1. Over-abstraction

Parting words are sometimes final, but these ones of mine are not. They are an invitation to keep on thinking about the matters to which Finocchiaro has engagingly directed our attention. One of the things that our present discussion helps make clear is the disoriented state in which we find the present literature on composition, in both logic and economics alike. Also much appreciated are Finocchiaro’s clarifications of some of the points I was confused about in my commentary, and for the further occasion they’ve given me to sort out my own thoughts about the matters under review here. Finocchiaro’s examples disclose two significant omissions, one on the part of logicians and the other on the part of economists. Logicians of the present day who take the occasion to mention composition arguments rarely trouble to negotiate the interrelations among the variables P, W and Q of composition claims in canonical notation. Notably absent are analyses of the underlying part-whole relations that deliver a property of all the parts to the whole of which they are its parts, notwithstanding the efforts otherwise of the 1977 paper. Economists, on one hand, simply will not address the compositionality in the terms in which it is presented in canonical notation. Finocchiaro is right to emphasize that his economics examples are presented for our consideration, not necessarily – or even for the most part – with his endorsement. But, upon consideration, they are strikingly informative examples, perhaps surprisingly so.

To take an example close to my heart, one of the virtues of Finocchiaro’s inspection of the logic textbook literature is its exposure of difficulties with the textbook treatments of Woods-Walton (and later Irvine) treatment of economically compositional contexts in the three editions of Argument. In the 2004 edition, it is claimed that economic reasoning “is inherently liable to the fallacy of composition” (p. 251), and that – to quote Finocchiaro’s paraphrase – “this liability is connected with the fundamental division between microeconomics and macroeconomics and the problematic relationship between the two.” On the basis of Finocchiaro’s data-sets, I find that I have changed my mind about these claims, or at least lessened the confidence with which I first advanced them. At the heart of
it all is the compositionality property in canonical notation: “Every part P of the whole W has property Q. So W has Q too”. The plain fact that compositionality claims in the economics literature are so rarely in canonical notation suggests (to me) that composition thus rendered holds little interest for economists. Suppose that this were so. Why would it be? It would be because the complexities of economics are seldom renderable in so stripped-down an idiom as “from all parts of W to W itself.” For one thing, it is surprisingly difficult to see in the structure of a functioning economic relationship anything as simplified as this one. It is not for nothing that economics is the plaything of statisticians, real number theorists and the purveyors of differentiations and integration, and more recently biologists and physicists. Structures in the form “All P have Q. So W has Q” are too abstract for economic reality.

A related example of over-abstraction is the habit of theorists of *abductive inference* to choose the schema

1. If H then E
2. E
3. Hence H

as canonical for abduction, for requisite interpretations of H, E, “if … then” and “hence”. Of course, it is an all but useless schema, in which all the weight is placed on the unschematized “if … then” and “hence”. It is a schema that breaks away from the gravitational pull of the very idea of abduction. It carries a helpful quite general reminder. It tells us that it is one thing to talk the talk of canonical notation and another thing entirely to walk it. (Quine himself talked it wonderfully, but walked it wobbily.)

I began my remarks at the OSSA session with a threefold expression of thanks to my colleague Maurice Finocchiaro. I thanked him for his plug of the 1977 paper. I thanked him for his data-sets. And I thanked him for having re-awakened my dormant interest in compositionality. In his reply, Maurice (I think that first names are now de rigeur at this parting stage) points out that in my *Errors of Reasoning* (2013), I leave untested the claim that none of the traditional examples exemplifies the traditional conception of fallacy in the logician’s sense of an error of reasoning that is commonly and confidently committed and subject to unusually high levels of recidivism. Consider hasty generalizations again. If hasty generalization really is an error of reasoning, it is a damnably difficult one to stop committing. The composition fallacy was one of those untested examples. Maurice wonders why. Was there, perhaps, some particular reason, beyond the size of an already large book, to omit it from consideration? The answer, as I am now led to believe, is not that an analysis of composition would have disturbed my thesis that none of the traditional examples instantiates the traditional concept of fallacy, but rather that composition corroborates it with emphatic effect. The problem, again is that hardly any grown-up reasoning about
entities of any interesting complexity is formulable in the canonical notation that logicians have mandated for compositionality, least of all in economics.

2. Complex Systems

Consider for example the hot-button issue of the economics of hot-climate mitigation. Usually considered as complements of cap-and-trade regimes, command and control prices imply that decision-makers have the terabytes of information on hand, together with the means to process it, on the basis of which it can be determined “whether shutting down natural gas for homes and pushing gasoline cars off the road create more benefits than costs. But [carbon-pricers have already] adopted cap and trade precisely because [they] don’t have that information.”

Of course, Watson’s point is that economies are too complex to be left to the command of centralized control centres. Notoriously, their complexity is not even yet a well-understood relation. It is partly a part-whole relationship, but is massively underdetermined by it. Complex systems are now the subject of sprawling research programmes. A leading researcher proposes that the “kernel” of the concept of a complex system can be captured as follows.

