

# Chapter 6: Space and Time

## 6.1 Introduction

In the earlier chapters, I have discussed how the pure form of space and time is epistemologically connected with the possibility of synthetic *a priori* judgments and synthetic *a posteriori* judgments in physics. I have also shown how the categories like substance-accident, cause-effect, and community make the knowledge of objects of experience possible. How the principles like ‘Principle of Permanence’ and ‘Principle of Causality’ justify us in our employment of the categories to the objects of experience is important. However, physics being dependent on empirical knowledge of the objects employs the categories. In this chapter, I argue that in Kant’s notion, space and time are necessary conditions for our knowledge. This knowledge is the knowledge of the objects of nature (or the world) through us. This is made possible only because of space and time. They are part of our cognitive nature, and so long as human nature remains unchanged, we cannot escape the bounds of senses. We must perceive objects as existing in space and time. I begin this chapter with exegetical explorations and critical reflections on Kant’s metaphysical and transcendental expositions of space and time. I examine how space is transcendently ideal and empirically real. I defend the position that geometry presupposes *a priori* property of space and also bring out Michael Friedman’s views on Kant’s space and time. I also argue that Kant’s space is not a theory-bound concept.

Kant's take on space and time differs from the theories of space and time that we get in modern physics (especially theoretical physics). Regarding space, in the Transcendental Aesthetic of the CPR, Kant was not directly concerned with questions like "what is space?" but with a philosophical question—"How do we conceive of space?" This question is neither theoretical nor ontological in the Kantian sense.

C. D. Broad's (1979, p.9) contention with Kant's *a priori* is that it has to be understood in two terms: negative view and positive view<sup>88</sup>. The former is in the sense of non-empirical. But the latter has been taken to be of two types: objectivist view and subjectivist view. According to the first, the causal relation and the relation of an event to a substance in which it occurs are the objective features of the world, quite independent of the processes in human or other minds. Hence, we just become aware of these independent features on the occasion of certain appropriate kinds of sense experience by a particular kind of rational insight. According to the second, the idea of cause and substance are ideas peculiar to human minds, which we project into the world on the occasion of certain appropriate kinds of sense-experience. This implies that Kant held a form of subjective view on the nature of space and time. To understand this, we have to understand his metaphysical and transcendental expositions of space and

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<sup>88</sup>Broad, C. D., *Kant: An Introduction*, C. Lewy (Ed.), London, Cambridge University Press, 1979, pp.9-11.

time<sup>89</sup>. I start with Kant's metaphysical exposition of space where he has given the four metaphysical arguments to prove *a priori* of space.

## 6.2 Space is not an Empirical Concept

The first argument tells us that space is not an empirical concept. The point of this argument is that all the physical objects of the world depend on our minds. The mind (the mind means our mind) has two types of properties, i.e., one is outer-sense, and another is inner-sense. Here, we will take the outer-sense of mind because space is a matter of outer-sense. The inner-sense of mind means the concept of an object which is inside of us. That is why conception belongs in the mind. But space outside of us is a physical object. We find that space is necessary *a priori* from our outer-sense<sup>90</sup>. We can think that there is space but no physical object in it, but we cannot think that there is a physical object but no space. Every physical object occupies some space. Space, therefore, is not a product of experience. Space makes plurality or multiplicity of bodies possible, and only because of space we can have experience. Space serves as a condition for our empirical knowledge and a condition cannot be empirical but *a priori*.

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<sup>89</sup>Kant gives his Metaphysical and Transcendental Expositions of Space and Time in the Transcendental Aesthetic of *Critique of Pure Reason*, N. K. Smith (Tr.), London, Macmillan, 1963.

<sup>90</sup>Albert Einstein wonders whether Kant's *a priori* concept of space is possible or not. See his *Ideas and Opinions*, S. Bargmann (Tr.), New Delhi, Rupa and Company, 2002, p.278.

