4 DIMENSIONS LIGHT AND SHADOW FIELD

This model has been difficult to verify because it requires a source with a really particular size structure. It has already been thought, with the aim of unifying particle and wave, but has not been realized, and it turns out that the phenomenon generated is much stronger than expected.

First, the source diffuses in a room and one observes in a large box provided with a vertical slit, bright and dark vertical bangs; and seeing that these bangs remain vertical when the position of the source is modified, one deduces from it the presence of a field of light and shade with 4 dimensions of real space.

Then, the surprise is great when guided by the observation in physics, the fourth dimension is added mathematically orthogonal to the 3 others in the 3d reference frame, which is also a novelty in geometry in space.

Finally, the characteristics of the horizontal field in the box and of a photon in the field are confirmed and a property of discontinuity in propagation for light and shadow is obtained.

The bright and dark bangs

The source is composed of a vertical striped cover in the shape of a sectioned sphere of precise size with a halogen bulb with one or two vertical filaments in its center and it produces light beams and vertical shadow volumes. It is hung by its flexible power supply in a room in which a box of about 60cm edges with a vertical slit of a few mm width and a screen is placed at 7m in the direction of an angle so that the center of the screen, the slit and the angle are aligned. At first, we observe in the box vertical and straight bright and dark bangs from the top to the bottom of the screen, the light beams and shadow volumes being cut vertically from the slit. Then it becomes very interesting if the source is pushed in any direction so as to impose large oscillatory movements while avoiding a rotational movement on itself, because the bangs remain vertical and distinct and adopt a very weak horizontal movement on either side of a vertical axis positioned in the center of the screen, which makes the phenomenon quite impressive from an observational point of view. With a larger box, these bangs are just as impressive because they are even higher and still vertical, distinct and straight, but the phenomenon is that they have a lot of lateral movement at the left and right ends of the image when the source is oscillating, so the use of a box of about 60cm of edges allows the selection of a volume of 3d space in which the horizontal movement is weak everywhere, which delimits a precise space and simplifies the analysis

The source is a spherical structure of diameter 29,5cm sectioned at the bottom made of 42 bands of average width 1,26cm opening on 42 slits of average width 0,95cm at mid-height. It can be equipped with a bulb with one or two vertical filaments positioned in its center.

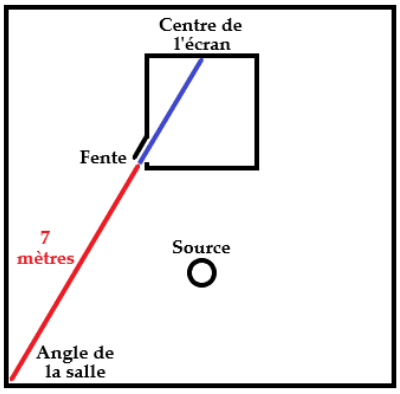
The field

Given the width of the slit and thus the absence of diffraction, if the phenomenon were common one could use geometrical optics to reconstitute the bangs from the drawings of the reflections on the walls of the room in front of the slit, except that the "inverse return" from the image of the bangs imposes to observe on these walls bright and dark bands with a very small possible angle of inclination in verticality, and in spite of everything one sees very inclined bands, or even absent, depending on whether it is the beam of conical shape projected at the bottom of the source which illuminates them. The geometrical optics seems to work individually in the room or in the box but as the reverse return does not work and the light beams and shadow volumes are cut vertically in the box from the slit, a break at the level of the latter prevents the light rays and shadow projections from being traced in straight lines. Considering this break and the regularity of the horizontal movement 2d of the light beams and shadow volumes still in the box, we see that we are dealing with a field that involves space. We name it "field of light and shade".

The box used measures approximately 60cmx60cmx60cm. We can also use a box with a little more depth slot-screen and / or a higher height, but it is preferable to limit the width so that the horizontal movement of the bangs on the screen is observed low everywhere. On the side, the vertical slit is of high length and facing it there is a white screen.