- A complex system must contain many subunits, whose number is left unspecified.
- Subunits must be independent at least some of the time.
- The interactions among these subunits must be nonlinear at least some of the time.
- Individual subunits modify their properties and behaviour with respect to a changing environment, resulting in the generation of new systemic properties that ‘reflect’ the change that the environment has undergone.
- In the case of self-organizing systems, subunits modify their own properties and behaviour in light of the system they jointly determine – in other words, there is ‘downwards causation’ operating from the systemic properties to the subunits’ properties.

In this large volume of 936 pages, there is but one mention of part-whole relations in which there is nothing reflected in what I’ve been calling canonical notation. The same is true, only more so, of its almost as large companion volume Philosophy of Economics (2012) edited by Uskali Mäki, in which there is no indexical mention of parts, wholes, composition or division. Fallacies merit twelve references, none having to do with the ones on offer here.

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Apart from Aristotle, no fallacy theorist makes the index of names, nor is Aristotle cited for either *Parts of Animals* or his contributions to fallacy theory. The moral? Compositionality in canonical notation is not a load-bearing concept in economics. It is hard to see how it would be in logic either.

### 3. Thermodynamic Costs

Before quitting this part, it might repay us to tarry awhile over William Watson’s reference to the terabytes of information that centralized carbon pricers would have to process in arriving at their decisions. At once questions arise. Where would such information come from and how would it be processed? Information theory is dominated by theoretical wrangles and high levels of polysemy. Even so, there is a body of opinion backing the idea that consciousness is a massive suppressor of information, a thermodynamically costly state to be in. It is estimated that the information in the sensorium – the site were information from the five senses converges – is \( \approx 11 \) million bits, most of which is lost when admitted to consciousness – only \( \approx 40 \) bits make that cut. Worse still is the transition from consciously possessed information and its linguistic expression. Only \( \approx 16 \) bits survive that transformation. To put it over-simply, no system demanding terabytes of information can conceivably function on consciously held and/or linguistically formulated information. If we make the plausible assumption that human cognition is an information-thirsty phenomenon, then we have it quite straightforwardly that whatever cognitive command we may ever achieve of the economics of carbon mitigation will be the product of information flow-throughs that are processed unconsciously.\(^4\) In his paper, Maurice touches on the (contested) view that, in their nervousness about debt, it is typical of conservative economists to be more vigilant about the composition fallacy than their liberal colleagues whose macro-principles take much of the sting out of macro-debt. (When I say that the view is contested, as Maurice points out, I mean that part of it that describes compositional nervousness as typical of conservatives.) I have come to a somewhat different

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\(^3\) Arguably the best book from antiquity on the part-whole relation was written by the founder of systematic logic, and yet no reference to parts and wholes is to be found in Aristotle’s logical discourses in the *Organon*, including the treatment of the enthymeme in the *Rhetoric*. *Parts of Animals* is a wonderful book on natural history, positively brimming with the myriad ways in which connections are wrought and maintained in the animal kingdom. To the best of my knowledge, no logician writing on part-whole fallacies has seen reason to consult this work. Certainly Walton and I didn’t in 1977. While on the subject of Aristotle, I might add that for him the combination and division of words fallacies are errors dependent on language. Depending on whether the words “can sit while walking” are taken in their combined or divided sense, it is true or not that Socrates can walk while sitting. In the divided sense, the claim is true. Even a seated Socrates has the power to stop sitting and start walking. However, things go wrong in the combined sense. Not even Socrates can manage to walk and sit at the same time. It is easy to see how different the modern fallacies are from these old ones. Part-whole fallacies are never construed as dependent on language, but rather are given the *extra dictionem* classification. See, for example, Irving M. Cohen and Carl Cohen, *Introduction to Logic*, 8th edition, New York: Macmillan, 1970; pp. 17-20.

\(^4\) There is a larger development of these points in *Errors of Reasoning* at pages 204-226.
view. It is driven by the thesis that information-rich cognitive ecologies must be consciously impoverished. If that is so then in the context of carbon-mitigation economies, free-marketers have a clear advantage over carbon-pricing bureaucracies. There may be some question as to whether command and control bureaucracies are conscious, but there is none at all about whether free markets are. They aren’t, period. This stirs the possibility that free-market economists are more attuned to thermodynamic realities of information-processing than their command and control rivals. The point of more immediate importance is that there is, in this rivalry about how carbon-mitigation is to be handled, little that pivots on part-whole relations in canonical notation.

Perhaps I might be forgiven for a small tip of the hat to the Woods-Walton effort to get to the bottom of the part-whole relation. As noted in my comments on Maurice’s paper, all the candidates we examined in 1977 are inadequate. This is both good news and bad, at once a setback and an energetic motivator of a wide-open research programme in the logic of human reasoning. Unless I am mistaken, bringing this project to a successful conclusion will add welcome flesh to Finocchiaro’s meta-argument schema 4:

(M4a) Argument A is an argument of composition because …;
(M4b) Argument A is incorrect because …;
(M4c) Argument A appears to be correct because …;
(M4d) Argument A is a common or frequent type, because …;
(M4e) Therefore, argument A is a fallacy of composition.

To make real progress here, we may have to give up the talk of canonical notation and learn to walk the talk of complex systems. I regard the fulfilment conditions on M4 as the sine qua non of a tenable account of the fallacy of composition. There only remains the challenge of finding them.