

Does Multiple Realizability Lead to Reductionism?

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[Abstract : The early proponents of functionalism (Putnam and Fodor) have put forward arguments for antireductionism. They argue that mental states are multiply realizable by possibly multifarious physical states. We cannot expect that psychological laws are reduced to the laws of physics in the way envisaged by identity theorists. This argument from multiple realizability has been challenged by Jaegwon Kim. After presenting the argument and Kim's challenge, this paper considers Block's response to Kim. I argue that Block's response is unconvincing and claim that multiple realizability does not lead to antireductionism. In addition, by analyzing Lockean idea of nominal and real essence, I show that the functionalist explanation about the essence of mental states allows the local reduction of mental states to physical states.]

Reductionism is an idea that one theory or phenomenon is reducible to some other theory or phenomenon. The type of reductionism on which metaphysicians and philosophers of mind are mostly interested suggests that all sciences are reducible to physics. In this sense of reductionism, the laws of all of the special sciences like psychology and other higher level sciences are derivable from physics. Type identity theory, or type physicalism, as a form of reductive physicalism claims that mental state types are reducible to physical state types. Hilary Putnam (1967) induces the idea of multiple realizability to refute reductionism and this idea is further developed by Jerry Fodor (1974). Jaegwon Kim (1992) has argued, against Putnam and Fodor, that the idea of multiple realizability does not refute reductionism rather it entails that the mental states of an organism can be locally reduced to its physico-chemical states. This claim is a challenge for the antireductionists who believe in multiple realizability. Ned Block (2008) tries to give an answer to Kim's challenge by introducing the Disney principle and the idea of D properties. By referring to the Disney principle he claims that mental kinds are kinds

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with respect to their D properties. He tries to show that Kim and Fodor both are mistaken in considering a mental property to be nomically coextensive to a heterogeneous physico-chemical disjunction. He claims that this sort of disjunctions is not completely heterogeneous. My aim is to examine Block's arguments in response to Kim, and defend that the multiple realizability leads to reductionism.

1.1. Multiple Realizability:

The concept of multiple realizability is understood in various ways. Generally, a kind (property, type, activity, etc) is multiply realizable if there are many different ways for things to be of that kind. For example, we can define a table by saying that it is a piece of furniture with a flat top and one or more legs, providing a level surface on which objects may be placed. But, there are different tables of different sizes, colors and heights – some are square in shape and some are round, some are wooden and some are made of metals, and so on; in spite of various differences we call them "table". The concept of "table" is multiply realizable – tables are different in shapes, colors and heights, but they all have 'a flat top supported by one or more legs and they can serve the same purpose'; all tables are the realizers of this concept. In the architectural domain 'being realized' means 'being embodied'. In this sense, a blueprint of a building is realized by that particular building and the building is the realization of the plan. In the case of chess, all games of chess are realized by some physical system or another. But "checkmate" can be realized in different ways – by the arrangement of wooden pieces on board or by electronic impulses in a computer.

The multiple realizability thesis about the mental claims that the same mental activities are realized by different physical systems. This claim has got inspirations from the observation that a single computer program can perform the same computation in various computers (Bechtel and Mundale, 1999).

This observation leads to the thought that a mental state is realized by many different organisms. For example, pain as a mental state is realized by various organisms like humans, octopuses, Martians, and so on. It is also possible that a mental state is differently realized within a species – pain in a person X is different than pain in person Y, and so on. This intuition about multiple realizability of mental states plays a crucial role in refuting the psycho-neural identity theory. In the following section we will discuss briefly about the multiple realizability argument, introduced by Hilary Putnam (1967) and developed by Jerry Fodor (1974), against reductionism.

1.2. The Multiple Realizability Argument for Antireductionism:

We have mentioned before that reductionism in philosophy of mind claims that psychology is reducible to neuroscience. According to E. Nagel's (1961) derivational model a theory T is reducible to another basic theory T* if and only if the terms of T are definable in terms of T*, and the laws of T are explainable by the laws of T* plus definitions. This model requires "bridge laws" which provide the essential reductive links between the vocabulary of the theory targeted for reduction and that of the base theory, and thus enable the derivation of the target theory from its reducer. These bridge laws are considered to have a biconditional form. They relate each primitive predicates of a theory to be reduced to a nomologically coextensive predicate in the base theory. Therefore, to determine what bridge laws are needed to reduce a theory T to another base theory T*, we need to know how the predicates of these two theories are related to each other.

To reduce psychology to more basic science like neuroscience, we need to derive the laws of psychology from the laws of neuroscience. Since the vocabulary of neuroscience does not include the terms and predicates of psychology, bridge laws are required to relate the psychological terms and predicates with the terms and predicates of neuroscience. According to Nagel's derivation model the reduction of psychology to neuroscience will have the following form:

- 1) $M_1x \rightarrow M_2x$
- 2a) $M_1x \leftrightarrow P_1x$
- 2b) $M_2x \leftrightarrow P_2x$
- 3) $P_1x \rightarrow P_2x$

In this formation (1) is considered as a law of psychology and M_1 and M_2 are psychological predicates; (3) refers to a law of neuroscience and P_1 and P_2 are predicates of neuroscience. (2a) and (2b) are the bridge laws which connect the predicates of psychology with the predicates of neuroscience.

The bridge laws which relate the psychological terms and predicates to the terms and predicates of neuroscience are empirically supported principles. For example, "pain occurs *iff* Cfs occurs" is an empirical statement which describes the correlation between a mental state term pain and a physical state term C- fiber firing. There is infinite number of mental states which are correlated with some particular physical states. The problem is that these kinds of correlations are not explainable in terms of more basic physical laws as the term pain does not appear in physical-biological laws. It means that we have to consider all such correlations as 'brute' facts to reduce psychology to neuroscience. To

get rid of these problems regarding correlations between mental state terms and physical state terms, one might move from psycho-neural correlations to psycho-neural identities. Instead of saying pain is correlated with C-fiber firing we may say pain is identical with C-fiber firing.

