Australasian Journal of Logic

Gluon Theory: Unified Unifiers

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Abstract

This paper is about two challenges concerning the gluons of complex objects. One is Marmodoro's argument, according to which, from the non-objecthood of gluons, it follows that gluons do not unify objects. I demonstrate that Marmodoro's argument fails. The second challenge is about the unity of gluons themselves. I show how gluon theory can reply to this challenge.

1 Introduction

Priest's gluon theory answers the problem of unity. In short, the problem of unity is as follows. A complex object is not merely a congeries of its parts. A wall is not only a plurality of the bricks of which it is made. Otherwise, the wall would be the same as the scattered bricks lying on the ground. There must be a unifier that makes a unity of a complex object's parts. Let us call this unifier, as Priest does, a gluon. A gluon, whether it is a structure, a form, causal interaction, etc., is something; it is an object. We just thought about it and referred to it. This results in a dilemma. On the one hand, if a gluon, metaphysically speaking, binds different parts of an object, then there must be another gluon, a hyper-gluon, which binds the object's parts to its gluon. Again, to bind this hyper-gluon to the former gluon and the parts of the object, there must be a hyper-hyper-gluon, and so on. We are off on a vicious regress, namely the Bradley regress. On the other hand, if there are no gluons, there will be no unity, and there cannot be an explanation for the difference between a complex unity and the plurality of its parts. To solve this dilemma, Priest argues that a gluon is and is not an object, and a gluon of a complex object makes it one by being identical with every part of the object. In this paper, I will discuss two challenges caused by these dialethic characteristics of gluons and reply to them. The first concerns the non-objecthood of gluons. If a gluon is not an object how can it unify a complex object? In this respect, we will discuss Marmodoro's objection to gluon theory which triggers the non-objecthood of a gluon [2]. The second challenge concerns the unity of a gluon itself. According to gluon theory, a gluon makes a complex object to be one. In other words, the unity of an object is grounded in its gluon. There seem to be good reasons that the gluon of complex objects are themselves complex. For one reason, the gluon of an object is identical with every complex part of the object and thus the gluon is itself complex Now, the question is whether this generates another regress that has been dismissed in gluon theory.

Thus, in the next section, we will briefly review gluon theory. In the third section, we will meet the two mentioned challenges and will reply to them.

2 Gluon Theory

Gluon theory explains how a gluon of an object, while blocking the Bradley regress, makes it one. Suppose x is an object comprising two parts: a and b. g_x is the gluon of x which binds its parts together. The regress is the result of the distinction between g_x and the parts of x. If g_x is distinct from a and b, then by adding g_x to the plurality of a and b, we gain nothing but another plurality that needs another gluon, a hyper-gluon, for its unity, and so on and so forth. On the other hand, if g_x is not distinct from x's parts, it must be identical with each part of x. Otherwise, suppose g_x is identical only with a. Then we are back where we started. g_x, similar to a, cannot be unified with b. Again, we have a plurality of objects which are not unified together. Thus, for the unity of x, g_x must be identical with each part of x. In this case, there will be no metaphysical space between g_x and other parts of x. Therefore, $a = g_x = b$. Since a and b are not identical, the identity-relation must be non-transitive. For this reason, Priest applies LP to the standard Leibnizian definition of identity [4, pp. 18-22]. Accordingly, two objects are identical iff one object has a property only if the other does. In the language of second-order logic, $a = b$ iff:

$$\forall X(Xa \equiv Xb).$$

Material equivalence ($\equiv$), which is used in the identity definition, works differently in a paraconsistent logic. In classical logic, for the truth of $A \equiv B$, both sentences must have the same truth value. The difference in a paraconsistent logic, such as LP, is that each side can have two different values. For example, if A is true only, and B is true and false, $A \equiv B$ is true (Even though it is both true and false, it is still nonetheless true). Consequently, in LP, material equivalence, $\equiv$, is not transitive, i.e. $A \equiv B, B \equiv C \nvDash A \equiv C$. For a counter-example, suppose A is true, B is true and false and C is false; the premises are true, but the conclusion is not true.

The following example indicates that g_x is identical with both a and b, while a and b are not the same. Suppose there are only two properties, P_1 and P_2. Let a belong to the extension of P_1, and the anti-extension of P_2, i.e. P_1a and $\neg P_2a$ are true, and $\neg P_1a$ and P_2a are false. And let b belong to the extensions of P_1 and P_2, i.e. P_1b and P_2b are true, and $\neg P_1b$ and $\neg P_2b$ are false.

In the following table, suppose that + indicates that the object is in (just) the extension, and − indicates that it is in (just) the anti-extension, and ± indicates both.

