Mental Representations: the New Sense-Data?
Chuck Stieg

Department of Philosophy
University of Minnesota

Abstract

The notion of representation has become ubiquitous throughout cognitive psychology, cognitive neuroscience and the cognitive sciences generally. This paper addresses the status of mental representations as entities that have been posited to explain cognition. I do so by examining similarities between mental representations and sense-data in both their characteristics and key arguments offered for each. I hope to show that more caution in the adoption and use of representations in explaining cognition is warranted. Moreover, by paying attention to problematic notions of representations, a less problematic sense of representation might emerge.

1. Introduction.
The notion of representation has become ubiquitous throughout cognitive psychology, cognitive

neuroscience and the cognitive sciences generally. Indeed, since the decline of behaviorism, the so-called cognitive explosion has been marked by explicit appeals to the notion of mental representations. Cognitive psychology's fascination with the field of artificial intelligence has been influential in providing cognitive psychologists with a model of the mind that incorporates many of the same features as the serial, digital computer such as the type advocated by Andersen (1983) and by Newell and Simon (1981). Among these features are representations (symbols) and computations, which involve operations on these representations. Since cognitive functions are thought of in this picture as a series of computations and operations performed on representations, explanations of cognitive phenomena involve spelling out what the relevant types of representations and processes are for a given cognitive ability or computational task.

The use of representations as explanatory constructs, as alluded to above, is not limited to cognitive psychology however. Appeals to representations occur in a variety of areas such as neuroscience, developmental psychology, visual media, education, and studies of social cognition. Within each of these areas there are debates about how best to conceive of representations, their structure, properties and so on, but there is little debate over whether there really are such things as mental representations that humans employ in their various psychological activities.[i] In this paper, I would like to address the status of mental representations as entities that have been posited to explain cognition. I will do so, however, in a rather roundabout way. This will involve examining another type of entity that has been posited to explain both perceptual experience and claims of knowledge: sense-data. Though some philosophers may still argue for some version of a sense-datum theory, the consensus view seems to be that such theories are fatally flawed and have been rightly abandoned.[ii] By showing that mental representations share some of the flawed characteristics of sense-data, I hope to show that more caution in the adoption and use of representations in explaining cognition is warranted. Moreover, by paying attention to problematic notions of representations, a less problematic sense of representation might emerge.

The paper will proceed as follows. Firstly, I will discuss a general notion of representation that embodies the way in which it is used in psychological contexts. I will draw on a variety of discussions from both cognitive psychologists and philosophers. Secondly, I will introduce sense-data and explicate some of the general motivations and characteristics of these entities. Next, similarities between sense data and mental representations will be discussed as well as similarities in some of the arguments given for each. Though the two may be similar in important ways, they are also dissimilar in important ways, specifically in regards to a conscious user. Though some uses of representations may be problematic, it is not necessary to abort all mention of representation in accounts of cognition.

2. Representational Theories of Mind.

A common meaning among uses of 'representation' involves that of a representation as standing in for something else. A word may be a representation on this view because it stands for something such as an idea, an object or an event. Though 'representation' can be taken to refer to a process or something that someone does, it is more commonly thought of as a product or a result when used as a mental representation (Martinez 1999). The type of entity that a mental representation is supposed to be is a cognitive entity as opposed to a physical entity or object. This cognitive entity is a type of knowledge structure, in the mind, that is taken to preserve information about things in the world or that symbolizes some state of affairs in the world (Martinez 1999; McNamara 1999; Shanon 1992). A mental representation, then, has content and carries some type of information.

Because of the ability to have content, mental representations play an important role in explaining behavior. Given a mental representation, for example, of the lay-out of your home, you can move throughout your home in the dark, imagine which painting at the gallery would look best on the wall in the living-room, and so on. These abilities all rely on having a mental representation of your home, which preserves the spatial layout of the objects and rooms therein, and on being able to perform certain operations on this representation. Representations can also be of an emotional and/or motivational sort such that problem solving tasks are explained by reference to an agent having representations of goal states, current states and the types of states that might result from performing various operations on analogues of the current state in an attempt to reach the goal state.[iii]

In addition to the above characterization of representations, there is another aspect to them that is important. Many philosophers, for example, appeal to a use-aspect of representation such that it is not enough that the representations have content, but the content that they have must be used in some way. That is, the representation, as a stand-in for something else, must be used by a system in a way that relies on what is being represented. Bechtel (2001), Grush (1997) and Millikan (1989) all provide philosophical analyses of representation that insist on the use aspect of representation and that incorporate it with a notion of information-bearing by the representation.[iv] Without the representation being used by some system, it is difficult to see how the representation might be said to have a particular content or a content which is causally efficacious. Furthermore, without the representation, and its content, being used in some way, it is hard to see how an appeal to it would provide any explanatory power.

Though there are some common elements to various views of representation, there are many disagreements as to what the properties and structures of representations in the cognitive sciences are. One of the longest lasting debates in cognitive psychology regarding representations has been whether or not they are best thought of as pictorial or as propositional. Pictorial representations (also referred to as analogical or as image-based) represent objects or events in a direct way as opposed to a symbolic, or arbitrary way. For example, a picture of a house preserves the same type of spatial relations and properties that the house it is a picture of has. Some important empirical studies have lent credence to the view that at least some human cognitive activities involve pictorial, or analogical, representation.[v]

However, there are also many studies that seem to support the view that mental representations are propositional in nature such as Ratcliff & McKoon's (1978) experiments involving subjects' speed of response to words that they had been exposed to previously. The results were the same as those predicted by a propositional network of words in which the presented sentences and words are connected in semantically relevant ways. Though the details of the experiments are not important, propositional views of representation hold that human knowledge is represented in propositional form, where a proposition is an atomistic element that can be true or false (McNamara 1999). Propositions can be combined and related in various ways to form new assertions and can be used to represent any well-specified set of information (McNamara, 1999, p.119). Furthermore, propositional representations have the ability to explain how thought can be truth preserving and can capture semantics, as well as how thought can display the characteristics of productivity and systematicity.[vi]

Though there might be certain instances of evidence for both pictorial and propositional representations, a notion of representation indicative of the ways 'representation' is used in cognitive psychology would probably best be viewed of as a continuum of representational forms (Martinez 1999). On one end of the continuum is propositional knowledge that employs discrete

symbol systems such as propositional and predicate logic, mathematics, and language. These forms of representation involve symbol systems with arbitrary relations between symbols and referents as well as independent rules that apply to the manipulation of each form's symbols. As one moves toward the other end of the continuum, one encounters analogical representational forms including episodic events, visual imagery, sounds, smells, textures, etc.