Kant has not accommodated Leibniz's relational and empirical concepts in his views of space and time though he thought quite in that way in his *Inaugural Dissertation*. Kant's *a priori* nature of space precludes it from being logically derived from experience. Space is non-empirical, purely intuitive, and a condition for all our experiences but not a derivation from them. Kant's concept of space is *a priori* particular (but not a concept in itself). This does not make it relational or substantive as Leibniz has thought. Kant answers Leibniz, in his first argument in the 'Transcendental Exposition of the Concept Space' (CPR, B41, p.70) that geometry as a subject of science determines the synthetic *a priori* properties of space because it always presupposes *a priori* space. The *a priori* representation of geometrical space in its origin must be intuition. No proposition of geometry can be obtained from the mere concept of space. In other words, the properties of space are available *a priori*. They do not inhere in space and time but are represented *a priori*, as inhering in them. When we represent space as having different properties like dimensionality, homogeneity, and continuity, we are representing it *a priori*. These properties are not empirical qualities. 'Geometry defines space *a priori*' obliges us to distinguish between 'space' and 'defined space'. The former is indeterminate and devoid of characteristics, but the latter is determinate and has characteristics like dimensionality, continuity, homogeneity, infinity, and curvature. Thus, physical space is nothing but determinate space occupied by matter or material bodies.

### 6.3 Space is a Necessary Condition

The second argument that space is “a necessary *a priori* representation”<sup>91</sup> means that it necessarily underlies outer appearances (outer intuitions). The first argument proves that space is the presupposition of experience, and the second argument proves that space is the condition of all appearance. From this condition, we can conclude that nothing can become an appearance without being spatial. Therefore, ‘Spatiality’ is the condition of all objects of outer intuitions. Were the representation of space a concept, we would have only comparative universality acquired through induction. But we have philosophical certainty and possibility of *a priori* construction of all geometrical propositions due to “necessary *a priori* representation” of space.

### 6.4 Space is Pure Intuition

The third argument proves that there is only one space. The word ‘*space*’ is a proper name; it resembles ‘*Albert Einstein*’ and not ‘*man*’. In other words, when we think of space, we think of something unique, which is the system of spatial reference in which all actual and conceivable physical things and events are located.

This above paragraph expresses the uniqueness of space and explains how Kant’s understanding of space differs from other discursive conceptions of space

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<sup>91</sup>Kant, I., *Critique of Pure Reason*, N. K. Smith (Tr.), London, Macmillan & Co Ltd, 1963, p.68.

(including the frame or modal based spaces). The space dealt with by Einstein in his two theories of relativity (1906 and 1916) and the space dealt in quantum physics is not similar to that of Kant. His views on space and time do not limit the possibility of other kinds of space rather they open the possibility of discursive spaces because all kinds of physical and theoretical spaces presuppose that one and only one space, whose representation is an infinite given magnitude. Hence, Kant's space does not go against any other understanding of space. His space is a prelude to the logical conception of space as the very beginner of experience, a form of sensibility and condition for all appearances. This is also one of the reasons why Kant excludes the Newtonian idea of 'Absolute Space'.

## **6.5 Space as an *A priori* Intuition**

This argument is about the representations of space, whereas the third argument is about space itself. The third argument states that there is only one space and hence, it is pure intuition. The fourth argument states that space is represented as an infinite given magnitude<sup>92</sup> whose parts co-exist. This representation of space as an infinite magnitude cannot be a conceptual representation because a concept has instances but no parts. In other words, the relation between space and its parts is different from the relationship between a concept and its instances. So our original representation of space is intuitive. Kumudranjan Goswami has discussed the difficulty of considering Kant's space as a concept in his *Kant's*

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<sup>92</sup>We cannot perceive all the objects of the universe and whenever we perceive any object, we perceive a part of the universe.

*Metaphysical Exposition of the Concept of Space* (Thesis) and has taken a position for Kant's space to be both conceptual and intuitive<sup>93</sup>. According to him, there are some apparent contradictions among the critics of Kant regarding whether space is a concept or an intuition. But there is a distinct difference between 'concept' and 'intuition' and 'intuition' and 'form of intuition'. Kant has maintained that the intuitive space is arbitrarily limited and divided into parts, and corresponding to these parts, we have concepts. 'A thing is infinitely divisible' does not mean that it is already infinitely divided.

Kant begins the fourth argument with the proposition 'space is represented as an infinite given magnitude'. If Kant has used the term 'given' to imply immediate representation in intuition, then it merely means the representation through which the object relates to actual possible experience. It should be understood that 'infinite magnitude' is not given to our perceptions but the objects of the world. We fail to perceive the entire set of objects of the world. The so-called 'world' is an 'ideal totality'.

