

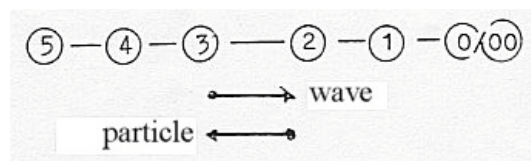
Electromagnetic Waves

Particles and waves - the double nature:

The double nature of matter and waves - or of their behaviour - as both particles and waves seems to have been a problem among physicist.

In the "dimension model" here this apparently contradictory behaviour is traced back to the fundamental opposition between inward and outward direction and the geometries of opposite, complementary d-degree poles, including angle steps:

- particle character in inward direction, enclosed centres, circular geometries,
- wave character in outward direction, radial geometries, direction towards more motions.



Three simple facts could illustrate the view here:

a) Photons of light waves with high energy can create electron - positron pairs in the neighbourhood of heavy atoms "which can absorb their momentum", according to the interpretation of physicists.

In terms of the model here we can say that the heavy atom as neighbourhood defines the radiation of photons as inward direction, and the absorption of momentum as one d-degree less of motions (~ higher degree of structure).

b) The so called photoelectric effect, which implies that there is need of a certain energy in the single beam, equivalent to a certain frequency, for the beam to knock out an electron from an atom shell, is an example of the particle-like or quantum-like property of the light. This is also an example where light has the inward direction.

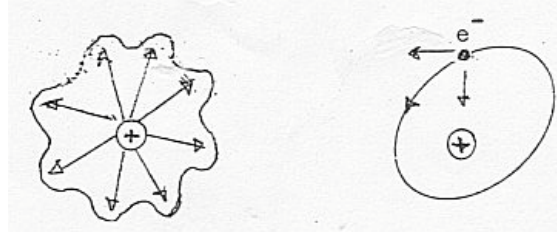
c) When atoms absorb a light wave quantum, coming in inward direction, it is transformed to a higher "circular" amplitude of electrons in the atomic shell. With return of the electron to a lower level, the energy is transformed to outward directed, radial radiation (waves).

*Even **electrons** have this double nature as particle like and waves, which should be possible to interpret in the same way: dependent on the direction, but in another d-degree than the photons of electromagnetic radiation.

In outward direction from the atom nucleus as centre, the electron should get its wave character, while as directed inwards towards the nucleus get its particle-like character.

This can be thought of as two moments in the Coulomb relation.

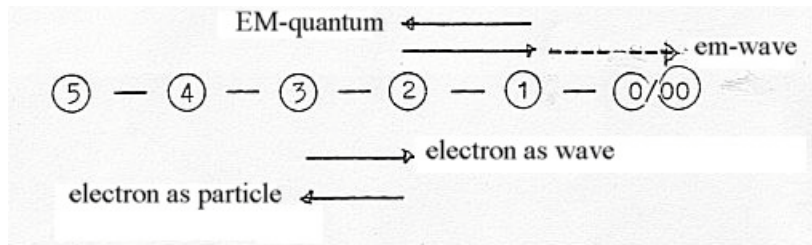
Outwards and inwards directions translated into the poles of 3rd d-degree: circular-radial:



- a centrifugal impulse moment, and in the rotation a tangential and a centripetal vector.

The aspects here give two different models of the atom, which can be said to depend on the direction of view: outward direction gives radial waves or electrons as "clouds"; (cf. Schrödinger's wave functions), inward direction gives electrons as particles in orbitals (as the Bohr model) ?

The dimension chain with indicated directions in point 4 above should rather, perhaps, be drawn as in the figure below, with charges and radiation in different steps:



The general interpretation here of matter (properties of Mass and Charge) with particle like character is seeing them as a kind of "inversion" of vector fields - in "negative" or inward direction.

(Note that we even among human beings as "particles" have a kind of interference phenomena - grouping together and no mans land between them...)

And in embryology we have for instance cellular tissue of skin which gets extinguished between fingers.)

Longitudinal and transversal waves:

(Shortened: L-/T-waves.)

L-waves (as sound waves, variations of densities along the path way in a field, is a 1-dimensional motion, anti-parallel motions "to and from each other", in a relation of 180° : $\leftarrow \rightarrow \leftarrow \rightarrow$)

They should represent the kind of waves in d-degree 4. (Compare the first identifications here, the "physical quantity" in d-degree step $5 \rightarrow 4$, identified only with the concept Density.)

