## Biology III

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## Part III

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## The Cell

## 1. Some general aspects:

1. A cell is a complex center, a " 0 -pole" in relation to its environment. At the same time it is a whole in itself, as dimension degree (d-degree) 5, $\sim 0 / 00$ in the background model applied here - including all the geometrical polarities of the dimension chain.

Chemical substances could be regarded as both building workers and building blocks that substantiate and illustrate an underlying drawing.

The enormous complexity in a cell seems only possible to understand if we regard it as results of internal polarizations within some already enclosed unit with a substantiated anticenter, an original structure of type $0 / 00$, center/anticenter (c/ac); the complexity a result of opposite, internal forces.
(Which kind of center, which kind of anticenter when first cell appeared?)

## 2. Why a relation between DNA or RNA and proteins as a genetic code?

It's one main question. Here the center - anticenter ( $\boldsymbol{c} \boldsymbol{- a c}$ ) relation between C -atoms in tetrahedrons of amino acids (ams) versus rings of the codon bases are stressed.

It is suggested that the relation can be illustrated with the hexagonal pattern below. Imagine a layer of graphite, or - with virtual free valences upwards next layer - a crashed diamond. (All substituents to C -atoms dismissed.)

Carbon rings, sharing edges, and centers with 3 radii (+ the virtual 4th) become two aspects on the same whole pattern. Two ways of reading.
(Other main classes of substances sketched as well.)

one peptide Suld prear tor

Fig C-1-7-Hex
One center with 3 radii is defined by 3 rings - as amino acids by codons.

The horizontal peptide in the figure above can illustrate how side chains of amino acids must point in opposite directions for each amino acid to get a separate triplet of bases. Codons too get opposite directions:


Fig C-8-Hex
(Eventual implication for interpretation of proteins?)


Amino acids (3 of them) give main contributions in synthesis of the bases. The simplest amino acid Gly makes up the very center at synthesis of the purine bases A and G. Asp makes up about half the pyrimidine bases. (Moreover, an amino acid as Ile is used in synthesis of fatty acids.)

One 6-ring in the bases gives theoretically, $2 \times \mathrm{N}-\mathrm{C}-\mathrm{C}$, the bound backbone chain in an amino acid. (See further The protein synthesis.)

Mean mass value of a codon base (RNA) is $126+1,6 \times 21+1$. Mean value of a side chain of amino acid is approximately half this number, $63,3 \times 21$. (About "A-Z"-numbers here.).

3 units with a central C -atom and 3 radii shape a 6 -ring. Cf. about mass number transformations in the genetic code where 8 bases give the backbone chains or side chains of 24 amino acids, a relation $1 / 3$.

RNA-chains have been found to possess a certain catalytic capacity, which may be easier to understand with the hexagonal illustration.

In our cells it's the halving of 6C carbohydrates (however transformed to 5C rings + 1 C , fructose) that through glycolysis and citrate cycle leads to synthesis of fatty acids and amino acids respectively.

About fatty acids, the illustration can be compared with the fact that the double layer of lipids in cell membranes at a certain temperature $\left(\sim 37^{\circ}\right)$ get hexagonal structures, an unstable state of phase transitions ( $\mathrm{Z} f$ ).

The figure doesn't include pentagon rings, the extra 3 edges in purine bases, not differences in angles of valences, nor any substituents. With the figure above it's not the intention to assert that this was 'the way it happened'. Yet, it may illustrate the close relations between substances and the underlying two aspects on the whole structure: a pattern of rings or a pattern of centers with 3 radii.

The idea of a crashed diamond leads to the thought of different substances created from the different ways and diffraction of light in a crystal.

## A speculation about phase waves - a very abstract thought:

From a hypothetical reasoning in a file on physics it could perhaps be possible to apprehend proteins (and other classes of substances) as a kind of "phase waves" on a superposed, substantiated level: expressions for relations between other substances as "waves" . Or DNA (RNA) as materialized phase waves between protein chains? (Cf. about the Balmer series for spectral lines of hydrogen, fig 1-1.) It contradicts of course scientists' opinion that such waves don't contain any information.
(If the mass numbers of codon bases could be associated with d-degrees or steps between d-degrees in different ways, see the Genetic code, and these steps also include angle changes, then the relation between the nucleotides as "rotating vectors" could give birth to phase waves? Such waves - or complex relations between them, could be imagined to decide the row of amino acids in a protein - or follow from them?)

## 3. The protein synthesis:

Compared with the view in the hexagonal pattern above and the very close c/ac-relation amino acids/bases, the synthesis of proteins in a developed cell appears as a much more complicated process "the other way around":


Fig C-10

Illustrated according to the loop version of the model - or as in a circle:


Fig C-12


Fig C-11-144-1-12
One theory among scientists about origin of the genetic code assumes a preceding stage of close connection between codons and amino acids before the transcription system developed. In secondary forms a close relation appears in DNA rolled up on histones, in ribosomes and in tRNAs, binding individual amino acids etc.

Could perhaps the existence of the special membrane-enclosed nucleol within the very nucleus of the cell, at a certain chromosome, containing material for the ribosomes (rRNA), reveal something about such an underlying origin of closer dependence?

Why this complicated, circumventing process to produce proteins? While amino acids directly engage in constructing bases, contributing most of them, the way from bases (ac-pole $\sim 00$ ) to amino acids (c-pole $\sim 0$ ) becomes very different, a "code", as a reference over the distances created by the separation.

One aspect with reference to the dimension model could be that outward direction from a 0 -pole ( $\mathrm{c} \rightarrow \mathrm{ac}$ ) implies radial structure in d-degree 3, while inward direction from a 00-pole appears as 'circular'. These complementary geometric forms could have decided the geometry of the very processes (?).

## 4. A cell as inversion of an atom:

The cell as the "elementary particle" of biology can be interpreted as an inversion of an atom. Its outer cell membrane may be seen as a potential barrier, an inversion of the nuclear, strong force (Fst).

- The lipid bilayer membranes keep together solely by hydrophobic bonds, an $\mathrm{H}^{+}$aggregating, gluey force, while proteins, DNA and other inner structures are built by the covalent force between atoms with unsaturated electron ( $\mathrm{e}^{-}$) shells. (About views on chemical forces here.)
$\mathrm{H}^{+}$and $\mathrm{e}^{-}$become elementary "carriers of forces" on the chemical level. - Charges are reversed, with relative negative charge on inside, positive on outside.
(Positive (+)-charge seen as originating from inward direction, negative (-)-charge from outward direction.)

A cell membrane as a surface is "semipermeable". It's characterized by changing phases or degrees of permeability. Permeability as a physical quantity is inversely proportional to charge squared. CF. d-degree 2 as surfaces and charge in this model assumed as a 2-dimensional physical quantity.

A cell in its main structure shows also a reversed relation mass - space in the relative sense of phases: membranes as anticenter of the cell around inner space. In atoms the protons $\left(\mathrm{H}^{+}\right)$represent most of the mass, while outer electron shells make up most of the atomic space.

About other suggested inversions, see file $1 / 7$, and mass number 544 in the genetic code as from the inverted p/e quotient.
(All physical forces, which in these files are interpreted as developed out of one another, must reasonably be expected to appear in the cell in their chemical versions. And naturally, a cell can be described in all physical quantities interpreted as steps in a dimension chain. (Density introduced as a first such quantity defined by the polarization center - anticenter, in later step expressed as mass per volume, in step $1 \rightarrow 0 / 00$ as distance per time and frequencies.


Fig 13-145-1

## 5. Proteins - Lipids, the macro-level structure:

In the cell, on its macro-level, the proteins come to form the main radial structure, the cytoskeleton, while the fatty acids as lipids make up the roughly circular structures, the primary cell membrane (in eukaryotic cells the nuclear membrane, the endoplasmic reticulum (ER), Golgi apparatus etc.)

It's the two main structure-building parts of the cell and the geometrical polarity radial - circular as poles out of d-degree 3 in the dimension chain.
(It's not the whole truth, since protein threads are also found as "horizontal" layers inside lipid membranes an as nets outside these on some kind of cells. Yet a main polarity.)


Fig 14-143-1
Protein threads as F-actin and microtubuli stretches radially outwards through cytoplasm and likewise in cilia and microvilli. Other proteins form the radial canals in lipid membranes. They function as infrastructure and transport tracks, as for instance spindles at cell division obviously also as vectors.

At protein synthesis the peptide chains grow 'straight through the walls' of lipid membrane in the endoplasmic reticulum in a way that feels curious, if not founded in a basic geometry.

Radial structures are principally unlimited outwards, circular structures closed. It's the same polarity as between electric and magnetic field lines $\mathbf{E}$ and $\mathbf{M}$. Cf. in file about forces relations to protons (p) and electrons (e) within plasma physics:
$\mathrm{p} \sim \mathrm{M}^{2}$
$\mathrm{e} \sim \mathrm{E}^{2}$
Hence,we find a connection between magnetic fields squared, protons $\left(\mathrm{H}^{+}\right)$and the closed H -bonded lipid membranes of a cell, as between electric fields squared, electrons (e) and covalent bonds of proteins.

The fact that the cell membrane in itself is a structure of both kinds, containing about $50 \%$ proteins, $50 \%$ lipids, could remind of light beams with their regular phase displaced changes between E- and M-factors. Compare again possible readings in figure 1 above.

In the dimension model the radial and circular poles of d-degree 3 may be seen as derived from 0 - and 00 -poles respectively in a haploid chain, illustrate in the figure below, however somewhat misleading: the steps for lipids sooner should be angled more perpendicular to the steps for proteins.

Amino acids in protein derive from molecules of 5-4-3C (carbon), while the synthesis of fatty acids is a repetitive process in step 3-2: (3C-1C $\rightarrow 2 \mathrm{C}$ ) to $\mathrm{n} \times 2 \mathrm{C}$. (Cf. 2 as d-degree of a border, a surface.) It's a synthesis on a multienzyme complex with amino proteins involved and amino acid Cys providing the HS-sites for attachment during the process..(Cf. Cys, mass of side chain 47 A , total mass of side chains of amino acids from 24 differentiating codons $=32 \times 47$.)


Fig C-15
In geometrical macro-structure the lipids develop in steps 1-2-(3): from linear fatty acids, d-degree 1, to 2-dimensional when with backbone chain of glycerol (3 C) to the spherical membrane enclosing 3-dimensional volumes, demarcating different phases and rooms.

About glycerol and polarization of carbohydrates, 6 C , into $2 \times 3 \mathrm{C}$, see below.

An essential process as from middle step 3-2 is the Pentose-phosphate cycle, that implies transformation of $5 \times 3 \mathrm{C}$ into $3 \times 5 \mathrm{C}$ (note number 15 , sum of d-degrees in the dimension chain), where one way is $6 \mathrm{C}-2 \mathrm{C}$ to $4 \mathrm{C},+3 \mathrm{C}$ to $7 \mathrm{C},-2 \mathrm{C}$. ( $7=$ sum of poles in d-degrees 3 an 2.)

It can be added that when plants build in 1 C from the air in a 5 C carbohydrate to 6 C , it is in the middle between 3 rd and 2 nd C -atom.
[About classes of substances on the molecular level here.]

## 6. L-waves, T-waves and subunits:

Fatty acids as subunits of lipids have a similarity with longitudinal L-waves, although in a zigzag shape. (Cf. perhaps the movements of single P-lipids along the membrane during its fluid phase.) Protein chains, unfolded, with their side chains of amino acids, correspond in a similar way to transversal T-waves.

It's presumed in the model that L-waves as linear, 1-dimensional,
[ $\rightarrow \leftarrow \rightarrow \leftarrow \rightarrow \leftarrow \ldots$ ] are connected with forces $\mathrm{F}_{\mathrm{G}}$ and $\mathrm{F}_{\mathrm{A}}$, gravitation and the complementary outward acceleration force. These represent d-degree 4 in a dimension chain of forces and are interpreted as polarized into positive and negative (rather antipositive) curvature in step $4 \rightarrow 3$ in the model here and appear in the polarity Mass and Space in terms of physical properties.

Membranes are connected with the polarity Mass - Space in the secondary sense of differentiating phases. Their $\mathrm{H}^{+}$-bonds (methyl bonds), connected with mass, are identified as pole 4 a among chemical forces, i.e. inward direction. The bilayers, however, of fatty acids in membranes can in fact be seen as illustrating both the inward and outward directions of d-degree 4.
(Cf. about linear waves as motions in section 8 below.).)
T-waves are exemplified by the more well-known electromagnetic waves and the force Feм, $[\downarrow \rightarrow \leftarrow \downarrow \rightarrow \leftarrow \ldots]$ with the complementary electric and magnetic factors $\mathrm{Fe}_{\mathrm{E}}$ and Fm. It's presumed as a force developed in following step 3-2 in the model.

The covalent bonds in proteins are identified as pole 4 b in the dimension chain of chemical forces, implying outward direction. Peptide bonds include polarity of charge $\left(\mathrm{NH}_{3}{ }^{+}-\mathrm{COO}^{-}\right)$and represent the L-factor in proteins as T-waves.

With these identifications the lipids come to represent a deeper, underlying level in relation to the proteins, where we for instance also have an angle step in the phase displacement between field components from $180^{\circ}$ to $90^{\circ}$.

How to regard this contradiction? The only way (?) seems to be to regard debranched degrees from higher steps meeting "the other way around" in accordance with the loop model.


As waves proteins and lipids should correspond to a substantiation of the dimension chain of motions:

- Step $5 \rightarrow 4$, physical quantity Density proposed, 1 degree debranched, linear waves as polarizations of density. (Bilayer of P-lipids as micells appear at higher density.)
- Step $4 \rightarrow 3$, Direction, d-degree 4, polarized to a perpendicular angle, $90^{\circ}$ : Twaves, 2-3-dimensional depending on aspect.

Both wave types contain the features of both poles of the higher d-degrees $\rightarrow 4 \rightarrow 3$. Backbone chains of the proteins (typo L-waves but expressed in quantity charge, d degree 2 ) become expression for divergent inner space (pole $4 b$ ), sustaining it as radial cytoskeleton.


Fig C-17
Waves as such could probably be best understood as the sewing together of the two complementary fields in each d-degree.

If the aspects above on lipids and proteins as corresponding to the polarity between Land T-waves, it leads naturally to other speculations. See section 8 below..
(It has to be added here that Archae bacteria, assumed as the oldest unicellular phyla, uses isoprenes, molecules of 5C, instead of fatty acids of $n \times 2 \mathrm{C}$ in their membranes. It implies carbon groups as a kind of transversal factors in their lipids too.)