Kant has given two arguments for the transcendental exposition of space, namely—(1) the existence of geometry can be made intelligible only if we regard the original representation of space as intuitive and (2) the original intuitive representation of space must be *a priori*.

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<sup>93</sup>Goswami, K., *Kant's Metaphysical Exposition of the Concept of Space*, Kolkata, Maha Bodhi Book Agency, 2017, p.230.

## 6.6 The Idea of Space in Geometry

Kant's idea of space in geometry is related to and clarified from his transcendental exposition of space. For him, space is a form of our intuition. That is why Kant first gives the metaphysical exposition and only then the transcendental exposition of space. Space is not an empirical concept, but an *a priori* condition for our empirical knowledge and geometry presupposes (determines) *a priori* property of space. The geometrical spaces that we have in our geometry apply to the objects of experience and reality.

The word 'Exposition' is used by Kant to mean a clear explanation (exhibition); it is metaphysical when it shows space as given *a priori*, and it is transcendental when the synthetic *a priori* proposition of geometry is acquired from space as a principle of sensibility.

Geometrical propositions are true of space and determine the properties of space *a priori*; because without space, there are no geometrical spaces, and it is impossible to say that there is a triangle, but there is no space. Hence, the idea of space is a presupposition in geometry. Despite all this, we must be clear of one thing: there are differences between Kant's concept of space and the concept of space in physics and mathematics. Stephen Körner has quite rightly justified Kant's concept of space:

We know that Kant is prepared to accept the empiricist account of the manner in which concepts refer to particulars only in the case of concepts which are abstracted from sense-perception. We also know his account of the reference of mathematical concepts

to space and time. As regards the manner in which, Kant's own principles, the other *a priori* concepts, e.g. causality, are applied. We know only that they must, in the same way, refer to perception. The application of these concepts depends on Kant's words: 'on the condition that objects are given to us in perception, to which they can be applied'. (p.91)

Kant distinguishes mental space and physical space. By mental space, he understands space as geometrically determined, and by physical space, he understands "extension of matter". Space in geometry as an *a priori* object can be presented in consciousness. This presented *a priori* object must be spatial. In this sense, space is the *a priori* condition of appearance. Thus, space as a pure form of intuition is in our mind, and we cannot get rid of it. It is the primary source, condition, and principle of sensibility.

## **6.7 Transcendental Ideality and Empirical Reality of Space**

In the context of Kant's concept of space as *a priori*, it becomes necessary to understand what Kant means when he says that space is transcendently ideal but empirically real. In this case, Kant tries to make clear that there is no reality of empty space. Devoid of all contents, they would be utter non-entities. They have no being in themselves and do not determine any real characters of things. They are merely our ways of representing sensible objects. It thus appears that space is ideal (being only our way of representing things). If space itself is ideal, whatever exists in space or possesses any spatial character cannot help but be

ideal also, and there is nothing perceptible that betrays no spatial character. The world thus turns out to be our representations only. We are commonly supposed to exist in space along with all other things in the Universe.

Kant tells us that space exists in us, and the whole visible world also exists in us. This is a complete reversal of the common-sense view<sup>94</sup>. The common-sense view says that chairs and tables existing outside have no shelter in ourselves. By chairs and tables, common-sense understands real, independent, self-subsistent objects, not dependent in any sense on anybody's consciousness. Kant, on the other hand, understands by chairs and tables mere appearances, i.e., representations of our mind, necessarily dependent on some consciousness. An appearance or representation can very well exist in us but certainly not as things-in-themselves. Sensibility is the faculty of the mind to receive impressions, and understanding is the faculty by which we think or judge. We are passive in sensibility but active in thinking or understanding. We owe our intuition, i.e., direct apprehensions of given objects, to sensibility and concepts to understanding. Both intuition and concept must combine in order to constitute a concrete case of knowledge. By mere thoughts, we get only empty ideas, and by mere intuitions, we get only blind impressions.

