

(iii) **An Image of the World**

A local event consists of 4 dimensions. In 3D computer graphics, you always count on 4 dimensions. As is known, there are two dimensions on the screen (2D for width and height) plus one dimension for the depth of the image and one dimension for the timing. The last two dimensions overlap each other as they relate to the causality of light as the cause of temporal development. The reason we must divide the depth and time is computationally due to the duality between the transmission of light from the object and the reception of the light in the subject as the receiving interpreter. (the eye and the brain or a measuring instrument, which in both cases is an object to the programmer.)

Historically, the term "right now and here" is called for a point. But in mathematical philosophy, the point has no extension, and therefore no existence over time in space-time.

A physical **entity**, somewhere in space, will always be extended to have a local existence.

We compare and refer here to the idea of the indefiniteness of quantum mechanics.

(iv) **Extension and Propagation of Space**

The way we can see the shape and extension of space is that the light is propagating.

We know that the stars had to be there, because the light comes to us from them.

The only way we can measure a distance in space is by utilizing light.

You might say, that at least locally you can just measure the distance with a stick, ruler, or tape measure. Here you must remember that light is needed to see the scale, and what holds the atoms in place in a material stick is light (electromagnetism). Thus, light is the only thing that expands the space for us and gives it form structure and extension. We just must keep in mind that in itself light is invisible, as we need light to see light, which is a causal contradiction.

(v) **The structure of light**

The traditional interpretation of light is, that it can be perceived as both waves and particles.

Let me try to describe an updated image of the light structure. Here I will start with Euclidean geometry. Here the concept of the line and the plane is very central.

Considered as a particle, the light moves along straight lines. As a wave, the light propagates as a transversal plane waves. How shall we understand this?

The **direction** of light is perpendicular to a transversal plane. Basically, the newest view of wave oscillation of light is a rotation in the transversal plane. The light always rotates transversely to the **direction** of movement. In physics, we represent the light **direction** by a vector **k**, which is perpendicular to the oscillation plane.

Popularly said, a vector is a line segment with a **direction** and a length, pictorially an arrow.

When we consider light as one particle (one photon) the photon has one specific energy E .

The energy of the photons is linked to angular frequency ω , $E = \hbar \cdot \omega = h \cdot \nu$, where \hbar is Planck's constant ($\hbar = 2\pi\hbar$) and the light cyclic frequency is $\nu = 2\pi\omega$. An example of this **quantity** is the colour of visible light, that is determined by the photon energy.

The particle momentum of the photons is $\hbar \cdot \mathbf{k}$, given by the wave vector **k** for the **direction** of light perpendicular to the transversal oscillation plane.

k has the length magnitude $|\mathbf{k}| = |\omega|/c = E/\hbar c$.

We imagine an imaginary photon, whose oscillation is a rotation in a circle, as it propagates **FORWARD** in the **direction** of light perpendicular to the plane of the circle. The **entity** that rotates is the electromagnetic field. A local field value in the free space rotates as it moves forward. This makes the rotation a spiralling helix movement.

The line arrow, the vector **k** represents the progressive helix spiral movement.

The imaginary photons can occur in two different states, left and right modes.

We will say the imaginary photons have the helicity +1 or -1.

We can now interpret the light consisting of an electromagnetic field wave whose local value rotates and moves forward at the speed of light.

The photon energy is given by the rate of rotation as the frequency of the rotation $E = \hbar \cdot \omega$. Since the imaginary⁴ photon is massless, its angular momentum is the same as its line momentum $\hbar \cdot \mathbf{k}$. In four dimensions we can express a photon by a four-component vector $k = \omega/c + \mathbf{k}$.

In summary, *all visual space* depends on light, and the propagation of light causes the idea of *time*. In all, we have the traditional concept of *space-time*.

Now we will proceed to develop an examination of an epistemology as an ethics foundation for understanding the a priori of physics.

The first chapters (pages 23-197) is originally written in Danish and translated into English primo 2017:

⁴ Imaginary just as the imaginary complex number plane, seen later throughout this book.