the cause” (*STh* I, q. 84, a. 2; see also *STh* I, q. 4, a. 2). This of course suggests the analogical character of virtual presence.

¹² This expression will be severely qualified below.

¹³ Schneider himself employs this word in his translation of *De Mixt. Elem.*, ln. 149; for one so critical of those who obfuscate the doctrine, he is surprisingly lax about being literal here (see Schneider, “The Anachronism of Certain Neothomistic Physical Doctrines,” 164). Bobik is the only translator to use the expression “by power” (he includes “virtually” as an alternative in parentheses) for this same passage (see Bobik, *Aquinas on Matter and Form and the Elements*, 122). Note that while no explicit reference to St. Thomas or Aristotle is being made in this context, Wallace’s account of “powers models” in inorganic substances implies the doctrine of virtual presence, or presence by power (see William A. Wallace, O.P., *The Modeling of Nature: Philosophy of Science and Philosophy of Nature in Synthesis* [Washington, D.C.: The Catholic University of America Press, 1996], 70-73).

quite,” which is hardly a philosophically precise manner of speaking.

It is clear, then, that if we insist upon saying that the elements are present virtually we are under an obligation to distinguish explicitly this use of “virtually” from its common use. However, many who purport to be explaining Thomas’s account simply say that the elements are “virtually” in the mixed substance and leave it at that, as though the matter is thereby made clear.¹⁴ This shows the superiority of translating *virtute* as “by power,” because it not only avoids the misapprehensions that almost inevitably arise with “virtually,” but its somewhat awkward sound suggests that a technical distinction is being made.¹⁵ Indeed, as I will show below, by directing the reader’s attention to the powers of the elements and mixtures the fittingness of this technical expression becomes clear. Nonetheless, very few Thomistic commentators seem to recognize that this translation is preferable, and have often offered expositions of the doctrine that lend themselves to confusion.

¹⁴ Although he does much to defend and articulate the Aristotelian-Thomistic position, William Kane does not seem to think it necessary to explain why we should use the word “virtually” at all: “Let us say that the elements are virtually present in the compound, that is, by virtue of the substantial form of the compound” (William Kane, O.P., “Hylemorphism [sic] and the Recent Views of the Constitution of Matter,” *Proceedings of the American Catholic Philosophical Association* 11 [1935], 73). Bittle, in a lengthy treatment of the Aristotelian “hylomorphic theory,” is no more clear: “every compound must have a single form, while the elemental forms themselves have passed out of existence; the latter are contained ‘virtually’ in the form of the compound” (Bittle, *From Aether to Cosmos*, 311). In an historical analysis of the debate about the unicity of form among the medievals Daniel Callus simply states that according to Thomas and his disciples the elemental forms are in a mixture “only virtually as implied, synthesized, and comprised in the higher form” (Daniel A. Callus, O.P., “The Origins of the Problem of the Unity of Form,” in *The Dignity of Science: Studies in the Philosophy of Science presented to William Humbert Kane, O.P.*, ed. James A. Weisheipl, O.P. [Washington, D.C.: The Thomist Press, 1961], 123). Finally, one of the worst culprits in this matter is R. Phillips, using “virtually” and “virtual” almost a dozen times in explaining substantial change, without explaining the meaning of the term until pages later. Even then he does not quite say why the word is an appropriate technical term (see R. P. Phillips, *Modern Thomistic Philosophy*, vol. 1: *The Philosophy of Nature* [Westminster, Md.: Newman Press, 1948], 137-39, 143-46).

¹⁵ Indeed, it may be no coincidence that Thomas never uses the adverb *virtualiter* or the adjective *virtualis* in the present context; he is always more concrete, using the noun *virtus* (in its nominative and ablative forms).

Because of this confusion, it is worthwhile first to note some of the criticism that has been made of Thomas's doctrine and of contemporary Thomistic expositions of this doctrine. More than half a century ago Virgil Michel criticized Thomists who attempted to reconcile contemporary science and Aristotelian-Thomistic natural philosophy concerning substantial change, saying that these neo-Thomists are forced to have

recourse to the obscure *virtual permanence* of the forms [of the elements] . . . [But] in the explanation of this phenomenon there is no common understanding among the authors. The attempts at an explanation of this virtual presence in general do not contribute to the honor of Scholastic clarity of thought, and are to some intelligible only when taken to be a vaguer way of merely saying that the old elements do as a fact reappear upon the corruption of the compound.¹⁶

More recently, Marius Schneider has made similar criticisms, beginning with the thesis that "Neothomistic views of the constitution of corporeal being conflict not only with one another, but—in spite of their intended faithfulness to Aquinas' philosophy—also with the teaching of St. Thomas itself,"¹⁷ a criticism with which I will agree to an extent. However, he then goes on to make the further, and ultimately more important, claim that virtual presence "not only sounds but most certainly is naive and medieval,"¹⁸ and that the accounts of Thomas and the interpretations of his present-day disciples are inherently

¹⁶ Michel, "On the Theory of Matter and Form," 252. Michel's own view is that any attempt at explaining the presence of the elements in a mixture in terms of potency or virtual presence is utterly contrary to experimental data: "It seems difficult to-day [sic] not to accept the conclusion that the elements retain their individual substance in compounds. The whole mass of scientific evidence in fact, for the building up of the elements out of common particles, when taken together, is overwhelming. . . . It can therefore hardly seem unphilosophical to subscribe to the *actual* permanence of chemical atoms in a compound" (ibid., 251-52 [emphasis added]).

It seems that Michel opts for what was traditionally the other position popular among the medievals: the doctrine of the plurality of forms in a substance (see ibid., 255-56). Note also that it is probably not a coincidence that Michel's article was written just before the birth of quantum theory (in the 1930s), in which the character of the "scientific evidence" changed considerably, and consequently so did our understanding of the atom.

¹⁷ Schneider, "The Anachronism of Certain Neothomistic Physical Doctrines," 142; see also 152-53.

¹⁸ Ibid., 151.

bankrupt, given the scientific evidence. Hence, Schneider reveals an underlying attitude that

neoscholastic philosophy cannot fulfill its task of offering a much desired realistic philosophy of nature as it is known in our age. . . . [For] whoever is faintly acquainted with modern physics . . . is aware that . . . scarcely any of the corresponding doctrines of the scholastic physics is true. . . . and whatever the truth value of modern science may turn out to be, the necessary scientific presupposition of Aristotelian hylomorphism most certainly does not represent a true conception of physical being.¹⁹

Hence, Schneider concludes his paper by asking rhetorically,

Is it too much to expect that contemporary Thomists who subscribe to the modern scientific views of the constitution of physical being . . . seriously reflect upon this insight of their master,²⁰ finally give up the attempt to defend obsolete physical doctrines, and offer their help for the realization of a truly *neoscholastic* philosophy of nature?²¹

Schneider seems to be making three points: (1) contemporary disciples of St. Thomas give neither plausible nor consistent accounts of the presence of elements in mixed substances; (2) these accounts are deformations of that offered by St. Thomas, and are motivated by a wrongheaded desire to reshape virtual presence in the image of modern scientific data; and (3) Thomas's own account cannot be salvaged and must be discarded. The first and second criticisms are true to a certain degree, while the last seems a bold but false assertion. However, since in this article I am concerned only with explaining Thomas's position, not with its truth or falsity as such, I must set aside the third criticism altogether; the first and second are more immediately pertinent to the present inquiry. That is, what is Thomas saying about how the elements are preserved in a mixed substance, and how does contemporary scholarship interpret this?

¹⁹ Ibid., 153, 160-61, 168.

