# BEYOND FINITUDE: EXPLORATIONS IN SPECULATIVE REALISMS AND MATERIALISMS

*Thesis submitted to Jadavpur University in fulfillment of the requirements for the award of*

*The Degree of Doctor of Philosophy (Arts)*

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**2022**

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# ACKNOWLEDGEMENTS

The journey of writing this thesis has been a long, arduous but nonetheless extremely gratifying one. There are some people without whose support I could not have completed this PhD dissertation. First of all, I would like to thank my supervisor, Dr. Anirban Das, whose constant guidance, unwavering support and erudite insights were my biggest strengths as a doctoral researcher. He tolerated my idiosyncrasies, which I am sure must have been trying at times, and patiently yet firmly steered the occasionally wobbly boat of this thesis through the stormy seas of my conceptual confusions and existential crises. Our review meetings were an invaluable support for me. I would also like to express my gratitude towards everybody at the Centre for Studies in Social Sciences, Calcutta for providing me with indispensable institutional support. Finally, I would like to thank my Baba and my Bhai for all the inchoate stuff which I cannot quite put in words. Last but not the least I would like to thank my friend Lena Engemark for just being there, always.

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# INTRODUCTION: ARE MATERIALISM AND REALISM RELEVANT? A LONG DEBATE

Let's suppose that in a room, there is a brown table, and on the brown table, there is a red book. Wilfrid Sellars (1993) narrates an episode of an exchange between four people present in the room. Sellars writes:

> "Tom: See that red book over there.
>
> Dick: [I don't see a book over there but] there is a red and rectangular physical object over there.
>
> Harry: [I don't see a red book over there, though I grant that] it looks to me as though there were a red book over there…
>
> Jones: [I grant that] it looks to me as though there were a red and rectangular physical object over there" (1993, 13-14).

Each of these four observations can be associated with a distinct philosophical position. While Tom's position is that of common-sense or naïve realism, Dick's is the scientific realist position, and the positions of Harry and Jones represent the Kantian rich and thin conceptual description positions respectively.

The title of my dissertation is *Beyond Finitude: Explorations in Speculative Realisms and Materialisms*. Quentin Meillassoux's *After Finitude,* published in English in 2009, has the avowed aim of resurrecting the Cartesian 'primary quality' from the clutches of metaphysics with the help of materialism and scientific realism. This chapter will frequently use certain

concepts such as Humean empiricism, Kantian transcendental idealism, scientific realism, materialism, naturalism and causality which are pivotal for the exegesis of Meillassoux's speculative materialism; care will be taken to explain each of these concepts as and when the need arises. This introduction begins with an articulation of the key arguments offered by Meillassoux in *After Finitude*. It subsequently goes on to critically engage with these arguments in order to be able to assess their potency and weaknesses.

## I. KANT AND THE CARTESIAN PRIMARY QUALITIES

*After Finitude*, a work which heralded the speculative realist movement in continental philosophy, begins with a lament over how the Cartesian dyad of primary-secondary qualities has been rendered obsolete following the rise of Kantian transcendental idealism. This Cartesian dyad cannot be understood without first comprehending Cartesian dualism. In the Cartesian dualist framework, there are two distinct and irreducible kinds of things: the psychological substance (or thought) and the material substance, which exist independently of each other (Moser and Trout 1995). In the Cartesian schema, while the essential property of the psychological substance is thinking or *res cogitas*, the essential property of the material substance is extension, or *res extensa.* Now, primary qualities are the qualities which material entities with extension possess. For instance, on a sweltering summer day, to state that the temperature is 38 degrees Celsius will be making a statement describing a primary quality, whereas describing the same weather as hot would qualify as a description of a secondary quality. In other words, secondary qualities entail subjectivity whereas primary qualities are those characteristics which a material entity objectively possesses. Now the question which might be asked at this juncture is: why does Meillassoux think that the concept of primary quality has been rendered philosophically irrelevant, against which tendency his intervention

is aimed? Meillassoux argues that it is the Kantian theory of categories of understanding which has rendered the Cartesian dyad of primary and secondary qualities irrelevant and obsolete. He devotes considerable parts of his book in delineating the Kantian origins of what he terms as correlationism.

Correlationism, a term coined by Meillassoux, stands for the idea that 'to be is to be a given'. Reality – material or noumenal – cannot be accessed because its knowledge is possible only through the mediation of various media such as consciousness (for Phenomenology), language or culture and society (for strong sociology). Massimi (2018) writes of a school of thought known as Perspectivism which advocates a position similar to the one attributed by Meillassoux to correlationism. Perspectivism states that all knowledge, including scientific knowledge, is possible only from one or the other 'human vantage point'; the favoured vantage point for Perspectivism is that of socio-historical context. According to Christopher Norris (2014), strong sociology argues for a 'flat ontology' and states that there are no truths beyond the current best knowledge, which emerges in a certain social context at a particular historical juncture owing to the dominant beliefs of the context. Thus, both Perspectivism and strong sociology argue that truth – including scientific truth – is an outcome of different 'vantage points' which are historically and socially situated. Insofar as there is no truth or accessible reality outside the vantage points for these schools, both Perspectivism and strong sociology may be described as correlationist schools. Massimi further observes that the conceptual roots of perspectivism can be traced back to Immanuel Kant since for Kant, knowledge is possible only because of the mediation of the forms or categories of understanding. Of course, there is a crucial difference between perspectivism and the Kantian theory of transcendental idealism. In the former, knowledge is possible only because of the mediation of historically situated perspectives whereas for Kant, the mediation is by *a priori*, mental forms. However, the commonality between them is that both perspectivism and Kant

argue that there is no knowledge of reality which is not mediated by a vantage point. Meillassoux's argument regarding the Kantian origins of correlationism is therefore not dissimilar to Massimi's arguments about the Kantian roots of perspectivism.

In *Critique of Pure Reason* (2007), Kant writes that the capacity to obtain representations when affected by material objects is sensibility; the effect or impact of external objects on sensibility is sensation; the knowledge which the relation between external objects and sensations give rise to is intuition; finally, the object of intuition is appearance (156, A20). For Kant, all empirically gained knowledge or intuitive knowledge is synthetic *a priori* knowledge. In the *Prolegomena to Any Future Metaphysics* (2004), Kant articulates the distinction between analytic and synthetic statements in terms of explicative and ampliative statements. Analytic statements are explicative because the predicates of such statements merely explain a meaning already contained in the subject. Synthetic statements on the other hand are ampliative because they add new insight or information to the predicate of the statement. The statements 'material objects are extended objects' and 'material objects are perishable objects' are examples of analytic and synthetic statements. Wilfrid Sellars (1993) however defines analytic and synthetic statements in terms of truth value; in an analytic statement, the meaning of the predicate is logically deducible from the subject, whereas no such logical deduction is possible in the case of synthetic statements. Now, if we return to the Kantian definition of intuition, stated above as the knowledge which is obtained from the relation between the external world and sensations, one would think that intuitive knowledge is synthetic knowledge gained empirically or *a posteriori*. According to Kant, however, synthetic knowledge is *a priori* knowledge because knowledge is possible only when sensations are organised or arranged into a relation by *a priori* logical forms of the mind (2007). Kant observes that 'accordingly, the pure form of sensory intuitions in general, in which all the manifold of appearance is intuited in specific relations, will be found in the

mind *a priori*' (2007: 157). In other words, sensations are gained *a posteriori* but these sensations or manifold of appearance become knowledge only when the *a priori,* mental forms of understanding organise them in a specific relationship. Insofar as the forms are there in the mind *a priori*, and they render knowledge possible, in the Kantian framework, synthetic *a priori* knowledge is possible.

## II. MEILLASSOUX'S MATERIALIST CRITIQUE OF KANT AND THE KANTIAN CONCEPTION OF OBJECTIVITY

Chapter III of this dissertation is dedicated to the exploration of the implications of the Kantian theory of *a priori*, mental logical forms for epistemology and for theories of nature of reality. This chapter examines Meillassoux's interpretation and critique of Kant and comments on the efficacy of Meillassoux's materialist critique of Kant. It has already been explained why synthetic *a priori* knowledge is possible for Kant; it is because even if sensations arise because of the effect of the external, material world upon the subject endowed with sensibility, yet knowledge becomes possible only when *a priori*, mental categories of understanding arrange and organise the sensations into particular relations. Since for Kant, knowledge is possible only because sensations are subsumed by the *a priori* forms of understanding, sensations are passive and it is understanding which is spontaneous (Sellars 1993). As a consequence of the spontaneity of understanding and mediation of the logical forms, no knowledge of the reality-as-it-is is possible.

In the *Prolegomena to Any Future Metaphysics* (2004), Kant writes he is unlike the idealists who deny the existence of the independent, material realm; the reality-in-itself exists but it remain inaccessible because all we have access to are objects of understanding which arise

because of the organisation of sensations into particular relationships by *a priori* mental forms. Thus, Kant has the following views on the material realm: a) it exists, or else there will be mere appearances without substance; b) it is inaccessible because knowledge is mediated by *a priori* mental forms or the categories of understanding. Kant states in the *Prolegomena to Any Future Metaphysics* (2004) that mathematics and science are also example of synthetic *a priori* statements. He cites the instance of a straight line, defined as the shortest distance between two points. The relation described in this definition depends upon the concept of magnitude, which is not observable empirically; rather, it is a concept of pure understanding. In *Critique of Pure Reason* (2007), Kant defines scientific objectivity in terms of judgment of experience. Kant states that there are two kinds of judgements: judgements of perception and judgements of experience. In the case of judgements of perception, the relation between two events or processes or objects is contingently or subjectively established whereas judgements of experience entail ordering of manifold of appearance by universal concepts of understanding. To put it differently, scientific knowledge is objective knowledge because appearances there are subsumed by pure concepts of understanding which are universal and necessary.

Commenting on the Kantian conception of scientific knowledge, Meillassoux observes that in the Kantian framework – wherein all knowledge is the outcome of subsuming of the manifold of appearance by different *a priori*, mental forms – scientific objectivity gets transformed into intersubjectivity. Thus, scientific objectivity becomes a distinct variety of subjectivity wherein appearances or sensations are organised by universal and necessary mental forms. As a result, the primary quality-secondary quality distinction collapses since primary qualities cannot be accessed. Meillassoux describes the Kantian theory of transcendental idealism as an example of weak correlationism. This is so because while the reality-in-itself remains inaccessible for Kant, he acknowledges that it exists independently of the mind and its

categories of understanding. Meillassoux's first critique of Kant is that transcendental idealism, with its emphasis on the idea that empirical knowledge or synthetic knowledge is always synthetic *a priori* knowledge mediated by pure mental forms of understanding, renders scientific objectivity obsolete. The achievement of the Kantian Copernican revolution in philosophy is that, according to Meillassoux, it is no longer asked what is the nature of reality; instead, different schools attempt to understand what is a more original form of correlation: is it language or consciousness or culture?

Meillassoux attempts to counter the Kantian correlationism entailing subsuming of the manifold of appearance by *a priori*, mental forms by materialising the mind itself. He states:

> "The empirical question is that of knowing how bodies that were organic prior to becoming conscious appeared in an environment which is itself physical. The transcendental question consists in determining how the science of this physical emergence of life and consciousness is possible" (2009: 22).

This observation of Meillassoux's reminds one of the argument made by Kant in the *Critique of Pure Reason* that transcendental idealism is concerned not so much with the nature of objects but rather, 'with our manner of cognising objects, insofar as such cognition is supposed to be possible *a priori*' (2007: A12, 154). Meillassoux's argument here is that while Kant is concerned with how *a priori* knowledge becomes possible, a more basic question is to ask how cognition and the mind themselves emerge. He situates the emergence of mind and mental faculties such as cognition in the evolutionary process, in a classic materialist move. He observes that the mind – which is the repository of the a priori, mental forms –is organic before acquiring consciousness, and this organic substance emerges from and in the physical realm. Meillassoux introduces the concept of ancestrality to refer to a period before the emergence of life and consciousness on the planet. Arche-fossil is the name of the extant

material evidence of the accretion of the universe and the planet before the emergence of life and consciousness and, thereby, of the mediating vantage point. Meillassoux writes that ancestrality refers to a time not merely distant from but anterior to all givenness. For Meillassoux, since mind and consciousness emerged at different phases of the evolutionary process, it is possible to conceive of a concept of time which is not a correlate of the mind or the mental forms. The problem with this materialist interpretation of time and mind is, I argue in Chapter III, that Kant does not deny the existence of the material realm. He acknowledges the existence of the reality-as-it-is which is the basis of the substance behind all appearances. Kant's argument is that the noumenal realm is unknowable and inaccessible since *a priori* categories of understanding subsume all appearances (the objects of intuition), and all that we have access to, as a result, are appearances. My critique of the materialisation of mind and mental categories by Meillassoux is that the materialisation of the mind does not explain how the Kantian insistence on the inaccessibility of the reality-in-itself can be overcome.

## III. MATERIALISM AND REDUCTIONISMS

Materialism is often accused by its critics of reductionism: in reducing mind and mental experiences to brain and brain states, it cannot explain experiences such as cognition, intentionality, desire etc. In order to explain why Meillassoux's attempt to counter Kantian correlationism by materialising the mind and the mental categories is inadequate, it is necessary to explain the nature of the charge of reductionism which materialism attracts. Chapter I of this dissertation is dedicated to elaborating and enumerating the ideas associated with materialism, and the kinds of reductionism it is accused of. Charles Wolfe (2015) writes that there are two fundamental tenets of materialism: 1) It is a monist philosophy which insists that everything extant is material or an outcome of relations between material entities;

2) It focuses on studying the brain-mind relation. Moser and Trout (1995) write that inspired by Cartesian dualism, some philosophers insist that materialism is the school which states that everything extant is material, and something is material if and only if it is extended in space. In other words, the material possesses length, breadth and mass. The critics of materialism at once ask, as Wolfe points out, that if everything extant is material as materialism states, then what happens to higher states such as intentionality, desire and free will? What is to become of immaterial entities such as the soul, mind and other abstract transcendental entities? Materialism thus attracts charges of reductionism, which can be broadly divided into two categories: 1) reduction of mind and mental processes to neuro-chemical brain states; and 2) reduction of humans and life to the machine. I try to counter these charges of reductionism against materialism in Chapters I and IV.

When materialism states that everything extant is material, it means that it does not grant existence to extra-material, transcendent entities. The mind and the soul for instance are transcendent because they possess no spatial extension. David M. Armstrong (1995) writes that naturalism and materialism are close allies because both deny the existence of transcendental entities. For Armstrong, nature is a causally self-enclosed spatio-temporal system, and naturalism acknowledges the existence of only those things which are part of the naturalist causal chain and have spatially and temporally definable properties. Transcendent entities such as soul, mind and free will, insofar as they are not spatial entities, are not governed by laws of nature. Emergent (that is, transcendent) entities must then be governed by emergent laws but what is the impact of the emergent laws upon the natural realm? Armstrong argues that all natural processes and phenomena can be explained in terms of laws of nature, but then how is the causal power of emergent laws manifested? And if the impact of emergent laws is not manifest, then where is the need for emergent or abstract or transcendent entities? Armstrong's invokes Occam's Razor to demolish the existence of non-

material, transcendent entities. He states that for Descartes the immaterial *animal spirit* interacted with and impacted the material body through the pineal gland. In his posthumous *Treatise on Man*, Descartes writes how the animal spirit enters the pineal gland in the brain and moves from there to the rest of the body. But this account of movement of the body involving the animal spirit has long been debunked. Thus, since the place of transcendental entities in the naturalist causal chain and the causal impact of emergent laws on material entities cannot be established, Armstrong argues that materialism may deny the existence of transcendent entities. But Armstrong himself acknowledges elsewhere that not all non-material processes or entities can be 'translated' into material ones. One way that materialism can counter the charge of reductionism of the mental to the cerebral is through the concept of plasticity, as expostulated by Richard Boyd, Denis Diderot and Lev Vygotsky.

In Chapter I, I argue that materialism is accused of two kinds of reductionism. The first kind, to which I refer as Reductionism$_1$, is the charge that by stating reasons similar to the ones articulated by Armstrong above, materialism reduces the mind and mental processes to neuro-chemical brain states. Richard Boyd (2013) observes that materialism can counter the charges of Reductionism$_1$ through the concept of constitutional and configurational plasticity without giving in to metaphysical essentialist or Lockean constructivist arguments. While the metaphysical argument is that mind cannot be reduced to the brain because their essences are different, the Lockean constructivist argument states that the two should not be conflated because linguistic conventions grant different meanings to the two terms: mind and brain. Neither explanation satisfies Boyd who instead proffers the theory of constitutional and configurational plasticity. Two objects may be made of the same substance but have different manifestations; for instance, a wooden bed and a wooden spoon are made of the same substance – wood – but have configurational plasticity as their manifestations are different. Likewise, two objects may have constitutional plasticity. Mind and mental processes have

corresponding brain states but possess configurational plasticity. Moser and Trout (1995) state how according to many schools of thought, it is a category mistake to reduce the mental to the cerebral because a discipline like psychology would then have to be replaced by physics. Secondly, they point out how despite the fact there is a cerebral process underlying all mental processes, the former is never experienced. Does that mean that the experiences studied by phenomenalism are meaningless? Certainly not, even materialists will agree. Thus, the concept of configurational plasticity as elaborated by Richard Boyd can be a tentative path to establish the materialist understanding of the brain-mind relation without giving in to reductionism. Again, similar to the concept of constitutional plasticity which Boyd ascribes to the brain, there is the notion of the social brain, developed in the early 20th century by the Soviet scientist Lev Vygotsky, which states that the evolution and the development of certain brain parts occurred in response to the social environment (Wolfe 2010). For example, the prefrontal cortex of the human brain developed to be able to memorise the complex symbolic system of human language.

Coming back to Meillassoux, his attempt to counter the all-encompassing mediating role which Kant grants to mental forms of understanding by materialising the mind is ineffective, I argue in Chapter III, because materialists themselves acknowledge that the materialist understanding of the mind-brain relation entails acknowledging that for every mental state and object there is a corresponding cerebral state, but not in terms of the reductionism of the mental to the cerebral. Materialism accepts the configurational plasticity of mind and brain, and the brain's constitutional plasticity insofar as the brain is a social brain impacted by social processes. Besides, as already stated, Kant himself acknowledges the existence of the reality-as-it-is, which in the case of the brain-mind relation will comprise of the electric-chemical processes in the central nervous system and the brain. Kant would acknowledge the existence of these processes; his argument is that transcendental cognition entails mediation

of all cognition by *a priori*, mental forms and hence, the inaccessibility of reality-in-itself. A materialist intervention in the form of materialisation of the mind does not answer effectively how reality-as-it-is, can be accessed. I argue in Chapter III that Meillassoux can more effectively counter the Kantian argument about the inaccessibility of the reality-in-itself through scientific realism. I explore the central tenets of scientific realism in Chapter II of this dissertation.

## IV. SCIENTIFIC REALISM AND SCIENTIFIC PROGRESS

Experimental philosophy arose in reaction to the philosophy of first principles wherein empirical observation and experimentation were considered insignificant and the goal was to explain the physical, empirical world in terms of *a priori* first principles. The Empiricism of the 18th century revolted against the essentialism of the earlier Rationalism. In *An Enquiry Concerning Human Understanding* (2007), David Hume states that knowledge comprises of the stronger impressions (akin to Kantian sensations, one may say) acquired by the senses from the physical world and the more attenuated, weaker ideas. Ideas again are of two kinds: relations of ideas and matter of fact. Now relations of ideas are those ideas which are analytic in nature, that is, where the knowledge is deducible from the definition of the term *a priori*. On the other hand, matter of fact is a synthetic term and reveals new information. Unlike Kant, who considers synthetic knowledge as synthetic *a priori* knowledge, Hume states that synthetic knowledge or knowledge of matters of fact entails causal relation. For instance, the sight of footprints on a desolate beach will lead the observer to infer that someone must have walked past the beach before her. Or a voice in the dark will make one conclude that there is an unseen person to whom the voice belongs. Hume cites these examples to highlight that synthetic knowledge concerning matters of fact always entail establishing cause-effect

relations between them. In other words, we gain knowledge about matter of fact because of the cause-effect relation. But this causal relation consists of nothing save observations of conjunction or contiguity between two events. Further, what accounts for the contiguity or regularity of the conjunction is the custom or habit of the observer. Thus, for Hume causality or causal relation comprises of only observations of contiguity between two events or objects and little else.

Drawing from this Humean ideation of causality as the observation of contiguity or conjunction of two events or objects due to habit or custom, logical positivism (and its later manifestation, logical empiricism) aims to reduce and reconstruct all scientific terms into terms about observable entities and processes, and thereby purge science of metaphysics. Mario Bunge (1967) observes that this tendency to expunge all unobservables from science gave rise to a new metaphysics which equates reality to observables. The positivists are saying not just that observation is the sole source of valid knowledge but that the observable alone is real. Roy Wood Sellars (1949) writes how A.J. Ayers argues in the empiricist vein that reality consists of sense-content. Richard Boyd (1991b) notes that logical empiricism deploys the process of 'rational reconstruction' to purge science of all unobservables, and thereby of metaphysics.

In a different essay, Boyd shows how scientific realism can illuminate the conceptual aporias in logical empiricism (1983). According to Boyd (1983), scientific realism can be defined in terms of the following characteristics: 1) Scientific terms are natural kind terms which have referential status; 2) Scientific terms have approximate epistemic access to the natural phenomena or entities they refer to; 3) If scientific terms are not referential or don't have approximate access to natural entities, then only a 'miracle' can account for the success and progress associated with science; and 4) There is a mind-independent reality. Scientific

realism is often accused of ‘inflationary metaphysics’ because it grants reality to the unobservables or theoretical posits of science (Saatsi 2018). This is so because unlike logical empiricism which states that only observables are real or extant, scientific realism argues that scientific terms or natural kind terms have a referential status even when they refer to theoretical entities such as causality. The theoretical posits of science are not merely convenient fictions or instruments for predictability; they possess referential status. It is crucial to clarify here that the unobservables of science are not the transcendent entities of metaphysics. As already stated, the transcendent entities by the virtue of being unchanging and not possessing spatiality are governed not by natural laws but by emergent laws which have no discernible causal impact on the physical or material or natural world. The theoretical posits of science on the other hand have a powerful causal explanatory role: they share a dialectical relation to scientific experimental methodology. Again, very significantly, a number of theoretical posits which were initially formulated as convenient fictions having instrumental utility were eventually proved to be extant, such as atoms, electrons, germs, electromagnetic waves to name a few. For instance, Gardner (1979) describes the transformation of the status of atom from a theoretical posit into a scientifically verifiable entity. Dalton first formulated the atomic theory in 1808, yet many were sceptical at that time about the existence of atoms because he could not provide the means for measuring atomic weight or demonstrate how many atoms constitute the molecules of an element. It is only in the 1850s that the existence of atoms was established because it became possible to determine the size of the molecule by measuring its diameter, molecular speed was similarly measured and the number of molecules per unit volume of an element also calculated, thereby establishing the validity of the atomic theory. Hence, scientific realism grants referential status to those scientific terms which refer to unobservables if they have an important position in the explanatory schema.

Juha Saatsi objects, however, that even mathematical terms are essential for scientific explanation but they are not real; how acceptable then is the scientific realist argument that scientific terms referring to unobservables have referential status if they are indispensable in the explanatory schema? Yet on the other hand, if the referents of the term are not real, how does one explain scientific progress? Logical empiricism denies the existence of unobservables or theoretical posits; constructivists, on the hand, accept the indispensability of theoretical entities for scientific explanation but view all scientific terms as constructs arising from within the rules of a paradigm. Thomas Kuhn states in *The Structure of the Scientific Revolution* (1996) that scientific truths are dependent on the scientific paradigms within which they arise. He cites the example of the changing conceptions of light: considered today a photon or a quantum particle which demonstrates both light and wave like properties, light was earlier believed to be an electromagnetic wave and Newton had an atomist view of light and thought it to be comprising of corpuscles. Kuhn argues that these varied conceptions of light demonstrate that there is no scientific truth not relative to the paradigm. Yet a scientific realist would ask that if scientific truth is truth immanent to a paradigm alone and determined by its experimental methods, theoretical posits etc., then can one argue that the corpuscular theory of theory of light is as valid as the quantum theory of light since each conception of light emerged from a different paradigm?

This problem can be stated differently as the problem of accounting for scientific progress. The term scientific progress is a normative term unlike neutral terms such as change or development; and when scientific realists talk of progress as being intrinsic to the expansion of scientific epistemology, they simultaneously acknowledge that the progress is not a linear one (Niiniluoto 2018). However, if all scientific truth is paradigm-relative, then how does science determine that one account of a given phenomenon is an improvement upon earlier ones? Another example can be cited here to better articulate the problem. Today, it is known

that scurvy is caused by vitamin deficiency; in earlier centuries, seamen suffered in large numbers from this debilitating disease because they didn't have access to fresh food for months, causing vitamin deficiency in them. In the 17th century, Captain Cook thought that consumption of malt could cure the disease; earth bath was also considered a remedy. However, we know now that the intake of citrus fruits reduces the symptoms of scurvy because they contain vitamin C, which in turn contains ascorbic acid, crucial for production and maintenance of collagen, a building block of the skin which gets severely affected by scurvy. Can we argue that the present knowledge of the cause and remedy of scurvy is an improvement upon or progress of scientific knowledge, even though this knowledge too is approximate in nature? Thus, scientific realism's claim that scientific progress can be accounted for only if it is accepted that natural kind terms have approximate access to real or natural entities stands vindicated. Secondly, Kuhn argues that a scientific paradigm shift occurs when an anomaly arises which cannot be explained by the terms and methods of the normal science; the question Boyd asks is that if truth is relative to or produced by the paradigm alone, then how can an anomaly which doesn't belong to the paradigm arise? The X-ray was discovered accidentally while experiments were being performed on the cathode ray, but how could it be discovered since it wasn't part of the-then prevailing paradigm of radiations? Scientific realism therefore explains scientific progress and paradigm shift in terms of the approximate epistemic access of scientific terms to material reality. These scientific realist arguments can be used to effectively counter the Kantian claim that reality in itself is inaccessible and all sensations or manifold of appearance are subsumed by *a priori*, mental categories of understanding. If reality is inaccessible, then how is it possible to account for the rise of new paradigms of science? Kantians might say that new paradigms emerge when the categories of understanding undergo change but they then need to explain what gives rise to the change in the *a priori* forms of understanding.