## 7. Polarizations into complementary "poles"?

According to the dimension model a developed cell should be possible to interpret as the result of polarizations into complementary "poles" as partial structures in different degrees and on a lot of levels. When it concerns the elementary definitions: opposite vector directions, mass - space, charges $+/$-, outside - inside, divergent - convergent motions etceteras, all kinds of complementary polarities can too easily be found in a cell - but how about classes of substances on a more concrete level?

## Carbohydrate - fructose:

The most obvious example is the division of carbohydrates: the halving of an hexose (fructose), leading to lipids and amino acids of proteins, i.e., the main circular versus radial structures of the cell.

Two 3C pyruvate +/-1 C gives
a) C 4 (note sign + , inwards) to mitochondria to oxaloacetate in citrate cycle (note a cycle), and
b) outwards (sign -) C2, Acetyl( $\sim \mathrm{Coa}$, ) leading to to fatty acids and isoprenes.


Fig C-18
In this process the glycolysis also gives the polarity between perpendicular parts of triglycerides (glycerol versus fatty acids).


Fig C-19-147-1
In a secondary or synthesizing way we find the branching from Acetyl( $\sim \mathrm{CoA})$ to elements in the two classes fatty acids, (the repeated process C3-C1 to $\mathrm{n} \times \mathrm{C} 2$ ), and isoprenes/steroids ( $3 \times \mathrm{C} 2-\mathrm{C} 1$ to $\mathrm{n} \times \mathrm{C} 5$ ). The amino acids Ileu and Leu that only differ stereometrically, contribute to fatty acids and steroids respectively.
(The ways for Acetyl(~CoA) has also a preceding ramification, where one joins the citrate circle, the "protein way", leading back to 6C - 5C molecules, here as keto acids.)

## DNA-strings:

The division of a carbohydrate as fructose leads to different classes of substances. When it concerns internal polarizations within the classes, DNA seems to be the only (?) or most obvious structure that corresponds to an unpolarized "d-degree".

It's opposite strands represent codons of mRNA and tRNA gets polarized into complementary units or "poles"; meeting "the other way around" on ribosomes as mRNA $\rightarrow \leftarrow$ tRNAs at the protein synthesis.

The opposite directions of strands lengthwise and the complementary forms of the bases underline the polarities as does the complementary syntheses of the bases.

## Complementary directions in structures:

Within classes the most obvious examples of opposite directions in structures are DNA strands and bilayer of lipid membranes between inner and outer rows of P-lipids.

There are striking similarities between these two molecular compounds with very different functions. Both consist of a) P-group, b) a carbohydrate element, c) then the specialized molecular objects: codon bases and fatty acids respectively:

P-group $\rightarrow$ deoxiribose $\rightarrow$ base $\longrightarrow \mathbf{H}$-bridge $<$ - base $\leftarrow$ deoxiribose $\leftarrow$ P-group $\mathbf{P}$-group $\rightarrow$ glycerol $\rightarrow$ fatty acids $\longrightarrow \mathbf{H}$-bonds $<$ - fatty acids $\leftarrow$ glycerol $\leftarrow \mathbf{P}$-group

The POxHx-groups surround both structures as "first and last" elements - as do the poles 0 and 00 out of d-degree 5 in the dimension model.

Notice P-atom, valence 5. and d-degree 5, polarized 0-00, origins for primary binding and polarizing forces in the model. (Cf. too fructose-6-phosphate that first when enclosed between two P-groups in fructose 1,6-bisphosphate can be halved by an enzyme.)

Another similarity may be seen in the perpendicular, vertical - horizontal bonds between P-groups and the carbohydrate part.

Simultaneously there is the principal difference between "linear" structure of glycerol and fatty acids in lipids and the ring closed corresponding parts in DNA, like a step from d-degree 1 to 2 . And ribose in DNA, 5C, presupposes the pentose-phosphate cycle $5 \mathrm{C} 3 \rightarrow 3 \mathrm{C} 5$.

About the different parts, it seems that the complementary relation between inner bases of the DNA-structure above could have correspondences in the outer, different kinds of attached molecules to "heads" of P-lipids on inner and outer layers respectively of membranes (Wikipedia, Lipid_bilayer).

We can also remember how the chains of fatty acids of lipids arrange in hexagonal patterns - like the one in codon bases - during certain phases. Geometrically it appears as a d-degree step 1 to 2 .

The correspondence between these central versus anticentral constructions needs certainly a better interpretation.

One view in terms of valences, to compare with the figure above on lipids and proteins as L- and T-waves. C-H valences $4--1, \mathrm{~N}-\mathrm{O}$ valences $3-2$ :


Fig C-20

## Polarities within lipids and proteins:

Compared with DNA a similar structural division of lipid membranes seems not to exist (?). If there is any complementary features between P-lipids of inner versus outer layer, in origin or construction, it doesn't seem recognized yet. There is however other kinds of internal polarities:

One is the transition between phases, which both can exist simultaneously on different parts of the membrane: the solid gel phase and the fluid one - as if area of the membrane had inherent subdivisions (?).

Another opposition is the just mentioned changes between ordinary and hexagonal structures (Zf p. 181).

A third feature, more adequately identified as a polarity, is the ability of lipid layers to form "plain and purl" structures, heads outwards or inwards: the polarity of directions out of d-degree 4. It's also a polarity of charge out of d-degree 2 in the model. The geometrical polarity of d-degree 2 has been defined elementary as outside/inside. On a macro-scale the bilayer membrane illustrates it. The sense or function, if any, of such inversions seems not clear.

One older observation was that fragmented membranes of mitochondria appeared some with "knobs" on the outside, some with these knobs on the inside, thus examples of such polarities and inversions.

Evaginating/invaginating parts of the membrane forming vesicles illustrate one kind of 3 -dimensional motion, assumed in structures of d-degree 2 and at the same time the polarization of directions of d-degree 4 . Cf. meteorology: high and low pressure cells debranched from Rossby waves around the North Pole.

Among proteins, there are one main polarity between synthesizing and breaking enzymes.

Another fundamental one seems to be the one between proteins as transporting vehicles, some transporting molecules outwards, some inwards - as kinesin and dynein in cilia
tubuli. They illustrate the opposite vectors of d-degree 4. (It would be very interesting to know which factors, amino acids or codons or other factors in such specialized proteins that are decisive for their complementarity.)

Certainly many other such examples of complementary proteins exist, also acting on long distances from one another. Are such complementary pairs of proteins eventually a fundamental principle rooted in the genes?

Human genome includes more than 100,000 proteins, while number of genes is only about 28,000 according to some data. It means that one gene on average should code for about 4 proteins. Through different frames at transcription or different cuttings of mRNA before? Do proteins from the same gene eventually show on polar relations in their functions?

It's hard to imagine any common x-dimensional unity as origin for complementary proteins, if not in opposite pieces of DNA-strands or perhaps in complementary folding?
(About classes of substances in cells, see further Biochemistry.).

## 8. Speculations:

## a) About L- and T-waves:

If we accept the hypothetical view in No. 6 above on fatty acids and proteins as substantiated L- and T-waves, and these are taken as connected with the pairs of forces $\mathrm{FG}_{\mathrm{G}}-\mathrm{F}_{\mathrm{A}}$ and $\mathrm{Fe}_{\mathrm{E}}$ - $\mathrm{Fm}_{\mathrm{M}}$ respectively, it awakes two kind of questions.


Fig C-21


Fig C-22
$\boldsymbol{A}$ first question is if proteins in any way or sense could be seen as derived from or later than lipids (!) as lower d-degrees from higher ones? Nothing in actual, internal biochemistry of a cell supports such a view. As atoms N and O derive from C in the carbon-nitrogen cycle of fusion in the sun but that's another history. Could some first amino acids have been constructed on, in or between bilayers of P-lipids? We can only point to some close relations: the attachment of ribosomes to membranes when protein synthesis occurs, the protein chains growing straight in through the membranes of the endoplasmic reticulum, processed further within the membrane enclosed rooms, as in the Golgi apparatus - and the $\sim 50 \%$ proteins curiously 'interrupting' the outer cell membrane itself.

The second question is if expressions for the pairs of connected forces in some way can be identified in the lipids and proteins.

About lipids, we could ask if the inner layer of a bilayer membrane differs in some essential but hidden way from the outer layer, in kinds of fatty acids or something else, mirroring the opposition between space and mass, between forces $\mathrm{F}_{\mathrm{A}}$ and $\mathrm{Fg}_{\mathrm{G}}$ ? There is the above mentioned inversions in directions that nets of P -lipids can undergo with P -
groups inward or outwards. (When? Under which conditions? If it is or gets explained, what could it eventually tell us about this relation $\mathrm{F}_{\mathrm{A}}$ - $\mathrm{FG}_{\mathrm{G}}$ in macrocosm?

Perpendicular to direction of a lipid, along the membrane,,,, L-waves seems expressed in motions: There is the curious fact that in the fluid phase "a given lipid will exchange locations with its neighbor millions of times a second" and thus can wander along the membrane (Wikipedia: Lipid_bilayer). Is this behavior really necessary! Biochemically? It sooner seems as just an illustration of an L-wave
$\rightarrow \leftarrow \rightarrow \leftarrow \rightarrow \leftarrow$ and the pole exchanges in d-degree $0 / 00$ of Motions in the dimension model.

In the model we have structure of a certain d-degree plus debranched d-degree as external motion. Regarding the fatty acids as substantiated structures of L-waves, the debranched d-degree - in a step from higher Density ( $5 \rightarrow 4$ ) to lower - could get this expression?

About proteins, they should illustrate the relation between $\mathrm{FE}_{\mathrm{E}}$ and $\mathrm{F}_{\mathrm{m}}$, the electric and magnetic forces or factors of Fem. Besides their role as cytoskeleton, like a static EMfield, they may be said to represent a communication system, distributed long ways as are EM-waves.

We could ask if any of the many polarities between amino acids or their codons in some way represents the opposition M-fields versus E-fields with some functions related to circular versus radial geometries? Surely an odd and here unanswered question. It's easier to imagine the relation between purine and pyrimidine bases of codons in terms of E - versus M -components ( $\mathrm{G}, \mathrm{A}$ versus $\mathrm{U}, \mathrm{C}$ or ? ).

## b) About amplitude versus frequency modulations:

Isolating the features of inward - outward directions in membranes versus proteins, it may be asked if the polarity between amplitude and frequency modulation in some way could be applied on these substances. In atoms the absorbed incoming energy of photons get translated to higher, "circular" amplitude of electron orbitals, while frequency of emitted energy are decided by radial electron jumps between orbitals. In nervous signals we have the similar polarity: amplitude modulation of incoming signals through dendrites of the nerve cell, note spread in its membrane, and frequency modulation in outgoing responses through its axons towards other cells.

The genetic code is a "language" and the 20 classical amino acids correspond in number roughly with number of phonemes in different languages, phonemes which are different combinations of frequencies.

Lipid membranes are difficult to study and hitherto they don't seem to be attributed much of individualized properties by scientists. However, the different membranes of nucleolus, the nucleus, the endoplasmic reticulum, the Golgi apparatus and cell membrane represent roughly different amplitudes. Could their positions eventually give them some hidden but essential differences that decide their roles for different processes and metabolism? One example is perhaps that certain parts of ER attract ribosomes. A more obvious one is the Golgi apparatus, where protein chains are undergoing different modifications within the different apartments outwards: why these steps in the modifications?

Elementary sketch of membrane amplitudes:


## 9. A cell as substantiation of motions:

In a dimension chain of structures outwards, the debranched degrees transformed to external motions come to form a dimension chain in opposite direction inwards. This according to the elementary postulates in the dimension model.

It awakes the thought that a cell would be best understood as a substantiation of this inward directed chain of motions, in this sense also an "inversion" of the atom (cf. No. 4).

$$
\begin{gathered}
00: 0<1<-2<-3<4<-5 \quad \leftarrow \text { D-degrees of motions } \\
5 \longrightarrow 4 \longrightarrow 3 \longrightarrow 2 \longrightarrow 1 \longrightarrow 0 / 00 \rightarrow \text { D-degree of structure }
\end{gathered}
$$

Fig C-24
Related is the fact that most structure-building in the cell occurs as steps inwards, from single units to linear additions to 2-3-dimensional structures of the type

$$
3 \leftarrow 2 \leftarrow 1 \leftarrow 0
$$

Among the multitude of motions there are the high mobility of cell membranes, invaginations and evaginations as 3-dimensional motions ( $\sim$ convex/concave as one polarity of d-degree 2 ) and contractions/relaxations of protein threads as a kind of 1dimensional vibration.

Nucleus and other organelles of a cell can also move around in the cell (cf. "translational motion in 3 directions?) and even rotate. The cytoplasm itself is continuously streaming in different directions ( Fb p .10 ).

The whole cell as a prison for trapped motions?
The metabolism of cells with nourishment from its environment corresponds to the presumed "breathing" of atoms, i.e. how atoms uphold their existence and structure through "breathing" of what is antimatter on their level - the surrounding "empty" space. Structure of matter breaks down when gravitation of Mass chokes the access to Space. Cf. the interpretation of light waves too.

## 10. About number 5 - as dimensions in the model:

- One, most elementary example is valence 5 of the P -atom: the HxPOx-groups having organizing and energy-storing functions in the cell.
(Could inorganic phosphorus eventually have served like a grain for growth of snow crystals, when a cell appeared?)
- A second example is ribose, the 5C-molecule of carbohydrate, essential in .nucleotides. As mentioned above the Pentose-phosphate cycle transforms 3 ribose C 5 to 5 C 3 -molecules. There we have the number 15, sum of the d-degrees in the dimension model Cf . $\mathrm{HCOH}=30 \mathrm{~A}$, sum of poles in the model.
- Another 5C-molecule is isoprene, three of which join to one C15 and these may join head to head, i.e. in opposite directions to form squalene of C30 on the way to steroids; 30 the sum of outer complementary a- and b-poles in our model.
Mentioned above too is the old, single-cell Archae bacteria, which uses isoprenes to create fatty acids (Wikipedia). As two C15 molecules can meet head to head, so can these isoprenes of Archae join their tails in a similar way.

On the level of organelles it has been found that ribosomes, where protein synthesis occur, appear usually in groups of about 5 in bacteria (Bc p. 79). Ribosomes are also very old organelles, compounds of RNA and proteins (cf. figure 1!).

- The Golgi apparatus in eukaryotic cells is described as most often consisting of 5 to 6 christae (Aph), membrane enclosed apartments or factory sections.
- Another kind of example could be the number of enzymes, $\mathbf{5}$, involved at copying of DNA to mRNA, a process demonstrated by Roger Kornberg and his team at Stanford about 2007.
- Finally we could remind of the $\mathbf{4 - 5}$ cyclic processes that scientists (e.g. Marquand) have considered as necessary conditions for life.


