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Composition

Debates about the relation of parts to wholes is a major part of modern metaphysics. Many puzzles have to do with different persistence conditions of the “parts” of a composite whole.

Mereological universalism or extensional mereology is an abstract idea, defined in 1937 by Stanislaw Leśniewski and later by Henry Leonard and Nelson Goodman (1940). It claims that any collection of things, for example the members of a set in symbolic logic, can be considered as the parts of a whole, a “fusion” or “mereological sum,” and thus can *compose* an object. Critics of this idea says that such arbitrary collections are just “scattered objects.” A mind-independent causal connection between objects is needed for them to be integral “parts.”

Mereological essentialism is RODERICK CHISHOLM’s radical idea that every whole has its parts necessarily and in every possible world. But this goes too far. No physical object can maintain its parts indefinitely and freeze its identity and information content over time. We can frame this as a third axiom of identity

Id3. Everything is identical to itself in all respects at each instant of time, but different in some respects from itself at any other time.¹

Mereological nihilists, such as PETER VAN INWAGEN and the early PETER UNGER, denied the existence of composites, seeing them as simples (partless entities) arranged to look like a composite object. For them, a table is “simples arranged table-wise.”

Van Inwagen made an exception for living objects. Surprisingly, he based the composite nature of biological entities on the Cartesian dualist view that humans are thinking beings. Van Inwagen then could see no obvious demarcation level at which even the simplest living things should not be treated as composite objects.

Information philosophy and metaphysics ask who or what is doing the arranging? Information provides a more fundamental reason than van Inwagen’s for treating living things as integrated composites and not simply mereological sums of scattered objects.

¹ See chapter 7, p.59 for our first two axioms of identity.



Information analysis extends a true composite nature to artifacts and to groupings of living things because they share a teleonomic property – a purpose. And it shows how some “proper parts” of these composites can have a holistic relation with their own parts, enforcing transitivity of part/whole relations.

A process that makes a composite object an integrated whole we call *teleonomic* (following COLIN PITTENDRIGH, JACQUES MONOD, and ERNST MAYR) to distinguish it from a teleological cause with a “telos” that pre-existed life. We show that teleonomy is the explanatory force behind van Inwagen’s “arrangement” of simple parts and that it applies to human artifacts like tables.

Biological parts, which we can call *biomers*, are communicating systems that share information via biological messaging with other parts of their wholes, and in many cases communicate with other living and non-living parts of their environments. These communications function to maintain the biological integrity (or identity) of the organism and control its growth. The teleonomy of artifacts like tables and statues is imposed by their creators.

Biocommunications are messages transferring information, for example inside the simplest single-cell organisms. For the first few billion years of life, single cells were the only living things, and they still dominate our planet. Messages between them are the direct ancestors of messages between cells in multicellular organisms. And they have evolved to become all human communications, including the puzzles and problems of metaphysics. A straight line of evolution goes from the first biological message to the contents of this book as you read it.

Like many metaphysical problems, composition arose in the quarrels between Stoics and Academic Sceptics that generated several ancient puzzles still debated today. But it has roots in Aristotle’s definition of the essence (*ουσία*), the unchanging “Being” of an object. We will show that Aristotle’s essentialism has a biological basis that is best understood today as a biomereological essentialism. It goes beyond mereological sums of scattered objects because of the teleonomy shared between the parts, whether living or dead, of a biomeric whole.



First, back to Aristotle's definitions of terms...

The term “substance” (οὐσία) is used, if not in more, at least in four principal cases; for both the essence (εἶναι), and the universal (καθόλου) and the genus (γένος) are held to be the substance of the particular (ἐκάστου), and fourthly the substrate (ὑποκείμενον). The substrate is that of which the rest are predicated, while it is not itself predicated of anything else. Hence we must first determine its nature, for the primary substrate (ὑποκείμενον) is considered to be in the truest sense substance.

Aristotle clearly sees a statue as both its form/shape and its matter/clay.

Both matter and form and their combination are said to be substance (οὐσία). Now in one sense we call the matter (ὕλη) the substrate; in another, the shape (μορφή); and in a third, the combination of the two. By matter I mean, for instance, bronze; by shape, the arrangement of the form (τὸ σχῆμα τῆς ιδέας); and by the combination of the two, the concrete thing: the statue (ἀνδριάς). Thus if the form is prior to the matter and more truly existent, by the same argument it will also be prior to the combination.²

The essence of an object, the “kind” or “sort” of object that it “is”, its “constitution,” its “identity,” includes those “proper” parts of the object without which it would cease to be that sort or kind. Without a single essential part, it loses its absolute identity.

