Mixtures and hylomorphism

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First puzzle: There are no mixtures, for either the ingredients continue to exist once they have been mixed or not; in the first case, they must be unaltered, and thus are not mixed; in the second case, they are destroyed, and thus are not mixed.
Aristotle's solution: the ingredients still exist potentially.

Second puzzle: Ingredients are either divided into further divisible parts ('pieces') or into indivisible parts ('particles'). The latter is impossible, and the first does not produce a uniform or homoeomerous mixture.
Aristotle's solution: the ingredients accommodate themselves to one another.

Requirements on an Aristotelian solution:

1. Alteration / Non-actual existence: The ingredients of a mixture must be (appropriately) altered, ie. no longer actually exist.
2. Non-destruction / Potential Existence: The ingredients must not be destroyed, ie. still potentially exist.
3. Uniformity: The mixture must be uniform, ie. any part of the mixture is a mixture of parts of the ingredients.
4. Containment: A mixture should contain its ingredients, ie. they should be parts of it and have a location that is included in the location of the mixture.
5. Coincidence: The ingredients of a mixture and the mixture should all be coincident.[1]
6. Recoverability: The ingredients of any mixture are recoverable.
   Derivability: Any mixture can be derived from its ingredients.
7. Proportionality: The form of a mixture is a ratio, or proportion, of elements.
8. Latent potentiality: the ingredients can have potentialities that do not derive from the mixture to which they belong.
9. Elemental underdetermination: The nature of a mixture can be determined on the basis of the primary contrarieties hot/cold and dry/wet, even though these are not determined by the ratio of its elements.
10. Unity: Mixing differs from growth, creation and destruction.
11. The Quantum Effect: The 'admixture' of relatively small ingredients results in growth, not in mixture.

Finean ingredients:

1. No extended simples: coincidence follows from uniformity (1995: 89, 178).
2. The ingredients are things, not stuff: recoverability is given the 'singular', not the 'generic' reading (1995: 91).

Criticism of Sharvy (1983): does not satisfy (1), (2), (7), and (5) only in the non-Aristotelian way of postulating coincidence of actual existents. More generally, mixtures cannot be mereological sums because they come into being only when the ingredients are put together, while mereological sums exist iff just one of their parts does (1995: 99).[2]

Criticism of Bogen (1995): does not satisfy (4) and (2) only on a non-Aristotelian understanding of 'potential existence' as 'presence by ability'. Resemblance is not enough: "After all, it is in much the same sense of 'presence' that we may talk of seeing a father or a mother in a child; for the child is like the father or mother, and the father or mother are respectively responsible for the extent to which the child is like them. But we would not want to say that the father and mother have the kind of presence in the child which would guarantee that the child is a mixture of its parents…" (1998: 281)

Criticism of Gill (1989): does not satisfy (1) and (2) only by restricting the properties of the ingredients that are inherited by the mixture to those had accidentially by mixed anhomoeomers (a "downgrading of essential properties", 1995: 105).

Things are compounds of matter and form. Mixtures are compounds of elemental matter and rational form, which is polyadic / multipronged in that it has application to several material components. The ultimate matter of some mixture (ie which is not itself a compound of matter and form) is not a sum of the ultimate matter of the ingredients; but rather the prime matter of all ingredients is the same and also the same as the prime matter of the mixture (1995: 114). The proximate matter of some mixture is either elements (Ascent) or the matter of elements (Leveling). Ascent distinguishes, implausibly, between a mixture that is obtained in two steps by the ratios 1:1 and 1:2 and a mixture that is obtained in just one step by the ratio 2:3 (1995: 116). Neither can it explain (11).

1. Fine says "compresent", and that this fifth condition follows from Uniformity, Containment and the assumption that the ingredients and the mixture are not extended simple, ie. are such that there is a part exactly located at every subregion of their location.
2. Fine (1994: 137) calls this method of composition "aggregation".

