3.4.2. The Linear Movement

3.4.2.1. The Concept of the Straight Line, through what?[105]

We now look at the classic Cartesian space with length, breadth, and depth (x_1, x_2, x_3).
I look at the meaning of the ***qualitative*** concepts: length, breadth, and depth. First, I claim, the a priori synthetic judgment: that the depth belongs to the past and defines the future as the positive ***direction*** toward a receiver. We have the depth (t_3) as is seen from the receiver, and its measure as from creation *FORWARD* to annihilation. The transversal is so wide (for us the horizontal) and breadth (for us the vertical height). If we disregard gravity, these two terms are similar (width and breadth are just that which is across), these (x_1, x_2) are transversal to a receiver (the viewer) that looks at the transmitter (the object). This means that in the free space (without gravity) the polar coordinates (ρ, φ) are a better representation of the transversal concept, than the Cartesian (x_1, x_2). The coordinates for the view $(\rho, \varphi, x_3)^{\tau} \leftrightarrow (x_1, x_2, x_3)^{\tau}$.[106]
Thus, we introduce the concept, that the transversal ***quality*** is a rotation represented by the complex number $\rho e^{i\varphi}$ (instead of linear displacements in Cartesian coordinates)[107].
Concrete examples of such transversal planes are objects like paper, a screen or a wall tabula for your intuition or the subject of the hemisphere (the stars) as a substance that really rotates relatively in the depth of the deep celestial sky over you on Earth.
Now we jump right through the transversal defining the ***primary quality*** of the substantial concept ***direction*** from event A to event B. An ***entity*** for such ***direction*** subject can be: To define vectors as objects with the coordinate connections $\vec{L}_3 \sim (0,0,L_3)^{\tau} \in \mathbb{R}^3$ and $\vec{\omega} \sim (0,0,\omega_3)^{\tau} \in \mathbb{R}^3$.
From the formulation of classical mechanics, we have $L_3 = I_3 \omega$, where I_3 is a factor for moment of inertia, see (3.63), (3.66). Apparently, the angular momentum L_3 is proportional to the angular frequency ω. But ***quantum mechanical*** interpreted, a circle oscillation is excited with an angular momentum operator $\hat{L}_3$ according to (3.63)→(3.66)→(3.88)→(3.104)→(3.110)→(3.167) $\hat{L}_3|1,\pm1\rangle \doteq \pm 1\hbar|1,\pm1\rangle$ has double-orientated eigenvalues $\pm 1\hbar$ that are scalar independent of ω.
This fundamental independence of ***quantities*** is interpreted as the pure ***primary quality*** of one ***direction***, that as in (3.168) and (3.171) is represented of

$$\hat{\vec{\omega}} = +\vec{L}_3^{+} = -\vec{L}_3^{-} = \vec{\mathbf{1}} \sim \hat{L}_3 \quad \text{where} \quad \left|\vec{L}_3^{\pm}\right| = 1. \tag{3.206}$$

By (3.172) we have that this ***direction*** is characteristic of every development through a transversal plane. With the Hamiltonian eigenvalue equation $\hat{H}_{\omega}|1,\pm1\rangle_{\omega} \doteq (1\hbar\omega + \hbar\omega)|1,\pm1\rangle_{\omega}$, (3.166)
we understand that the excitation of the circle oscillator is given by a ***quantity*** of the angular frequency energy, which precisely represents the rotation vector $\hat{\vec{\omega}} \leftrightarrow \vec{\omega} \sim (0,0,\omega)^{\tau}$.
This implies that we measure $\omega[\hat{\omega}]$ in terms of our reference angular frequency $\hat{\omega} = 1$.
The unit vector $\vec{\hat{\omega}} \sim (0,0,1[\hat{\omega}])^{\tau}$ has the ***primary quality*** a ***direction*** of the axis of rotation.
This allows the rotation of the vector $\vec{\omega} = \omega\vec{\hat{\omega}} \sim (0,0,\omega[\hat{\omega}])^{\tau}$ in coordinates. $(\omega = \pm|\omega| \in \mathbb{R})$[108].
The spatial ***quantity*** of the extension is measured with the reference $[c\hat{\omega}^{-1}]$.
From this rotation vector ***direction***, a unit vector is written $\mathbf{e}_3 \sim (0,0,1[c\hat{\omega}^{-1}])^{\tau}$.
Although we count the two unit vectors $\vec{\hat{\omega}}$ and $\mathbf{e}_3$ to have the same ***direction*** they in our ontological intuition belong to two different scaling dimensions:

- $\vec{\omega}$ and $\vec{\hat{\omega}}$ belong to the rotation axis measured by the angular frequency $[\hat{\omega}]$.
- $t\mathbf{e}_3$ and $\mathbf{e}_3$ belong to the transmission measured by the development parameter $t[\hat{\omega}^{-1}]$, which can be transformed into an extension[109] $\vec{z} = ct\mathbf{e}_3$ measured with the unit $[c\hat{\omega}^{-1}]$.

[105] The idea of time as a causal linear ***direction*** dated back to Augustine (354-430): Creation Existence Doomsday.
[106] The coordinate set $(x_1, x_2, x_3)^{\tau}$ represents a column vector coordinates as the transposed of a row set (x_1, x_2, x_3).
[107] The factor ρ is not a dilation, but only a stochastic coordinate parameter of the radial distribution in the transversal plane.
[108] We let the negative frequencies $\omega < 0$ represent the ***quantum*** number -1 for $\vec{L}_3^{-}$.
[109] When the ***subton*** speed c of the extension is measured with the same reference $[\hat{\omega}]$, we can put $c = 1$.