²⁰ The insight to which Schneider refers is Thomas's admission that if light were atomic, then Aristotelian natural philosophy would be based on faulty principles. See II *Sent.*, d. 13, q. 1, a. 3.

²¹ Schneider, "The Anachronism of Certain Neothomistic Physical Doctrines," 173.

II. THE ALTERNATIVES TO ST. THOMAS'S DOCTRINE

The natural way to present the answer to this is to look at St. Thomas's explanations of the subject, focusing in particular on his only extended treatment of the matter, *De Mixtione Elementorum*. Thomas begins with a *via negativa*, telling us how the elements are *not* present in a mixed substance. The two explanations which Thomas opposes are particularly noteworthy insofar as some Thomists seem to be close to attributing one or both of them to Thomas.

The first position Thomas addresses, and then criticizes, is that of Avicenna,²² namely that "while the active and passive qualities of the elements are reduced in some way to a mean [quality] through alteration, the substantial forms of the elements remain [in the mixed substance]."²³ Avicenna is saying that the elemental substantial forms retain their actuality even after the generation of the mixture, and the only real change seems to be an accidental one. Hence, Thomas summarizes Avicenna's account elsewhere by saying that the elemental forms "remain integral," "in act," and "in the mixture in act with respect to essence."²⁴

One might notice that this is essentially the doctrine of the plurality of forms about which there was much controversy in the thirteenth and fourteenth centuries.²⁵ Indeed, if the description is

²² "Elements are not corrupted into their species in the complexion [*complexione*], but are converted [*convertuntur*]" (Avicenna, *Metaphysica*, tract. 8, cap. 2, fol. 97vb-98ra; see also *Sufficientia*, tract. 1, cap. 10, fol. 19rb). Callus notes that Avicenna is inconsistent in this matter inasmuch as he gives a very different account of how the forms of lower organisms are in those of higher ones (see Callus, "The Origins of the Problem of the Unity of Form," 127-29, esp. n. 10).

Thomas does not specifically attribute this position to Avicenna here, although he does elsewhere (*STh* I, q. 76, a. 4, ad 4; and *De Anima*, a. 9, ad 10). Algazel seems to agree with Avicenna in this (see his *Metaphysica* II, tract. 3).

²³ "qualitatibus activis et passivis elementorum ad medium aliquo modo reductis per alterationem, formae substantiales elementorum manent" (*De Mixt. Elem.*, ll. 3-6).

²⁴ "integras remanere" (*STh* I, q. 76, a. 4, ad 4); "actu remanere" (*Quaestiones Quodlibetales* I, q. 4, a. 6, ad 3); "actu sunt in mixto secundum essentiam" (*De Anima*, a. 9, ad 10).

²⁵ Callus notes this as well (Callus, "The Origins of the Problem of the Unity of Form," 128 n. 10). If this is correct, one might also include Avicenna and Gundissalinus as targets of Thomas's criticism here, although there is no explicit reference made to the raging debate on the plurality of forms in this opusculum.

taken strictly, it is congenial to an atomic theory of matter. I should qualify this claim, however, because most atomists would say that there is no substantial form of the whole aggregate of elements, and hence no true mixture, while pluralists admit that there is a primary substantial form of the mixture to which the elementary forms are subordinated and by which they are directed.

Thomas begins to probe the second position—that of Averroës²⁶—by pointing out that some recognized the problematic character of Avicenna’s position, and so posited a more complicated alternative to avoid its absurdities:²⁷

the substantial forms of the elements in a way remain in the mixture. But . . . the forms of the elements do not remain in the mixture according to their completeness, but are reduced to a certain mean. For they [Averroës and his followers] say that the forms of the elements admit of more and less, and have contrariety with respect to one another.²⁸

No language of actuality or potentiality is used in this account, so the position is somewhat vague. It is like Avicenna’s insofar as the elemental substantial forms are present in the mixture (in actuality?); it is unlike it insofar as they seem to be blended in some way, perhaps analogous to the way Avicenna describes the blending of the active and passive qualities of the elements.

Now, because Averroës knows that substance does not admit of degree,²⁹ his position must be more subtle. According to Averroës,

²⁶ See Averroës, *De Caelo et Mundo*, bk. 3, coms. 67 and 68. Again Thomas does not refer to his opponent by name in this context here, but he does elsewhere (see *De Anima*, a. 9, ad 10; *STh I*, q. 76, a. 4, ad 4; and *Expositio Super Librum Boethii De Trinitate*, q. 4, a. 3, ad 6). On the Averroist doctrine, see Andrew G. Van Melsen, *From Atom os to Atom: The History of the Concept Atom*, trans. Henry J. Koren (Pittsburgh: Duquesne University Press, 1952), 66-73; Robert P. Multhauf, “The Science of Matter,” in *Science in the Middle Ages*, ed. David C. Lindberg (Chicago: University of Chicago Press, 1978), 384-86.

²⁷ *De Mixt. Elem.*, ll. 53-54.

²⁸ “formae substantiales elementorum aliquantulum remanere in mixto. Sed . . . formae elementorum non manent in mixto secundum suum complementum sed in quoddam medium reducuntur; dicunt enim quod formae elementorum suscipiunt magis et minus et habent contrarietatem ad invicem” (*De Mixt. Elem.*, ll. 56-57, 59-64).

²⁹ “Each substance as such is not said to admit of variation of degree. For example, if that substance is a man, he cannot be more of a man or less of a man, whether he is compared to himself [at different times] or with another man” (Aristotle, *Categories*, 5.3b36-37).

the forms of the elements are the least perfect [forms] inasmuch as they are closest to prime matter. Whence they are means between substantial and accidental forms, and thus inasmuch as they approach the nature of accidental forms, they can admit of more and less.³⁰

Hence, because of the grades of perfection found in various natural forms, Averroës in effect says that elemental substances do not fit into one of the ten categories of beings. Rather, he attributes to the elements in a mixture³¹ a sort of intermediate position between accidents and substances. While the elemental forms do seem to be actual,³² they are not quite substantial and yet are more than accidental.³³

Thomas takes issue with both of these positions.³⁴ So we know that whatever he means by virtual presence or presence “by power,” he cannot mean that the elements exist in actuality; nor can he mean that, because of the ontologically impoverished nature of the elements, they are able to straddle the distinction between substance and accident. That describes how the elements

³⁰ “Formae elementorum sunt imperfectissimae, utpote materiae primae propinquiores; unde sunt mediae inter formas substantiales et accidentales, et sic, in quantum accedunt ad naturam formarum accidentalium, magis et minus suscipere possunt” (*De Mixt. Elem.*, ll. 68-73). See also *De Anima*, a. 9. ad 10; *STh* I, q. 76, a. 4, ad 3; and *Quodl.* I, a. 6, ad 4.

³¹ Thomas does not specify whether, according to Averroës, the elements as such—i.e., both in and outside of a mixture—have forms that are intermediates between accidental and substantial forms. The language seems to suggest it, but one can answer the question with certainty only by a careful study of Averroës’s cosmology.

³² This seems the more natural reading of the text, although some have held that the imperfect existence that Averroës is attributing to the substance of the elements is a form of potential existence. See, for example, Wallace, “Are the Elementary Particles Real?,” 179; and Anneliese Maier, *An der Grenze von Scholastik und Naturwissenschaft*, (2d ed.; Rome: 1952), 29.

³³ If the reader finds it difficult to understand Averroës’s position, he should note that Thomas describes this odd doctrine as being “improbable for a number of reasons,” and as “even less plausible” than that of Avicenna (lns. 74 and 54). Elsewhere he puts it more strongly: “this is even more impossible” than Avicenna’s account (*STh* I, q. 76, a. 4, ad 4), and is “ridiculous” (*De Anima*, a. 9, ad 10). If the fundamental notion of substance is “being in itself” and of accident “being in another,” how can something be neither a substance nor accident? How can it be *in between*? This seems to deny the law of the excluded middle.