4 dimensions of real space to explain the phenomenon

In order to know more about the space exploited by the field, one poses a galilean reference frame of real space 3d (x, y, z) orthogonal of center C where the dimensions are with the mathematical properties of geometry in space thus with true dimensions of space with "x" in distance slit-screen, "y" the width positioned horizontally on the screen of the bangs and "z" the height; and although we cannot use geometrical optics at the slit, we use the fact that the observed bangs are the images of the striped mask of the source and thus that each fringe on the screen has a light beam or a volume of shadow source in the room that is proper. This fact, we see immediately that when the inclination of the source varies, a fringe traverses the vertical space crossed by its beam or source volume on its horizontal trajectory, this creating incompatible spaces between the trajectories of the close bangs that are superimposed on the screen. With a larger box, the higher lateral deflection of the bangs implies many superimposed trajectories and it might be necessary to add several "dimensions of space" to eliminate all the incompatible spaces thus created, but with the box used and according to the very weak horizontal movement of the bangs on the screen, and this despite the source producing large oscillations in any direction all the trajectories of the bright bangs can be organized on a straight line without touching each other and it is the same for the trajectories of the dark bangs, which means that one is obliged to add exactly one dimension of space to the 3 dimensions if one wants to eliminate the incompatible spaces, i.e. that 4 dimensions of real space are necessary to explain this phenomenon



Positioning, not to scale, of the box in top view. The center of the screen, the slit and the corner of the room are aligned, which has the effect of positioning a vertical axis, around which the bangs bounce when they are in motion, in the center of the screen. A distance of 6,50m minimum between the slit and the angle must be taken if one wishes a regular image.