These two dimensions are each other's inverse by multiplication $(\omega t = \phi)$, with the reference unit neutral element $\hat{\omega}^{-1} = \hat{\omega} = 1$. They complement each other as a ***direction*** of angular frequency energy $\vec{\omega}$ that propagates with $t\mathbf{e}_3$ by the development parameter t, which can then be exchanged for an extension $\vec{z} = ct\mathbf{e}_3$ by the ***subton*** speed of information c.
This complementary dualism by scaling around a ***direction*** has its cause in, that we through (3.166) insists, that the harmonic circle oscillator is excited with an energy eigenvalue $\hbar\omega$ as its own given ***quantity***.

3.4.2.2. The Unitary Direction as an Abstract Interpretation

The just mentioned complementarity means the introduction of a concept of an abstract unit vector $\vec{u}$ for a ***direction*** that I call a unitary vector,[110] I.e. $|\vec{u}| = 1$ without reference to any scale dimensioning in physics. Later below section II. 4.4, we will call this property ***a primary quality of first grade.*** When this is associated with something in physics, it represents pure ***quality*** as a ***direction*** only with its own ***quantity***, (the idea: $1 \cdot 1 = 1/1 = 1$)
When we multiply this with a real number, we get something rather ***quantitative*** $\vec{q} = q\vec{u}$.
The characteristic of the ***quantity*** is what capacity we attach to the ***direction*** concept.
Do we attach ***direction*** $\vec{u}$ to the concept depth of the natural space we can associate it with a coordinate vector $\mathbf{e}_3 \sim (0,0,1)^{\tau} \leftarrow \vec{u}$. In this way, the norm is simply left to the transcendental. Someone must then keep track of this, otherwise. The idea of the unitary ***direction*** is independent of the scalar design and is locked to the magnitude idea $|\vec{u}| = 1$.
We, humans, tend to immediately accept a concept ***direction*** as transcendental a priori given, and any understanding of its interfacing with the surroundings is taboo.
But I would argue that the ***direction*** is subject to the rotation in the environment, not only as an idea of the rotation group $U(1)$ with $\odot = \{U_\theta : \theta \to e^{i\theta} \in U(1) \mid \forall\theta \in \mathbb{R}\}$,
but also, as a created active circle rotation as a ***subton*** ${}^{\mathrm{AB}}_{\odot}\Psi_{\pm\hat{\vec{\omega}}}$ with ***direction***. I write

$$\hat{\vec{\omega}} \sim \vec{\mathbf{1}} \sim (0,0,1)^{\tau} \xrightarrow{subton} (\odot, 1)^{\tau} \sim (\circledcirc, 1)^{\tau} \sim (\mathbb{C}, 1)^{\tau} \qquad \text{and} \qquad \odot \parallel \circledcirc \perp \hat{\vec{\omega}} \tag{3.207}$$

Here I have suggested that the first two coordinates are indifferent as they represent the rotational symmetry $\odot$ of the transversal plane.
Traditionally, such a cylinder is represented by the polar coordinates of the cylinder $(\rho, \theta, 1)$.
This characterises the ***qualitative direction*** expressed by $\vec{u}$ for the created ***direction*** from a transversal plane $\vec{n} = \vec{u}$ is the idea of a *locus situs* for a created ***subton***, at an event A, which is the starting point for the ***direction***, which results in event B for its annihilation.

The rotation axis with the ***direction*** $\hat{\vec{\omega}} \leftarrow \vec{u}$ through A and B is the center axis of the polar coordinates, where the radial distribution follows $\circledcirc \leftrightarrow 2\tilde{r}(\rho) = \frac{2}{\sqrt[4]{\pi}}\rho e^{-\frac{1}{2}\rho^2}$, for $\forall\rho \geq 0$ in agreement with the auto-norm $|\hat{\vec{\omega}}| = 1$ and the transversal rotational symmetry provides uniform distribution over $\forall\theta \in [0, 2\pi[$. The depth in the development before B given as the angular phase development $|\phi_{\mathrm{B}} - \phi_{\mathrm{A}}|$ is an autonomous measure of the extension of the ***subton*** along the ***direction*** $\hat{\vec{\omega}} \leftarrow \vec{u}$.
From the frequency-energy eigenvalue equation (3.166) we have a given ***quantity*** of rotation joined with the given ***direction*** $\vec{u}$ of the rotation axis expressed as $\hat{\vec{\omega}} \leftrightarrow \vec{\omega} = \omega\vec{\hat{\omega}}$, then expressed $\vec{\hat{\omega}} \sim (0,0,1)^{\tau} \leftarrow \vec{u}$ Here we have already assigned a norm $|\vec{\hat{\omega}}| = 1$ to the vector, in that the real scalar $\omega \in \mathbb{R}$ for the angular natural frequency as a factor in $\vec{\omega} = \omega\vec{\hat{\omega}}$ only give sense if it relates the angular frequency norm $\hat{\omega}$.

[110] The abstract of the vector $\vec{u}$ is that it in principle exists in a space with arbitrary numbers of linearly independent dimensions $(u_1, u_2, \ldots u_j, \ldots u_N) \leftarrow \vec{u}$, in which it is unitarily required by $|\vec{u}|^2 = \Sigma_j u^j u_j = 1$. We must be able to choose a frame of reference so $(\ldots 0,1,0,\ldots) \leftarrow \vec{u}$.

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