³⁴ The arguments he offers against them are in *De Mixt. Elem.*, ll. 18-52, 74-118, for Avicenna and Averroës respectively. Note that if Averroës’s account is interpreted loosely or charitably, Thomas agrees with it (see *In Boet. de Trin.*, q. 4, a. 3, ad 6). But it is fairly obvious that this is not the meaning that Averroës intends.

are not in a mixture. The question remains, how *are* they in a mixture?

III. ST. THOMAS'S GENERAL SOLUTION TO THE QUESTION

Saint Thomas then makes the transition to his own account, noting the parameters required for any answer to be plausible, saying that “one must discover another mode by which both the veracity [genuine character] of the mixture is preserved, and yet the elements are not totally corrupted but remain in the mixture in some way.”³⁵ After explaining the manner in which elemental qualities affect each other he offers the following solution:

Therefore, the powers of the substantial forms of the simple bodies are preserved in mixed bodies. The forms of the elements, therefore, are in the mixed bodies not in act but by power. And this is what Aristotle says in the first book of *De Generatione et Corruptione*: “Therefore they,” that is, the elements in the mixture, “do not remain in act, like ‘body’ and ‘white’ [remain in act], and neither are they corrupted, either one or both of them. For their power is preserved.”³⁶

This summary is the core of the doctrine referred to as “virtual presence.” It is both an explanation and an interpretation of a notoriously ambiguous passage from the Aristotelian corpus that has plagued commentators for over two millennia. We will unpack this account by focusing on different aspects of it.

The first and most obvious point that Thomas (and of course Aristotle) is making is that, *contra* Avicenna and Averroës, the elemental substances are not *actually* preserved in the generation of the mixed substance. To use Aristotle’s example, “white” and

³⁵ “Oportet igitur alium modum invenire, quo et veritas mixtionis salvetur, et tamen elementa non totaliter corrumpantur, sed aliquantulum in mixto remaneant” (*De Mixt. Elem.*, ll. 119-22).

³⁶ “Sic igitur virtutes formarum substantialium simplicium corporum in corporibus mixtis salvantur. Sunt igitur formae elementorum in corporibus mixtis, non quidem actu sed virtute. Et hoc est quod Aristotelis dicit in I De generatione, ‘Non manent igitur—elementa scilicet in mixto—actu ut corpus et album, nec corrumpuntur nec alterum nec ambo: salvatur enim virtus eorum’” (*De Mixt. Elem.*, ll. 145-53; see also *Quodl.* I, a. 6, ad 3; *STh* III, q. 77, a. 8; *Summa contra Gentiles*, IV, ch. 35; II, ch. 56). The passage from Aristotle is *De Generatione et Corruptione*, 1.10.327b29-31, with Thomas using the Moerbeke translation.

“body” can each be predicated of a man that has undergone an alteration of skin tone, and this is because these predicates signify his actual qualities or attributes.³⁷ However, when (according to the medieval theory of elements) a metal is generated out of a certain proportion of earth and water, we cannot predicate earth or water of this metal because they are not its actual qualities or substance—unless we say that the metal is not a substantial unit. At best we can say only that the metal is earthen or aqueous, meaning that it is *made from* such, and that such are *in* the metal. Simply put, whiteness and corporeity are in act in a mixed substance, while the forms of the elements are not. The substantial forms of the elements, according to St. Thomas, have corrupted in some fundamental way.

The natural question, then, concerns this denial of the actual preservation of the elements: is virtual presence, then, nothing more than potential presence? For clearly one does not want to say simply that virtual presence is a third mode of being *between* potency and actuality. To do so would be to deny that the distinction between the actual and the potential is exhaustive of what in any way exists. This interpretation would not only be contrary to the convictions of Thomas, a good disciple of Aristotle, but it might also be unintelligible; what *is* either *is in actuality*, or *is able to be* (and this ability exists in things that are in actuality). Indeed, to read Thomas to mean that virtual being is literally and unequivocally a mode of being *between* actual being and potential being would be to claim that Thomas is making a mistake similar to that of Averroës when he posited the being of the elements in a mixture to be *between* accidental and substantial being. In both cases the distinction would be *ad hoc* and probably a contradiction in terms, so if one insists on describing presence by power as a third mode of existence between potency and act, he may do so only by making severe

³⁷ “White” signifies an affective quality or a disposition, while “body” signifies a secondary substance.

qualifications of this expression.³⁸ Properly speaking, this description is inaccurate, and so one should avoid it.

The only logical possibilities, then, are that the elements in mixtures exist either in act or in potency—and, because Thomas explicitly rules out the former, the latter is the only option. Hence, virtual presence must at its root be a kind of potential existence. Indeed, the word *virtus* itself suggests this inasmuch as it is the translation of *dunamis* (duvnamī) in the *De Generatione et Corruptione* passage Thomas quotes above. *Dunamis* itself may be translated as “potentiality,” “possibility,” “capability,” and of course “power,” and the shades of difference in meaning found among each of these alternatives makes translation difficult.³⁹ However, we can rule out at least one very restricted use of the word *dunamis* in the present context: the word is not intended to refer to the technical name of the second species of quality in Aristotle’s *Categories*,⁴⁰ for at least some of the “powers” or “capabilities” of the elements include heat and frigidity, which fall into the third species of quality.⁴¹ Hence, the use of *dunamis* (and *virtus*) Thomas understands to be implied here is broader in its scope.

³⁸ Although it is clear from his numerous works on related matters that Wallace has a very penetrating understanding of St. Thomas on virtual presence, he chooses this infelicitous expression on at least one occasion, saying that Thomas “took a middle position [between those of Avicenna and Averroës], that the elements were present in compounds neither actually nor potentially, but virtually. . . . Although real, however, [an elementary particle] is not fully actual, nor is it merely potential; rather it has a virtual existence” (Wallace, “Are the Elementary Particles Real?”, 179). Peter Hoenen likes to say that “the forms of the elements are not present in *pure* potency nor in act, but virtually” (Peter Hoenen, S.J., *The Philosophical Nature of Physical Bodies* [the first and second parts of book 4 of the *Cosmologia*], trans. David J. Hassel, S.J. [West Baden Springs, Ind.: West Baden College Press, 1955], 39 [emphasis added]). The modifier “pure” helps to ameliorate the ambiguity insofar as it specifies that the kind of potency we are ruling out is that proper to prime matter, as Hoenen goes on to say (see *ibid.*, 40-45).

³⁹ Note that because *virtus* is a translation of *duvnamī*, not of *ajrethv*, it is less fitting to translate *virtus* as “virtue,” a word which in English suggests moral excellence and would be inappropriate in a discussion about inorganic substances. However, the notion of excellence will be relevant in our discussion of the blending of the elemental qualities. Indeed, there is an etymological connection between *virtus* in the sense of power and *virtus* in the sense of moral virtue inasmuch as *virtus* comes from *vir*, “man”; *virtus* implies “manliness,” “courage,” and “strength.”

⁴⁰ *Categories* 8.9a14-28.

⁴¹ *Ibid.*, 8.9a29-10a10.

However, the fact that *dunamis* can be translated as potentiality and possibility suggests another question: does saying that an element is virtually present in a mixed substance mean nothing more than that it is within the pure potentiality of the mixture to corrupt into that element again? Is Thomas saying simply that it is physically possible—that is, nothing more than “not impossible”—for the mixed substance to perish at some time and thereby to produce the elements from which it originally came to be? This would appear to say little more than that the mixed substance, having prime matter as a constituent principle in it, can in principle corrupt into any physical substance. What is virtually present, then, would be simply what is within the *pure potentiality of the primary matter* of a physical substance.