In sum, the key aspects of representation in use in the cognitive sciences seem to involve the following ideas. Representations are entities that carry information, or have content. They do so within a larger system such that the content they bear is used by the system. At least some cognitive activities involve producing, storing and recalling representations of things such as faces, locations, goals, events, etc.[vii] Since cognitive psychology views the mind as a representational system that takes in sensory input, forms sensory and perceptual representations of that input and performs various computations on those representations in order to illicit some output, explanations in cognitive psychology take the form of breaking down cognitive phenomena into basic representations and algorithms and then showing how they work together to produce some phenomena.

Given that the entire project of cognitive psychology is built around the notion of mental representations, it seems crucial that the notion of mental representation be viable. If it is not, then the results may be disastrous for cognitive psychology as a research program. One would expect that there would be very persuasive arguments for the postulation and use of mental representations, however, there seem to be surprisingly few of them.

One way to try and address the adequacy of mental representations is to compare them with another explanatory posit that has fallen from favor. In the next section, I will present the notion of sense-data before bringing out similarities between them and mental representations. In viewing some of the similarities, we will also take a look at some of the arguments given in support of both sense-data and mental representations to get a better idea of the relation between them.

3. Sense Data.

Philosophers have been interested in perception for quite some time. In the *Theaetetus*, Plato considered, among other things, what the relationship might be between knowledge and perception. Descartes famously questioned the legitimacy of the senses in the *Meditations*. Berkeley, Locke, and Hume all examined the role that perception plays in forming ideas and knowledge as well. In the tradition of Locke and Hume, philosophers in the early part of the 20th century focused much of their philosophical attention on perception. In so doing, they inherited a particular view of perception and a collection of arguments and problems, such as the argument from illusion and secondary qualities, that had been considered problems that any theory of perception ought to be able to accommodate. In this section, I will introduce the notion of sense-data as it has been used by G.E. Moore and Bertrand Russell at some point in their philosophical theorizing. I will also present the argument from illusion and the argument from secondary qualities (or from science) that might be thought of as arguments for the view that we only perceive sense-data. After doing this, I will mention some of the criticisms that have been launched at sense-data.

3.1. What are Sense-Data?

Sense-data are supposed to be the immediate objects of experience. They are the entities that one is immediately aware of when one is having a perceptual experience. In Moore's way of putting

it, sense-data are "directly apprehended." Though he changed his view later, Moore thought things such as colors, sizes and shapes were sense-data.[viii] So, for example, upon seeing a red leaf, what one actually sees is a reddish patch of color, of a certain shape and size. These are the sense-data one actually sees and is actually aware of. That is, the seeing of the thing is a direct apprehension of the sense-data; a reddish patch, of a certain shape and size.

Furthermore, these sense-data are not the physical objects in the world that one might be inclined to think of as the objects we perceive. The reddish patch of color of a certain shape and size in a particular location is not the leaf, nor a part of the leaf. They are distinct from the leaf. The sense-data exist in our experience, not in the external world, and as such are private to the perceiver.

Moore went on to elaborate three views that he took proponents of sense-datum theories to share:

> 1) that absolutely every sense-datum that any person ever directly apprehends exists only so long as he apprehends it, (2) that no sense-datum which any one person directly apprehends ever is directly apprehended by any other person, and (3) that no sense-datum that is directly apprehended by one person can be in the same space with any sense-datum apprehended by any other person-that no sense-datum that is seen or heard or felt by me can possibly be either in the same place with or at any distance from any that is seen or heard or felt by any one else (Moore, 1978, pp. 42-3).

Moore took the above views to be what philosophers meant by sense-data existing only in the mind. Moore, however, seems to have preferred to think of sense-data as being mind dependent rather than *in the mind*. He also allows himself leeway in the extent to which he accepts the above three views in that he admits that he does not know to what extent they are true since he does not know of any conclusive arguments one way or another. However, Moore does admit that he thinks they are very probably true (Moore, 1978, p. 44). In any event, the above three characteristics of sense-data will be important to keep in mind when discussing the relationship between sense-data and mental representations.

Russell also has a similar conception of sense-data as Moore. In *The Problems of Philosophy,* Russell makes a distinction between the act of being aware of the contents of experience and the contents themselves:

> Let us give the name of 'sense-data' to the things that are immediately known in sensation: such things as colours, sounds, smells, hardnesses, roughnesses, and so on. We shall give the name 'sensation' to the experience of being immediately aware of these things (Russell, 1912, p. 12).

From Russell's discussion of sense-data and how he is lead to posit their existence, it seems clear that he accepts the views that Moore claims are common to sense-datum theorists. In an attempt to make clearer, claims of knowledge, Russell turns to information that might be provided by the senses. He considers a table and various types of perceptual experiences one might have of the table. For example, the table might look shiny from one viewpoint but a darker brown from another, and if more than two people are looking at the table at the same time, they

will see different things since they are looking from different viewpoints. Likewise, the table might appear and feel smooth to the touch, but upon closer examination with a microscope, the table will appear grainy and porous. But which of these cases is a case of seeing the real table? How can we know which is the real table? These cases, concludes Russell, show that what we experience is not the same as the table itself. What we experience, what we are aware of are sense-data.

Views (2) and (3) above, seem to fall out of this argument rather well. That is, part of the doubt of the existence of the real table is derived from the idea that what is directly apprehended by one person is not directly apprehended by another. And since what is directly apprehended is partially determined by and situated in the awareness and context of the perceiver, different people's sense-data cannot be in the same space.

That Russell holds view (1), that every sense-datum that any person ever directly apprehends exists only so long as he apprehends it, seems to follow from his treatment of the existence of the external world. Russell argues that it is a simpler hypothesis that there are physical objects in the world that exist independently of our perceptions of them, and in doing so, he juxtaposes the continued existence of an actual cat to that of a fleeting cat that only exists when he perceives it. The hunger of the cat would be hard to explain if it were only sense-data that sprang into existence and then disappeared continuously as he sometimes perceived it and sometimes did not (Russell, 1912, p. 23). As the immediate objects of experience, sense-data only exist as long as they are being experienced. Otherwise, it is not clear where these objects would be when they were not being experienced.