Kant describes space as a form of sensibility. Space and time are the forms in which we intuit or perceive objects. We human beings are so constituted that we can perceive objects only spatially and temporally (in space and time). We must be clear of two things here; first, space is part of our subjective conditions of

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<sup>94</sup>Common-sense view of space is that space and whole visible world exists outside us.

knowing, and secondly, it is the condition for us of objective knowledge. If anything is to be the object of knowledge to us, it must be given in space. Space, though being considered as ideal or subjective, is the objective condition of our empirical knowledge. This is what Kant expressed by saying that '*space*' is transcendently ideal but empirically real.

Kant has explained the difference between the subjectivity of sensations and subjectivity of space. Sensations are subjective in the sense that they are found in a particular subject, whereas the statement that space is subjective means that it belongs to the subject as opposed to the object. In the case of sensations, we contrast and compare different subjects or persons and in the case of space, we contrast all subjects with the object. Sensations are caused in us by things, but it is absurd to maintain that space is caused by our minds. Sensations have an objective reference. Having a sound sensation is an event, but space is not an event. For all these reasons, we must not confuse the two kinds of knowledge.

Kant has dealt with space and time separately, although they are inseparable from each other. He has given altogether four arguments for the metaphysical exposition of time. If time is an empirical concept, then the perception of succession and co-existence would not be possible. The presupposition of time in succession and co-existence determine the *a priority* of time.

## **6.8 Time is not an Empirical Concept**

The concept of time is not an empirical one because it is not derived from experience. The representations of time are presupposed as underlying the *a priori*. It makes our perception of succession and co-existence possible. Hence, *a priori* determination of succession and co-existence make this kind of representation possible. Therefore, our perceptions of things and events are impossible without the presupposition of time.

Scientists (like Einstein and Stephen Hawking) talk about the marriage of space and time, the curvature of space, time travel, gravity wave, and parallel universes concerning the explanations of theories of reality. In all these, time cannot be independent of space and vice-versa. Kant is also not against them because we cannot even imagine that we are in space but not in time. The perception of space is the perception of time, though it is not easy to understand the real perception of time in both common sense and scientific view.

## **6.9 Time is a Universal Condition**

Time is a necessary representation. We cannot remove time itself in respect of appearance in general, but quite well think of it as void of appearances. We cannot say that we are not in time, or things are not in time because time is given *a priori*. In Kant's own words, "In it alone is the actuality of appearances

possible at all”<sup>95</sup>. Thus, time is a universal condition of the possibility of all appearances.

Here, time as a universal condition is different from the universality derived from the empirical concept of time. The universality of time considered in a scientific theory is derived from induction (probability and approximation) which makes space for a theoretical possibility of time-travel in different directions. But Kant’s problem is not the problem of whether we can travel back in time and know our past. Kant’s *a priori* of 'space and time' does not obstruct either the possibility or the impossibility of time-travel. The problem of time-travel is theory-bound. For example, in the 'Theory of Relativity', everything is taken on the consideration of the speed of light.

## **6. 10 Time is a Pure Intuition**

There is only one time. Both space and time are pure intuitions. We derive apodeictic<sup>96</sup> principles from time. Different times are not simultaneous but successive. The principles derived from experience would not give strict universality and apodeictic certainty. Hence, the time has only one dimension. J. N. Mohanty (2014, p.39) has rightly said, “We intuit things in Euclidean space and in a time which is one-dimensional—it flows in one direction. But it is not logically necessary that our perceptions should be in Euclidean space and in this one-dimensional time. Other forms of time are logically conceivable.”

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<sup>95</sup>ibid, A31, p.75.

<sup>96</sup>For Kant, ‘apodeictic’ is connected with the consciousness of necessity.

In the Kantian sense, time is not perceived in the way empirical objects are perceived. Accordingly, the formulations of principles of nature, which are synthetic *a priori*, are made possible due to the strict universality of space and time. Time as a pure intuition is not derived from experience. Whatever is derived from experience cannot have strict universality.

