

To defend mereological reductionism from 2 objections

Lee, Jun-hyo

In this paper, I will deal with what mereological reductionism is, what problem occurs if we accept mereological reductionism and how we could avoid the objections against mereological reductionism. Mereological reductionism is a doctrine to say that the whole can be reduced to the parts. But the mereological reductionist encounters at least two serious objections. One is dilemma style objection, and the other is so-called sinkhole objection. Here I will present my own answers to these objections.

1. What is mereological reductionism(MR)?

Mereological reductionism(MR) is the view that the whole can be reduced to the parts.¹⁾ According to MR, only the parts are ultimately real and the whole is just conceptual fiction.²⁾ This point can be simply shown by considering the following four choices.³⁾

1) Mark Sidertits(2007), *Buddhism as Philosophy*, Indianapolis: Hackett Pub. p.54

2) I do not agree with the Buddhist Reductionist in this point because I do not think the whole is just conceptual fiction. If the whole is just conceptual fiction, there is no difference in ontological status between physical objects like person, desk, chair and genuine fictional objects like Holmes, unicorn, dragon. I think the sentence 'There is a desk' is conventionally true whereas the sentence 'There is a unicorn' is conventionally and ultimately false. I think this difference in ontological status can be explained by appeal to ultimate truth.

3) Mark Sidertits(2007), *Buddhism as Philosophy*, Indianapolis: Hackett Pub,

- (1) Wholes and parts are both real.
- (2) Wholes are real, parts are unreal.
- (3) Neither wholes nor parts are real.
- (4) Wholes are unreal, only parts are real.

Buddhist reductionist shows us that (4) is true by elimination. First, consider (2). If (2) is true, then there is only one big real thing. The view is called absolute monism. But if absolute monism is right, how can we know that there is only one big thing? For one thing(or part) to perceive another thing(or part) there should be at least two things(parts). One is perceiver and the other is what is perceived. Someone might say that for one thing to perceive another thing, there is no need to be at least two objects. For example, I or my consciousness can perceive myself. But even in this case my consciousness is divided into two parts, namely perceiver and what is perceived. And perceiving part is not caught until we objectify the part. If we objectify the part, then the part will be caught but still perceiving part is not caught. In this way there are always parts which are not caught by reflection. Reflecting or perceiving part is the very part. If I am a perceiver and a part of one big thing, at least I am individuated as real part. But absolute monist should say that I am not real. But If I am not individuated as real thing, there is no way to explain how I perceive or know that only one big thing is real.

Next, consider (3). If (3) is true, then there is nothing to exist. This view is called metaphysical nihilism. If you have at least one thought now, metaphysical nihilism is refuted readily. That's because a thought is an entity and I cannot deny that I have a thought or I

am thinking now.

Last, consider (1). If wholes and parts are both real, then they should be either identical or distinct. Suppose that the whole is identical with the parts in relation. But this insistence cannot be true because of Leibniz's Law especially, the principle of the indiscernibility of identicals. The principle of the indiscernibility of identicals says that if x and y are numerically identical, then x and y share all the same properties. But the whole and the parts have different property each other. The whole has the property of being one, whereas the parts have the property of being many. Therefore, the whole and the parts are not numerically identical.

Suppose that the whole is distinct from the parts in relation. One worry is that two real things come to occupy the same space. It is explicitly counterintuitive. The other worry is that the whole has no explanatory role. Our experience can be explained in terms of facts about the parts in relation. So we don't need to postulate the existence of the whole.

So far, we have justified the main thesis of MR by eliminating the other options. According to MR, only the parts are real. So mereological reductionists call the parts ultimate real, the whole conventional real. The distinction ultimate/conventional is also applied to the truth.

A statement is conventionally true iff it is acceptable to common sense and consistently leads to successful practice.

A statement is ultimately true iff it corresponds to the facts and neither asserts nor presupposes the existence of any conceptual fictions.⁴⁾

4) Mark Sidertits(2007), *Buddhism as Philosophy*, Indianapolis: Hackett Pub, p.56

I will use ‘ultimate term’ as referring to ultimately real thing, ‘ultimate truth’ as referring to statements that includes only ultimate terms. And I will use ‘conventional term’ as referring to conventionally real thing, ‘conventional truth’ as referring to statements that includes at least one conventional term.