## About cancer, some very abstract thoughts:

Development of cancer has been said to occur in 4-5 steps.


Fig C-25-154-1
0 -pole is defined as primary, integrating binding force in the dimension model, 00 -pole primary polarizing force. The 0 -pole is also the one of unity, the 00 -pole the one of multiples.

Experiments with "exogastrulation" in development of embryos showed that the cells of the animal pole ( $\sim 00$-pole) when tied off from the vegetative pole only developed to an amorphous, hollow mass, while the cells from the vegetative pole ( $\sim 0$-pole) differentiated towards different organs, although not complete.

Cancer as amorphous, undifferentiated cell divisions could thus correspond to the result of an isolated 00 -pole, its uninhibited, unregulated divisions when the 0 -pole as integrating binding force has been weakened.

The observation that cancer cells often first appear in rings (Aage Möller 1974, lecture) seems to support the analogy with exogastrulation. It's also said that pregnancy can have a suppressing effect on cancer - perhaps because an embryo represent a vigorous center.

A 0 -pole, a center, gives outward direction as integrating force, which could correspond to field lines from a cell outwards towards other cells. A 00-pole, an anticenter, gives inward direction as a polarizing and isolating force.

Mutagen, carcinogenic chemical substances contain for instance often CHx-groups which give inward direction (aromatic, ring-shaped carbohydrates too, in molecular structure inward directed). Cf. for instance the T-base $=$ U-base plus a $\mathrm{CH}_{2}$-group that turns a strand of nucleotides inwards to DNA. Characteristic for cell division in opposition to interphase is duplication of DNA with T-base instead of $U$ as in mRNA.

A cancer cell leaves the tissue level of organization and 'casting', the distribution of roles, and returns to the cell level. In the big chain of levels this is also a direction inwards, towards underlying level compared with the cell as part in a bigger whole.

In this respect cancer would be about the same as the relation between unicellular and multicellular organisms. (Which proteins or genes separate these classes?) Cancer
can be encapsulated like "resting spores" - and spread as "swarm spores", leading to metastases in the body.

It's said that similar, repeated stimuli or irritations from outside - of all kinds - can initiate cancer, one-sided pressure and even distilled water repeatedly brushed on laboratory animals. This could be translated to a suppression of "the whole" and with it the integrating center in the organisms? The organism's response to the stimuli may lead to exhaustion that in reality depends on "all the rest" that doesn't get activated, the whole that are dismissed in favor of the part.

## 11. Prokaryotic - Eukaryotic single-cells:

Here about theories of how eukaryotic cells emerged. Other aspects in additional file (No.. b) to Aviation,

Prokaryotic unicellular organisms ( PKc ) as blue-green algae and bacteria lack nuclei with membranes and mitochondria. Eukaryotic cells (EKc) have both these membranes and several other organelles in cytoplasm.

PKc have similarities with the embryological blastula stage of multicellular organisms, EKc with the gastrulation stage with several inner tied off parts of membrane à la "vesicles" to creation of specialized tissues and separate centers. Compare too the evolution from 1- to 2- to 3-layer organisms.

It's a common view on embryological development that it reflects earlier stages of evolution. We could presume that the same principles for 'evolvement/involvement' are prevalent on underlying levels as on superposed ones.

Thus, it becomes a possible hypothesis that development from algae and bacteria to EKc occurred in a corresponding way, through invagination (of material) of their cell membranes.

But why should it take billions of years?
Another hypothesis among scientists is that mitochondria and chloroplasts are bacteria and algae that have immigrated into or become incorporated by bigger, heterotrophic cells - and then lost their capacity for independent existence. (According to some theory the nucleus itself should have been an outsider that had immigrated into another PKc before chloroplasts.).

Similarities between ribosomes in EKc and PKc have been one reason for this hypothesis. However, it doesn't explain emergence of the nuclear membrane in EKc. It's also pointed out that several components of mitochondria "curiously enough" are synthesized in cytoplasm of EKc outside mitochondria.

Such things seems sooner to support the other hypothesis among scientists about invaginations of own membrane of the gastrulation type. Similarities in ribosomes could be regarded from the aspect that organelles of PKc and EKc make up analogous dimension steps on different levels. And cilia have also a little DNA but are not attributed or suspected to have had any earlier independent existence.

There are other facts that seem to favor the theory about invaginating cell membrane. There can be found such invaginations to "mesomeres" already in PKc and certain structures analogous with an endoplasmic reticulum (Bc p. 290). The theory needs of
course another explanation of DNA in mitochondria and chloroplasts, but already in PKc smaller, ring formed DNA-strands (plasmids) exist outside the bigger DNA-thread (Fc p. 168 f.).

The relation between EKc and PKc has features of the type center - anticenter, also the one between higher and lower d-degrees but this relation is ambiguous.

Certain features point to PKc as of higher d-degree in our interpretations: the use of both L- and D-forms of amino acids in their membrane proteins, the less polarized (not sexual) cell divisions and the less amount of inner motions for instance (see here). In other respects PKc have the features of anticenter. They remain a multitude of singlecells, while EKc leads further to multicellular organisms, to a new level. (Cf. the small satellite cells in he peripheral nervous system surrounding the bodies of big nerve cells.).

This ambiguity could follow from a dimension chain, where debranched degrees in first higher steps meet "the other way around" from anticenter, the 00-pole, inwards.

A general postulate or aspect on the dimension model for evolution is also the stepwise building in of the 00 -pole, the anticenter.

Perhaps the two different hypotheses above can be seen as only two aspects on the same development, only two opposite directions of reading a dimension chain, illustrated in the figure below.

1) Prokaryotic cells as created from debranched degrees in higher steps, meeting the other way around in synthesizing direction inwards $3 \leftarrow 2 \leftarrow 1 \leftarrow 0 / 00$, immigrating into cells from higher d-degrees: a reading of the chain inwards.
2) Pre-eukaryotic cells from higher d-degree steps $5 \rightarrow 4 \rightarrow 3$ meet at their outer surface (d-degree 2 ) structures from steps $2 \leftarrow 1 \leftarrow 0 / 00$, which get enclosed through invaginations. This is a more or less equivalent description than that in point 1 , reminding of the gastrulation of multicellular embryos from blastula stage.

An ambiguity appearing in step 3-2.


Fig C-26-162
The similar ambiguous relations appear among multicellular organisms when it concerns 1-, 2- and 3-layer animals.

The two theories become connected with the two ways to look at the dimension chain, "horizontally" as a "straight chain" in synthesizing direction inwards - or "vertically" as in the loop model, outward - inward directions meeting in step 3-2: d-degree 5 polarized a) 0-00, b) 4-1, c) 3-2.

Should this view imply that EKc perhaps existed much earlier in time than believed, that both kinds EKc and PKc eventually emerged as c-ac-poles simultaneously? In a relation one to many? Archae bacteria, now regarded as an own phyla, show certain features similar to both PKc and EKc.

One question is why only one (or some?) PKc transformed to EKc. A special change in outer environment? A mutation? Something that got wrong at cell division ...? A kind of "neoteny" in the evolution of chromosomes? - Or just an underlying principle, implying steps towards more complicated structures as in a dimension chain, in similarity with how classes of substances develop from strings towards higher d-degrees in shape: $3 \leftarrow 2 \leftarrow 1 \leftarrow 0$ ?

## Invaginating layers and cells as trapped light?

A related speculation concerns the layers of different substances that surround cell membranes of many organisms: outer layers of proteins, glycolipids, mucopolysaccharides and such combinations of the more elementary classes of molecules.

Could perhaps such layers have been a first phase during evolution? (Compare the hexagonal pattern in first figure above) Layers that invaginated and closed and made outer kinds of molecules inner ones? A pole exchange center - anticenter in our model. This in the same way - and by the similar forces - as the blastula transforms to gastrula in multicellular organisms?

In the dimension model, as said above, one general aspect is the stepwise "buildingin" of the 00 -pole.

And what about strings of nucleotides? It's a bit curious that DNA as chromatids on photos seem mostly attached to the inside of nuclear membrane. It's said that DNAthread in bacteria is attached to their cell membrane. Couldn't DNA also primarily have been formed on the outside of a membrane layer, exposed to light, and then have invaginated? Chromosomes as molecules for refraction of light could on an early stage of evolution easily have been affected by chemical environment at a surface?
Chromosomes as "substantiated light", "lumosomes"? (Autotrophic bacteria that used other energy sources should in that case have been a later adaptation?)

The light-capturing chloroplasts with DNA are for instance located along the surface layer of the cell wall in Spirogyra algae, and development of chloroplasts is dependent on light exposition. The respiratory chain in mitochondria with DNA is attached to its cell membrane.

Steroids get bound to lipid membranes but binds also to DNA.
With the mentioned facts it seems possible to imagine that DNA (or rather RNA) once were located and constructed on the outside of a lipid membrane and then through invaginations became the inside - immigrated. Cf. on the multicellular level invagination of the neural tube: outside becomes inside, environment built-in. Cells as trapped light?

Cf. Evolution, the turn inside-out of blastula in embryology of some sponges and similar processes in colonies of flagellates.

## 12. Some final words:

What could have been the real root of a first cell? We may speculate about an original conglomerate, a multidimensional network, something like the principle in the hexagonal pattern in figure 1 above, where different stereometric configurations and points of refraction in different angles and readings of patterns - or restratifications have given the different classes of substances and combinations of them. And that meshes in the network as matrices or the like could have been the origin of the coupling between proteins and codon bases, bases where parts of the rings simultaneously make up atoms in amino acids. Structure relations in the network then through polarizations and substantiations developed to processes of syntheses for different substances.

Yet, what could have served as a very first "center" and first "anticenter", poles within which a cell developed, in a sense that agrees with the dimension model?

An eventual complex network or series of layers is hard to see as such poles out of some 5 -dimensional pre-unit. Nor does DNA resemble such a first center.

- Just energy in some form, serving as center? Corresponding to how amino acids and bases etceteras on an underlying level are shaped from elementary molecules in MillerUrey type of experiments?
- Or one single hydrogen atom H , the inversion of which appears as first anticenter? As guide for a pure mathematical, organizing principle underlying the development? (Cf. about quotient $\boldsymbol{e} / \boldsymbol{p}$ in files here and here about the genetic code. About inversion also file 1/7; 7 "not developed" d-degrees according to the string theory.
- Or a P-group, inorganic phosphorus $\left(\mathrm{H}_{3} \mathrm{PO}_{4}\right)$, an atom as P with valence 5 as core for condensation, functioning as the speck of dust for an ice crystal around which it gets organized?
- Or just organic molecules trapped in a metal environment as first anticenter? The polarity of metals - non-metals, defined by the "octet rule", enough as definition of first center-anticenter poles?

A center defines directions - outwards / inwards. In chemical terms for instance hydrophilic - hydrophobic directions. In next step in the model a spherical structure versus a radial one gets defined.

Within the cell as a whole, a unit, interpreted as a whole dimension chain, each step can according to primary postulates develop to whole secondary chains, the steps in these to tertiary chains etceteras.


Fig C-27-143-2
It gives an exponentially increasing number of directions and structures within the cell and increasing number of motional moments as processes.

The hypothetical conglomerate of both lipid layers and nucleotides and proteins could then be imagined to polarize, creating increasing distances within these poles,
with development of circular processes from the different steps. Something like the embryological gastrulation of a eukaryotic, multicellular organism.

## A note:

It's hard to believe that all cells on the Earth derive from just one single cell, even if it's unknown how a cell is born in other ways than through duplication. Why then look for life on other distant planets! It's illogical.

Either there exist a principle of Nature of only one single cell as one center of Universe (which happened to be here). Or life appeared under right circumstances on a lot of places - on the Earth and other planets.

To an extra link: Levels from Micro- to Macrocosm

## Centrioles - Cilia

## 1. A fundamental invention:

Centrioles are among the most beautiful and clear expressions for geometrical design within biology; an "invention" of eukaryotic cells on the level of organelles.

In cross-section the structure illustrates the center - anticenter polarity ( $0 / 00$ ) in arrangement of microtubuli and radial fields illustrated by the spokes, in our model defining dimension degree (d-degree) 4 with outer poles 0 and 00 , which meet in the ddegree of motions.



Fig Cil-1-157-1
Why the number 9 in the ring of tubules? Scientists don't seem to ask such questions. For some speculative proposals, see the end of this file.

Cilia and eukaryotic flagella, built on this plan, appear as first "extremities" of cells. They serve a double function of sensory antennae and external locomotion in the environment. Nearly all mammalian cells have one cilium.

The inner centrosomes, consisting of two centrioles, have been called the "heart" of the cytoskeleton system in a cell, radiating through its cytoplasm.

Notice in the dimension model that d-degree 1 are debranched in each step outwards and may polarize into the "d-degree of motions"


Fig Cil-2

## 2. Evolution:

Evolutionary, such cell extremities have simpler forms in Archae and prokaryotic cells, and the evolution may be described as steps from center to anticenter or just to more complex c/ac-structures:

- from simple bundles of protofilaments in Archae (resembling pili), as an original center, to
- central but hollow, bigger, screw-shaped tubules (center widened to a circle) in prokaryotes, to
- the c-ac structure with explicitly anticentric manifold of tubules in eukaryotic cilia, including spokes.

This evolution has a character of d-degree steps from center to anticenter and simultaneously of geometrical steps of substantiation $3 \leftarrow 2 \leftarrow 1$ in plain projection.

The differences include 2 polarities:
a) between Archae and the other: In Archae bacteria the microtubules are build from below, i.e., from inside the cell outwards (as a form of secretion). In pro- and eukaryotic cells they are built from the top furthest out. It reveals a pole exchange $0-00$.
b) Next pole exchange of type 0-00 appears between prokaryotic and eukaryotic cells in the transportation of building material:

- in prokaryotic cells it occurs inside the hollow tubule,
- in eukaryotic cells outside the walls of the many microtubules;
a polarization c -ac besides the one between one central tubule and many smaller at anticenter.

Such features support a view in the development from center to anticenter, principally outwards, during increasing complexity, while simultaneously the direction in the dimension chain is inwards.