### **6.11 The Original Representation of Time is *A priori***

The concept of time is not a general concept. We talk about different times and their intuitions. Without the presupposition of the original representation of time, other different times are not possible. All different times, presuppose time, and the representation of the latter comes first. This does not mean that there are no other kinds of time; they are there and exist within a single or particular time which is purely intuitive. Hence, it should be borne in mind that in order to arrive at the idea of an objective world, the additional constructive concept is still necessary—the event is localized not merely in time but also in space. The views of Michael Friedman presented in the next section (§ 6.12) will help us to understand how Kant comes to describe space and time as two fundamental and complementary components that are necessary for the acquisition of knowledge of experience.

### **6.12 Michael Friedman on Kant's Space and Time**

According to Michael Friedman, Kant in his 1770s started applying the critical empiricism of Isaac Newton and John Locke to study the physical world. Critical

empiricism followed the hypothetic-deductive method for investigating the physical world, which Kant described as a world of quantity, a basic notion established during the scientific revolution.

Kant was an admirer of the formal (logical) structure of Newton's *Principia Mathematica* and the axiomatic method of Euclidean geometry. As a consequence, he admitted that all propositions of geometry must apply to the objects of actual or highly probable experience. Thus, geometrical propositions could neither apply to all possible worlds beyond the given world of experience nor could they be reduced to the truth of logic, as Leibniz had suggested in the *Theodicy* (prop. 351).

With regard to Leibniz-Clarke Correspondence (1768), Friedman tells us that Samuel Clarke<sup>97</sup> had defended Newton's position that space and time were objective and absolute. This means that they were different realities that existed prior to extended objects and events. However, Leibniz had disagreed with Clarke's view and asserted that space and time were subjective and relative. They were the spatial order of actual and possible relation between extended objects or events. They were thus ontologically derivative. For Leibniz, they were merely well-founded appearances. This view had little chance of success where Newton's dynamics and Euclidean geometry were accepted. Kant differs from Clarke's and Leibniz's views of space: to Kant and Poincaré space is devoid of any character and non-empty. Entities or things are always perceived or at least perceivable in principle. However, space and time are not perceived.

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<sup>97</sup>Samuel Clarke (1675–1729) was an influential British metaphysician and theologian.

Even geometry as a branch of pure mathematics does not deal with the spatial order of things.

Kant at the beginning of his career (during the pre-critical period), sometimes supported Leibniz's relative space but generally came to accept Newton's absolute space. Later, the writings of Crusius and Lambert on space reinforced this theory in Kant's mind. He later described 'absolute space' as having a reality of its own and as being independent of all matter.

Kant in his 'Inaugural Dissertation' (1770) defended space and time as 'pure intuition' or absolutely primary, formal principles of the sensible world. Later, in the CPR, he described space and time as two fundamental and complementary components that are necessary for acquiring knowledge of experience. This pure intuition is singular and its concept more general. Kant in his 'Inaugural Dissertation' comes to the conclusion that Leibniz has neglected simultaneity and his relational definition of time is tautological. Time for Kant was, therefore, neither Newton's substance (self-subsistent) nor Leibniz's function; it was rather a pure intuition that was self-subsistent and antecedent to things-in-themselves.

### **6.13 Kant's Space is not a Theory-Bounded Concept**

Newton has taken space to be absolute and substantial, in which everything including our bodies exists, because he ascribes physical reality to space, and especially to empty space. Descartes also asserts that space is identical with the extension, but we know that extension is connected with bodies, and an extended

space is not 'empty-space'. We can accept that the concept of extension owes its origin to our experience of solid bodies. But from this, it cannot be concluded that the concept of extension may not be justified in the case which has not itself given rise to the formation of this concept. Such an enlargement of concepts can be justified indirectly by its value for the comprehension of empirical results. The assertion that extension is confined to bodies is, therefore, certainly unfounded. Kant does not ascribe physical reality to space. If space itself can be established it must be discovered empirically existing in space and time. We can take it in this way that space is the condition of existence of objects. Further, for Newton, space is a self-subsistent reality, a container inside which all objects are accommodated and it is God's boundless uniform sensorium. Newton's extension of space as 'God's Sensorium' does not help us to have a clear understanding of his description of space. Carlo Rovelli (2017) tells us that no one has understood what Newton meant by 'God's Sensorium', perhaps not even Newton himself<sup>98</sup>. Newton's views of space, being the self-subsistent reality, and God's boundless sensorium, are also rejected by Leibniz, Kant and Einstein. According to Leibniz, space is merely a relation between objects, and it is not self-subsistent, and God does not need a sense organ to perceive objects. Einstein<sup>99</sup> found it utterly unconvincing except as a rhetorical device used by

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<sup>98</sup>Rovelli, C., *Reality is not What it Seems*, S. Carnell and E. Segre (Trs.), New, Delhi, Penguin Books, 2017, p. 64.