## V. NECESSITY AND CONTINGENCY

In *After Finitude*, Meillassoux wants to counter correlationism or givenness arising from the Kantian position, yet he also wants to avoid metaphysical concepts such as real necessity and theory of sufficient reason. Metaphysics states that entities exist independently of the mind, but it further goes on to absolutize existence using the concept of real necessity which states that everything that exists, exists for a reason. Armstrong writes in *What is Law of Nature* (1983) that while empiricism leaves causality too soon by reducing it to the observable regularity between events, metaphysics takes it too far by trying to assert the theory of sufficient reason. This necessary causality or the theory of sufficient reason leads to an uncaused cause as the ultimate cause, which can be God. In the case of Aristotle, the law of sufficient reason asserts the existence of *telos* or purpose of existence. Charles Wolfe (2015) writes that for Aristotle, to exist is to exist for a reason, and that reason is its function. Aristotle was dissatisfied with Platonic theory of forms because it could not explain change, yet he wanted to save change from the contingency theory of the atomists such as Epicurus, Democritus or earlier pre-Socratic philosophers such as Empedocles who argued that there is no design or order in nature; to them, Aristotle's objection is that if there is no purpose, then how to explain observable regularity? Against the Aristotelian absolute of the *telos* (also postulated by functionalist theories) and other metaphysical absolutes, Meillassoux posits a *contingent absolute* or the idea of 'necessity of contingency'. Chapter IV of this thesis explains why Meillassoux's articulation of the contingent absolute is ineffective, for he draws his notion of contingency from the Humean ideation of the contingency of causal relations rather than from a materialist conception of contingency; materialism has a rich tradition of arguments positing the contingency of the natural laws and natural order against the

arguments of real necessity or sufficient reason posited by metaphysics. Hume on the other hand, it will be demonstrated in Chapter IV, is not claiming that the natural order is contingent but that observation – which is the sole source of valid knowledge in empiricism – cannot demonstrate whether the natural order is contingent or necessary. Significantly, Meillassoux bases the concept of 'necessity of contingency' on the Humean imaginary hypothesis; this is an unwitting attempt – it is argued in Chapter IV – to reduce the non-totalisable possible to the imaginable, something that Meillassoux is avowedly opposed to.

## VI. CONCLUSION

In philosophy, it is only metaphysics and metaphysical theories which aim to understand the nature of reality. Materialism and scientific realism are charged with engaging in metaphysics because they undertake ontological enquiry, into the nature of reality and material entities even though they eschew metaphysical concepts such as transcendent entities, law of sufficient reason, causal necessity and Absolute being. Meillassoux's *After Finitude* is an investigation of the nature and status of causal necessity in the materialist and realist tradition. The broad aim of this thesis is to critically examine how effective is Meillassoux's speculative investigation into the nature of Necessity and Contingency of the material realm. It has long been held that the realm of science or nature and the realm of the mental are distinct and disparate from each other. This delicate balance which philosophical dualism maintains between the two realms is challenged by the monism of materialism which insists that there is a mind-independent, material reality, and by scientific realism which argues that natural kind terms have approximate epistemic access to this reality. The problem with materialism and scientific realism is that they are viewed as pre-critical philosophies which aim to analyse and access a reality existing independently of the mediation of language,

consciousness and mental categories of understanding and culture. Does this aim seem too naïve or simplistic a goal? There are no easily resolvable answers. Analytic philosophy boasts of many proponents of scientific realism, naturalism and materialism; the publication of *After Finitude* reinvigorated the interest in materialism and realism in continental philosophy. The aim of this dissertation consisting of four chapters is to understand how Meillassoux's key concepts, such as his materialist critique of the Kantian idea of the inaccessibility of the noumena and the contingency of causality, can be critically examined in the light of the contemporary as well as older debates around materialism and scientific realism.

# I. MATERIALISM AND REDUCTIONS: A REASSESSMENT

**ABSTRACT:** The theory of materialism has historically attracted the charge of reductionisms of various kinds; it has also been accused of dismissing certain philosophical concepts such as mind, soul, or free-will, thereby leaving for philosophy the position of 'handmaiden' of the natural sciences. How can materialism retain its monist ontology while avoiding reductionisms at the same time is a question which has been one of the primary concerns of the defenders of materialism. The aim of this chapter is two-fold: first, to examine the works of David Armstrong, Richard Boyd and Charles Wolfe in order to argue that the mind-brain identity theory can be upheld without resorting to reductionism of the mental to the cerebral; second, to formulate a materialist concept of the organism that retains its distinction from mechanistic reductionism while at the same time not attributing its difference from the machine to any metaphysical concepts such as Holism, Vitalism or Soul. The biologist Richard Lewontin claims that the metaphor of the machine which is often used for the 'organisms' is inadequate, and even erroneous, because it does not take into account 'the multiple causal pathways' which constitute the organism. The chapter will attempt to combine the idea of multiple causality with the materialist rebuttals to accusations of reductionisms by its critics.

## I. INTRODUCTION: MATTER, MATERIALISM, REDUCTIONISMS

There are diverse materialisms in different eras; broadly, however, materialism may be described as the monist view which states that all natural processes, events, states and objects are either material or outcomes of relationships between material entities. Two key characteristics can be formulated from this definition: firstly, if everything extant is material, it follows that both organic and inorganic entities are material. Secondly, it entails that the 'mental is really the cerebral' (Wolfe 2016b). A critic may discern the reductionist tendencies

in the very definition of materialism, and ask that if everything that exists is material, and if everything mental is actually cerebral, then how does one account for powerful philosophical concepts such as mind, mental states, soul, will and intentionality? In fact, the formulation of the charge of reductionism against materialism in moral terms has been that it conflates the 'higher' states such as free will, consciousness and purposiveness to 'base' or lowly matter (Wolfe 2016a). But it will be demonstrated below that such accusations are ill-founded and can be countered from within a materialist framework. Before initiating a discussion on materialism and the reductionisms it allegedly entails, it is pertinent to ask: what is matter?

For Descartes, sensations – which are the basis of sense data, and thereby, of ideas – are caused by something which is distinct from and independent of the mind and the senses; this distinct entity has the properties of extension, shapes and movement, and it is this extended thing which Descartes calls 'body' or 'matter' (Descartes 1985). Thus, while matter, in the Cartesian schema, is defined as that which possesses the property of extension or *res extensa* and is independent of the mind, materialism is the monist theory which states that since everything that exists is material or a product of interactions amongst material things, it is not far-fetched to claim that mental events and physical events are 'made of the same stuff', although there are differences in the 'arrangement' or 'configuration' of the material forces inherent in them (Boyd 2013). To put it differently, there are constitutive continuities between the material and the non-material (which may include the mental states and phenomena as well as metaphysical conceptions of the living organism) but they are discrete and hence reductionism of mind to brain is unacceptable. Again, there is another – quite prominent – kind of reductionism which materialism is accused of indulging: if everything extant is material, then how does one distinguish between organic and inorganic entities, or between, say, humans and a stone or a Fanta can (Wolfe 2010)?

This chapter is divided into two major sections that delve into the two kinds of reductionisms which materialism is primarily accused of. These two reductionisms may be termed as Reductionism$_1$ and Reductionism$_2$. The first section, which deals with Reductionism$_1$ or the view that materialism in arguing about mind-brain identity equates the mental and the cerebral, explores materialist arguments in David Armstrong's Central State Theory, Richard Boyd's concept of Plasticity and Diderot's notion of the 'soft substance of the brain' as articulated by Charles T Wolfe to counter Reductionism$_1$. The second section, in order to be able to effectively challenge the view that materialism is guilty of Reductionism$_2$, which reduces the complex unity which is the organism to a machine, explores Richard Lewontin's concept of multiple causal pathways and its usage in biology. The aim of the chapter then is to argue in conclusion that when materialism avers the cosmological view that all things which exist are material and the view of the mind-brain identity, it does not necessarily follow that Reductionism$_1$ and Reductionism$_2$ are also what materialism espouses.

## II. REVISITING MIND-BRAIN IDENTITY OR REDUCTIONISM$_1$

The history of philosophy identifies different schools of materialism in different eras: the Atomists such as Democritus, Epicurus, Lucretius are considered materialists. In Letter to Herodotus (1926), Epicurus makes the materialist observation that an 'investigation of nature' shows that the universe comprises of 'bodies and spaces', and that bodies are either atoms themselves or compounds which come into existence due to combination of atoms. Aristotle, who wanted to strike the 'middle ground' between the theory of ideal forms of the Platonists and the idea associated with the Atomists that the universe is constituted by material bodies in motion, which are governed by contingent laws, aimed to combine the two, but in the process he favoured Form. According to Charles T Wolfe (2016a) Aristotle is

dissatisfied with Platonism since its theory of 'ideal forms' cannot explain change but he also seeks to 'save change' from the 'contingency' of the atomists; thus, Aristotle explains change in terms of *telos*, or purpose. 'To change is to change for something', the Aristotelian teleological theory states (Wolfe 2016a). Secondly, the Aristotelian theory of Hylomorphism, despite its name which suggests objects or beings as compounds of Form and Matter, refutes that they are so; the essence of an entity is always manifest in its form alone (Hartman 1976). Wilfrid Sellars (1949) while enunciating the theory of Hylomorphism attributes a sort of emergent materialism to Aristotle; in the Aristotelian schema, all things found in the universe are of four kinds: the physical entities; the physical entities which are organic or vegetative; the physical, organic entities which are sensate but not rational (that is, the brute), and finally, physical, organic, sensate substances endowed with the faculty of reasoning. For Aristotle, matter is common to all these kinds of substances but the essence of entities lies in their Form, and hence matter is 'lower level' than form.

After the Atomists and Aristotle, the next thinker who seriously theorised about matter, according to Aram Vartanian (1953), is René Descartes. Vartanian contends that Descartes gave rise to not just idealism but also materialism, because along with stating that *res extensa* or extension is the property of matter he also granted that motion, albeit mechanistic motion, is intrinsic to matter and thereby laid the foundational plank for the works of later materialist philosophers such Julian Offray de la Mettrie. Thus, while for Aristotle matter was the 'lower level' or the 'potential' of form, for Descartes the motion or movement intrinsic in matter is mechanistic in nature. From these accounts, it seems that since matter lacks purpose according to Aristotle on the one hand and conscious agency as per Descartes on the other, materialist monism is necessarily reductionism, for matter cannot explain consciousness, will, or even epigenesis, nor can it explain the mind and its states. Reductionism, of which materialism is often accused, is the charge that when materialism insists on brain-mind

identity, it attempts to destroy what Spinoza had described as 'imperium in imperio' or the idea that the human mind is a 'kingdom within a kingdom' (Wolfe 2010). The human mind is unique and it is the seat of experiences and states which are not reducible to physiological or neural processes. Reductionism[1] is the charge that materialism tries to efface the differences of meanings between mental and cerebral terms and thus ignores the uniqueness of the mental and the phenomenal states.

## II.1. ARMSTRONG'S CENTRAL STATE THEORY: LOST IN TRANSLATION?

Right at the outset, it is pertinent to outline the Cartesian argument as to why mind and brain cannot be considered identical. Vernes (2000) articulates the difference of mind and brain in terms of the Cartesian primary and secondary qualities as follows:

> "The ways that physics and common sense conceive of matter are undoubtedly fundamentally different. For the latter, the qualities of matter are closely related to the sensations we have of it. Bodies are blue or red, hard or soft, heavy or light, whereas science speaks of atoms, waves and particles" (3).

Secondary qualities are experiential and co-related to the mind (Meillassoux 2009). David Armstrong (1993) observes in *A Materialist Theory of the Mind* that the mind-brain relation has been broadly theorised from three opposing philosophical vantage-points: while Mentalists argue that the material is reducible to the mental, the materialists advocate various kinds of mind-brain identity theories. Finally, there are the Dualists who view mind and brain as distinct entities, each possessing different set of qualities. Mind is, for instance, non-spatial whereas the brain, by the virtue of being material, has a spatial location. Armstrong identifies

two principal schools of dualism: the Cartesian dualism and Bundle dualism of Locke and Hume. Each of these schools have a different conception of the mind and thereby of the mind-brain relationship. Unlike Aristotle, Descartes views the subject as a compound of the mental and the material but he fails, according to Armstrong, to theorise well the relation between the non-spatial, non-substantial mind and the material body and mind. Likewise, bundle dualism, which drawing from Hume defines mind as a 'series of perceptions', also cannot theorise the relation between the mind and body well. Armstrong juxtaposes the Central State theory vis-a-vis the dualist ones; he defines the central state theory in the following terms:

> "The second form of Materialism is what the American philosopher Herbert Feigl has called the central-state theory of the mind. Mental states are identified with physical states of the organism that has the mind, in particular, with states of the brain or central nervous system. Such a view has always been attractive to many psychologists, but until recent years most philosophers have thought that there were obvious and conclusive objections to this sort of theory" (1993:10).

The central state theory is not, however, a theory that advocates Reductionism[1] because when Armstrong writes that 'mental states are identified with physical states', he does not mean that mental states are experienced as states of the brain. Instead, it may be argued that for Armstrong the Cartesian distinction between primary and secondary qualities is also upheld by the central-state theory when he observes that in our experience the mental states are of a 'peculiar, mental sort' (1993: 77). The central-state theory as it is formulated by U.T. Place and J.J.C Smart emphasises upon the role of physical stimuli – which result from neuro-chemical processes – in generating mental states in the subject. Such an account is inadequate for Armstrong because it cannot explain a mental state such as intentionality which is not the

outcome of any physical stimuli. Rather, intentionality is a mental state which is the cause of other mental states and behaviours. Armstrong's central state theory is materialist because it acknowledges that corresponding to every mental state or event there is a physical property; when a rubber-band is stretched, materialism will argue that stretchability is a property of the band that exists even when it is in in the relaxed state, unlike phenomenalism which focuses only on the experience of the state of being stretched at that given moment. But Armstrong's materialism also allows him to concede that the 'translation' of the mental state to a state of the brain is never complete, and hence the two are distinct states. Armstrong writes:

> "Then the question arises whether it is possible to do full justice to the nature of these mental states by means of purely physical or neutral concepts. We therefore try to sketch an account of typical mental states in purely physical or neutral terms. The account might fall indefinitely short of giving translations of mental statements, yet it might still be plausible to say that the account had done justice to the phenomena. Of course, this does leave us with the question how, lacking the test of translation, we can ever know that we have succeeded in our enterprise" (1993: 84-85).

David Armstrong's central state theory therefore counters Reductionism[1] - the idea that experience of the mental states is same as states of brain - by putting forth two arguments: while the first points out how not all mental states are caused by physical stimuli, including intentionality which is itself the cause of so many actions; the second argument of Armstrong's concerns the problem of the lagging in the 'test of translation' which gnaws at brain-mind identity theories.

## II. 2. BOYD'S PLASTICITY OF THE MIND: ON CONFIGURATIONAL DIVERSITY

Richard Boyd provides another set of powerful arguments against Reductionism[1] but without forsaking materialism. Boyd (2013) writes that John Locke articulates anti-essentialist arguments against the mind-brain identity argument, of which he is critical. Against the metaphysical dualism which asserts the distinction between mind and matter in terms of difference of essences, Locke proposes a constructivist argument in favour of the distinction. Essential properties of entities are not necessarily essential properties in the Lockean framework because empiricism states that the traits or qualities attributed to a natural kind term or a general term is 'given by conventionally adopted criteria for telling which things fall under the term' (69). Furthermore, as per this account, the mind-brain identity is outright invalid; since the meanings and properties associated with the terms 'mind' and 'brain' by linguistic conventions are different, they must be discrete entities too. Hence, materialist claims such as '$H_2O$ = water', and 'pain = C-fibre firing' are meaningless in such a Lockean account. In trying to overcome essentialism which states that entities possess characteristics necessarily, Locke proposed the constructivist account which posits traits of objects and living beings as meanings associated with general and natural kind terms (used for classification of the entities), and meanings in turn as a consequence of linguistic conventions. Boyd observes that Locke thus replaces metaphysical essences with nominal essences. Boyd contrasts the Lockean account with a materialist account as follows:

> "For better or worse, the materialist claims that mental states, events, and processes are really physical. He does not claim merely that we could adopt the convention of saying that they are. He claims they are already, anyway! If he says that pain is identical to C-fiber firings, he means it. He does not mean that we could identify the

one term with the other term - he does not even mean that it would be rational to adopt such a convention" (2013: 73).

This passage from Boyd is crucial because it enumerates the materialist view about the relationship between entities or natural kinds and their properties; unlike metaphysical essentialism, materialism does not claim that certain properties of an entity constitute its necessary essences: properties of entities occur to them contingently. Secondly, unlike Lockean empiricism, materialism does not claim that properties of things and beings are a matter of linguistic convention, for the entities really possess those properties. Finally, in arguing against both the ideas of necessary essence and linguistic convention and in insisting upon the reality of the properties of entities, materialism does advocate the constitutive identity of the mind and the brain. In other words, materialism does not advocate 'the syntactic reducibility of the vocabulary and laws of all the sciences to the vocabulary and laws of physics (2013: 85). In order to expound the difference between the mental and the material terms while insisting on the identity of the mental and the material states or processes, Boyd employs the concept of plasticity of mind. Boyd defines plasticity of the mind as 'its capacity to be realized in more than one way; the plasticity of a type of event, state, or process is indicated by the degree of variability in the particular (token) events, states, or processes that could realize it' (2013: 87). The key terms for consideration in this definition are 'variability' and 'realisation'. Boyd states that plasticity of the mind – and of any other thing – is of two kinds: constitutional plasticity and configuration plasticity. The two concepts can be illustrated thus: a wooden chair and a wooden spoon both have configurational plasticity as they are diverse manifestations or 'realisations' of the same substance, wood; what they lack is constitutional plasticity since both are made out of the same thing. Boyd cites genetic differences amongst people or any species in general as an instance of constitutional plasticity. In the case of the mind-brain relation, Boyd's argument

thus is that they are constitutionally identical but disparate because they possess configurational plasticity. Or in other words, configurational plasticity of the mind means that there are numerous possible manifestations of a given mental state and its experience. But to assert the constitutional identity of brain and mind does mean that there is no constitutional plasticity of the brain. For instance, the materialist argument 'pain = C-fibre firing' does not mean that for the mental state of pain, there is one and only one corresponding neuro-anatomical state. Every mental state does not have one correlated physiological state; there is a multiplicity of causes even in the constitution of the physiological, as will be discussed below. Hence, according to the materialism which Boyd favours, there is constitutional plasticity as well as configurational plasticity in case of both cerebral and mental processes and states.

There are drugs and experiments capable of producing specific mental states in the subject. La Mettrie (1996) explains the relation between the mental and the physiological in *Machine Man* thus:

> "What was needed to change the bravery of Caius Julius, Seneca, or Petronius into cowardice or faintheartedness? Merely an obstruction in the spleen, in the liver, an impediment in the portal vein. Why? Because the imagination is obstructed along with the viscera, and this gives rise to all the singular phenomena of hysteria and hypochondria" (1996: 6).

This observation by western modernity's first self-proclaimed materialist at one level resonates with Boyd's notion of non-reductive materialism and its claim that the mental is inextricably linked to the cerebral. Or to put it in the words of Boyd, '...materialism entails the physiological definability of pain in man, and of other mental and psychological events, states, and processes...' (92-93). Thus, for materialism, the mental and the cerebral are not

distinct, as it is for the dualists, because they have different necessary essences; again, unlike the Lockean constructivists, materialism does not view the mental and the cerebral as discrete because 'linguistic conventions' have assigned different nominal essences to the terms 'brain' and 'mind'. For materialism, the mental and the cerebral are inseparably but contingently linked to one another – a link which is not dependent on metaphysical essence or linguistic convention – and therefore it insists on the mind-brain constitutional identity. Yet that identity is not of the variety of Reductionism$_I$, which aims to efface the difference between the two. Boyd's concept of plasticity of the mind helps in overcoming Reductionism$_I$, because it insists on the configurational plasticity of the mind. There are multiple manifestations of a given mental state, vouching for the reality of its configurational plasticity and the multiple manifestations or realisations give rise to a myriad of phenomenal experiences. This configurational plasticity of mental states ensures that the phenomenal or the experiential is not conflated with the material, or the mental with the cerebral.

The charge of Reductionism$_I$ against materialism has therefore been challenged by Armstrong and Boyd by their different materialist theories: while the central state theory cites the problem of lack of translatability which renders the autonomy of the mental and the phenomenal, the concept of configurational plasticity of the mind allows for a multiplicity of realizable mental states, and thereby for their distinctiveness from the cerebral.

### II.3. CONSTITUTIONAL PLASTICITY OF THE BRAIN: THE BRAIN AS THE BOOK AND THE READER

In order to illustrate the concept of constitutional plasticity of the brain, Boyd invokes the case of recovery from aphasia caused by brain lesions: there is evidence to suggest that

recovery happens because some other part of the central nervous system starts carrying out the function of the damaged tissues. This instance substantiates the concept of brain plasticity by pointing out that it is inaccurate to localise the neurophysiological basis of a given mental state to a single part of the brain alone, and likewise, it is inaccurate to resort to single causality to explain a physiological process and a mental phenomenon. According to Boyd, the materialist attempts to define mental states in physiological terms are meaningful if they take into account the constitutional plasticity of the brain. He observes:

> "Let "Q" rigidly designate the set of all those physiological states that, in some possible world, realize pain in man. Q may well be infinite. Nevertheless we can inquire whether the most plausible version of materialism entails the identity statement "Pain in man = the state of being in a state that is itself a member of Q." This statement represents the most general possible physiological definition of pain in man" (2013: 92-93).

If the concepts of the central state theory and of configurational plasticity of the mind endeavour to gainsay the allegation of Reductionism$_1$ by arguing that the materialist emphasis on brain-mind identity can accept the autonomy of phenomenal and mental states by allowing for their configurational diversity and distinctiveness, Reductionism$_1$ can also be effectively questioned by the concept of the plasticity of the brain, with its opposition to localisation of physiological states and to assigning of single physiological causation to a given mental state. Denis Diderot, according to Charles Wolfe (2016b), recognised the 'malleability' of the brain as well as opposed the cerebral localisation of the neurophysiological processes which give rise to the distinct phenomenal and mental states. Wolfe writes that Diderot's notion of the plasticity of the brain can be expressed as follows: "Our minds and brains are (potentially)

subject to constant change and alteration caused by our ordinary developmental engagement with cultural practices and the material world" (2016b: 5).

Contrasting Diderot's conception of the (plastic) brain to that of Locke, Wolfe argues that while for Locke, there was no need to investigate the brain in order to study the mind because the brain was passive and static, for Diderot the brain is plastic because it is self-organising in nature: it can alter its functioning in reaction to changing physiological and physical environments. Cerebral plasticity renders it possible for Diderot to compare it to a book which also reads itself. Further, for Diderot, sensitivity arises not in the brain but in the brain-body network, rendering the concept of cerebral localisation a little more difficult to defend, and that of brain plasticity a little more tenable. Both Richard Boyd and Denis Diderot posit the concept of brain plasticity to challenge the notion of cerebral localisation which states that every mental process and state – phenomenal, cognitive, psychological – is correlated to a specific brain function; while Boyd's conception of brain plasticity challenges the idea of brain localisation by elaborating the concept of multiple physiological causality of a given mental state, in Diderot's framework, the brain possesses plasticity because it is 'self-organizing, self-interpreting and co-constituted in relation to the external world' (2016b: 13).

The idea of cerebral plasticity is further bolstered by the concept of the 'social brain' as developed by the neuropsychologist Lev Vygotsky. If in the 18th century, Diderot used metaphors such 'a book that reads itself' and 'living wax' that retains all the shapes it receives, in the early 20th century, Vygotsky attempted to experimentally prove the plasticity of the brain by illuminating upon its socially embedded nature (Wolfe 2010). Influenced by the Spinozist 'externalist' idea that the subject is not defined by her interiority, but in relation to the natural and social network to which she belongs, Vygotsky argues that while there is mind-brain identity constitutionally, the brain 'itself (is)… social' and he favours the view 'of

cerebral architecture as reflecting changes in the linguistic, social and cultural environments' (2010: 11). Vygotsky and Alexander Luria argue that in the process of her cognitive development, the child first comprehends concepts and ideas socially, and later she individualises them. Wolfe articulates Vygotsky's theory as follows:

> "Thus the central tendency of the child's development is not a gradual socialization introduced from the outside, but a gradual individualization that emerges on the foundation of the child's internal socialization, in the Spinozist terms outlined above, we don't compose the network(s), they compose us." (2010:13).

For Vygotsky and Luria, the 'functional organisation of the brain' too indicates that it is impacted by social and environmental factors, just as the organism is impacted by them, as will be discussed below. The observation of Vygotsky and Luria that the brain is socially determined gets strengthened subsequently by the idea of Terence Deacon that humans are a 'symbolic species' since the development of the prefrontal cortex of the brain reflects its adaptations in response to development of memory processes, which in turn result from complex symbol learning (Wolfe 2010). The brain, therefore, possesses plasticity in yet another way since it co-evolved with language and linguistic symbols, and hence is socially constituted as much as mental states are constituted physiologically.