1.2.1. Putnam's Version of the Multiple Realizability Argument:

Hilary Putnam in his paper "Psychological Predicates" (1967) has argued against psycho-neural identity theory by introducing the idea of multiple realizability of mental states. He claims that mental states are realized by various different organisms and physical systems, and they are not reduced to any particular physical-chemical states. For example, pain as a mental state is not reduced to a brain state; there are many different pain capable organisms and physical systems which do not have a brain like ours. He maintains that if the identity thesis is true then there is a specific physical-chemical state such that any organism (not only humans or mammals) is in pain if and only if (a) it possesses a brain of a suitable physical-chemical structure and (b) its brain is in that physical-chemical state (1967, p-436). It means that the physical chemical state in question is a possible state of a mammalian brain, a reptilian brain, a mollusc's brain and so on; and it is not possible for this particular brain state to exist in any possible physical system which is not capable of feeling pain. But pain is realized by various different organisms which are not similar to neural-physical structures. Pain as psychological predicate can be applied to mammals, reptiles, molluscs, and so on, but the physical-chemical correlates of pain are different across all pain capable organisms. Since pain and other mental states are realized by various different organisms with different physical structures, mental state types are not identical to any specific physical state type. Putnam's multiple realizability argument can be described in the following simple form:

1. All mental state types are multiply realizable by distinct physical state types. (the multiple realizability thesis)
2. If a given mental state type is multiply realizable by distinct physical state types, then it cannot be identical to any specific physical state type.
3. No mental state type is identical to any specific physical state type. (the anti-identity thesis)

1.2.2. Fodor's Version of the Multiple Realizability Argument:

Fodor in his paper "Special Sciences" (1974) has argued that classical reductionism – the view that all events which fall under the laws of any science are physical events and hence fall under the laws of physics – is not required for the unity of science. He maintains that each and every

special science has its own vocabulary and laws, and “reducibility to physics” imposes a constraint upon the acceptability of theories in the special sciences. The consequence is that “the more the special sciences succeed, the more they ought to disappear”. In place of reductionism, he suggests identity conditions to support the token-physicalist which claims that an event in special sciences is a physical event and thus he tries to justify the unity of science. To support his claim, he tries to show that we need not to accept type physicalism or reductionism to be a token physicalist. In contrast with type physicalism, token physicalism holds that psychological types and properties are not neural-physical types, but each individual token psychological event (for example, the particular pain I am feeling now) is in fact a neural event. If we consider token physicalism to be true, it will not infer the truth of reductionism; reductionism is not a necessary condition for token physicalism.

Let us assume that S is a special science and is reducible to physics. According to Nagel’s model of reduction to reduce S to physics, we need to derive the laws of S from the laws of physics. Let (1) $S_1x \rightarrow S_2y$ be the law of S and S_1 and S_2 are the predicates of S; and (2) $P_1x \rightarrow P_2y$ be the law of physics in which P_1 and P_2 are the predicates of physics. Since, S_1 and S_2 are not predicates of physics we need bridge laws: a) $S_1x \leftrightarrow P_1x$, b) $S_2y \leftrightarrow P_2y$, to relate the predicates of S to that of physics. The bridge laws specify the coextensions between the reduced and the reducing sciences.

By using the example of Copernicus-Gresham’s law, Fodor tries to explain the difficulty within the reduction of special sciences to physics. A successful reduction of Copernicus-Gresham’s law involves a generalization that covers disjunction of many events which have nothing common in their physical descriptions. For example, some events of monetary exchange involve dollar bills, some involve writing your name on a check, and some involve strings of money and all these events share nothing common under their physical descriptions (1974, p-103). That is, there is no physical predicate which is co-extensive with “being a monetary exchange”. But according to Fodor,

[...] reductivism claims not only that all natural kinds are co-extensive with physical natural kinds, but that co-extensions are nomologically necessary: bridge laws are laws. So, if Gresham’s law is true, it follows that there is a (bridge) law of nature such that ‘x is a monetary exchange \leftrightarrow x is P’, where P is a term for a physical natural kind. (1974, p-104)

It seems really impossible that P would have to cover not only all the systems of monetary exchange that there are, but also all the

possible systems of monetary exchange. Thus Fodor claims that there can be no physical predicate which is a candidate for P in 'x is a nomologically possible monetary exchange iff P_x'. Therefore, he concludes that economics is not reducible to physics (1974, p- 104).

After proving the irreducibility of economics to physics, Fodor moves to psychology. He maintains that there is nothing special in the irreducibility of economics. The reasons why economics is not reducible to physics, according to him, are paralleled by those which suggest that psychology is unlikely to reduce to neurology. Fodor claims that, for psychology to be reducible to physics, each psychological natural kind predicate that exists should have a co-extensive neurological natural kind predicate, and the generalization which would state this co-extension should be considered as a law (1974, p-104). He gives two distinct arguments showing that psychology is not reducible to neurology. He claims that there may not be a lawful relationship between brain states and psychological states, or at least any relationship that can be precisely expressed as a law that would reduce psychology to neurology. He represents three reasons to support his claim:

- a) There are no firm data for any but the grossest correspondence between types of psychological states and types of neurological states.
- b) It is entirely possible that the nervous system of higher organisms characteristically achieves a given psychological end by a wide variety of neurological means.
- c) If we consider the assumption that every psychological event is a physical event to be true, it will not help us to claim that the natural kind predicate of psychology are co-extensive with the natural kind predicates of any other discipline (including physics). (1974, p-105)