This is obviously *not* what Thomas has in mind. If it were, then there would be no need to give a new name—presence “by power”—for such a kind of potential being, and this sort of potentiality would not be peculiar to the relationship of a mixture with its constituent elements. If by calling something virtually present in something else we mean simply that the former “has the power” to be generated from the latter, then not only are the elements virtually present in the mixture, but also one element is virtually present *in another element*, since the elements can transform into each other. In fact, on this account a mixture would be virtually present in an element, since the latter can become the former (e.g., water can become wine). However, as Thomas never speaks in such a way, it is clear that he restricts the doctrine of virtual presence to the presence of elements (or simpler substances) in mixtures (or more complex substances).⁴² Earth is said to be present by power in metal, the plant soul in the animal soul,⁴³ and the lesser number in the greater,⁴⁴ but not vice

⁴² Aristotle himself is clear about this when he discusses elemental presence in mixtures, when he brings up presence *dunavmei*, “by power” or “by potency,” for the sake of distinguishing mixtures from elemental change. See *De Generatione et Corruptione*, 2.7.334b8-30.

⁴³ See *Quodl.* I, a. 6; *De Unitate Intellectus*, par. 49; *STh* I, q. 76, a. 4, corpus and ad 5. I will say more about what one might call “psychic virtual presence” in the concluding section.

⁴⁴ See *Quodl.* I, a. 6, corpus and ad 1; *STh* I, q. 76, a. 3. See also Aristotle, *De Anima*, 2.3.414b19-32.

versa. So it is clear that he does not mean that the elements are present in a manner of *pure* potentiality—the way we say prime matter is potential, and indifferent, with respect to every material form—when he says the elements remain *virtute*.

If virtual presence does not mean that the elemental substantial forms are actually in the mixed substance and if it does not mean simply that they are within the pure potentiality of the prime matter of the mixture, then Thomas means something in between these two extremes of actual being and purely potential being. On these things, I should note, there is little disagreement in the literature interpreting St. Thomas. However, there *are* shades of disagreement concerning the further specification of the doctrine, which I will discuss as I expound Thomas's account.

IV. PRESENCE BY POWER

Let us return, then, to the discussion of Thomas's and Aristotle's respective choices of the words *virtus* and *dunamis*. According to Thomas, if an element is virtually present—present “by power”—in a mixture, while its substance is not actually present, its powers are preserved. When he says the “powers” or “abilities” are preserved, this word may signify any number of attributes or properties of the element; in fact, the very opposition Thomas draws between the elemental powers (preserved) and the elemental substantial forms (not preserved) suggests both that these powers are actualities and that the word is being used to refer to accidental forms indiscriminately.⁴⁵ This interpretation seems to be supported, and somewhat specified, by Thomas's description of how the qualities of the elements exist in the mixture, for as he lays the foundation for his doctrine of virtual presence he notes that

⁴⁵ I use the word “accident” in a broad sense to include not only attributes that are purely incidental and transient—as when one says that “in the Agora” or “blushing” are accidents of Socrates—but also those that are peculiar and predicable only of one species—as when one says that “risible” is an accident of Socrates. Simply put, by “accident” I mean anything that is not a primary substance or its substantial form. See the distinction between kinds of accidents in *De Principiis Naturae*, c. 2, par. 343; and *De Ente et Essentia*, c. 7.

It should be considered, then, that the active and passive qualities of the elements are contrary to each other and admit of more and less. Moreover, from contrary qualities that admit of more or less can be constituted a mean [intermediate] quality that savors of the nature of each extreme, such as grey between white and black and tepid between hot and cold [do]. Therefore, with the excellences of the elementary qualities having been so remitted, a certain mean quality is constituted from these which is a proper quality of the mixed body.⁴⁶

The powers referred to as being preserved in the mixture appear, then, to be the active and passive qualities that differentiate the elements and allow them to act upon each other. Thomas seems to be using “power” in a way that coincides with the fundamental notion of *dunamis* Aristotle offers in the *Metaphysics*, namely, a “principle of change in another thing or in the thing itself as other.”⁴⁷

However, it would be premature to conclude from this that virtual presence is simply a combination of the potential presence of the substantial forms of the elements and an actual presence of the elemental qualities. As Thomas says, the active and passive elemental qualities, being contraries, can be present in the mixture only in the way that extremes are present in a mean; whatever this latter expression means exactly, we must at least say that these qualities are not *actually* present, lest we deny the principle of non-contradiction. Thomas would then be saying that a substance composed of fire and earth would be both actually dry

⁴⁶ “Considerandum est igitur quod qualitates activae et passivae elementorum contrariae sunt ad invicem, et magis et minus recipiunt. Ex contrariis autem qualitibus quae recipiunt magis et minus, constitui potest media qualitas quae sapiat utriusque extremi naturam, sicut pallidum inter album et nigrum, et tepidum inter calidum et frigidum. Sic igitur remissis excellentiis qualitatum elementarum, constituitur ex his quaedam qualitas media quae est propria qualitas corporis mixti” (*De Mixt. Elem.*, ll. 123-32). See also *STh* I, q. 76, a. 4, ad 4; and *ScG* IV, c. 81. Note that he also says that the elements “remain in power, as Aristotle says. This is inasmuch as the proper *accidents* of the elements remain with respect to a certain mode [i.e., moderation], in which the power of the elements remains” (*De Anima*, a. 9, ad 10 [emphasis added]).

⁴⁷ “ἡ ἐστὶν ἀρχὴ μεταβολῆς ἐν ἄλλῳ ἢ ἐν ἑαυτῷ” (Aristotle, *Metaphysics*, 9.1.1046a10). Wallace’s interpretation of the plural of *dunamis* and *virtus* as “powers of action” (Wallace, “Are the Elementary Particles Real?”, 179) is then fairly accurate. Schneider’s “accidental forces” (Schneider, “The Anachronism of Certain Neothomistic Physical Doctrines,” 164) interpretation of *virtutes* in *De Mixt. Elem.*, l. 146, conveys the sense to a certain degree but it certainly is not a good translation.

and actually moist, one composed of water and air both actually hot and actually cold.⁴⁸

Nor can we, to avoid this incoherence, say that one part of the mixture is actually hot and another actually cold, for Thomas and Aristotle understand inanimate mixtures to be perfect blends, homogeneous substances. Each of the parts of such mixtures, then, must be like the others; this means that each part shares not only in specifically and numerically one substantial form, but also in specifically and numerically one active or passive qualitative form—the mixture properly speaking has one temperature and one degree of moisture. It is true that Thomas sometimes classifies organisms among mixtures, and that these are obviously heterogeneous (for example, some parts of an organism are more moist than others).⁴⁹ However, the primary concern in the doctrine of the virtual presence of the elements is their preservation in a homogeneous mixture, what Aristotle calls a “homoeomer” (οἰμοιομερής).⁵⁰ For the elements are only indirectly components of organisms—the matter from which a man is produced is seed and menses, not earth, air, fire and water—but are directly the components of homogeneous mixtures, which can thereby be disposed to serve as the matter of organisms. Hence, we are again forced back to some manner of potential existence, this time for the elemental *qualities*.⁵¹

⁴⁸ For “contraries . . . cannot belong at the same time to the same thing” (Aristotle, *Metaphysics*, 4.6.1011b17; see also 4.4.1005b36-32; and 5.10.1018a25-38). Schneider voices a similar warning, or rather a complaint (Schneider, “The Anachronism of Certain Neotomistic Physical Doctrines,” 164). In the medieval account (adopted from Aristotle) of the four fundamental elemental qualities corresponding to the four terrestrial elements, fire is hot and dry, air is moist and hot, water is cold and moist, and earth is dry and cold. The order of the predicates is not arbitrary; fire and air are both hot, but fire is hotter and heat distinguishes it more than air. See Bobik, *Aquinas on Matter and Form and the Elements*, 144-82 and 252-83.