Materialism often incurs criticism as a reductionist theory; one such form of reduction entails the accusation that in insisting on mind-brain identity, materialism seeks to reduce concepts such as mental processes, phenomenal states, cognitive activities such as thinking, reasoning, remembering to being identical to neuroanatomical processes localised in different sections of the brain. Such reductionism can be termed as Reductionism$_1$ and it can be countered by invoking materialist concepts such as the central state theory of David Armstrong, which points out how not all mental states – like intentionality – can be explained as being evoked

by physical stimuli. The central state theory thus endeavours to develop a more complex understanding of the mind-brain relation while acknowledging that the mental and the cerebral retain distinctiveness and autonomy conceptually since the former cannot be translated into the latter in its entirety. Richard Boyd maintains the materialist argument of mind-brain identity but his concepts of constitutional and configurational plasticity aid in countering Reductionism$_1$, as Boyd grants configurational plasticity to the mind as is manifest in its varied realisations. The mental state of pain can be described in materialist terms as 'pain=fibre firing' but this formulation expresses only the constitutional identity of the two but fails to capture the configurational diversity of the mental state of pain. Again, constitutional identity only means that at the physiological level pain can be described as fibre firing caused by injury to tissues, but there isn't one physiological process which is responsible for the state: pain can be caused by umpteen number of physiological factors and all of them have to be taken potentially into consideration for making the statement 'pain=fibre firing' valid. The same argument of multiplicity of causality also effects brain functioning. There is no localisable cerebral process corresponding to a mental state, as the brain itself adapts and organises itself to various external factors. The plasticity of the brain is reflected thus in its social embeddedness, as Diderot and Vygotsky argue.

In attempting to counter Reductionism$_1$, materialism also attempts to allay fears that it runs the risk of reducing philosophy to mere scientism, or to the status of 'handmaiden of science' (Wolfe 2016b). Materialism favours naturalist explanations – the idea that exegesis of natural events and phenomena should be in consonance with scientific explanations – but it can uphold naturalism without falling into the quagmire of Reductionism$_1$ if it formulates the thesis of mind-brain identity building upon the concepts discussed above.

## III. THE MECHANISTIC MODEL OF THE LIVING ORGANISM, OR REDUCTIONISM$_2$

In the posthumously published essay *Treatise on Man* (1985), Rene Descartes exhorts the readers to imagine the body as a machine: in this account, he first compares the process of digestion of food in this body-machine (which is like the human body in every sense, save for the absence of soul) to the way water acts on quicklime. The digested food provides nourishment to what Descartes terms as the 'animal spirit' which in turn enters the pineal gland located in the brain, and from there, through the ventricles of the brain, enters the nerves and causes movement in the body. Descartes thus imagines the possibility of movement in the body devoid of soul and its agency! Descartes states:

> "Now, to the degree that these animal spirits thus enter into the ventricles of the brain, they pass from there into the pores in the brain substance, and from these pores into the nerves. And according as they enter, or tend to enter, one or the other of these, they have the power to alter the shape of the muscles into which these nerves are inserted, and by this means make the members move, just as you may have seen in the grottos and fountains of our King, in which the simple force imparted to the water in leaving the fountain is sufficient for the motions of different machines, even making them play musical instruments, or speak words according to the diverse disposition of the tubes conducting the water" (Descartes 1664:7).

Descartes' comparison of the movement of the 'animal spirit' through the nerves to cause motion in the body to the functioning of the water-pumping machine was influenced by the development of science of hydraulics in his time (Donaldson 2009). According to Freudenthal and MacLaughlin (2009), the impact of the developing science of mechanics was so immense on science and philosophy alike that it became acceptable to compare the

machine to nature: there was mechanisation of nature and of the body. Thus, Descartes granted mechanical motion to base matter which was considered base precisely because it lacks the agency and intentionality of the soul. This Cartesian idea of mechanistic motion as intrinsic property of matter immensely influenced idealists as well as materialists, as stated earlier. Idealists argue that in the absence of the soul, the movement of the brutish animals is also of mechanistic nature (Vartanian 1953). But human movement is defined in anthropocentric terms as being caused by a force which is irreducible to matter (Wolfe 2016a). The materialists, however, influenced by the Cartesian notion of mechanistic motion compared the human body to a machine, causing much consternation amongst anti-materialists who accused medical materialists of reductionism. The question is how justified is the charge of mechanistic reductionism against materialism?

Eduardo Macheray (2012) defines 'to be alive' as possessing the characteristics of self-reproduction, evolution and metabolism. When the human body, or any other living organism, is compared to a machine, allegations of mechanistic reductionism are bound to arise because the machine does not possess any of these characteristics. Wolfe describes the problem in this manner:

> "...a machine is a system of inanimate parts, presumably without a central controller, and certainly without an internal "vital principle." Hence, when a living body—animal or human—is described as being like a machine (or "nothing else but a kind of machine or automaton"), we can feel fairly confident about what is happening: the various properties of organic life—the real, basic properties of what it is to be alive and in a body: self-maintenance, goal-directed behavior, and perhaps even intentionality or consciousness — are being reduced to basic mechanical properties" (2016a: 48).

A machine is not dynamic; it is not alive. Devoid of the vital principle or life, it cannot reproduce, or evolve, or metabolise, and certainly lacks mental states such as consciousness. Then why did materialists such as la Mettrie compare the human body to a machine, when mechanistic motion attributed to the machine obviously cannot account for any of these characteristics of life? In *Man-Machine* (1996), Julian Offray de la Mettrie writes: "The human body is a machine which winds itself up, a living picture of perpetual motion" (1996: 7). A little later in the text, he observes: "We think, and we are even honest citizens, only in the same way as we are lively or brave; it all depends upon the way our machine is constructed" (1996:8). It seems from these statements that accusations of mechanistic reductionism levelled against materialists are not unfounded since la Mettrie views the human body as a machine, which is determined by the natural laws governing its functioning. But such an accusation is indeed misleading because la Mettrie also marvels about the innumerable possibilities immanent in nature, which cannot be comprehended *a priori*. He states how Trembley 'discovered generation without mating by simple segmentation' in the case of polyps, something that would have been unimaginable until proved by experiment (1996: 11). He also speculates about the possibility of apes acquiring language, given the similarities of the cerebral anatomy in humans and apes. La Mettrie, in other words, argues that human are anatomically and physiologically determined by laws of nature, which renders the parallel to machines apt; but the motion of the man-machine is not mechanistic since living matter of which it is constituted is far too complex and dynamic. Diderot too was a determinist who at the same time refuted mechanistic motion ascribed to matter 'because of his vision of living matter in perpetual transformation' (Wolfe 2016a: 39).

The dualists and the idealists maintained that motion in matter is merely mechanistic whereas in living organism could be explained by concepts such as teleological movement, Holism, or Vitalism. Whereas for Aristotle, change in the living organism was the movement towards

the realisation of a Form, and thereby of the organism's *telos*; in the case of Holism, its advocates argue that an organism is not simply a sum of its parts, unlike the machine (Wolfe 2014). As a whole, organisms are not reducible to their parts because of their capacity to adapt. Vitalism is another such school of thought which positioned itself against the mechanistic reductionism of materialism, because for the vitalists there is 'extra-causal' force which animates organisms (Wolfe 2008). The 18th Montpellier vitalists were a group of medical men in France and some of them were opposed to experimentations such as dissection and vivisection on corpses and animals on the ground that the physiological functioning of the living organism could be best understood by observation of such bodies; dissection of corpses only reveals properties such as decomposition and degeneration which is not a part of the living organism (Wolfe 2016a). Therefore, the view of schools such as Holism and vitalism is that there is an extra-causal and extra-material force immanent in organisms which grants them the power of self-organising (captured in the obsolete concept of homeostasis), directionality of behaviour and consciousness, and this force is not present in matter which renders it dead. Their argument against materialism is that when it claims – like Diderot and la Mettrie do – that organisms are determined by laws of nature, it is necessarily engaging in mechanistic reductionism, because if living beings are subject to biological determinism, then they are completely bound to the nature granted to them by the natural laws and have no more 'will' or freedom than does a machine. Just as the river cannot be held responsible for the destruction it wreaks during high tide, humans cannot be held responsible for their actions if they are biologically determined, vitalism argues (Wolfe 2013b). Thus, the accusations entailed in mechanistic reductionism are two-fold: firstly, in defending biological determinism of organisms, materialism depicts them as little better than machines, devoid of free-will, consciousness and agency; secondly, such biological

determinism cannot and does not take into account the extra-causal force of life which differentiates living organisms from the dead lump that matter is.

Mechanistic materialism can therefore be described as the second kind of reductionism of which materialism is accused, and it can be termed Reductionism$_2$. If the charge of Reductionism$_1$ stems from the idea that mind and brain are constitutionally discrete entities with different metaphysical and nominal essences which the materialist concept of mind-brain identity tries to dismiss; the allegation of Reductionism$_2$ rises from the idea that living organisms are distinct from non-living objects and matter itself because the former is endowed with a force – vital or otherwise – which is not caused by any material force, and therefore, when materialism argues in favour of biological determinism, it is attempting to deny states such as free-will, agency, consciousness, and goal-directed action which are possible only because of the force immanent in organisms. Materialism defends itself from the charge of mechanistic reductionism or Reductionism$_2$ by employing the arguments which Diderot and la Mettrie do: biological determinism does not necessarily render organisms akin to machines because matter itself is dynamic and capable of accounting for all the transformations which happen in the organism. Just as la Mettrie invoked the instance of Trembley's experiments with polyps that demonstrated non-sexual reproduction to highlight nature – and matter – as a complex process which has not yet been comprehended in a totalising way, Diderot argues in D'Alembert's Dream that the so-called inert matter is itself capable of engendering as evinced by a simple observation of the ubiquitous egg. The egg is a mass of lifeless matter but 'through application of heat' and 'assimilation of nutrients', the egg becomes alive (Wolfe 2009). Hence, it may be argued that when materialism rejects extra-causal concepts such as teleology, holism and vitalism in favour of biological determinism of organisms (which allows for naturalistic enquiry), it does not engage in Reductionism$_2$ or equate organisms to machines because matter – governed by laws of nature

– is itself capable of producing life and sensate, conscious organisms. The process of matter engendering life which Diderot illustrated with the simple example of the egg, has been elaborated upon by the biologist Richard Lewontin.

## III.1. GENES, ENVIRONMENT, CHANCE AND MULTIPLE CAUSAL PATHWAYS

Reductionism$_2$ or mechanistic reductionism has so far been described as the charge against materialism that in arguing that organisms are biologically determined, it denies the existence of the extra-causal force which is immanent in organisms, and thereby cannot explain capacities or potentialities of organisms such as goal-oriented behaviour, self-organisation and consciousness. As a result of such reductionism, organisms are reduced to mechanical entities. Early modern materialists defend determinism against such criticisms by contending that matter itself is dynamic and capable of producing life. Another variation of Reductionism$_2$ is the argument that materialism reduces the organism to its constituent parts. There is no consensus amongst philosophers about the status of the organism: is it a relic of the past when holism dominated biology, or is the concept of organism relevant to capture the idea of the 'functional unity of a system of integrated parts' (Canguilhem 1989, in Wolfe 2014: 11). The variation of Reductionism$_2$, which one may term as Reductionism$_{2.1}$, is the idea that the unity or the whole that the organism is, gets replaced by the idea that there is only a sum of parts. Thus, combining the criticisms expressed in Reductionism$_2$ and Reductionism$_{2.1}$, one gets the allegation that materialism first reduces (through its defence of biological determinism) organisms to mere mechanical contraptions, and then by dismantling the concept of organismic whole in favour of molecular determinism, the concept of organism itself is done away with.

Richard Lewontin writes in *The Triple Helix: Gene, Organism and Environment* (2000) that there is a pronounced tendency in biology to favour the idea of genetic determinism, which describes the sequences of nucleotides of which genes are constituted as the blueprint of the organism. The metaphor used for the role and the position of the genes in determining the organism is of the camera film: just as the developed photograph contains only that image which exists in an unrealised form in the negative or the film, likewise, a developed or mature organism possesses only those characteristics which are coded in its genes. Lewontin opposes this ideation of genetic determinism of the organism favoured by developmental biology; he argues in favour of evolutionary biology which argues for examining the roles of the environment, chance and the organism itself in its constitution. Lewontin does acknowledge the importance of genetic determinism in the constitution of the organism. In *Biology as Ideology: The Doctrine of DNA* (1991), Lewontin observes that the vast and complex edifice of human civilisation over which we gloat and marvel is itself possible because of genetic determinism; the progress of civilisation depended in its early days upon the capacity of the human to make tools out of stones, and this capacity of the human depended on her size. If she were too small, she could not have had the physical strength to break stones and sculpt tools and weapons out of them. The size of humans, which is on an average between five and six feet, is genetically determined. Likewise, the sensations which give rise to sense data, and thereby, ideas and thoughts, are possible because of the complexity of the central nervous system of humans, and the neural complexity of the central nervous system is genetically coded (Lewontin 1991). Further, proponents of developmental biology who support the idea of molecular or genetic determinism also state that lions can never be lambs, or vice-versa because of genetic differences (Lewontin 2000).

Such decisive arguments in favour of genetic determinism seem to render the determinism favoured the 18th century philosophes rather naive; la Mettrie's speculation that apes might

acquire linguistic skills, given the similarities of their cerebral anatomy to that of humans, now seems like a proto-scientific dream from a hoary antiquity, but what the defenders of the genetic determinism thesis miss, according to Lewontin, is the role of multiple causal pathways in determination of a given organism. Firstly, in focusing largely on genotypes and overlooking the differences brought about by phenotypes, developmental biology doesn't pay adequate attention to the role of environment in accounting for differences of the ontogeny (Lewontin 2000). Environment and genetic material combine to constitute the organism, and yet the organism – or the unity of integrated parts – exceeds both. An organism creates its own environment; if in a garden there is grass and stones, a phoebe needs the grass to build its nest but has no need for the stone whereas a thrush uses the stone to crush a snail on, which it consumes. Lewontin thus writes:

> "First, there is no 'environment' in some independent and abstract sense. Just as there is no organism without an environment, there is no environment without an organism. Organisms do not experience environments. They create them. They construct their own environments out of the bits and pieces of the physical and biological world and they do so by their own activities" (1991: 70).

Besides genes and environment, chance also plays a very significant role in the formation of ontogeny of the organism, as Lewontin highlights, citing the instance of the process of bristle formation in the fly drosophila. The drosophila has sensory bristles all over its body which arise from three cells: one forms the bristles; the second, the socket out of which the bristle develops; and the third cell forms the nerve cell which renders communication between the bristle and the central nervous system of the fly possible. Now, the drosophila has bristles underneath its two wings but there is always variation in the number of these bristles on the left and the right side of the drosophila. What can explain this difference, Lewontin asks. It

cannot be genes or environment since the left and right sides of the same organism cannot have different genetic make-up or be impacted by the environment differently. Lewontin argues that the difference in the number of bristles on left- and right-hand sides of the same drosophila can be accounted for by contingency. Molecules which carry out cell metabolism through their interactions are limited in number, and as a consequence, the molecules have to migrate from one part of the cell to another to carry out certain processes. In the case of the drosophila, the bristle-forming cell must go to the surface of the developing fly's body; any delay in the division of the 'precursor cell' causes delay in the formation of the bristle-forming cell, and as a result 'it will not arrive at the hardening surface soon enough to be included as a bristle' (2000: 36). It may hence be argued, as Lewontin does, that multiple causal factors such as genes, environment and contingent factors in the physiological processes all contribute to the constitution of an organism. In other words, there are multiple causal pathways which constitute the organism and contribute to its normal functioning. Lewontin writes:

> "Organisms are also extremely internally heterogeneous. Their states and motions are consequences of many intersecting causal pathways, and it is unusual that normal variation in anyone of these pathways has a strong effect on the outcome...To be a victim of a malfunctioning liver or kidney or a growing tumor, or even to suffer from a non-life-threatening respiratory infection, is to be dominated by a single abnormal physiological element. Indeed, we may define "normality" as the condition in which no single causal pathway controls the organism" (2000: 93-94).

It is with the concept of 'multiple causal pathways' which constitute an organism and ensure its normal functioning that one can counter Reductionism$_{2.1}$, which is the allegation that materialism dismisses the very concept of organism when it is reduced to its constituent parts.

Developmental biology tries to reduce the interconnected system which is the organism to its genetic structure, but Lewontin counters such genetic determinism with the concept of multiple causal pathways. However, this concept complements materialism since environment, contingent physiological factors and the organism are all material entities. Finally, Lewontin deploys the concept of multiple causal pathways to challenge mechanistic reductionism too; he observes that unlike machines, which function in accordance with a fixed number of causal factors (such as levers, pulleys, a particular force), an organism functions because of multiple causal factors, and the influence of each of these factors vary; as a result, the mechanistic model of the organism is redundant. From 18th-century materialist philosophers to contemporary biologists, many counter Reductionism$_2$ and its variant Reductionism$_{2.1}$ within the materialist framework by acknowledging biological determinism but arguing that such determinism does not necessarily lead to mechanistic reductionism; to be determined by laws of nature does not mean that the organism is a mere machine because matter is dynamic and complex as multiple causes interact to cause and transform it, many of which are still beyond the grasp of present-day science, as la Mettrie argues. Equally important is the fact that these biologically-determined, multiple causal factors which are responsible for the constitution and functioning of the organism are impacted by contingency or stochastic processes too, as Lewontin states.

## IV. CONCLUSION

Of late there has been a renewal of interest in materialism; thinkers of disparate philosophical traditions are trying to theorise matter and the material anew. Tracing the history of materialism reveals that the charge of reductionism against the school is almost as old as the school itself. Aristotle argued against the Atomists that in emphasising upon the integral role

of contingency in matter and its motion to explain changes in the phenomenal world, they reductively dismissed the permanence of the Form. Descartes granted motion to matter but this motion was strictly mechanistic in nature and could neither explain transformations in the living organism nor account for 'higher' mental states such as consciousness, free-will, intentionality. The emphasis was on steadfastly holding on to the dualist distinction between matter and mind as constitutively discrete. However, materialism holds the monist view that everything that exists is either material or result of interactions amongst material entities. From this follows the claim of mind-brain identity which attracts the charge of Reductionism$_1$, or the idea that materialism, by the virtue of arguing in favour of the mind-brain identity thesis, reduces mind and mental states to neuroanatomical states. This form of reductionism can be countered by materialism by the aid of Boyd's concepts of constitutional and configurational plasticity of the brain and the mind; by Armstrong's version of the central state theory which acknowledges the difficulty of 'translating' the mental and the phenomenal to the cerebral; and by Diderot's conception of the brain as a dynamic 'book which reads itself' as well as Vygotsky's Spinozist concept of the social brain. These materialist theories and concepts do not suffer from Reductionism$_1$ because they grant that the mind and its various states are configurationally diverse and distinct from the cerebral states and also because they highlight how the brain itself is constituted in many ways by the external – including social – environment.

A second kind of reductionism which materialism is often accused of is the idea of mechanistic reductionism. It has two variations: the first kind of mechanistic reductionism, which may be called Reductionism$_2$, states that since materialism favours biological determinism of organisms, it deprives them of agency manifest in intentionality, self-organisation and consciousness of organisms and thus reduces them to machines. The second kind of mechanistic reductionism which materialism is criticised for may be termed

Reductionism$_{2.1}$ and it states that in favouring determinism, materialism dismantles the organism itself and reduces it to its constituent parts. Genetic or molecular determinism which developmental biology supports is an example of Reductionism$_{2.1}$. Materialism, however, argues that biological determinism of organisms does not necessarily result in mechanistic materialism because the material is dynamic by the virtue of being constituted contingently by multiple causal pathways. Materialism has been castigated often as being reductionist but these are some of the ways that materialism can be defended naturalistically, while countering reductionisms of various kinds.

# II. SCIENTIFIC REALISM AND QUANTUM THEORY - ON THE STATUS OF THE 'UNOBSERVABLES'

ABSTRACT: The idea that there is a 'verification-transcendent' reality which exists 'independent of observation' associated with scientific realism invokes the criticism that it is a metaphysical theory. Scientific realism tries to avoid the tag of being a metaphysical doctrine by its epistemological argument which states that science is the only effective way of gaining objective knowledge. Scientific realism, however, continues to attract the criticism of being a theory immersed in the quagmire of metaphysics because unlike logical empiricism and constructivism, it does not view theoretical terms as mere instruments of experimental predictions; scientific realism grants referential status to theoretical terms with 'epistemic access', and views scientific theories as corresponding to physical phenomena and entities, and as thereby being a source of objective – approximate and not absolute – knowledge of the physical realm. By granting referential status to theoretical terms, scientific realism is accused of ontologising the unobservables, which can neither be verified nor falsified by existing scientific methodologies. Against this charge, scientific realism posits the idea of the dialectical relation between theoretical terms, referring to the unobservables and scientific methods. The second argument made by realism in favour of granting referential status to scientific terms and to the idea that the relation between scientific theories and external reality is one of approximation, is articulated in the 'no miracle' thesis. Both these arguments made in defence of scientific realism by Richard N. Boyd stand challenged by the so-called orthodox interpretation of quantum mechanics. The aim of this essay is to examine the possibilities and relevance of the two arguments of scientific realism in countering the idea

that the existence of quantum states in the microphysical world renders realism obsolete. It also explores the arguments made by the 'agential realism' theory in order to find out if the orthodox quantum theory can be reconciled to scientific realism.

**I.**

Philosophy of science is commonly considered to consist of debates between logical empiricism and the two schools which emerged in reaction to its near hegemonic status: constructivism and scientific realism. David Hume states in *An Enquiry concerning Human Enquiry* (1999) that John Locke articulated the distinction between analytic and synthetic statements; analytic statements are those where the conclusion is deduced from the premises whereas synthetic statements are those which furnish new information, gained empirically. According to Hume, synthetic statements about matter of fact which is arrived at through inductive inference cannot have the certainty of analytic statements because they entail establishing cause-effect relation between two observable events or entities or 'matters of fact' but causal relation itself is established on the basis of experience, which again is based upon habit or custom. Emphasising the inextricable link between causation and experience, Hume defines causality as follows:

> "Causation arises entirely from the uniformity observable in nature, where similar objects are constantly conjoined together, and the mind is determined by custom to infer the one from the appearance of the other. These two circumstances form the whole of necessity, which we ascribe to nature. Beyond the constant *conjunction* of similar objects and the consequent *inference* from one to the other, we have no notion of necessary connexion" (1999, pp. 60).

In other words, it is constant conjunction of two phenomena in nature which gives rise to the inference by the mind of that one of them follows from the appearance of the other. What we have is the perception of the uniformity of the conjunction of two observable events and therefore, to the 'sensible qualities' but not any access to the real or 'secret nature' of the object. This Humean emphasis on observation as the sole source of reliable knowledge which is inductively gained forms the foundation plank upon which the edifice of logical positivism and its later variant logical empiricism stand. Richard Boyd (1983, 1991) argues that this primary focus on the observable as the basis of valid knowledge gives rise to the problem of logical empiricism's inability to account for the role theory and theoretical terms (which don't refer to observables); logical empiricism tried to solve the problem by taking recourse to 'rational reconstruction' of theoretical statements to strictly empirical formulations but the problem persists. Logical empiricism also suffers from others problems such as the inability (i). To acknowledge the role of theory in improving scientific methodologies, and vice-versa and hence, that the relation between theory and scientific method and evidence is dialectical; and (ii). To counter the realist 'no miracle' argument which asks what other than 'miracle' can account for the predictive success of successful scientific theories if there is no mind-independent reality which these theories approximate. Yet, the works of the Copenhagen school of quantum theory, and especially Niels Bohr with his emphasis on 'holism' in the quantum system and equating 'determinism with measurability', positivism seems to have pushed back scientific realism to the realm of metaphysics again (Bohm 1993).

In this chapter, I shall examine the problems of logical empiricism enumerated from a realist perspective and in the light of these problems, delve into the ramifications of a positivist interpretation of quantum theory. One promising new line of enquiry about a possible reconciliation between the positivism of quantum theory and realism of classical physics has

been developed by Karen Barad in her theory of 'agential realism'; the chapter will also explore how agential realism deviates from scientific realism. The chapter is divided into four main sections: the second and the third sections articulate the points of contention between logical empiricism and scientific realism regarding the status in science of the unobservables and of the scientific terms which refer to them; the fourth section peruses the arguments which claim that quantum physics poses insurmountable challenge to the plausibility of scientific realism. The concluding part will attempt to examine the feasibility of the 'naturalist' interpretation of Bohr by Barad.