Fodor's second argument is based on the concept of multiple realizability. It claims that even if there are neurological natural kinds co-extensive with psychological natural kinds, such co-extensions can't be lawlike. For, it seems likely that there are nomologically possible systems other than organisms which satisfy no neurological predicates but satisfy natural kind predicate in psychology. From these two arguments Fodor comes to the conclusion that psychological kinds are irreducible to physical kinds. (1974, p-105)

Fodor maintains that if the predicates of special sciences are reducible to the predicates of basic sciences, like physics, then it will undermine the unity of sciences. He claims that [...] there is an open empirical possibility that what corresponds to the natural kind

predicates of a reduced science may be a heterogeneous and unsystematic disjunction of predicates in the reducing science, and we do not want the unity of science to be prejudiced by this possibility. (1974, p-108)

He explains this claim by constructing a reduction schema of following form:

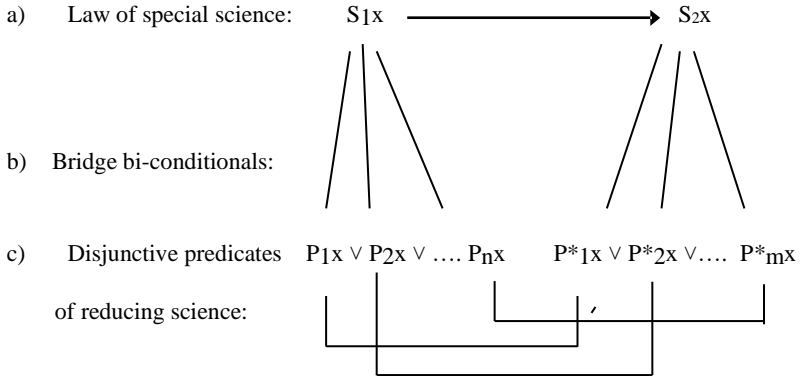


Figure 1: Fodor's schema of reduction

$S_{1x} \rightarrow S_{2x}$ is a law of the special science and S_1 and S_2 are the predicates of special science, since they are multiply realizable, the bridge laws may be of the following form: $S_x \leftrightarrow P_{1x} \vee P_{2x} \vee \dots P_{nx}$, and $S^*_x \leftrightarrow P^*_{1x} \vee P^*_{2x} \vee \dots P^*_{mx}$. According to Fodor, ' $P_{1x} \vee P_{2x} \vee \dots P_{nx}$ ' and ' $P^*_{1x} \vee P^*_{2x} \vee \dots P^*_{mx}$ ' are not natural kind predicates in the reducing science, because these predicates are disjunctive. He holds that a universal generalization can be qualified as a law statement if the predicates which constitute its antecedent and consequent are of natural kinds. Since, the predicates that appear in the bridge laws are disjunctive, not natural kind predicates, at least some bridge laws are not laws according to Fodor's characterization (1974, p-108). It means that the laws of special science are not explainable by the laws of lower-level science as the derivation laws or bridge laws involved in that derivation are heterogeneously disjunctive and they are not lawlike. If the bridge statements are not lawlike, it would not be possible to claim that every event which consists of the instantiation of an S predicate is identical with some event which consists of the instantiation of a P predicate; that is reductionism would lose its strength. Fodor suggests that bridge statements do not express the correspondences between the natural kind types of the reduced and the reducing science; rather they express true token identities (1974, p-110).

Moreover, if we consider the taxonomies of the special sciences to correspond to the taxonomy of physics then the laws of special sciences will be exception less (if the laws of basic sciences are exception less). As a result the generalizations of special sciences will turn to be trivial and special sciences will lose their significance as autonomous science. But if we consider the laws of special sciences are not exception less, then we have to accept that bridge laws are also not exception less. That is, given the reductionist model, we cannot consistently assume that the bridge laws and the basic physical laws are exception less, while assuming that the laws of special sciences are not exception less.

1.3. Kim's Arguments:

In his paper titled "Multiple realizability and the Metaphysics of Reduction" (1992), Jaegwon Kim has argued that the concept of multiple realizability does not help to establish psychology as an autonomous science rather it seriously compromises the disciplinary unity of psychology as a science. Multiple realizability of mental states does not entail the irreducibility of mental states to neural states rather there is an inherent indication that mental states of an organism are locally reduced to its physico-chemical states.

According to Putnam, a mental state like pain is realized by infinitely many different physical organisms and therefore pain is realized by a single neural kind N . There is a multiplicity of neural-physical kinds for pain- may be N_r realizes pain in reptiles, N_h realizes pain in humans, N_m realizes pain in Martians and so on. Therefore, it is not possible to define one single neural basis of pain that could realize pain across all types of pain capable organisms. Kim proposes that if pain is realized by a single neural correlate across different organisms then we can consider the possibility of realizing pain by different physical correlates of pain in different systems. In other words, we can consider the realizability of a mental state among the different mechanisms of a single system. For example we may consider pain in humans is reducible to N_h , Pain in reptiles is reducible to N_r , Pain in Martians reducible to N_m and so on. It means that we can take the disjunction, $N_h \vee N_r \vee N_m$, as the single physical substrate of pain. But Fodor, as we have discussed before, has argued that this kind of disjunctions cannot be allowed as they are not qualify as a kind which is occurred in a law.