While this is strictly “true,” for all practical purposes most objects retain the overwhelming fraction of the information that describes them from moment to moment, so that information philosophy offers a new and quantitative measure of “sameness” to traditional philosophy, a measure that is difficult or impossible to describe in ordinary language.

Nevertheless, since even the smallest change in time does make an entity at $t + \Delta t$ different from what it was at t , this has given rise to the idea of “temporal parts.”

2 Aristotle, *Metaphysics*, Book VII, § iii (



Temporal Parts

Philosophers and theologians have for many years argued for distinct temporal parts, with the idea that each new part is a completely new creation *ex nihilo*. Even modern physicists (e.g., HUGH EVERETT III) talk as if parallel universes are brought into existence at an instant by quantum experiments that collapse the wave function.

DAVID LEWIS, who claims there are many possible worlds, is a proponent of many temporal parts. His theory of “perdurance” asserts that the persistence through time of an object is as a series of completely distinct entities, one for every instant of time. Lewis’s work implies that the entire infinite number of his possible worlds (as “real” and actual as our world, he claims), must also be entirely created anew at every instant.

While this makes for great science fiction and popularizes metaphysics, at some point attempts to understand the fundamental nature of reality must employ Occam’s Razor and recognize the fundamental conservation laws of physics. If a new temporal part is created *ab initio*, why should it bear any resemblance at all to its earlier version?

It is extravagant in the extreme to suggest that all matter disappears and reappears at every instant of time. It is astonishing enough that matter can spontaneously be converted into energy and back again at a later time.

Most simple things (the elementary particles, the atoms and molecules of ordinary matter, etc.) are in stable states that exist continuously for long periods of time, and these compose larger objects that persist through “endurance,” as Lewis describes the alternative to his “perdurance.” Large objects are not absolutely identical to themselves at earlier instants of time, but the differences are infinitesimal in information content.

The doctrine of temporal parts ignores the physical connections between all the “simples” at one instant and at the following moment. It is as if this is an enormous version of the Zeno paradox of the arrow. The arrow cannot possibly be moving when thought frozen at an instant. The basic laws of physics describe the continuous



motions of every particle. They generally show very slow changes in configuration – the organizational arrangement of the particles that constitutes abstract information about an object.

One might charitably interpret Lewis as admitting the endurance of the elementary particles (or whatever partless simples he might accept) and that perdurance is only describing the constant change in configuration, the arrangement of the simples that constitute or compose the whole. And the arrangement is information.

Then Lewis's temporal parts would be a series of self-identical objects that are not absolutely identical to their predecessors and successors, just a temporal series of highly theoretical abstract ideas, perhaps at the same level of (absurd) abstraction as his possible worlds?

Mereology

Mereology is the study of parts which compose a whole. What exactly is a part? And what constitutes a whole? For each concept, there is a strict philosophical sense, an ordinary sense, and a functional or teleonomic sense.

In the strict sense, a part is just some subset of the whole. The whole itself is sometimes called an “improper part.”

In the ordinary sense, a part is distinguishable, in principle separable, from other neighboring parts of some whole. The smallest possible parts are those that have no smaller parts. In physics, these are the atoms, or today the elementary particles of matter.

In the functional sense, we can say that a part serves some purpose in the whole. This means that it has may be considered a whole in its own right, subordinate to any purpose of the whole entity. Teleonomic examples are the pedals or wheel of a bicycle, the organs of an animal body, or the organelles in a cell.

The same three-part analysis applies to the question of what composes a “whole” object.

Some philosophers (e.g., Peter Unger and Peter van Inwagen) deny that composite objects exist. This is called “mereological nihilism,” though a more accurate name would be “holistic nihilism,” since it is composite wholes that they deny. They do not deny the



parts, which they call “simples.” Van Inwagen argues, for example, that tables are just “simples arranged tablewise,” where the simples are partless objects.

Note that the arrangement of parts is not material, but *immaterial* information.

The strict philosophical definition of a composite whole, especially in analytic language philosophy, is just its being picked out by a philosopher for analysis. An example might be “there is a table,” or in Quine’s existential quantification form, “ $\exists x (x = \text{‘a table’})$.”

The ordinary sense of a whole is an object that is distinguishable from its neighboring objects. But such a whole may be just a part of some larger composite whole, up to the universe.

The teleonomic sense of a composite object is that it seems to have a purpose, the Greeks called it a *telos*, either intrinsic as in all living things, or extrinsic as in all artifacts, where the purpose was invented by the object’s creator, or compositor.