Fig Cil-3

$$
\begin{array}{rlr}
5 \rightarrow 4 \rightarrow 3 \rightarrow \leftarrow \leftarrow \leftarrow \leftarrow 1 \leftarrow 0 / 00 & \text { increasing complexity } \\
& \rightarrow 1 \text { degree debranched } \rightarrow \text { arhaebacteria } & -1 \leftarrow 0 / 00 \\
& \rightarrow 2 \text { degrees debranched } \leftarrow \rightarrow \text { procaryotic bacteria } & -2 \leftarrow 1 \leftarrow 0 / 00 \\
& H(3)(2,5) \text { dgrees debranched } \leftarrow \text { eucaryoric cells } & -3 \leftarrow 2 \leftarrow 1 \leftarrow 0 / 00
\end{array}
$$

Fig Cil-4
(The fact that these organs are not homologous but built in different ways with different proteins, can support the presumption here that it's geometrical principles that reign.)

## 3. Polarities in eukaryotic cilia:

## Transportation:

In eukaryotic cilia there is further the polarity between outer and inner "dynein arms" of microtubules at anticenter:

- transportation upwards of building material occurs as said above on inner side of microtubules,
- transportation downwards occurs on outer side of them, which corresponds to the fundamental directions of d-degree 4 in the dimension model (inwards from anticenter, outwards from center).

The outer and inner arms differ too in protein structures ( $K I-O$ ), hence in some respect obviously polar. One reference mentions the proteins kinesin and dynein as such mutual polar proteins in directions of transportation.

The polarity resembles the arrangement of vessels in plants: outer phloem for downward transport and inner xylem for upward transport. There is actually a similarity too between the different structures of cilia in Archae, prokaryotic and eukaryotic cells and the development of steles (a, c, e in file Plants, No. 4). Plants as cilia of the Earth!

There is further the similarity that roots of trees lack pith, and basal bodies of cilia "lack" the central tubules.

## Structural differences of anticenter:

The differences between centrioles in cilia, basal bodies and centrosomes may be regarded in terms of d-degree steps:
a) Inside the cell, in centrosomes and in basal bodies of cilia, the centrioles consist of 9 triplets, $\mathbf{9 \times 3} \mathbf{3}$ tubules at anticenter. Outside the cell surface, in cilia, they consist of 9 doublets, $\mathbf{9} \times 2$ tubules The numbers 3 and 2 happen to correspond to outer poles in ddegree 2 and 1 in the model.

Geometrically the difference corresponds to the step from membrane surface (ddegree 2 ) to cilia as d-degree 1 on a relative macro-scale.
b) The centrosomes ( $9 \times 3$ tubules) in the inner of the cell consist of 2 centrioles (mother- and daughter cell) in a curious $90^{\circ}$ angle to one another, which geometrically implies definition of a 3-dimensional volume.

When not taking part in cell division one of these centrioles migrates to the surface and transform to a basal body, thus illustrating a halving as a polarization step from a volume to a surface (d-degree $3 \rightarrow 2$ ).
c) The centrosomes as MTOC organelles, near nucleus, organize the radial protein skeleton of the cell. Their function as vector fields (d-degree 4a-4b as outer poles of ddegree 3 ) becomes obvious.

Eukaryotes appear as a new level in d-degree step 3-2 through meeting of directions according to the loop model. It's possible to imagine centrioles in this step as a complex center ( $0^{\prime} / 00^{\prime}$ ), expressing the radial / circular polarity among proteins in this step:
$0 \rightarrow \rightarrow \underline{00^{\prime} / 0^{\prime}} \leftarrow \leftarrow 00$, a haploid chain, which get a complex center in the middle, $\mathrm{c}_{2}$


Fig Cil-5

- In d-degree 3 it would give the triplets, function of center (MTOC) for radial outward vectors, the cytoskeleton and the spindles as vector fields at cell division.
- In d-degree 2 outwards it would give the doublets, function of basal bodies and further the structure of cilia.

Concerning forces, the electromagnetic force ( Fem ) has been assumed defined in step 3 -2 in the dimension chain of forces. The radial cytoskeleton arranged by centrosomes have a direction outwards from minus-charge at center, plus-charge towards cell membrane as is assumed about charges from 0 - and 00 -pole respectively.

## Centers and spokes:

Centers of centriole structures are of different kinds: in the inner centrosomes as in basal bodies there are no visible tubules but "something", not possible hitherto to identify. Hence called " $9 \times 3+0$ " structures.

Cilia outside the cell surface are of two kinds: the primary, non motile one, without identifiable center structure, and motile cilia with 2 single tubules in the center. How explain this difference?

One guess is that the "something" in the center of inner basal bodies and centrosomes as 0 -pole in the d-degree 4 of vectors are less substantiated, not yet have got the ringstructured mass through inward direction from environment as anticenter. Cf. also number 9 and 11 , section No. below.

Scientists would probably explain it as a question of need for stability in outer motile cilia or something like that? The function of these centers is not yet understood.

Spokes in the cross-section depart from tubules at anticenter and end in "heads" (some thicker structures) about halfway to the center. These spokes are unexplained too. It's difficult not to presume some invisible spokes as vectors from the center too, and the picture can remind of the $\mathrm{F}_{\mathrm{G}}$ and $\mathrm{F}_{\mathrm{A}}$-forces in macrocosm: gravitation inwards to mass of galaxies and outward acceleration force ( $\mathrm{F}_{\mathrm{A}}$ ) of "invisible" Space.

## 4. Sensory and motile cilia:

The basic structure appears either as sensory antenna, called primary cilia, " $9 \times 2+0$ " structures, or as organelles for locomotion," $9 \times 2+2$ " structures, the motile cilia. The types represent the fundamental opposition of the nervous system in multicellular organisms. (All developed neurons have one cilium and fibers for cilia are found on the neural plate.)

## Primary, sensory cilia:

As the nervous system guides inner processes on a multicellular level, so seems primary cilia of cells in vertebrates and mammals guide a lot of internal structural relations, positions and processes in the body and coordinate a big number of signaling pathways (Wikipedia). Failures in their structure seems for instance to have a role in the position of heart to the right instead of left side in the body!

Maybe these regulating functions are just expressions for cilia as structures of d-degree 1 on the cell level and the very jumps or steps of polarizations in a dimension chain behind relations in the organism?


Fig Cil-6-157-2

Each step:


Fig Cil-7-161-1

Cf. that d-degree $0 / 00$ (or 00 in a haploid chain) as anticenter represents first polarizing force in our model, and passive motions of these cilia are induced by environment. It's also possible to think of poles 1 a and 1 b of d-degree $0 / 00$ of motions in terms of insubstantial "field lines" in the environment.

The primary cilia are used in more or less specialized shapes in the primary senses of mammals, in photoreceptors in the eye, as kinocilia on hair cells in the ear and on olfactory neurons in the nose.

Cilia as primary receptors of sunlight in the eye have a certain similarity with chlorophyll on the molecular level in its circular structure, corresponding to the rotational construction of porphyrins to anticenter rings around a center (a Mg-ion in chlorophyll).

## Motile cilia and motions:

Centrosomes have been called motional centers inside the cells, organizing the cytoskeleton. The motile cilia as first extremities serve external locomotion, d-degree $0 / 00$ in our model.

Developed cilia contain over 600 different proteins (Wikipedia). However, it has been shown that $\mathbf{2}$ proteins is enough to bring about the beating motions of flagella (= cilia in eukaryotes). The 2 proteins could be illustrated by the poles 1 b and 1 a in the figure above. It's added that many of the over 600 individual proteins can function as small "nanomachines".

Flagellum of human sperms is actually a modified cilium. (Cf. the mass number of side chain of amino acid Arginine $=101$, said to be richly found in fish sperms. About number 101, cf. the ES-chain in the genetic code.)

The motion starts at the very tip of cilia furthest out according to observations. Curiously enough, since the "motor" is positioned at the base of cilia. However, in our model motions are the very end of a dimension chain outwards.

Tubulin makes up the building blocks of microtubules. It's a globular type of protein (like F-actin in muscles), which can illustrates quantification of a line in "half steps" into motions..


Fig Cil-8
The polarization into "half steps": the poles 1a, "motions to each other", and 1b, "motions from each other" in the model, can give the pendulation as between two poles of convergence and divergence. The figure could illustrate motions along the tubules. The cilia describe externally a 2 - or 3-dimensional motion: a planar, wavy one - or in other cases a more 3-dimensional one with power and recovery strokes (Wikipedia). These d-degrees of motions are in the model associated with d-degrees 3 and 2 respectively (cf. No. 3 above). Which factors that decide the difference of motional degree seems still not clear.

Several internal motions in the tubular structures are described: a sliding or clipping force at positions of ATP, also an oscillating movement along the whole length ( $\mathrm{KI}-\mathrm{O}$ ).

Further, a rotating or twisting force ( $\mathrm{KI}-\mathrm{O}$ ). The microtubules have an ability of contraction too ( Zf ). It's the two dynein arms in eukaryotic flagella that get the microtubules in the doublets to slide against each other, which gives the external motion (Wikipedia).

Thus, with all these sliding - rotating or twisting - oscillating - contracting and clipping motions it seems as if they could represent all the presumed motional moments in different d-degrees of the dimension chain:


Fig Cil-9-157-2
(D-degrees of motions in the model: Vibration 1, rotation 2, spiraling 3, pumping as expansion/contraction 4, and "pole exchange" as first embryonic germ to motion in d-degree 5 .)

About details, there are at least 9 different types of dynein proteins ( $K I-D, K I-O$ ), eventually differentiating the microtubuli in degrees of stiffness and sliding velocity as it sounds. Connected with different d-degree steps?

## 5. Number 9:

Why this number 9 (x 3, x 2 ) of peripheral microtubules in centrioles and cilia structure? As said above, scientists don't seem to ask such questions. A random number?

It's a general hypothesis in this work however that such numbers can have a deeper foundation. We may repeat that this number has nothing to do with numbers of chromosomes or number of protein threads in cytoskeleton arranged by centrosomes.

Naturally, following different suggestions are only speculations.
a) Reading each step in the dimension chain as 2-figure numbers, the difference outwards - inwards in directions $=9$ :

5 -|- 4 -|- 3 -|- 2 -|- 1 -|- 0/00
$54-45,43-34,32-23 \ldots 10-01=9$.
It would agree with the interpretation of motions in d-degree $0 / 00$ as turns in main directions.
b) Compare number $11=54-43,43-32 \ldots 21-10$ : the difference between steps in outward or inward direction, i.e. in one-way direction.

Note that 11 is the number of protofilaments in almost all flagella of prokaryotes (Wikipedia).
(If number-base systems (nb-x) should be connected with different d-degrees - cf. the genetic code, part III -9 in nb-10 $=11$ in nb-8. A d-degree step between pro- and eukaryotic flagella types - ? - simultaneously with a step from fiber level to first tube form, d-degree step 1 to 2 ?).
c) Number 2 in center of motile cilia: at each d-degree the difference in directions inwards higher d-degree and lower one is 2 , also marking a difference of directions: $5 \leftarrow$ $4 \mid 4 \rightarrow 3$, read as $45-43$ etc. A factor of opposite directed motions in each "quantum jump" between d-degrees?


Fig Cil-10
d) Number 9 as inversion of a series of 10 -power displaced $11111 \ldots$ ?
$9 \wedge 0,1111111 \ldots$

Fig Cil-11-157-2
(5 ten-powers as steps.)
e) Doublets as 99 ?
$101 \wedge 99009900 \ldots$
Cf. about side chain of Arginine above = 101 and last number in the ES-chain, the genetic code..
f) Five steps of 1 (degree) squared:
$11111^{2}=123454321=9$
figures:


Fig Cil-12-157-1b
9 figures from 1 to 5 inwards and back outwards. First and last "1" in the number as poles 1 a and 1 b in the dimension chain. This interpretation should imply that the total circumference of microtubules had opposite poles and identifiable half turns in some way. (Cf. the curious angled copying of the daughter cell in centrosomes?)
g) The d-orbitals for 10 electrons in the periodic system is the middle one in the $2 x^{2}$ series $(x=5-0)$ behind this system. There is 1 central ring-shaped electron orbital and 9 electrons divided, 3 on coordinate axes, 6 on pairs of plane quadrants. That's 9 polarized, more peripheral orbitals.
Could centrioles - as developed in the middle step according to the loop version of our model - have a deep correspondence in this d-orbital?


Fig Cil-13
It's said that the doublet of microtubules in cilia consist of 13 threads in the A-rings, 10 in the B-rings (http://www.solunetti.fi/se/solubiologia/varekarvat 1/2/Cilier):
$1 / 2 \times 26=13$ for A-rings with dynein arms and bridge to B-ring of next doublet with 10 threads?
$(9 \times \underline{23}=207=$ number for A-base in nb-8; an association to the genetic code. $)$
h) 9 triplets in the volume of cytoplasm $=27$ microtubules $=3^{3}$ 9 doublets $=18$, outside the cell membrane, d-degree $2=2 \times 3^{2}$
A step $3^{3} \rightarrow 2 \times 3^{2}$ (18 in $2 \mathrm{x}^{2}$-chain above)
j) Simple reading of numbers in last d-degree step of the dimension chain:

Step $1 \rightarrow 0$ as $10: 10-/+1($ as $1 \mathrm{a}-1 \mathrm{~b}$ ?) $=9$ and 11 , difference 2 ?
lb-poles define a new anticenter, $\sim$ the 9 doublets.
1a-poles define a new center, $\sim+2$ central tubules ?
Whatever to believe about the numbers, centrioles and cilia structure seems to be the way of atoms to tell us a fundamental story about life.

## Plants

The 5-dimensional model is here applied on plants with aspects on mostly rather elementary data. Plants show more clearly geometrical features from the model in their different kinds of polarities.

## 1. Numbers and fundamental directions in angiosperms:

Angiosperms are classified in two main groups with distinct features: the one with 2 cotyledons or seed leaves (dicots), the other with 1 cotyledon (monocots). The dicots are 5-4-numbered in flowers, the monocots are 3-numbered, often $2 \times 3$, in their flowers. Cf. the elementary dimension chain 5-4-3-2-1-0 less developed as 5-4-3-3 or 5-4-6.


Fig Pl-1-163-1

All plants follow a "numerical plan" based on numbers 5, 4, 3 and multiples of these ( $P s$ p.56). for instance 4 sepals, 4 casrpels, 4 petals, 8 stamens, called a " 4 -merous" plan.

If amino acids and the genetic code can be derived from a dimension chain through the "exponent series", it would be natural to find corresponding number relations on superposed levels. The recurrent number 5 should have a foundation. In this "exponent series: $\mathbf{x}^{\wedge} \mathbf{2 / 3} \mathbf{x} \mathbf{1 0 0},(\mathbf{x}=\mathbf{5 - 0})$ the mass of G-plus C-coded amino acids (side chains) are derived from numbers 5 and 4 , and the difference to A-plus U-coded amino acids is derived from number $2 \times 3$; cf. $3+3$ petals, $3+3$ stamens, 3 carpels is the basic type in plants with 1 cotyledon.

