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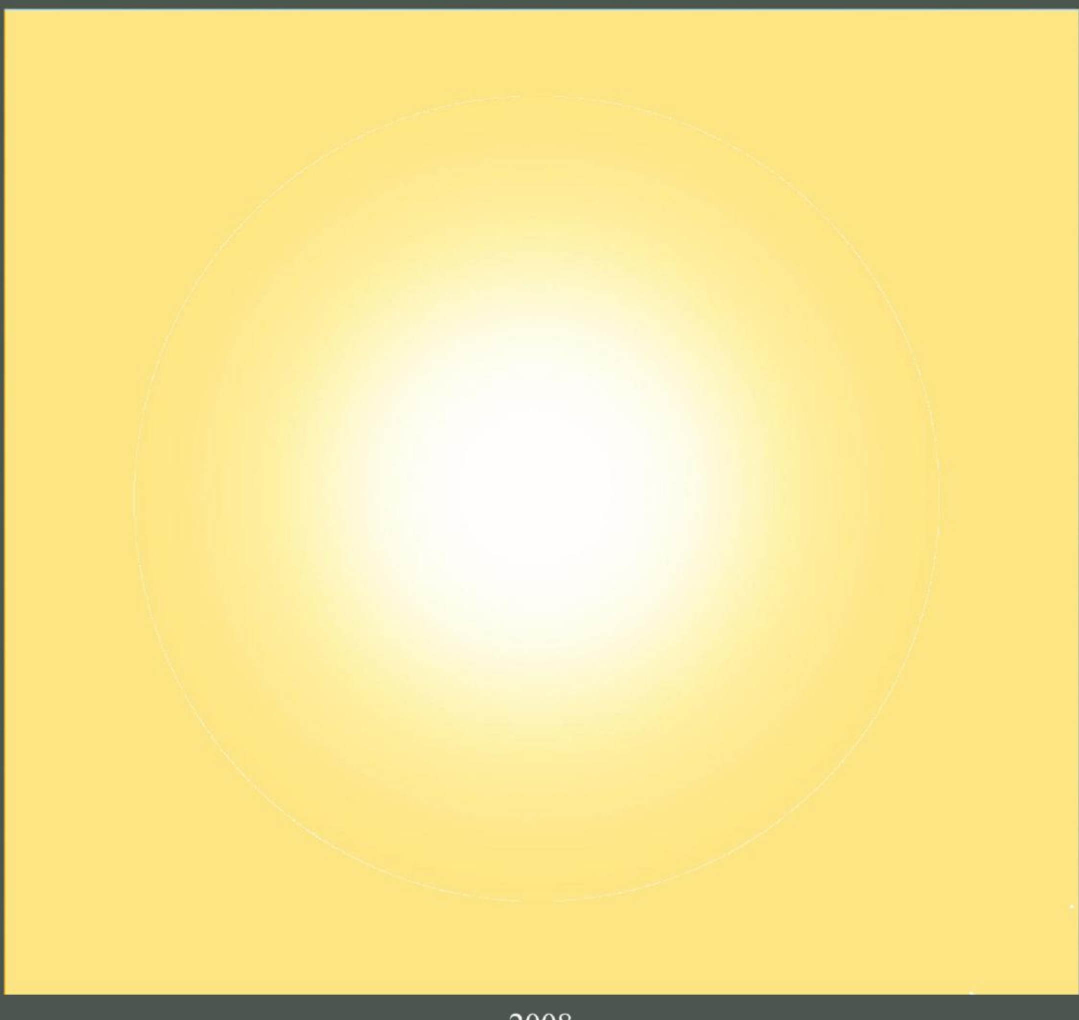
THE DIMENSIONS OF THE SPACETIME



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THE DIMENSIONS OF THE SPACETIME

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In the science that studies the representation of reality, and in the sciences from it derived, a central role is given to the observer.

The existence of space is independent of the observer, the space exists independently of human presence or other presences, but the structure of the space and its representation, which is the model of the world, that our brain through all the senses develops, is intimately connected to the observer that processes it.

However the greatness of man consists in coming out himself, in knowing the reality that is inside and outside of his body, doing without it, transcending it.

Thanks to this human capacity we understand that we have to distinguish between the concept of space relative to the observer and the concept of absolute space, that is untied from it, then between the representation relative to the observer and the absolute representation, or using a term dear to me, between the relative stereica and the absolute stereica.