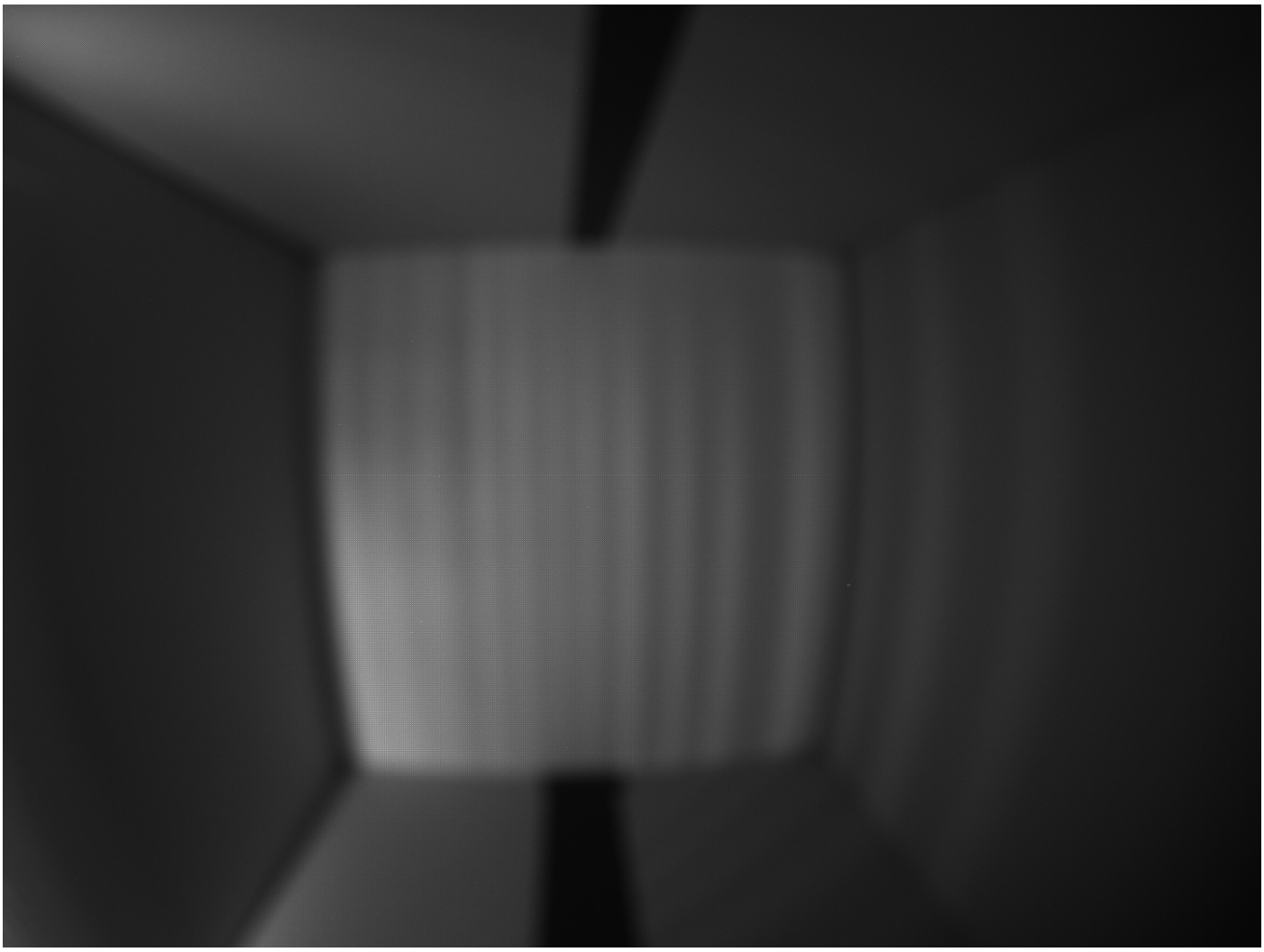


Photo of the bangs made with an astronomy camera. In order to gain in luminosity, the slit is positioned at 5,50m only of the angle of the room. The bulb used is with 1 filament. With 2 filaments, the bangs have a little more relief and are a little less defined.

Passage in 4d

In physics, we put the parameters PL Propa Light and PO Propa Shadow in "x", ML Light Movement to which we attribute the trajectories of the bright bangs and MO Shadow Movement to which we attribute the trajectories of the dark bangs in "y", and we eliminate the incompatible spaces by separating these last ML and MO from "y" with the help of this supplementary dimension that we call "a". And it is also physics that will push to merge the two cases of horizontal reference points to have only one observable case. However, the reasoning, guided by physics, is presented only in geometry because the dimension "a" is really added mathematically in the 3d reference frame to pass to 4d, which is a novelty in itself.

If the source is maintained tilted, as if one makes a freeze-frame of the movement of oscillations, the bangs are filmed vertical and right by the camera of astronomy in the box and one observes them with the computer screen (in blue). The distance between the slit and the corner of the room is 5.50m.

And it is, to clarify, rather focused on making geometry connections specific to 4d. The letter p is used for the word parameter, and one need only follow the Passage to 4d table.

" We go from the **assumed 3d** to the **incomplete initial conditions** by positioning "a" parallel to "y" passing through C and then to the **preparation of taking the parameters** by the rotation of axis "a" at right angles to the 2d (a, z) to have "x" and "z" superimposed and "y" and "a" superimposed in the horizontal plane. In these three phases, the parameters are geometrically related in the original "x" and "y" dimensions.

When the 4p parameters are taken, there are two cases. In case 1, the color parameters O PO and MO are transferred from "x" and "y" into "z" and "a" and all the parameters of the case receive a 1 at the end of the name and in case 2, the color parameters L PL and ML are transferred from "x" and "y" into "z" and "a" and all the parameters of the case receive a 2 at the end of the name. In the next phase, in case 1 and case 2, the dimension "a" is added orthogonally to "y" in the horizontal frame with rotation of the entire 2d (a, z) and we obtain the 4-dimensional and 4-parameter 4d/4p 1 of case 1 and 4d/4p 2 of case 2 valid frames because the parallel parameters are compatible and the initial orthogonalities are preserved. For the two phases, the **4p parameters** and the **4d/4p horizontal reference frame**, the parameters are taken out of the original dimensions at the phase of taking the 4p parameters, and we notice that it is all the parameters with a 1 from case 1 or all the parameters with a 2 from case 2 that were positioned in the original "x" and "y", and not the parameters of case 1 and case 2 mixed. It is therefore the geometry specific to case 1 or case 2 that allows the properties of the original dimensions to be retained.

