Chapter 7
The Phenomenology of Space and Time: Husserl, Sartre, Derrida

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The notions of space and time have been a subject of philosophical discussion since antiquity. In modern philosophy, Newton's concepts of absolute space and absolute time was subject to criticism by empiricists like Berkeley and Hume, who prepared the ground for Einstein and the ideas behind his theories of relativity. Simultaneously with Einstein's revolutionary works in physics, the development of new philosophical methods by Edmund Husserl and others under the heading of *phenomenology* opened for renewed investigations of a broad range of scientific ideas, among them the concepts of space and time. The phenomenology of space and time is the subject of this article. I will emphasize that the concept of space to be discussed is the concept of empty space. Empty space is what people traditionally have thought that spatial bodies are "in", and which shows itself where there are no such bodies "filling" the space. One of the themes of this article is how to define a corresponding concept of "empty" time to obtain a symmetric description of space and time.

One of the lesser known but original phenomenological studies of space is found in Jean-Paul Sartre's monumental work, *Being and Nothingness* (BN) from 1943 [6]. Sartre does not discuss the notion of space extensively, but he brings in some novel and clarifying ideas, in particular by associating space with the phenomenological concept of absence or nothingness (*néant*). In the first part of this article I will give a presentation of Sartre's contribution to the phenomenology of space.

I will then consider the notion of time. Sartre's treatments of space and time are quite different. However, to see space and time together is important. When Hermann Minkowski suggested the unified concept of space-time in his famous 1908 paper [4], he made the prediction that "space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union between the two will preserve an independent reality" (p. 75). Now, the concept of space-time is formulated in a mathematical language, and is often considered as an abstract

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formalism far removed from our immediate experience of the world. But taken at face value, Minkowski's statement implies something more. If only space and time in combination is to be preserved as independent realities, the ontology and space and time must be closely related. I will outline how Sartre's analysis of space can be transferred to that of time, thus showing the symmetry of space and time and laying a phenomenological foundation for the notion of space-time.

Then I will compare Sartre's notion of space to Einstein's. In *The Meaning of Relativity* (MR) [2] Einstein redefines the concepts of space and time in a way appropriate for the theories of relativity. He starts with our experience of space in a way that can be seen as a simple phenomenological analysis, and I will show how a close reading of Einstein's text reveals a fundamental similarity to Sartre's ideas.

When we consider phenomenological description and abstract geometry, one may question how these combine. For instance, does a geometrical description, with its idealized concepts, imply an abstraction leading to a loss of meaning compared to the concrete experience of real bodies in space? Or does the mathematical language reveal some additional meaning which cannot be seen in the immediate experience, such that we are lead to understand the world better? This worried Husserl and it was the subject of many of his late works, among them the article *The Origin of Geometry*, written in 1936 and published posthumously in 1939. When Jacques Derrida translated this article into French in 1962, he wrote a introduction which was almost six times longer than the original article, in which he through a critical reading of Husserl's text developed his own ideas on mathematics, language, ideality and meaning. In the last part of this article I will give an outline of this one-way discussion between Husserl and Derrida. I will show how Sartre's study provides an illuminating case for this discussion.

Sartre's treatment of space is found in various places in BN, and none of the passages are very long. The notions presented are integrated as a part of a comprehensive ontological system. A terse statement of the essential idea can be found on p. 491: "… geometrical space … is a pure nothingness". To understand this, we need a brief explanation of Sartre's notion of nothingness. This is one of the most important concepts on BN, as seen from its title, and Sartre's use of the concept represents one of his novel contributions to phenomenology. BN is, according to its subtitle, a phenomenological ontology, in which the concept of nothingness plays an important role.

The core of phenomenology is the idea of intentionality. To be a conscious mind is always to be conscious of something, to see is to see something, to think is to think about something, to imagine is to imagine something, to know is to know something, to understand is to understand something, etc. This "directedness" is called Intentionality and is, according to phenomenology, the defining property of consciousness. To see, think, imagine, etc., are called intentional acts. In an intentional act, we are aware of something, and this something, the object of our awareness, is called the intentional object. Among intentional acts, the act of intuition will be particularly important. Intuition in phenomenology is a translation of German *Anschauung*, meaning sense perception. To be an intentional object is to appear to consciousness in some way. It can be something that we see, something that we think about, something that we imagine, etc. This is the way we relate to the world and the world available for our knowledge and understanding is a world of intentional objects. It is important to notice that intentional acts also include indirect observations, abstractions, and symbolic representations, but somehow even our most abstract theories of the world must be rooted in our experience of the world as appearance.