We can presume that gravitational waves is of this kind, or rather the "GA"-waves, "G" for acceleration inwards, "A" for acceleration outwards, according to the interpretation of forces and "MEGA"-fields.

T-waves, the transversal electromagnetic waves (EM-waves), implies motions in 3 directions, along both the path way and transversal to this in two orthogonal directions, that of the E- and the M-vectors as polarised planes, a 90° relation.

a. Polarisations:

- L-waves: polarised in 1 dimension = that of the propagation way.
- T-waves: polarised in 3 dimensions, one along the propagation way.

b. Propagation directions:

- L-waves: propagates in 3 dimensions, spherically, around a central source.
- T-waves: propagates in 1 dimension, linearly.

R-waves?

There is a need for a third kind of waves here, between these two kinds above, to get a scheme that fits in our dimension model: waves that should be polarised in 2 dimensions and propagate in 2 directions. *Connected with which fields?*

Wave types and different temperature motions:

vibration	rotation	translation
1	2	3
\		/
d-degree of motion		

- L-waves: connected to and generated by vibrations
- R-waves connected with rotation ?
- T-waves: connected with translations of charged particles,

R-waves generated by rotation? The rather unknown "rotons" of circular structure (vortices) are mentioned in studies of liquids as liquid Helium.

Why shouldn't they exist also in the development of macrocosm from fields to aggregated masses?

Quanta of waves:

vibration	rotation	translation
[phonons]	[rotons]	[photons]

Wave types and their connection with elementary physical quantities:

In this model identifications of elementary physical concepts (qualities rather than quantities) with the different dimension degrees has been done as below (see the presentation of the model):

5	→	4	→	3	→	2	→	1	→	0/00
Density		Vector		Mass		Charge		Distance		Motion
		fields		Space						

One could eventually presume a description of wave types as follows:

- L-waves: Density variations in vector fields ?
- R-waves: Field variations in masses / space ?
- T-waves: Mass-Space variations in charges ?

Reasonable or not - ? - the waves can be understood as expressions for the motions out of lost d-degrees in structure of a unit. The variations conceived as the source of the waves.

(Since energy and mass are equivalent, we ought to have at least a little mass variation when the atom absorbs or emits electromagnetic radiation = T-waves.)

R-waves again: it seems as these waves or "rotons" are created at borders, through the polarity (and friction?) between solid matter and liquid, or more generally by difference in just Densities (and/or or velocities). If so, they could perhaps be interpreted as "derivations" from L-waves. (More about the 4→3-step and rotation in another file.)

A summary of d-degree aspects:

	L-waves	R-waves	T-waves
D-degree of the physical quantity that varies	4	3 ?	2
D-degree of propagation	3	2 ?	1

Wave motion as structure	1	2 ?	3

We have the dimension chain of motions in the opposite direction to the dimension chain of structure.

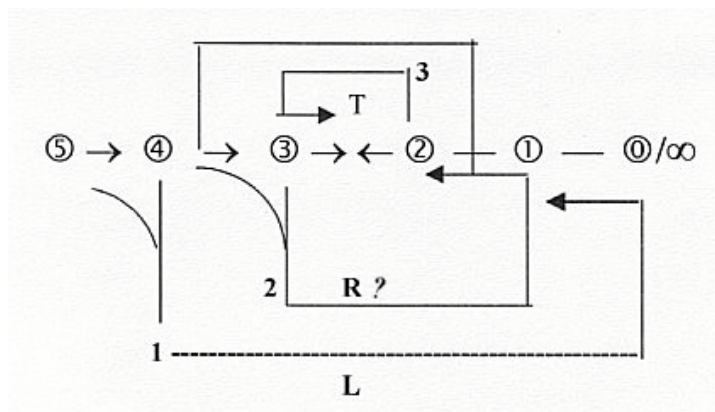
The role of waves in polarisations of d-degrees to lower d-degrees - ?

L-waves as motions become an aspect on the separation of matter ($\rightarrow \leftarrow \rightarrow$) –vacant space: matter in maxima, vacant space in minima, in universe.