So if we merge the two 4d/4p benchmarks into one, we get a **horizontal 4d/8p benchmark** with two parameters per dimension that is valid because the parameters are still compatible and the original orthogonalities are preserved, and with dimensions with the same names "x" "y" "z" and "a", but the case-specific geometry bindings cannot be undone because they protect the original dimension properties, and it is therefore necessary to redefine the organization of the geometry links between parameters in order to establish these links by case when we go to 4d, effective between parameters of different dimensions and not between the two parameters in one dimension, noting that the two dimensions "x" and "y" and the two dimensions "z" and "a" are copies in unlinked parameters of the original "x" and "y". Furthermore, we see that these casewise connections and the right angles of the 2d fixed from the beginning are the only connections of geometry in 4d.

In order to establish the case connections, one must know the phase of **taking the 8p parameters** just before that of the 4d/8p reference frame, which is obtained by horizontal rotation in the opposite direction of the 2d (a, z), and see how this is achieved from the phase of still before preparing to take the parameters. When passing from the latter to the 8p parameter setting, the parameters of (y, x) are copied directly into (a, z) and, knowing that in 4d, two parameters are not linked in the dimension, the geometry links between the respective parameters of the dimensions "x" "y" "z" and "a" of the 4d are directly "forgotten" and used to establish the links by case, then identified in links of color organized by side, the parameter of color of a dimension joining the parameter of the other

color of the superimposed dimension, that is to say two links L or two links O between " x " and " z " and two links L or two links O between " y " and " a ". And we distribute these L or O connections on the whole of the figures in 4d by coloring in passing the right angles which are the only connections of geometry between orthogonal parameters and thus also L or O connections. Without forgetting the forgotten links.