I have presented Russell and Moore's views of sense-data just to give a taste of what sense-data are supposed to be like, but there are certainly many more philosophers who have subscribed to some version of a sense-datum theory. For example, Price was a staunch proponent of sense-data, as was A.J. Ayer.[ix] Additionally, sense-data played a larger role than just that of answering what the objects of experience are. They also figured prominently into foundationalist epistemologies. By establishing an immediate given in sensory perception, for example, it was hoped that this given could act as an incorrigible and solid basis from which to build more complex beliefs and claims of knowledge. Sense-data were supposed to be the raw information that could lead unproblematically to more complex, true beliefs.

3.2. Some Arguments for Sense Data.
The types of arguments given in support of sense-data share certain characteristics. The reasoning attributed above to Russell also shows aspects of what is referred to as the argument from illusion. In this section, I will present two general forms of arguments for sense-data that have been given at various times and make a few remarks about each. The first is the argument from illusion, and the second is a combination of the argument from secondary qualities and from science. The two arguments rely on a similar assumption, the phenomenal principle, which will be discussed below. This assumption is similar to an assumption made in some arguments for mental representations, which will be highlighted in a later section.

The argument from illusion is perhaps the most popular argument used for sense-data. Hume gives a version of it in section 12, part 1 of *An Inquiry Concerning Human Understanding*, Russell and Moore each give versions of the argument in the works mentioned above and Ayer also gives a detailed treatment of it in *The Foundations of Empirical Knowledge*. The following formulation of the argument from illusion is a paraphrased version of the argument found in Robinson (1994). It goes like this.

In some cases of perception, physical objects appear other than they actually are. Whenever something appears to someone to have a sensible quality, there is something that the person is aware of that has that quality. Therefore, in some cases of perception there is something that the person is aware of that has sensible qualities that the physical object the person is supposedly perceiving does not have. Since something that possesses a quality that another thing does not have implies that the two things are not identical, it follows that in some cases of perception what the person is aware of is something other than the physical object the person is supposedly perceiving. This other object of perception is a sense-datum. However, since this only suggests that sense-data are the objects of perception in some cases, it is added that veridical perceptions and delusive (or illusory) ones are indistinguishable qualitatively. That is, there is a continuity in quality between them such that all cases of perception must involve the same processes. Thus, in all cases of perception, what the perceiver is aware of is something other than the physical object and is instead a sense-datum.

A few comments about this argument are in order, though more could be said.[x] First of all, though an application of Leibniz's Law does imply that two entities that do not share all properties are not identical, it is not immediately clear that a sensible quality, which does not seem to belong as a quality to a physical object, indicates that there are two entities with different properties. It is conceivable that there is really only one entity, the physical object, which has been attributed a characteristic that it does not have. Similarly, it is possible that the sensible quality is really just a by-product of the context in which the subject is seeing (hearing, touching, etc.) the object. Thus, perceiving a bent stick in water might not be an instance of perceiving a sense-datum of a crooked patch of brown while the stick remains straight, but rather a case of seeing a stick that is in water. The refraction of light by the water, and the other aspects of what is being seen that might be relevant, should also be taken into consideration as playing a role in what is perceived. If this were done, then the case involving a stick in water would not be a case of simply comparing an unbent stick to a bent stick and concluding that there are two separate entities.

Related to the above concern is a worry over the second premise that "whenever something appears to someone to have a sensible quality, there is something that the person is aware of that has that quality." Robinson (1994) refers to this as the Phenomenal Principle and argues that, though it has been doubted and criticized, it is stronger than given credit for. Indeed, this premise seems to be the crucial one in the argument from illusion since it is what allows the move from having an experience of something to there actually being something which has the quality sensed. But this premise seems in danger of begging the question from the start since the conclusion of the argument is supposed to be that there are immaterial objects of perception. Yet, granting the Phenomenal Principle guarantees that whenever it appears to someone that so and so that there is something that is so and so. The burden of showing that this is the case rests on the sense-data theorist and should not be assumed in the argument for sense-data.

Objections to the Phenomenal Principle have also been given by philosophers who endorse various versions of intentional theories of perception where perceptual states are viewed in the same light as intentional states like beliefs and desires. For example, Searle (1994) and Tye (2000) view perceptual states as types of intentional states that represent other states of affairs. Searle (1994) can be read as suggesting that a principle like the phenomenal principle fails existential inference since, for example, a report that Sarah perceives that a stick is crooked does not imply that there is some stick that is crooked just as "Billy believes that Santa Claus will come on Christmas Eve" does not imply that "there is some x such that Billy believes x will come on

Christmas Eve" (Searle, 1994, p. 385). The mere fact that someone believes something about some thing, does not entail that there actually is some existent thing with those properties or that is the object of that belief. Intentional states, in being about some state of affairs, allow for mistakes like believing that there are unicorns or that Santa will come on Christmas Eve. Similarly, if perceptual states are intentional states, merely perceiving some object in some way does not mean that there is some object that is that way. Rather, the perception is about, or represents, some other state of affairs (in the world most likely), and it runs the risk of getting that state of affairs wrong. If the argument from illusion does trade on this type of move, then it seems to involve a fallacy and to warrant serious pause before taking such an argument seriously.[xi][xii]

Another argument given for a type of sense-datum theory is one that might sound a bit Lockean or like that of Eddington in tone. Consider the following. Objects appear to possess a number of primary and secondary qualities. They look certain colors, to be certain sizes, etc. However, science has shown us that they possess none, or at least a tiny fraction, of the properties that we assume them to have. Therefore, almost all of the qualities we perceive are creations of perception and exist only in subjective states, i.e. they are sense-data.