Kim identifies Fodor's argument for disallowing disjunction is dependent on the following two assumptions:

1. To reduce a special-science theory T_M to physical theory T_P , each "kind" in T_M (presumably, represented by a basic

predicate of T_M) must have a nomologically coextensive “kind” in T_p ;

2. A disjunction of heterogeneous kinds is not itself a kind. (1992, pp-8-9)

Kim shows that if we disallow disjunctions on the basis of Fodor’s argument then we have to consider pain and other mental states, which are multiply realizable as non-scientific kinds. He focuses on the “Physical Realization Thesis”- the conjunction of the restricted correlation thesis and a corollary belief, which is accepted by many functionalists (Kim mentions Fodor as a proponent of this thesis). The Physical Realization Thesis states the following:

[...] pain, or any other mental states, occurs in a system when, and only when, appropriate physical conditions are present in the system, ... significant properties of mental states, in particular nomic relationships amongst them, are due to, and explainable in terms of, the properties and causal nomic connections among their physical “substrates”. (1992, p-14)

Based on this thesis Kim (1992, p-14) argues that if the property N has a disjunctive definition, $N_h \vee N_r \vee N_m$ which is considered as heterogeneous disjunction, then N is a nonnomic property; and since pain is nomically equivalent to N , pain itself is equally heterogeneous and nonnomic as N .

If we consider N_h , N_r and N_m as a heterogeneous lot and try to resolve the problem by introducing a general notion N then we have to accept that what is true for the case of human pain is also equally true for the pain instances in reptiles and Martians. Let us consider a possible law which states that, “Pain causes anxiety reactions” and it passes the projectibility test in humans. According to Kim, we cannot claim that this law will also hold for reptiles and Martians if we accept the Physical Realization Thesis that psychological regularities hold in virtue of the causal-nomological regularities at the physical implementation level. Because the brain states of reptiles and brain states of Martians are not similar to the brain states in humans. It means that the general notion N is not considered as a replacement of heterogeneous disjunction like $N_h \vee N_r \vee N_m$.

The problem with defining N in terms of the disjunction of N_h , N_r and N_m is that the instances fall under N_h , N_r and N_m is different according to the Physical Realization Thesis. As humans, reptiles and Martians are supposed to have different physical structures, the physical correlates of

pain in those systems are supposed to be different. It means that there is no similarity between the predicates denoted by N_h , N_r and N_m and thus there disjunction is considered to be heterogeneous. Therefore if pain is equivalent to N which is defined by the heterogeneous disjunction $N_h \vee N_r \vee N_m$, pain will be considered as equally heterogeneous and nonnomic.

Kim claims that functionalists might try to hide the disjunctive nature of pain by considering pain as a second order property. Second order properties consist in having a property with a certain functional specification. Pain is a second order property in the sense that it is the property of having some property with a certain specification in terms of its typical causes and effects and its relation to other mental properties. If pain is considered as tissue damage detector then in a certain organism if something causes tissue damage then it will activate the pain mechanism in that particular organism which will cause escape behavior in normal situations. Let us call the functional specification "F". According to the concept of multiple realization there is more than one property that meets the specification F. Thus, if N_h , N_r , and N_m all satisfy the specification of F, the property of having pain is nothing other than the property of having N_h or N_r or N_m - that is the disjunction of $N_h \vee N_r \vee N_m$. It means that the construal of mental properties as second order properties will in general turn out to be the disjunctions of their physical realization bases. Therefore, if we define $N_h \vee N_r \vee N_m$ as heterogeneous and unacceptable, then we cannot consider pain to be a scientific kind. (1992, p- 15)

It is clear from the above discussion that the nonnomicity of N leads to nonnomicity of pain. Now, it seems that Fodor's argument for proving the irreducibility of higher level kinds – mental kinds, to lower level kinds – physical kinds, and his attempts to establish psychology as an autonomous science is in vain. If mental properties are not of nomic kind then laws cannot be formulated in terms of these properties. Therefore mental predicates which are multiply realizable will not be able to enter into any scientific theory that formulates causal laws and causal explanations. It means that if we accept the notion of multiple realizability of pain then there will be theories of pain in human, pain in reptiles and pain in Martians but no unified theory of pain that will include all pains across all pain capable organisms. It seems that the idea that psychology cannot be a science with a unified subject matter, is hidden in Multiple Realization based antireductionist argument, though it tries to establish the view that psychology is an autonomous science. (1992, pp-16-17).

Kim argues that mental kinds are not causal kinds and therefore they cannot qualify as proper scientific kinds. If we consider the Principle of Causal Individuation of Kinds – the view that “objects and events fall under a kind, ..., insofar as they have same causal powers”, then we have to agree that N_h , N_r and N_m , which are heterogeneous as kinds, to have different causal powers and enter into different causal laws. It means that as pain is realized in different physical organisms, pain itself cannot show a unique causal power than the disjunction of $N_h \vee N_r \vee N_m$ (1992, p-17). To make the point clear, let us consider a mental state M which is multiply realized by different systems. Instances of M realized by a particular physical system should be grouped under one kind as they have the same physical base and instances of M realized in different physical system should be grouped under distinct kinds as their physical bases are distinct. Therefore, M cannot be considered as a causal kind as it has different physical base i.e. it is realized by different physical causal kinds. Thus Kim (1992) claims that as mental kinds are not causal kinds, they cannot qualify as proper scientific kinds.

To sum up, According to Kim the conception of multiple realization involves the entailment that if psychological kinds are multiply realized then psychology itself is also multiply realized. He claims that “If physical realizations of psychological properties are a ‘wildly heterogeneous’ and ‘unsystematic lot’, psychological theory itself must be realized by an equally heterogeneous and unsystematic lot of physical theory” (1992, p-20). In this sense we can consider scientific psychology to be species specific.