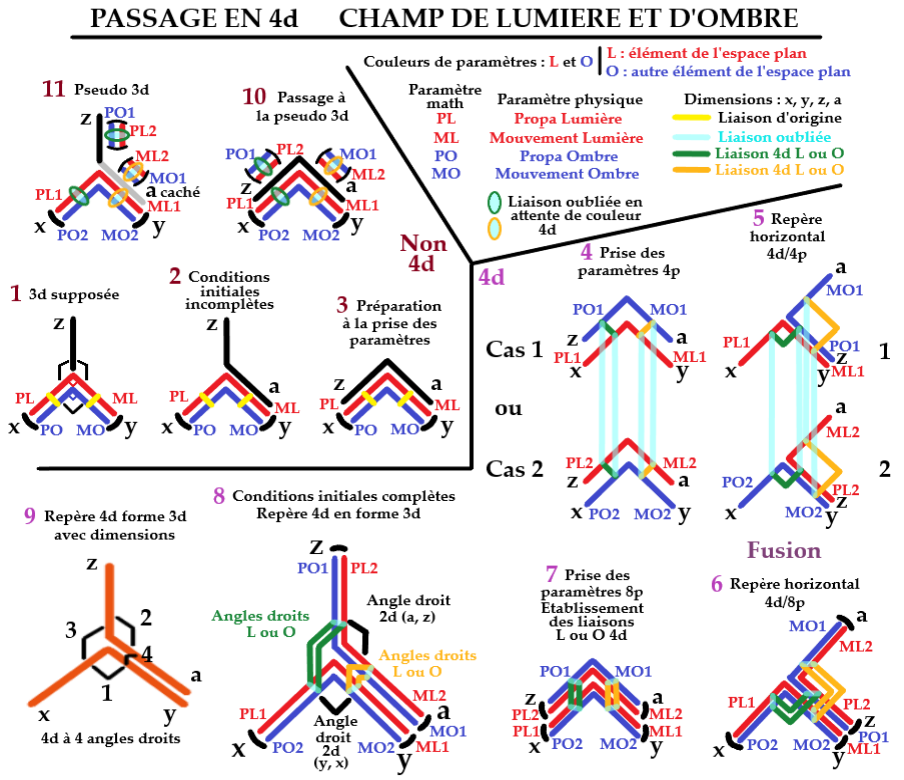
links per case = 4d links L or O

Then one passes from the taking of the 8p parameters to the phase of the **complete initial conditions**, that is to say a 4d reference frame of the same 3d form as at the incomplete initial conditions, by the rotation of axis "a" in right angle of the 2d (a, z) upwards, in which there are 4d L or O links between the parameters of "a" and the parameters of "y". And since there is "pivotal" orthogonality between these parameters, those of "a" oriented vertically in the 2d (a, z) and those of "y" always oriented horizontally in the 2d (y, x), the pivotal right angles between the parameters of "a" and "y" are identified as the only geometry connections between the parameters of the dimensions "a" and "y" in the 4d frame of reference in 3d form. This allows, in 4d reference frame, to count only the 2d right angle (y, x), the 2d right angle (a, z), two pivotal right angles of color L or O between the parameters of "y" and "a" and two right angles of color L or O between the parameters of "x" and "z".

This leads to a **4-dimensional reference frame with 4 right angles**. Since the 4d L or O links do not affect the overall geometry, the right angles between parameters are reflected in their respective dimensions and the only geometry link between the "a" dimension and the "y" dimension in the 4d reference frame in 3d form is a pivot orthogonality link. The 4 right angles counted in this frame of reference are then the 2d right angle (y, x), the 2d right angle (a, z), the right angle between "x" and "z" and the pivot right angle between "y" and "a" i.e. :

"x" orthogonal to "y" orthogonal to "a" orthogonal to "z" orthogonal to "x"

And so even if we see that in 4d we are limited by the right angles because we cannot give the orthogonality between " x " and " a " and between " y " and " z ", we can still say that a dimension is well "added orthogonally to the 3 others in a 3d orthogonal frame of reference" when we go from 3d to 4d by using the form of the 4d frame of reference where the positions of the axes can be given by



the 3d and knowing that it is only the orthogonality in pivot that counts between "y" and "a" in 4d. To verify this, there are: "x" orthogonal to "a" and "y" orthogonal to "z" in 3d; "x" orthogonal to "y", "x" orthogonal to "z" and "z" orthogonal to "a" in 3d and 4d; and finally we place ourselves in 4d frame of reference with "a" orthogonal in pivot to "y" and we obtain all the necessary orthogonality.

Pseudo 3d. The pseudo 3d is the 4d frame of reference in 3d form from which we remove the parameters of (a, z), the geometry links resembling "forgotten links waiting for 4d color", and where the dimension "a" is hidden to simulate the starting 3d and its proximity to the 4d. Being less incomplete than the assumed 3d, the pseudo 3d allows confirmation that the parameters of (a, z) PO1 MO1 PL2 and ML2 are the parameters that add to the parameters of "x" and "y" in 4 dimensions.

In more concrete terms

The reasoning of geometry is a first because it allows to pass from a 3d reference frame to a 4d reference frame in 3d form by adding the dimension "a" in the rules while noticing all the same that there are parameters which are added in 4d.

Moreover, as the parameters remain geometrically linked by 8-parameter case, there are no incompatible spaces in 8-parameter physics and thus for all 4d.

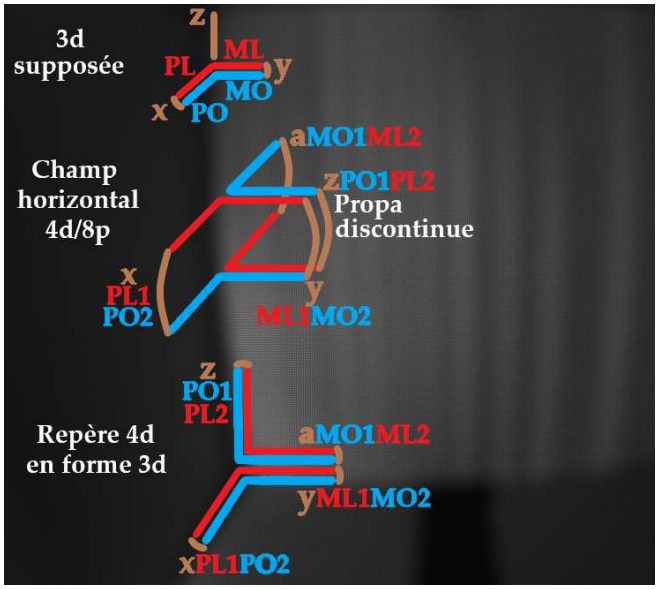
Still in physics, we obtain the characteristics of the field in the box or "horizontal field" as well as of a photon in the box: two 4d/4p benchmarks each observationally incomplete with only PL or PO in "x" are merged into an observationally complete 4d/8p benchmark of the horizontal field with PL and PO in "x", which gives the characteristics of a photon E=hC/λ in a point of space horizontal field that is 4 dimensions and 8 parameters