(Together with eventual "R-waves" in next step polarising matter in orbital planes...?)

Perhaps could also the separation of plus- and minus-charges in microcosm be interpreted in terms of longitudinal and rotational waves?

Formally in this model lower d-degrees, ultimately motions, are assumed as polarising forces in relation to the higher d-degrees. If we see waves as these motions, and these waves meeting "from outside", "the other way around", the 1-dimensional L-waves should polarise d-degree 4 to 3, 2-dimensional "R-waves" polarise 3 towards 2, that is to the property of Charge,



and with 3-dimensional T-waves we get a turn in the direction, in the middle of the chain, so T-waves should uphold and confirm themselves and the existence of charges as their source!

(Longitudinal waves on the 4-dimensional field level are perhaps also expressed in what we conceive as the expansion of Universe and its counterdirection Gravitation, contraction?)

Critical notes:

Here as elsewhere the difficulty with this model appears: where to find the unpolarized d-degrees 4 - 3 - 2 - 1 which according to the model are binding forces in relation to lower d-degrees? They seem to have only a geometrical existence, not possible to identify in the physical world? (Einstein's et al 4-dimensional space-time is of course accepted but a geometrical, mathematical concept.)

According to the model we should have 2-dimensional waves (sea waves are one example) in d-degree 3, related to Masses and 3-dimensional Space. They should imply the loss of 1 d-degree in the spreading or propagation, to "orbital" planes. We could probably see such waves in the Schrödinger's wave functions for electron shells, and as a physicist has proposed in late decades, behind maintaining of the (plane) structure of the spiral arms of our galaxy (what he called "density waves" (if so derived to d-degree 2)).

Are they then connected with rotation, the typical 2-dimensional motion, or is there another principle behind the degradation of 3-dimensional propagation to 2-dimensional planes?

If coupled with rotation of masses, they could possibly be interpreted in connection with the despised centrifugal force (cf. about spin).

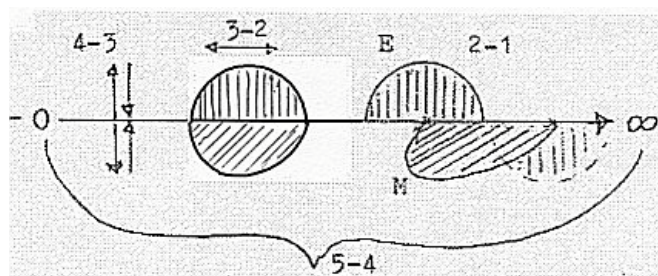
Then we have (presumably) other types of 2-dimensional waves in pure electric fields and pure magnetic fields?

The bigger problem in this model is that we have "no place in the dimension chain left" for a new pair of complementary forces as d-degree poles between G-A-forces and M-E-forces!

Could the weak force F_w be connected with R-waves in 2 dimensions -?? - and have a "counterpart" in macrocosm? Or rather the nuclear force? Or should one assume that the A-G-forces as poles 4b-4a of d-degree 3 **not** are connected with L-waves but with 2-dimensional "R-waves", rotations an expression for these "waves"?!

L-waves spreading in three dimensions should in that case be attributed to the unpolarized 4-dimensional fields created between the poles centre and anti-centre. (In ordinary physics seen as the 4-dimensional space-time). (Cf. perhaps the physicists' concept vector bosons as quanta of field waves?)

And what about 4-dimensional waves in d-degree 1 of structure, with poles assumed as charges +/- ? They should, according to the scheme, spread or propagate in 0 dimensions - ! - or in Time only!

EM-waves

Structure:

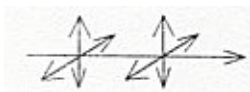
Polarisations:

- Nodes 0 ---- 00 (or ac - c - ac - c for a wavelength along the path line, defined by the electron jumps in the atoms:

$\leftarrow 00 \rightarrow 0 \leftarrow 00 \rightarrow 0 \leftarrow 00 \rightarrow 0 \leftarrow 00 \rightarrow$ *path line*
D-degree 1 of motion structure in d-degree 4.

- To — from the path line, the variation directions in the EM- vectors.
 $\uparrow\downarrow - \uparrow\downarrow - \uparrow\downarrow - \uparrow\downarrow - \uparrow\downarrow \longrightarrow$ *path line*
D-degree 2 in d-degree 3.