Compare also the Balmer series for spectral lines of hydrogen, within the visible area, $\mathbf{m}=5,4,3$ and $\mathbf{n}=2$ (introduction).

It's also meant that direction of evolution has been the one from plants with 2 to plants with 1 cotyledon - or eventually that both types derive from a common, preceding type most like the dicots ( $S b$ ). It sounds natural looking at the figure below: the single cotyledon seems as a "halving", as out of a polarization in terms of the dimension model:


Fig Pl-2 (after picture from reference Ps, p. 78)
Compare however the ambiguity in reading of the dimension chain, straight outwards or as in the loop model: debranched degrees from higher steps meeting the other way around, in synthesizing direction:

[Number of dicots nowadays is said to be about $3 \times 55.000$, number of monocots about $1 \times 55.000$ : a quotient 3 to 1 , as $(5+4)$ to 3 , although it's hard to believe in a connection and the estimation of numbers must be very uncertain. Other figures exist.]

Roots differ between the two main classes of plants:
Primary root in dicots goes vertically downwards and becomes the main root. This is the primary coordinate axis of the plant outwards - inwards as poles of dimension degree (d-degree) 4, on the physical level corresponding to forces. FA of expanding Space, (here defined by sunlight) and $\mathrm{F}_{\mathrm{G}}$ gravitation towards Mass.

In monocots this root disappears and gets replaced by "radial" adventitious roots, which can be interpreted as a d-degree step $4 \rightarrow 3$. These roots originate also from the lower part of the stem, that's from the upper side of the seed, from the pole 4 b of d-degree 3 in our model, representing outward direction, leading to radial structure in next step. Although, as through mixed with the opposite pole, now inwards.


Fig Pl-4-163-2
Growth of woody plants with 2 cotyledons is both lengthwise and horizontally radial, called secondary growth of thickness; in plants with 1 cotyledon it's only lengthwise, called primary. In directions outwards in a dimension chain it implies a reduction in ddegrees from dicots to monocots, which seems supported in the evolution (?). The terminology suggests the opposite direction. Dimensionally it corresponds to an additional step $4 \rightarrow 3$ in coordinate axes (about cambium below) and implies anyhow a higher potential of development. (Cf. about animals in file Evolution, No. 7.)

Vascular, conductive tissue has a cylindrical or net-shaped character in dicots, while it gets split up in strings in monocots (see further below).

Other corresponding features are that leaves most often are outspread sheets in dicots but become more linear, band-shaped in monocots ((in macro-shape as a d-degree step 2 $\rightarrow 1$ ), and venation is branched in dicots, mainly unbranched in monocots - a development towards the linear form also in this aspect.

## 2. Main polarizations of directions:



Fig Pl-5-166-1
Plants develop, animals "invelop" or involve themselves.

Seed of a plant growths outwards from both its poles, while the animal embryo growths circular and inwards through invaginations from its poles (in a "negative curvature").

That's by no means the whole truth but yet a fundamental opposition. Outward - inward directions as fields of d-degree 4 corresponds also to a $0-00$-polarity and the relation between an underlying and a superposed level. It's the relation too between plants and animals living on plants.

It's said that a special radial polarity can be reversed in plants by certain chemicals as for instance ethylene: adventitious roots can grow inwards the stem center instead of outwards. Are there perhaps similar substances that are decisive for the polarity plants - animals, besides chlorophyll and the photosynthesis?

From Succinyl (CoA), when it leaves the citrate cycle, the process goes to creation of porphyrins together with the amino acid Gly. These porphyrins have a center - anticenter structure that may illustrate d-degree $0 / 00$ in our model and represent a crossroad and division of ways to chlorophyll of plants and hemoglobin in animal blood.

Roots usually lack pith - also in this respect characterized by inward direction, lack of a center.

A comparison in directions between pines and firs could illustrate the d-degree step 4 $\rightarrow 3$ and following steps as halvings:

- Pine: main root vertical; new shoots vertical; paired needles, arranged in a circle, and long.
- Fir: root branched along the surface of the ground; new shoots horizontal; needles unpaired, in half circles and short.


## 3. Symmetries of flowers:

Symmetry planes from many to one:


Fig Pl-6-164-1
Radial symmetry implies a shape of the type vector fields between center and anticenter as out of d-degree step $5 \rightarrow 4$ in our model (in plane projection).

The bisymmetric shape exists in 4-numbered cruciferous flowers. Two perpendicular coordinate axes have been assumed in the model to follow from d-degree step $4 \rightarrow 3$ Zygomorphic shapes are for instance labiates and flowers resembling butterflies.
The earliest flower plants (mostly represented in gymnosperm class Bennettitatae) had open flowers with radial symmetry, and early fossils of angiosperms show that these too had mostly flowers with open, radial symmetry (Sb p. 128).

Hence, a development should have occurred from more symmetric to less symmetric, more irregular flower shapes.
(Cf. the development from early radial-symmetric 1-2-layer animal organisms to lateral bisymmetrical ones as worms or fishes.)

Radial-symmetric flowers exist both with and without terminal flowers, while those with only 1 symmetry plane don't have terminal flowers. In the inflorescence it implies a transition from the vertical axis up - down to the lateral axis as a dimensionally later step.


Fig Pl-7-164-2
(See further No. 8 below about inflorescence.)
The development of more irregular flowers as labiates, tube-shaped ones and those with spurs and such shapes came later with other types of insects. The growing together of petals to more or less closed rooms could be the result of the inward directed force, one pole of d-degree 3, the degree of volumes. Cf. cotyledons that get the form of tubes in monocots.

In the differentiation of petals it's often possible to observe the division 4-1 or 3-2 of number 5 as in the loop version of the dimension chain:
(Three steps of polarizations: $5 \rightarrow 0 / 00,5 \rightarrow 4 / 1,5 \rightarrow 3 / 2$; an angled reading of the chain.)

We can note that in labiates for instance, its the upper lip that has 2 lobes, the lower one 3 lobes, positions corresponding to the views here on higher degrees and numbers as the deeper, lower ones, lower degrees as the more superficial ones.

## 4. Conductive tubes:



Fig Pl-8-166-2

- Transportation of water and salts upwards goes through tubes called xylem (X), transportation of carbohydrates and other synthesized substances goes downwards in tubes called phloem $(\mathrm{Ph})$; synthesizing direction $=$ inwards toward higher d-degrees in the model. (About molecules, cf. a figure about ' $\mathrm{A}-\mathrm{Z}$ "-numbers of chemical elements.

Outward direction in the dimension chain means increasing entropy. The transport of water upwards in the vessels occurs mainly through vaporizing as the main driving force and doesn't demand energy. In terms of phases it implies a d-degree step $2 \rightarrow 1$, liquid to gas phase. In the opposite downward = inward direction the transport demands energy, i.e. in direction towards higher d-degrees. (It may contradict our feelings of gravitation, the $\mathrm{FG}_{\mathrm{G}}$-force, yet the direction of Space outwards, the $\mathrm{F}_{\mathrm{A}}$-force, dominates plants.)

The general arrangement of xylem and phloem in dicots illustrates very clearly the general principle in the model: outward direction from center, the 0 -pole, inward from the anticenter, the 00 -pole. It seems defined by at least 3 polarities:

1) center - anticenter in cross section : ac $\rightarrow \downarrow$ and $\leftarrow$ c
2) direction of transportation up/down, $\downarrow$, and

3 ) stem - root directions.
Xylem with upward transport is arranged in an inner ring, phloem with downward transport in a peripheral one, a center - anticenter polarity.

Further, at creation of the primary tubes in the stem, phloem $(\mathrm{Ph})$ is constructed in inward direction and xylem (X) in outward direction (Fb)
$: \underline{a c} \rightarrow \mathrm{Ph} \mid \underline{\mathrm{X}} \leftarrow \mathrm{c}$.
In the root however, both kinds of primary vessels are created from outside inwards, which appears as decided by the polarity stem - root and inward direction of the root becoming dominating. Roots lack pith and thus their vessels come to make up the center.

Monocots have as mentioned above only the primary growth of thickness, while among dicots the secondary growth of thickness develops from an intermediate layer, the vascular cambium, between xylem and phloem, which can be compared with mesoderm in animals.

In cross-section the tissue layers between surface layer and pith grows both radially and circularly, which gives the annual rings with increasing amplitudes, according to the geometries in d-degree step 3-2.


Fig Pl-9-167-1
From the vascular cambium the directions of growth of Ph and X gets reversed: $\mathrm{ac} \leftarrow \mathrm{Ph} \mid \underline{\mathrm{X}} \rightarrow \mathrm{c}$, Ph outwards, X inwards., It retains the relation of positions (ac- c) as obviously more fundamental.

Cf. the secondary center in step 3-2 in the "haploid" version of a dimension chain: $(0 \rightarrow 4 \rightarrow 3 \rightarrow \underline{\mathbf{c} 2} \leftarrow 2 \leftarrow 1 \leftarrow 00)$. to compare with development of mesoderm or cambium from which we get outward direction. (The same concerns coelom in Deuterostomia animals.)

Arrangement of xylem and phloem according to illustrations (Ps p. 75) the inner xylem have a tight, radial structure, the ring of phloem a scattered, fragmented circular structure of vessels in cross-section, showing the geometrical polarity radial - circular poles of d-degree 3 in our model but also the one of unity versus multitude between 0 and 00 -poles.

The radial and circular growth of thickness becomes a growth in d-degree 3 in relation to lengthwise growths of d-degree 4 , up-down, when it concerns the main coordinate axes.

The fact that cells of xylem become hollow and dead in forming the canals while cells of phloem are living, even if lacking nuclei, may surely be explained in terms of good function, but could seem to contradict most other dimensional views in these files.

However, there is the opposition Space versus Mass, the $\mathrm{F}_{\mathrm{A}}$-force up-/outwards of Space and down-/inwards of Mass, and the $\mathrm{F}_{\mathrm{A}}$-force is the one characterizing plants, unquantified direction from 0 -pole and unity. From this aspect the cell death in xylem could be described as a return to the deeper vector level where the property of mass disappears and where the conducting canals are just vector fields. (That centrioles in the inner of a cell of the type $9 \times 3+0$ is perhaps a related fact?)

The alternative view on xylem, in the other direction, is that the shapes of cells transform to lower d-degrees outwards, become 2-dimensional tubes, 1-dimensional conductive canals on a macro-scale, and in last step only is transportation, vectors for motions, d-degree 0/00.

When it concerns transported media, water represent naturally a phase of lower ddegree than synthesized carbohydrates in phloem. It represents steps in phases from liquid to gas phase (vaporizing of water the driving force upwards in xylem) and further to the division, the polarizing of water and a "plasma phase" in the elevation of electrons in photosynthesis. (In contrast, direction inwards implies steps towards phases of higher, substantiated d-degrees.)

The cell types for phloem and xylem are said to originate from differentiation of cells at apex of branches - furthest out, corresponding to $0 / 00$ in the dimension chain. Cf. that outer poles of d-degree 4 , the one of vector fields, meet in d-degree $0 / 00$ of motions.
(What to call the phase of emptiness?)

## Steles:

There is a theory about the historical evolution of the conductive tissue in plants. (Fb p. 80). That evolution resembles an illustration of features in a dimension chain:


Cross sections. Figure freely from the source
a) center - anticenter polarization as in a step $5 \rightarrow 4$, the "protostele":
a central xylem surrounded by phloem. Is found in first land living plants,
b) a radial field of directions as a step $4 \rightarrow 3 \mathrm{~b}$, the "actinostele":
xylem becomes star-shaped with ridges that divide the surrounding phloem. Is found in the stems of very old fossils of land living plants.

It's also the type of stele, the "radial conductive string", found in all ferns and in roots of seed plants. Actinostele are typically 'exarch' with xylem growing inwards. Perhaps that's a reason why the roots - growing inwards - of vascular plants normally are considered to have exarch development (Wikipedia). (In opposition as it seems to endarch xylem that grows outwards, said to be typical for stems of seed plants.)
c) a circular, cylindrical form as in a step $3 \mathrm{a} \rightarrow 2$, the "siphonostele":
xylem in a close cylinder, its outside covered by phloem. Its shape is assumed as
resulting from a developing pith in the center, hence a kind of center displacement outwards.
d) division of the circular ring as a (partial) step of polarization $2 \rightarrow 1$, the "dictyostele": gaps in the closed cylinder.
e) a splitting up of the cylinder to separate strings, as a last step $1 \rightarrow 0 / 00$, the "eustele": each string composed of inner xylem, outer phloem.

It is assumed that the type of stele in stems of monocots, called "atactostele", with its spread strings - as 'points' in a macro-scale - possibly can be derived from this eustele, which in that case should agree with the other dimensional features of the step from dicots to monocots as a kind of halving.

Number of tubes is also a differentiating feature among plants. Botanists distinguish between plants with 2-3-4-5 ..etc. tubes, which seems as a principle of division agreeing with views in the dimension chain as numbers.

## 5. About two other polarities between species of plants:

Transversal polarity of directions within structures of flowers are said to have a big systematic value for classifications among plants.

One distinction is made between plants where the seeds grow peripherally from enclosing walls of carpels and those whose seeds grow from the middle, the center; hence, a center - anticenter polarity, the complementary poles out of d-degree step $5 \rightarrow$ 4 in the dimension chain.


Fig 11 from reference Sb
However, there are more clear examples of central ovules than in the right figure above, where carpels are folded radially inwards and ovules develop as from the center their borders define. (Cf. d-degree 4 a in the model and last step where motions to each other define a new 0 '-pole. In fact, it resembles also how material growths from the animal pole in an animal embryo and invaginates at the V-pole.)

An example of plant with central seeds is the 5-numbered sticky catchfly and an example of anticentral seeds is the 4-numbered crucifer family. It's in notable agreement with the dimension model when numbers are read as expressions for ddegrees: the relation higher to lower d-degree, here 5 to 4 , as a relation center anticenter.

Among plants with numerous stamens a distinction is made between those where the stamens are formed from inside outwards, centrifugally, and those where the stamens are formed centripetally, from outside inwards. Hence, a counterpart to the distinction of seeds above.

Cf. the similar distinction between prokaryotic and eukaryotic algae: in prokaryotic algae the cell wall at cell division is formed from outside inwards, in the eukaryotic ones from inside out (Fb s. 31).