⁴⁹ For example, see *De Caelo et Mundo* III, lect. 8.

⁵⁰ See Aristotle, *De Generatione et Corruptione*, 1.5.321b17-22; 1.10.328a3-14; and 2.7-8.

⁵¹ Aristotle is explicit in calling this a mode of potential presence: “When one [contrary quality] exists simply in act, the other exists in potency [*dunavmei*]; when, however, it is not wholly so, but [relatively] hot-cold or cold-hot, because in being mixed things destroy each other’s excesses, then . . . *neither of the contraries will exist simply in act*, but something intermediate which, inasmuch as it is in potency more hot than cold (or vice versa), is proportionately twice (or three times or such) as hot in potentiality as cold” (Aristotle, *De*

However, again we must distinguish: the elemental qualities are not potentially present in the intermediate quality in an unqualified potentiality. The elemental qualities do not survive the mixing, but neither are they wholly corrupted. As Thomas puts it, the quality proper to the mixture “savors” or “has the flavor of”⁵² the qualities of the elements. Just as the taste of something bitter is apparent in the flavor of something bitter-sweet, and sweetness in sweet-and-sour pork, so are the qualities of elements readily apparent in the intermediate or mean quality proper to the mixed substance.

Thomas’s analogy with mixed colors⁵³ illustrates the same point: one can almost *see* the presence of black and white in the color grey, and if (*per impossibile*) someone had never seen the color grey or a particular shade of grey he could immediately identify the extremes blended in this mixture.⁵⁴ This is why grey

Generatione et Corruptione, 2.7.334b9-16 [emphasis added]). Similarly, Thomas says that “the mixture itself does not have in actuality something of those things which came together in its mixing [i.e., the elemental forms and qualities], but in potency only [*potentia tantum*]” (*Metaphys.* I, lect. 12).

⁵² “sapiat” (*De Mixt. Elem.*, l. 127). Phillips likes to say that the elemental powers are themselves virtually present in the mixed substance (Phillips, *Philosophy of Nature*, 134 and 144-45). Although the reason for wanting to speak this way is understandable, this is an unfortunate way of describing the matter because it amounts to saying that the *powers* of the elements are present in the mixture *by their powers being present*. Since there is little illumination in this manner of speaking, we should restrict the designation of “virtual presence” to the elements themselves, not to their powers themselves.

⁵³ See *De Mixt. Elem.*, ll. 128-29, quoted above. This is drawn from Aristotle, *De Sensu et Sensato*, 3.439b18-440b25.

⁵⁴ This is very similar to the lone exception to absolute empiricism that Hume makes: “Suppose, therefore, a person to have enjoyed his sight for thirty years, and to have become perfectly acquainted with colors of all kinds, except one particular shade of blue, for instance, which it never has been his fortune to meet with. Let all the different shades of that color, except that single one be placed before him, descending gradually from the deepest to the lightest; it is plain, that he will perceive a blank, where that shade is wanting, and will be sensible, that there is a greater distance in that place between the contiguous colors than in any other. Now I ask, whether it be possible for him, from his own imagination, to supply this deficiency, and raise up himself the idea of that particular shade though it had never been conveyed to him by his senses? I believe there are few but will be of opinion that he can” (David Hume, *An Enquiry Concerning Human Understanding* [2d ed.; Indianapolis: Hackett Publishing, 1993], sect. 2, pp. 12-13). Though Hume is suggesting that we can almost see the mean in the extremes, while Thomas is saying that we can almost see the extremes in the mean, nonetheless the parallel is obvious. Even the staunch empiricist admits an exception to the basis of his philosophy because of the manifest nature of this case.

is sometimes defined as light-black or darkened-white, depending on the shade. Hence, in commenting on Aristotle's discussion of the mixture of sensible qualities, Thomas says that "those things which are mixed together obscure each other."⁵⁵ Notice that Thomas says that colors obscure (*obscurant*) each other, not that they are hidden by (*latent*) or completely eclipse (*occultant*) each other.⁵⁶ Hence, black and white are known to be present in grey not only from the experience of grey yielded from mixing the two together, but from a simple observation of the color itself.

Similarly, Thomas is suggesting, the presence of each of the elemental qualities in the intermediate seems to be readily apparent to the discerning eye. This is clear again with the case of hot and cold in tepid,⁵⁷ which—unlike black and white in grey—is not just an analogy but *is* a real example of the blending of elemental qualities. Lukewarm water is sometimes described as cold and at other times as warm, depending on what use one is going to make of it—cold when one wants a bath, warm if one wants to fill a vase of roses. So Thomas means nothing vague or mystical (and certainly nothing dubious) in suggesting that we can discern the elemental qualities in their intermediate; rather, he is appealing to a manifest matter of experience. We can recognize the intermediate quality *as intermediate*, that is, as an actual quality in its own right that is at the same time a sort of balance or equilibrium⁵⁸ between two extreme qualities. The extreme

⁵⁵ "ea quae commiscetur obscurant se invicem" (*De Sensu et Sensato*, c. 7). This is a summary of Aristotle at *De Sensu et Sensato*, 7.447a14-33.

⁵⁶ *Obscurant* is also Moerbeke's translation of *ajfanivzein* (at 447a22) which could mean either "to conceal" or "to obscure."

⁵⁷ See *De Mixt. Elem.*, ll. 129-130, quoted above.

⁵⁸ One is tempted to say "tension," but this choice of words seems a little too Empedoclean and violent sounding for what is really a natural unity, or synthesis. Today we might call it a bipartisan compromise or resolution.

One might go even further and draw an analogy between the extreme elemental qualities' presence in the mean quality of the mixture and the relationship between contrary extreme habits, called "vices," and the mean habit between them, called "virtue." The virtue of courage is not a combination of being alternately rash and cowardly, or in feeling an inner struggle in which one desires both to run away and to dash into the fray. The courageous man is not in inner turmoil because his intellect and his passions are harmonized; he recognizes the danger of performing an action but also knows that the common good must be served in protecting the city. Similarly, a mean quality in a mixed substance is one quality that is a perfection and union of two opposed qualities that nonetheless coexist (in potency)

degree of the quality of the element is not preserved but the quality itself is inasmuch as the mean quality has a “share of the natures of each” extreme.⁵⁹

To make the nature of this sort of tempering of the extremes a little more concrete, Thomas continues, saying that the intermediate quality proper to a mixed substance

differs in diverse [mixtures] according to the diverse proportions of [elements in] the mixture. And this quality is indeed the proper disposition to the form of the mixed body just as the simple quality is to the form of the simple body. Therefore, just as the extremes are found in the mean which shares in the nature of each, so the qualities of the simple bodies are found in the proper quality of the mixed body.⁶⁰

Naturally, there is a ratio among the parts or respective concentrations of the elements in the mixture and this ratio is proper to each species of mixture.⁶¹ Thus, the more one element

harmoniously in the mixture. On a virtue as a disposition or quality that is the perfection of an imbalanced or extreme power, see *STh* I-II, q. 49, a. 1; *STh* I-II, q. 55, aa. 1 and 3. On Aristotle’s general doctrine on the composition of intermediates from their contraries, see *Metaphysics*, 10.7.1057a18-29.