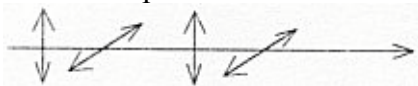
- E — M-vectors, orthogonal (90°) to each other:



D-degree 3 in d-degree 2.

To this comes

- Phase displacement 90°:



D-degree 4 (including Time) in d-degree 1

(Since analysis is optional according to this model, an electromagnetic wave should be possible to analyse as a 5-dimensional motion too, To the motions in 3 directions (x, y, z) comes plane and circular polarisation of light.

Unpolarized light: the vibrations define volumes, d-degree 3

Plane-polarised light: vibrations define planes, d-degree 2.

Unpolarized light is often described as motions "in all planes perpendicular to the path line". There must be a change of aspects (?) in this formulation: there is only one plane perpendicular to the path line, seen in the direction of propagation, while all other planes of variation include the path line, seen from the side.)

In simple geometry definitions:

According to a roughly sketched elementary hypothesis, the 3rd d-degree will be polarised into **radial and circular structures**.

This polarity, in the dimension chain of motions, is transformed to the amplitude variations of the radial vector fields, defining a circular circumference in the transverse wave.

In d-degree 2 then we have the complementary poles of E- and M-field variations, defining perpendicular planes, and the line, the d-degree of Distance, the common co-ordinate axis for the two partial planes E and M, in motions as sine/cosine waves (convex/concave forms).

A wave period (or wavelength) should most likely be seen as structured in simultaneity (backwards-forwards at the same time). In some respect should then a time division within a wavelength be impossible. (This perhaps a fact with coupling to Heisenberg's uncertainty principle?)

Added here:

As the electromagnetic T-waves includes both longitudinal factors and the doubly transversal ones, we could ask if not the assumed type of waves in **gravitational and outward acceleration fields (and eventual "R-waves") take part in these T-waves?** Behind the typical character of interference for example we could perhaps trace the influence from $F_G - F_A$ -waves?

Propagation:

How electromagnetic waves can propagate through vacant space has sometimes been seen as a mystery

With the dimension model here the Vacant Space (in line with Dirac etc.) is interpreted as the complementary pole to matter. With this starting point matter and vacant space should be interpreted as coupled via underlying level or higher d-degree as simultaneous results of a polarization. Coupled as "negative" energy and positive energy:

- E-field: as outward direction from the atom, from matter as the centre pole.
 - M-field, as inward direction, from vacant space as antimatter, the anticentre pole
- 00.

Negative energy $-Emc^2$ raised to zero:

The meeting with the complementary vacant space as "negative" energy" should imply a momentary depolarization on some level. We could presume the description that the **negative energy repeatedly is raised to the E0-level, that of the path line.**

Phase displacement as the cause:

The phase displacement between E- and M-fields seems as the real cause to the propagation and the condition for it, the possibility of pacing out a distance, - as the two legs of human beings in walking, while centre of gravity oscillates...

Energy E0 as the source:

The propagation way itself as a series of nodes 0-00-0-00... should be defined as energy zero or an E0-line, the border between E- and E+ as polar energy forms.

The secondary plus-energy (E'+), expressed in the frequency of the wave, depends on **how often the wave passes this E0-border.**

We can say that the wave **actually gets its energy from E0 as the primary source** of complementary energy forms, with roots in the 5th dimension degree.

Breathing vacant space

The light wave is **breathing vacant space**, which is another way to express the E/M-relation. As the atom does according to assumptions here. And that its existence as a partial structure with positive energy is established through this respiration still more directly than that of material particles.

In this context we could remember the deflection of light passing the sun. Einstein's interpretation in terms of the curved space-time met critics who suggested that the magnetic field around the sun could be responsible for this deflexion. This seems reasonable according to the view here: the light wave disturbed by this magnetic fields orientation, "undernourished" or eventually overfed in its dependence on it (the inward directed "negative energy" of Vacant Space "sucked out" around big masses in some sense). The effect could be the curved Space and shouldn't necessary contradict the view of Einstein?