1.4. Block’s Response:

In his paper “Anti-reductionism Slaps back” (2008), Ned Block argues that Kim’s view regarding heterogeneous disjunctions and kinds are based on notion of projectibility. According to Kim (1992), kinds are projectible properties. Heterogeneous disjunctions are not projectible, therefore they are not kinds. From this “kind- heterogeneous disjunction” distinction, Kim (1992) argues that as pain is nomically coextensive with a heterogeneous physico-chemical disjunction, either both pain and heterogeneous disjunction are kinds, or neither pain nor the disjunction is a kind. If we consider the first alternative- both pain and heterogeneous disjunction are kinds, to be right then the multiple realizability argument against reductionism has no merit. Because the bridge law that associates pain with the disjunction links a kind to kind, thus it neutralizes Putnam-Fodor objection to reductionist claim that pain is reducible to the disjunction. Again, if the second alternative is right that is pain and

disjunction both are non-kinds, then pain cannot be qualified as a scientific kind and there could be no genuine science of pain or thought. Thus it can be said that as properties of psychology are multiply realizable they are not kinds at all and there is no genuine multiply realizable sciences.

Block tries to defend the autonomy of psychology and other multiply realizable sciences. He claims that Kim and Fodor is wrong in claiming that mental kinds are nomically coextensive with “completely heterogeneous disjunctions” of physico-chemical properties. His point is that these disjunctions are not completely heterogeneous. He represents that there are two kinds of different properties, namely design properties or D properties and realization properties, and with respect to these two properties a disjunction is considered as completely heterogeneous or as less heterogeneous. According to Block, a disjunction is considered as heterogeneous, even in a lesser degree, with respect to realization properties and far from it with respect to design properties. Therefore whether a disjunction is considered as a kind or not is defined differently in terms of these two properties. Let us consider Blocks argument in detail.

Block gives an example from Disney movies where teacups think and talk but in the real world we cannot consider teacups to be thought capable. Anything that can think, in the real world, needs more structure than a teacup, since what properties should be attributed to a thing is decided by the laws of nature. As Block says, “We might call this the Disney Principle: that laws of nature impose constraints on ways of making something that satisfies a certain description” (2008, p-120). We can consider a single computer program to be realized by a vast variety of computers which are different physically. But we cannot think that the function of mental is realized by a vast variety of different organisms. Very few systems can evolve the function of mental and even if they are multiply realized, laws of nature may impose constraints on it (According to Block these natural constraints concern the physical structure of realizations of thinking but it is possible that there might be abstract constraints at other levels). It means that we cannot impose the property of thought or mentality on a huge number of organisms as it is realizable by very few organisms which have the specific characteristics of being thought capable, which are selected by nature. It means that there is certain similarity among the thought capable organisms in terms of those specific characteristics the presence of which allows them to be capable of thought. What does it mean? According to Block it means that “constraints impose similarities” and reductionists ignored this fact by claiming that multiple realizability

allows completely heterogeneous realizations (2008, p-121). I have a disagreement with Block in this regard on which I will focus on section 1.5.

Block claims that, beside natural constraints, there are other forces, like natural selections, learning, conscious design etc, which are expected to produce similarities. To explain how natural selections can produce similarities he has considered the structure of the eye – it is more or less similar in various organisms. For learning, he has given the example of the understanding of fractions – the idea of fractions can be taught in various ways but it will produce the same understanding. Pens are designed to have the same properties though there is huge difference in materials and principles of operations. But Block claims that these types of forces are not able to produce deep scientific similarities or similarities at all level of realization and design. For example natural selection can impose similarities only at the level of functioning while evolution and learning impose similarity at the more superficial level. According to Block, the Disney Principle indicates similarities at all levels (2008, p-122). He explains this with an example of making an eye. It involves constraints not only on the design level but also at the realization level. At the design level we need to consider that it is designed to perform some specific job, for example seeing something, and in the realization level making of an eye requires some materials which are transparent enough to transmit light without destroying much information. Therefore, it is reasonable to expect less than total heterogeneity at both levels as both of these levels involve some natural constraints. Since evolution enforces similarity only at the design level, variations are mostly expected at the realization level rather than at the design level. And for this reason multiple realization is expected.

Block (2008) suggests that special science properties are divided into two types: those that are selected and those due to peculiarities of the realizations. He has mentioned “ghost” of past pains (Aerodotalgia), having touch sensation on amputated hand when amputee’s cheek has been touched (hand/cheek phenomenon), as examples of properties that is a peculiarity of realization. These properties are called realization properties. On the other hand properties that are the product of selection (may be evolutionary), learning and design – in conjunction with the Disney Principle, are called D properties. Block has mentioned a scientific generalization for perception which states that “Stimulus generalization curves fit the Shepard description” as an example of D property. It is expected for the next evolved creature to have the same D property.

Block claims that, Kim is right about realization properties that they are not scientific kind, but he is wrong about D properties. Stimulus generalization is a property of perception and it is common to many different creatures, that is, this property is multiply realizable. Though perception is multiply realizable, it is a kind – it has a D property. I believe that stimulus generalization as a property of perception does not necessarily entail the homogeneity of perception across all possible organisms. That is the presence of D property does not necessitate kindhood. I will discuss the reasons behind my assumption in section 1.5.

Block's view of projectibility also involves the notion of these two properties, namely realization property and D property. In a particular case different strength of projectibility is expected with respect to different types of properties. For this reason whether a property or a disjunction of properties is a kind or not is also relative. He suggests that mental kinds project more to D features than to realization features.

Since kindhood is relative to the degree of projectibility, pain and the physico-chemical disjunction, which is nomically equivalent to pain, are either kinds or non-kinds with respect to the degree of projectibility. But does the relative nature of kind helps to prove the impossibility of reduction? Is this claim, that kinds are relative, sufficient to prove Kim's idea of kinds to be mistaken or to establish the autonomy of psychology? I will argue that Block's arguments against Kim regarding the nature of kinds are not strong enough to convince us to think that kinds are relative. Even if we consider that his claim that kinds are relative to be acceptable in some sense, it is not capable of refuting Kim's argument against the autonomy of psychology as a science.