<sup>99</sup>The larger celestial body bends space, creating contraction and expansion of it and consequently creates a gravitational wave. This wave is very feeble and undetectable with an ordinary telescope. According to Einstein, this bending of space with contraction and expansion provides it with a property of elasticity. Again, the gravitational wave is responsible for the curvature of

Newton in his explanation of the nature of space. Kant has excluded Newton's inclusion of 'God' in his explanation of space. Karl Popper writes the following in connection with Kant's treatment of cosmological problems<sup>100</sup>:

His first important book, *The Theory of the Heavens*, has the interesting sub-title: *An Essay on the Constitution and the Mechanical Origin of the Universe, Treated according to Newtonian Principles*. It is one of the first formulations ever made to cosmology and cosmogony. It contains the first formulation not only of what is now called the 'Kant-Laplace hypothesis' of the origin of the solar system but also, anticipating Jeans, an application of this idea to the 'Milky Ways' (which Thomas Wright had interpreted as a stellar system five years earlier). But all this is excelled by Kant's identification of the nebulae as other 'Milky Ways'—distant stellar systems similar to our own. (pp.177-8)

The positivist philosophers think that science is progressive in the sense that scientific views are always changing for the better, whereas other areas exhibit just change. In other words, the progress of science consists of the subsequent accumulation of observation and the cumulative growth of theories. However, Kant was not doing hardcore physics. His main project was to find out how pure physics and mathematics as a systematic subject of science are possible. The Transcendental Aesthetic of his CPR as a part of his thesis was to show how space and time are pure forms of conditions for our knowledge of the object of experience and how geometrical and theoretical space are dependent on that

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space. However, the curvature of space as a scientifically discursive theory does not exclude the Kantian space.

<sup>100</sup>Popper, K. R., *Conjectures and Refutations: The Growth of Scientific Knowledge*, London, Routledge & Kegan Paul Ltd., 1954, pp. 177-8.

space which is *a priori*, pure intuition, given the infinite magnitude and whose representation is original representation. Kant has not confined himself to his concept of space but goes beyond Newton and rejects Newton's unnecessary metaphysical contribution of 'God's boundless sensorium' to space and Leibniz's views of the relation between objects<sup>101</sup>. According to him, space is not self-subsistent reality (not objective) but the subjective requirements of our human sensory-cognitive faculties, to which all things must conform. Space and time serve as independent instruments (tools) that arrange and synthesize the image of the objects by our sense organs. All the raw data supplied by our sense organs would be useless if our mind had no ability to procure pure intuitions of space and time to make sense of it all. This subjective condition as a spatial-temporal process requires a synthesizer to synthesize the sensory input within our cognition to be turned into knowledge. Therefore, space is one of the subjective conditions for all our experiences but not a derivation from it. This view is also a part of his 'Copernican Revolution'. But in contrast to this point, Einstein writes:

One remark about the concepts in general, before we turn to the problem of space: concepts have reference to sensible experience but they are never, in a logical sense, deducible from them. For this reason, I have never been able to understand the quest of the *a priori* in the Kantian sense. In any ontological question, our concern can only be to seek out those characteristics in the complex of sense experiences to which the concept refers. (p.278)

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<sup>101</sup>Calkins, M. W., 'Kant's Conception of the Leibniz Space and Time Doctrine', *The Philosophical Review*, Vol.6, No.4, 1897, p.369.