The above argument is compelling in that it does seem that science makes its living by distinguishing between appearance and reality. And the more advanced and successful science becomes, it seems the wider the gap between appearance and reality becomes. For example, there seems to be quite a difference between what quantum physicists tell us about the world and what we perceive our everyday world to be like. However, apart from the obvious caution that goes along with any conclusion reached via a historically fragile means such as science, it still is not clear that just because some field of some science is occupied with using, manipulating and analyzing a very particular set of entities, properties, and so on, that this set exhausts ontology. Each field of science is focused on a very limited subject matter and part of the world. Just because one particular level of analysis omits certain things, it does not follow that they do not exist at some other level of analysis or description. This is admitted by the above argument in allowing for the subjective status of sensible qualities, but it could also be argued for by one who wanted to suggest that the qualities might still be objective qualities of physical objects. They might simply be qualities that only emerge at a certain level of analysis or from a certain interaction and relation between different objects. Thus, it might be allowed that a leaf is not intrinsically red, but that its color, far from being a subjective state of a perceiver, is a relational property between the leaf (and its physical characteristics) and light waves. In this sense it is not necessary that the properties be creations of perception.

But even if it is right that science has shown that certain qualities do not belong to objects, and even if it is right that science is right, it does not follow that these qualities are sense-data. They might only be sensible qualities and be dependent upon a perceiver, but that does not entail that they are immaterial entities or objects of perception. A further assumption seems necessary to reach the conclusion that they are sense-data; namely the same assumption from the argument from illusion: the phenomenal principle. Perceiving something alone does not entail that the something exists. Only if one assumes that whenever one perceives something with a certain sensible quality, that there is something that possesses that quality, does it follow that the sensible qualities in our subjective states, which science tells us do not belong to objects, are immaterial entities, i.e. sense-data.

In its reliance on something like the phenomenal principle, the argument from science and qualities is similar to the argument from illusion discussed earlier. A reliance on an assumption

like this will also be pointed out in relation to arguments for mental representations. For now though, it is sufficient to see that the above two arguments are two of the more popular ones given in support of the sense-datum doctrine. Moreover, these arguments have not been successful in establishing that all we ever directly perceive are sense-data. The arguments and sense-data themselves have been thoroughly criticized and rejected by the majority of philosophers interested in such matters. In the next section, I indicate a few of the general worries regarding sense-data before moving on to discuss their relation to mental representations.

3.3. A Few Criticisms of Sense-Data.
Some of the problematic features of sense-data that have led to its rejection include the following. First of all, it is not clear where sense-data are located. They are supposed to be in our experience, but it is unclear where that is exactly. Given their private nature, sense-data, as objects of experience, are mental phenomena. But then, our experiences would be in our minds, and it seems odd to think of our experiences as existing in our minds. They are things we have and do by interacting with the world and others, not observations of entities in our minds. Moreover, in perception, it seems that the things we are usually aware of are related in various ways to one another spatially. So the various sense-datums must also be spatially related to one another. For example in the visual experience of seeing leaves in a forest, the redness must be combined with the leafness and be situated in a context of other data, making out the rest of a forestry scene. But it seems difficult to explain how immaterial entities can be spatially related to one another.

Similarly, as the things we are actually aware of in perception, sense-data must have the properties that we are aware of in perception, namely, redness, squareness, etc. But how do immaterial entities come to have these types of properties? And since it seems obvious that we normally use these properties in reference to particular objects like cars, tents, clouds, etc, and they make sense in doing so, can we make sense out of using them to refer to immaterial sense-data? Do these words and properties mean the same thing when applied to sense-data? It seems difficult to see how they do, but if they mean something else, or if the properties are not quite the same, then what do we mean by them and how does the postulation of sense-data clear anything up in explaining the connection between our perception and the world?

In addition to the above problems, there is a problem with spelling out the relation between sense-data and brains. This seems to be an instance of the general interaction problem for substance dualism in explaining how immaterial and material substances interact. It is clear that in perception there are physical processes taking place in the brain. If one really does only perceive sense-data, do the physical events cause the sense-data to occur? And do sense-data cause us to do things like move our limbs in particular ways? If so, how do these seemingly two different types of events affect one another? Sense-data are supposed to be immaterial entities, but brain processes are obviously events involving physical entities. The lack of answers, or conceivable answers, to these questions leaves sense-datum theories seemingly implausible.

There are other problems as well such as whether sense-datum theories really go any way towards explaining what seems to need explaining in perception: the relation between the perception (the representational and phenomenal element) and the world (Jackson 2000). There is also the question of whether sense-data can have properties other than the ones they appear to have. Mostly, sense-data seem troubling because they seem difficult to fit into the popular physicalist view and conjure up notions of spectators passively viewing the goings-on of their minds. Additionally, they seem to be needless ontological additions since there are perhaps

more parsimonious ways to explain perception without postulating sense-data. Though there might be a variety of reasons as to why sense-data have been rejected, it is common knowledge that they have been rejected.

In the next section, I will discuss some important similarities between mental representations and sense-data. Some of these similarities will be ones that resemble problematic features of sense-data. This should help to raise caution over the widespread use of mental representations that cognitive psychology and some philosophers of mind are committed to. To further the idea that there are important similarities, I will argue that a key problematic assumption made in arguments for sense-data, the phenomenal principle, is akin to an assumption made in some influential arguments for mental representations.

4. Common Threads.
First, there are obvious ways in which sense-data and mental representations differ. Sense-data are entities called upon in reference to a very small class of problems, namely perceptual experience and epistemological enterprises. In contrast, representations figure into explanations of a wide array of cognitive phenomena, including perception, goal-oriented behavior, memory, inference making, and language use just to name a few. Similarly, while sense-data, as objects of experience, only exist while being experienced or apprehended, representations are thought of as being used regardless of whether they are consciously experienced or not. Thus, representations can figure into explanations of phenomena in which no mention of consciousness is made, whereas sense-data cannot.[xiii]   Sense-data are also not as obviously crucial to a large scientific endeavor, or research program, as representations are. As mentioned earlier, representations play important roles in many fields, but are the centerpiece of theory construction in cognitive psychology. Without the use of representations and computations, it is not clear what explanatory form cognitive psychology would take. It surely would be very different than it currently is. However, even though there are many ways in which they differ, mental representations and sense-data are also alike in certain important respects. First, I will look at the similarity in arguments for each entity, and secondly, I will explore similarities of characteristics of each entity.

