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Reduction: The Solution to Mind Representation?

Abstract: Chomsky is an evolutionary figure in linguistics. His greatest contribution lies in transformational generative grammar, which put an end to the leading position structuralism had held in language for more than 30 years. His naturalistic methodology has greatly influenced the research of both linguistics and psychology, and he is also considered to be the first to study language from the cognitive perspective. He insists on a naturalistic methodology; therefore, he was even considered by some to be a physicalist. However, this is not the case. On the contrary, TGG, as a critique of the behaviorist view of language, is intertwined with a critique of physicalism. On the one hand, he thinks the mind, like chemical elements and electrons, can be approached from a third-person perspective; on the other hand, he again admits there exists consciousness, which can be merely approached in terms of a first-person authority, which, therefore, is a fatal challenge to his core theory. Now there remains a new solution to this dilemma, that is, to admit that the mind is a special natural phenomenon with two means of existence: one is involved in physical aspects with the brain, and the other is concerned with something mental, with the former approached by a third-person perspective and the latter better researched via a first-person authority.

Keywords: brain; naturalistic approach; Noam Chomsky; physicalism; TGG

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1 Introduction

Noam Chomsky is an evolutionary figure in the history of linguistics. His theories put an end to structural linguistics, which had held a leading position for more than three decades in America. His naturalist approach to science has had a great influence upon the study of both psychology and linguistics and he was the first to study language from a cognitive perspective. His study of

generative grammar has been intertwined with the critique of physicalism. As behaviorism is based on empiricism, which in turn advocates physicalism, Chomsky's opposition to behaviorism is actually the result of his objecting to physicalism. Chomsky's argument against physicalism came from the concept of physicalism. Therefore, we need to make clear what physicalism is, before we make an analysis of his critique of physicalism.

2 What is physicalism?

"Physicalism" is also sometimes referred to as "materialism," though they are not necessarily one and the same. "Materialism" is an ancient term, with a long history, while "physicalism" is a relatively new term which was introduced in the 1930s by Otto Neurath and Rudolf Carnap, both of whom were key members of the Vienna Circle. Both terms can be interchangeable. However, sometimes people prefer the term "materialism," since it is closely related to the interpretation of metaphysical matter. Physicalism, on the other hand, seems inseparable from the interpretation of language. In the context of this article, we do not differentiate between the two terms, but we use "physicalism" instead of "materialism" because Chomsky's main contribution was to the study of language. For us, physicalism claims that everything in the world is made of matter, which is also true of mental phenomena. All things in the world are either made of matter or can be reduced to matter in one form or another. Chomsky challenged this claim.

He did not reject the concept of physicalism from the start, because he thought physicalism could not stand by itself if there were such an entity whose existence was in forms other than materials. This point is similar to Karl Popper's (1972) scientific epistemology known as falsificationism, when he distinguishes the scientific from the unscientific. Popper uses the statement "All swans are white," which can be proven to be false if a black swan can be found. Chomsky did not object to physicalism because so much discrepancy exists in its claims. The reason why he showed his opposition to it is that he did not think there was any definite content in the concept. He says: "The supposed concepts 'physical' or 'material' have no clear sense [...]. There seems to be no coherent doctrine of materialism and metaphysical naturalism, no issue of eliminativism, no mind–body problem" (Chomsky 2000: 92).

For Chomsky, such terms as "physical," "matter," and "objects" are merely the symbols representing those entities of which we have a rough understanding, and since Newtonian evolution, the physical world is of truth,

and nothing physical could be added to show the causes for gravitation. The term "physicalism" also serves a kind of teleological purpose, and it is adopted to represent the natural world which is studied in terms of naturalist methodology. As a physicalist, Jeffrey Poland (2003: 29–48) thinks this term is adequate for the exploration of the natural world and he is glad to accept this so-called methodological physicalism. In reality, methodological physicalism is not a description of the natural world, but merely of a point of view. Most cognitive scientists advocate David Papineau's view that contemporary physicalism is not a methodology, but an ontological view, that is, that everything in the natural world is made of matter, or that everything can be reduced to matter in one form or another, or that the properties of matter are physical. Nevertheless, it is not necessarily possible to study everything by means of naturalist methodology (Papineau 2001 :1–36).