1.5. Evaluation of Block's Response:

Let us consider the Disney Principle first. There is no disagreement that "laws of nature impose constraints on ways of making something that satisfies a certain description" (2008, p-120). Properties of mentality are not attributed to those organisms that do not have certain characteristics or structures to have mentality. We need laws of nature to distinguish a sort or a type from other sorts or types. Differences between types entail similarities among the instances of a certain type. Let us assume that type A is different than type B and that there are laws by which the differences between type A and B are explainable. Instances of type A are X_a , Y_a and Z_a , and instances of type B are X_b , Y_b and Z_b . It is obvious that the instances of type A- X_a , Y_a and Z_a are different than the instances of type B- X_b , Y_b and Z_b . But similarities (not identities) are expected among and within the instances of type A as they belong to the same

type, that is we can expect similarities among X_a , Y_a and Z_a – for example, they all may have some common characteristics by virtue of which they fall under the same type, namely type A. In the same manner we can expect similarities (not identities) among X_b , Y_b and Z_b as they all belong to the same type, namely type B. Therefore it can be claimed that “constraints impose similarities”. Up to now there is no disagreement with Block at this point.

Now let us assume that M denotes a mental type and it is realizable by type A and type B (type M is different than type A and type B but these types are considered to realize type M). Type A realizes M in terms of its physical base A_p and type B realizes M by means of its physical base B_p . As we have seen before that type A and type B are different, it can be claimed that A_p and B_p are also different. As A_p is the physical base in A that realizes M then instances of A- X_a , Y_a and Z_a also realize M in terms of A_p and the instances of B- X_b , Y_b and Z_b realize M in terms of B_p . Now, if we want to define M in terms of its realizations among type A and type B then we have to define M by the disjunction of the physical base of both type A and type B, that is A_p and B_p - which involve different realizations of M among type A and type B. In other words M will be nomically equivalent with the disjunction of $A_p \vee B_p$ according to the physical realization thesis (that we discussed before while examining Kim’s arguments). But is there any reason to think that this disjunction is homogeneous? Given that A and B are two different kinds and the difference is defined by laws of nature, the instances of type A and type B are also different, and M is realized differently by the physical bases of A and B, namely A_p and B_p which are different, it seems quite obvious that the disjunction of $A_p \vee B_p$ is heterogeneous not homogeneous.

We can consider the example of multiple realizability of pain in this regard. I will analyze the same example that has been given by Kim (1992). Let us consider N be neural states which realize pain. As pain is multiply realizable we have to specify a neural state for each pain capable organism to realize pain. Let us consider N_h to understand pain in humans, N_r to understand pain in reptiles, N_m to understand pain in Martians (there can be infinitely many pain capable organisms). If we want to define N as a property or a type then we have to define it by disjoining N_h , N_r , N_m . But are they same neural states? In humans N_h is C-fiber stimulation, in reptiles N_r might denote some different stimulation mechanism and in Martians N_m might denote some mechanism that is different than in humans and in reptiles. That is N_h , N_r and N_m do not denote similar neural states. We can think about the matter from a different perspective: let us consider a law that “pains cause escape behavior” and this generalization has been well

confirmed for humans. Should we expect this generalization will also hold for Martians? If we accept the physical realization thesis that psychological regularities hold in virtue of the causal–nomological regularities in the physical implementation level then we have to agree that the generalization mentioned above will not hold for Martians as humans and Martians are different organisms with different physical structures. Therefore we cannot claim that though N_h , N_r and N_m all are pain realizing mechanism but they are not similar regarding their various properties. They involve heterogeneity at design level as well as in realization level. It seems obvious that disjunctive definition of N involves heterogeneous disjunction, that is $N_h \vee N_r \vee N_m$ is a heterogeneous disjunction.

However if we consider only human pain N_h then we will have homogeneous disjunction. Let us assume that N_{hj} realizes pain in Jack, N_{hm} realizes pain in Maria and N_{hl} realizes pain in Lisa given that Jack, Maria and Lisa are humans. If we want to define N_h then we will have a disjunction of N_{hj} , N_{hm} and N_{hl} . They all are the instances of c-fiber stimulations, that is they all have a similar realization base and if we consider something to be true for Jack's pain then it is likely to be true for pains in Maria and Lisa as well. For example, if pains cause escape behavior under normal conditions in humans then this generalization is likely to cover pain instances in Jack, Maria and Lisa. The disjunction of N_{hj} , N_{hm} and N_{hl} can be considered as a homogeneous disjunction and this kind of disjunctions tends to pass the projectibility test.

From the above discussion it can be said that if we consider a kind (or a type or a property) to be realizable by various different organisms then the disjunctive definition of that kind (or a type or a property) is heterogeneous and hence cannot be considered as a scientific kind.

According to Block, D properties are properties "... that are the product of channeled selection, learning and design- in conjunctions with the Disney Principle..." (2008, p. 124). He has considered stimulus generalization as a D property of perception common to many creatures that differ in their realization of perceptual systems. He maintains that perception is a scientific kind and that it is multiply realizable. Thus he argues that Kim is wrong in claiming that kinds that are multiply realizable are not scientific kinds. The basis of Kim's claim is that multiply realizable properties involve heterogeneous disjunction and that sort of disjunctions are not projectible and therefore multiply realizable properties are not kinds.

Block maintains that what all perception mechanisms have in common is that they all play the same role in different organisms.