4.1. Arguments for Mental Representations.
Two types of arguments for positing mental representations show surprising similarity to the types of arguments for sense-data discussed above. The first type of argument involves taking notice of some characteristic of thought, or some aspects of thought, and concluding from this that thought must involve states of a certain kind or be instantiated by a particular type of medium, for example a language of thought.

Fodor (1975) exhibits this type of reasoning in his argument for a language of thought in which cognitive abilities involve representations of a propositional type that share features with language such as a compositional syntax and semantics. He argues for this type of representational format by noting certain aspects of human cognitive abilities such as productivity and systematicity. Productivity is the notion that thoughts can be extended, or are unbound. This is also a feature of language since words and sentences can be continuously recombined. Systematicity involves the recognition that a thinker who can think one type of thought can thereby think another thought; for example if one has the capability to think "Jim loves Peter," one has the capability to think "Peter loves Jim." Not only would a representational system that is propositional in nature allow for cognition with these properties, it also is the only system available that can do so, according to Fodor.

Georges Rey (1995) also offers an argument of this sort for the claim that cognition involves a type of representational medium. He presents his argument in this way.

1. There are thinking things that are capable of rational thought, involving at least first-order logical thought.
2. Anything that is capable of rational thought is capable of making logical transitions in thought: i.e. it is psychologically possible that it pass from one thought to another by virtue of logical properties of its thought.
3. First-order logical properties are in part constituted by (semantically valuable) logico-syntactic constituent structure.
4. For transitions between thoughts to occur by virtue of logico-syntactic constituent structure, those constituents must be causally available features of the thinker.
5. Therefore, a thinking thing is a thing some of whose states have (semantically valuable) logical syntactic constituents that are causally available to the thinker.
6. Therefore, there are things some of whose states have (semantically valuable) logico-syntactic constituents that are causally available to it; i.e. there are things whose states entoken sentences in a LOT (Rey, 1995, p. 203).

The above two arguments are influential and compelling. They rightly set out certain important characteristics of human cognitive capabilities. However, they both seem to me to be guilty of an important mistake. Both arguments make the move from noting these characteristics to inferring that thought must be formatted in a particular way. It does follow that, since thought can have these characteristics, any proposed account of human cognition must explain how these qualities can emerge or take place. But it does not follow from noting these characteristics, that thought or cognition has to be structured in a particular way. It can be structured in any of a number of ways as long as the properties are accounted for, and the properties in this case are more in line with effects of processing or aspects of cognition as opposed to the medium of cognition itself.

This mistaken type of inference is similar to the inference pointed out in the argument from illusion specifically and hidden in the argument from science about secondary qualities. That inference involved making the move from there appearing to be something with some sensible quality perceived to there being something which exists that has that property. In both the arguments for sense-data and mental representations, there is first a noting of some quality. In the case of sense-data, the quality noted is the appearance that something has some sensible quality. In the case of Rey and Fodor's arguments, the quality noted is a characteristic of thought. Next, there is a postulation in both cases from the thing, or property, noted to there being something which has that quality and which is responsible not only for that quality appearing as it does, but also is structured in the way that that quality appears. The argument from illusion tells us that this something is a sense-datum, and Fodor's and Rey's arguments tell us that this is a representational medium.[xiv] However, the crucial move in each argument is the same, and that move seems fallacious.

There is another type of argument given to support the postulation of mental representations. Cognitive tasks sometimes require a storage of information to be recalled and recombined. Sometimes that information is not immediately available in the external environment of the agent. In such cases, it is plausible that the agent is utilizing an internal system of representations that stand for the required objects, states of affairs and information. After all, what else could it be? Furthermore, since many of the same physical processes and behavioral outputs occur in cases where it seems most plausible that internal representations are at

work, it also seems plausible to suppose that they are at work in all cases.

This argument shares obvious features with the argument from illusion as well. In the argument from illusion, it is argued that in some cases, the delusive ones, what we perceive are sense-data. From there it is suggested that there is an indistinguishable quality between delusive and veridical perceptions and that the best explanation of this is that in both cases what we perceive are sense-data. After all, what else could it be?

Both arguments, in these forms, are inferences to the best explanation. They both suggest that the only plausible way to account for their respective phenomena is to accept their diagnosis, i.e. the conclusion they are pushing. Arguments of this sort are not always bad ones, but they do not exactly instill confidence. They are tentative in nature and rely completely on the strength of current states of knowledge and imagination. In so doing, they rarely stand the test of time. For example, the argument from design for the existence of God seems persuasive only when there are no other available explanations of how complex entities can come into being. However, once the theory of evolution by natural selection was developed, a viable alternative had arisen. This seriously affected the compelling nature of the argument from design and relegated it to a rather unflattering position in the annals of critical thinking. Similarly, there might be further developments in the psychological sciences that make positing internal representations unnecessary.[xv] But whatever the merits of this second type of argument, it is only my purpose to point out that there are similarities in both the characteristics and arguments for sense-data and mental representations.

4.2. Characteristics and Implications.
Probably the most philosophically significant similarity between sense-data and mental representations consists in the picture they each create for the position that human beings are in. Both serve as the key point of impact between ourselves and something else. They take on the role of intermediaries, in the head as it were, between us and the world and thereby create a gap between where we are and where the world is. There seems to be a certain view of the self, or the mind, which is reinforced as a result of this gap. The view is a view of a Cartesian mind that is isolated from the rest of the world, receiving images of various sorts which can then be operated on to infer further things or to develop further beliefs beyond the immediate images. The mind here is the viewer of the scene and the locus of judgement.[xvi]

On the sense-datum view, the perceiver views the immediate and incorrigible data, the contents of its experience, but the perceiver is somehow separate from the contents and what they do or do not represent. The perceiver then uses the data to infer or build upon in order to arrive at some further belief that outdistances the original data.

In the same way, the representational view operates on representations. Instead of images, or sense-data, there is a representation that is the vehicle of information. The representation is the intermediary between the world and the cognizer and informs the cognizer of the world via its content. The cognizer is instantly severed from the world and is limited to representations of it. Instead of inferring or building more complex knowledge claims from the representations, as the sense-datum theorists did, the cognizer performs "computations" on the representations. These computations involve processing that passes the relevant information on to further processing modules until an appropriate output or activity is engaged given the type of initial input. But at each stage, the processing does become more complex as the data from the earlier stage is used in a different way and added to at the next stage just as workers on an assembly line do. Each has a different job with a different set of instructions, and each performs their task on the product of the

worker immediately before them, which performed their task on the product of the worker immediately before them, and so on. But it becomes fuzzy just who these workers are in the representational picture and how their activity is actually instantiated and carried out in the actual organism.