2. Objections against mereological reductionism and answers to them.

2-1) Objection1: Dilemma

The first objection is dilemma-style one. According to mereological reductionism, there are 2 kinds of truths. Then, can 2 kinds of truths be mixed up or not?

If 2 kinds of truths can be mixed up, the problem of vagueness arise. Suppose that your chair is made up of 10^{12} elementary particles. If I subtracted 1 particle from it, it would still be your chair. That is because even if I do not deliberately subtract 1 particle, such a small exchange between objects always happens in the micro-world. Again, if I subtracted 1 more particle from it, it would still be your chair. I can iterate this process until there remains no particle. But I cannot find the boundary between chair and non-chair. That is a so-called problem of vagueness.

If 2 kinds of truths cannot be mixed up, we cannot make our sciences true. For example, the sentence ‘All observable matter in the universe consists of 12 elementary particles’ is true if our Standard Model of particle physics is right. But the above sentence includes both assumed ultimate term(12 elementary particles) and conventional term(observable matter). So if mereological reductionists

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say that 2 kinds of truths cannot be mixed up, the above sentence will be meaningless. But it is hard to believe that our theories of sciences are just meaningless.

Of course it is possible for the reductionist to bite the bullet here and say that inter-theoretic statements are not strictly speaking meaningful, they only seem so because they hint at semantic connections between the two discourses.

But I think the strategy to bite the bullet is not plausible. One problem is that the identity criterion of a theory is not obvious. Now, it is a standard view that our chemistry is reduced to our particle physics. In this situation, do we have one unified theory or two distinct theories one of which is reduced to the other? If the insistence that we have one unified theory makes some sense, statements in a theory as well as inter-theoretic statements should be meaningless. It is because chemistry involves many terms which are not ultimate terms.

Another problem is that I cannot find any independent reason to forbid inter-theoretic statements to be conventionally true except the problem of vagueness. If we could preserve our intuition about sciences by making inter-theoretic statements conventionally true, at the same time, avoid the problem of vagueness, it'd be better choice than to bite the bullet.

2-2) Answer: grasping the first horn

I think we had better grasp the first horn of the dilemma. That is, dealing with the problem of vagueness is better than making our theory of science meaningless.

One reason to prefer the first horn is that we can think of our intuition as data which should be explained, but if our theory of

science is not conventional truth nor ultimate truth, it seem to me that we have no way to explain our intuition.

Another reason is that according to general methodology of philosophy, the more intuition one philosophical theory can preserve, the better the philosophical theory is.

The other reason is that if we grasp the second horn of the dilemma, similar kind of problem can occur within conventional truth. That is, the problem of mixing up higher order conventional term with lower order conventional term. Consider the following sentence 'My desk consists of 10^{10} iron molecules'. The above sentence is made up of only conventional terms but these terms have different orders. The term 'molecule' is more fundamental or closer to ultimate truth than the term 'desk'. So, we can make similar kind of dilemma style argument. On the one hand, if conventional terms with different orders can be mixed up, the problem of vagueness arise. My desk consists of 10^{10} iron molecules. If I subtracted 1 iron molecule from it, it would still be my desk. If I subtracted 1 more iron molecule from it, it would still be my desk. I can iterate this process until there remains no molecule.

And if conventional truth with different orders can be mixed up, why can't ultimate truth be mixed up with conventional truth? Suppose that fundamental elements in particle physics belong to 1 order(ultimate truth), atoms(from this, conventional truth) belong to 2 order, molecules belong to 3 order and so on. If 1 order cannot be mixed up with any higher order, why can 2 order or 3 order be mixed up with higher order? I cannot find any reasonable ground to support this discrimination. As the sentence 'My desk consists of 10^{10} iron molecules' is thought of conventional truth, the sentence 'All observable matter in the universe consists of 12 elementary particles' seems to be thought of conventional truth.

On the other hand, if conventional truth with different orders can't

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be mixed up, much more intuition should be given up. Our everyday statements like 'My computer has 512 megabytes of RAM', 'I can't listen to anything in my car, because my car radio is broken' as well as statements in particle physics should be given up.