⁵⁹ “participat naturam utriusque” (*De Mixt. Elem.*, l. 138). Bobik says cryptically that “it is not at all necessary for this mean quality to be anything at all like either of the extreme qualities; it may turn out to be a surprise of some sort, even a complete surprise” (Bobik, *Aquinas on Matter and Form and the Elements*, 123-24). How a quality can be intermediate between two extreme qualities and yet be nothing like them is mystifying to me. How could we discern the extremes in the mean *at all* if this is possible? Looking at the color grey we would not be certain that it isn’t a mean between purple and green.

⁶⁰ “differens tamen in diversis secundum diversam mixtionis proportionem; et haec quidem qualitas est propria dispositio ad formam corporis mixti, sicut qualitas simplex ad formam corporis simplicis. Sicut igitur extrema inveniuntur in medio quod participat naturam utriusque, sic qualitates simplicium corporum inveniuntur in propria qualitate corporis mixti” (*De Mixt. Elem.*, ll. 133-40). See also *ScG* III, c. 22, pars. 7 and 8; *IV Sent.*, d. 44, q. 1, a. 1, q. 1, ad 4; and *Quodl.* 10, a. 3, ad 2.

⁶¹ The difference in quality, then, is in a sense due to a difference in quantity (see Aristotle, *Metaphysics*, 10.7). This fact is of prime importance to anyone trying to articulate how the Aristotelian-Thomistic account of elemental combination fits with contemporary science and atomic theory. Many have recognized this and done just that (see, for example, Bobik, *Aquinas on Matter and Form and the Elements*, 121-26, Hoenen, *Philosophical Nature of Physical Bodies*, 65-74, Kane, “Recent Views of the Constitution of Matter,” 72-74, and Phillips, *Philosophy of Nature*, 144-50). One might call this the ancient “law of fixed proportions.” In any case, it should be noted this is not necessarily an atomistic account of the mixing of the elements. One can speak of two quantities having a ratio but not thereby corresponding to a number of discrete particles. Indeed, two continuous quantities could be

predominates in a mixture, the more the qualities of the mixture will resemble those of that element.⁶² While the substantial forms of the elements corrupt in their own proper and actual existence, the ratio of these parts that go into the production of this mixing bowl, as it were, is fixed and is the proper disposition of the new substance.

Before completing his explanation of virtual presence in *De Mixtione Elementorum*, Thomas makes a further point about how the elements are present in the mixed substance by their powers somehow being preserved. This is worth adding if we are to give a full account of virtual presence. He notes that

while the quality of a simple body is indeed other than its substantial form, it nonetheless acts in virtue [i.e., in the power] of its substantial form; otherwise heat would only be able to make things hot, and by its action a substantial form would not be educed into actuality (since nothing acts beyond its species). Thus, therefore, the powers of the substantial forms of the simple bodies are preserved in mixed bodies.⁶³

incommensurable (and therefore necessarily non-atomistic) and still bear a ratio to one another.

⁶² Indeed, if the ratio of one component to another is exceedingly high, Thomas (following Aristotle) thinks that not only is the mixture simply referred to by the name of the predominant component, but in fact (if a certain threshold ratio is breached) the substantial form of this component consumes that of the more diffuse component form. For example, a mixture of water and a drop of wine is really just water (although the water now acquires some of the qualities of the wine to some extremely mild, usually indiscernible, degree). The opposite occurs if the wine predominates by far and the water is diffuse. See Aristotle, *De Generatione et Corruptione*, 1.5.321a33-b3; 1.10.328a23-32, and Thomas's commentary *De Generatione et Corruptione*, lect. 14.

⁶³ "Qualitas autem simplicis corporis est quidem aliud a forma substantiali ipsius, agit tamen in virtute formae substantialis; alioquin calor calefaceret tantum, non autem per eius actionem forma substantialis educeretur in actum, cum nihil agat ultra suam speciem. Sic igitur virtutes formarum substantialium simplicium corporum in corporibus mixtis salvantur" (*De Mixt. Elem.*, ll. 140-47). Elsewhere he makes a similar comment about the meaning of presence "by power": "the power of the substantial form [of the element] remains in the elementary quality, allowing that it has been remitted and as it were reduced [*reducta*] to a mean. For the elementary quality acts in the power [*in virtute*] of the substantial form, and otherwise the action which is done through the heat of fire would not terminate at the substantial form [of fire being educed]" (*Quodl.* I, q. 4, a. 6, ad 3). On the manner in which mixtures or elements bring about substantial changes through alteration, see *STh* III, q. 7, a. 12; *IV Sent.*, d. 44, q. 1, a. 1, q. 1, ad 4; *Quodl.* I, a. 6, ad 2; X, a. 3, ad 2.

Thomas, perhaps having in mind the fact that certain rubbing motions of sticks or the scraping of flint and steel can produce fire, draws the conclusion of the final sentence by means of an implied minor premise. The syllogism is as follows: fire is able to induce another body to combust only by virtue (i.e., by the power)⁶⁴ of its substantial form in it; certain mixed substances can induce other bodies to combust; therefore, these mixed substances do this only by virtue (i.e., by the power) of the substantial form of fire in them. Somehow the virtue or power of the fire to cause combustion is present in substances that have fire as one of their elemental constituents. And, like other qualities, this power or virtue exists in the mixed substance to a remitted or tempered degree. Thus, the most distinctive and most significant activity that a fire can perform can also be performed, albeit less readily and to a lesser degree, by what has fire in it. Hence, the virtue or power of the element fire that is preserved in the mixture is not only the active quality heat (tempered by its contrary, cold), but also fire's ability to induce combustion which derives from its substantial form.

Thus, Thomas's answer to the question of how the elements exist in a mixed substance is that they exist by their powers existing, and this means that their substantial forms in and of themselves do not exist in actuality, and in fact neither do their active and passive qualities, at least not to their full "excellence."⁶⁵ Speaking most properly, both are preserved only *in potentia*, although I add that the preservation of the elemental powers is both more evident and less potential than that of the elemental substantial forms.⁶⁶ For (as I argued above) not only is

⁶⁴ Alternately, "under the influence" or "guidance," as Bobik puts it (Bobik, *Aquinas on Matter and Form and the Elements*, 124-25).

⁶⁵ See *De Mixt. Elem.*, l. 130.

⁶⁶ Emphasizing that virtual presence is a kind of potential presence, Bobik summarizes St. Thomas's account by taking an example from modern chemistry, saying that "hydrogen and oxygen are not there actually, though they are there potentially—and in two senses of 'potentially': 1) virtually (by their power), and 2) retrievably" (Bobik, *Aquinas on Matter and Form and the Elements*, 125). I have not focused as much on the retrievability of the elements because St. Thomas does not focus on it in his explanation of virtual presence (although it is certainly implied). The second difficulty I will point out in the concluding section, revolves, at least in part, around the significance of elemental retrievability.

the presence of the elemental qualities evident to sense—unlike that of the elemental substantial forms in the mixture—but the substantial forms are there only *virtute*, that is, only *by means of their powers*. We know the former are preserved because we know that the latter are preserved, although technically both are preserved only potentially, the elemental substantial form because there can be only one actual substantial form of one substance, and the elemental powers because opposed qualities cannot exist in one (homogeneous) subject at the same time.⁶⁷

I will add one more comment to make a little clearer how the power of the element can be preserved potentially (in an intermediate) but preserved nonetheless with a higher grade of actuality—and therefore a greater degree of evidence—than the elemental substantial form. It can be said that in some mixtures the presence of elements is more evident than in others—one might say that the virtual presence is stronger in them. For, if one element predominates in a mixture (providing it does not consume the other element[s]),⁶⁸ the proper quality of the mixture will be very close to that of the element. For example, the medievals readily inferred that water predominates in glass because of its transparency, its coolness to the touch, and its

However, it seems to me that Bobik is not clear enough that the qualities or powers of the elements exist themselves in a sort of potentiality. He frequently (see *ibid.*, 124-25) refers to the elemental forms as corrupted and the elemental qualities as preserved, and while this is true in the sense explained above, it is not true without qualification because this language sounds as if the elemental qualities are preserved *in act*. However, this is to a certain degree a matter of emphasis.