The most important example of a teleonomic process is of course biology. Every biological organism starts with a first cell that contains all the information needed to accomplish its “purpose,” to grow into a fully developed individual, and, for some, to procreate others of its kind.

By contrast, when a philosopher picks out an arbitrary part of something, declaring it to be a whole something for philosophical purposes, perhaps naming it, the teleonomy is simply the philosopher’s intention to analyze it further as a composite object.

For example, something that has no natural or artifactual basis, that does not “carve nature at the joints,” as Plato described it, that arbitrarily and violently divides the otherwise indivisible, is a perfectly valid “idea,” an abstract entity. This notion that anything goes for the philosopher to select as a composite whole is known as “mereological universalism.”

The combination of arbitrary objects is called a “mereological sum.” A frequent example is a combination of the Statue of Liberty and the Eiffel Tower, although there is a strong teleonomic component to this mereological sum as they are both part of the



oeuvre of the great engineer Alexandre-Gustave Eiffel. Remember our first axiom that everything is identical to anything else “in some respect.” Here two respects are Eiffel and built in France.

Mereological Essentialism

Aristotle knew that most living things can survive the loss of various parts (limbs, for example), but not others (the head). By analogy, he thought that other objects (and even concepts) could have parts (or properties) that are essential to its definition and other properties or qualities that are merely accidental.

Mereological essentialism is the study of those essential parts.

At his presidential address to the twenty-fourth annual meeting of the Metaphysical Society of America in 1973, ROD CHISHOLM defined mereological essentialism as the idea that if some object has parts, then those parts are essential, metaphysically necessary, to the particular object..

“I shall consider a philosophical puzzle pertaining to the concepts of whole and part. The proper solution, I believe, will throw light upon some of the most important questions of metaphysics.

The puzzle pertains to what I shall call the principle of mereological essentialism. The principle may be formulated by saying that, for any whole x , if x has y as one of its parts then y is part of x in every possible world in which x exists. The principle may also be put by saying that every whole has the parts that it has necessarily, or by saying that if y is part of x then the property of having y as one of its parts is essential to x . If the principle is true, then if y is ever part of x , y will be part of x as long as x exists.”³

Chisholm draws three important conclusions.

(A1) If x is a part of y and y is a part of z , then x is a part of z (this is the transitivity of parthood).

(A2) If x is a part of y , then y is not a part of x (the whole is an improper part of itself).

(A3) If x is a part of y , then y is such that in every possible world in which y exists x is a part of y (can we explain this?).⁴

3 Chisholm (1973) ‘Parts as essential to their wholes. *The Review of Metaphysics*, 26: p.582.

4 *ibid.*, p.587



For Aristotle, and in ordinary use, not every part of a whole is a necessary part (let alone in all possible worlds). How does Chisholm defend such an extreme view as his A3? We can speculate that he assumes that the essential nature of something must preserve its identity, so that A3 can be rewritten

(A3') If x is a part of y , then y is an essential, that is a necessary, part of y needed to maintain its identity.

Much of the verbal quibbling in metaphysical disputes is about objects that are defined by language conventions as opposed to objects that are “natural kinds”.

Mereological universalism is the idea that an arbitrary collection of objects or parts of objects can be considered a conceptual whole – a “mereological sum” – for some purpose or other (mostly to provoke an empty debate with other metaphysicians).

Modern metaphysics examines the relations of parts to whole, whole to parts, and parts to parts within a whole using the abstract axioms of set theory, a vital part of analytic language philosophy today. Because a set can be made up of any list of things, whether they have any physical integrity or even any conceivable connections, other than their membership in the arbitrary set. Consider the “whole” made up of the Eiffel Tower and the Statue of Liberty!

Mereology is a venerable subject. The Greeks worried about part/whole questions, usually in the context of the persistence of an object when a part is removed and the question of an object's identity. Is the Ship of Theseus the same ship when some of the planks have been replaced? Does Dion survive the removal of his foot?

The idea that an arbitrary collection of things, a “mereological sum,” can be considered a whole, does violence to our common sense notion of a whole object. It is an extreme example of the arbitrary connection between words and objects that is the bane of analytic language philosophy. “When I use a word,” Humpty Dumpty said, in rather a scornful tone, “it means just what I choose it to mean—neither more nor less.”



Mereological universalism also leads to the idea that there are many ways to compose a complex material whole out of a vague collection of simple objects. This is what Peter Unger called the *Problem of the Many*.⁵

It led Peter van Inwagen to his position of mereological nihilism, that there are no composite wholes. Van Inwagen says there are no tables, only simples arranged table-wise. The “arrangement” is the information in the table. When we can identify the origin of that information, we have the deep metaphysical reason for its essence. Aristotle called the arrangement “the scheme of the ideas.”