There are two points here. One is that there is a picture of the self as an isolated entity that deals with the world through intermediaries, which is reinforced by both the sense-data view and the representationalist view. Both views involve a triadic relation between an object, content and a user. We are the user, and we come to know about objects via our interaction with the vehicles of content (sense-data or representations). This notion of a user carries with it philosophical baggage of a Cartesian sort that runs into some of the same problems as sense-data.[xvii]

Another point involves the adequacy of the postulated entities to explain the phenomena in their respective fields. Sense-data were supposed to explain perceptual experience and how knowledge was possible. In the argument from illusion, the fact, if it is a fact, that veridical and delusive perceptions are qualitatively similar is supposed to be explained by it being the case that what is actually perceived in both cases are sense-data. The reason that "perceiving" a red leaf on a tree in a dream or during an hallucination is so much like perceiving a red leaf on a tree when there really is a red leaf on a tree in front of one, is because what is being seen in both cases is the same thing. It is sense-data. However, as an explanation it becomes somewhat disappointing since the qualitative similarity is supposed to be *explained* by some type of immaterial entities which are themselves mysterious. How do they work? How do sense-data get caused by the brain and observed by the mind? It seems like what is supposed to provide the explanatory import is itself vague and lacking in detail.[xviii]

This is much the same predicament that the representationalist view finds itself in when it purports to explain cognitive phenomena in terms of representations and algorithms. These entities and processes are as much in need of explanation as the phenomena they are supposed to explain. Furthermore, relegating the work of these posits to unspecified boxes, or modules, does not aid in explaining how representations and algorithms perform the functions that they are intended to perform. Consider a case of object recognition. How does a person recognize an object as an object of a certain type? The going psychological explanation involves the subject storing representations of various concepts or categories. Upon receiving some visual stimulus, say, the subject forms a representation of that object and then compares it to other activated, stored representations. The one it most closely resembles is the type of object that the presented object is recognized as. This process is spelled out in different ways according to which type of representations one thinks are being employed, for example, geons in a propositional format or images of whole objects in a pictorial format, but the idea is basically the same. However, the level of abstraction involved in this type of explanation not only again suggests the idea of some detached entity doing the comparison, but it also leaves it a mystery as to how these representations operate and get compared and so on.

The relation between sense-data and mental representations goes further though. Sense-data are admittedly immaterial entities. They are not physical entities, but they are objects of our experience. What type of entity is a mental representation? Given the general rejection of substance dualism in philosophical and scientific circles, it cannot be the case that the majority of philosophers and scientists hold that mental representations are immaterial entities. Indeed, they are given the respectable title of cognitive entities by Martinez (1999). "Representations… are…defined to be more-or-less coherent structures that are cognitive (rather than physical) and that stand for, or represent, some real or imagined situation" (Martinez, 1999, p.15). Though it is

unclear what a cognitive entity is exactly, it cannot simply be a type of disposition, capability or process since mental representations are claimed to be products of some sort distinct from processes. They are supposed to be a type of thing: a cognitive thing, but how that gets spelled out is unclear.

Indeed, it is not a simple problem, and it raises questions that are similar to questions that plagued sense-data. For example, what type of thing is a cognitive thing? How do things of this type interact with physical things like brains? Obviously, attempted answers to these questions will try to avoid notions of immaterial substances and will be typically physicalist in spirit by invoking notions like functionalist accounts of the mind, supervenience, etc. But these views and concepts are themselves unclear and encounter their own problems. Indeed, the mind-body problem is a daunting philosophical problem for a reason: it is difficult. But it is not circumvented and *justifiably* ignored by simply asserting that whatever entity, physical or not, which is posited, connects up in *some* way with the physical and then going about ones business by positing "cognitive" entities that do all of the bumping, grinding and explanatory work.

In addition to raising some of the same types of questions regarding types of entities and the nature of their relations, mental representations also bring with them a sense of the private that sense-data do as well. For example, a few of the views common to sense-datum theorists elaborated by Moore, seem to apply to mental representations as well. Two of the three views were that no "sense-datum which any one person directly apprehends ever is directly apprehended by any other person, and that no sense-datum that is directly apprehended by one person can be in the same space with any sense-datum apprehended by any other person—
that no sense-datum that is seen or heard or felt by me can possibly be either in the same place with or at any distance from any that is seen or heard or felt by any one else," (Moore, 1978, pp. 42-3). Both of these seem applicable to mental representations in that if I have a particular mental representation of my wife, for example, you will not be able to have that same mental representation, though you might have *a* mental representation of my wife. Not only will my representation have certain attitudes related to it and play a different role in my representational economy, it will also, ex hypothesi, be my representation, formed by my cognitive faculties in their particular way given their particular context. The type of representation and its content might be inferable by a third party, but it cannot be directly apprehended by a third party. In this way, then, mental representations are private much the same way that sense-data are.

The private aspect of both entities need not be a negative aspect of either. I bring it up because the similarity between them seems the strongest in the mentalistic and mysterious way in which both sense-data and mental representations are cast. This mentalistic quality seems very apparent in the private nature of both and in the juxtaposition of each to physical objects. Furthermore, it is this type of characteristic, as mental/immaterial/cognitive/etc., that seems to make them the most puzzling and the most difficult to articulate. It is strange that the immaterial and mysterious nature of sense-data provides good grounds for rejecting them, but that similar reasons do not prompt the same reaction towards mental representations.

5. Concluding Remarks.
In this paper, I have suggested that there are important similarities between sense-data and mental representations. The most important ones seem to me to be that both are, in a sense, non-empirical entities posited to explain certain mental phenomena, though it is not obvious how either provides much of a satisfying explanation. There are various reasons for this. One, there is much disagreement over what the nature of mental representations is. Though it was not

discussed much in this paper, there were also disagreements over the nature of sense-data (for example, see Putnam 1994). Given the ambiguity over what form mental representations are supposed to take, it is difficult to provide thorough and deep explanations of the phenomena they are intended to explain. Also, the vagueness of what type of an entity (cognitive, functional, etc.) mental representations are, adds to the worry that they do not provide adequately deep explanations since it would be nice to have a good idea of what the thing is that is explaining something else.