	P_1	P_2
a	$+$	$-$
b	$+$	$+$
g_x	$+$	$\pm$

It can be easily checked that $\forall X(X_a \equiv X_{g_x})$ is true, and thus $a = g_x$. Also, $\forall X(Xg_x \equiv X_b)$, and thus $g_x = b$. Moreover, because of the way material equivalence behaves in LP, a and b are not identical.

g_x is an object i.e., $g_x = g_x$. It is identical with each part of x, but it is also not an object, because $g_x \neq g_x$ follows from $\exists X(Xg_x \wedge \neg Xg_x)$.[1] In the example above, $P_2g_x \wedge \neg P_2g_x$. One can easily check that this is true of every object which has contradictory properties. Moreover, in a non-transitive identity, the middle object is always inconsistent.[2]

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[1] The same is true of the identity between each part of x and the gluon of x. The gluon of x is both identical and non-identical with every part of x. One should note that the non-identity between the gluon of an object and its parts does not result in the Bradley regress. That which binds g_x to the parts is g_x itself. For more see [4, p. 22].

[2] See [4, p. 20].

Thus, to block the Bradley regress, which is the cause of the problem of unity, an object's unifier i.e., its gluon, must be identical to each part of the object. Since the parts are distinct, identity relation must be not transitive. One of the consequences will be that gluons of complex objects are and are not objects. Enough for the preliminaries. Let us now see the aforementioned challenges to gluon theory.

3 Unified Unifiers

In this section, we will firstly discuss Marmodor0's objection concerning the non-objecthood of gluons and then we will discuss a regress concerning the unity of gluons themselves.

3.1 Non-objecthood of Gluons

Marmodoro argues that gluon theory cannot solve the problem of unity [2]. Her argument triggers the non-objecthood of gluons:

> The first problem concerns the claimed identity between a gluon and each of the parts it unites into the whole. The difficulty lies in the metaphysics underpinning the claim that an entity that is not an object can be identical to an object. [...] As a unifier, the gluon is not an object; but it is precisely as a unifier that it is identical to each of the parts it unifies. How then can it be identical to an object, not being an object itself? Priest is silent on this question.

Marmodoro asks how, if a gluon is not an object, it can be identical to another object. The answer lies in the semantics of gluon theory and Priest's account of objecthood. It is true that a gluon is not an object, but it is also an object. For more clarification, let us spell out what objecthood and non-objecthood are.[3] Every object is self-identical, and that which is self-identical is an object. This is a logical truth: $\forall x(x = x)$. Accordingly, suppose we make a list of all objects. That which is not an object is not identical to any object on the list. Thus, c is not an object iff $\forall x(x \neq c)$. Similarly, gluons are objects, because they are self-identical. In the example

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[3] For more on Priest's definition of objecthood, see [4, p.49].

above, $g_x = g_x$. Nevertheless, g_x is also non-self-identical. For, as already mentioned, $\exists X(Xg_x \wedge \neg Xg_x)$, and from a Leibnizian definition of identity it follows that $g_x \neq g_x$. From this, it follows that $\forall x(x \neq g_x)$. This is true of every object which occurs as the middle object in a non-transitive identity relation. A gluon of a complex object is identical with distinct objects, i.e. is a middle object in a non-transitive identity relation. Thus, gluons of complex objects are not objects. In fact, this is true of every inconsistent object, and gluons are some of them.

Therefore, in our example, g_x is an object. It is identical with a and b. Not only $g_x = g_x$, but also $g_x = a$ and $g_x = b$. Being identical with two distinct objects implies the inconsistency of g_x from which it follows that g_x is not an object, i.e. $\forall x(x \neq g_x)$. This is how that which is not an object is identical with distinct objects and unites them into a whole.
Marmodoro continues:

> Even if it were the case that the gluon had dialetheic status, both being and not being an object, Priest's claims of unity is not that the gluon-that-is-an-object is identical to each of the object's parts, but that the gluon-that-is-not-an-object is.

The gluon of an object is not two different things, one being identical to the parts and the other being the unifier. g_x is and is not an object at the same time and from the same respect. What Marmodoro says i.e., that the gluon-that-is-not-an-object unifies the object and not the gluon-that-is-an-object, does not make sense in the context of gluon theory. As explained above, a gluon unifies a complex object by being identical to its parts. One of its implications is that the gluon is not an object (though it is also an object).