Leveling, however, makes it difficult to explain how the form of the mixture may be a composite of the forms of the ingredients: in what sense may the ratio be said to include / be composed out of the elemental forms of which it is a ratio? The elemental forms are potentialities which are only latently present in the mixture, in the way component forces are 'present' in the resultant one (1995: 125), or conflicting desires leave someone 'paralysed' (1995: 127). The dispositional property must thus be distinguished from the disposition; it is individuated extrinsically:

> …once we recognize how the presence of one disposition may modify the operation of another, we see how two dispositions might simultaneously be present in an object even thought they would not then both operate in the way they would if the other disposition were absent. (1998: 284)

The form of the mixture is thus an 'intermediate' of the elemental forms of the ingredients, and can be calculated on the basis of these elemental forms, which are quantities of cold/hot and dry/wet. Indeterminacy of decomposition is avoided by reifying latent capacities, analysing the intensive magnitudes of temperature and dryness in terms of quantities of heat, cold, dryness and wetness (1995: 130, 139)

Contrary to component forces and conflicting desires, however, for the combined capacity (which is the form of the mixture) to come into being, "the component capacities must somehow engage or lock on to one another" (1995: 142). Once this engagement has taken place, the decomposition of the combined form is a "mere fiction" (1995: 144), "the contraries to not themselves directly attach to the subject but only attach in so far as they belong to a combination" (1995: 142). Nevertheless, they are still the forms of the ingredients (which continue to exist potentially in the mixture). The form of the mixture may be carved up in different ways (1995: 145–147): $(E+F)m = Em_1 + Fm_2$, where m is a mixture of some compound of a quantity of earth m_1 with the form E and some compound of a quantity of fire m_2 with the form F. The elemental parts Em and Fm are then posterior to the mixture "[f]or their status as parts is to be understood by deriving them from the whole rather than by deriving the whole from them; they are to be obtained by analysis from the whole rather than the whole by synthesis from them" (1995: 149). They may be compresent in the mixture because "[t]hey can be discerned within the mixture by means of structural realignment; but at the most basic level they are not there" (1995: 151). Nevertheless, they possess a strong sense of potential existence, "a more substantive form of existence [than mere possibility] as derived parts" (1995: 154):

> One is not merely saying that there is a possible future in which the nonactual ingredient becomes actual. One is also saying that this possibility has its basis in the ingredient itself; it is because of some capacity or tendency in the ingredient that it is possible for it to become actual. (1995: 153)

To resolve the problem of elemental underdetermination (9), we must take the contraries in one element to be linked (1995: 156) and thus the elemental form to be unitary: the mixing is of elemental forms not of contraries, *contra* G&C 334b17-18.

To explain the quantum effect (11) and the slippery slope to which it gives rise, Fine (1995: 162) uses the "downgrading of essential properties" of Gill (1989): the small quantity of wine added to the water (which makes the water grow) is essentially / internally hot (say), but makes the water only accidentally / externally hot (ie. the heat is not constitutive of the form of the water). Among homoeomers, mixing is the only type of two-one change which involves a change of homoeomerous form (1995: 167), and is itself homoeomerous, consisting of subchanges which are through and through the same (1995: 168).

Three drawbacks of Fine's singular ('thingy', not 'stuffy') reading of the recoverability condition:

- To allow for tracking of like ingredients through subsequent mixings (earth and air mixed with fire and air), "Aristotle must give up the idea that the ingredients can be tracked through to the mixture or he must resort to the questionable idea that the object might be tracked under a variation in form" (1995: 173)
- If the matter of the ingredients is prime, they cannot be tracked, for their matter is the same as the matter of the mixture (and of the other ingredients). Recoverability must thus be given up for the mixing of homoeomers.
- Aristotle's theory is inconsistent with (un-Aristotelian) mixing of like quantities: "Let us suppose, pace Aristotle, that two bodies of water could mix. Then both bodies could be tracked to the total location of the composite. The tracking criterion would therefore demand that two bodies of water be at that location. But common sense and Aristotelian metaphysics demands [sic] that there be only one; no sense can be given, either intuitively or within Aristotelian metaphysics, tot the claim that there are two or more bodies of water throughout a given location." (1995: 176)

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