This ontological view is a case in point. In the meantime, we should note that Chomsky fully accepts a scientific approach as well. He is dedicated to the study of natural science, which made it possible for him to be suspicious of physicalism, whose existence is of decisive importance. He is willing to indicate the significance of expressing scientific method via methodological naturalism, so that we can avoid the confusion caused by Papineau's physicalism. As a naturalist, Chomsky advocates the fundamental role of a scientific approach which is adapted to the study of the natural world and purports to establish the ontology of the world. He himself is not a physicalist at all. Therefore, when Dennett (1991: 387) classified Chomsky as a physicalist in *Darwin's dangerous idea*, he was completely wrong. If Chomsky were a physicalist, he would never have said anything against his own doctrine.

3 Is there any historical basis to the challenge of physicalism?

Chomsky's study never ignores the history of science. If we say that Copernicus's victory over Ptolemy on heliocentric theory and Galileo's victory over Aristotle on free-falling objects shows us the development of both scientific and cognitive ability, then Newton's triumph over Descartes' mechanic philosophy is the extension of physicalism, which indicates there is much more to be included in the concept of the physical, which also shows that we are not sure at all about what matter is supposed to be. This perhaps explains why Chomsky throws bombs at physicalism. He thinks if we could specify the object

of study, then it would be a must that physicalism needs to be defined explicitly. For example, for natural sciences like physics, chemistry, neuroscience, and biology, there are specific objects of study. Physics studies matter and its motion and behavior through space and time and the related energy and force, and its aim is to study nature at its most fundamental level, as well as to discover and apply general laws to force, motion, matter and energy, and space and time as well. Chemistry involves itself with atoms, compounds composed of atoms, elements, and molecules; it is a subject far more than a collection of facts and a body of knowledge. It is all about matter. Both physics and chemistry are the specializations of physical science. Biology is concerned with life and living organisms, and it also deals with their physical structures, chemical composition, function, and evolution, and so on.

Chomsky (2009) thinks Newton discarded the ideal interpretation mode through the study of universal gravitation. This ideal mode has been integrated into mechanic philosophy, with the extension of the conception of matter, and with the extension of moving bodies in different shapes and sizes as well. For mechanic philosophers, it was such forces as push, pull, resistance, slope, or division that enabled an object to come into motion. The way Newton approached gravity proved mechanic philosophy to be wrong. Chomsky thinks Newton introduced a different scientific framework to get access to gravitation, which contributed to the extension of the concept of physicalism. At that time, both scientists and philosophers were not confined to the presupposed definition of matter, and instead, they posited an appropriate interpretation of a working mechanism of the natural world. The gravitation theory discloses that celestial bodies revolve and orbit according to such parameters as centrifugal force, acceleration, and angular momentum, which was beyond the scope of Descartes' contact mechanics. From then on, it seemed that science was not always about reductionism, but about the establishment of the accessible explanatory theory, which guided us to treat the posited entities as the reality, aiming to be ultimately unified into core science. This unification does not necessarily find full expression in reduction, and it may be the result of the extension of the concept of matter to be accommodated into the newly developed discipline (Chomsky 1995b).

As far as Chomsky is concerned, science may make progress without considering whether there exist matter and motion and energy and force or not. Newtonian revolution can be expressed with so-called "mitigated skepticism" (Hume 1975). He hoped science, without fail, was committed to trying to build theories to explain the natural world, and by no means should it be stopped from doing so, even if the properties of matter are not decided yet, just as expressed in Hume's works: "While Newton seemed to draw off the veil from

some of the mysteries of nature, he showed at the same time the imperfections of the mechanical philosophy; and thereby restored her ultimate secrets to that obscurity, in which they ever did and ever will remain" (Hume 1983: 542).

Newton did not explain the working mechanism of gravitation. Nor did he say anything about how gravity could come into effect. This stance toward scientific attitude is just right, that is to "boldly hypothesize and carefully verify" (Hu 2000[1]). This skepticism means a fresh scientific attitude, the purpose of which is not in the pursuit of the final explanation, but in the optimal statement about the natural phenomenon (Chomsky 2009). However, skepticism does not hinder scientific development, but shows the scientific freedom. In a way, skepticism allows the scientists to establish theories to explain natural phenomena and to make predictions.

If we cannot abandon the concept of matter and movement based on imagination, understanding, and common knowledge, then we can by no means come to a new way to study simple motion and any other aspect of the natural world, including the brain. The Newtonian revolution provided a new thinking pattern in physics, which had constantly caused confusion among his contemporaries. Few people could accept his theory, and it was not widely appreciated until two hundred years later. Newton himself did not buy his own theory for a while. At times, he regarded the super distance motion as "absurdity." Chomsky believes the most important fruit for Newton was that he used mathematical description in universal gravity and the laws of motion; he was not restricted to the established concept of physicalism and served as a role model for both his peer scientists and his successors.