**II.**

> "*Consider this: Is the pious being loved by the gods because it is pious, or is it pious because it is being loved by the gods?"* (Plato 1997, 10a)

In *Euthyphro*, Socrates asks his eponymous interlocutor to explain his definition of piety, the value which Euthyphro so ardently defends. In the course of the dialogue, Socrates enunciates the difference between the quality of 'piety' and the state of being 'loved by gods' by pointing out that: "We speak of something carried and something carrying, of something led and something leading, of something seen and something seeing, and you understand that these things are all different from one another and how they differ?" (1997, 10b) That the object and the subject, or the observed and the observer are discrete, is what Socrates seems to be arguing. In early modern philosophy, the practice of observation was not taken seriously as knowledge of the external world and the laws governing them was considered to be derivable from 'first principles'. Revolting against the speculative natural philosophy – as favoured by Descartes – early modern experimental philosophy focussed on the significance of observation and experimentation as being crucial for advancing knowledge of the physical

world (Anstey 2016). Proponents of natural philosophy insisted on separating the legitimate from the spurious by arguing that hypotheses are unacceptable unless they are derived from observation and experimentation. This emphasis on observation to keep natural philosophy free of metaphysics is 'reasonable' but in the process, a 'new metaphysics' emerged which rather than maintaining that observation and experimentation are legitimate tools of gaining knowledge of the external world – and thereby holding on the distinction between the observer and the observed which Socrates had articulated to Euthyphro – views the physical realm as being 'made of sense data' (Bunge 1967). Mario Bunge (1967) points out that observationalism or operationalism which gained immense traction in the 1920s pronounced the idea of the 'autonomous external world' as a 'metaphysical legacy from classical physics' and considered 'every atomic state was the outcome of some laboratory manipulation'. In philosophy too, this equation of the observed and the observable with the physical reality found acceptance among the Humean logical positivists. Roy Wood Sellars (1949) states that according to the empiricist philosopher A J Ayer since knowledge of the external world was possible only through senses, it is reasonable to argue that the physical world maybe defined in terms of 'sense contents'. Sellars' argument against positivism is that the latter may accept that ordinary perception is the outcome of the 'interplay of sensory data and conception' but will not accept that empirical statements have referential function and are not reducible to the 'mode of its verification'.

Richard Boyd (1991) enunciates the two fundamental principles of logical empiricism which has already been discussed above: (I). the principle of knowledge empiricism, and (II). The verificationist theory of knowledge. While the argument of knowledge empiricism is that all synthetic knowledge is sensory knowledge alone, it leads to the verificationist theory which states that a theory and its terms are meaningless as they are not testable and thereby, verifiable. The combination of the two gave rise to the 'rational reconstruction' principle

which aimed to purge all traces of metaphysics from the natural sciences by reconstituting scientific statements in such a manner that they don't admit the existence of any unobservables. Instead, a theoretical term referring to certain unobservables is to be reconstructed 'in terms of the laboratory procedures in practice associated with the term'. Boyd argues that the method of rational reconstruction championed by empiricism gives rise to an inevitable problem: it aims at eliminating theoretical terms (about unobservables) and to replace them with strictly observable and hence verifiable or falsifiable descriptions but it cannot successfully expunge the heavy 'theory dependence' of science.

Hume defines causation as 'unity observable in nature' because of constant conjunction of two phenomena which makes the mind to accustom itself to view them as being causally related; all that is observable, however, is the conjunction of the two phenomena. Logical empiricism aims to logically reconstruct causation into the claim that causal relation exists between two events if the perceived effect is 'deductively predictable' from the cause. Thus, logical empiricism which aims to eliminate all traces of metaphysics from science by reformulating or 'logically reconstructing' causality – a metaphysical concept as explained by Hume – as a relation of deducibility or predictability between two events. Boyd (1991) argues that even this attempt at logical reconstruction of so fundamental a concept as causality suffers failure because the deduction of one event from another is possible only within a theoretical framework, and thus, theory dependence cannot be escaped by rational reconstruction. The first problem that Boyd identifies in logical empiricism, therefore, entails its inability to escape theory dependence by taking recourse to logical reconstruction. Empiricism insists on the redundancy of theory and theoretical terms referring to the unobservables by emphasising upon the 'evidentially indistinguishable' thesis concerning 'empirically equivalent' theories (Boyd 1983). If two theories are empirically equivalent, or yield the same experimental results about the observables under study, then they are

evidentially indistinguishable even if they propound different theoretical accounts of the unobservables. Boyd explains the empiricist argument in favour of evidential indistinguishability of scientific theories as follows:

> "Suppose that T is a proposed theory of unobservable phenomena... A theory is said to be empirically equivalent to T just in case it makes the same predictions about observable phenomena that T does. Now it is always possible, given T, to construct arbitrarily many alternative theories which are empirically equivalent to T but which offer contradictory accounts of the nature of unobservable phenomena. Since scientific evidence for or against a theory consists in the confirmation or disconfirmation of one of its observational predictions, T and each of the theories empirically equivalent to it will be equally well confirmed or disconfirmed by any possible observational evidence. Therefore no scientific evidence can bear on the question of which of these theories provides the correct account of unobservable phenomena; ...since this construction is possible for any theory T, it follows that scientific evidence can never decide the question between theories of unobservable phenomena and knowledge of unobservable phenomena is thus impossible" (1983, pp. 47-48).

The evidentially indistinguishable thesis of empiricism in combination with the arguments about knowledge empiricism and the verificationist theory of knowledge, tries to posit the redundancy of any theory concerning the unobservable by stating that since they can neither be verified nor falsified through tests, they cannot be confirmed or disconfirmed, and hence, they are meaningless. Empiricism itself, however, still cannot escape theory dependence despite its vehement opposition to the practice of theorising about unobservables and it is this aporia which Boyd captures in the failure of empiricism's efforts at the rational reconstruction of causality. In order to overcome the problem plaguing empiricism because of

its denial of theory dependence, a number of other accounts emerged; van Frassen's constructive empiricism is one such theory which considers theorising about unobservables as pointless exercise when it entails the realist commitment to 'something supposedly other and more than empirical-observational warrant' but nonetheless accommodates the practice of theorising and hypotheses-building about the unobservables as having instrumental or pragmatic use in the sciences (Norris 2014; Boyd 1991). Constructivism acknowledges the theory dependence of natural sciences since for constructivism, all practices of science such as criteria for valid observation, sound experiment design, valid scientific evidence and the very question of what problem to solve is 'constituted by and constructed from the theoretical tradition to which the scientist belongs' (Boyd 1983). Thus, unlike empiricism, constructivism accepts that scientific practices are deeply embedded in theoretical concepts but like empiricism, constructivism views theories concerning the unobservables as outcomes of convention and tradition. One may wonder at this juncture – like Christopher Norris (2014) does – how can one distinguish between truth and 'present-best knowledge' and between present best knowledge and 'working belief' if the constructivist view that scientific theories, their constitutive terms and hypotheses are all products of a paradigm, or tradition, is accepted? The ramifications of the anti-realist rejection of the observation-independent, verification-transcendent natural realm on epistemology will be discussed in the next section.

Coming back to the status of unobservables referred to by theory and theoretical terms, while empiricism views theory dependence of science to be a metaphysical relic and tries to overcome the dependence by the practice of rational reconstruction, and by highlighting the redundancy or pointlessness of theory through the evidentially indistinguishable thesis concerning empirically equivalent theories. Boyd points out the inadequacy of the rational reconstruction method in expunging theory. Some empiricists such as Bas van Frassen and the constructivists accept the importance of theorising in sciences but they favour an

instrumentalist (and not a realist) view of the scientific terms and hypotheses. In order to challenge the evidentially indistinguishable thesis about empirically equivalent theories, Boyd (1983) argues that the distinction which empiricism makes between testable observables and unverifiable or unfalsifiable unobservables is not as steadfastly perpetual as empiricism makes it out to be. To explain this argument, Boyd posits the concept of dialectical relationship between theory and scientific method, and it is a powerful counter to empiricism's attempted equating of knowledge with the observables and the observed. Since Boyd's conceptualisation of the dialectical relation between theory and scientific methodologies is from a realist perspective, it makes sense to articulate the key tenets of scientific realism.

Arthur Fine (1991) views scientific realism as an 'interpretive stance towards science'. He defines scientific realism as follows:

> "It sees science as providing reliable information about the features of a definite world structure, and thus it construes the truth of scientific statements as involving some sort of articulated external-world correspondence" (Fine 1991, pp. 529).

This definition indicates the epistemological stance of scientific realism: scientific terms and statements are themselves constructed out of semantic conventions but they refer to, or correspond to an external world. This definition is, however, an inadequate one because it does not clarify whether the correspondence between scientific terms and the external, autonomous physical world is absolute or approximate. Boyd (1983) defines scientific realism as consisting of the following tenets: (I). Theoretical terms in scientific theories are 'putatively referring expressions'; (II). Scientific theories interpreted realistically are conformable as 'approximately true' by scientific evidence acceptable to the existing methodological standards; (III). The history of scientific development reveals that it is

'largely a matter of successively more accurate approximations to the truth about both observable and unobservable phenomena'; and (IV). The reality which sciences study is not reducible to being either observable sense data, or a construct of social and linguistic conventions. It is, in the words of Boyd, 'largely independent of our thoughts and theoretical commitments.' This last argument which makes claims about the 'nature of reality' and hence draws the flak of being merely unverifiable, metaphysical speculation, has been captured in the Norris' definition of scientific realism. Norris (2004) states that the epistemological stance of realism that the relation between scientific theory and external reality is one of correspondence or reference does not mean that there is absolute correspondence; rather, successful scientific theories are ones which are approximately true since physical reality at the cosmological level on the one hand, and at the micro-physical level on the other, is beyond sensible grasp of humans, and therefore, reality itself consists of both the observed and the observables (accessible by senses or by scientific tools), and the unobserved, and the unobservables. Thus, the two fundamental arguments of scientific realism are as follows: (I). The first is an ontological argument since it entails speculation about the nature of the external world, governed by the laws of nature, which exist independently of and therefore, is not reducible to sense data or the observables; or constructions of conventions; (II). The second principle of scientific realism as captured in the definitions of Fine and Boyd above is an epistemological one which states that scientific terms and theories have a putative referential function. Having articulated the key characteristics of scientific realism, one may return to Boyd's conception of the relation between scientific theories and methodologies as being 'dialectical'.

Boyd (1983) argues that the distinction between observables and unobservables is not a 'sharp' one because there are many entities which were initially presented as hypothetical objects but which later on, proved to be extant with the advancement of scientific

methodology and devices. Atoms, germs, electromagnetic field are some such instances. Boyd's attempt here is to challenge and overcome the empiricist insistence of defining valid knowledge as consisting only of the testable knowledge about the observed and the observables, and his intervention therefore is an epistemological one. Boyd argues that if valid scientific knowledge is not equated with the testable and the observable alone, and thereby, if theorising about unobservables are allowed, the theoretical entity referred to by the theory can aid in improving scientific methodology which in turn, can improve formulation of theory. Boyd observes:

> "Our methodology, based on approximately true theories, would be a reliable guide to the discovery of new results and the improvement of older theories. The resulting improvement in our knowledge of the world would result in a still more reliable methodology leading to still more accurate theories, and so on" (Boyd 1983, pp. 65).

The relation between theory (regarding the unobservables and the unverifiable theoretical entities) and scientific methodology (for testing scientific evidence and improving experimental predictability concerning the observed and the observables) is thus a dialectical one. This dialectical relation is illustrated in Gardner's account of the controversy in the field of chemistry in the 19$^{th}$ century about the status of atoms. Michael Gardner (1979) states that a realist account of a theoretical term entails that it is considered to refer to an existent object, whereas an instrumentalist account of a theoretical term requires that the unobservables referred to by the theoretical terms in considered not as literally true but as a convenient fiction which enables 'summarizing, systematizing, deducing, etc. a given body of information' about observable phenomena. He, like Boyd, argues that the distinction between the observable and the unobservable is not a water-tight one since history of science is replete with instances of entities which were initially posited instrumentally as convenient fiction but which eventually were proved to be extant: Galileo's theory of the parabolic path of

projectiles, and Max Planck's account of quantum of energy emitted by the black box which absorbs radiation, are examples of such entities. Gardner states that the 19th century witnessed such a controversy about the status of the reality of atoms. John Dalton puts forth his atomic theory in 1808 which asserts that matter is made of atoms which are indivisible and indestructible; further, atoms of a given element are indistinguishable and atoms of different elements vary by the virtue of having different weights. Such an account of atom had many detractors because to prove the existence of atoms, their atomic weight must be determinable but Dalton could not furnish the method for measuring atomic weight, or for determining the number of atoms which unite to form the molecule of a compound. Gardner, drawing from Lakatos' criteria of 'progressiveness' of theory, observes that a theory concerning certain unobservables may be acceptable from a realist perspective if its constituent hypotheses are testable and the values of their quantities are determinable. This account of the imperative that a theory concerning untestable unobservables must consist of testable hypotheses and determinable values of quantities resembles Boyd's second tenet of scientific realism which states that valid scientific theories are the ones which are conformable by existing scientific evidence and methods. Thus, in order for establishing the existence of atoms, it was vital that their atomic weights should be calculable, and molecular formula should be stated. A decade after Dalton propounded his theory of atoms, the works of Dulong and Petit showed that the 'product of specific heat' and atomic weight are constant; another decade passed before Dumas found that vapour densities of elements may be used to calculate atomic values but Dumas remained sceptical about the existence of atoms. Finally in the 1850s, Cannizzaro came up with the method for calculating atomic weight and hence, molecular formula but he could not calculate the number of molecules per unit volume of an element. This difficulty was solved with the emergence of the kinetic theory of gases which enabled the calculation of hitherto indeterminate quantities of entities which are fundamental to the atomic theory such

as size of a molecule which could now be determined from the measurement of the diameter of the molecule; molecular speed which could be now be calculated from molecular velocity derived from 'measurement of gas pressure and volume', and of course the number of molecules per unit volume of an element. Gardner observes about the transformation of the atomic theory in the course of the 19th century from being a theory about the unobservable atom, to a viable theory about an extant entity as follows:

> "Clearly, then, the determinateness of quantities and the testedness of hypotheses played a major role in the gradual transition from an instrumentalist to a realist interpretation of the atomic theory" (1979: 23).

Therefore, the realist argument to counter the empiricist stance about the unacceptability of unobservables given their non-testable nature, is that the relation between theoretical terms, or hypotheses concerning unobservables may – and often does – serve to improve the scientific methodologies for calculating and testing evidence, and improved methodologies in turn helps in making the theories more accurate. In contrast to the realist dialectical account of the status of the unobservables in science, the instrumentalist account such as of Ernst Mach who viewed atoms as convenient posits which help explain certain observable phenomena, denies that unobservables referred to by theoretical terms are real because such an acknowledgment will entail acknowledgment of reality of concepts such as causality which empiricism views as a metaphysical extravaganza (Norris 2004). According to Norris, what the instrumentalism of Mach, logical positivism of early 20th century and constructive empiricism have in common is the denial of granting reality to unobservables and thereby, accepting the referential function of theoretical terms. Norris writes:

> "It is a version of the standard empiricist argument which holds that sensory acquaintance is the source of all knowledge – 'nihil in intellectu quod non prius in

sensu' – and which eschews any recourse to theories or hypotheses concerning the existence of causal powers, dispositional properties, 'hidden variables' (in the quantum context), or other such merely notional appeals beyond the empirical evidence" (2004: 8-9).

The instrumentalist and the empiricist view cannot, however, explain how to account for progress of scientific knowledge in the absence of independent causal relation between real entities and observable phenomena; for instance, in the case of the atomic theory, the existence of the theoretical posit called atom could be proved only if atomic weight could be measured, and the measurement of this quantity required molecular formula, and this in turn, necessitated the determination of molecular size, speed and the number of molecules per unit volume of a given element. The empiricist account also cannot account for the predictive success of scientific theories. These questions – how to explain and account for progress of scientific theories and how to explain their predictive success – constitutes the next set of realist arguments against empiricism. The first realist argument of Boyd which may be called the idea of dialectical relation between theory or hypothesis (featuring unobservables), and scientific methodology thus counters the empiricist claim that only observables are acceptable as source of valid scientific knowledge., The second realist argument, building on the first argument that unobservables can be the basis of valid knowledge, states that unobservables can be granted the status of real, extant entities in order to account for scientific progress.

**III.**

Boyd (1985) argues that scientific realism is defensible because it provides 'the best scientific explanation for various facts about the ways in which scientific methods are epistemically

successful'. His claim is that realism alone is commensurate with the accommodationist theory of natural kind terms. For the theoretical matrix M, $t_1$ to $t_n$ refer to all the theoretical terms which constitute the matrix and $f_1$ to $f_n$ are the various properties referred to by the terms of the matrix. These theoretical terms of the matrix have the function of 'underwriting the reliability' of the various explanatory practices of the theoretical matrix. This can be guaranteed only if the theoretical terms are 'natural kind' terms, which means that they have 'epistemic access' to the 'structures in the world'. In other words, 'what is predicated of $t_1$ within the practice of M...(should) be approximately true of things which satisfy $f_1$' (Boyd 2010). Thus the accommodationist theory states how the use of natural kind terms enables the 'accommodation' of the 'inferential practices' of M to real phenomena and entities and their causal relations. Natural kind terms are called so because they have 'epistemic access' to causal structures and natural phenomena. In a different essay, Boyd (1983) observes that the idea of epistemic access of natural kind terms can be described as a naturalistic theory of reference of scientific terms. Realism can account the predictive success of scientific theories because it considers the constitutive theoretical terms as evidential, and the terms can be evidential only if they have epistemic access to properties and phenomena of the physical world. Hence, Boyd observes:

> "Roughly a (type) term t refers to some entity e just is the case where complex causal interactions between features of the world and human social practices bring it about that what is said of t, is generally speaking and over time, reliably regulated by real properties of e" (1983: 68).

A natural kind term – which may refer to observables or unobservables – can contribute to the explanatory practices of the theory it is part of, only if it is evidential or referential in nature, and has epistemic access to real properties of the object it refers to. Christopher Norris (2014) argues that if the realist interpretation of the epistemic or predictive success of

scientific theories as being caused by referential status of natural kind terms with epistemic access is denied as anti-realist sceptics do, then only a miracle or 'cosmic coincidence' can account for the successes and progress in science manifest in its history. Anti-realism will question the idea of scientific success or progress by enumerating the numerous instances to be found in the history of science where a theory has eventually been proved to be untenable and therefore, has been debunked. The Ptolemaic geocentric model of the solar system, or the phlogiston paradigm are examples of such failures, and these instances make the anti-realists argue that scientific terms do not refer to any autonomously extant physical entity or observer-independent phenomenon; rather, they bolster the 'sceptical meta-induction' which deny validity of the realist claim that scientific progress is traceable in the movement of science from discredited theories to the 'current best' ones which are approximately closer to the objective truth (Norris 2004). Thus, if Boyd's concept of natural kind terms with epistemic access is combined with the miracle argument, one can persuasively argue that the patterns of gradual progress of science, and the instances of remarkable predictive success of scientific theories which history of science is replete with, can be explained only if the realist argument that scientific terms are referential and theories have naturalist denotations is accepted.

Thomas Kuhn (1996) traces the changing understanding of the concept of light through the history of science. Today, the consensus in scientific community is that light is photon, or quantum-mechanical entity; it is both a wave and a particle. Prior to this, the consensus was that it is a 'transverse wave motion'; prior even to that, scientists agreed that light was 'material corpuscles'. But even this scientific consensus was an achievement of Newton's *Optiks*; prior to the publication of this text, there were competing theories about the nature of light; one school considered it to be a characteristic of material bodies; another, a modification of the space of between bodies and the eye. It is the emergence of the

Newtonian paradigm which defined light as material corpuscles, which gained wider acceptance, and yet, each of these earlier schools with its own set of observations and 'cluster of optical phenomena that its own theory could do most to explain', contributed towards the body of 'concepts, phenomena and techniques from which Newton drew the first nearly uniform accepted paradigm for physical optics'. Kuhn himself acknowledges that Newton's corpuscular theory of light drew from the earlier competing theories which were struggling to satisfactorily characterise light but the Kuhnian line of argumentation causes anti-realists to argue that in the case of light, these different conceptions indicate that scientific terms are not referential by nature but constructs which acquire stable meaning only within a paradigm. Kuhn articulates this view as follows:

> "Only when all the relevant conceptual categories are prepared in advance, in which case the phenomenon would not be a new sort, can discovering that and discovering what occur effortlessly, together, in an instant" (1996: 55-56).

In the Kuhnian constructivist view, therefore, a paradigm supplies normal science with its axioms, hypotheses and terms which the science tries to refine through experimentation, mathematisation**.** To highlight the paradigm-relativist nature of the meanings or denotations of scientific terms, Kuhn cites the controversy over the question as to whether oxygen was 'discovered' or invented? About oxygen, Kuhn states that both Priestly and Lavoisier are claimants to the title of the discoverer of oxygen and yet, neither can be called its discoverer in the true sense of the term. Priestley isolated oxygen before Lavoisier but he, given his functioning within the Phlogiston paradigm (a hypothesis which regarded fire as a material substance), considered it to be 'dephlogisticated air'; Lavoisier announced in his Oxygen Theory of Combustion that Priestley's gas was 'the substance that combustion removed from atmosphere'. He observed that the gas was the 'air itself entire' but even he mistakenly insisted that oxygen gas was 'an atomic principle of acidity' that was formed only when the

principle united with caloric, the-then prevalent hypothesis about heat, that defined heat as fluid. Thus, even though both Priestley and Lavoisier 'discovered' oxygen, neither discovered the components and characteristics that are associated with the gas today because both were observing and experimenting upon the gas from within their respective scientific paradigms.

Against such interpretation of scientific terms which deprive them of their referential function and deny that they have epistemic access, Norris (2004) observes that constructivism entails 'making truth somehow dependent on knowledge, knowledge on some given (even if optimal) state of belief, and that belief-state on whatever sorts of ruling idea — or paradigm-relative preconception — happen to be currently in favour.' Norris argues that this constructivist tendency to equate truth with belief-state, and to view theoretical terms – devoid of epistemic access – as being convenient fictions with instrumental use invented by the paradigms within which they are used, cannot explain predictive success of scientific theories unless it takes recourse to explaining it in terms of miracle. Norris writes:

> "Science becomes just an episodic sequence of fluke (since rationally unaccountable) successes in getting things to work while the history of science becomes nothing more than a kind of postmodernist narrative riff on the contingencies of time and change" (2004: 5).

Constructivism and empiricism which deny the referential status of theoretical terms vis-a-vis observables and unobservables, and treat them instead instrumentally, cannot explain the predictive or epistemic successes of scientific theories except by taking recourse to the miracle argument, realism argues. There is another related contradiction in Kuhn's paradigm-relativist argumentation. According to Kuhn (1996), a scientific paradigm comprises of all the laws, concepts, theories and methodologies of experimentation which function as an axiomatic basis for further research by normal science and its practitioners. Yet, paradigm

changes or scientific ‘revolutions’ do take place, which lead not to more precision or refinement of an existing paradigm but to its toppling. Paradigm shifts are initiated by the discovery of an ‘anomaly’: when a phenomenon is inexplicable by the dominant paradigm; this anomaly may be theoretical or outcome of experimentation. Boyd (1983) points out that if all scientific terms, observations, experimentations, and methodologies are immanent to one paradigm or the other, then the anomalous observations which cause the paradigm-shift from normal to revolutionary science are themselves ‘inexplicable within the paradigm’. In other words, if all scientific terms are paradigm-relative, then constructivism cannot explain the rise of the anomaly which does not belong to the paradigm of the normal science or to the emerging post-revolutionary paradigm either. Kuhn’s own example of the status of X-rays may be used as an illustration of Boyd’s argument. Kuhn writes that when Roentgen accidentally discovered the X-Ray while carrying out ‘investigation of the cathode ray’, it was already known in the scientific community that there are many kinds of radiations: the visible, the infrared and the ultraviolet. Yet, there was a lot of resistance to the acceptance of the X-ray as one more kind of radiation because they violated ‘deeply entrenched expectations…implicit in the design and interpretation of established laboratory procedures’. Kuhn states that since cathode ray equipment which produced the x-ray were by the time of Roentgen’s accidental discovery already an integral part of many European laboratories, its discovery was so revolutionary because it might have been produced by other scientists working with the equipment, and the x-ray might have even been ‘implicated in behaviour previously explained without reference to them’. As a result of the discovery of the new radiation, many previously completed experiments and their conclusions were now in need for re-examination. But the radiation itself the accidental discovery of which rendered it an anomaly to the existing paradigm, during the transition from the pre-revolutionary to the post-revolutionary paradigms didn’t belong to either and thus, in that state remains

inexplicable within the constructivist discourse. Thus, realists argue that natural kind terms and theories (which refer to unobservables) themselves may be semantic constructs and abstractions, but they are not – unlike what empiricism and constructivism claim – convenient fictions or instrumental tools for explanation. They have a referential status which alone can explain predictive or epistemic success within a paradigm or a theoretical matrix, and scientific progress across paradigms.

There is another powerful Kuhnian argument which has received realist rebuttals: it concerns the concept of incommensurability of paradigms which Kuhn employs to counter the idea of progress of science. According to Kuhn, when paradigm shift takes place, it entails toppling of the earlier paradigm because even if the same terms are used by the two paradigms, they assign very different meanings and definitions to the terms. As a result, different paradigms are characterised by 'semantic incommensurability' (Boyd 1991). Further, the incommensurability – arising from differences of definitions – between competing theoretical schools and paradigms gives rise to different evaluative criteria for observations, experimentations, and methodologies of each of the paradigms, and as a consequence, the two cannot be compared. The lack of comparability of paradigms resulting from their semantic incommensurability, renders the idea of progress of science redundant (Gardner 1979). However, Gardner, drawing from Shapere, argues that when a paradigm shift occurs, 'a chain of reasoning' might connect the two paradigms which makes the shift explicable in naturalist terms. The paradigm shift may thus be viewed as 'rational evolution' or progress from a theoretical matrix with less explanatory and referential potential to another which is more approximate to the objective truth.