Now, Sartre points out that we do not only see what is there, but also what is not there, for instance because we expected to see something which for some reason does not appear. The absence which we in this way “see” is for Sartre an example of a general concept of nothingness. Very often the word nothingness in Sartre can be replaced by the word absence. It can be a concrete thing (I believed I had put my keys on the table, but when I look for it I only see no-keys, their absence) or a person (I had an appointment with Pierre in the café, but when I look for him, I see only no-Pierre, Pierre’s absence), or a state of affairs (I believed that the sum of the angels of a triangle was 120°, but found out that it is not the case, that “sum-equals-120” is not an existing fact, it is absent from all reality). Nothingness is also a condition for logical negation. When I say that it is not the case that the Pierre is in the café, it is a statement of Pierre’s absence, and hence of nothingness. Nothingness is also a condition for the constitution of objects, which appear in analogy with a paper cut, where what is not the figure is cut away, and the figure itself stands out against this nothingness. This brief sketch should indicate the wide range of situations where nothingness appears as an element of an intentional act. Sartre points out that nothingness is both subjective and objective. It is objectively true that Pierre is not in the café, but his absence “is there” because I, the subject, am looking for him. Thus, nothingness is a phenomenological concept, it concerns how the world appears, it is more than just logical negation, for which it is a precondition. And such is Sartre’s phenomenological concept of space, that it is pure nothingness, pure absence, in this case absence of things, of bodies.

The concept of space as nothingness is mainly elaborated in BN on p. 20. This passage is a part of a section describing the kinds of being that includes non-being as a part of their way of being. Possible examples would be an empty box, where the empty space within is an essential part of making it a box, or, again, a paper cut where what is the figure is there only on the background of what is not there because it is cut away. In this context, space is introduced. Sartre considers space as derived from the notion of a spatial distance, exemplified by two points at a distance. He describes how this situation can be an intentional object in two ways, or, more precisely, how it can be two different intentional objects or appearances. There is one in which the distance itself is made into an intentional object, in the form of being thought of as a line segment connecting the two points and having a certain length. The other intentional object consists of the two points, where the distance is just an absence because the two points are not connected. The last alternative is the intention which gives us the notion of empty space as nothingness. You cannot see, think of, or imagine both these intentional objects at the same time, to see one dissolves the other, according to Sartre. The concept of a distance as absence is an fragment of a full concept of space as a combination of all distances of all spatial objects in a given situation. This means that, properly speaking, one cannot say that something is "in" space like a fish is in the water or the wine is in the bottle. Space is not a being of its own which something can be "in", but refers to a relation between the spatial objects.

Now we turn to the question of time. When Hermann Minkowski suggested the unified concept of space-time, one was faced with the question: How can the separate concepts of time and space, each being deeply rooted in our ordinary experience of the world, possibly "fade away", to be replaced by space-time, which is usually regarded as a pure mathematical abstraction? To solve this problem, we would need a phenomenology of time displaying the symmetry between time and space. In BN, time is treated quite differently from space. In his treatment of time, Sartre focuses on the experienced temporality of the subject. The question is if it is possible to see time as something analogous to space as nothingness. This is what we will try.

First, we remind ourselves that when considering space, we were talking about empty space. Empty space is that which shows itself in the nothingness of a distance. And it is also the notion of empty space which lies behind the traditional (and Newtonian) notion of a pre-existing space which spatial bodies are "in". The space as nothingness in Sartre is also an interpretation of empty space, a different one from the absolute space of Newton. So, we are looking for a corresponding concept of "empty" or pure time, not for the concept of the temporality of a process. This is a precondition for interpreting time as nothingness on par with space.

A distance, as Sartre describes it, is between two points in space. If we take a step further, we can say that a point in space is a projection into space of a space-time event. In physics, an event is not something with a content taken place at a moment in time and at place, it is just the moment and the place as such, but seen together, disregarding what actually might be happening there and then. In Minkowskis formulation of the special theory of relativity, the event is the primary thing, its division into a time and a space component depends on a frame of reference. In a phenomenological perspective, the frame of reference is given by the consciousness for which the described phenomena appear. So we can take a space-time split as given. As the two points p and q at a distance are the space projections of two events $u = (p, t)$ and $v = (q, s)$, the two moments s and t are at a distance in time. And as the distance in space creates space, so the distance in time creates time, in the meaning of "empty time" or "pure time", time *as such*. Pauses, breaks, intervals of silence, are examples of such pure time, pure nothingness in time in analogy with the pure nothingness of space between points at a distance.