4 What can we understand?

Chomsky's integration of "mitigated skepticism" into the naturalist view of the mind is one of his advantages. Descartes thought human rationality was a general tool to deal with all contingencies (Descartes 1931: 116). Few people agree with Descartes' immaterialist ontology, and most people assume there exist cognitive boundaries which make it difficult to probe deep down into the natural world. Contemporary philosophers hold that, in principle, there is no logic limit for human cognitive ability, but Chomsky thinks they did not get the spirit of biology at all. He writes: "the theory of evolution places humans firmly

1 This expression summing up John Dewey's approach to scientific method was put forward by Hu Shi, a Chinese scholar who developed Dewey's (e.g. 1910) instrumentalism in the 1920s.

within the natural world, taking humans to be biological organisms, much like others, hence with capacities that have scope and limits including the cognitive domain" (Chomsky 2015: 56).

Just as our bodily organs enable us to breathe, digest, even perceive objects, our mind and cognitive powers are able to find solutions to some problems but not to others. The discovery of penicillin was definitely one of the most important events in medical history. Prior to this, patients often died from trivial injuries and infections. Such diseases as tuberculosis, pneumonia, meningitis, septicemia meant death, and the patients could do nothing but wait for their body eventually to fail. Fleming's discovery put an end to these diseases, which was a huge leap forward in medical science. Before we could cheer up, new problems arose one after another – Motor Neuron Disease, AIDS, cancers, and leukemia – remaining incurable. In recent years, Paclitaxel, a chemotherapy medication, has been used to treat a number of types of cancers including ovarian cancer, breast cancer, lung cancer, Kaposi sarcoma, cervical cancer, and pancreatic cancer. However, it generally takes 20 or even 30 tons of bark in order to get merely one kilogram of paclitaxel, making the rare plants even rarer, coming close to extinction. Medical scientists have found a way to treat cancers, but they cannot find a way to shorten its growth cycle or avoid the extinction of the yew tree.

Different from Descartes, Chomsky gives a more specific account of the mind. He thinks the mind is a collection of modules which serve their purposes separately and interact with each other as well, and their working is linked to the central nerve system. The language module is a good example. Those patients whose language module remained intact despite other modules being damaged could still speak their language.

Chomsky is the first to put forward the module approach to the mind; however, he is not the only one to study modularity. Fodor's contribution to modularity is also worth mentioning, although they both differ in their views. Chomsky did not reduce modules to a computational system, while Fodor's modularity is defined in terms of causal and functional roles. He suggests all the modules of different parts of the mind permit possible relations with external objects. Mental states have contents about things in the natural world. The mind, as a whole, takes responsibility for the input-output mechanism. It seems that Fodor's modules can be reduced to a computational system, although he himself claims that he strongly opposes a reductive account of the mind (Fodor 1981: 152–174). Fodor's modularity is restricted in many aspects since he is mainly concerned with the input-output mechanism in perception and response. Chomsky's modularity, on the other hand, has a broader scope, and he discusses the modular devices which inspire certain scientific hypothesis, and

he is even concerned about the module for making judgments and decisions. Both Fodor and Chomsky unanimously arrive at the same concluding remarks, in Fodor's term, "epistemic boundedness." The specific domains of the mind modules tell us that we can comprehend certain kinds of natural properties, leaving other aspects uninformed, since they are beyond our cognitive ability and are unintelligible. Chomsky argues that the cognitive capabilities of all organisms are limited by biology and that certain problems may be beyond our understanding:

> A Martian scientist, with a mind different from ours might regard this problem [of free will] as trivial, and wonder why humans never seem to hit on the obvious way of solving it. This observer might also be amazed at the ability of every human child to acquire language, something that seems to him incomprehensible, requiring divine intervention. (Chomsky 1988: 152)

Just as the chimpanzee Washoe could only get 350 symbols with so many years of training, the same is true of Neam Chimsky. He could not learn as well as humans, in spite of his genetic resemblance to humans. This is also true of humans. There is always something we need to explore before we have any chance of getting access to it.