By matter I mean, for instance, bronze; by shape, the arrangement of the form (τὸ σχῆμα τῆς ιδέας); and by the combination of the two, the concrete thing: the statue (ἀνδριάς).⁶

Van Inwagen makes an exception of living things, and Unger has abandoned his own form of nihilism in recent years. Both Unger and van Inwagen now accept the idea that they exist.

Van Inwagen's says that his argument that living beings are composite objects is based on the Cartesian “cogito,” I think, therefore I am. He proposes,

“($\exists y$ the x s compose y) if and only if the activity of the x s constitutes a life.

If this answer is correct, then there are living organisms: They are the objects whose lives are constituted by the activities of simples, and, perhaps, by the activities of subordinate organisms such as cells; they are the objects that have proper parts. Therefore, if there are no organisms, then, since there are lives, the Proposed Answer is wrong. In Section 12 I gave reasons for supposing that there were living organisms. That is, I gave reasons that I intended to be available to the philosopher who, like me, thinks that there are no visible inanimate objects. (Most philosophers, unless they are Nihilists or general skeptics, will scarcely want reasons for believing in organisms.) I have argued that situations apparently involving tables and chairs and all the other inanimate furniture of the world are to be understood as involving only simples. There are no chairs, I maintain, but only

5 See chapter 30.

6 Aristotle, *Metaphysics*, Book VII, § vii



simples arranged chairwise. My “reasons for believing in organisms,” therefore, are reasons for stopping where I do and not going on to maintain that there are no organisms but are only simples arranged organically. My argument for the existence of organisms, it will be remembered, involved in an essential way the proposition that I exist.”⁷

DAVID WIGGINS and PETER GEACH debated the problems of absolute and relative identity over several years and one version of their argument used the ancient puzzle of Dion and Theon, as extended by Geach to a modern puzzle called Tibbles, the Cat.

Their argument can be analyzed in information terms as what *constitutes* a material object, as we discuss in the next chapter.

Biomereological Essentialism

Information philosophy provides a much deeper reason for biological organisms being “composite objects” and as having “proper parts” that are themselves composites and not merely the “simples” of van Inwagen and other mereological nihilists. These biomeric parts are created and maintained by anti-entropic processes that distribute matter and energy to all the vital parts using a biological messaging system to control the distribution of biological materials and free energy. There is a “telos” (or Aristotelian “entelechy,” loosely translated as “having the final cause within”) implemented by messaging between all the vital parts. We call this *teleonomy*, following the suggestions of COLIN PITTENDRIGH and JACQUES MONOD.

But teleonomy, which depends on the communication of abstract messages between the biomers, is not possible in a materialist metaphysics that denies the existence of immaterial ideas.

We should distinguish ordinary biomeric parts that can fail and be replaced from those that cannot be replaced. These *vital* biomers are essential in a stronger sense. Without them, the teleonomy of the whole is destroyed. The organism decays to smaller living things and possibly all the way to dead material (“dust to dust”).

7 Van Inwagen (1990b), *Material Beings*, p.213



Composition as Holism and Emergence

The phrase “the whole is greater than the sum of its parts” serves as a slogan for holists and gestaltists. Mereological nihilists deny the existence of such “wholes.” The “whole” or “gestalt” is best seen as the immaterial information structure of the composite object. Holists, and gestaltists think such structures are *emergent*. We agree, what emerges is an increase of immaterial information, what van Inwagen recognizes as the “arrangement” of the simple constituent objects.

Information emerges because it is not conserved, as are matter and energy. Information has been increasing since the beginning of time. Everything emergent is part of that new information. Living things are dynamic and growing information structures. Van Inwagen implicitly recognizes them as composite wholes. They are forms through which matter and energy continuously flow, powered by negative entropy from the sun and managed by information communications between their vital parts. As they grow, their information increases and genuine new capabilities emerge.⁸

And we find that information in living things (ideas, thoughts, intentions, purposes) can exert *causal control* over the material world. ROGER SPERRY famously used as an example of downward causation in the mind as similar to the way “a wheel rolling downhill carries atoms and molecules... caught up and overpowered by the higher properties of the whole.”⁹

Composites exert *downward causation* over their parts. This is the solution to Descartes’ mind-body problem as well as the free will problem, which very simply depends on the possibility of choosing between different actions.

8 See the growing argument, chapter 27.

9 Sperry (1969) ‘A Modified Concept of Consciousness,’ *Psychological Review*, 76, 6, p. 533