An apparent problem could be that while to a consciousness two points at a distance can be experienced in one single experience, two moments do not happen simultaneously. Thus one would think that the two moments belong to two different intuitions. Here we need to bring in Husserl's study of time consciousness ([5], pp. 127–143). Husserl observes that our experience of temporal objects is not limited to the factual "now". His favorite example is a melody. We do not only hear one tone, and then another tone, the tones just passed is retained in consciousness in such a way that we actually hear a melody, not only single tones. Gradually the retained tones fade away and disappear from consciousness, but because of the retention we actually experience also time intervals, like we experience space intervals. Thus a "Sartrean" phenomenology of time becomes possible, and together with the phenomenology of space it represents an experiential foundation for the concept of space-time.

It is interesting to compare Sartre's concept of space to Einstein's, which is expressed in *The Meaning of Relativity* (MR). This book introduces space-time step by step, going from the immediate experienced space and time to the mathematically formulated theories of relativity. Einstein makes a point in going back to the immediate experience to get free from the heritage of Newtonian mechanics with its concepts of "absolute space" and "absolute time" given independently of observation. It is easy to discover the influence of Hume and Mach in Einstein's text, but we have no real indication that Einstein was familiar with Husserl's philosophy. He could have been: He was a friend of the mathematician Hermann Weyl, who knew Husserl and his philosophy very well. Weyl was in Göttingen at the same time as Husserl, went to some of his lectures and married one of his students. Later Weyl became a professor in Zürich while Einstein still was there. Moreover, Weyl taught Einstein's theory of general relativity in Zürich and published in 1918 the first textbook on this subject, *Space Time Matter* [7]. This book begins with a presentation of Husserl's phenomenology, which is used as a philosophical introduction to the concepts of space and time. It is highly probable that Einstein read the book, but although MR is based on a general phenomenological perspective, we do not find any specific phenomenological concepts in the book.

While Sartre starts derives the notion of space from the distance between points, Einstein starts with the distance between three-dimensional bodies. Thus, like Sartre, Einstein develops the concept of space from the concept of a distance. Where there is a distance between two bodies, there is space. To explain the concept of a distance, Einstein follows an elaborate procedure, beginning with the concepts of replacement (change of position) of a body and of what he calls a continuation. If we have given two three-dimensional bodies, we can think of one being moved relative to another. We can for instance bring one body up to another so that they are touching each other. By bringing other bodies up to a body A, A is said to be continued, i.e. extended. If we have another body, X, we can imagine A to be continued until it is in contact with X, i.e. such that there is no longer a distance between X and A. Such a continuation of A is something that is imagined, which has not taken place, but which we assume could be done. Thus, in the terminology of Sartre (which Einstein, of course, does not use), a continuation is nothingness. Now, Einstein defines the space of A as all imaginable (not realized) continuations of A. Thus, space is in fact an absence, precisely the absence of the continuations of A. Thus, we see that Einstein's notion is basically the same as Sartre's, although expressed in a slightly different way.

How would space appear to us in ordinary life, in my immediate visual experience, according to Einstein? Einstein's suggestion is, as we have seen, that space is nothing but the lack or absence of a physical body somewhere. Where there is space, there could have been a body, but it isn't. As bodies may have shapes and dimensions, pieces of space can be said to have the same, inherited from the absent body which would remove the space by its presence. We say that the body would replace the (empty) space. If we have a piece of space in front of us, and this piece of space could be replaced with a cube of length 20 cm in all three directions, then the space can be said to be cubic with the length 20 cm in the same directions. Einstein imagines this as taking place in relation to a given body (the body of reference) which we can imagine being extended, and which defines space (a piece of space) as the absence of this extension. Thus, he thinks that this concept of space always assumes that some body is originally given, to which the space, the absence, is defined. In ordinary life, he thinks that the earth functions as such a body of reference, which we are so used to that we never think about it. That is why we think of space as something that exists by itself, the everyday notion of absolute space.

Given the Sartre-Einstein phenomenological notion of space as absence or nothingness, we can now turn to the question of the meaning of the mathematical concepts of geometry in relation to the phenomenological description of space. Usually the introduction of the mathematics is considered as adding a “formalism” representing a new level of abstraction which removes us from the world of physical meaning, that is, the world appearing in intuition. This point of view is roughly what we will call intuitionism. It is highly misleading, and misses some interesting philosophical insights. The main objection to intuitionism is that “abstraction” is already implied in any given experience, and what mathematics does is rather to provide us with a language for unifying an otherwise fragmentary relation to the intentional object in question. A language displays what Wittgenstein called the logical structure of the phenomenon, which leads to better understanding, and hence—in fact—*more* meaning. And mathematics is nothing but a particularly sophisticated language.