Apical growth versus lateral growth, mentioned above:
Coordinate axes as expressions for d-degrees: the 4th vertical, the 3rd lateral:

|  | Apical growth | Lateral growth |
| :---: | :---: | :---: |
| coordinate axes | 4 | 3 |

Fig Pl-12-169-1
See further No. 8 below about inflorescence.
Coniferous trees and certain broadleaf trees have a principally indeterminate apical growth upwards along the vertical axis. In many broadleaf trees however, especially deciduous trees, the apical main shoot dies in each branch generation and it is the lateral shoots that grow and develop.

Note that gymnosperms as conifers are earlier in evolution and we get an evolutionary step d-degree $4 \rightarrow 3$.

Cf. that early plants with radial symmetry have top flowers, not the later irregular, zygomorphic ones.

An indication of the qualitative difference - as through a quantum jump - between the directions designated " 4 " and " 3 " is that the same chemical substance, auxin (from the amino acid Trp), have different effects vertically and horizontally: promotes the vertical growth of apex but impedes the growth of lateral shoots.

Impeding chemical signals from the apex increase also the angle of lateral shoots towards 90 . In the dimension model the inward direction (pole 4a) is a primary polarizing force and outward/inward directions transform to a perpendicular relation in step $4 \rightarrow 3: 180^{\circ} \rightarrow 90^{\circ}$. (It reminds of the similar function of human brain where most motor signals from cortex, $\sim$ "the top", seems to be of the inhibiting type.)

The horizontal position of leaves can probably be interpreted as a result of one "antigravitational force" ( $F b$ ) upwards and a downward directed force, expressed in the stronger content of auxin on the upper side of leaves. It's an interesting introduction of the FA-force from expanding Space in macrocosm into the upward growth of plants. It's $_{\text {t }}$ also in agreement with how the $3^{\text {rd }}$ dimension is generated as complex result of the poles of d-degree 4 in the dimension model here.


Fig Pl-13-169-2
About ferns it's said that most of them have a top cell that first through 4-sided division become the meristem cells, which in their turn divide 3-sidedly in the shoot, hence a step $4 \rightarrow 3$ in the very process of divisions.

## 6. Evolution of seeds and flowers:

A relation between conifers and flowers, an illustration:


Fig Pl-14-172-3
Male and female seeds of cones spread by the wind, united in a flower.

A flower in relation to a developed plant: illustrated by d-degree 5 developed through following steps in a dimension chain in relation to last "d-degree $0 / 00$ ", equivalent with $5^{\prime}$, where new poles 0 ' and $00^{\prime}$ are defined: a substantiated start for new individuals. In a level chain it's the single cell level, compared with the contact and tissue levels.


A d-degree step $1 \rightarrow 0 / 00$ is however represented in every step outwards in the dimension chain, at each polarization (ramification), like seeds on cones of conifers.

## Theories about the development of seeds:

It's believed that conifers originated from a duplication of genome, which led to a polarization between micro- and macrosporangia that became separated on different cones or even on different individual trees. Through a new polarization - "meiosis" - it led to a haploid phase and fertilization through wind-carried pollen. It sounds as a series of "polarizations" on different levels. (Cf. Genetics.)

How the complementary, sexual polarity arose from simple cell divisions isn't explained but seems to presuppose a small, unrecognized difference between two "daughter" cells at each division, stepwise - or suddenly? - growing to complementarity.

The "telom theory" can be said to concerns a still deeper level.
Telom is the simplest type of branching in vascular plants, the Y-form (Sb p. 99) , hence of the type $2^{x}$. According to this theory germs to seeds in seed ferns should derive from a lateral meeting between such teloms ( Sb ).
a)

b)


Fig Pl-17-173-2
The thought seems to be that meetings between equal, potent cell tissues give rise to a new level of development. The theory resembles how germs to fruits, the ovules, develop at borders where carpels meet.

Cf. meeting leaves defining a border: d-degree $2 \mathrm{a}-1-2 \mathrm{~b}$ in our model and last step $1 \rightarrow 1 \mathrm{a} / 1 \mathrm{~b}$ and $0 / 00$ in our model, where "motions to each other" define a new 0 '-pole. It's a meeting between opposite directions.

In the dimension model it's assumed that a meeting between two similar units (of type dimension chains) is necessary for a development of a new level. Only two similar units with outward direction from a 0 -pole give such a meeting; mutually they become complementary. $\mathrm{O} \longrightarrow \mathrm{I}<\mathrm{O}$. Two equal units become each other's anticenter. Yet, a secondary factor seems necessary to presuppose that leads to the polarity macro/microsporangia

## Stamens:

Stamens in flowers are probably transformed petals (Sb p.158) according to a more common belief, stamens and petals are understood as homologous organs. In macroshape it's a relation d-degree $2-1$, cf. outer poles of d-degree $1=2 \mathrm{a}, 2 \mathrm{~b}: \underline{2 \mathrm{a}-1-2 \mathrm{~b}}$, which may confuse the interpretation.

It seems that it could be an example of the same telom theory. Stamens defined at meeting of petal edges (?), left figure below. Right part of the figure illustrates a similarity with how seeds are arranged in certain ovaries, as at the edges where carpels meet?



Fig Pl-18-173-1

## Theories about emergence of flowers:

A flower corresponds according to certain hypotheses to a shoot, i.e. stem and leaf parts, however not quite so ( $S b$ p. $126 f$.). Flowers have also germs of roots, which shoots seems to lack as they are described (?). It's said as a fact that the female cone of conifers is a branched shoot, part of the trunk with leaves. If so, it would lack a germ to roots! Retrieved in the male cone? Cf. inward direction of roots and in male gametes?

Three theories share the hypothesis that anticenter just folded around a center (expressed in terms of the dimension model):

- that the leaf carrying seeds just folded and closed along its edges to form a wall around what became the pistil.
- that stalked microsporangia on leaves in a circle below upper small branches with germs to seeds came to grow up and close around the seeds; upper leaves becoming carpels, the lower ones with microsporangia becoming stamens and formed the perianth (Sb, p. 127). Or
- that in groups of macrosporangia the central became germ to the seed (nucellus) and surrounding groups became the coverings.

Hence, what becomes the seed would be defined by the position, a simple geometrical circumstance (similar to the one between vascular tubes phloem and xylem, originating from polar cell types at apex of branches).


Fig Pl-19-171-3
In outer form it implies a step inwards from a plane arrangement of d-degree 2 to a closed form of d-degree 3 . Simultaneously a force behind the folding seems presumed, as a convergent vector, pole 4 a in our model, transformed to a circular geometry versus a radial center (macrosporangia on twigs? - as in a d-degree step $4 \rightarrow 3$.

Yet, it sounds unlikely that such a process simply should take place on spread out leaves. The development must presuppose a jump on the genetic level. Cf. a dimension chain as "haploid", $0 \rightarrow 4 \rightarrow 3 \rightarrow \leftarrow 2 \leftarrow 1 \leftarrow 00$, where the 00-pole of d-degree 4 is debranched and meet "the other way around" in inward direction:


Fig Pl-20-005-1
An associated but alternative theory $(\mathrm{Sb})$ about origin of flowers is that these derive from a preliminary stage in development of a seed where the inner leaves remained folded. It's the kind of theory called neoteny (Sb p. 127) where a new kind of species starts from an earlier phase of embryonic development of an earlier species. (Cf. the thought that human beings derive from the similar embryo stage of the anthropoid ape.)

In positions, conifers have seeds directly on leaves as lateral and in shapes 2dimensional, while flowers appear directly on the top of main axis or branches as on ddegree 4 or 3 with both ovulum and petals/stamens. It could be interpreted as a difference in levels: In this sense a kind of neoteny.
$\uparrow$


3: lateral axis. seeds 3 directly on leaves 2 4: "vertical" axis - floral axis 1. 5. genetic level, innermost

Hence, flowers of angiosperms seem to derive from a deeper, virtual level.
Cf. the theory that flowers derive from "shoots", at an apex.
In outer shape, however, a flower in itself can be described in d-degrees 3-2:
Ovary is a room, d-degree 3, with the female reproductive cells and comes to include the nourishment, $\sim$ mass, from the polar nuclei that fertilized become triploid.

Stamens derived from petals, d-degree 2.
Simplified to d-degrees 3-2-1-00:


Fig Pl-22-173-
3: ovulum -2 : petals -1 : stamens, filaments -00 : pollen sacs
The development regarded according to the loop version of a dimension chain:

|  | Turned inside - out: $3 \rightarrow 4 \rightarrow 0 \rightarrow \uparrow \leftarrow \infty \leftarrow 1 \leftarrow 2$ |
| :---: | :---: |

Fig Pl-23-172-2,
Pl-24-172-2b

From center outwards in a flower there are 5-6 'layers" or steps of concentric structures:

```
embryo sac - integument - carpels -1- stamens - petals - sepals.
seed of conifers
                        >
seed of conifers
``` \(\qquad\)
``` angiossperms
```



A seed of conifers with integument
Fig P-25-171-1

- Integument is created from inside the seed outwards.
- Carpels $=$ "fruit leaves" become part of fruits, cf. mass in d-degree 3.
- The steps 2-1-00 in the figure become turned in the other direction

$$
00 \leftarrow 1 \leftarrow 2
$$

Structure versus motions characterizes the polarity female pistil- male pollen in agreement with the directions from 0 - and 00 -poles in the haploid version of a dimension chain.
(D-degree of motions increases with decreasing d-degree of structure outwards in the dimension model. Structure and motions become opposite dimension chains.)

Male reproduction cells show the inward direction from 00-pole (the pollen tube one expression) and become characterized by movability. While corresponding female cell shows the outward direction from a 0 -pole only in its structure, in the upward directed style of the pistil.

In general terms the evolution is naturally of the same kind as in the animal kingdom to more and more enclosed embryos. It illustrates also the general principle of a stepwise building-in of the 00 -pole (fertilization being just a primary example), which is one way to express the condition for further differentiations.

## 7. The cell level: Cell divisions to eggs and sperms:

In higher plants the female reproductive cell divisions is similar to the one in animals but goes further. It divides first two times to 4 cells $=1+3$;
-3 cells "disappear" - or perhaps just get "immaterialized" into vector fields of d-degree
4 ? (Cf. Genetics, last No.). In plants the remaining cell divides three times to 8 cells.

- These 8 cells get positioned 3-2-3 in the ovulum, cf. d-degree 2 and its outer poles in the dimension chain below: $3 \mathrm{a}-2-3 \mathrm{~b}$ :
$\mathbf{3}$ antipodals - $\mathbf{2}$ central polar nuclei -3 cells at the opposite end $=2$ synergides plus the egg.


Fig Pl-26
It seems that we could regard the one cell that develops further as represented by the step $4 \rightarrow 3$ in dimensional terms.

Cf. the loop model, where step $4 \rightarrow 3(+1)$ outwards corresponds to step $2 \leftarrow 1$ inwards: As mentioned above the 2 polar nuclei (eventually fused) become triploid after
fertilization by one of two sperms. On one level in he cell we have simultaneously three polarizations from 5 to 2 or from $0 / 00$ to 3 , in the $2^{x}$-series giving 8 cells.

The male reproductive cell follows first the simple $2^{\mathrm{x}}$-series: $1 \rightarrow 2 \rightarrow 4 \rightarrow 8$ but in following step within the pollen grain a complemntarity appears here too, with one "vegetative" cell that don't divide, one cell that divide in 2 sperm cells, thus giving a 3cell male grain.

The "pole meeting" from center and anticenter respectively becomes indeed complex. Just one further note:

Since one of the sperms fertilize the polar bodies in ovulum, one the egg, they seem obviously to be complementary in some respect - like poles $2 \mathrm{~b}-2 \mathrm{a}$ in the figure above?

Opening of the ovule has different angles, which becomes a secondary distinction between species (Psp.77): vertical, horizontal, oblique as $180^{\circ} \rightarrow 90^{\circ} \rightarrow 45^{\circ}$, a general feature hypothesized in the model when the dimension chain is regarded in terms of angle steps, halvings of a whole circle.

Function of the antipodals doesn't't seem known:.
They obviously mark a main "vertical" axis in relation to the egg with synergides, hence a kind of axes $00 \leftarrow \rightarrow 0$.

One question is if they perhaps have some influence on the development of a first sector division within ovary, a central axis of tissue to which central ovules are bound in flowers with seeds from center?

Another hypothesis could be that they have some guiding effect on the surrounding of the ovary, right through its wall, on petals and stamens and their circular growth? (Compared with the cell material at animal pole of animal embryos.)


Fig Pl-27
On the deep, underlying elementary level of physics the inward direction (pole 4a) is the $\mathrm{F}_{\mathrm{G}}$-force of gravitation, the outward direction the $\mathrm{F}_{\mathrm{A}}$-force (pole 4 b ) of expanding space.

In a more narrow sense the two forces could be re-found in flowers:
a) Inwards from 00-pole, fertilization of egg and mass growth through nourishment.
b) Outwards from the 0 -pole: fruits splitting up - seeds spread - disseminated.

Like contraction to stars and fusion, "disseminating" fused matter and sometimes explosions to new cycles.

## 8. Inflorescence-foliation- leaf forms and venation:

Some sketched descriptions of the variation with aspects from the dimension chain; not unambiguous and not a foundation for any systematics.

## Examples of inflorescences



Fig Pl-28-174-1

## Examples of foliation:



Fig Pl-29-174-2

## Examples of leaf forms and venation:



Fig Pl-30-174-3
As a shared variation of inflorescence, foliation and leaf forms with their venation appears

- radial divergence from the same node,
- branching in pairs from a shared node,
- displaced nodes
as steps towards increasing one-way direction from manifold to 2 -fold to 1 single branching.

The displacement of nodes could be suspected as expression for time: more and more debranched degrees in a dimension chain transformed to motions, equivalent Time.

| Inflorescences e.g. | umbel | - 2 -sided cyme | - vaceme |
| :--- | :--- | :--- | :--- |
| foliation: | rosette | - opposite | - alternate (spiralled) |
| venation: | palmate | -feather type 1,-2 with displaced nodes |  |

Fig Pl-31-175-1

## Inflorescence:

A sketch on how to regard the variations of inflorescence in a dimension chain:
In d-degree steps:
$5 \rightarrow 4$ : Multistage flowers as cymes imply branching of the main axis, here regarded as representing d-degree 4 . The repeated "center - anticenter" branching shows on a high potential on this deeper level. These flowers seem all (?) to have top flowers, eventually an expression for the definition of new nodes as new centers.
$4 \rightarrow 3$ : Top flower versus only lateral flowers may be interpreted as a step from step 4 $\rightarrow 3$ in terms of coordinate axes. Branching of these flowers of umbel type from one node becomes an expression for the radial pole 3 b in our model.
$3 \rightarrow 2$ : Displaced nodes in raceme type can express the added motional moment in ddegree 2, from 2-dimensional rotation to 3 -dimensional spiraled motion in d-degree 2 according to the model: a new factor of Time. The same differentiation appears within sessile flowers in a step from spadix or composite to spikes.
$3 \rightarrow 2 \rightarrow 1$ : The differentiation from multi sided to 2 -sided to 1 -sided spread in space becomes an additional differentiation, so among cymes but also among sessiles from spadix to composite, 2 - to 1 -sided: the latter connected with step $4 \rightarrow 3$ : vertical to horizontal axis.