The geometry, which for many centuries establishes its foundations in the concepts of point, straight line, plane, etc., has crossed the threshold of the absolute without having full consciousness, without fully consider the role of the observer in space.

It is instinctively accepted a compromise between the relative and the absolute. Dressed the absolute of a dress relative.

The ingenious absurdity of giving dimension to the point, calling it free of dimension, has allowed us to build a wonderful model of reality relative to our body. We arrived to treat even the infinitely far, even considering it an unattainable goal.

This model of the world, which made us understand thousands of phenomena, this model defined by the rules of projective geometry, showed at a certain level of knowledge its limits.

The large distances traveled by man in macroscopic and microscopic space, the discoveries about the light, that led to the theory of relativity and the quantum theory, have created in the science a rift between the models of reality and the laws of reality, between geometric representation, and physics (1).

It's necessary to develop the representation of space, so that it is in agreement with current knowledge, and, as always, is the bearing structure of the whole scientific universe.

The continuity of space principle and the curvature of space theorem

The man does not know a finite world, but only an infinite world. A stone is an infinite body, because it can be broken down indefinitely in ever smaller particles, placed at mutual enormous distances in proportion to them, as it happens in the universe to the stars and galaxies.

What we call finite is only the delimitation, namely the identification related to our senses, of a infinite portion of the world.

The man in fact ignores the concept of finite, as opposed to infinite, completely absent in nature.

It's important to clarify that the infinite exists, not the infinitesimal, understood as the result of an infinite division, since the first, the infinite, excludes the second. Dividing into infinite parts means never reach an infinitesimal part.

The concept of infinity leads to fundamental conclusions.

In agreement with the axiom of continuity of real numbers, by induction from experimental reality, it sets out the following fundamental principle

THE CONTINUITY OF SPACE PRINCIPLE

We consider two distinct points A and B in space: always exists between A and B a point C, distinct from A and B, or rather there are infinite.

The position of A and B in space is relative to the observer, to its reference system.

By principle follows immediately that between two infinity of distinct points there is always a point C distinct from them. If in fact between A and B always exists C, the principle declares that between A and C, such as between B and C, there is always a point distinct from these and since the principle applies no limits to each new point, it can be said that C separates two infinite number of distinct points.

The principle of continuity (or principle of absolute immisurabilità of space) allows first to demonstrate the fundamental

THE CURVATURE OF SPACE THEOREM

The space can not be represented with straight lines and planes, but with circumferences and spheres.

Let r be a generic straight line, A and B two points on it. There is no a fixed absolute distance between A and B. Due to the principle of continuity, in the absence of the observer, that is in the absolute, A and B may be considered to be at any distance.

Immediate consequence is that in this condition any two points on the straight line can be considered infinitely close, any two points on the straight line can be considered infinitely distant.

So the points at infinity r, infinitely distant, can be considered infinitely close, which is impossible if the straight line is open, because the points at infinity are by definition unattainable.

It follows that the straight lines closed. In this case, in fact, two infinitely distant points can always be considered to be infinitely close.

The closed line r is a circumference, because at every point on it the line perpendicular to the tangent line is an axis of symmetry.

Stretching from the straight line to the plane, the sphere exists, not the plane.

For the principle of continuity the term *infinitely close* equivalent to the term *coincident*. The maximum closeness there is when two points A and B coincide.

If these do not coincide always exist, for the principle of continuity, a point C between them, and therefore A and B would not be infinitely close.

The closing of the straight line r therefore leads to affirm that the reality can not be represented by straight lines, but only from the circumferences and therefore that it can not be represented by planes, but only by spheres.

The image of the world on our retina is produced by light energy, radiating also along circular trajectories.

The representation of the phenomena coming to us is still effective by accepting the straight line and the plane as an approximation of minimum portions of circles and spheres, but the representation of the immense extensions of the microcosm and the macrocosm imposes the exclusive presence of circles and spheres. We'll call then *circles and spheres maximum* the euclidean straight lines and planes.

Dimensions of the space

The geometry, that is the representation of space used for the study of nature, led us unconsciously to cancel in reality the dimensions over the third.

Euclidean geometry is based on the paradox that the straight line has one dimension, the plan has two dimensions, the space three, but these and other bodies are made from points without dimension.

This representation, which has greatly simplified the conception of reality and has enabled the science to do gigantic steps, however, has led to a fundamental error that has persisted through the centuries.