The account so far has articulated the various realist arguments against (I). the empiricist epistemological claim that valid scientific knowledge consists only knowledge of observables which are testable or verifiable, and that theoretical terms referring to unobservables should

be expunged from science through their rational reconstruction; and (II). the empiricist as well constructivist claims that even if theoretical terms concerning unobservables as well as observables are used in science, they should be viewed as convenient instruments of prediction of observable phenomena. While against the first empiricist argument which argues for rational reconstruction of theoretical terms since they can neither be tested nor verified/falsified, realism puts forth the concept of dialectical relation between theory and scientific methodology, which shows how the two can contribute to each other's evolution and development; against the second anti-realist argument which denies referential status to theoretical terms, and treats them as instruments of explanation of the observable, realism argues that scientific progress as well as predictive success enjoyed by scientific theories cannot be explained without viewing the theoretical terms as natural kind terms with epistemic access as the only other alternative is of the miracle argument. Again, if theoretical terms which are themselves semantic constructions have no epistemic access and if the meanings and denotations assigned to them are entirely paradigm-relative, then scientific progress or the anomalies which give rise to the need for a paradigm shift cannot be explained either. Thus, realism does furnish more adequate accounts of scientific progress and predictive success of successful scientific theories, as compared to empiricism and constructivism. Yet, scientific realism faces seemingly insurmountable challenge in the face of the philosophical implications of quantum mechanics. Brian Ellis wonders:

> "Is scientific realism any longer the philosophy of science which we feel naturally compelled to accept? I should think that many space-time and quantum physicists would be quite puzzled by the suggestion that the theories they accept, and work with, might literally be true, since they have no clear conception at all of the reality with which these theories might correspond" (1985: 50).

The next section shall explore how quantum mechanics challenges scientific realism's conceptions of the observer-independent reality, of the status of unobservables in science, and of epistemic access to the theory-independent reality.

**IV.**

Arthur Fine (1991) observes that scientific realism and quantum theory appear to be irreconcilable because realism requires that science has epistemic access to, or approximates a physical world, and the 'entities, properties and relations' that constitute the world is observer-independent. Quantum theory, on the other hand, is a scientific paradigm which smashes this observer-world (or mind-matter) dualism because it is a 'probability-laden' theory in which the observer and the measuring apparatus both play the central role in determination of measurement results of experiments. Pascual Jordan (quoted by Mermin) describes the implication of quantum theory as follows:

> "Observations not only disturb what has to be measured, they produce it.... we compel [the electron] to assume a definite position.... we ourselves produce the results of measurement" (Jordan, in Mermin 1991, pp. 501).

There are physicists and philosophers alike who are dissatisfied with this account of the micro-physical world in orthodox quantum theory; most famously, Einstein in the 1935 EPR paper (named after its authors Albert Einstein, Boris Podolsky, and Nathan Rosen) argues that quantum mechanics suffers the shortcoming of providing an incomplete account of physical reality because it did not grant independent existence to properties of quantum entities, and instead views them as outcomes of measurements and observations. The blow that quantum theory dealt to the understanding of the physical world by classical physics,

gave new fillip to the protracted philosophical debate over the realist idea that reality cannot be equated to the observables, and further, that reality itself is engendered by observations. There is a vast and rich literature on the implications of quantum mechanics for scientific realism; the aim of this section is to evaluate the relevance of the two realist arguments made by Richard Boyd against empiricism and constructivism, articulated above in the light of the claims of quantum theory. The arguments stated that a) there is a dialectical relation between theoretical terms referring to unobservables and scientific methodologies, and hence, contrary to the empiricist stance, theoretical terms should be permitted as source of valid scientific knowledge provided that they are interpreted in naturalistic manner; and b) not only should theory and theoretical terms be accepted as source of valid knowledge, they should be realistically interpreting as referential in nature. Realism insists that without these two arguments, the consistent predictive success of scientific theories, and the progress of science cannot be explained satisfactorily. The question which now arises is how effectively do these arguments defend realism in the face of the radically different understanding of the physical world of quantum theory. In other words, one wonders as Ellis (1985) does that what is the relevance of the realist claim of the referential status of natural kind terms when quantum theory has revealed the physical world itself to be uncertain?

Light, according to Newton, consisted of tiny particles or corpuscles; this atomistic view of light arguably marks the beginning of the modern theory of light. In 1801, Thomas Young demonstrated the interference phenomena which proved that light has wave-like motion. When two waves combine, either the crest of one coincides with the trough of another, or the crests of the two waves combine. In the case of light, the existence of Newton's Rings (the phenomenon wherein there are alternate bands of light and darkness) indicates that when the crest of one beam of light combines with the crest of another, it is a constructive combination and the result is a band of brightness, whereas if the combination of two trains of light is such

that the crest of one combines with the trough of another, there is darkness. Thus, the study of interference phenomena proved the wave-like nature of light. Drawing from the earlier works that established the relation between magnetism and electricity, James Maxwell established that light was an electromagnetic wave. The next major development happened in 1900 when Max Planck proposed the black body conjuncture. A black body is a closed and black-walled container that absorbs all the radiation falling on it, and completely emits the light out. Max Planck proposed, contrary to the sponge model of black body radiations, that the emissions in the black body took the form of packets of energy of definite size (Polkinghorne 2002). Planck stated that the energy content of these packets or quanta of emitted radiation is proportional to the frequency of the radiation. In 1905, Einstein established that the problem of photoelectric effect – a phenomenon in which a beam of light ejects electrons from a metal – could be solved if light is considered as a 'stream of persisting quanta', or a photon. Hence, history of science witnessed a momentous characterisation of light: while the earlier works of the likes of Young and Maxwell established that light is an electromagnetic wave, the works of Planck and Einstein proved that it is also a quantum of energy, or photon. The bug-bear question was how the two characteristics of light be reconciled?

In 1897, the negative charge in an atom was discovered; it was named electron. Whereas as per the earlier 'plum pudding' model, the spectral frequencies detected in the atom correspond to the oscillation of the negatively charged electron in the positively charged nucleus of the atom; it was replaced by Rutherford's solar system model wherein the atom consists of a positively charged nucleus which contained most of the atomic mass, and of the inversely charged electron which orbits the nucleus because of the force of electrical attraction (Norris 2000). However, there was still no consensus on the referential status of the terms such as atoms, electrons or nucleus: it was unclear whether they were convenient instruments for explaining the observable electromagnetic wave-like behaviour of light, or

whether these theoretical terms refer to extant entities. If the electrons orbit around the nucleus of the atom and radiate energy 'through the propagation of electromagnetic waves', then as per the law of conservation of mass-energy, the electrons should slow down and eventually collapse into the nucleus of the atom but this does not happen (Norris 2000). In 1913, Niels Bohr suggested the quanta solution to explain the why electrons did not collapse and make atoms unstable, just as Planck had applied to radiation. Bohr argued that the quantity of energy emitted will not take any value but only a 'series of sharp values' in the quantised form (Polkinghorne 2002). Drawing from the idea that light exists in both wave and particle like states, and Bohr's idea that the electron existed in a particle-like quantitised state, Louis de Broglie showed mathematically through the application of the Planck formula that electrons could manifest wave-like properties. Thus, quantum theory established that entities such as the electron exist in the quantum state and thereby, possess wave-particle dualism.

David Bohm (1993) observes that quantum theory as developed by Bohr and Heisenberg 'was based on two postulates: (a). the indivisibility of the quantum of action and (b). the unpredictability and uncontrollability of its consequence in each individual case.' The unpredictability associated with the quantum objects gets illustrated by the double slit experiment, in which when an electron gun is used to fire one electron at a time at a screen on which there are two slits A and B, and a detector screen beyond the slit screen, the arriving electron makes a mark at the point of impact of the detector the detector screen. The individual electron's behaviour is found to be particle-like but when a large number of marks have been made by the electrons, they form the interference effect thereby manifesting wave-like behaviour. This experiment shows the wave-particle dualism of the electron. Further, proof of superposition can also be derived from this experiment since the mark made by an electron at the mid-point of the detector screen reveals that it has travelled through both the

splits at the same time even though it is indivisible. The wave-particle dual nature of the electron and its superposition reveals the uncertainty of the quantum state. The probabilistic and uncertain nature associated with quantum entities poses a challenge to the realist claim that theoretical terms have epistemic access to the natural realm; if the micro-physical realm itself is uncertain, how can theoretical terms' denotations be approximate to them? Heisenberg's microscope argument substantiated his uncertainty principle by highlighting the unpredictability of the exact position and momentum of a quantum particle when it scatters a quantum of energy through the lens of a microscope (Bohm 1993). Again, unlike the classical or the macro realm where there the observed and the observing apparatus are discrete, in the case of quantum objects, the indivisibility of quantum of action renders it impossible to separate the two. The implication of the inseparability of the observed object and the observer for realism is immense: if they constitute an indistinguishable whole, where does the realist claim about the existence of an observer-independent physical world stand? John Wheeler's delayed choice experiment further strengthens the holist perspective since it shows that the very state that a quantum object attains depends upon the interference of the observer. Adapting the two-slit experiment, Wheeler attempted to demonstrate that if light from a pinhole source of light is lit near an opaque screen with two closely located parallel splits, then – as is expected given the wave-like nature of light – they form interference effect on the detector screen. Now, if detectors are placed close to the slits to detect which slit the light has passed through, its wave-like character collapses and the photon is detected. Wheeler's contribution to the experiment was the observation that it is 'possible to look back' from the detector screen to deduce which slit a given photon traversed through (Davies 2004). Thus, Wheeler's argument is that the observer can affect both to the constitution of the physical state of the quantum object, and also to the state that it was in the past. Paul C. Davies writes: "In this manner the experimenter helps determine the nature of light, indeed, the nature of

reality. the experimenter participates in deciding whether light is made up of waves or particles" (2004, pp. 8-9). Given that these two striking features associated with the quantum realm, namely, the inseparability of the observer and the observed in the quantum action, and the unpredictability of experimental outcomes resulting in the perceived uncertainty of quantum reality itself, how does realism respond to them? Does the uncertainty stem from the limitations of the present best knowledge of the quantum realm, or is the uncertainty an intrinsic feature of the micro-physical world itself? Norris describes how the 'orthodox' quantum theoretical account leads to the perceived redundancy of scientific realism; he writes:

> "So indeed it must appear if one accepts the orthodox line of argument according to which (1) quantum mechanics is the most successful (observationally and predictively adequate) physical theory we possess; (2) its results are incompatible with any 'deeper' realist or causal-explanatory account; and therefore (3) realism is no longer an option for any philosophy of science that would claim to respect the most advanced findings of present-day applied and theoretical physics" (2004:132).

Einstein considered the interpretation of quantum theory by the Copenhagen school – consisting of leading lights of quantum theory such as Bohr and Heisenberg among others – as incomplete because in insisting upon the uncertainty and unpredictability of the quantum realm, it could not give a causal explanatory account of the processes such as wave-particle dualism, superposition, wave-function collapse, lack of measurability of values such as location and momentum of the quantum particle and the observer-dependence of the experimental results. The concept of 'spooky action at distance' states that 'acquisition of a definite value of a property by the system in region B by virtue of the measurement carried out in region A' challenging which the EPR paper posited the 'reality criterion' according to which if 'a wave function describes two correlated particles, two correlated particles,

localized in regions A and B, far apart'; then, 'If, without in any way disturbing a system, we can predict with certainty (i.e., with probability equal to unity) the value of a physical quantity, then there exists an element of physical reality corresponding to this physical quantity' (Mermin 1991, pp. 502; Shimony 1991, pp. 520). Thus, what was argued in the EPR paper is that the values of the properties of momentum and position of the particles exist independently of their measurement, and so, corresponding to these values, 'elements of physical reality' must exist which the Copenhagen school's account cannot explain. In 1964, John S. Bell demonstrated using a *gendanken* experiment that showed that the EPR reality criterion – with its emphasis on the intrinsic properties of a physical system which exists independently of observation – is irreconcilable with experimental data of quantum mechanics (Mermin 1991; Shimony 1991).

But the question continues to persist as to whether the uncertainty associated with the properties of the quantum realm intrinsic to the system itself, or does it represent an epistemological limitation? Realism must deal with this question because it argues against the problem of 'epistemological fallacy' wherein epistemological aporias are projected as properties of reality itself (Norris 2014). Quantum mechanics is a statistical theory which is concerned with predicting and computing probabilities of experimental results but since those predictions are probabilistic in nature, it considers quantum probabilities are limits of human knowledge (Vigier 1992). The question which now arises from a realist perspective is how does the Copenhagen school's paradigm of quantum mechanics account for emergence of new particles and new experimental findings which may happen in the future? Against the Copenhagen school's interpretation of quantum mechanics which assigns finality to the probabilistic experimental results, are the realist physicists such as Einstein, De Broglie and Bohm for whom reality is 'immense and immeasurably beyond' current best knowledge; in the realist vein, Einstein argues, 'scientists lift successive veils behind which nature hides its

deeper behavior' (Vigier 1992). To the realist question which asks whether the unpredictability and uncertainty associated with quantum states are outcomes of limitations of the presently held theory, and hence, epistemological in nature, or whether they are intrinsic properties of the quantum entities, the advocates of the Copenhagen school argue that the probabilistic outcomes are final and therefore, quantum reality itself is uncertain. Realists then ask how can such a theory account for newer findings which might come to fore in future? In other words, how could one be sure that there is no need to move beyond the phenomenal and the results derived from it? Thus, the first realist argument made by Boyd to counter the empiricist claim that unobservables cannot be part of valid knowledge, can be invoked here to question the epistemic finality associated with the probabilistic outcomes of experiments on quantum objects.

The generic name for the theories which proposed realist interpretation of quantum theory is 'hidden variable' theories. One such theory called the pilot-wave theory, propounded by De Broglie argues that the wave-particle dualism manifest in quantum objects indicates that both the wave and particle-like properties have real counterparts (Vigier 1982). In other words, the particle is a real 'point-like object with a definite trajectory' and it is accompanied or guided by a 'physically real' wave which satisfies Schrodinger's equation (Torretti 1987). J P Vigier observes:

> "As is known, Einstein, De Broglie, and their present followers, never accepted Bohr's assumption that quantum probabilities represented an ultimate limit to human knowledge. In this sense, direct heirs of Newton and Laplace, they have always held that probability distributions should result from the real action of randomly correlated subquantal causal motions – a conception which implies the introduction of subquantal hidden variables to interpret the probabilities correctly described by the field (and field equations) of quantum mechanics" (1982: 924).

Likewise, David Bohm's hidden variable theory matches the predictive-observational results of experiments while also providing a realist causal explanation of quantum phenomena (Norris 2014). The votaries of the Copenhagen school's interpretation will not allow for the possibility of the existence of the 'unobservable' hidden variable because it shares with positivism and empiricism, commitment to knowledge empiricism which – as already described – states that sensible or observable knowledge is the only valid knowledge as well as to the verificationist theory which states valid knowledge is testable or verifiable. They remain indifferent to the potential of the dialectical relation between theoretical posits and methodology, and hence, the hidden variable hypotheses are not engaged with. Bohm (1993) states that given the holism associated with the Copenhagen interpretation of quantum mechanics, which states that the parts 'are not in definite state' or that observed and the observer or the observing apparatus cannot be separated, leads Bohr to the conclusion that 'the state of being is inherently ambiguous at the quantum level of accuracy' but this results in epistemological fallacy because it entails 'tacit identification' of determinism with predictability. The dominant or the Copenhagen interpretation of quantum theory argues, given its preference for the empiricist argument that observable knowledge alone is valid knowledge, there are no and cannot be any hidden variables corresponding to observable properties of quantum objects. This argument challenges Boyd's concept of the dialectical relation between scientific theory and method, in which each contributes to the evolution and improvement of the other. It also states given the indivisibility of the quantum of action or the inseparability of the observed phenomena from the observing apparatus, the probabilistic results computed from experiments are final and therefore, the quantum realm itself is uncertain. This challenges the fundamental realist principle that there is an observation-independent physical reality. Realism can – and does – rebut these arguments by asking that if there is no certainty of experimental results from the best theories of the present, how does

this lead to the conclusion that newer quantum entities, better predictive methods and apparatuses will not emerge in future to explain what cannot be explained at present? In other words, how can the dominant interpretation of quantum theory a) argue that the observable alone is real or valid knowledge and have no place for unobservable theoretical posits such as hidden variables if the hypotheses on which the theoretical entities are based are themselves testable?; and b) equate predictability with determinism, and epistemic uncertainty with inherent uncertainty at the quantum state?

Karen Barad (2007) proffers a new account of quantum theory which is called 'agential realism'. Barad states that Bohr should be interpreted not as an empiricist or positivist like traditional realists do but as a realist who broke the observer-observed binary division, by stating that the observers – that is, humans – themselves are part of the nature they observe. Barad writes:

> "But even more remarkably, Bohr understands these issues-concerning word and world -to be inextricably linked. According to Bohr, our ability to understand the physical world hinges on our recognizing that our knowledge-making practices, including the use and testing of scientific concepts, are material enactments that contribute to, and are a part of, the phenomena we describe" (2007: 32).

Challenging the traditional realist argument that physical reality, governed by natural laws, exist independently of observers, Barad's agential realism puts forth the concept of 'intraction' which means that entities or agency are mutually constituted through their intra-action. Barad's argument can provide a realist interpretation of the 'indivisibility of quantum of action' thesis. According to the classical physics' account of causality, laws of nature are universal, observer-independent and govern behaviour of matter which itself exists in space independently of observation and temporally, propagates forward (Vigier 1982). When

quantum theory argues that given the indivisibility of the quantum of action, the separability or distinction between the observed object or phenomenon and the observing apparatus becomes ambiguous, and as a result, the uncertainty of experimental results in quantum theory means uncertainty of processes of the quantum realm itself, and hence, there is no independent quantum ontology (Bohm 1993). Barad resolves the impasse between classical and quantum causal accounts by her post-humanist concept of 'intraction'. If the observer is herself part of nature, and if the argument is that entities and agencies – human as well as nonhuman - come into being through mutual co-constitution, then the inseparability of the observer and the observed is not to be viewed as disruption of ontology, but the constitution of a new ontology of co-constitution through agential intraction amongst human and nonhuman, natural agencies. This appears to be promising development in the field of the quantum mechanics-scientific realism debate, but a question persists: if entities have putative existence only through mutual co-constitution, then does this mean that hidden variables of the quantum realm, or other non-observables do not exist until they have 'intraction' with the human observer, who is, according to Barad, a natural entity? Christopher Norris (2004) offers the concept of 'stratified reality' which states that reality is stratified because it is composed of multiple ontological domains, some of which are constituted by human intervention, some others are 'affected' by it while there are levels in the stratified reality 'which are wholly independent of our sundry interests, methods, investigative procedures, techniques of observation, etc.' (11). Barad powerfully argues that realism is not about approximation to or 'representation' of independent world but 'about the real consequences, interventions, creative possibilities, and responsibilities of intra-acting within and as part of the world' (2007, pp. 37). But is the absence of observer-independent physical realm, its objects and their properties, do they come into being only when they 'intract' with the human observers?

The chapter is aimed at understanding the arguments put forth in favour of the claim that quantum mechanics renders scientific realism an obsolete metaphysical theory. It does so because of its twin tenets of indivisibility of quantum of action, and uncertainty of quantum world deduced from unpredictability and uncontrollability of scientific experiments on quantum objects. The dispute between scientific realism and its opponents such as empiricism and constructivism is over the status of unobservables: the first point of dispute between the two is over the question as to whether unobservables can be basis of valid knowledge? The empiricists aim to expunge unobservables through their rational reconstruction into observables, and hence, testable entities. Against this view, realism posits the argument of dialectical relation between unobservables referred to by theoretical terms, and scientific methodology which enables the evolution of both of them. When the dominant interpretation of quantum theory denies to take into account various hidden variables, one may ask drawing from the realist dialectical relation argument, how can it account for the possibility that newer quantum entities with better explanatory power may emerge in future? Secondly, from the unpredictability of experimental results of quantum theory and the holism associated with the theory which states that the observer and the observed cannot be separated, its mainstream proponents deduce that the probabilistic experimental results are final, and uncertainty of quantum states. To this the realist will ask how can the quantum theory progress if it attaches finality to itself?

# III. RESURRECTING THE 'ABSOLUTE' WITHOUT METAPHYSICS: ON MEILLASSOUX'S MATERIALIST CRITIQUE OF KANT

**ABSTRACT:** The term 'correlationism' coined by Quentin Meillassoux is an umbrella term for the varied anti-realist schools of thought which deny that there is an 'autonomous' external world, which exists independently of and is not constituted by the stand-point of the observer; and that 'objective' knowledge of this external world is possible. According to Meillassoux, correlationism consists of the claim that it is impossible to distinguish between the subjective and the objective, since both emanate from inter-subjectivity. Therefore, the need of acknowledging the existence of an autonomous, mind-independent material realm which can be basis of objective knowledge dwindles, and schools of thought such as materialism and scientific realism justly incur the accusation of being metaphysical. Meillassoux argues that it is the 'finitude' of human epistemology immanent in the Kantian conception of 'categories of understanding' that gave rise to correlationisms of various kinds, even though Kant himself is a 'weak correlationist'. The aim of this chapter is two-fold: first, it aims to closely examine the claim of Meillassoux about the Kantian origins of correlationism; and second, it will endeavour to critically engage with Meillassoux's materialist rebuttal to Kant's concept of categories as *a priori*.

**I.**

Can there be a material realm amenable to realist and naturalist accounts of it? In other words, how feasible is it to accept that scientific terms or terms of natural kinds refer to the entities and events which actually exist, and that these terms can be considered as revisable hypotheses about the corresponding material entities? Scientific realism claims that empirical statements have referential status, while materialism argues that there is a physical state corresponding to every mental state even if the two are discrete (Sellars 1949; Boyd 2013). In *After Finitude: An Essay on the Necessity of Contingency* (2009), Quentin Meillassoux argues that the realist and the materialist interpretations of the events and entities of the material realm – distinct though they are from each other – as an assertion of existence of the 'absolute' against the 'givenness' of correlationism. Meillassoux writes that dogmatic metaphysics upholds as absolute that which is the outcome of the 'ontological argument' linked to 'sufficient reason' linked to uncaused cause or the *causa sui.* While the ontological argument entails the assertion that 'this or that thing' – whether it is the Aristotelian *telos* or the atom or the 'perfect God' – must absolutely be, it often combines in dogmatic metaphysics to make use of the principle of sufficient reason and thereby, insist that everything that exists, does so for a reason. This principle, in order to avoid infinite regress, then comes up with the one cause which causes everything else, that is, the uncaused, perfect cause. Aristotle explains change in living beings and in nature in terms of such a necessary absolute: *telos* or end which is manifest in the Form; his argument is that living creatures including humans undergo changes in order to attain the final form which is a manifestation of their purpose of existence. But the question which gains immense traction following John Locke and David Hume is that how can metaphysician demonstrate the unconditional or necessary existence of a given entity? Vernes (2000) makes in this connection the argument about the order of perception in contrast to the disorderliness of imagination. In imagination, the cinnabar may undergo colour changes umpteen number of times, or the billiard ball when

hit by another ball, may acquire multiple paths, but no such thing happens in perception. When the disorderliness of imagination is contrasted with the orderliness of perception, it becomes the basis of scepticism towards metaphysical absolutes. Drawing from this, Hume emphasises on empirical knowledge as the only form of valid knowledge and even goes to the extent of espousing a form of nominalism, which entails psychologism, since it claims that not only there are no universals as they cannot be verified empirically, but that meaning is assigned to a linguistic symbol on the occasion of its usage and therefore, meaning '…is a psychological act involving self, sign and the designatum' (Sellars 1948; 604). Immanuel Kant, unlike Hume, is interested in explaining what accounts for the order of perceptual acts, and he introduces *a priori*, mental logical forms called categories of understanding to explain the order. As a result, the absolutes – entailing the ontological argument, the principle of sufficient reason and the *causa sui* – of dogmatic metaphysics are challenged, and thereby, the idea of the necessarily existing determinate entities.

Meillassoux argues that while the absolutes of dogmatic metaphysics have been rightly rejected, such 'de-absolutization' has resulted in the rejection of the possibility that there can be non-dogmatic absolutes (which exist contingently, and don't entail invoking of necessary causality or sufficient reason). The finitude introduced by empiricism (of Hume) or transcendental idealism (of Kant) renders even non-metaphysical absolute as obsolete. In order to distinguish between the metaphysical absolute and the non-metaphysical absolute, Meillassoux states that the metaphysical absolute is established through the principle of sufficient reason (which states that the absolute exists necessarily, that is, for a reason) while no such causal relation is invoked in the case of the non-metaphysical absolute. But those schools of philosophy which, in order to 'de-absolutise', collapses the distinction between the two, they emerge as proponents of – what Meillassoux terms as – 'correlationism'. The term 'correlationism' is a broad, umbrella term which is used to designate the various schools of

thought which insist on the inseparability, and thereby, the co-constitution or the correlation of 'the act of thinking' and 'its content' (Meillassoux 2009; 36). There are two major philosophical implications of correlationism: firstly, if everything knowable is 'given-in-thought' or a correlate of thought, then, the thing-in-itself, or the autonomous material realm cannot be known, and known to exist; secondly, if everything knowable is a correlate of thought, then the distinction between the objective and subjective also disappears since they are both at the most different manifestations of the subjective. The first implication which denies the accessibility or knowability, and in certain schools, the very existence of the autonomous material entities and events, and thereby, of the non-metaphysical absolute, rings thereby the death-knell of scientific realism and materialism. Meillassoux observes:

> "This decision alone suffices to disqualify every absolute of the realist or materialist variety. Every materialism that would be speculative, and hence for which absolute reality is an entity without thought, must assert both that thought is not necessary (something can be independently of thought), and that thought can think what there must be when there is no thought. The materialism that chooses to follow the speculative path is thereby constrained to believe that it is possible to think a given reality by abstracting from the fact that we are thinking it" (2009: 36-37).