Yet, one may argue that unifiers are just ontologically different kinds of objects. This is what Marmodoro proposes by comparing gluon theory to other attempts in the history of philosophy to solve the problem of unity:

> Historians of philosophy will want at this point to object that when philosophers such as Aristotle, Frege and Bradley say that what unifies an object cannot be an object like the object it unifies, they are making a comparative judgement. They are saying that the unifier is a different type of thing from what it unifies. It is still something, an object of discourse, but ontologically different, whether it is a form, or an incomplete object, or a relation.

Marmodoro's suggestion is to accept that gluons belong to an ontologically different kind of objects. In the history of philosophy, there are several examples of such an approach to solving the problem of unity. According to this approach, a unifier is a different kind of object that unifies a complex object just by its nature. Accordingly, these philosophers do not explain how unifiers unify objects.[4]

As already explained, gluon theory is not based on a categorical difference of objects.[5] If the unifier is a different kind of object, the question of what unifies the unifier (which is merely a different kind of object) to the other parts of the object in question remains unanswered. Moreover, by just claiming that for instance, a form unifies an object, the problem of unity has not been solved. It should also be explained how parts of an object make a unity. In Priest's own words: "But how, exactly, the form does this is left somewhat mysterious. You certainly don't make an omelette by throwing a recipe into the bowl with eggs!" [4, p.41]. On the contrary, as we have seen, gluon theory explains how a unifier unifies a complex object.

As we saw, Marmodoro's arguments do not work against gluon theory. But there are ways to improve her objection, or in other words, there are more questions that can be asked about gluons. In what follows, we will consider one concerning the unity of gluons themselves.

3.2 Are Unifiers Unified?

A gluon of a complex object makes it one. To block the Bradley regress, as Priest argues, the gluon of x, g_x, must be identical with each part of x. Although this explains the unity of x, it does not say anything about the unity of g_x. If the parts of x are complex, g_x must be complex too.[6] If so, gluon theory's reply to the Bradley regress involves a complex object, g_x, whose unity is not being explained in the explanation of the unity of the object in question i.e., x. Suppose x is a chair. g_x is identical with every part of x including its four legs. Since the legs of x are complex objects, g_x is also complex. The unity of x is metaphysically dependent on g_x. But g_x

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[4] For more see[4, ch.3].

[5] Priest has already discussed these solutions to the problem of unity [4, ch.3 and p.12].

[6] That seems to be true of ordinary material objects. Parts of a car, a table, a house, etc. are also complexes. Thus, our discussion here is a restricted application of Gluon Theory i.e., merely to ordinary material objects. Obviously, this is an optional assumption that these objects consist of complex parts.

is itself a complex object. If the unity of g_x is metaphysically dependent on g_{g_x}, the same question can be asked about g_{g_x}. If the unity of every object is grounded in a complex object, it seems that we fail to explain the unity of all objects.

Accordingly, the following questions can be asked: Do gluons generate another regress? And if so, is it the Bradley regress that has been transferred to another place? And if it is not the Bradley regress, is this regress vicious or not? In what follows we will discuss these questions.

Let us first see how Bradley himself defined the Bradley regress. Bradley discusses an infinite regress, to become known as the Bradley regress, concerning the unity of qualities of an object, the unity of propositions, and the unity of the mind.[7] Let us consider the first one. Bradley advocates a bundle theory of objects according to which an object is just a bundle of qualities and there is no substratum that holds the qualities of the object together. Bradley gives an example of a lump of sugar. It seems to be something that has some qualities such as sweetness, whiteness, and hardness. Bradley rejects the existence of a property bearer which does not have any property. Then he indicates that the lump of sugar cannot merely be the properties it has, because these properties must be united, and this unity results in an infinite regress. Bradley states that for the unity, or co-existence, of two properties a relation must relate them. Now the question is what relates the relation to properties. Suppose A and B are properties and C is the relation. Bradley explains the issue as follows.[8]

> There is a relation C, in which A and B stand; and it appears with both of them. But here again we have made no progress. Something, however, seems to be said of this relation C, and said again of A and B. And this something is not to be the ascription of one to the other. If so, it would appear to be another relation D, in which C, on one side, and, on the other side, A and B stand. But such a makeshift leads at once to the infinite process.

Thus, the Bradley regress is generated when that which is to be accounted for is exactly the same thing that was to be accounted for before.[9] In Bradley's example above, what is to be accounted for is the connection between A and

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[7] For more, see [3].

[8] [1, p.18]. It has been quoted in [3] too.

[9] See [4, p.186].