2-3) Dealing with vagueness

I think there is no genuine problem of vagueness. That is because if you're concerned with vagueness in idiolect, the problem can easily be solved by making up your mind and if you're concerned with vagueness in public language, nobody knows how the extensions of predicates is determined. But this is not entirely the matter of ignorance. This is somewhat the matter of absence of agreement. It is because the term 'extension' is technical term and the meaning of technical term is determined by user's intention or consent between users. But we don't have any agreement or consent on what determines the extensions of predicates, how the extensions of predicates are determined by an algorithm or a function to determine the extensions of predicates.

First, consider what determines the extensions of predicates. Many philosophers of language or linguists seem to think that the extensions of natural kind terms like 'water', 'gold' are determined by nature, and the extensions of technical terms like 'arthritis', 'momentum' are determined by experts. But they say nothing about how the extensions of vague predicates are determined. I think the only way left is the use of language users.⁵⁾

Next, consider how the extension of predicates is determined. We can count the use of language users as data or input. But data needs

5) But here I remain silent of whether 'use' means actual use instances or dispositional use. Williamson seems to bear in mind dispositional use.

an interpretation, and input needs a function to determine the extensions of vague predicates. Data or input itself is neutral on how the extension of predicates is determined. Suppose that the following data is given to you.

	Assent	/ Dissent
A man with 10,000 hairs is bald.	10,000	0
A man with 10,001 hairs is bald.	9,999	1
A man with 10,002 hairs is bald.	9,998	2
.		
.		
.		
A man with 19,998 hairs is bald	2	9,998
A man with 19,999 hairs is bald	1	9,999
A man with 20,000 hairs is bald	0	10,000

Suppose that this data is gathered in linguistic community C with 10,000 members and all members agree on the fact that a man with less than 10,000 hairs is bald and a man with more than 20,000 hairs is not bald. This data itself does not fix the extension of 'bald' in C. That is because we have no agreement on how to interpret the data. Epistemicist might say that the boundary dividing bald man and non-bald man is between 15,000 and 15,001. Supervaluationist might say that the sentence which says that a man with 10,000 and less than 10,000 hairs is bald is super-true but the sentence is which says that a man who has from 10,001 hairs to 19,999 hairs is bald not super-true nor super-false. Fuzzy logicist might say that 'a man with 10,000 hairs is bald' is fully true, 'a man with 10,001 hairs is bald' is 99.99% true, 'a man with 10,002 hairs is bald' is 99.98% true and so on and so forth. But the important point is that data itself does not favor any interpretation among them.

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Then, which interpretation is the most preferable? I dare to say that epistemicist interpretation is the most preferable one, if you are concerned with formal semantics of public language. That is because epistemicist interpretation produces simpler, more conservative semantics than any other interpretations.⁶⁾

2-4) Objection2

The second objection against MR can be called the sinkhole objection⁷⁾ because the objection says that if particles can be infinitely divisible, then the existence of world drain away infinitely. The exact argument can be reconstructed as following.

- (1) It is possible that particles can be infinitely divisible.
- (2) If particles can be infinitely divisible, then there is no mereological atom.
- (3) If there is no mereological atom, then there is no ultimate truth.
- (4) If there is no ultimate truth, then all the actual is fictional.

Con : It is possible that everything actual is fictional. But this is absurd.

This argument is against MR. An opponent to MR might say that the consequence is absurd, so at least one of the premises should be

6) By 'interpretation', I mean something simple; determining the extension of certain predicate. In this sense, there is no essential difference between epistemicist interpretation and semanticist interpretation. If you accept epistemicist interpretation, you will get semantics which epistemicism will give you. If you accept supervaluationist interpretation(one of semantic interpretations), you will get semantics which supervaluationism will give you.

7) Mark Siderits(2003), *Personal Identity and Buddhist Philosophy*, England: Ashgate. p.77

false. According to MR, (3) is true, but if we give up MR, we have no reason to think that (3) is true. That is, even if there is no mereological atom, we can say that there is something to exist.⁸⁾

I have two answers to the sinkhole objection. One is typical Buddhist Reductionist's response to the objection. But I think this response is not sufficient to refute the sinkhole objection. So I prepared the other answer to the objection.

2-5) Answer1: The consequence is absurd. Therefore, (1) is not true.

The first answer is using 'One person's modus tollens is another's modus ponens' strategy.⁹⁾ Mereological Reductionist can say that this argument is showing us not that (3) is false but that (1) is false.