It is interesting to note that the interpretation of Aristotle offered by at least one non-Thomist concerning elemental presence in a mixture seems almost identical to that of St. Thomas: “(a) Fire, Earth, Air, and Water are present in a chemical compound only by ability (*dynamis*) [*virtute*], i.e., in virtue of the possession by the compound of intermediate abilities of the same kinds [*sic*, as?] the maximal abilities which are peculiar to the heat of Fire and Air, the cold of Earth and Water, the dryness of Fire and Earth, and the wetness of Air and Water; (b) The presence by ability of an element in a compound consists of (nothing more than) the possession by the compound of the relevant non-maximal abilities” (James Bogen, “Fire in the Belly: Aristotelian Elements, Organisms, and Chemical Compounds,” *Pacific Philosophical Quarterly* 76 [1995]: 379).

⁶⁷ On how the elements mix inasmuch as their qualities mix, see *De Partibus Animalium*, 2.1.646a12-24; also see Fine, “The Problem of Mixture,” 304-5.

⁶⁸ See note 62 above.

smoothness (reducible in part to moisture).⁶⁹ Although it possesses none of these to the degree that water does (water is a better medium of sight, is cooler, and is obviously more moist), it is not unreasonable to say that glass is, for example, transparent, without making any further qualification. This quality of the element seems to be preserved almost wholly intact; it is more actual than, say, the slight grade of opacity the glass has from the earth that is in it.⁷⁰ While we can say of the water's substantial form *as such* that it exists in the glass simply in potency, nevertheless its powers are stronger, more actual in the glass, and so by *these powers—virtute*—water's presence is stronger.⁷¹

V. REMAINING QUESTIONS

Despite my elucidation of Thomas's account of virtual presence, most of which has been said before by others, there remain points about which there has been much debate in making sense of both St. Thomas and Aristotle on this matter.⁷² Hence, what I have offered is at best only the foundation of an interpretation of Thomas's account of virtual presence. However, to point the way wherein more work needs to be done, I will conclude by noting two disputes on the nature of the preservation of the elements in mixtures according to Thomas and Aristotle.

⁶⁹ Glass even takes its name from *glacies*, "ice" (contrary to myth, Aristotle did not take ice to be substantially different from water; see *Meteorology*, 1.11.347b15, where he says that snow, frost, and rain-water are all the same substance, "differing only in degree and amount"). Note that even contemporary science classifies glass as a liquid because of its lack of integrity over time—that is, its ability to flow (albeit, very slowly). This amorphous character is observable in old windows (e.g., stained glass in old churches) that appear warped and "runny."

⁷⁰ On the intrinsic opacity of earth, see Aquinas, *De Sensu et Sensato*, c. 5.

⁷¹ On the grades of potentiality in a mixed substance according to St. Thomas, see *ScG III*, c. 22; *De Potentia*, q. 3, a. 4, ad 14 and 16; and *XII Metaphys.*, lect. 2. Hoenen uses language similar to mine in describing virtual presence: "In the compound the forms of determined elements are not in pure potency, but in potency which approaches the act of elements" (Hoenen, *Philosophical Nature of Physical Bodies*, 42; see also 48-49).

⁷² It is unfortunate that neo-Scholastics—focused as they are on making sense of St. Thomas, sometimes forgetting his self-identification as a disciple of Aristotle—and analysts—who long ago set aside the medievals as less-than-critical interpreters of the Philosopher—do not pool their resources and compare notes in this discussion. Much could be gained on both sides, and perhaps many exegetical matters could be resolved.

First of all, can one say that an element existing potentially or virtually in a mixture is the same in number with the element that went into the change? Or—since this is somewhat misleading, and since one wonders what it would mean for something to have potential numerical unity—can the very same piece of earth that went into the mixture be yielded out of it upon the corruption of the mixture? On Aristotelian-Thomistic principles, one's inclination should be to answer in the negative,⁷³ but the fact that there has been some dispute about this should give one pause.⁷⁴

This question obviously owes part of its motivation to the contemporary atomistic viewpoint, for therein one tends to think of atoms as particles that move from one molecular composition to another: as it is sometimes put poetically, “we are each made of stardust.” The atomist, and even a Thomist trying to overcome modern atomistic prejudices, will imagine and speak of the atoms as though they retained their numerical identity throughout their existence.⁷⁵ However, one should recall that, if properly understood,⁷⁶ the idea of atomic building blocks is not opposed to Aristotle's or St. Thomas's understanding of elemental

⁷³ Aristotle is fairly clear on this: “This again is where the investigation begins: do all things return on themselves in the same way, or not, but rather some in number and some in form only? It is evident that those whose substance . . . is imperishable will be the same in number . . . but those whose substance, on the contrary, is perishable must necessarily return on themselves in form, not in number. That is why water from air and air from water is the same in form, but not in number, and if these too are the same in number, still they are not things whose substance comes to be, the sort, namely, that is capable of not being” (*De Generatione et Corruptione*, 2.11.338b12-19). This translation is taken from *Aristotle's De Generatione et Corruptione*, trans. C. J. F. Williams (Oxford: Oxford University Press, 1982), 59. On numerical unity in general, see Aristotle, *Metaphysics*, 3.4.999b28-1000a4; 5.6.1016b32-1017a3.

⁷⁴ Cohen, for example, promotes the idea of numerical unity. See Cohen, *Aristotle on Nature and Incomplete Substance*, 91-93, and 99.

⁷⁵ One should be careful about identifying the atomistic view with the reality of the situation. Quantum theory seems to demand that this intuitive inclination to tag atoms with numerical identity throughout their various alterations and interactions be resisted and even discarded. Scientists are finding themselves hesitant to say anything about atoms when they aren't actually being measured. There is a sea of literature on this topic; from a Thomistic viewpoint, see Wallace, “Are the Elementary Particles Real?”, 171-83; idem, “Elementarity and Reality in Particle Physics,” in *From a Realist Point of View*, 185-212; Edward MacKinnon, S.J., “Atomic Physics and Reality,” *Modern Schoolman* 38 (1960): 37-59.

⁷⁶ That is, if and only if atoms are understood *not* to have actually distinct substantial forms while in the mixed substance; they can possess only virtual existence.

combination; their doctrine of natural minima should settle that question.⁷⁷

This leads us to the second difficulty. If an element does not maintain its numerical identity after becoming a part of a mixture, one starts to wonder in what way virtual presence preserves the elements in any significant sense. On this matter one finds two main camps in the secondary literature: on the one hand, those who interpret Thomas (and Aristotle) to be promoting a watered-down and almost metaphorical sense in which the elements exist in the mixture, and, on the other, those who find a more tangible and “full-blooded” account of the same.