It is limited the space to only three dimensions.

The dimensional structure of the space must be reviewed in the light of *the continuity of space principle* and *the curvature of space theorem*, deepening the crucial and inseparable role of the observer.

To understand how the space take shape in the known reality, you need to disassemble and reassemble the dimensions, even though the dimensions of course can not be separated, but they are aspects of the same being.

Consider a line L having the curvature cL and an observer O_1 part of it.

To the observer the line L has the dimension 1, because he, being part of L, has no knowledge of cL curvature in dimension 2.

The observer O_2 extended also in the dimension 2, has full knowledge of the curvature cL.

Consider a surface S having the curvature cS and an observer O_2 part of it (2).

To the observer the surface S has the dimension 1 and 2, because he, being part of S, has no knowledge of cS curvature in dimension 3.

The observer O_3 extended also in the dimension 3, has full knowledge of the curvature cS.

Consider a volume V having the curvature cV and an observer O_3 part of it.

To the observer the volume V has the dimension 1,2 and 3, because he, being part of V, has no knowledge of cV curvature in dimension 4.

The observer O_4 extended also in the dimension 4, has full knowledge of the curvature cV.

The fourth dimension is the curving of three-dimensional space, that is the enlargement or shrinkage of its circles and spheres.

Going to the general structure of the space, we can now extend what has already been described for the first four dimensions to those of higher order.

Consider a space N having the curvature cN and an observer O_n *part of it.*
To the observer the space N has the dimension 1,2 and n, because he, being part of N, has no knowledge of cN curvature in dimension n+1.
The observer O_{n+1} *extended also in the dimension n+1, has full knowledge of the curvature cN.*

You can then draw the conclusion that

each new dimension corresponds to a new curving of space.

The dimensions are connected to one another and the space, inseparable, should be considered as a whole, as a superimposition of n dimensions of nature.

The fourth dimension of the space

If there was not the fourth dimension we could not have a microscope or a telescope, but we could not have even the organ of sight and therefore the knowledge.

When our body is in motion, the eye allows the visual system to perceive the same data information that the brain would take if the looked object enlarged or shrank in the fourth dimension.

When we go closer a small body we have the same vision on the retina if it enlarged in the fourth dimension. When we go away from a large body we have the same vision on the retina if it shrank in the fourth dimension.

The ability of the eye is enlarged when we use tools as the microscope or the telescope. These tools enable to stretch further in the fourth dimension, because they give us perceptively the same information that we would have if the object enlarged or shrank further in the fourth dimension.

When we go closer or away, the spherical wavefront of the light differently meets the crystalline lens, which deflects, by refraction, this energy before it reaches the screen of the retina.

This deviation is greater when the eye approaches the object looked and smaller when the eye moves away from it.

The enlargement or shrinkage, operated by the moving lenses of an optical centered system or by the crystalline lens in the moving eye, enables us therefore to extend the observation in the fourth dimension.

Without the fourth dimension reality would not be explored, indeed would not even perceivable. Would be useless the crystalline lens and the same eye, because, as we shall see, in the absence of the fourth dimension, the same light radiation would not exist.

In fact our knowledge would be extended only to our ability to limb movement and much more grateful to the touch than the sight.

But the organ of sight is in perfect agreement with the nature of the light radiation, because the curvature of the crystalline lens enables to reverse the curvature of the wavefront emitted by a punctiform light source, wavefront which by convex becomes concave and convergent at the image point on the retina.

Therefore, the eye enable to us to decode the light information that we send the bodies around us, through millions of wavefronts, and therefore an immense number of photons, that, without the crystalline lens, would overlap indistinctly on the retina without creating any image.

We know that, if a body extends in the fourth dimension, it assumes infinite three-dimensional sizes, and its characteristics are invariant respect to the three-dimensional position of an observer, because this is not able to evaluate any change in the fourth dimension.

It follows that, compared to the man, as three-dimensional observer,

the entity part of the fourth dimension has not corpuscular nature, has no mass and has invariant features.

The light, and generally the energy transmitted by electromagnetic waves, is massless and has invariant features compared to man.

It is deduced that, compared to man, as a three-dimensional observer,

electromagnetic energy, extends into the fourth dimension.

The quantic spherical wave assumes, compared to man observer, infinite sizes, spreading in the whole space.