Perception mechanisms in a certain group of organisms are supposed to be the same as they are the result of channeled selection in the evolutionary process. Therefore it is expected that the common properties i.e. D properties of a perception mechanism involved in a group of the same type of organisms is expected to be present in the next evolved creature of that particular group of organisms. It might seem plausible that perception, among all organisms of a certain group, is a kind, as it involves stimulus generalization (D property) as a property among all creatures of that certain group. In a certain group of organisms the perception mechanism is the result of the same evolutionary process. Human perception system is the product of channeled selection in the evolutionary process of humans. As evolution moves towards a certain channel, 'the result of evolutionary selection' for a certain group of organisms will be different than that of another distinct group of organisms. It may not be the case that perception mechanism is the same in all different organisms; rather different organisms have developed different perception mechanisms according to their need, even they perform the same task. Let us consider pain mechanisms that detect tissue damage in different organisms. Different organisms have developed different mechanisms for detecting tissue damage in those organisms. For example, in humans tissue damage is detected by C-fiber stimulation, in octopuses tissue damage might be detected by some other pain mechanism, say N-fiber stimulation and so on. All pains in humans and octopuses have the same property in the sense that they detect tissue damage. But the mechanisms that work behind detecting tissue damage in humans(C fiber firing), is different than the pain mechanisms in octopuses (N fiber firing), that detect tissue damage in octopuses. Both octopuses and humans have pain mechanisms that perform the same function of detecting tissue damage, but the D property (which is the product of channeled selection in humans in conjunction with the Disney principle) of pain mechanisms in humans and the D property (which is the product of channeled selection in octopuses in conjunction with the Disney principle) of pain mechanisms in octopuses are quite different in their physical-chemical structures. Similarly all perceptions as a mental kind may perform the same role but their realization in different organisms involves differences in their physical bases. If we try to define perception in general then we will get disjunctions of different perceptions in different organisms. Thus, perception (in general as a mental phenomenon) which is multiply realizable involves heterogeneous disjunction and perception cannot be considered as a scientific kind.

According to Block, whether a property or a disjunction of properties is a kind or not is relative in terms of projectibility of that property or properties. “A and B are projectible if finding of an A that it is a B gives one some – even if very small – justification for believing that the next A is a B” (Block, 2008, p- 113). He maintains that the disjunctions of physical states nomically coextensive with pains or thoughts are kinds relative to projection to D properties of psychology. Let us consider the examples of pain discussed before. What can be considered as the D property of pain or D property of perception? What is fixed by channeled selection in all pains or all perceptions? What is common in psychological states like pains that are multiply realizable? As we have seen before what is common in all human pains is that they are all C- fiber stimulations which can be considered as D property of human pain that are result of channeled selection in conjunction with the Disney principle. Again, for all octopus pain there might be some different pain mechanism common in all pain instances in octopuses. Now, what will be the D property of all pains in general? Is there is any common mechanism for all pains that is the result of channeled selection in conjunction with the Disney principle? If we consider pain as multiply realizable then there are different pain mechanisms in different pain capable organisms which are the result of channeled selection in conjunction with the Disney principle in different organisms. That is psychological states like pains which are multiply realizable do not have any D property in common. What is common in all pains is just their functional role but the definition of their functional role again involves heterogeneous disjunction as the functional role is multiply realized by vastly different pain capable organisms. If a psychological state is multiply realizable then it does not have any property like D property that can be universalized over all different instances of that particular psychological state in different physical realizers of that state. It seems that psychological states do not have any D property and thus the issue of kinds being relative in terms of projectibility of properties becomes irrelevant. As psychological kinds are multiply realizable and their definitions involve heterogeneous disjunction, psychological kinds cannot be considered as scientific kinds.

Now let us consider the issue of reducibility of psychology to more basis sciences and relative nature of kinds. Though, we have just seen that, the issue of kinds being relative becomes irrelevant in the considerations of psychological properties as they do not have D properties but for the sake of discussion let us assume that kinds are relative. Does the relative nature of kinds helps to prove the irreducibility of mental kinds? Let us assume that pain as a mental state is nomically coextensive with a

physico-chemical disjunction which is heterogeneous. If pain is a kind then it cannot be identical to a nonkind like a heterogeneous disjunction. And if pain is identical to a nonkind then pain itself is a nonkind. If pain is a nonkind then it cannot be considered as a scientific kind and thus psychology will lose its autonomy as a science. On the other hand, if pain is a kind then the heterogeneous disjunction which is considered as nomically coextensive with pain should be considered as kind. It seems that the objection, which has been raised by Putnam and Fodor against reductionism, loses its merit. Block has tried to give a solution to this dilemma for the antireductionists by introducing the idea of D properties so that the physico-chemical disjunctions can be considered as homogeneous not heterogeneous. But the psychological states are in general multiply realizable and for this reason they do not involve D properties. It is impossible to design a universal property to be realized by all different organisms. We cannot conceive a property which is the product of channeled selection in all different organisms—evolution in a certain sort of organisms moves towards a certain channel and we cannot expect a universal channel to explain evolution across all sorts of organisms. Therefore, we cannot expect physico-chemical disjunctions that are nomically coextensive with a mental property to be homogeneous.

1.6. Real vs. Nominal Essence:

But still one might ask the question why we should consider the physico-chemical disjunctions to be heterogeneous if they are instances of a same mental state. If pain is equivalent with the disjunction of pain instances in all possible pain capable organisms then they all are the instantiations of the same mental state pain; and thus one might claim that this disjunction is homogeneous. To deal with this sort of claim we can analyze the concept of pain.

Let us start with the question what makes a pain a pain? As we know pain is realized by the vast variety of species with completely different physical structures, it gives rise to the question whether there is anything common among all these realizations of pain. One possible answer might be that they are all realizations of the same mental state “pain”. Then, one might ask the question, “what is common in all pains?” or what the essence of pain is. We can get various different types of answers regarding this question. Since we are considering pain along with the concept of multiple realization, a functionalist definition of pain will be better suited for our purposes.