## Foliation:

Regarding foliation, the variations radial, opposite and spread foliation could also be described in terms of angle steps:

- from $360^{\circ}$ in rosette and whirled foliation to
$-180^{\circ}$ in opposite foliation
- to smaller angles, e. g. $144^{\circ}$ or $120^{\circ}$ in spiraled foliation with displaced nodes.

It's said that most dicots have opposite to spiraled foliation, while monocots mostly have spiraled ones. Hence, also in this feature the monocots show a certain displacement towards lower d-degrees according to first interpretations above.

Such a displacement separate also rosette from whirled foliation. Cf. radial vector field outwards in d-degree 4 and radial structure, pole 3 b in d-degree 3 in the model: a rosette at the base of the main axes or stalk, at the origin in the seed, and the whirled leaves further out.

## Leaf forms and venation:

Even in the venation of leaves the stepwise displacement of nodes are found, from

- a node in the center of shield-shaped leaves to
- radial nerves from edge of the leaf (kidney-shaped or the like) to
- nerves branched in pairs to
- displaced branching of the nerves (feather veined) to
- parallel veins,
approximately as geometrical steps in d-degrees $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$. Parallel nerves
become especially common among monocots.

Forms of the leaves follow roughly the venation: round to oval to linear shape with all variations between.

Leaves with lobes seems to have an animal parallel in tissue death, for instance in the death of web between toes and fingers; assumably an effect of the inhibiting gradient from the 00 -pole as polarizing force; a polarization of charge?

## Some notes about trees:

- It seems as if trees often branch in about 5 steps from root - trunk out to the leaves?
(This regards Swedish broadleaf trees and is no scientific information.)


Fig Pl-32-165-1
The branching gets often a character of angle steps, one hypothetical aspect on d-degree steps in the dimension model. (In the schematic right figure above as $\rightarrow 180^{\circ} \rightarrow 90^{\circ} \rightarrow$ $45^{\circ} \rightarrow 22,5^{\circ} \rightarrow 11,25^{\circ}$.) And the leaves return to earth, i.e. in the inward direction, with an "energy gap" in the angle rest, $\sim$ the defoliation.

A developed broadleaf tree gets the form of a magnetic field around a staff: in at South Pole, out at North Pole.


Fig Pl-33-165-2

- Nuclei of branches, born within the trunk, are often groups of 2-3-4-5 in number, so it's said, and migrate outwards the bark. (Perhaps a model of how the planet system was born?)
- Like surface of the Earth a tree has negative charge at the surface and positive in its center, like the atom and in opposition to its origin , the individual cell. Horizontal parts of plants become negative charged on the upper side, positive underneath. Hence, positive charge from inward direction, negative from outward direction, as in the atom.
(A hazel bush as a cascade particle?)


## Evolution <br> - THE ANIMAL KINGDOM -

## 1. Some general aspects:

It's hard to see how only "random mutations" and "natural selection" could explain an evolution towards more complex organisms. All kinds of variations, yes. But hardly the increasing "capacities" of creatures from the enormously well adapted bacteria.

It has been said that even the simplest unicellular forms of life that have survived to our days have nearly all types of enzymes as higher animals ( $J B$ ), the same number and kinds on different levels in the evolutionary chain. And all fundamental functions exist already in the unicellular organisms.

If this still is valid after an immense amount of new knowledge during last decades, it has implications for the Darwinian view on evolution.

When it concerns multicellular organisms all phyla within the animal kingdom seem to have been differentiated already in Precambrian times ( $E z$ ). "In no case any transitional forms of today or as fossils are found."*
*If now this statement isn't a kind of circular definition: the definition of phyla builds probably (?) on the lack of transitional forms. The classifications of phyla are also much debated.

For instance: fossil finds cannot confirm an evolution from 1- to 2- to 3-layer animals. On the other hand an evolution in the dimension of time seems proved within a group as chordates.

If we assume (irrespective of divisions into phyla) that all basic forms - with different degrees of complexity - appeared more or less "simultaneously" from the eukaryotic cell, we have to imagine that they got differentiated out of some underlying, basic differentiating principles, perhaps as through a series of more or less momentary 'quantum jumps'; the following differentiations within the basic forms along another coordinate axis of time. This as analogous to the first seconds of Universe after big Bang with following development through billions of years.


Fig Ev-1-177
Environment changes slowly. If crediting Darwinian "trial and error" mutations '50 \%, of the truth, we have still $50 \%$ to account for and ascribe to basic structural principles.

Then, the longtime evolution should be connected with a hierarchy of genes of the same kind, with primary rows of genes differentiated into secondary, more specialized
ones; the primary genes perhaps getting activated at certain threshold points of major changes in evolution?

The different coordinate axes may also be seen as appearing in the relations egg $\rightarrow$ individual versus individual $\rightarrow$ environment: egg the 0 -pole, environment the 00 -pole. It's a bond of dependence that implies mutual changes between the "poles".

## 2. Biologists' primary bases for classification of organisms:

## Sub-cellular level:

a. Autotrophic - heterotrophic organisms (= not depending - depending on organic nourishment as plants versus animals)
b. Prokaryotic - Eukaryotic organisms
(cells without nuclear membrane as algae and bacteria - cells with nuclear membrane)

## Eukaryotic organisms, animals:

- Unicellular - multicellular organisms
- 1-, 2-, 3-layer organisms
- Coelom (body cavity) types: degrees in development of a true abdominal cavity (Acoela, Pseudocoela, Schizocoela, Enterocoela)
- Protostomia - Deuterostomia: oppositions in directions regarding formation of organs. (Deuterostomia is the branch leading to vertebrates, mammals and Homo Sapiens.)

About classifications on the sub-cellular level, $a$ ) and $b$ ) above, see additional file.
In the last 4 points of classifications it's easy to recognize the geometrical steps in dimension degrees (d-degrees) of the dimension chain, our background model. A rough, first description of the evolution in synthesizing direction inwards in the chain:

- from single cells as points to cell-contacts of multicellular organisms, a step $1 \leftarrow 0$,
- to number of tissue layers as surfaces, $\leftarrow 2 \leftarrow 1$
- to separation of inner abdominal room in mass and space, step $3 \leftarrow 2$,
- to the differentiations in directions inwards/outwards, front-back etc. in step $4 \leftarrow 3$.


In the dimension chain in physical and geometrical terms:


Fig Ev-3-179x
a-poles with features from 00-pole, b-poles with features from 0-pole:
$0-00$ also a relation between higher and next lower d-degree.
The level chain in a developed chordate corresponds rather naturally to these basic classifications:

|  | Organism - System - Organ - T |  |  |  | Tissues - |  | ritacts - | The Cell |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 5 | 4 |  | 3 | 2 | 1 |  | 0100 |
| Poles: | 0/00 |  | 4b/4a | $36 / 3 \mathrm{a}$ | a 2b/2a |  | 1b/1a |  |

Fig Ev-4-179-1


Fig Ev-5-179-2
The first three steps above of evolutionary classifications corresponds to the embryonic development of a 3-layer chordate:
$\frac{\text { Egg } \rightarrow \text { Morula }}{\text { unicellular } \rightarrow \text { multicellular }} \frac{\text { Blastula } \rightarrow \text { 2-layer bladd er }}{\text { tissue level }} \frac{\rightarrow \text { Gastrulation }}{\text { coelom - body cavity develops }}$

Fig Ev-6-179-4
[A couple of following differentiations within Deuterostomia:

- Invertebrates - Vertebrates.
- Vertebrates: egg-laying - mammals.
- Mammals: without amnion - with amnion.

Subgroups within group Vertebrates

- Tunicates $\rightarrow$ Lancelets $\rightarrow$ Cyclostomes $\rightarrow$ (e.g. lampreys) $\rightarrow$ armored sharks (Placoderms) $\rightarrow$
- Cartilaginous fishes $\rightarrow$ Lungfishes $\rightarrow$ Ray-finned fishes and bony fishes $\rightarrow$
- Coelacanths ("Old Four Legs") $\rightarrow$ Amphibians $\rightarrow$ Reptiles $\rightarrow$ Birds // Mammals $\rightarrow$ Homo

Sapiens.
Biologists have divided living organisms in 5 kingdoms (Fc p. 95), a number 5 that hasn't much to do with the 5-dimensional chain tested here:Unicellular prokaryotic - unicellular eukaryotic plants - fungi (mushrooms) - animals. ]

## 3. Unicellular to multicellular organisms, step $\mathbf{1} \leftarrow \mathbf{0 / 0 0}$ :

The evolution from first prokaryotes to eukaryotes and then to multicellular organisms took billions of years. Changes of the environment and chemistry of the atmosphere of Earth are taken as main factors.

However, there seems to be a lack in the explanations between this very slow, continuing change of the environment and produced, outer conditions on one hand and the clear, "sudden" steps on the level of the cells themselves on the other.
It could indicate the existence of certain thresholds in values of parameters (light, oxygen etc. ), which function as borders for marked, new constructions.

As said before there are many intermediate forms with cell contacts (regarded as ddegree 1 in the level chain) forming colonies of individual cells, also among prokaryotes. It's however only eukaryotes that develop to multicellular organisms, obviously representing a new degree of integration.

Some aspects on this transition could hypothetically be

- inversions of some kind?
- new center defined at meeting between individual units of equal potential?
- a deeper center as start of cell division?
- just a reversed relation in relative amount of e.g. DNA and proteins versus lipids?


## About inversions:

Multicellular organism represent unity among cells - as guided by the integrating 0-pole in our model. Unicellular organisms express separation between cells - as out of the polarizing 00-pole. The multicellular represent unity, the unicellular the multitude - in spite of amount in their names.

The relation unicellular egg - developed organism in the multicellular organism appear as a kind of reversion - or the previous opposition built in: it's the egg that has the high potential for differentiation, while the developed organism represent already differentiated cells, corresponding to start and end of a dimension chain as steps of polarizations.

In terms of directions outwards / inwards it could be pointed to the circumstance that unicellular organisms have a tendency to seek themselves inwards multicellular organisms, to live inside these - as for instance algae in fungi and bacteria in animal stomachs - like viruses more explicitly. (A parallel to the theory (No. 11) of mitochondria and chloroplasts as immigrants in eukaryotic cells.)

Certain 1-layer species as calcareous sponges have a "curious" turn of the blastula inside-out at their embryonic development. Similar processes occur in colonies of flagellates as Volvox (Ezp. 57), hence among individuals referred to step $1 \leftarrow 0 / 00$ in our interpretation here, single cells to cell contacts.

Such "inversions" could be the expression for the "pole exchange" in last step $1 \rightarrow$ $0 / 00$ of our model (where motions outwards define a new anticenter, motions inwards a new center. (This last step $1-0 / 00$ is represented in each higher d-degree step too.)

The invagination of vegetative pole in embryology of chordates - as an antipositive curvature inwards - may perhaps be understood as a less drastic equivalence.

## New centers defined through meeting of units ...?

It's from eukaryotic cells that multicellular organisms develop and it's eukaryotic cells that develop sexual cell divisions. (It's said too that sexual reproduction are initiated at changes in environment among organisms that have both alternatives.).

One could imagine that in a certain step a duplication of DNA could occur, leading to meios, a halving as a polarization $\leftarrow \rightarrow$ at cell division, which the other way around gives the opposite meeting between two complementary units, defining a new, more highdimensional center: $\rightarrow 0 \leftarrow$. (Also a kind of inversion of directions, here in the process of reproduction.)

Yet, sexual reproduction doesn't in itself lead to multicellular organisms. (A condition is perhaps that the small difference, assumed here in file Genetics, between "daughter cells" at simple cell divisions, has grown far enough to complementary poles that imply and stress the mutual dependence?)

Geometry in positions of cells may have been a primary factor, perhaps the most elementary, behind the evolution of multicellular organisms?

There are species of bacteria (myxobacteria) that first spread radially outwards, then turn to grow in inward direction towards certain centers and superpose these, which through these superpositions become defined as spores (Bc p. 319). It's an example that indeed seems to illustrate the views here on opposite directions of fields - and a kind of fertilization through meeting of opposite poles. There is already an underlying "we" in these groups, assumed as through some mutual signals.

Cf. how the very relative position of single cells decide their development to different parts of a flower according to theories about plants.

In a field of first cells the one in the center could have been defined as 0-pole, the furthest out as anticenter, 00-poles, the opposition connected with a radial versus circular geometry; the central cell becoming defined by its position as outward directed and consequently with high differentiating potential, a condition for a multicellular organism. While cells at anticenter remain a multitude of similar cells. Cf. that this also characterizes ectoderm in multicellular organisms - and cells from the animal pole at "exogastrulation" (No. 4).

Now, as far as is known, the evolution of multicellular organisms from unicellular ones seems to have taken billions (?) of years. Then we have to count on three historical phases: 1) cell divisions and "radial" spread of the unicellular individuals over the surface of the Earth = divergence, 2) pole exchange to inward direction, 3) convergence leading to meetings with other cell groups. If so, it would be a parallel on another timescale to what is mentioned about the myxobacteria above.

We may compare the spread of human beings in small groups of kinfolks and clans out over the world and at certain densities a turn to convergence and confrontations with other kinfolks and clans, stepwise leading to more hierarchical structures and superposed organization of societies...
[ Level development:
One suggested view in the dimension model here is that a condition for level development is a meeting between equivalent units (of 5 -dimensional types) with centers as 0 -poles, whose mutual relation thus becomes opposite, defining new more complex centers.

$$
\begin{aligned}
& \uparrow \text {-way to new level } \\
& \text { (0/00) - a complex new center } \\
& 5 \rightarrow 4 \rightarrow 3 \rightarrow T \leftarrow 3 \leftarrow 4 \leftarrow 5 \\
& \text { unita } 11 \quad 12 \quad 2 / \quad 11 \text { unit b }
\end{aligned}
$$

Fig Ev-7
The contrast to such level development would be just repeated propagation:
$5 \rightarrow 4 \rightarrow 3 \rightarrow 2 \rightarrow 1 \rightarrow 0 / 00$, as propagation of a single 5-dimensional unit.]