To the observers man the space shows its as an entity that changes with the changing of the dimensions, assuming different appearance and consistency, in synthesis different state.

We can consider dimensional states of the space, that is curvature, as different states of energy.

Compared to the human observer, the four dimensions identified the energy without corpuscular nature, the three dimensions identified energy with corpuscular nature.

Operating with optical instruments we can get a greatly enlarged or reduced image to a given body.

During the displacement of an optical system, these images of the body are always generated, thanks to the fact that photons, emitted by it, assume infinite three-dimensional sizes in the fourth dimension.

Through the lens the four-dimensional space expands more or less, changing density, that’s bending, in a continuous way, uninterruptedly, without fractures or starts.

Now you can better understand the concept of the observer, who of course arise from human observer, and is intimately linked to the nature of light.

It 'important to clarify that the ocular axis for the human observer is devoid of curvature, but in reality it is curved and has variable curvature.

The ocular axis is identified by a series of photons that have overlapping images coincident on the retina.

The concept of straight line is born out of the alignment of these photons, or better, by the superposition of their trajectories and, since the trajectory of each photon is curved, the axis resulting also is curved.

The alignment, thanks to the nature of photons, thanks to the fact that they have infinite sizes in the fourth dimension, always occurs, regardless of enlarging or shrinking of the image that, through optical instruments, man produces in the process visual and regardless of the distance that the body, from which the photon is emitted, has from the eye.

It is described as the curvature of the space consists in the enlargement or shrinkage of the circles and spheres which conform to reality.

To the concept of curvature we can associate the concept of space density. The curvature is the effect of the variation of density of the space. Increase the distance between the points of a sphere means decreasing the density of the space, enlarging the sphere, increasing the radius, then decreasing the curvature.

There is an absolute value of the density, but there is the variation of the density. If the density were constant curvatures or dimensions wouldn’t exist . Curving the space in the fourth dimension is equivalent to vary the density of the three-dimensional space.

Generalizing we can deduce that

curving the space in the dimension n+1 equals to vary the density of the space of n dimensions.

This is in keeping with the inseparability of the dimensions.

Although in absolute the man, as all the space, is a multidimensional entity, to understand the material energy structure of the space you need to refer to the man as an observer three-dimensional, remembering that man is capable of conceiving the existence the upper and lower dimensions of the space.

The space shows a homogeneous dimensional presence and the order that the man places to the dimensions is relative to himself, as observer man.

The nature does not determine what is the first dimension, because the enlargement or shrinkage of the space makes no sense in absolute, that is without a reference system.

On the other hand there cannot exist a dimension independent of the preceding and following dimension, because it was shown that to curve the space in the dimension n+1 is equivalent to vary the density of the n-dimensional space.

But at the same time is broadened the fundamental and essential role of the observer.

From Galilei to Newton, Maxwell, Einstein, to the observer is assigned a cartesian reference system, because physics, blossoming from the plant of the euclidean spatial representation, conceives of course the observer in harmony with this.

The knowledge of the n-dimensional spherical space broadens the concept of observer. An observer of the macrocosm and the microcosm has the absolute dimensions of the space he want to observe.

The observer will have to enlarge to take immense spaces or, which is the same, that the space, by him took, will have to shrink.

The no-measurability of the space

If both the object and the observer extend in three dimensions, one can be related to other and the observer can examine the shape of the object, relative to it. But each of them can not say how much is curved the other in the fourth dimension.

If an observer contracted in the fourth dimension, our body, which to us appears unchanged in the three dimensions, would be to him more and more big. Then he would think that his body is unchanged and that we expand in the fourth dimension, that we curve in the fourth dimension.

But, because it’s not possible to represent the space with straight lines and planes, we can not operate any measure, because we cannot apply to the light rays the laws of projective geometry, valid for straight lines and planes.

Two points are part of only one straight line, that is identify only one straight line, but the same points, as is known, are part of infinite circumferences. This means that with the center of the crystalline lens and the image point is not possible to identify only one circumference, representing the ray of the light that has produced this point on the retina.

Only the measures, with optical instruments, through short distances, may be correct, that is subject to errors so small that we consider them null.

On large or very large distances however the optical instruments cannot give any correct measure.

The finite theorem

From the principle of continuity and the theorem of the curvature follows that two diametrically opposite points of any sphere does not have a fixed distance, absolute, but, released by the observer, both may be considered infinitely distant or infinitely close.