Functionalists try to explain the meanings of mental terms in terms of inputs, outputs, and connections to other mental terms.

According to this view, mental properties are second order properties. For example, pain is the property of having a property with a certain functional specification in terms of its typical causes (inputs) and effects (outputs) and its relation to other mental states. Thus, it can be said that what all pains have in common is the causal functional role they play in different organisms. If N_h is pain in humans and N_m is pain in Martians then what is common in N_h and N_m is they play the same causal functional role. It seems that this explanation is acceptable not only among the functionalists, especially those who believes in multiple realization, but also among reductionists who holds that a mental state in a particular organism is reducible to a certain physical state in that organism, that is mental states are locally reducible. But this explanation suggests that pain or other mental states do not have anything intrinsic in them, they are only functional kinds. That is they have only nominal essence. To have a clear idea about the nature of mental kinds as functional kinds we need to focus on these two technical terms; real essence and nominal essence.

John Locke, in his famous book *An Essay Concerning Human Understanding* (1689) introduced the terms “real essence” and “nominal essence”. According to him, real essences are the basic constitutions which cause the observable qualities of the substances, and the nominal essences are the abstract ideas that constitute the definitions of species or genera [Locke, 1689 (II, xxxi, 6)]. To understand the idea clearly we have to focus on his idea of substance. He holds that the quality of substance is “the power to produce any idea in our mind” [Locke, 1689 (II, viii, 8)]. Qualities of a substance can be divided into three types- a) primary qualities, b) secondary qualities and c) tertiary qualities. The inseparable features of a body- size, shape, weight, etc, are the primary qualities of a body [Locke, 1689 (II, viii, 9)]. The colors, sounds, smells, tastes, etc are the secondary qualities of an object. Since these features of objects do not exist in the objects themselves and they are just the power of primary qualities of the object to produce an idea in us of a certain kind, they are considered as secondary qualities [Locke, 1689 (II, viii, 10)]. The tertiary qualities of a body are those powers which, by virtue of the primary qualities of that particular body, give that body the power to produce observable changes in the primary qualities of other bodies. For example, the power of sun to melt metals is a tertiary quality of sun [Locke, 1689 (II, viii, 23)].

Nominal essence is the collection of particular qualities, from among these three kinds of qualities, that is observable together in substance and that collection is considered to define a species or genus; Locke used these terms – ‘species’ and ‘genus’, not as applicable only in the realm of

Biology but as applicable to any possible classification scheme. That is, the term 'nominal' refers to names or naming and he used the term to indicate that classifying substances based on their similar qualities is an exercise in naming. For example the nominal essence of water is the abstract idea that constitutes the definition of water- a clear, tasteless, colorless liquid, required for both animals and plants and the most widely used of all solvents, etc. What makes the nominal essence an essence is that it contains both the sufficient and necessary conditions for something to be a member of its genus or species. According to Locke, species are "the workmanship of the understanding", not of nature [Locke, 1689 (III, viii, 13)]. Nature gives similarities and we create definitions of genus and species. That is, we decide what we want to include in our definitions of species or genus.

On the other side, a real essence makes an object what it is, it precisely as nature made it. Real essence of an object does not include human choice for it to be what it is. In the case of water, H₂O is the real essence—the very construction of water molecules that make it water.

Now let us go back to the consideration of mental kinds. As functionalists define pain and other mental states in terms of their causal role, they do not have any real essence. In case of water we can say that all samples of water must be quantities of H₂O molecules, and being composed of H₂O molecules is the essence of water. Pain or other mental states do not have an essence in that sense. What all pains have in common is the causal functional role they play in different organisms. As pain does not have any real essence, we cannot claim for one single physical mechanism to realize pain in different pain capable organisms. If we consider Cfs (C-fiber firing) to denote pain in humans it is not necessary for Cfs to denote pain in other organisms. For example, we may consider Rfs (R-fiber firing) to denote pain in reptiles, Mfs (M-fiber firing) to denote pain in Martians and so on. The consideration of Rfs for denoting reptilian pain or the consideration of Mfs for denoting Martian pain does not make any obstacle on the reduction of human pain to Cfs. Again, the reduction of reptilian pain to Rfs does not entail the impossibility of the reduction of Martian pain to Mfs. Though the physico-chemical compositions of Cfs, Rfs and Mfs are completely different, they all are considered as pain- instances by virtue of their functional roles they play in respective organisms. As pain does not have any real essence like water, there is nothing contradictory in reducing human pain to Cfs, reptilian pain to Rfs and Martian pain to Mfs. On the other hand, pain in all organisms in general cannot be defined without the disjunction of different pain instances in different pain capable organisms

because pain is multiply realizable. This sort of disjunctions is heterogeneous therefore not capable of being a kind. We cannot expect pain to be realized in a homogeneous way. Realization of pain in different organisms will be heterogeneous in nature. Pain and other mental states are reducible to its physical base that realizes those mental states. It seems that the concept of multiple realizability is compatible with the idea of species specific reducibility of mental states. Thus, we can claim that the multiple realizability argument which was introduced by Putnam and later developed by Fodor to refute reductionism seems to entail reductionism.

Conclusion

I have argued that, contrary to the claims of functionalists (Putnam and Fodor), multiple realizability does not lead to antireductionism and considered the antireductionist claims, based on the concept of multiple realizability and Kim's reply to the antireductionist thesis. Later this paper has also considered Block's argument against Kim's response and analyzed Block's arguments and claimed that his arguments are not sufficient enough to refute Kim's arguments. Moreover, this paper has also analyzed Locke's idea of real essence and nominal essence to show that a mental kind does not have any real essence; it has only nominal essence and a mental kind is a functional kind. I have defended Kim's stance in this debate. More specifically, multiple realizability of mental states does lead to reductionism.

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