But this answer has some problems. First, this strategy makes mereological reductionists tie with their opponents. But this strategy does not directly rebut the sinkhole objection. Second, whether or not particles composing our world can be infinitely divisible, whether or not there are fundamental particles which are not divisible seems

8) Mark Siderits(2007), *Buddhism as Philosophy*, Indianapolis: Hackett Pub. p.165. Siderits seems to think that a trope-theoretic account do any better at avoiding the objection. But I think trope-theoretic account is subject to similar problems. Suppose that there is one white patch in front of us. We human beings can recognize only one color property, namely whiteness in the patch. But alien 1 that has better eye sight and more vocabulary than human being could recognize two color properties, namely, whiteness1, whiteness2 in the patch. And alien2 that has better eye sight and more vocabulary than alien1 could recognize three color properties, namely, whiteness1, whiteness2, whiteness3 in the patch and so on. In this counterfactual situation, how many properties are there in the patch? It seems to me that as perceiver's eye sight improves, infinitely many properties can be found in the patch.

9) Mark Siderits(2003), *Personal Identity and Buddhist Philosophy*, England: Ashgate. p.77.

to be the matter of empirical investigation. I am not sure that these questions can be settled down by a priori investigation.

2-6) Answer2: The consequence is absurd. Therefore, (2) is not true.

Our contemporary theory of physics seems to support that (2) is false. For according to Standard Model of particle physics, all observable matters are made up of 12 elementary particles.

But even if our present theory seems to support the existence of fundamental particles, the history of physics does not seem to support the existence of fundamental particles.¹⁰ Physics has constantly founded smaller and smaller particles. That is, molecules, atoms, proton, neutron and quarks... This process might continue eternally.

But Standard Model of particle physics seems to support the existence of fundamental particles in another sense. Most people seem to think an extended entity with size when they say about particles. But according to our model, 12 fundamental particles are point-particles. That is, they are not extended, so do not have size as their physical quantity. They just appear to have size and be extended, because particles have repulsive forces each other. The closer they approach each other, the more energy they need. Therefore, we cannot divide our fundamental particles, because they are point-particles according to Standard Model.

But there seems to be one problem in this picture.

The inverse square law says that the force exerted by A on B is inversely proportional to the square of the distance between A and B. So if we double the distance between them, the force A exerts on

10) Jonathan Schaffer(2003), 'Is There a Fundamental Level?', *Nous*37.

B is one fourth what it was. Conversely, if we halve the distance the force is quadrupled. Now remember that space is infinitely divisible. This means that if atoms are mere points, the space between two atoms A and B may be halved infinitely many times. So as B approaches A, the force that A exerts on B will rapidly approach infinity. And this seems absurd. How could something with no size at all contain within itself more force than there should be in the universe?¹¹⁾

Yes, it appears to be absurd. I do not have any excuses for this absurdity. But I want to point out two trivial things. First, this absurdity does not give us sufficient or good reason to give up a scientific picture in so far as experiential evidences support the picture that is, most results of experiments coincide with the expectation of the theory. Second, there have been many counterintuitive things among what our scientific theory says. For example, gravitational force acting at a long distance in Newtonian mechanics, grades in infinity in Cantor's set theory, non-local causation in Quantum mechanics and so on. But these were not given up just because of intuitive absurdity.

So far, I have presented some reasons to believe there are indivisible fundamental particles by appeal to our science, especially particle physics. I have another reason to believe that (2) is false on philosophical ground. Many philosophers think that (1) is true, because 'particles can be infinitely divisible' is conceivable. That is, they infer possibility from conceivability. I want to use the concept 'conceivability' to reject (2). Here, I bear in mind certain notion of 'conceivability' which Chalmers call positive conceivability. I use the notion of positive

11) Mark Sidertits(2007), *Buddhism as Philosophy*, Indianapolis: Hackett Pub, pp.164-165.

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conceivability because the notion is standard and common between philosophers.

Positive conceivability, rather than negative conceivability, seems to be what most philosophers have had in mind when discussing conceivability. It is positive conceivability that corresponds to the sort of clear and distinct modal intuition that Descartes had in mind, and which reflects the practice in the method of conceivability as used in contemporary philosophical thought-experiments.¹²⁾

First of all, positive conceivability is to form a mental image, especially to form a perceptual mental image. But just forming a mental image is not everything. We need further process namely, interpretation process to insist that something is possible. Interpretation is to take a mental image to satisfy a certain description given that that description does not contradict with further qualification. Suppose that you are considering the sentence 'It is possible that pigs fly' and judge this sentence as true. This consideration consists of three processes.