In philosophy, cognitive limitation is not a new topic at all. Locke and Kant put forward the philosophical prospect of our cognitive limits. Kant argues that how we perceive the empirical world depends on forms of perceptual intuition and all specific categories, which, in turn, restrict the way we look at our internal world. Chomsky has a different way of looking at this problem, though he is influenced by Kantian tradition. He thinks we cannot draw a clear demarcation between our cognitive boundaries and all the verified facts. The cognitive boundary declared in science is but temporary, and not conclusive at all. We are not certain yet what problems are beyond our understanding for a time and what mysteries will stay unsolved forever.

It is true we know so little of the working mechanism of our brain that we cannot study our cognitive capabilities systematically. McGinn uses "cognitive closure" to describe cognitive boundedness (McGinn 1989), and he even uses "transcendental naturalism" because he acknowledges the possibility that solutions might fall within the grasp of an intelligent non-human of some kind (McGinn 1993: 1–8). Compared with McGinn, Chomsky takes a more open attitude toward cognitive boundedness. Although McGinn's idea is inspired by Chomsky, he is more like Locke and Kant, and thinks a priori may lead to our solution to the mind–body problem.

5 Can the mental be reduced to the physical?

Chomsky is always skeptical about physicalism, especially about the concept itself. His understanding of the Newtonian Revolution means an open attitude toward scientific ontology, so that he was not restricted to classic concept of matter. Epidemic boundedness is also reflected in every period of time over history, just as we accepted Descartes' mechanics and the classic concept of matter, and expected his mechanic philosophy to be used to interpret Newton's observations. This turned out to be a failure. Scientific development did not provide us with new theories to explicate working mechanisms of the natural world, nor could it work for important natural phenomena like Newton's gravitation. All this makes us expect even more of such scientific hypotheses as modularity of mind. After all, science is studied through modules of our mind, even though there are still blind spots and cognitive limitations. What if modularity of mind could be helpful in explaining mental properties?

Of course, Chomsky could seek a totally different position to back up his own ideas – scientific progress is just the right evidence to support his modularity of mind. A case in point is that his study of language serves as the evidence for his modularity. He always held the view that the process of language acquisition could not be explained in terms of such general mental faculties as association or inductive inference. With little language stimulus and limited input, children can still acquire the language successfully, without any formal instruction. Chomsky therefore hypothesized that there already exists a certain internal mechanism in the human mind which plays a key role in child language acquisition, to put it specifically, the language module. Although this has not been studied by neurophysiologists, it is a hypothesis necessary for interpretation of child language development. Few people can accept modularity of language, just as Hanover had complained that it was hard to accept the Newton's new theory since Newton's law of universal gravitation was a great challenge to his mechanic physics. This is always true of new theories in science in the course of history, especially those that challenge certain authority.

Chomsky did not deny that the language module could be explained in terms of neurophysiology, and indeed he did take this possibility into consideration. However, he argues that cognitive science, unlike other science, is not supposed to subscribe to reductionism, the way chemistry and biology are. The language module, first and foremost, aims to give an adequate account of linguistic competence. However, we still have no clue of matter and its nature, on which our science rests, although we have never stopped seeking a definite concept of these since Newton's revolution. Special sciences can develop as

independent disciplines, either by being integrated into other science, or by being transformed into core sciences, or become the result of the extensions of core sciences. Chemistry is a case in point. After the collapse of mechanical philosophy, the classic concept of matter kept being challenged. Chemistry could be singled out for independent study, because chemical elements were not restricted to reductionism, but instead were the result of the extension of the classic concept of matter, or put another way, it is not necessary that these elements be reduced to matter. The extension of the classic concept of matter enables chemistry to be unified with physics. This unification is the result of a scientific revolution in the late 1920s and the early 1930s (Chomsky 2015), following "the scientific unification" defended by logical empiricism. Its core is that high-level science can be reduced to low-level science, and ultimately to physics. This shows us the hierarchy of science from special sciences, which stand on the higher level, to general sciences, which sit at the lower level, from the higher level to the lower level. This illustrates that chemical science composes the lower level of natural science, and natural sciences like physics can accommodate themselves upward to the level above it. In other words, lower-level science seems more closely related to matter which is constructed of molecules and atoms, and in this sense, chemistry can be reduced into physics. That the concept of matter became extended in chemistry makes reduction unnecessary. The unification achieved between physics, chemistry, and biology is again expected to cover cognitive science as well, though there is still a long way to go.

6 Does reduction work for mind representation?

Chomsky's main concern is language and the mind. He thinks language study aims to explore the knowledge of language and the system of rules of language. Linguistics is a science in that it aims to provide a general theory explaining why languages are the way they are; language is the universal faculty of mind. Like physicists and chemists, linguists also need to make hypotheses about language. Language is by no means different from other entities (James 2007: 21). Naturalistic methodology, which can be used in natural sciences, is also true of language and mind study.