B. But appealing to C does not make it. Again, the connection between C and either A and B is to be accounted for and, thus, the connection between A and B has not been explained. Going back to gluon theory, what was to be accounted for is the unity of an object, x. Suppose x has only two parts a and b. What unifies a and b, namely g_x, cannot be either a or b.[10] But if it is another object distinct from a and b, there will be a need for another gluon to unify a, b, and g_x, and so on. Thus, the Bradley regress is generated. The fact that g_x is identical to both a and b, blocks the Bradley regress, because g_x is not distinct from x's parts and thus there is no need for another hyper-gluon to unify a, b, and g_x.[11] However, in this picture, the unity of g_x has not been explained. As mentioned, we assumed (optionally) that the parts of x are complex. This optional assumption implies that g_x is also a complex. Now, does it make any problem for Priest's solution to the problem of unity? What was to be accounted for to solve the problem of unity is the unity of x, and g_x makes it. The unity of g_x is not that which was to be explained. Thus, the question of the unity of g_x does not make a direct problem for Priest's response to the Bradley regress. In fact, gluon theory breaks the Bradley regress. Yet, it seems that we have faced another regress: by explaining the unity of any object, there will be another object i.e., its gluon, whose unity is to be explained. If g_x is a complex object, it has g_{g_x} i.e., the gluon of g_x, which makes it a unity. The same thing can be said about the gluon of g_{g_x}. Thus, there is another regress here. Now, the question is whether this regress is vicious or not.

A regress might not be vicious in itself, but it can be vicious with respect to some explanatory project. Even if we accept that the regress of the unity of gluons is not vicious in itself, it is vicious with respect to the explanation we asked for, which is of the unity of every object. An object, x, is a unity in virtue of its gluon, g_x. g_x is a unity in virtue of g_{g_x}, and so on. Thus, it seems that we do not have an explanation of the unity of every object, and we fail to explain the unity of every object. Therefore, if that is the case, the regress of the unity of the unifiers i.e., gluons, is a vicious one.

Let us explore every step of the argument. The domain of objects, here, includes only the material objects. The argument has the following steps:

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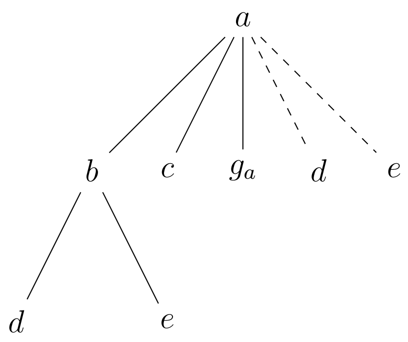
[10] Otherwise, the plurality of an object's parts scattered in the ground would be the same as the object in question.

[11] One may object that g_x is also non-identical with the parts of x, and thus we need another object to bind them together. This is true, but the other object is g_x itself. For more clarifications, see [4, p.22].

1. For every x, the unity of x is grounded in g_x.
2. Gluons are objects. Thus, for every x, the unity of g_x is grounded in g_{g_x}.
3. For every x, since x and its parts are complex, g_x is also complex.
4. From (1), (2), and (3), it follows that the unity of every object is grounded in a complex object whose unity is grounded in another complex object. Thus, every explanation of the unity of an object is based on a complex object whose unity is not explained, and we fail to explain the unity of every object.

(1) and (2) are parts of gluon theory. (3) needs some explanations. Recall the example of a chair. Material objects, like chairs, consist of complex parts.[12] The gluon of a material object is identical to its parts. Thus, the gluon is also complex. Now, the unity of such complex gluons is our concern.

The regress in (4) is based on a presupposition: g_{g_x} is not g_x itself. What determines the relation between g_{g_x} and g_x is whether the parthood relation is transitive or not. If the parthood relation is transitive, the gluon of g_x will be itself. Otherwise, it is not. Consider the tree below (lines indicate parthood):



b and c are parts of a. d and e are parts of b. If parthood is transitive, d and e are also parts of a. In this case, g_a is identical not only to b and c, but also to d and e. Since g_a is identical to b, it follows that d and e are also parts of g_a. Such parts, i.e. the parts of a's parts, are those which are identical to

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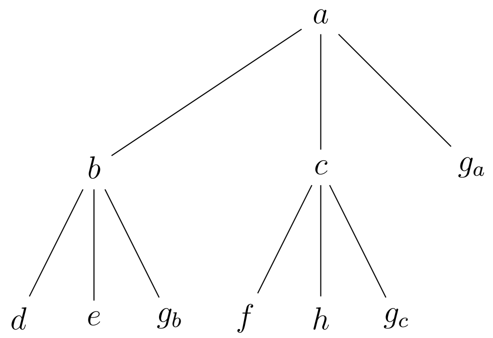
[12] One may object that a material object can consist of only simple (non-complex) objects. We will back to this question.

the gluon of g_a. If parthood is transitive, all parts of a's parts including their gluons are also parts of a, and thus g_a is identical with every one of them. This means that the gluon of g_a is itself.[13] Accordingly, an object, g_a, which is the ground for the unity of a is also the ground for the unity of itself, and thus its unity is not grounded in another complex object. In this case, the aforementioned regress will not occur.[14]

However, the transitivity of parthood is not obvious.[15] Suppose that I am a part of a music band, and my spleen is part of me. It is hard to accept that my spleen is a part of the band. Nevertheless, it would be an advantage for the gluon theory if it is not restricted to transitive parthood relation. Hence, let us back to the regress supposing that parthood is not transitive. How can gluon theory break the regress?