Moreover, the issue of what type of entity mental representations are also raises a number of troublesome philosophical questions like the ones raised against sense-datum theories. For example, how do they interact with physical objects? How do they manage to represent accurately the states of affairs they are said to represent? Do mental representations, such as analogical representations, contain some of the properties (for example, spatial properties) within them that are also contained in the state of affairs that they represent? If so, how, and do those properties carry the same types of connotations when applied to representations that they normally have?

In addition to these questions, the implications that seem to follow from the representational view mirror those of the sense-datum view. Both provide us with an image of a detached self that acts as an observer of what is in the mind and in the world but that is not clearly a part of either. The view of such a self seems troublesome and not only leads to strange ontological commitments, but also to difficult epistemological problems such as skepticism.

In addition to some of the above problems, there are also concerns over some of the arguments given for mental representations. The two arguments presented above both have particular deficits which mirror deficits in past arguments given for the sense-datum view. That is, they rely on similar strategies and moves that appear to be problematic or unconvincing for the same reasons.

Mental representations play an enormous explanatory role in the various cognitive sciences, but there seem to be many reasons to be suspicious of invoking mental representations at will. I have tried to get at some of these reasons by comparing mental representations with sense-data which have themselves fallen out of favor and been rejected. If mental representations do share some of the problematic features of sense-data, for which they were rejected, then it seems that some concern and caution should be taken toward the status of mental representations. I have argued that they do share some of these characteristics and that, therefore, some caution should be taken toward the status of mental representations.

This might prove disastrous for cognitive psychology, which seems to invoke the types of representations discussed in this paper, but less so for other areas of investigation such as neuroscience. The types of representations appealed to in neuroscience, for example, seem to be ones more committed to respecting actual neural processing in the brain as opposed to only being constrained by whether the representation in question can perform the cognitive job under consideration.[xix] A lack of concern for the implementational level might be fine if all one is concerned with is building a computer to perform some task, but if one is concerned with how humans actually do what they do, then how the brain actually contributes to these abilities should not be ignored. Furthermore, by focusing on representations at the neural level, it is less likely that one will encounter problems of pictures and viewers that seem to arise from focusing on representations as cognitive entities.

Perhaps an important lesson to learn from the case of sense-data is that we should be less inclined to think of the mind as *consisting* of functionally defined representations and algorithms,

but we should think of it as *interpreted* as such computing devices. That is, the way to avoid some of the problems of sense-data is to avoid insisting that there really are representations in the mind. If mental representations are just ways of describing the activity of the mind, much like providing a computational interpretation/description of any other kind of device (e.g. Fodor's Coke machine (1981) or Searle's computational window (Searle, 1997, p.16)), then there is no concern about mental representations being in the mind. They are just interpretations.

Notes

----

[i] Of course, there are some who argue against the view that human cognition involves representations; for example, van Gelder (1995), Akins (1996) and Stufflebeam (2001). There are also a variety of alternative frameworks emerging for explaining human cognition such as Dynamic Systems Theory and connectionist networks (though whether the latter makes use of representations in some sense is controversial).

[ii] Examples of modern day sense data theorists include Frank Jackson (1977) and Howard Robinson (1994).

[iii] Explanatory patterns like this in psychology are similar to the ones Fodor (1975) appeals to in arguing for accepting an ontology of representations.

[iv] Stufflebeam (2001), however, argues that the user-aspect of representation is flawed as a characterization of representation.

[v] Experiments involving mental rotation seem to indicate that events that take place during imagined shape rotation are very similar to ones that take place during perception of actual object rotation (Shepard & Metzler 1971; Shepard & Cooper 1982). Mental scanning of map images has also been tested and the results used to argue for the use of visual images in at least some cognitive activities (Kosslyn, Ball & Reiser 1978).

[vi] These are enormously important reasons as to why Fodor (1975) argues for a propositional view of representation, the language of thought hypothesis, and will be mentioned in more detail in section 4 of this paper.

[vii] The nature of the entities that perform these tasks, as mentioned, might differ however.

[viii] In revised comments (1952) to the printed form of these lectures, Moore remarks that he should only have referred to the 'patch' as a sense-datum and not its color, size, and shape (Moore 1978).

[ix] Ayer's version of the sense-datum theory is slippery. In The Foundations of Empirical Knowledge, Ayer argues for sense-data but only as a linguistic program. On his view, many of the assumptions at play in the argument from illusion do not establish, factually, that all we ever directly perceive are sense-data. He proposes alternatively that the language of sense-data should be adopted to describe our perceptual experiences because it provides certain benefits and clears up certain ambiguities in reference to our experience. His view seems to be that there is no factual difference between using sense-data language and material object language because there will be no facts to distinguish the one from the other. As Austin points out, this seems to make it appear as if people can use words in any old way they please and that there would not be any question as to the truth or falsehood of any matter. Though Ayer seems to allow that there can be genuine disagreements where empirical facts are at stake, Austin rightly challenges this claim by arguing that for Ayer, empirical facts only refer to sensible appearances (Austin 1962, 60). Indeed, in mentioning some of the benefits of the sense-data language, Ayer seems to commit himself to accepting the existence of experiences with contents, but yet calls into question the existence of

material objects or anything beyond phenomenal appearances "…it is useful for us to have a terminology that enables us to refer to the contents of our experiences independently of the material things that they are taken to present" (Ayer 1955, 26). This quote seems to suggest that Ayer does have some conception of sense-data as real and as more than just some linguistic device.

[x] For example, see Austin (1962).

[xi] Martin (2000) offers a different analysis of the argument from illusion. He suggests that the argument is not for sense-data but is an argument against naïve realism. Martin also develops an interesting discussion of the differences and common ground between direct realists and sense-data theorists which revolves around taking certain assumptions, such as the Phenomenal Principle and its opponent Transparency, as ways of interpreting appearances via introspection. The debate, on Martin's view, becomes one that turns on trying to understand how we can be mistaken about what seems so obvious to us: our awareness of how things appear to us.