In the twentieth century, philosophers thought to unify science by means of the reduction of theories. This kind of understanding began with logical positivist representatives, like Rudolf Carnap and Otto Neurath. Then the rise of scientific realism advocated unity of entities instead, which was very important

in both the philosophy of mind and the philosophy of language. These reductionist approaches are common to empiricalists. Rationalists, however, are another story. Especially Chomsky, one of the rationalists, thinks physicalism is vacuous and without any definite content. No wonder he does not agree with those reductionists. His review of Skinner's *Verbal behavior* is a strong critique of behaviorism and of empiricism. He thinks the mind is of internal structures which are able to process information and cognize universal grammar. He agrees with Skinner about the way data comprehension can be interpreted in terms of mental processing, of which the faculty of language is a component part. He thinks Skinner was right to view external behaviors as empirical materials for mental science.

For Chomsky, there are two types of raw materials legitimate enough to be the basis of mental science. One is of the brain and its activities as well; the other is of explicit behaviors. He thinks human behaviors do provide quite a lot of evidence for scientific study of the mind. He was greatly influenced by Descartes, especially by Descartes' notion that it is the creative use of language which differentiates human beings from other animals and machines. This creativity of language is beyond Descartes' ability to explain, and that is why he resorted to "a thinking substance". Chomsky takes a naturalist inquiry into mind, the same way Descartes looked into cosmology, physics, optics, and neurophysiology. It seems that the third-person view of the mind is related to physicalist views and is of physicalism; it is more like when we look at the mind from the outside, treating the mind exactly as if dealing with the objective world out there. This is the way science looks into the mind. Chomsky holds that "mind" cannot be considered as a special phenomenon, and that it is actually the same as the object of study in physics, optics, chemistry, and biology. The mind is but another aspect of natural phenomena in the real world. Naturally, study of the mind falls into the naturalist framework; to some extent, this way of investigation may expect to be unified into scientific theories. Mental study is, therefore, the study of body and body activities, or mental activities are synonymous with brain activities.

At this point, Chomsky seems to be contradicting himself. On the one hand, he is strongly opposed to reductionism, advocating the unification of science; on the other hand, he is self-contradictory and makes his theory inconsistent. Besides, he also concerns himself with the study of consciousness, which is definitely of internal properties. The unique property of consciousness makes it different from other natural phenomena. Just as Searle put it, "the ultimate absurdity is to try to treat consciousness itself independently of consciousness, that is, to treat it solely from a third-person point of view, and that leads to the view that consciousness as such, as 'inner', 'private' phenomenal events, does

not really exist" (Searle 2000: 28). Chomsky is trapped in a dilemma. He chooses naturalist methodology to approach the mind and its properties, only to find the first-person view of consciousness is the one and only choice.

7 Concluding remarks

Chomsky's critique of physicalism leads to his naturalist methodology. For him, the mind is just as much a natural phenomenon as the physical, chemical, electrical, and biological, and naturalistic inquiry into mental phenomena benefits the unification of science. However, he failed to take into consideration the fact that the mind, beside its physical properties, has its own peculiarities, its unique properties, and the internal properties which physical objects, chemical elements, biological cells, and other particles lack.

Naturalistic inquiry does work for the study of the external properties of mind, such as the study of the nerve system and its working mechanism; however, the study of the mind is more than that. Under no circumstances is naturalistic inquiry adequate for an all-round understanding of the mind and its internal properties. The only thing we can do is admit that there are two aspects of mind, the external and the internal. A third-person view can merely gain access to the external, but leaves the internal part untouched. We do not regard these two aspects of mind as metaphysical dualism, as Descartes assumed in the 17th century, because neither is an independent form of matter. Instead, we do not deny that we are unable to find a definitive solution to mind problems at this point of time of scientific development. For the convenience of mind studies, we adopt a naturalistic approach to the external properties in order to unify it with our core science, with either mental phenomena being reduced to what is accepted in physics theory or physics theory being accommodated to the inclusion of mental facts. In this way, we do not need to separate the mind and mental properties from the rest of the world of nature, nor do we need to ignore the difficulty of integrating mental phenomenon into a naturalist framework. At the same time, we can also learn a little from Hume's "mitigated skepticism", appropriate appreciation of the mind, and appropriately leaving it there for later study. Then we do not have to reduce the mind to being "mysterious" matter.

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