Speculations about what there can be 'independently of thought' and 'that thought can think' about the autonomous absolute that exist 'when there is no thought' can be described as the concerns of both materialism and scientific realism. Both these schools have been criticised as metaphysical for their insistence on the existence of such entities independently of thought, mind or language. Scientific realism, especially, has been accused of encouraging 'inflationary metaphysics' by logical empiricism in so far as it insists on the referential function of scientific terms (Saatsi 2018). Meillassoux focuses on the Kantian roots of correlationism which insists on transforming the absolutes not just of dogmatic metaphysics

(with its reliance on the principle of sufficient reason) but also of scientific realism and materialism into 'givens' of thought.

The aim of this chapter is two-fold: the first aim is to closely examine the specific claim of Meillassoux that it is Kantian transcendental idealism which gives rise to correlationism; the second aim of the chapter is to critically evaluate the effectiveness of the materialist counter of Meillassoux to Kant's concept of *a priori* categories of understanding which constitute experience and thereby, render knowledge possible. The chapter has been divided into three following sections: the first explores the Kantian arguments – based on the rules or the categories of understanding – in favour of epistemic finitude and the inaccessibility of the absolute, autonomous thing-in-itself, and the realm of the noumena. The second section elaborates Meillasoux's 'speculative' materialist response to Kant, and its relation to other older materialist traditions. The last section will aim to demonstrate that Meillassoux's materialist response to the Kantian arguments is incapable of effectively countering them, especially the ones about the unknowability and inaccessibility of the thing-in-itself. In this section, I argue that a scientific realist stance, drawing from the 'no miracle' argument will better tackle the Kantian division between the noumena and the phenomena.

**II.**

Early in the *Critique of Pure Reason* (1997), Kant defines transcendental cognition as a system which is 'in general concerned not so much with objects as with our manner of cognising objects, insofar as such cognition is supposed to possible *a priori*' (A 12, 154). Again, Wilfrid Sellars (2002) observes that for transcendental logic, the task is to explain how the mind 'gains knowledge of the world it is a part of' (272). These observations indicate that the Kantian transcendental philosophy is mainly an epistemological system,

aimed at explaining how the mind gains knowledge. Next, Sellars writes that Kant brought about the 'epistemological turn' in philosophy in insisting that 'the distinction between epistemic and ontological categories is an illusion. All so called ontological categories are in fact epistemic' (2002; 270). This is so because mind gains knowledge of the world, that is, synthetic knowledge *a priori* through innate conceptual abilities called the categories of understanding. For Kant, synthetic knowledge is synthetic *a priori*.

In the *Prolegomena to Any Future Metaphysics* (2004), Kant explicates the distinction between analytic and synthetic statements; analytic statements are explicative insofar as they do not add anything to 'the contents of the cognition' while synthetic statements are ampliative, that is, the predicates of synthetic statements add to the contents of the subject, and not merely explain them. Kant illustrates the difference thus: the statement 'all bodies are extended' is an analytic statement since extension as a property of matter can be assigned to it *a priori*; while the statement 'some bodies are heavy' contains new information in the predicate which is not contained already in the subject. Wilfrid Sellars (1953) does not, unlike Kant, define the dyad of analytic-synthetic statements in terms of whether they augment the content of the subject by adding new information to predicate but in terms of their truth value. Sellars states that an analytic statement is true by the 'virtue of the meaning of the terms' involved, whereas synthetic statements are neither true nor false logically. The truth of synthetic statements is conditional upon empirical observation, one would think. However, at this juncture, Kant makes the claim that synthetic statements are true *a priori*. In the *Prolegomena to Any Future Metaphysics,* Kant explains how intuitive knowledge can be gained *a priori*, and hence, how synthetic *a priori* is not an oxymoron. According to Kant, all knowledge is gained through two mental sources: sensibility and understanding; while sensibility gives rise to intuition, understanding causes concepts. In the *Critique of Pure Reason* (2004) Kant states that the 'receptivity' or the capacity to obtain representations by

getting affected by material objects is sensibility; the effect upon sensibility of external objects is sensations; the knowledge which arises because of the relation between the external objects and the sensation is intuition and it is empirical; and finally, 'the indeterminate object of empirical intuition' is called appearance (156, A20). Thus, one would think that synthetic knowledge insofar as it augments the contents of the subject of the statement, and since it is not derivable logically, it must be empirical gained or intuitive knowledge which can be acquired only after external objects have acted upon the mind. But according to Kant, synthetic *a priori* is possible because even though the 'matter of appearance' or 'that which corresponds to sensation' is learnt about in an *a posteriori* manner, the 'manifold of appearance' itself becomes comprehensible knowledge or intuition because they are arranged in a particular relationship, and this form which renders arrangement of the manifold of appearance possible, is itself an *a priori*, mental form. Kant, hence, observes that 'accordingly, the pure form of sensory intuitions in general, in which all the manifold of appearance is intuited in specific relations, will be found in the mind *a priori*' (157). Thus, in the Kantian framework, intuition is pure intuition because the manifold of appearance which rises from the relation between the empirical sensation and the external object becomes comprehensible only because certain pure, mental forms organise and arrange them into specific relationships. As a result, the distinction between understanding and sensibility also considerably weakens; Wilfrid Sellars observes in this regard:

> "A strong indication of this is found in the close relationship which exists in Kant's mind between the two dichotomies: sensibility, understanding; intuition, concept. The first item on each pair is introduced under the heading of 'receptivity', the second under that of 'spontaneity'. Alas! This neatness soon falls victim to the exigencies of argument" (2:1993).

This exigency of argument is, as already stated, brought about by the concept of *a priori*, mental logical forms which mediate all perceptual sensations, and organise them in specific relations. The Kantian theory of transcendental idealism is, therefore, a doctrine of logical forms. Kant describes these *a priori*, mental forms which is a precondition for all knowledge as categories of understanding. It might be argued then, as Sellars does, that in the Kantian transcendental framework, there is 'passivity of senses' and 'spontaneity of understanding (Sellars 1993). At this juncture, before proceeding to the explication of the Kantian *a priori* categories of understanding, it will not be an otiose task to reiterate the crucial arguments made so far: Quentin Meillassoux, the proponent of continental speculative materialism, argues that correlationism – or the tendency to argue about the inseparability of the material world and the 'thing-in-itself' from thought and hence, the idea that at least, epistemologically, the extant is always a given – demolishes all absolutes, not just those of dogmatic metaphysics which posits and justifies its absolutes through the principle of sufficient reason but also those of scientific realism and materialism because if the absolute or the autonomous world is a co-constituted by thought or consciousness or language of the subject, then, the mind-independent material realm is unknowable for us. Meillassoux claims that Kant's transcendental idealism is a progenitor of correlationism. The first objective of this chapter is to examine this claim, and in order to do so, it is necessary to understand the distinctions between the dyads of analytic-synthetic; understanding-sensibility; and concept-intuition. Kant argues that synthetic *a priori* knowledge is valid knowledge because pure intuitions are possible, and they are possible because the manifolds of appearance, or sensations are meaningful only because they are ordered and arranged in a specific relation by *a priori*, logical forms of mind known as the categories of understanding.

In the *Prolegomena to any Future Metaphysics* (2004), Kant dilates upon these *a priori* categories; he states that even though the manifold of appearance or sensations occur in

relation to the and when affected by material objects, pure intuition or *a priori* cognition is possible because in the subject there are 'forms of sensibility which in me as subject precedes all actual impressions through which I am affected by objects' (34). Kant laments that David Hume restricted the scope of synthetic knowledge only to the concept of causality and didn't attempt to extend its scope to speculate about the feasibility of synthetic *a priori*. Synthetic *a priori* knowledge is possible because pure intuition is possible and this kind of intuition is, in turn, possible because there are *a priori*, mental forms of sensibility in the subject which exist prior to the rise of manifold of appearance when sensibility is impacted by external objects. The first consequence of the conceiving the possibility of *a priori* cognition due to *a priori* forms of sensibility is the division between phenomena and noumena. According to Kant, because perceptions or sense impressions or sensations or manifold of appearance are ordered and organised by forms of sensibility which precede them, what we, as subjects, have access to are 'objects of experience' or 'objects of senses', and not 'as they are in themselves' (34). The implications of the inaccessibility of the things-in-themselves will be discussed below. Coming back to the forms of sensibility, they might be described as the rules of organising sensations. These rules are apodictic and universal. Kant goes on to demonstrate that just as pure intuition is possible because of the *a priori* forms or rules, pure mathematics is also possible because time and space which are the two fundamental concepts in mathematics are themselves pure intuitions. Kant observes that

> "Even arithmetic forms its concepts of numbers through successive addition of units in time, but above all pure mechanics can form its concepts of motion only by means of the representation of time. Both representations are, however, merely intuitions; for, if one eliminates from the empirical intuitions of bodies and their alterations (motion) everything empirical, that is, that which belongs to sensation, then space and time still remain, which are therefore pure intuitions that underlie *a priori* the

> empirical intuitions, and for that reason can never themselves be eliminated; but, by the very fact that they are pure intuitions *a priori*, they prove that they are mere forms of our sensibility that must precede all empirical intuition (i.e., the perception of actual objects), and in accordance with which objects can be cognized *a priori*, though of course only as they appear to us" (2004: 35).

The purpose of incorporating this longish quote is to use it to argue that Kant, in order to establish the primacy of the *a priori* categories of understanding or forms of sensibility employs a method of reason which will later by employed by logical empiricists and materialists alike: the method of logical elimination of what each school considers the superfluous in order to reach the core. In the case of the materialists, they attempt to establish how corresponding to every mental state, there is a material – that is, neuro-chemical in the case of living beings – state; likewise, the empiricists endeavour to demonstrate through methods such as 'rational reconstruction' that in a scientific statement, the theoretical terms are redundant and can be replaced by empirical terms without compromising the meaning of the statements. As a proponent of transcendental idealism, Kant, employs the same principle as the materialists who preceded him – such as La Mettrie, who in *Man Machine* argues that underlying every phenomenon which purportedly indicates the autonomy of the mind, and other idealist entities such as the soul, there is a biological process at work – to demonstrate the opposite, that is, how underlying the empirical there are forms of pure intuition. Arithmetic develops its concepts by connecting various 'units of numbers' temporally and similarly, geometry deals with bodies with extension but the empirical quality of extension cannot be made sense of without the pure form of space. Thus, pure mathematics is possible for Kant because fundamental to the disciple are the *a priori* intuition of time and space, which are 'demoted' to being pure forms of sensibility. Now the question which may be asked at this juncture is that if *a priori* synthetic knowledge is possible because *a priori*

cognition or pure intuition is possible, and if pure intuition is possible because of the *a priori* forms present in the mind which are anterior to empirical sensations and perceptions, then what are the qualities of the *a priori* forms themselves? For Kant, the *a priori* conceptual forms are apodictic and universal, as has already been stated above. Wilfrid Sellars (2002) states that in order to establish that *a priori* synthetic knowledge is possible, it is important that the Kantian rules or pure forms are severed from their innateness, and given a 'linguistic turn' instead (268). Sellars argues for a linguistic interpretation of the Kantian forms which constitute 'the conceptual structure involved in experience' because the categories or the pure forms are conceptual forms, and it is language which is the 'bearer of conceptual activity'. Hence, for Sellars, the *a priori*, logical forms of Kant are linguistic forms. Sellars (1953) observes that language as a system of communication as well as bearer of the possibility of conceptualisation is a rules-based system. There are broadly two kinds of rules which govern language and render it a coherent system: the intra-linguistic rules or the syntactic rules, which deal with the 'symbols of symbols'; and the extra-linguistic rules or the semantic rules whereby linguistic terms or the definientia acquires extra-linguistic meaning. He then argues that the difference between the syntactic and semantic rules of language are spurious because since 'obeying a rule entails recognizing that a circumstance in one to which the rules applies', but the recognition itself – for instance, the empirical recognition on sighting a tomato that it is red – necessitates the prior existence of the concept of red (133). Thus, concept precedes the semantic rules of language by which a term acquires extra-linguistic meaning. This Kantian interpretation of the semantic rules of language by Sellars is punctuated by his realist claim that for synthetic *a priori* knowledge to possible, or for synthetic *a priori* statement to be true, the predicate should not only syntactically derivable from the subject, but there should be 'extra-linguistic or real connection' between them which renders the meaning of the predicate true (1953; 128). That's the reason why Sellars states at

the end of this essay that he is not strictly a transcendental idealist. Sellars' realism will be returned to later; at this point, it is sufficient to point out, as Sellars does, that concepts precede even the semantic rules by which terms acquire extra-linguistic meanings. Hence, Sellars substantiates by examining the rules of language, Kant's claim that synthetic *a priori* knowledge is possible.

Sellars (1993) further demonstrates how concepts underlie all empirical observations by using the categories of 'rich' and 'thin' conceptual episodes. Sellars illustrates his observation as follows:

> "Tom: See that red book over there.
>
> Dick: [I don't see a book over there but] there is a red and rectangular physical object over there.
>
> Harry: [I don't see a red book over there, though I grant that] it looks to me as though there were a red book over there…
>
> Jones: [1 grant that] it looks to me as though there were a red and rectangular physical object over there" (1993: 13-14).

These stances indicate for Sellars that visual perception can be conceptualised in three distinct ways: the position of Tom is of a naïve realist who doesn't distinguish between physical stimuli and its conceptual, or constructed aspect; Dick, on the other hand, has a materialist position which recognises that 'book' is a construal but which insists on the presence of sense impressions of 'red' and 'rectangular' forming the base upon which concept of book is construed. Finally, the positions of Harry and Jones reflect the Kantian position since they acknowledge that perception entails access to 'objects of experience' of Kant, and never to things-in-themselves. The difference between them is that Harry's stance

is one which recognises the act of perceiving a red book on a brown table as one of rich conceptual episode, whereas, Jones construes it as a minimalist or a thin conceptual experience. Sellars' aim is to demonstrate through this example that perception can never be equated with 'sheer receptivity', and it always entails, as has already been stated above, the passive senses being acted upon by 'spontaneous' understanding. Sellars argues that Kant does not distinguish between non-conceptual sense impressions or 'impressions of pure receptivity, and the conceptual forms of space and time which serve as the basis for the pure intuition and thereby, the discursive and conceptual representations of all other entities (whether those representations be rich or minimalist conceptual episodes). Thus, while Kant argues that synthetic *a priori* knowledge is possible because pure cognition is possible, which in turn is possible because underlying all empirical observations are *a priori*, conceptual forms of sensibility, including time and space; Sellars goes a step further, and states that non-conceptual sense impressions constitute the basis for pure formal intuition to emerge. Kant, however, is not dismissive of the mind-independent reality which for him is the basis but not constitutive of human knowledge. For Kant, in the words of Sellars, knowledge is 'postulated' and never 'found'.

**II.1.**

The preceding section expostulated how the Kantian theory of transcendental idealism establishes, going beyond the analytic-synthetic divide, that synthetic *a priori* knowledge can be gained because pure cognition or pure intuition can happen, which occurs because of the existence of *a priori*, conceptual forms that are innate in the human mind. Wilfrid Sellars gives both a linguistic as well as a realist spins to the concept of innate conceptual forms. The 'linguistic turn' which Sellars gives to the Kantian innate forms consists of pointing out that

these forms by the virtue of being conceptual in nature must be accessible only language; now, language is governed by syntactic (intra-linguistic) rules and semantic (extra-linguistic) rules whereby terms acquire meaning but even to learn from experience so that the terms acquire synthetic meanings, the subject must have prior concepts. In the Kantian vein, Sellars therefore argues that synthetic knowledge is gained through experience but experience is always shaped by conceptual categories. Sellars, however, also insists on asserting a realist position when he states that for a term's meaning gained by semantic rules to be true, the referent must exist. And that underlying the rich and minimalist conceptual episodes constituting the experience of visual perception are non-conceptual sense impressions arising from the relationship between the material objects and sensations. But what is Kant's position on the autonomous material realm? According to Kant, the ontological should not be conflated with the epistemological: the independently-subsisting material world exists but it cannot be accessed or known for we can know only appearances or the objects of senses which emerge and acquire the qualities they have because of the *a priori*, mental forms which are universal and necessary. How does then Kant distinguish between subjective knowledge and objective knowledge which sciences aspire to?

In the *Prolegomena to any Future Metaphysics* (2004), Kant responds to the first question posed in the previous paragraph regarding the status in transcendental idealism of external reality, by clarifying that unlike traditional idealism, he does not consider the autonomous material realm, a mere 'illusion'. On the contrary, he writes, his views are the opposite. He states:

> "There are things given to us as objects of our senses existing outside us, yet we know nothing of them as they may be in themselves, but are acquainted only with their appearances, that is, with the representations that they produce in us because they affect our senses. Accordingly, I by all means avow that there are bodies outside us,

> that is, things which, though completely unknown to us as to what they may be in themselves, we know through the representations which their influence on our sensibility provides for us" (2004: 40).

This observation by Kant – which we shall return to in the next section on Meillassoux's interpretation and critique of Kant – clarifies that for Kant, the mind-independent, material world is existent but unknowable, because even though there is a relation between the manifold of appearance or sensations and the material objects, it is thought which orders sensations and there are innate forms in thought which give rise to the objects of senses, or appearances. For Kant, therefore, the Cartesian distinction between primary (objective) and secondary (subjective) qualities of objects is a futile one because the primary qualities are also accessible only through the *a priori* mental forms. In arguing that the noumenal or the autonomous material world exists, Kant attains two goals simultaneously: on the one hand, he saves the material realm from the idealists who view it as an illusion; on the other hand, he establishes that the appearances or the objects of senses or representations which we have access to, are not 'mere self-produced brain phantoms to which no object at all corresponds' (2004: 43). In the second preface to the *Critique of Pure Reason* (2007), emphasises this very argument that how without acknowledging the existence of things-in-themselves, we will be compelled to make the 'absurd conclusion that there can be appearances without anything that appears', and hence, the objects of the senses which are the building blocks of knowledge, will themselves merely be mental illusions (B XXVII, 27). The question that arises at this point is that if thing-in-itself is extant but unknowable, and objects of senses or appearances (postulated by the *a priori*, mental forms) are all that we can know and access, then how does one ascertain which of these representations are objectively true, and which are not? And what gets counted as scientific knowledge? The radical finitude which Kant

introduces in epistemology through the concept of the logical, *a priori* forms renders any access to the independent material realm strictly impossible.

In the second preface to the *Critique of Pure Reason* (2007), Kant observes that necessary laws of nature can never be 'accidentally' discovered; science can gain insight only about that aspect of a natural phenomenon which 'it produces after a plan of its own' (B XIII, 20). In other words, just as the manifold of appearance can become knowledge only when thought orders them in a particular relationship, likewise, perceived natural phenomena can become a basis for natural laws only when antecedent to the perception, are scientific concepts. In the words of Kant, reason '…learns from nature, not fictitiously ascribe to it, what it cannot learn through its own resources, yet it must seek as its guide, in order to learn from nature, that which it has itself put into nature' (20). According to Kant, objective knowledge does not entail reason gaining access to any aspect of a thing-in-itself but it is that which is universally valid and necessary.

In *Prolegomena to any Future Metaphysics* (2004), Kant introduces the concepts of judgment of perception and judgement of experience to elucidate the difference between objective and subjective knowledge. He observes that a judgement is a judgment of perception, if it entails linking two sensations or appearances contingently; the judgement of perception is therefore subjective judgment. On the other hand, a judgement is judgement of experience if the manifold of appearance is ordered by *a priori*, universal and necessary concepts. To put it differently, synthetic *a priori* knowledge is objective because pure concepts of understanding (which are universal and necessary) 'subsume' appearances and order them in certain stable relationship which earns the status of objective knowledge. In order to illustrate the argument that scientific knowledge is objective knowledge because it entails subsuming of appearances by pure concepts of understanding, Kant states that the objective fact 'a straight line is the shortest distance between two points' can be validated

only by the concept of magnitude which is, however, not derivable empirically or from a contingently observed relation between two entities; rather, it requires that it be recognised as a concept of pure understanding. Hence, for Kant just as pure mathematics is possible because time and space which underlies most mathematical concepts, are themselves concepts of pure understanding; likewise, pure science is possible because objectivity itself can be defined as entailing judgements of experience which entails universal and necessary connections between various perceptual impressions or appearances, and such a connection is possible only if the appearances are subsumed under *a priori* concepts of pure understanding. There can be no tryst with nature, natural phenomena and natural laws without universal, necessary concepts which are *a priori* in the understanding.

**III.**

The Kantian theory of transcendental idealism is principally a 'doctrine of logical forms' which are *a priori*, universal and necessary (Sellars 2002). As these forms are anterior to empirical intuition, in the Kantian frameworks the senses are viewed as passive upon which 'spontaneous' understanding must act to give rise to pure intuitions. Synthetic *a priori* knowledge is possible in this framework, and seemingly empirical intuitions always entail conceptual episodes, whether rich or minimalist. In this theoretical framework, even the objectivity which scientific knowledge aspires to requires that universal, necessary, *a priori* concepts of understanding organise appearances. Transcendental idealism however, unlike, traditional idealism, does insist that the external, autonomous material realm exists and that it is not a mere illusion because if their existence is denied, objects of senses or representations or appearances themselves will have to be acknowledged as sheer phantoms of the mind. For Kant, therefore, the external noumenal world exists but it remains unknowable since all

knowledge arises from experience, and experience itself requires *a priori* concepts of understanding, which belong to the mind. Massimmi (2018) describes Kantian philosophy as philosophy of 'a vantage point' just as Meillassoux refers to it as the proto-theory of correlationism.

Perspectivism – the view that all knowledge, including scientific knowledge as being historically or culturally situated – arose in reaction against 'metaphysical' realism which asserts, in the words of Hilary Putnam, that "the world consists of some fixed totality of mind-independent objects. There is exactly one true and complete description of 'the way the world is'" (Massimi 2018; 165). Kant's view that knowledge is possible only because mental, *a priori* forms or categories of understanding underlie all empirical or perceptual intuitions can be considered as the theoretical ancestor of Perspectivism since both emphasise on the necessity of a 'human vantage point' for knowledge of nature to be possible. The differences between the two are of course striking since for Kant, the vantage point that mediates between the autonomous material realm and intuition consists of innate, universal and necessary forms of pure understanding whereas for Perspectivism, the vantage point consists of historical and cultural traditions but insofar as both emphasise on the inevitability of the vantage point for knowledge to be possible, perspectivism may be considered as a branch of the Kantian tree. Meillassoux terms this primacy on the 'human vantage point' – whether historically or culturally or linguistically construed, or involving idealisation by *a priori* forms of understanding – as correlationism which, as already been stated above, he describes as the position which argues about the inseparability of thought and the material realm. Christopher Norris (1998) states that the Kantian 'Copernican Revolution' comprises of placing man at the centre of the epistemological process. About the Kantian project of 'critical epistemology, Norris writes:

> "This project rests on an illusory idea of 'man' as the subject-presumed-to-know, a strange 'empirical-transcendental doublet' – in Foucault's famous phrase – who is somehow both object and subject of his own cogitations. That is to say, he is a curiously bifurcated creature somehow capable both of achieving objective self-knowledge in the causal, anthropological, or empirically-determined mode, and of rising above that realm to vindicate the claims of autonomous selfhood and free-willed ethical or speculative thought" (31).

Kant's correlationism, thus, consists of making humans the basis or the source of both objectivity and subjectivity in knowledge since epistemology in the Kantian framework becomes an exploration not of the mind-independent, natural or material realm but of 'human understanding' mediated by *a priori* conditions of understanding through which alone reasoning is possible. Meillassoux's claim that Kant and his theory of transcendental idealism marks the genesis of correlationism therefore stands vindicated, it may be concluded. Kant, however, acknowledges the existence of the material realm since in its absence, appearances or sensory representations themselves run the risk of being considered as illusory. Recognising this crucial aspect of Kantian theory, Meillassoux argues that Kant can be described as a 'weak correlationist' (2008). Meillassoux writes:

> "Because although the author of the Critique of Pure Reason maintains that the thing-in-itself is unknowable, he also maintains that it is thinkable. For Kant effectively allows us the possibility of knowing *a priori* that logical contradiction is absolutely impossible. Although we cannot apply categorical cognition to the thing-in-itself, the latter remains subject to the logical condition that is the prerequisite for all thought. Consequently, for Kant, the following two propositions have an absolute ontological scope:

1. The thing-in-itself is non-contradictory.

2. The thing-in-itself exists, otherwise there would be appearances without anything that appears, which for Kant is contradictory" (31).

Meillassoux terms the Kantian variety of correlationism – which acknowledges the existence of the thing-in-itself – as 'weak correlationism' precisely for this acknowledgment. The other variety of correlationism is that of 'strong correlationism' which, according to Meillassoux, uses the Kantian argument of unknowability of the thing-in-itself to de-absolutise the principle of non-contradiction itself: just because thought is non-contradictory, it does not mean that the unknowable thing-in-itself or the inaccessible material realm is non-contradictory too. Strong correlationism can be viewed as the manifestation of a contradiction inherent in Kantian transcendental idealism: if the thing-in-itself is unknowable because synthetic *a priori* knowledge is possible only through experience, and because experience involves *a priori* concepts, then how does Kant know that the noumena or the autonomous material realm, actually exist? In other words, if the noumena is unknowable in the Kantian framework, how can it be thinkable? This is one significant criticism which Meillassoux makes against Kantian transcendental idealism: whence comes the absolute that the noumenal realm exist if it is unknowable by the virtue of the claim that all knowledge is outcome of *a priori*, logical forms of understanding? The second criticism which Meillassoux articulates against the Kantian variety of idealism is regarding the status of scientific knowledge, and especially of 'ancestrality' in the Kantian framework?