4d/8p, and this photon is constructed with two subparts 4d/4p each formed by a 2d Light and a 2d Shadow ; which is also a first since the characteristics in real space dimensions of a photon are obtained from a simple visual observation in reality.

Finally, after having noticed beforehand, from the drawing of the bright and dark bangs, that zPO1 positioned on the screen in the 4d/4p 1 reference frame is a discontinuous shadow propagation because of its orthogonality with PL1 in "x" and that zPL2 positioned on the screen in the 4d/4p 2 is a discontinuous light propagation because of its orthogonality with PO2 in "x", we obtain a property of discontinuity in direct propagation in space for the light and the shadow by gathering zPO1 and zPL2 in a single dimension of the observable 4d/8p field, that is to say zPO1PL2 which is thus a "double discontinuous propagation of light and shadow observed on the screen". And this interesting property will be useful to create pieces of light and shadow stopped or suspended in space like holograms using the field of light and shadow and its geometry.
In more concrete terms, we have discovered a fourth dimension of physical and mathematical space.

To be continued
By using a smaller box in which we let enter a little luminosity of the field, positioned on an eye or provided with a camera, we see the light propagating in the darkness of the box in the form of small luminous discs, and among the few special observations already made we can note the "hole in reality" which is the transformation of one of these disks into the image of a zone of the 3d space located in the field seen from a position different from the position of observation, that is to say a shortcut of directly observable space, which can be useful for example to observe a zone hidden by the 3d relief. But the field of light and shadow will also demonstrate a great compatibility with the observer's thought, its discovery marking the beginning of a new physics, more natural.

Simon Rivera



The assumed 3d, 4d/8p horizontal field and the 3d shaped 4d marker are in position on the fringe image. The slit is located in the extension of "x". In the horizontal field, we see the discontinuous propagation zPO1PL2 positioned on the screen.

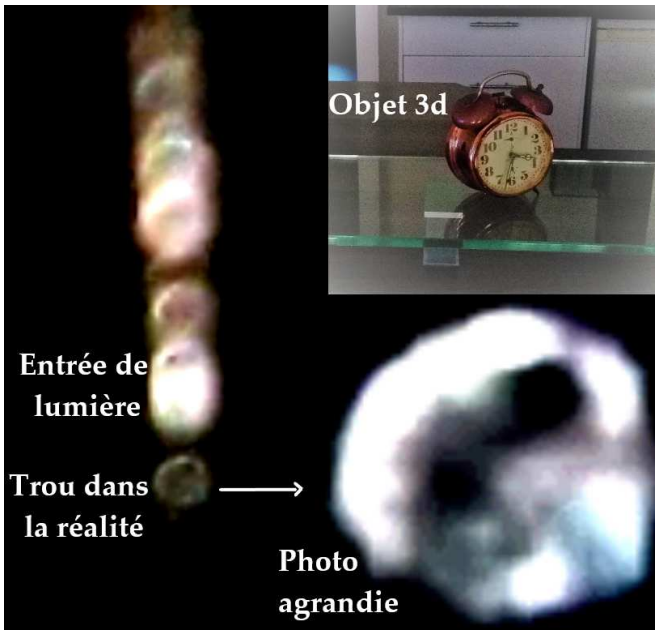


Image of a hole in reality obtained with a camera equipped with a small box pierced placed on the lens, the source being equipped with a bulb with 1 vertical filament. The luminosity of the field which enters the box reconstitutes the image of an object 3d located in the field.