Life reproduction

The propagation of the waves can be interpreted as a kind of consecutive copying out of the vacant space, with vacant space as "material", and in a real sense then the propagation shows **the fundamental structure of biological reproduction.**

Compare for example the construction of lipids for cell membranes $\wedge\wedge\wedge\wedge\wedge$ as an illustration of a periodical decimal fraction (1/7), and how cells through copying with help of material from the surrounding and division are feeding their own proceeding existence.

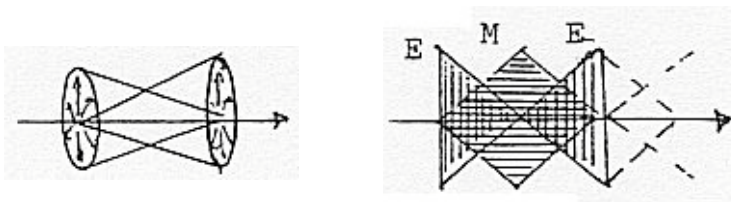
Hence, the light can be seen as the very model for eating and reproduction: the biological partition and duplication (out of the environment).

Lumosomes as chromosomes:

We have the similarity too between a light wave and the DNA spiral or "helix": the complementary bases G - C, A-T (even if two pairs in chromosomes, and something like a phase displacement and the turning around its axis - similar to a circular polarized light wave...

The backbone as a light wave!

These E- and M-fields with a phase displacement give the picture of **two counterdirected gradients** with origin in one another.



(In the figure above has the perpendicular direction of vibration been ignored.)

We can compare this structure with the way in which the **chord string and the backbone vertebrae** are build-in into one another or joined during certain stages in the embryonic development of vertebrates. (Then discs between vertebrae as a softer kind of "antimatter" ...).

Light waves reproducing themselves:

A dimension chain has the meaning too of 5 "derivation steps" leading to a secondary 5-dimensional unit, according to postulates. Such a mathematical chain in 4 steps is the example below:

$$\begin{array}{ccccccc} _ & \sin x & _ & \cos x & _ & -\sin x & _ & -\cos x & _ \\ & y & & y' & & y'' & & y''' & \\ | & & & & & & & & | \end{array}$$

(5th step as a pole exchange 0/00?)

Numbers of a dimension chain inverted:

$\text{Arc tan } 1/3 + \text{arc tan } 1/2 + \text{arc tan } 1/1 = 90^\circ =$ the angle and phase displacement between E- and M-field components in the light wave. Electromagnetic waves generated in d-degree steps $3 \rightarrow 2 \rightarrow 1$ according to viewpoints here.

Amplitude - Frequency:

Amplitude and frequency is joined physical quantities in a simple electromagnetic sine wave. They are expressions for complementary energy forms:

- **potential energy: - amplitude,**
- **kinetic energy: - frequency.**

They could be seen as results of a polarization of energy E_0 in 3rd d-degree, a polarization of the type circular / radial.

An energy quantum as an amplitude difference in the atom gets translated outwards to energy expressed in the frequency of the electromagnetic wave. That is, we could say, a conversion of the energy form from **circular to radial**, from amplitude to frequency, from potential energy to kinetic energy.

These energy forms are translated into one another at absorption and emission of radiation:

- amplitude becomes a measure of received and absorbed energy,
- frequency a measure of emitted energy.

$A \rightarrow f$: outwards
 $f \leftarrow A$: inwards

The difference in energy forms can be described from the viewpoint of forces:

- amplitude can be interpreted as a measure of the strength of the **polarizing force**, acting inwards.
- frequency inversely interpreted as a measure of the strength of the **binding force** (strongest furthest in), at translation outwards.

The translation - or inversion - from frequency to amplitude represents inward direction. The inversion from amplitude to frequency the outward direction.

(A little letter symbolism: f as in frequency can be written $1/T$ for Time. In DNA, the gene code, we have the base pair A--T, T representing the binding between the to chains of DNA, that is in its "inward direction". In its outward direction, when copying to RNA, the T-base is replaced with the U-base.

Compare the development of speech sounds from u to v, from v to f, f as in frequency!)

Amplitude - as connected with inward direction, absorption of energy, is then related to the 00-pole, with anti-centre. Frequency, emitted energy, is related to the 0-pole, with the centre.