[xii] Of course, this analysis of the argument is only damaging if perception is taken to be intentional, but since mental representations are taken to involve some level of intentionality, this type of interpretation can be assumed and applied to a similar argument for mental representations below.

[xiii] Thus, mental representations do not fulfill the first view that Moore attributes to sense-datum theorists, namely, that a sense-datum exists only so long as it is being perceived.

[xiv] Though Fodor argues that thought must be propositional in nature, Rey maintains that his argument leaves open what type of format representations have.

[xv] There are many emerging now. Clark (1997) details many alternatives, though he also thinks there are still important scenarios in which talk of internal representations are important and will likely remain important.

[xvi] Clark (1997) is a wonderful critique, and alternative, of this type of conception of the mind, self and cognition.

[xvii] It becomes even more uncomfortable when one considers pictorial, or analogical, representations. How do pictures play a representing role unless there is someone to look at them?

[xviii] Putnam (1994) makes this same point.

[xix] Though, that is not to say that there is not abstraction, appeals to functional categories, or information processing prevalent in neuroscience.

References

Akins, K. (1996). Of Sensory Systems and the 'Aboutness' of Mental States. Journal of Philosophy 93: 337-72.

Andersen, J.R. (1983), The Architecture of Cognition. Cambridge, MA: Harvard University Press.

Austin, J.L. (1962). Sense and Sensibilia. Oxford: Oxford University Press.

Ayer, A.J. (1955). The Foundations of Empirical Knowledge. London: Macmillan & Co. Ltd.

Bechtel, W., et al. (Eds.). (2001). Philosophy and the Neurosciences: A Reader. Malden, MA:

Blackwell Publishers Inc.

Bechtel, W. (2001). Representations: From Neural Systems to Cognitive Systems. In W.

 Bechtel, et al. (Eds.), Philosophy and the Neurosciences: A Reader (pp.332-348).

Clark, A. (1997). Being There: Putting Brain, Body, and World Together Again. Cambridge,

 MA: MIT Press.

Fodor, J.A. (1996). The Mind-Body Problem. In S.M. Cahn, P. Kitcher, G. Sher & P. Markie

 (Eds.), Reason at Work (pp. 715-729). Fort Worth, TX: Harcourt Brace.

Fodor, J.A. (1975). The Language of Thought. New York: Thomas Y. Crowell Company, Inc.

Grush, R. (1997). The Architecture of Representation. Philosophical Psychology 10: 5-23.

Hume, D. (1962). An Inquiry Concerning Human Understanding. A. Flew (ed.), New York:

 Macmillan Publishing Company.

Jackson, F. (2000). Some Reflections on Representationalism. draft for NYU seminar, 5 April

 2000, posted at nyu.edu/gsas/dept/philo/courses/consciousness/papers/Representationalism

 NYUU5April00.PDF.

Jackson, F. (1977). Perception. Cambridge: Cambridge University Press.

Kosslyn, S.M., Ball, T.M., & Reiser, B.J. (1978) Visual Images Preserve Metric Spatial

 Information: Evidence from Studies of Image Scanning. Journal of Experimental

 Psychology: Human Perception and Performance 4: 47-60.

Martin, M.G.F. (2000). Beyond Dispute: Sense-data, Intentionality and the Mind-body

 Problem. In T. Crane & S. Patterson (Eds.), History of the Mind-Body Problem.

 (pp.195-231). New York: Routledge.

Martinez, M.E. (1999). Cognitive Representations: Distinctions, Implications, and

 Elaborations. In I. Sigel (Ed.) Development of Mental Representation: Theories and

Applications (pp.12-32). Mahwah, NJ: LEA Publishers.

McNamara, T.P. (1999). Single-Code versus Multiple-Code Theories in Cognition. In R.J.

Sternberg (Ed.) The Nature of Cognition. (pp.113-35). Cambridge, MA: MIT Press.

Millikan, R.G. (1989). Biosemantics. In S.P. Stich & T.A. Warfield (Eds.), Mental

Representation: A Reader. (pp.243-58). Cambridge, MA: Blackwell.

Moore, G.E. (1978) Some Main Problems of Philosophy. New York: Humanities Press Inc.

First published in 1953.

Newell, A. & Simon H.A. (1981). Computer Science as Empirical Inquiry: Symbols and

Search. In Haugeland (Ed.) Mind Design (pp.35-66). Cambridge, MA: MIT Press.

Putnam, H. (1994). Sense, Nonsense, and the Senses: An Inquiry into the Powers of the Human

Mind. Journal of Philosophy 91: 445-517.

Ratcliff, R. & McKoon, G. (1978). Priming in Item Recognition: Evidence for the Propositional

Structure of Sentences. Journal of Verbal Learning and Verbal Behavior 17: 403-21.

Rey, G. (1995). A Not 'Merely Empirical' Argument for a Language of Thought.

Philosophical Perspectives, 9, AI, Connectionism, and Psychology, 1995, 9: 201-22.

Robinson, H. (1994). Perception. New York: Routledge.

Russell, B. (1912). The Problems of Philosophy. Oxford: Oxford University Press.

Searle, J.R. (1997). The Mystery of Consciousness. New York: New York Review, Inc.

Searle, J.R. (1994). Intentionality. In S. Guttenplan (Ed.) A Companion to the Philosophy

Of Mind. (pp.379-86). Malden, MA: Blackwell Publishers Inc.

Shanon, B. (1992). Are Connectionist Models Cognitive? Philosophical Psychology 5:

235-55.

Shepard, R.N., & Cooper, L.A. (1982) Mental Images and their Transformations.

Cambridge, MA: MIT Press.

Shepard, R.N., & Metzler, J. (1971). Mental Rotation of Three-Dimensional Objects.

Science 171: 701-03.

Stufflebeam, R.S. (2001). Brain Matters: A Case Against Representations in the Brain.

In W. Bechtel et al. (Eds.) (pp.395-413). Malden, MA: Blackwell Publishers.

Tye, M. (2000). Consciousness, Color, and Content. Cambridge, MA: MIT Press.

Van Gelder, T. (1995). What Might Cognition Be, If Not Computation? Journal of

Philosophy 92: 345-381.