This was the subject of the historical discussion between Edmund Husserl and Jacques Derrida taking place in the latter’s translation of *The Origin of Geometry* (OG) into French. Derrida wrote an introduction [1] to his translation which was almost six times longer than Husserl’s original article, and Derrida’s criticism or “deconstruction” of Husserl’s text and its philosophical assumptions is of profound interest for understanding what we do when we use mathematics in modern physics, including in the geometry of space, time and space-time. Husserl was concerned and worried about the development of science since Galileo into higher and higher degrees of abstraction and mathematisation. He thought that it was the immediate experiences and practical applications from which the scientific theory originated that gave a theory its fullness of meaning, and that the high degree of abstraction and the extensive mathematisation of science lead to a gradual loss of meaning. For Husserl, the development of geometry from a practical tool for design and building into a purely abstract mathematical science of ideal entities is an example of such a development. Husserl was not making an empirical historical investigation, what he presented was rather a reconstruction of what must have been the main steps in this development.

In his long and detailed introduction to Husserl's article [1], Derrida pays attention to the fine points in Husserl's text, pointing out the unresolved tension between admitting the necessity of the ideal, as we find it in the concepts of a language, and at the same time criticizing the alienation and degradation following from the idealization of mathematics in geometry. Derrida points out that what Husserl says about the ideal concepts of geometry, is true of language in general. To Husserl, geometry is both a means of expressing timeless truths and an abstraction hiding "sedimented" and forgotten layers of historical meaning. Thus, for Husserl, the establishment of ideality trough mathematical concepts and mathematical notation leads to forgetfulness of the meaning-giving origin in intuition. And at the same time this process is necessary for establishing the timeless validity of the mathematical theorems. Derrida finds in Husserl's text also statements to the effect that language in itself works in a similar fashion as mathematics. But the ideality of language is liberating meaning just as much as hiding or forgetting it. To Husserl, writing, notation, and hence language, is a system for representing a meaning originating in the immediate intuition, or, for the "pre-geometer", in his practical dealing with specific spatial problems. In Derrida's view, in any knowledge and understanding there are already implied concepts which are ideal entities established through the sign system of a language. All concepts are ideal in the sense of being repeatable and recognizable, which is in fact a condition for being applicable as language. Only through ideal concepts an experience makes sense, can be understood, repeated in memory and communicated to others. Thus, the immediacy of intuition imagined by Husserl as being the sole source of meaning of the ideal concepts is in itself an illusion. Derrida calls it the myth of the presence. There is no such thing as an immediate presence, untainted by language and thus ideality. The forgetfulness implied by developing geometry from a set of practical applications to an abstract theory is an unavoidable part of language in general and is not a particular problem for the mathematical concepts of geometry or other abstract sciences. It is just one side of the process which also leads to the establishment of meaning through idealization.

The points and straight lines of geometry are ideal entities, and Derrida's point is that so are the concepts of language. Any potential loss of meaning following from introducing such geometrical objects into a world of immediate experiences is similar to the potential loss of meaning in any language use.

The position that the meaning of language as well as mathematical ideas has its source an original intuition is called by Derrida *intuitionism.* Later writers, including myself, have argued that is possible to distinguish Husserl's intuitionism from phenomenology (see e.g. [3]).

We can use Sartre's analysis of space as an example. As mentioned above, Sartre considers the situation of having two points at a distance. He identifies two possible intentional objects which can be associated with this situation. One corresponds to space as nothingness, in which the end points are the foreground objects being at a distance. This being-at-a-distance is a lack or absence of material fullness, and this absence is space. The second intentional object is the distance itself as a line segment connecting the points, and the points are background objects being the end points of the line segment.

Here we observe that here is no original unmediated presence to relate to which represents the immediate intuition in Husserl's sense. In Husserl's own wording, the situation as it appears is always constituted, and in this case constituted in one of two possible ways. It is one of Derrida's points that there is an opposition between Husserl's theory of constitution and his theory of the original unmediated presence appearing in intuition. This is Derrida's method "deconstruction", to reveal the inner tension in the theory under consideration instead of criticizing from the outside. In this case the tension between Husserl's theory of constitution and his theory of presence.

The two intentional objects outlined above, corresponding to two different acts of constitution, are relevant here, because the duality of description differentiates between the notion of empty space, which induces anxiety of heights or open places and the mathematical space, which is based on the notion of the line segment between the points. Both descriptions are ideal descriptions, and the last one includes a concept which is a part of the mathematics of geometry, namely a line segment. Thus, we have here a simple example of a form of intentionality which can be developed into something much more complex by applying an elaborate mathematical structure instead of just a piece of a straight line.

The two ways of constituting the originally given situation are revealing. The geometrical description of space will never explain the phenomena of spatial anxieties, while the nothingness description cannot reveal the kind of structured reality represented by the elaborate geometrical mathematics needed for physics. We see that we can use a phenomenological analysis against Husserl; more precisely: against his intuitionism. This is necessary to rescue both the adequacy of scientific knowledge in modern physics and the fundamental philosophical and psychological insights of phenomenology.

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