Consider the tree below. Lines show parthood relations.



g_a is identical with b and c which are both complex. Thus, g_a is also complex. What is the gluon of g_a? As we saw, considering that parthood is not transitive, g_a is not its own gluon. The gluon of g_a must be an object other than itself. g_a is identical with b and thus has d and e as its parts. Also, g_a is identical with c and thus has f and h as its parts. Therefore, the gluon of g_a i.e., g_{g_a}, is the object which is identical with the parts of b and c. Similarly, the gluon of g_{g_a} is identical with the parts of d, e, f and h. Thus, the regress may be generated only if the parthood chain continues infinitely,

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[13] g_{g_a} is a part of g_a, and g_a is a part of a. If parthood is transitive, g_{g_a} will be a part of a too. g_a is identical with every part of a, and thus is identical with g_{g_a}.

[14] For the same reason, if parthood relation is symmetric i.e., every object is a part of itself, the regress will not occur. Gluon theory is silent on whether parthood relation is symmetric or not.

[15] See [4, p. 89].

and the parthood relation is not transitive and does not reach a stage where it becomes, and thereafter remains, transitive. Otherwise, the regress will be broken.

Moreover, if objects, at the bottom of the chain, consist of only simple objects, there will be no infinitely continuing parthood chain. Suppose in the tree above, d, e, f, and g are simples. Since a simplex is not complex, it is a unity by itself. Thus, the gluon of a simplex is itself. Now, consider b. g_b is the gluon of b and is identical with the parts of b i.e., d and e. The gluons of d and e are themselves. Since g_b is identical with both d and e, the gluon of both d and e is g_b. It follows that g_b is the gluon of b and its parts. Thus, the regress is broken. The same can be said about c and all other objects at the bottom of the parthood chain which only consist of simples. There, the gluon of an object is also the gluons of the object's parts. Accordingly, the regress is broken.

Thus, we have seen that if the parthood relation is transitive (or each branch on the parthood-chain reaches a stage where parthood becomes, and thereafter remains, transitive), or objects are at the end made of simples, the aforementioned regress will be broken.

4 Concluding Remarks

We met two challenges for the theory of gluons. The first one was Marmodoro's objection according to which from the non-objecthood of gluons it follows that gluon theory fails to explain the unity of objects. We saw that her argument is *non-sequitur*. The second challenge was the explanation regress according to which every explanation of the unity of an object is grounded in a complex object. We saw that gluon theory encounters this regress only in a special case: objects are gunky and there is at least one branch of an object's composition tree which does not reach a stage where it becomes, and thereafter remains, transitive. Both of these conditions together should be satisfied to generate the regress. For the latter condition, the non-transitivity of parthood is presupposed. However the non-transitivity of parthood does not imply the latter condition. Parthood relaion may not be transitive but every branch of composition tree reaches a stage where it becomes transitive and stays like that. In this case, the regress will be broken. Gluon theory is not based on the transitivity of parthood relation. In fact, Priest himself accepts that parthood is non-transitive [4, p. 89]. As explained, the nontransitivy of parthood, in itself, does not make a problem for gluon thery. What about objects being gunky? Gluon theory is to explain the unity of every object i.e., not only x, but also all the parts of x, and all the parts of parts of x, and so on, down the parthood-chain with x at its head. If objects are gunky, the parthood-chain is indefinitely descending. In this case, any attempt to explain the unity of every object fails, and this is not because of the nature of gluon theory. Any theory, aiming to explain the unity of every object, encounters this difficulty, and this is the result of objects being gunky. Thus, in order to be able to give a finite explanation of the unity of all objects, every parthood-chain, starting with x, must terminate in simples. In other words, in order to explain the unity of every object, objects must not be gunky. Accordingly, there is no need to put any restriction on parthood relation with regard to its transitivity or non-transitivity.

Acknowledgement

I would like to thank the anonymous reviewers of this paper for their extremely helpful comments. I am also thankful to Graham Priest and Bethany Somma. This paper is part of a project supported by Fritz-Thyssen Stiftung. I am very grateful for their generous support.

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