In *After Finitude* (2008), Meillassoux introduces the term 'ancestrality' and delineates it as consisting of the evidence of what existed on the planet prior to the accretion of life. Carbon dating – consisting of techniques such as calculating the rate of disintegration of radioactive nuclei of an isotope of the object, and law of thermo-luminescence – enables the

determination of the age of objects which existed on earth prior to accretion of life. He terms such objects as 'arche-fossil'. Meillassoux terms the scientific statements about the age and characteristics of such entities, as 'ancestral statements'. He argues that ancestral statements consist of the knowledge about the origin of the universe, and of earth, and of all the cosmic processes and events which took place before life, and more specifically, 'consciousness' emerged on the planet. He is interested in exploration of ancestrality because it concerns events which are not just temporally and spatially distant from consciousness or a conscious observer but also anterior to it. Next, he asks how will the ancestral statements be viewed within the Kantian framework according to which scientific objectivity implies, as has already been discussed, the universality and necessity of a causal relation between two objects of experience, which is brought about by the *a priori*, mental rules which orders the relationship? In other words, what is the status of scientific statements about ancestral events and arche-fossils in the Kantian framework of pure science? Meillassoux observes that since for Kant, objectivity consists of universality of a scientific statement (and not of the realist concept of 'adequation'), in the Kantian correlationist framework, ancestral statements will be viewed as follows:

> "According to the correlationist, an ancestral statement is true insofar as it is founded upon an experiment that is in the present – carried out upon a given fossil-material – and also universalizable (and hence by right verifiable by anyone). It is then possible to maintain that the statement is true, insofar as it has its basis in an experience which is by right reproducible by anyone (universality of the statement), without believing naïvely that its truth derives from its adequation to the effective reality of its referent (a world without a givenness of the world)" (2008: 16).

Hence, in the Kantian framework, it is possible to maintain that ancestral statements are objectively true without acknowledging the terms of the statements as 'adequation' of reality,

or without granting referential status to those statements. It becomes necessary at this juncture to outline laconically the difference between Kantian transcendental idealism and scientific realism in their ideation of objectivity, although this will be explored in greater details in the next section. The Kantian position, which has already been explicated, states that objectivity entails judgment of experience which is brought about by the apprehension of universal and necessary relation between objects of experience or appearances, and that such universal relation is the outcome of the *a priori* forms of understanding. Scientific realism, on the other hand, considers scientific statements as consists of 'revisable hypotheses' about events governed by laws of nature, and scientific terms or terms of natural kind as possessing referential status (Meillassoux 2008; Saatsi 2018). In the words of Meillassoux, the distinction between the two concepts of objectivity is:

> "The empirical question is that of knowing how bodies that were organic prior to becoming conscious appeared in an environment which is itself physical. The transcendental question consists in determining how the science of this physical emergence of life and consciousness is possible. Now, these two levels of thought – the empirical and the transcendental – are like the two faces of a flat sheet of paper: they are absolutely inseparable but they never intersect. But your mistake consists precisely in allowing them to intersect – you have turned a structure which should have remained flat into a Mobius strip" (2008: 22).

In the Kantian schema, objective knowledge is viewed as the conditions of possibility of scientifically objective knowledge: Meillassoux's observation reveals that while scientific realism will examine how adequate are a set of natural kind terms in capturing a natural event or process, transcendental idealism will be concerned about how the 'science' consisting of these terms emerge. This is reminiscent of the argument of Christopher Norris (2014) that constructivist schools of philosophy of science such as strong sociology in their emphasis on

'flat ontology' conflates conditions of possibility of knowledge, with truth itself. In the case of Kant, humans with their innate, *a priori*, logical categories of understanding become the source of objectivity (Norris 1998). For Meillassoux, therefore, Kant introduces a debilitating finitude in epistemology by transforming objectivity into an investigation about the objective rules or forms or categories which are *a priori* and which are the conditions of the possibility of scientific knowledge, and thereby, destroying the possibility of knowability of the thing-in-itself, or the autonomous natural realm which Meillassoux aims to restore to the status of an 'absolute' albeit a non-metaphysical absolute. In order to achieve this end, Meillassoux posits a materialist interpretation of the Kantian logical forms or the categories of understanding.

In *After Finitude* (2008), Meillassoux makes two observations about the nature of the 'transcendental' in transcendental idealism: firstly, since transcendental refers to the *a priori* conditions of knowledge, it deals with forms. Secondly, just as the transcendental conditions are essential for knowledge of bodies, bodies are also required for the transcendental forms to occur. Unlike metaphysical absolutes, which are all encompassing in scope, the Kantian categories of understanding are conditions of possibility of knowledge located in a determinate, finite entity, that is, the human. Now, time and space are for Kant *a priori* forms of understanding through which empirical intuition arises. Ancestral statements, on the other hand, conceives of a sequence of events which is anterior to the emergence of time as a form of understanding because these events took place before the emergence of consciousness in humans. For Meillassoux, the positing of the 'ancestral space-time' entails pointing out the inadequacy of the transcendental conceptions of time and space since the latter cannot conceive of time and space preceding the rise of consciousness. Now tracing the argument backwards, we see that since synthetic knowledge, including scientific knowledge, emerges within experience, and experience consists of *a priori* forms of understanding, and as the forms are located within finite bodies of humans, and as these bodies and their consciousness

arose at a particular geological epoch, geological time or 'time of science' 'temporalizes and spatializes the emergence of living bodies; that is to say, the emergence of the conditions for the taking place of the transcendental' (2008; 25). The concept of ancestral time, therefore, surpasses the transcendental conception of time. Such a counter to the transcendental conception of time as a form of understanding is clearly a materialist conception on the part of Meillassoux.

Charles Wolfe (2016) observes that materialism traditionally attracted the criticism of being crude and reductionist because in insisting on the monist view that everything extant is either material or outcome of relation between material entities, it effaces the autonomy of 'higher' entities such as the soul, free-will, consciousness *et. al.* Materialism therefore insists on the material genesis of all natural processes and entities and on their naturalist explanation. In order to answer the question as to how can base matter germinate life, Denis Diderot writes in *D'Alembert's Dream* that the humble egg is an inert, lifeless mass but through application of heat and assimilation of nutrients, the egg gets transformed into a living being (Wolfe 2009). Materialism posits a cosmological view according to which matter is neither a dead lump or mass nor is it a metaphysical construct; the argument is that motion which is intrinsic to matter is what gives rise to life and thereby, consciousness in matter. At the same time, this generative power of matter is open to scientific experimentation, materialists argue. 'The plasticity of the cerebellum or the regenerative properties of Trembley's polyp' are a few of the scientifically testable natural phenomena which materialists invoke as evidence of the naturalistically explicable powers of matter (Wolfe 2016; 11). Hence, Meillassoux's concept of ancestral time which precedes the transcendental conception of time, and within which consciousness and hence, the forms of understanding – including time – emerged, resonates well with the materialist cosmological view which argues about the material origins of all natural entities, both organic and inorganic.

Meillassoux's materialist interpretation of the Kantian *a priori* forms of understanding is, however, an inadequate rebuttal to transcendentalism. According to Kant, as has already been discussed, transcendental idealism is unlike other idealisms which dismiss the material realm as illusory; the Kantian noumenal realm is extant but unknowable. Recognising precisely this, Meillassoux describes Kant as a 'weak correlationist' since Kant states that the thing-in-itself exists and that it is thinkable (since it is non-contradictory). It may be argued that since Kant recognises the existence of the autonomous material realm, he may acknowledge that material processes are at work in the noumena, and that accretion of life and consciousness are the outcomes of material process which are chronologically anterior to the forms of understanding. Meillassoux himself articulates this position thus:

> "But at the deeper level (being gives itself as anterior to givenness), I grasp that the correlation between thought and being enjoys logical priority over every empirical statement about the world and intra-worldly entities. Thus I have no difficulty reconciling the thesis of the chronological anteriority of what is over what appears – this being the level of meaning that is superficial, realist, derivative – with the thesis of the logical priority which givenness enjoys vis-à-vis what is given in the realm of givenness" (2008: 15).

Since Kant agrees that an autonomous natural realm exists, he will not the rule out the feasibility of materialist account of the genesis of life and consciousness (and thereby of consciousness); in the second preface to the *Critique of Pure Reason* (2007), he observes, however, that in order to learn from nature, we seek as guide what we have ourselves thrust upon it: the *a priori* conditions of knowledge, or the forms of understanding. The materialist rebuttal of Meillassoux to Kant, wherein he posits a materialist account of the origins of the categories of understanding within ancestral time is incapable of satisfactorily countering Kant because in response to the materialist account, a Kantian might point out that no matter

what events took place prior to consciousness, its knowledge is possible only through the forms of understanding. An arche fossil, or any other ancestral event – including the genesis of life and consciousness – might have come into being at a time prior to the existence of the forms of understanding, but their knowledge can be gained only when they recognised as 'conceptual episodes'. Thus, both the conceptions of time, the transcendental concept of time as well as Meillassoux's concept of ancestral time-space entail use of concepts which are *a priori*, and not empirical. The noumenal realm therefore remains unknowable, and the correlationist principle about the inseparability of the 'being' from thought remains unchallenged. Meillassoux posits the correct problem, that is, the destruction of the (non-dogmatic, metaphysical) absolute by Kantian transcendental idealism and other stronger kinds of correlationism. He, however, fails to explicate an adequate solution to the problem; his materialist interpretation of the emergence of the forms of understanding in ancestral time-space following the accretion of life and matter does not counter the Kantian claim that thing-in-itself is unknowable. The finitude of the Kantian forms of understanding and the givenness of appearances, and knowledge within the forms, and thereby, the inaccessibility of the autonomous material world cannot be challenged through materialist-naturalist account; a rebuttal based on the arguments of scientific realism is expostulated in the next section.

## IV.

Meillassoux describes his variety of materialism as 'speculative materialism' because he is engaged in speculation (which is not empirically verifiable) about the nature of non-dogmatic, metaphysical absolute. He articulates a materialist account of the ancestral time-space and of the genesis of the categories within it. This section argues how he can find a powerful ally in scientific realism in his quest for recuperating a non-metaphysical absolute.

Fabio Gironi (2018) observes, drawing from Andrew Cutrofello, that the analytic-synthetic philosophy divide can trace its origin to the two different responses to the Kantian question, what is man? Whereas for continental philosophy, human existence is 'empirically transcendental', for analytic philosophy, the reverse position has greater traction, that is, human existence is 'transcendentally empirical' (2). Quentin Meillassoux appears as an iconoclast in the continental tradition since he, in attempting to access the non-dogmatic absolute, aims for a 'direct grasp of reality – scientifically describable (and therefore, conceptually available) reality – not a real qua unknowable but a real as exhaustively knowable', and thereby, breaks away from influential school of continent philosophy such as phenomenology (3). Yet, Meillassoux is very much a part of continental tradition insofar as his work is influenced by those of Bachelard (who belongs to the French rationalist tradition) and Althusser (who propounded the concept of aleatory materialism). Gaston Bachelard used two terms to indicate why science is a 'progressive enterprise' which progresses from being an 'illustrative metaphor' to sound scientific theory; these are *histoire sanctionée* and *histoire perimée*. The first term refers to those episodes in the history of science which have contributed to its progress, while the latter term is used for those episodes which have not played any role in advancing scientific knowledge (Norris 1998; 26-27). Thus, the concept of scientific progress which is integral to scientific realism is also important in the French rationalist tradition of continental philosophy. The aim of this last section is to elaborate how scientific realism can contribute to the formulation of a stronger rebuttal to the Kantian view that *a priori* forms of understanding underlie all experiences, including of empirical intuition, and therefore, reality-in-itself cannot be accessed. Materialism with its monist view of the natural realm can describe how the *a priori* forms emerged at a particular point in ancestral time-space following the accretion of life, and the much later appearance of humans on earth. What Meillassoux achieves when he juxtaposes the ancestral space-time with the Kantian

conception of time and space as forms of pure understanding is that he expands and transforms the concept of time, but his Kantian interlocutor might insist – and justly so – that while ancestral time refers to events and phenomena which took place on the planet in a geological epoch prior to the emerge of the thinking subject, and thereby, of *a priori*, logical forms of understanding; knowledge about such material events always entails such conceptual categories situated within human understanding. How can Meillassoux posit a conception of objectivity wherein objectivity is not universality of knowledge owing to universal and necessary conceptual connections between appearances, brought about by *a priori* forms?

Scientific Realism can be broadly described as the school in philosophy of science which breaks away from both logical empiricism and constructivism of various kinds. Empiricism in its efforts to break away from the metaphysical first principles reduces the material, natural world to the empirically observable and views it as the 'metaphysical legacy' of classical physics (Bunge 1967). Saatsi (2018) writes that for empiricism, the terms in scientific usage which refer to unobservable entities and events such as 'laws of nature, natural kinds and objective modality' are remnants of 'inflationary metaphysics'. In other words, for empiricism the realist commitment to a material or physical reality of scientific terms, even if they are unobservable, is sheer metaphysics. Scientific realism, in response, argues that scientific explanation is impossible without invoking natural kind terms which refer to the unobservables, whether it is causality, or the electromagnetic field, or atoms. One of the early 20$^{th}$ century proto-realists was Hans Reichenbach of the Berlin school who argues that if scientific knowledge is considered to comprise only of observable events and entities, then inductive inference which is an important mode by which science acquires new knowledge, becomes impossible (Neuber 2018). Thus, one of the principles associated with scientific realism is that unlike empiricism of various kinds, it accepts natural kind terms referring to

unobservable events and entities and processes as integral to scientific explanation. The next principle is that unlike constructivism – which too accepts the usage of terms referring to unobservables but as historically and culturally situated constructs – scientific realism grants referential status to the natural kind terms, that is, it views that scientific terms refer to extant processes, events and entities even if they are unobservable. Scientific realism argues that since scientific explanations require reference to unobservable events, causes, laws, entities et. al., and since the usage of those terms are indispensable for explaining the experimental and explanatory success of a scientific theory, it requires an 'ontological commitment' to 'whatever is doing the explaining' (Saatsi 2018). This realist principle is called the 'explanation to the best inference' thesis or the IBE. A successful scientific theory is one which can furnish the best explanation of a given natural event; now, if the indispensable theoretical terms and hypotheses of the theory are not approximately true, then nothing save sheer 'miracle' can explain the explanatory and predictive success of the theory (Norris 2014). The IBE and the 'no miracle' thesis are combined by scientific realists to argue that the predictive and explanatory success of successful scientific theories can be explained without taking recourse to arguments invoking coincidence or miracle only if the natural kind terms and hypotheses which indispensable for the explanatory schema of theory are considered to refer to reality. This means that if the scientific terms have referential status, then the terms are approximately true and hence, they can grasp the referent. Or else, scientific truth can aspire to no higher a status than that of a 'potential explanation' (Saatsi 2018). But, on the other hand, since the terms are human constructs, and the meanings attributed to them are from the standpoint of humans, given their cognitive finitude, how can one be sure that these terms approximately grasp the aspect of reality it refers to? To this correlationist critique of scientific realism, one can point out that if scientific terms do not approximately grasp or access reality, then scientific progress itself cannot be accounted for.

Thus, scientific realism uses the IBE – the idea that indispensable hypotheses and terms of a successful theory must have referential status, for without it, the success of the theory has to be attributed to miracle – to establish that scientific terms can approximately grasp reality; and it uses the argument of scientific progress to state that if the natural kind terms did not gradually access more and more aspects of a natural event better over time, then scientific progress itself is impossible. Meillassoux's materialist account of ancestrality can draw from the scientific realist argument in favour of granting referential status to scientific terms, and to the idea that these terms capture approximately some aspect of the ancestral reality, in order to counter the Kantian claim that the autonomous reality cannot be accessed. Terms referring to ancestral entities and events such as fossils, arche-fossils, or the rate of radio-active decay of the isotope of the fossil objectively grasp those material events, even if partially. For otherwise, in the absence of the referential status of the ancestral terms and statements, and if all synthetic *a priori* knowledge is the outcome of innate, logical forms of understanding as it is for Kant, then how does one distinguish the concept of geological time from the conception of time in various mythological and theological accounts, which also had wide inter-subjective appeal when science was in its infancy? And how does identify the former concept as a progress from the latter? Speculative materialism of Quentin Meillassoux can therefore make use of scientific realist principles such as invoking of terms referring to unobservables for attaining great explanatory success; and of granting referential status to those terms, by deploying the IBE and the 'no miracle' thesis, to strengthen the concept of ancestral space-time wherein natural events took place anterior to the rise of consciousness, and that the material evidence of the ancestral processes give access to those primeval events, thereby contributing to the progress of scientific knowledge.

**V.**

This chapter explains why Meillassoux is justified in describing Kant as a correlationist, even though he acknowledges that the latter is a weak correlationist. Secondly, it juxtaposed the Kantian conception of objectivity with those of speculative materialism of Meillassoux, and scientific realism; the epistemological finitude which Kant imposes on the possibility of grasping mind-independent, material reality by defining objective knowledge as consisting of the universal and necessary relation whereby the forms of understanding order appearances or objects of experience, cannot be countered by a materialist interpretation of the forms alone. The materialist argument is that these *a priori* forms of understanding emerged at a particular point of ancestral space-time, when no consciousness present to witness the event or access it as an object of experience, or representation. To this argument, the Kantian response will be ancestral events anterior to the emergence of thought did take place, but there can be no knowledge of those events without the *a priori* forms of understanding, and thereby, nature and natural events are but correlates of thought. In other words, materialist cosmological accounts or ancestral statements are meaningful only because they are accessed through *a priori*, mental concepts and that the events themselves remain unknowable. This idealist finitude of epistemology rendered insurmountable by Kant, the chapter attempts to can be more effectively countered by employing the scientific realist principle which states that natural kind terms have 'referential status' using the IBE and the 'no miracle thesis' for otherwise, scientific truth is merely a 'potential explanation' and as a result, no account of progress of scientific knowledge is possible.

# IV. ARE NATURAL LAWS NECESSARY OR CONTINGENT? A MATERIALIST CRITIQUE OF MEILLASSOUX'S PRINCIPLE OF FACTIALITY

ABSTRACT: In *After Finitude: An Essay on the Necessity of Contingency* (2008), Quentin Meillassoux posits the concept of 'principle of factiality' in order to establish the contingency of the natural order and the natural laws which govern the realm of nature. The principle of factiality states – in the materialist vein – that there are no real necessities or the law of sufficient reason; there are also no necessary entities. The contingency of entities and natural laws is the only necessity. He establishes the necessity of contingency of absolutising 'facticity', or the correlationist argument that whether laws of nature are necessary or contingent cannot be known given that the realm of nature as an 'in-itself' remains inaccessible and the mediation of correlation insurmountable. Meillassoux, having asserted the necessity of contingency of natural entities and laws, tries to grapple with the perennially relevant question of metaphysics: if natural laws and the natural realm are contingent, then what explains regularities observable in the realm? The philosophical arguments which Meillassoux employs 1) to establish the contingency of the natural order; and 2) to explain observable regularities in the natural order, occurring in spite of the contingency of the natural laws, entails a representation of materialism's notion of contingency as chance occurrences within the stability of natural laws. The aim of this chapter is to point out the inconsistencies in Meillassoux's formulation of the materialist concept of contingency and to argue that while Meillassoux attempts to draw his concept of radical contingency or principle of factiality governing the natural order from Humean scepticism, the contingency of natural laws and the natural order can be derived from materialism itself.

## I. INTRODUCTION

Atomist philosophers such as Epicurus and Lucretius and pre-Socratic philosophers such as Empedocles were thinkers who advocated the contingency of the natural order. In *Letter to Herodotus*, Epicurus writes that atoms and the void interact to produce the cosmos or the universe; the world is one amongst 'indefinitely many' which appear and disappear as a result of the motion of the atoms in the void and their interaction. The appearance and disappearance or generation or perishing of the worlds is proof that no design or teleology governs the world (Warren 2009). In the materialist poetic treatise *On The Nature of Things*, Lucretius writes that atoms which move incessantly parallel to each other contingently undergo a swerve or *clinamen* which causes them to interact with other atoms which in turn causes nature to produce entities; this 'free motion of atoms' occurs contingently (Morel 2009). Therefore, on the one hand, the atomist tradition is materialist because according to Epicurus, nature consists of atoms which move in the void, and of composites which are constituted by atoms; on the other hand, it views the material nature as existing contingently or devoid of design since indefinite universes are formed and destroyed, and because the swerve or the *clinamen* of the atoms happens contingently. Louis Althusser writes in the essay *The Underground Current of the Materialism of the Encounter* (2006) that the *clinamen* is an 'infinitesimal swerve' which renders the encounter of atoms possible, and thereby gives rise to the order of the world. Althusser observes that the 'audacity' of the Epicurean account of the origin of the world is that since the swerve of the atoms results in the encounter among the atoms which are in motion parallel to each other, and since this encounter gives rise to the world, it means that the atoms, the *clinamen,* and their encounter precede all meaning, and all 'Reason' (2006: 169). As a result of the materialist Epicurean account of the origin of the world because of contingent encounters, Althusser argues that

three concepts are challenged. Firstly, the contingency governing the material universe challenges the idea that Reason controls the universe: it posits 'non-anteriority of meaning' (168). Secondly, it challenges the principle of sufficient reason which asks why there is something rather than nothing in the world. Finally, since the natural realm, its entities and its laws exist contingently in the Epicurean materialist account of the universe, a contingent encounter of atoms which produces the world is no guarantee of its durability. Althusser writes that '(a) successful encounter, one that is not brief, but lasts, never guarantees that it will continue to last tomorrow rather than come undone' (174). Thus, the Epicurean account of the natural realm is materialist because in this account, reality consists of atoms and composites and the void; it also eschews Necessity or design by arguing that our world is one amongst many which have been generated and destroyed by the contingent encounter or interaction amongst the atoms. However, if the world is contingent, then what can account for the regularities observable in nature?

Aristotle is opposed to Platonism and its theory of ideal forms because it cannot explain change perceptible in the natural realm; he is also opposed to atomism and other pre-Socratic materialist philosophers because they cannot explain through their account of contingency of the natural world, the stability observable in the natural realm. Aristotle argues that materialists rely only on material and efficient causes to explain change but neither can account for the 'persistence of identity over time'; that which endures cannot be caused by matter since matter itself is perishable and replaceable. Therefore, what persists or endures is caused by the *telos* or function of the entity (Wolfe 2016a: 23). This is one of the most enduring criticisms of materialism's claim against contingency of the natural realm: if natural laws are contingent, then what can explain the regularities observable in nature? Quentin Meillassoux in the materialist vein posits his concept of contingency of the natural realm and its laws which he calls the principle of factiality. Meillassoux further acknowledges that the

distinct concept of contingency of the natural realm delineated in the principle of factiality must be able to give an account of the perceived regularities in the causal relations in the natural realm. In order to be able to explain the persistence of causal relations between entities and phenomena of the natural realm while at the same time holding on to the veracity of the principle of factiality, or the contingency of the natural realm and its laws, Meillassoux limns the concept of non-totalizability of all that is possible. The non-totalizable reality which Meillassoux posits is drawn from Hume's understanding of imagination which can conceive an immense number of varied effects of a given cause without running into contradiction. Secondly, the concept of contingency which he elaborates in the principle of factiality is juxtaposed against the concept of chance which he attributes to materialism. The aim of this chapter is two-fold: firstly, it aims to show that the distinction which Meillassoux makes between the concept of contingency described in his principle of factiality and the concept of chance – which is described as aleatory reasoning or chance occurrences within stable laws of nature – is a specious or vacuous one, because materialism is not opposed to the idea of contingency of laws of nature. The second aim of this chapter is to critique Meillassoux's attempt to derive his concept of 'non-totalizable' reality from Hume; the aim here is to demonstrate how Meillassoux's account of non-totalizable reality can be bolstered and enriched by materialist accounts of nature.

## II. CORRELATIONISM, FACTICITY, ABSOLUTE, HYPER CONTINGENCY

In *After Finitude: An Essay on the Necessity of Contingency* (2008), Quentin Meillassoux writes that if it is asked what is the cause and explanation of the perceived regularities observable in nature, the responses of the various schools of thought will depend upon what their view is of the principle of sufficient reason. David M. Armstrong writes in *What is Law*

*of Nature* (1983) that the principle of sufficient reason entails assertion of real necessity, which states that to exist necessarily, means to exist in all possible worlds. In other words, if an entity exists because of real necessity, it exists in all possible worlds, and it exists for a reason. The reason, Armstrong argues, is traced back to an uncaused cause, or an absolute cause; it could be God or *telos*, as Aristotle claims. Armstrong describes the principle of sufficient reason as follows:

> "To appeal to the Principle of Sufficient Reason is to insist that there must be an explanation why things are so rather than another way. The appeal must therefore enlist the sympathy of anybody who, like myself, looks to an account of laws which treats them as the explanations of regularities. Should we not go further and explain the laws themselves?" (1983: 159).