Kant's concept of space as *a priori* is neither unintelligible at least in the case of his transcendental philosophy, nor is Einstein's view fully right. The contrast between their concepts of space is due to their distinct commitment to the separate subjects of inquiry. The *a priori* nature of space does not imply it to be logically derived from experience because space is non-empirical and not derivable from it. The concept that space is universal has led many philosophers to think that it is empirically derived. For Kant, space is *a priori* particular and the use of the concept of space in theoretical physics and other theories is different from his application—in this connection, his approach is one of transcendental philosophy because it is concerned not much with the manner of our cognition of objects to prove them to be possible *a priori* but with certain presentations, as only applied *a priori*. Hence, space is *a priori* particular, and we can never represent it to ourselves as empty of objects, and this does not make it relational and substantive. It is the condition of all appearance or condition for us of objective knowledge. It is represented as an infinitely given magnitude whose parts co-exist and this representation of space as infinitely given magnitude cannot be conceptual because a concept has instances and no parts. The relation between space and its parts is different from the relation that subsists between a concept and its instances. We have conceptual representation in addition to our intuitive representation of space. We arbitrarily limit and divide the intuitive space, and corresponding to these parts of space we have concepts. Thus, the concepts that we have in pure mathematics and theoretical physics are the concepts of discursive spaces or theory-bounded spaces. Therefore, the original representation of space is not conceptual but purely intuitive.

Werner Heisenberg argues in *Physics and Philosophy*<sup>102</sup> that he is not in a position to follow Kant if the term ‘*a priori*’ is used in the absolute sense. Heisenberg thought that the term ‘*a priori*’ can be used in some other way because an absolute *a priori* concept in a system turns to be rigid and obsolete. A system of concepts of science can include all kinds of concepts to make it able to describe every event and phenomenon of the world. He even denies discussing Kant’s space and time as *a priori* forms of intuitions. This is quite enough to indicate that he was not against Kant’s philosophy of science (or quite sure about his ideas of the Kantian space and time). Kant has considered his transcendental philosophy as a kind of universal science which is not applicable in theories like relativity and quantum. That is just because of his acceptance of Non-Euclidian geometry in the theories of relativity and quantum. However, it would be wrong on the part of Heisenberg to blame Kant for bringing out the difficulty in the use of phrases like ‘time has been created’. I have already mentioned that his Kant’s space and time as particular forms of intuition do not contradict any other theories of space and time. Spatial order of things is not accepted by Kant. To Kant and Poincaré, space as space is devoid of any character and has no entity. Entities are at least perceived in principle, but space and time are not perceived. The spatial order of things is not dealt with by geometry as a branch of pure mathematics.

We use proper names like ‘world’ and ‘universe’ to describe our world and universe. Space as a spatial order of things is equivalent to the world and

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<sup>102</sup>Heisenberg, W., *Physics and Philosophy: The Revolution in Modern Science*, London, Penguin Classics, 2000.

universe. This ideal totality is regarded by Kant as non-regulative of thought, and it is not constitutive. We know only 5% (approximately) of the universe, and our process of knowing is progressive, and we have no real knowledge of the world and universe. The world or the universe is not like an object but an ideal aggregate of everything that exists. Hence, our perception, experience, and knowledge are confined to this or that part of this ideal totality and theory is never logically proved by experiment.

## 6.14 Conclusion

In this chapter, I have critically explored all the arguments given by Kant, i.e. from § 6.2 to § 6.5 and from § 6.8 to § 6.11, for the metaphysical and transcendental expositions of space and time. Infinite space and infinite time are pure intuitions since there are only one space and one such time. Contrasted with them we have finite space and finite number of empirical objects. In § 6.6, I have defended how the idea of space is a presupposition in geometry, which also means the propositions of geometry are true of space and determine the properties of space *a priori*. Geometrical space is not real space but mental space. In § 6.7, I have explained how space is transcendently ideal and empirically real in the Kantian sense. Space and time are not self-subsistent realities but the subjective requirements or conditions of our human sensory-cognitive faculties (to which all the objects or things of experience must conform). The objects of experience are perceived by us when their manifold parts are apprehended by us one after another (i.e. successively). Spatially existing objects are received in our consciousness temporally. In § 6.12, I have

discussed Michael Friedman's thoughts on how Kant's space and time differ from those of Leibniz and Newton in many ways and are more progressive in nature. In § 6.13, I have explained how Kant's view of space is neither a theory-bound concept nor against any other kind of theoretical (discursive) space of physics. Space as a spatial order of things is equivalent to the world or universe. This world or universe, as the ideal totality, is not regulative of thought. The method of exploring is constitutive, as well as a heuristic.