First, you form a certain mental image.

Second, you take that image to satisfy certain description 'pigs fly' or 'flying pigs'.

Third, you approve of the sentence 'It is possible that pigs fly'

I think we cannot perceptually imagine something beyond the scale of perception such as molecules of H₂O or German winning the Second World War. But I think we can conceive molecules of

12) David Chalmers(2002), 'Does Conceivability Entail Possibility?', in Tamar Gendler&John Hawthorne(eds), *Conceivability and Possibility*, Oxford: Oxford University Press.

H₂O or German winning the Second World War because we can imagine a certain configuration of visible particles and interpret that image as molecules of H₂O, we can imagine a part of a world in which German armies win the Second World War and interpret that image as German winning the Second World War. I think this applies to the case of an infinitely divisible entity as well. We cannot perceptually imagine an infinitely divisible entity but we can form certain image like this.

And we can take that image to satisfy the condition ‘infinitely divisible entity’. But here, the important point is that the term ‘infinity’ is not natural language term but mathematical term. So I think we cannot conceive infinitely divisible entity without mathematics.

If we use mathematics when we interpret a certain image, I think we can conceive infinitely divisible entity. But I think it’s not atomless gunk. According to Lewis¹³⁾, atomless gunk is an individual whose parts all have further proper parts.

*If something is made of ‘atomless gunk’ then it divides forever into smaller and smaller parts-it is infinitely divisible. However, a line segment is infinitely divisible, and yet has atomic parts: the points. A hunk of gunk does not even have atomic parts ‘at infinity’; all parts of such an object have proper parts.*¹⁴⁾

So, with mathematics we can conceive something infinitely divisible but here are two options. One is infinitely divisible atomless gunk and the other is infinitely divisible entity made up of points. But I think the idea of atomless gunk is implausible. At

13) David Lewis(1991), *Parts of Classes*, Oxford: Basil Blackwell. p.20

14) Theodore Sider(1993), ‘Van Inwagen and the Possibility of Gunk’, *Analysis* 53, p.286.

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infinity, atomless gunk will be nothing. Suppose that we have measured the size of one object made up of gunk. We can divide the size of the object by 2 infinitely. The conclusion is 0. Because atomless gunk is not composed of point-like entity, gunk comes to be nothing. But it seems to me mysterious that being comes to be nothing just by dividing it infinitely.

To, summarize, my argument is as following.

(i) You can use mathematics or not when you conceive something.

(ii) Without mathematics, you cannot conceive infinitely divisible entity because you cannot form a perceptual image of infinitely divisible entity and you cannot interpret alternative image representing infinitely divisible entity as infinitely divisible entity without mathematical term.

(iii) With mathematics, you can conceive infinitely divisible entity. But it is not atomless gunk but infinitely divisible entity with point-like atoms because the idea of atomless gunk is mysterious.

Regardless of whether or not you use mathematics when you conceive something, sinkhole objection seems to be unsound. If you use mathematics when you conceive something, (2), that is, if particles can be infinitely divisible, then there is no mereological atom, seems to be false. For if you use mathematics, you can conceive infinitely divisible entity but there are point-atoms. If you do not use mathematics when you conceive something, (1), that is, it is possible that particles can be infinitely divisible, seems to be false. That is because you cannot conceive infinitely divisible entity without mathematics and we don't have evidence supporting that it is possible that particles can be infinitely divisible. Because there is no independent reason to block us from using mathematics when we

conceive something, I think my argument implies that (2) is false.

3. Conclusion

Thus far, we have seen what mereological reductionism is, what objections can be raised against MR and how the mereological reductionist could avoid the objections against their doctrine. I have answered the first objection by saying that the problem of vagueness in public language cannot be properly formulated because ‘extension’ is technical term, and there is no agreement between philosophers or linguists in how to determine the extension of a predicate. I have answered the second objection by rejecting premise (1) or (2). I’m not sure that I am really succeeded in defending MR and I don’t think all work is done by refuting 2 objections I have dealt with. But I hope that my argument have shown you that MR is not refuted at least by 2 objections I have dealt with and MR is still viable view.

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