The principle of sufficient reason thus consists of asking why there is something, rather than nothing in the world; or why something is one way rather than another, and to trace back the answers to these questions to a 'single, necessary being, an Absolute', whether it be *telos* or providence. To Meillassoux's question above regarding what can explain the stability or the regularities of the cause-effect relation observable in the natural world, the metaphysician will invoke the 'Absolute' or the necessary being which is God to justify the stability; the regularities is indicative of order and order is caused by the uncaused absolute or God. The materialist on the other hand will state that since everything natural and all laws of nature are immanent to and engendered by the naturalist causal chain, the stability is not necessarily so; the regularities are determined by laws of nature which are themselves contingent, as Epicurus argues. The third position is the agnostic position taken by the correlationist who will argue that since the 'in-itself' is inaccessible by categories of understanding (if the correlationist is a Kantian), or by consciousness or by language, it cannot be known if the regularities observable in the natural realm are due to the principle of sufficient reason, or if

they exist contingently. Meillassoux describes the agnosticism inherent in the correlationist position as facticity, or the idea of 'thought's inability to uncover the reason why what is, is' (2008:53). Meillassoux argues that the argument about thought's inability to discover the sufficient reason behind the stability of the natural realm can be taken forward in two discrete directions: while the subjective idealists will absolutise the correlation itself, and argue that the 'correlation is the only veritable in-itself' (2008: 52), the speculative materialist will, on the other hand, aim to absolutise facticity itself. It will entail transforming a limit of thought to a quality or trait of reality itself. Meillassoux writes:

> "In other words, instead of construing the absence of reason inherent in everything as a limit that thought encounters in its search for the ultimate reason, we must understand that this absence of reason is, and can only be the ultimate property of the entity. We must convert facticity into the real property whereby everything and every world is without reason, and is thereby capable of actually becoming otherwise without reason. We must grasp how the ultimate absence of reason, which we will refer to as 'unreason', is an absolute ontological property and not the mark of the finitude of our knowledge" (2008: 53).

Absolutising facticity consists of converting a limitation of thought to a property of the natural world: it is not that the observing subject, given the mediated nature of her knowledge of the physical world, cannot know whether there is a principle of sufficient reason at work to account for the regularities of causal relations. There is no necessity in the natural realm, and that 'everything and every world is without reason' is a real ontological property of the natural realm. This absence of reason for the existence of the natural world and the laws governing them is described by Meillassoux as the principle of factiality. Thus if one summarises Meillassoux's arguments leading to the assertion of the principle of factiality, one finds that against the certainty associated with the metaphysical and the materialist

positions regarding the ontological status of the principle of sufficient reason, he posits the agnosticism of the correlationist position which states that given that all knowledge is always-already mediated by correlations, whether of formal categories of the mind, or language or consciousness, we cannot know whether causal regularities are caused by laws of nature which exist necessarily or contingently. This absence of knowledge acknowledged by correlationism is what Meillassoux describes as facticity. His speculative intervention consists of asserting the principle of factiality by absolutising the facticity, and thereby converting the limit or 'finitude' of knowledge into a real, ontological property of the natural realm and its entities and its laws. Subsequently, Meillassoux enumerates two theoretical moves: firstly, he states that the concept of contingency which the principle of factiality brings forth is very different from the notion of contingency of the natural realm espoused by traditional materialist philosophy. Secondly, in absolutising facticity, and thereby transforming a state of ignorance or limitation of knowledge to certain knowledge about the contingency of the natural realm articulated as the principle of factiality, Meillassoux traces the origins of his principle of factiality in Humean scepticism. The next two sections will critically examine these two theoretical positions of Meillassoux and point out certain inconsistencies and contradictions in them.

## III. HYPER CHAOS OF THE PRINCIPLE OF FACTIALITY VS. 'PRECARIOUSNESS' OF CONTINGENCY OF MATERIALISM

Once facticity has been absolutised resulting in the establishment of the principle of factiality, it leads to the return of contingency. Facticity stands for the finitude of knowledge regarding whether the principle of sufficient reason is extant or not, whereas absolutising it results in certainty that there is no necessity at work underlying laws of nature. In the absence of

necessary reason, there opens the possibility of a 'capacity-to-be-other' (2008:57). It also opens the possibility that an entity or a natural may cease to exist. The principle of factiality opens up possibilities which Meillassoux describes as follows:

> "There is no reason for anything to be or to remain the way it is; everything must, without reason, be able not to be and/or be able to be other than it is" (2008:60).

The 'capacity to be other' or the 'capacity to not to be', which opens up once the principle of sufficient reason and real necessity are proved to be impossible to exist in the natural realm due to the absolutising of facticity and thereby establishing the principle of factiality, brings forth a notion of contingency of the natural realm and its laws which are distinctly unlike 'empirical contingency' which is characterized by precariousness. Meillassoux is here making a distinction between absolute or pure contingency which the principle of factiality brings about and 'empirical contingency' which characterizes the material world and its inhabitants: all material entities are perishable. The first distinction between absolute contingency and empirical contingency is that the former is a pure possibility which may or may not be realized; like the 'capacity to be other' and 'the capacity to not to be' may or may not be manifested, 'perpetual preservation' of a determinate entity is also possible. In the absence of necessary reason for the existence of the natural order, all these possibilities are likely. As a result, what we have because of the absolutising of facticity and demolition of real necessity is a 'hyper-chaos' (64). Pure contingency allows for destruction, non-appearance as well as preservation of natural entities. Absolute, pure contingency will however never be able to produce a necessary being. This concept of contingency as 'hyper-chaos' also requires that the laws of nature are contingent (83).

On the other hand, empirical contingency, Meillassoux claims, captures the eventual perishability of all material entities. He calls this 'precariousness'. Empirical contingency is

metaphysical because it states that all things will necessarily perish if they are material. This is so because materialism assumes or 'presupposes the immutability of physical laws'. When we play a game of dice, Meillassoux writes, we are playing a game of chance wherein there are a fixed number of equally probable outcomes, given the rules of the game and the number of faces of the dice. In other words, chance entails probability. Meillassoux argues that the materialist conception of laws of nature is one which states their immutability, and therefore, the contingency which materialism permits is not pure contingency which results from the principle of factiality at work in hyper-chaos, in the absence of real necessity or sufficient reason, but of chance which has fixed probabilistic outcomes. Commenting on the Epicurean notion of contingency at work in the natural realm, Meillassoux writes:

> "In Epicurus for instance, it is clear that the clinamen, the tiny aleatory deviation in the trajectory of atoms, presupposes the immutability of physical laws: the specific shape of atoms (smooth, hooked, etc.), the number of different kinds of atoms, the indivisible character of these elementary physical units, the existence of the void, etc. – none of these can ever be modified by the clinamen itself, since they provide the conditions for its effectuation" (2008: 99).

How accurate or acceptable is this account by Meillassoux of the concept of contingency in materialist tradition as involving immutable laws of nature, and therefore, permitting by the way of contingency of outcomes, only probabilistic outcomes (meaning that the possibilities are thinkable and finite), and therefore, entailing not pure and absolute contingency but mere chance? Paul Moser and J.D. Trout (1995) observe that many materialists hold a deterministic account of causal relations; it means that because of nomic subsumption, 'laws admit no exceptions' and that the state of a natural entity governed by laws of nature at any given time is 'a necessary consequence' of its state at an earlier time (12). Thus, governed by the laws of nature, the same set of causes produce same set of effects. However, how does

materialism view the laws of nature? Are they necessarily existent, or are they contingently extant? In *What is Law of Nature* (1983), David M. Armstrong defines laws of nature as 'relations among universals'. Armstrong states that inference from one observed particular to other unobserved particulars, which when generalized, gives rise to a universal, is not possible unless the existence or functioning of natural laws is assumed. In other words, no inference or projection from the observed to the unobserved is possible without laws of nature. Armstrong also uses a realist argument in defense of the existence of laws of nature: if there are no laws of nature, then how do scientific theories make successful predictions? Armstrong writes that '…the scientific theories which we work with are obviously a reasonable approximation to at least some of the real laws of nature' (1983:6). Armstrong's argument for insisting that causal relations between entities cannot be explained in terms of observable regularities alone, and must entail the existence of laws of nature are therefore two: firstly, if there are no laws of nature, no generalization or projection or inference from the observable particular to the unobservable universal (which is manifest in the material particular) is possible; and secondly, if inference from the observable particular to the unobservable universal is not possible, then how is scientific predictability possible? Successful scientific predictions are possible because scientific theories have approximate epistemic access to the laws of nature, Armstrong argues. But are these laws of nature existent because of the principle of sufficient reason? Armstrong disagrees and cites reasons for his disagreement. As has already been stated above, the principle of sufficient reason states that everything extant, exists for a reason; when the principle of sufficient reason is coupled with the concept of real necessity, it means that everything extant exists for a reason and in all possible worlds. The reason for existence is traced back by metaphysics which employs the principle of sufficient reason, to an Absolute such as God or *telos*. Just as entities exist for a reason, the principle of sufficient reason will assert that laws of nature also exist

for a reason. Armstrong writes that metaphysics posits two accounts of necessity of laws of nature: the strong necessity account and the weak necessity account. According to the strong necessity account, strong necessity is at work if two or more universals are nomically linked to each other in all possible worlds. The doctrine of strong necessity, therefore, asserts that the universals as well as the law governing them are necessary beings. Weak necessity theory states that the universals may be contingent beings but and therefore exist contingently but wherever they exist, they are governed by the law which is necessary. For instance, Socrates may be a contingent being but in whichever world Socrates exists, he is a human. Thus, Socrates and human might be contingent universals but their relation or the law governing their relation is universal. The doctrine of weak necessity therefore combines the 'contingency of universals' with the necessity of laws (1983: 167). According to Armstrong, the problem plaguing both the doctrines of strong and weak necessity is that the necessary laws remain 'unsubstantiated laws'. To be necessary means to be true in all possible worlds, but how can the instantiation of the law in all possible worlds or universe be demonstrated? In the case of the doctrine of weak necessity especially, for the law to be necessary, the universals must be necessary but since the universals are contingent, that is, there are worlds in which they don't exist, then the law demonstrably remains unsubstantiated (169). Insofar as necessary laws remain unsubstantiated, necessity of laws cannot be established.

Further, necessary laws have nomically and therefore logically impossible antecedents. Armstrong writes the following about necessary laws with logically impossible antecedents:

> "As Mellor points out, if the laws of nature are necessary (it seems to be irrelevant whether the necessity is Strong or Weak), then such laws will have logically impossible antecedents. Such laws, then, correspond to nothing at all in any world. The best which could be claimed for them is that they are vacuously true" (1983: 170).

By pointing out how necessary laws 1) have nomically and logically impossible antecedents, and 2) remain unsubstantiated because it cannot be demonstrated that they are true in all possible worlds or universes, Armstrong challenges the necessity of natural laws. He argues that natural laws are real, for otherwise inference-making from observable particulars to unobservables becomes impossible, and predictability of scientific theories cannot be carried out, but since the necessity of natural laws entail that they are true in all possible worlds and as this claim cannot be substantiated or demonstrated, natural laws are not necessary but contingent. Armstrong observes that while the Regularity theory which argues that observable regularities of causal relations in the natural realm is no guarantee of the existence of natural laws and thereby in equating natural laws to the mere observance of regularities, gives up too soon, the principle of sufficient reason in insisting that whatever exists, exists for a reason, and exists in all possible worlds, carries the account of causality and natural laws too far. Meillassoux, therefore, wrongly attributes to materialism the claim that natural laws are immutable; far from it, insofar as materialism rejects both 'real necessity' and regularity theory, it argues that natural entities are deterministic insofar as they are governed by laws of nature but the laws of nature exist contingently.

## IV. THE HUMEAN ROOTS OF THE PRINCIPLE OF FACTIALITY

Let us begin this section by quoting a long passage from *After Finitude*; this passage includes the terms and the ideas which will be critically examined in this section. Meillassoux writes:

> "What has been our approach to Hume's problem, and to what extent can we claim to have provided a solution to it? We began by reformulating the problem: *instead of assuming that Hume's imaginary hypothesis concerning 'a hundred different events' resulting from the same causal sequence was a chimera which had to be refuted, we*

> *sought to uncover what it was exactly that prevented us from believing in the truth of such a hypothesis*, given that reason, on the contrary, issued an emphatic invitation to accept it. We then noticed that at the root of this presupposition lay an instance of probabilistic reasoning applied to the laws of nature themselves; a piece of reasoning which there was no reason to accept once its condition – the claim that conceivable possibilities constitute a totality – was revealed to be no more than a hypothesis, as opposed to an indubitable truth" (2008: 107, emphasis added).

The key terms in this passage are 'Hume's problem', the 'solution' to the problem, 'Hume's imaginary hypothesis' and 'probabilistic reasoning'. Each of these terms need to delineated in order to articulate a materialist critique of what I term as the Humean roots of Meillassoux's principle of factiality. What is Hume's problem? In *An Enquiry Concerning Human Understanding* (2007), David Hume states that human cognitive faculties are two: perception of the senses or sensations or impressions which are vivacious; and the more attenuated or 'feeble' ideas. Ideas or 'objects of human reason' are of two kinds: relations of ideas, and matter of fact. Relations of ideas are analytic in nature, that is, they consist of propositions which are 'discoverable by mere operation of thought' (2007: 18). Geometric or arithmetic relations are examples of relations of ideas. Matters of fact, on the other hand, refer to those ideas about entities which cannot be known *a priori*; they entail empirical observation. From one observable particular, another unobservable particular or matter of fact is inferred. What connects different matters of fact is therefore a cause-effect relation. For instance, the discovery of a watch on a deserted island makes one infer that humans must have come to the island before. Likewise, the sound of a voice making a speech in the dark convinces the listener that there must be a person there, even if she is not visible in the darkness. Therefore, Hume concludes that it is causality which establishes relations between matters of fact. Hume writes about matters of fact:

> "I shall venture to affirm, as a general proposition, which admits of no exception, that the knowledge of this relation is not, in any instance, attained by reasonings à priori; but arises entirely from experience, when we find, that any particular objects are constantly conjoined with each other" (2007: 19).

But what does experience, which is the basis of knowledge of all matters of fact, consist of? For Hume, knowledge of matters of fact is gained through causal relation and knowledge of causal relation arises from experience, which in turn consists of experience of contiguity or conjunction of two events or entities. Now, what renders the experience of conjunction reliable is habit or custom. At this juncture, Hume cites the instance of bread; he states that by observation, we know the colour, taste and shape of bread. Further, experience tells us that bread nourished humans in the past but what is the guarantee that a loaf of bread which will be consumed in the future, will provide nourishment then as well? Hume observes that, "the bread, which I formerly eat, nourished me; that is, a body of such sensible qualities, was, at that time, endued with such secret powers: But does it follow, that other bread must also nourish me at another time, and that like sensible qualities must always be attended with like secret powers? The consequence seems nowise necessary" (2007: 24). This example instantiates that in the Humean empiricist schema, experience guarantees 1) knowledge of the causal connections observed in the past; and 2) knowledge of the present, which comprises only of observable traits of matters of fact. As a consequence, experience cannot guarantee that the causal connection observed in the past can be extrapolated into the future, just as we cannot know for certain that just because a loaf of bread provided nourishment in the past, it will continue to do so in the future as well. Imagination is unbounded, and it can form ideas which are not constrained within the limits of reality, without running into contradictions. It is only relations of ideas which run the risk of contradiction since they are defined and inferred *a priori*. About matters of fact, imagination or thought can form all kinds of ideas

without the risk of contradiction. Experience tells us that the bread nourishes or sun rises in the east but experience cannot guarantee or ascertain that this causal relation will continue in the future; imagination or human thought can think of numerous variations of the causal relation. Hume's famous example is of one billiard ball hitting another; imagination can think of 'hundred different events' following from the cause (2007: 21). Now we have a sense of Hume's problem mentioned by Meillassoux: it states that as neither experience nor thought can guarantee the occurrence of causal relation in future, how is it possible to infer the future from past experience? Meillassoux extends this Humean account of limitation of experience to the principle of sufficient reason and states that in the sceptical Humean framework, experience cannot guarantee whether real necessity is extant or not.

Meillassoux states that Hume does not acknowledge that the principle of sufficient causality does not exist; rather, he states that experience which is the sole source of knowledge about matters of fact cannot establish whether the principle of sufficient causality and real necessity are extant, or not. Having accepted that for Hume, causality comprises only of the experience of conjunction or contiguity between two events which is given only by habit or custom, Meillassoux attempts – as is stated in the passage – above to find a way to prove that numerous effects of a cause which the imagination can conjure are not mere 'chimera'. In the Humean schema, imagination or human thought is not a source of reliable knowledge of causal relations since it is 'unbounded' and can think of 'hundred different events' as the effect of a single cause. Then why is Meillassoux attempting to base his account of hyper-chaos, or contingency of the natural realm and its laws on the unbounded nature of imagination? Meillassoux rejects metaphysics on the grounds that it posits an absolute or necessary being which is the basis of the principle of sufficient reason. But in making the Humean account of imagination as the basis of his solution for the Humean problem – which states that experience cannot guarantee that causal relation observable in the past will be

manifest in future – is he not taking recourse to an idealist metaphysics which he avowedly eschews?

The Humean problem has already been described; it states that experience can guarantee only the veracity of causal relations observed in the past, not in the future. Further, in Meillassoux's words, 'Hume too never really doubts causal necessity – he merely doubts our capacity to ground the latter through reasoning' (2008: 90). Meillassoux rejects causal necessity, as has already been stated. He observes that causal necessity cannot be demonstrated because it does not exist. If causal necessity and the principle of sufficient reason don't exist in the natural realm, then what guarantees that the observable regularities of causal relation will continue in the future? The solution which Meillassoux proposes to the Humean problem – of past experience of causal relations not guaranteeing their existence in the future and thus, the question concerning the basis of stability of the perceived natural realm – is that experience cannot totalize reality. Using Cantorian set theory, Meillassoux argues that everything possible cannot be totalized by experience. Thus, possibilities may emerge in future because of the absence of necessary causality in the state of hyper-chaos such as the state of becoming the other, the state of not being, or the state of perpetual preservation which is not totalizable by experience. In other words, the possible unleashed by pure contingency in the state of hyper-chaos (brought about by the absolutising of facticity) cannot be totalizable. Here Meillassoux runs into a contradiction: on the one hand, his solution to the Humean problem consists in theorizing as possible what is not totalizable by experience, yet on the other hand, he insists on establishing that the possibilities conjured up by the Humean 'imaginary hypothesis' could be real. Isn't the Humean imaginary hypothesis or unbounded human thought or imagination still marked by finitude of experience? I articulate here two critiques of the Humean roots of Meillassoux's solution to the Humean problem of what explains observable regularities in the natural order if neither the natural

entities nor the laws governing them exist because of real necessity (established by absolutising facticity or the Humean claim that existence of causal necessity cannot be demonstrated by reason).

While Meillassoux acknowledges the finitude inherent in the Humean account of causality as mere experience of conjunction or contiguity of events or entities due to custom or habit, he also wants to transform the Humean imaginary hypothesis which states that unbounded human imagination can think of a 'hundred events' as outcome or effect of a given cause from a chimera to a reality by making it the basis of his account of hyper-chaos where possibilities unrestrained by totalizing tendency of experience can be realized. If the possible which pure contingency can bring forth cannot be totalized by experience, then where is the need to make the 'unbounded' and yet very much finite human imagination the limit of the possibilities? The first critique of Meillassoux's assigning of central importance to the Humean imaginary hypothesis is that in the Humean epistemological schema, there is no place for imagination. Only the empirically observable is real and the source of valid knowledge as the example of bread above highlights. Hume says about the loaf of bread that all that is observable about it are its colour or shape, not the property which provides nourishment and as the unobservable cannot be real, there is no guarantee that a loaf of bread will provide nourishment in future. Richard Boyd (1991b) states that since the observable alone is real in the Humean schema, the Humean account of causation consists of equating 'cognitive contents of causal statements' to the 'cognitive contents of observable statements' (355). To put it succinctly, the causal consists only of the observable. Humean empiricism is the philosophical ancestor of Logical Empiricism in the 20$^{th}$ century which in its zeal to purge science of metaphysics (which is what unobservables, including theoretical posits of science, are) tries to rationally reconstruct the unobservable into the observable. As a result of the rational reconstruction, the logical empiricist definition of causality states that cognitive

contents of natural laws are no more than the observation statements which are deducible from the laws. Boyd describes the process of rational reconstruction of causality in the logical empiricist tradition as follows:

> "The version of Hume's account that prevails in twentieth-century empiricist philosophy is significantly different. Roughly, this account holds that an event $e_x$ causes an event $e_2$ just in case there are natural laws $L$ and statements C describing conditions antecedent to $e_2$ such that from $L$ and C, together with a statement reporting the occurrence of $e_2$, a statement describing the subsequent occurrence of $e_2$ can be deduced" (1991b: 348).

Thus, Boyd argues that while in the Humean understanding of causality, events are causally related or connected if they 'instantiate' an observable pattern, in the logical empiricist account of causality causal relation is established if the effect is logically deducible from the causes, which is possible if there are statements describing the law governing them, the cause and the antecedent conditions of the effect. The Humean account of causality therefore consists of observability while the logical empiricist account of causality which is influenced by Hume consists of logical deducibility of the effect from the cause. Where is the place of imagination in the Humean account of knowledge? Given the empiricist rejection of theoretical posits of science even if they have causal explanatory power and are part of scientific experiment design, where is the need for Meillassoux to attempt the resuscitation of the Humean imaginary hypothesis?

## V. MATERIALIST ACCOUNT OF CONTINGENCY OF THE NATURAL ORDER AND LAWS

While Humean empiricism and its 20th century manifestations such as logical empiricism conflates the real with the observable, and thereby relinquishes the possibility of emergence in future of unobservables as real, materialism has a rich tradition of conceptualising the contingent as real. Charles Wolfe (2016a) writes that there are two characteristics of materialism: firstly, it is a monist philosophical tradition which states that everything existent is material or an outcome of combination of material entities; secondly, it aims to explore and theorise the mind-brain relation. If the first characteristic associated with materialism is that everything extant is material, then the question arises: what is it to be material? Paul Moser and J.D. Trout (1995) state that to be material means to possess the quality of extension, even though they hasten to add that extension or *res extensa* is a Cartesian posit. Materialism is opposed to Cartesian dualism, which states that the mental and the material realm are distinct and disparate. For the materialists, matter and the motion inherent in it are the cause of everything material, by which they mean, everything governed by laws of nature. David Armstrong (1995) writes that even though materialism and naturalism are not synonymous, what they have in common is the rejection of everything transcendent or abstract which are not governed by laws of nature. Since materialism states that 1) everything extant is material and caused by matter and its motion; and 2) nothing abstract or transcendent which is governed by emergent laws instead of laws of nature can exist, there is no place for the metaphysical and non-material Design, or Telos, or Necessity in the natural order. Right at the beginning of the essay, it has been discussed how in the Epicurean materialist schema, worlds appear and disappear contingently. Materialism is of many varieties: strong materialism such as eliminative materialism or reductive materialism will demolish the transcendent by reducing it to the material, weak materialism such as emergent materialism on the other hand will insist that corresponding to every transcendent event or state or entity, there is a material event, state or entity. This can be illustrated by the process of

'materialisation of the soul' in Western thought. Wolfe and van Esveld (2014) write that the Aristotelian theory of hylomorphism which states that soul exists in the body, even though it is the immaterial soul which is the form, gave rise to the initial attempts at materialising the soul: early Enlightenment thinkers such as Pietro Pomponazzi insists that the soul is dependent on the body for its existent and hence, is material. Pierre Bayle speculates the possibility that soul is not immortal. Medical materialists such as Galen argues that the soul is produced by 'humoral mixtures' of the body while anatomists, such as Robert Willis in his studies on the functions of the different parts of the brain, found that the cerebellum across species have a similar structure even though the cerebral cortex of humans is different from other species, given that it is the seat of higher-order functions such as memorising. These discoveries and speculations served to materialise the brain. Given this tendency of materialism to materialise everything extant, there is no place for the immaterial necessary causality or design or the non-demonstrable principle of sufficient reason in materialism; the extant emerge from matter contingently. Just as Epicureanism, discussed at the beginning of the essay, states that the universe is generated and destroyed contingently, Denis Diderot and Erasmus Darwin are also materialist votaries of contingency of the natural realm and its laws. For Darwin, there is no coherence of life in the natural order, whether it is at the level of micro-organisms or higher animals (Wolfe 2016a). Diderot observes in the *Letter on the Blind* that given the contingency of the natural realm and the laws governing it, many 'unpredictable metamorphoses' of species are possible which are beyond the pale of imagination (Wolfe 2016a). Charles Wolfe (2009) states that Diderot was conscious of the 'infinite multitude of natural phenomena' and that it is not imagination which can think of all the infinite possibilities but nature itself which can produce them, given the contingency of the natural laws. Thus, Meillassoux's account of pure and absolute contingency which can

render all non-totalizable possibilities real can be bolstered if he draws from the materialist account of contingency of the natural realm and the natural laws.

## VI. CONCLUSION

The aim of this chapter has to been to argue that while Meillassoux's speculative account of contingency of the natural order and natural laws based on the absolutising (and thus, ontologising) of facticity – the idea that whether natural laws are contingent or real cannot be known by reason – opens the path for theorising the necessity of contingency in the natural realm, he misrepresents the materialist conception of contingency as mere probabilistic chance based on the immutability of laws of nature. The chapter highlights how Armstrong demonstrates the contingency of natural laws by pointing out that necessity, both of the strong and weak varieties, entails the rejection of claims like the idea that to be necessary is to be true in all possible worlds, which can never be substantiated. Again, Meillassoux's solution to the problem of explaining how there can be observable regularities if there are no necessary laws at work involves mathematically postulating possibilities which are not totalizable by experience. The chapter asks why Meillassoux bases this solution of non-totalizable possibilities in the state of hyper-chaos from the Humean imaginary hypothesis given the fact that there is no place for imagination in the Humean epistemology which equates the real with the observable. The chapter argues that the non-totalizable possibilities realisable by pure contingency have been theorised in the materialist tradition adequately, given that it materialises everything abstract or transcendent, and therefore has no place for Design, or Telos or Necessity. In materialist theory, laws of nature are determinate but they exist contingently and hence nature can produce limitless variations and metamorphoses not bound by the imagination.

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