This nature of the space implies that, on the basis of this configuration, does not exist a center or a border that limits the universe, because no sphere can be considered the center and border.

From what expounded above we arrive at the following

THE FINITE THEOREM

Every spherical surface divides space into two absolutely equivalent half-spaces.

Let P_1 and P_2 be two observer points, the first inside, the second outside the spherical surface σ.

If P_2 shrinks to the fourth dimension, (or, this is the same, the space 3d expands), its distance from the surface σ and its radius increases. On the contrary, curvature decreases, this being the inverse of the radius.

Shrinking the two points is equivalent to removing them from the σ on the maximum circumference r for P_1 and P_2. As well as the near by point $S_{1,}$ this circumference and σ necessarily also have the point S_2 in common.

Curvature of σ decreases to zero relative to P_1 , when $P_{1,}$ is on both r and σ ,that is, when P_1 coincide in S_2.

The same situation would be achieved if P_2 shrinks.

It follows that a generic point P can be considered either inside or outside the sphere σ and that therefore the two half-spaces, separated by σ, are absolutely equivalent.

This theorem enables you to deepen knowledge of nature of the space, where the finite in absolute does not exist, but in the representation only, in which it is knowed by the observer as a separation between two infinities.

The demonstration of n dimensions of curved space completely changes our conception of the world, leading us to a new representation of the space, and then of the reality, difficult, seemingly elusive.

But this is the reality and we must strive to grasp it, we need to find the tools to be able to explore it.

We must therefore take possession of the concepts and their linguistic terms required to represent the reality, as we did for all the concepts since the beginning of the history of scientific research.

With the current terms we can say that the space has infinity, sphericity and variable dimensional density.

G. M. C

NOTE

(1) A. Einstein writed*:"A complete system of theoretical physics consists of concepts and basic laws to interrelate those concepts and of consequences to be derived by logical deduction. It is these consequences to which our particular experiences are to correspond, and it is the logical derivation of them which in a purely theoretical work occupies by far the greater part of the book. This is really exactly analogous to Euclidean geometry, except that in the latter the basic laws are called 'axioms'; and, further, that in this field there is no question of the consequences having to correspond with any experiences. But if we conceive Euclidean geometry as the science of the possibilities of the relative placing of actual rigid bodies and accordingly interpret it as a physical science, and do not abstract from its original empirical content, the logical parallelism of geometry and theoretical physics is complete. We have now assigned to reason and experience their place within the system of theoretical physics. Reason gives the structure to the system; the data of experience and their mutual relations are to correspond exactly to consequences in the theory.*

On the possibility alone of such a correspondence rests the value and the justification of the whole system, and especially of its fundamental concepts and basic laws."

About the quantum theory he so express himself:*" The most difficult point for such a field-theory at present is how to include the atomic structure of matter and energy. For the theory in its basic principles is not an atomic one in so far as it operates exclusively with continuous functions of space, in contrast to classical mechanics whose most important feature, the material point, squares with the atomistic structure of matter. The modern quantum* *theory, as associated with the names of de Broglie, Schr6dinger, and Dirac, which of course operates with continuous functions, has overcome this difficulty by means of a daring interpretation, first given in a clear form by Max Born:-the space functions which appear in the equations make no claim to be a mathematical model of atomic objects. These functions are only supposed to determine in a mathematical way the probabilities of encountering those objects in a particular place or in a particular state of motion, if we make a measurement.*

This conception is logically unexceptionable, and has led to important successes. But unfortunately it forces us to employ a continuum of which the number of dimensions is not that of previous physics, namely 4, but which has dimensions increasing without limit as the number of the particles constituting the system under examination increases. I cannot help confessing that I myself accord to this interpretation no more than a transitory significance. I still believe in the possibility of giving a model of reality, a theory, that is to say, which shall represent events themselves and not merely the probability of their occurrence."

A. Eistein, On the Method of Theoretical, 1975 Newton- Compton editori.

(2) *It 'important to add a clarification on the concept of curvature. The intrinsic curvature of a surface, which is Gauss, needs the third dimension to operate on the surface the measures that inform of the same curvature.*

Giuseppe M. Catalano, The illusion of Gauss on the intrinsic curvature, *Istituto Internazionale Studi Avanzati di Scienze della Rappresentazione dello Spazio, Palermo, 2011.*