The controversy revolves around a distinction between whether virtual presence means that the elements are “constitutionally” or merely “genetically” present in the mixture.⁷⁸ While there are sometimes significant nuances that distinguish their particular positions, Wallace, Cohen, and Fine fall into the former camp,⁷⁹ while Maier, Schneider, Gill, Bogen,

⁷⁷ See Aristotle, *Physics*, 1.4.187b13-22 and b30-37; *De Caelo*, 1.9.278b1-3. Also see Thomas’s commentary, I *Phys.*, lect. 9. For discussions of natural minima in Thomas and the other medievals, see Wallace, “Are the Elementary Particles Real?,” 177-79, especially nn. 14 and 15; and Anneliese Maier, *Die Vorläufer Galileis im 14. Jahrhundert* (Rome: Edizioni di Storia e Letteratura, 1949), 179-90. Oddly, Maier seems to think that the ideas of atoms and of natural minima are unconnected, at least among the medievals; see Maier, *On the Threshold of Exact Science*, 130 n. 5.

⁷⁸ I draw these terms from Schneider, “The Anachronism of Certain Neothomistic Physical Doctrines,” 164-68. Among the Aristotle scholars, Bogen refers to the former as “component realism” (Bogen, “Fire in the Belly,” 388-89). Fine holds for the elements as “concurrent ingredients” in the mixture (Fine, “The Problem of Mixture,” 276).

⁷⁹ See Wallace, “Are the Elementary Particles Real?,” 177-79; Cohen, *Aristotle on Nature and Incomplete Substance*, 90-98; and Fine, “The Problem of Mixture,” 266-370, esp. 273-85. Cohen’s position is a bit difficult to categorize, especially his notion of “ontological sabbatical”; he sometimes says that “on my view, the compound [“mixture” in our language] . . . consists of elements bereft of their natural dispositions” (98 n. 69), which sounds a lot like *actual* presence. Nonetheless, I think Cohen is more in line with the constitutional account than the genetic one; in any case, he thinks that his interpretation differs from that of St. Thomas, which he thinks is equivalent to Gill’s, a genetic interpretation (see *ibid.*, 90, 98 n. 69). He also believes that the genetic interpretation of Aristotle is “probably the most plausible one” (*ibid.*, 90), despite his own inclinations and speculations.

As regards other members of this division, some (e.g., Hoenen and Phillips) are difficult to categorize because they do not address the problem explicitly. However, I suspect that both lean more in the direction of the constitutional account (see Hoenen, *Philosophical Nature of Physical Bodies*, 70-72, and Phillips, *Philosophy of Nature*, 144-46).

and Needham fall into the latter.⁸⁰ The question depends on whether it is accurate to say that the elements are component or integral parts; those who say the elements are constitutive of the mixture say yes, while those on the genetic side say no. To use the words of a member of the former camp, “one can say that an elementary particle is a part of a physical body. . . . Part is to be taken to be correlative with whole . . . [and hydrogen and oxygen] are fully real as its [water’s] parts. . . . [an element is] a real part of such a body, as an integral component.”⁸¹ On the other side, the claim is that the elements are not components; they are ingredients in the mixture only in the sense that it came to be out of these elements and they will corrupt back into these elements. Thus, virtual presence merely defines where the mixture came from and what it will later on become. A mixture is simply a substance that is disposed to corrupt into certain things rather than just anything, and thus the elements are in it simply in the sense that they are that into which the mixture will break down.⁸²

I suspect that a definitive determination of what Thomas would say in this matter will require a careful study of how he uses the words “in,” “part,” and “whole,” and so the natural places to focus would be his commentaries on *Physics* 4.3 and *Metaphysics* 5.23-26.⁸³ Depending on how this question is

⁸⁰ See Maier, *On the Threshold of Exact Science*, 138-39; Schneider, “The Anachronism of Certain Neothomistic Physical Doctrines,” 164-66; Gill, “Matter against Substance,” 393; Bogen, “Fire in the Belly,” 384-86, 389-90; and Needham, “Aristotelian Chemistry,” 262-69. Each of these has a slightly different position. Many of the analytic philosophers believe that Aristotle’s elemental forms are nothing more than the combined active and passive qualities—that is, they have no *substantial* forms. Nonetheless, this position, which is obviously opposed to that of Thomas, will not affect the essence of the controversy.

⁸¹ Wallace, “Are the Elementary Particles Real?,” 177, 179.

⁸² Cohen summarizes the genetic position by saying that the elements’ “potential existence amounts to nothing more than their recoverability” (Cohen, *Aristotle on Nature and Incomplete Substance*, 91); this presence is a “genetic property,” merely a “remark about its [a mixture’s] origins and ancestry” (ibid., 97). As Needham puts it, “Earth is, however, totally absent from an Aristotelian mixture [sic]. . . . Although there may be a sense in which a mixture might be considered to be derived from, or decomposable into, elements *they* are not present in the mixture, not even potentially” (Needham, “Aristotelian Chemistry,” 266, 269). Note that Needham’s final claim, that the elements are *not even potentially* present in the mixture, is saying more than the others who stand by the genetic interpretation; there is a tendency for this position to reduce to saying that the elements are not really preserved at all.

⁸³ *IV Phys.*, lect. 4; lect. 5; *V Metaphys.*, lect. 20; lect. 21. See also *STh* II-II, q. 48, a. 1.

resolved, there is still the further question of whether or not Thomas's position will be viable as an accurate description of the physical world. For if the genetic account of virtual presence is correct—and this is the more conservative reading, I think—and this account follows from the Aristotelian-Thomistic conviction that mixtures are homoeomers (i.e., every part is like every part),⁸⁴ then Thomas's position may need modification. For, as Hoenen puts it,

today no one can hold that tenet generally accepted because of defective experimentation from the time of St. Thomas up to modern times, namely, the tenet that for the most part inorganic compounds . . . are homogeneous. Today the heterogeneity of microstructure is established without a doubt.⁸⁵

However, Thomas frequently describes heterogeneous substances—that is, the higher living things (which he even calls mixtures on occasion)⁸⁶—as having not only inferior kinds of souls, but even the elements in them *virtute*.⁸⁷ Hence, heterogeneity is an impediment neither to substantial unity nor to the virtual presence of the elements.⁸⁸

In any case, it is difficult to determine the truth of the matter even with the measuring instruments we possess today, and one should not be surprised at such difficulty in understanding something that comes so close to prime matter in its nature (or lack thereof).⁸⁹ At least we can say that we have made a good

⁸⁴ This is held by both Bogen ("Fire in the Belly," 384-86) and Needham ("Aristotelian Chemistry," 264-69).

⁸⁵ Hoenen, *Philosophical Nature of Physical Bodies*, 49; see also *ibid.*, 70-73.

⁸⁶ See above, note 49.

⁸⁷ See *Quodl.* I, q. 4, a. 6, corpus and ad 1; *STh* I, q. 76, aa. 3 and 4.

⁸⁸ Hoenen agrees; Thomas and Aristotle "proposed no theoretical objections to it [i.e., the heterogeneity of a substance]—this is impossible even on peripatetic principles. . . . In fact, St. Thomas . . . had some difficulty in trying to explain why specific heterogeneity was present only in living beings and not in the inorganic" (Hoenen, *Philosophical Nature of Physical Bodies*, 71). Phillips makes similar points (see Phillips, *Philosophy of Nature*, 148-50).

⁸⁹ As we delve into more and more fundamental material levels, we approach what is closer and closer to primary matter, which has no actual properties in and of itself; it is pure potentiality and essentially indeterminate. See *ScG* II, c. 90; *STh* III, q. 57, a. 4; *Compendium Theologiae*, c. 74. No doubt this is part of the reason for the so-called "quantum strangeness" that permeates the data of particle physics nowadays. On this matter, see citations in notes 1 and 75.

beginning toward articulating St. Thomas's account of elemental presence *virtute*, "by power," his resolution of a debate that is as old as the Presocratics, and therefore as old as philosophy itself.