Concepts as "**strong**" and "**weak**" energy becomes **complementary**, not only degrees of something on a scale. One step for an electron between high amplitudes (high potential energies) gives radiation of low energy, low frequency. One electron jump between low amplitudes (near the nucleus) gives high radiation energy, high frequency.

Frequency modulation gives a longitudinal information wave, a density variation along the propagation way. **Amplitude modulation** gives a transversal information wave, perpendicular to the propagation direction. - That means a relation at right angles, as radial versus circular geometry from the viewpoint of the atom.

The **same relation occurs in the nervous system**: There is amplitude modulation of nerve signals in the membranes of nerve cells - to compare with atom shells, and

frequency modulation in the nerve fibres - to compare with the EM-waves radially emitted from the atom.

Higher amplitudes could be thought of as corresponding to increasing potentials towards lower d-degrees in a dimension chain, longer distances to the E0-line:

c. Size is translated into numbers, numbers translated into size. Size: amplitude.

Number: frequency.

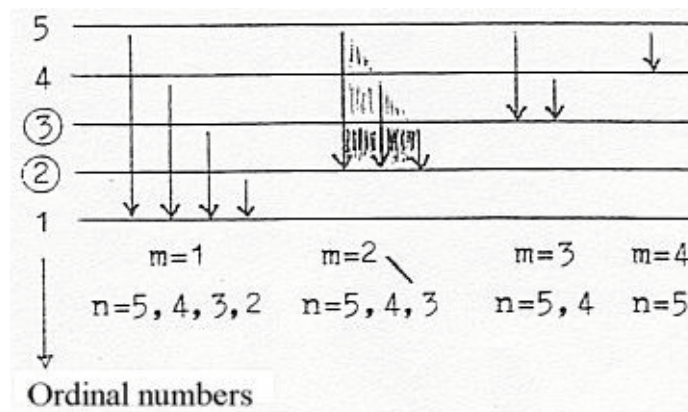
Inverse quantities (or qualities) in a simple sine wave.

(A dimension potential, which in a d-degree step outwards gets polarized to outer poles in next lower d-degree, will also be translated into quantities or numbers signifying the potential value of the lower d-degree. This according to a hypothesis in this model. A certain d-degree step could in that case represent a certain number of something.

It ought to imply that a number of equal units of something, for example of wavelengths - primarily should be quantified into groups of different sizes, representing d-degrees. And mean that nothing will happen before such a group has been "added up".?)

Lyman-Balmer-Paschen-Brackett-series:

There is a beautiful formula and series for possible electron jumps in hydrogen atoms (H), the so-called Lyman-Balmer-Paschen-Brackett series. If we count with only 5 of the possible jumps, we have them as in the figure below:



Dimension chain numbers as in opposite direction.

Visible light marked with shading.

The formula:

$$\frac{1}{\lambda} = \text{constant } R \left(\frac{1}{m^2} - \frac{1}{n^2} \right)$$

Rydberg's constant for the spectral lines of H, hydrogen:

$$R_H = 1,0967758 \times 10^7 \text{ (x 1/m)}$$

$$\text{For } m = 2, n = 5 - 4 - 3$$

The quotients between them, times 100, give reduced the A-numbers for three of the RNA-bases: U-A-G.

UAG and UGA are stop codons in the process of protein synthesis, and AUG, the codon for Meth, is starting the process.

What about the C-base, 111 Å? Lowest spectral line of oxygen (O) is 4368 Å divided with the H-line in the middle above 4863 Å is 1,11... (Other possibilities?)

And what should these spectral lines have to do with A-numbers of the RNA-bases?

Or why shouldn't they?

Compare all numbers we can get for amino acids, grouped after the codons, from the number chain of 5 - 4 - 3 - 2 - 1...See Amino acids.

Chromosomes too seem to have a double nature of particles / waves, in some respects follow the same structure model as light waves, although on a much superposed level

- There are chromosome "granules" - and spiral waveforms on different levels of organisation and / or in different phases.

Chromosomes are sometimes drawn as knots on a string.

It is the parted chromosome, the single thread that copies itself through material in the environment, in processes of the cell and its reproduction.

To EM-waves - additional aspects and hypotheses:

- **Light velocity**
- **Length of a photon?**
- **Hypothesis about polarizations between long and shorter EM-waves.**
- **Hypothesis about "side waves"**
- **Phase waves**