## A deeper center at start...?

Another hypothesis is the thought that the cells at divisions of unicellular individuals didn't get quite separated and retained a closer connection to one another on this fundamental level that concerns the inner of the cell with relative negative charge.

The same thing could be described as a cell division that has reached a deeper level, e.g. the field level of d-degree 4 instead of earlier only of d-degree 3 .

It should imply a character of what is called neoteny, a branch of evolution starting from an earlier embryological stage of an individual.

The field level - and strength of integrating 0-pole of d-degree 4 in terms of the model - is obviously incorporated to an internal property in multicellular organisms.

## Relative amounts of proteins...?

In fundamental aspects the cell can be regarded as inversion of an atom. The relative negative charge inside membranes is mainly given by the proteins, which also make up the radial structure in cytoplasm and cell membranes with origin from center. As radial they are principally unlimited outwards - in opposition to the closed circular component of lipid membranes. (Cf. also the polarity the $\mathrm{F}_{\mathrm{A}}-\mathrm{F}_{\mathrm{G}}$ forces outwards / inwards.)

Thus, if the protein production became dominating over the one of lipid membranes, suddenly or not, it could have implied a new degree of communication and transports between cells - as materialization of field lines.
The clear demarcation of a center through a nuclear membrane in eukaryotes could perhaps been a factor in such a change (?).

Light with its double character of particles and waves could be regarded as a ground plan for the opposition unicellular - multicellular organisms: in inward direction appearing as particles, to compare with individual, separate quanta as cells, in outward direction appearing as waves, corresponding to the primary, uniting, wavy proteins on the field level of multicellular organisms.
(What should in that case among cells correspond to the certain conditions within quantum mechanics that gives these opposite aspects on photons?)

## 4. Classification in 1-, 2-, 3-layer animals, step $2 \leftarrow 1$ :

The division of animals according to number of tissue layers concerns dimensionally ddegree 2 in the sense that tissues represent cell contacts forming surfaces. We get the number chain 1-2-3 as outer poles of d-degree 2 and 1 and from 1 in the dimension chain. (Cf. that the 1-layer animals according one theory originates from 2-layer ones.)

The complementary poles $2 \mathrm{a}-2 \mathrm{~b}$ out of d-degree 2 in the dimension model are in elementary geometrical terms defined as outside/inside and/or convex/concave.
1- to 2-layer species become more or less bowl-shaped around the gastric cavity in their outer design.


Fig Ev-8
(The term species here used without regard to the scientists' classification of levels into kingdoms, phyla, classes, orders, families, genus, species.)

There have been separate opinions between scientists on how to classify "1-layer" organisms as sponges since they also have an inner layer of cells, however more individual, not quite united to a tissue. They could be called 1.5 -layer organisms. The same regards true Diploblastica, "2-layer" animals as Cnidarians (hydras, e.g. jellyfishes and corals), which have an extracellular layer between its two main tissues that can include spread cells, thus could be called 2.5-layer species.

With reference to the figure above and "outer poles" as partial structures of each ddegree in the model such confusion or halfway steps are natural.

About differentiation of organs besides the gastrula the 1-layer species have only spicules as a kind of skeleton in the layer of extracellular material besides spread individual cells inside outer tissue. Among these however a kind of contractile cells appear as precursors to muscles.
(About forms of spicules as basis for classification, see file Skeleton.)
2-layer species get further nervous and muscle functions but hardly as separated organs, only as a differentiation between single sensory cells besides muscle cells in the same epithelium (of d-degree 2) and ganglia that innervate the muscle cells.

First with 3-layer species, where the intermediate layer forms a real $3^{\text {rd }}$ tissue of cells, 3dimensional organs develop. Organs in the level chain as d-degree 3.

In the level chain of organs we have regarded skeleton defined in d-degree step $2 \leftarrow$ 1 and muscles in step $3 \leftarrow 2$. Thus, there is a natural correspondence between the classification of species and of organs, especially when counting with the outer poles in different d-degrees in the model.


Fig Ev-9
(About d-degrees as numbers it could be added that with a $3^{\text {rd }}$ tissue layer and development of a front - back axis in more developed animals the intermediate coelom material gets differentiated into 2-3 sections.)

The gastric cavity (the stomach) gets stepwise differentiated from 1.5- to 2.5-layer species and within these groups.

The step from radial inflows in sponges to one-way directed inflow (the original embryonic mouth) in 2.5 -layer classes are one example. (It's a drastic change similar to the one between the circular blastula and definition of a coordinate $\mathrm{A}-\mathrm{V}$-axis in embryology of chordates.)

The cavity in 1.5-layer animals is only a sac with inside and outside - as outer poles of d-degree 2. In 2.5-layer animals as hydromedusae the cavity is differentiated in a radial canal and a ring canal (Ez p. 62), the geometrical poles 3 b and 3a in our model.

There are however transitional forms in shapes of the inflow canals: In 1.5-layer sponges the complexity of the inflow canals increases - from straight radial (ascon type) inwards to angled with side pores in membranes that have become wavy in convex - concave bows (sycon type) to a branched network of canals with widenings to globular chambers in the epithelium (leucon type) with flagella of the cells converging inwards (Ez p. 52, 50), i.e. a more 3-dimensional structure. It can be compared with how glands develop in chordates.)

Cf. that these shapes of canal systems in structures geometrically correspond to ddegree steps $4 \rightarrow 3 \rightarrow$ in the dimension model, see No. 7 below about "Directions...".

In 2.5-layer species the gastric cavity becomes divided through walls, "septa", as a stepwise materialization of the inward direction. (According to reference Fc p. 113 they radiate outwards from center of the gastrula, but according to the figures on the same page rather from the periphery inwards.) While hydras lack septa, jellyfishes have partial septa, corals whole septa.

Numbers of septa are essential in the classifying system. Septa in the extinct tetracorals were shaped in 4 steps through three angle steps from a "vertical" axis which gives number of septa 2-6-10-14 (Fc p.113); compare number of electrons in $s-p$ $-d-f$ orbitals, intervals in the $2 \mathrm{x}^{2}$-chain behind the periodic system. Septa in stony corals (most corals of today) are typically " 6 -radiant", have 12 primary septa.

Another differentiation occurs in muscle functions on septa of 2.5-layer corals (Ez p. $75)$, which have "radial" muscles on one side of the septa walls with divergent, protracting function, and longitudinal muscles mouth - foot with contracting function along the vertical axis on the other side. Hence, a polarization both of coordinate axes to $90^{\circ}$, assumed angle step in d-degree 4 to 3 , and of elementary directions outwards/inwards in function as well as on wall sides, poles of d-degree 2. Cf. d-degree 3 in the model with outer poles $4 \mathrm{~b}-4 \mathrm{a}$ of d-degree 4 , Direction, and muscles referred to d-degree step 3-2 in the dimension chain of organs.

Other features separating these tissue classes concerns capacity of external locomotion, forming of colonies and symmetry, see No. 7 below.

## 5. Coelom — differentiations, step $3 \leftarrow \rightarrow \mathbf{2}$ :

Coelom from mesoderm regards the $3{ }^{\text {rd }}$ real tissue layer (Triploblastica).
Within the class of 3-layer animals the differentiation of this coelom is obviously as said above a question of polarizations Mass - Space, that's out of d-degree step 3-2 in our model. It implies steps from species as Acoela with coelom as a whole mass to species with splits in coelom (Schizocoela) to species with coelom divided in outer and inner layers (d-degree 2) with real secondary body cavity (Enterocoela).

We have the inward direction of gravitation ( $\mathrm{FG}_{\mathrm{G}}$ ) connected with the property Mass, the outward acceleration force ( $\mathrm{F}_{\mathrm{A}}$ ) connected with Space in macrocosm as well as here, however, in a reversed relation: inner space, surrounding mass. (Cf. the cell regarded as inversion of an atom.)

One can describe these polarizations either in terms of mass - space, physical poles 3a3 b out of step $3-2$, or just as a step from mesoderm as a volume (d-degree 3 in our model) to mesoderm as surface layers (d-degree 2 ).

## 6. Deuterostomia - Protostomia, step $4 \leftarrow 3$ :

Some characteristic polarities, although not general in all respects:

## Protostomia

- nervous system ventrally
- heart dorsally
- archenteron becomes mouth
- mesenchyme from ectoderm (outer layer)
- exoskeleton
- schizocoel common
- spiral cleavage of egg often
- segmentation of body typical


## Deuterostomia

- nervous system dorsally
- heart ventrally
- archenteron becomes anus
- mesenchyme from endoderm (inner layer)
- endoskeleton
- enterocoel (real body cavity)
- never spiral cleavage
- not segmentation

As said in first paragraphs above this opposition concerns directions, d-degree 4 and poles 4 a and 4 b , inward/outward directions in our model:

- partly inwards - outwards from anticenter - center poles (ectoderm- endoderm) in such things as creation of skeleton, (exoskeleton versus endoskeleton) and mesenchyme, - partly in positions of first neural and nutrition systems in relation to the two coordinate axes Animal - Vegetative poles (A-V) and Front - Back (F - B), in file Embryology interpreted as corresponding to d-degrees 4 and 3.)

The complementary polarity of d-degree 4 here implies also a further "centralization" of separate functions to organs, representing d-degree 3 in the level chain.

As for coelom in preceding paragraph, it's enterocoel that implies a real secondary body cavity, internal secondary space. Again, we have the fundamental opposition Mass Space:

Space as such, representing divergence from 0-pole, here separating mass to tissues in both directions, seems as a factor behind the domination of outward direction in Deuterostomia, the properties that lead further to chordates.

Mass of less split coelom represent convergence and inward direction, thus connected with Protostomia, including arthropods, the insects.

Why are insects so small and elephants so big?! Why this difference between enormous amounts of eggs and only a few? It seems as if it could have its origin in this opposition between contraction from the 00 -pole and divergence from the 0 -pole.

Further there were the differences

- in egg division: Protostomia often spiral cleavage, Deuterostomia never.
- segmentation: typical for Protostomia, in Deuterostomia no segmentation.

Spiral cleavage of first egg occurs among Protostomia in many groups of Schizocoela. It implies a kind of rotation, assumed as motional moment in d-degree 3 in our model.

In Deuterostomia_first cleavages of eggs are "bisymmetrical", vertical and horizontal, which means along crossing orthogonal coordinate axes that define a center. In such egg cleavage all 4 to 8 cells have principally direct contact with the center, the origin. (Cf. stem cells that separated can develop to whole individuals.)

Thus, the opposite kind of egg cleavage reflects also this polarity between center with "radii" - and anticenter as circular rotation.

It corresponds to a view on the dimension model where a-poles of all d-degrees derive from end of the dimension chain, b-poles from its start:


Fig Ev-10
Spiral cleavage leads to early differentiated cells in opposition to the radial and bisymmetric one where the daughter cells keep a higher potential of differentiation.

Compare perhaps that the first egg cell in mollusks (Protostomia) undergoes several internal polarizations in the cytoplasm before the total cell cleavage, while such polarizations in Deuterostomia as lancelets or frogs (batrachians) are only one or two.

Segmentation as a division in more or less equal parts of the body implies a division along the Front - Back axis, the axis which typically gets developed in 3-layer animals. It's also the axis we have seen as representing d-degree 3 in embryology of chordates.

Segmentation is typical for big groups of Schizocoela Protostomia such as ringed worms (Annelids) and Arthropods. Even mollusks are believed to come from originally segmented forms.

Organs that in segmentation are repeated in each segment are shells - the exoskeleton, extremities as some kind of legs, a pair in each segment, nervous ganglia and muscles. That is organs mainly created from outside inwards - the characteristic direction of Protostomia. ("Superficial" egg cleavage - on the surface, d-degree 2 - in the class arthropods seems as a connected feature.) The alimentary canal, however, from vegetative 0 -pole runs through the length of the body unsegmented. Cf. threadlike colonies of unicellular organisms that sometimes have a canal straight along the thread with shared protoplasm.

> It has been said somewhere in a physical context (no reference here available) that convergent vectors (Vconv) don't reach the center. If so, the segmentation of worms could be one example!

> Why the multitudes of Masses in macrocosm - and the unity of expanding Space? Perhaps the density of divergent vectors from a center (not identified or defined) hampers and overcomes the convergent vectors "half ways" ? Compare Vdiv, the FA-force, with what is called "dark matter" and estimations of its relative strength or overweight in relation to mass and the FG-force, ( $70 \%$ to $30 \%$ or other similar figures).

Some features of segmentation appear also among Deuterostomia as chordates, e.g. in muscles of the alimentary canal, in the straight abdominal muscle of humans, in our notochord and in bladders on the neural tube in its embryological development.

Segmentation on the level of organs corresponds to a similar feature on the level of tissues: cells in the outer tissue (ectoderm, the skin) are more or less equal, while cells in endoderm have a high potential for differentiation. Compare about exogastrulation in file Embryology_concerning Deuterostomia: isolated tissue material at animal pole
doesn't differentiate while that from invaginated ventral pole can develop rather much of organs.

Hence, there is a quantification and multitude as repetition from outside (the quantifying 00 -pole), a continuum and unity from inside (the quantified 0 -pole ). In the dimension model the force from 00 -pole is the primary polarizing one, the pole from 0 -pole the primary integrating one; a relation quantification - continuum related to the one between particles and waves.

Standing waves, longitudinal and/or transversal, could to a certain degree illustrate segmentation - as it seems expressed in motions of worms!



Fig Ev-11
A wave and its reflection between two borders correspond to opposite directions in the dimension chain, the reflection implying a pole exchange and a quantification. If the illustration is more than a metaphor, why should the double direction be typical for Schizocoela Protostomia? The reflected wave as "inwards" along the F - B axis in this group eventually stronger than in the other?

> It's said that stationary waves appear when "the force is not in phase with the velocity". However to interpret and apply that statement, one could speculate about phase displacements of waves as a differentiating factor between animal groups.

> Such phase displacements may correspond to half steps in the dimension model here, a displacement between a d-degree and the jump or d-degree step: border - interval. Cf. first figure in this file, differentiation through primary steps. Examples are the relation between vertebrae and spinal cord in humans, also development of extremities from the web between fin bones in fishes.

The opposition plants - animals, if expressed in terms of standing waves could be:

- Plants: longitudinal waves, open ends.
- Animals: transversal waves, closed ends. (Source Wikipedia, Standing wave.)

Segments can during embryological development and historical evolution get differentiated functions and be packed together. In the Protostomia class crawfish (crayfish) the 5 front segments develop to the head. Note once again number 5! It's about the same when it concerns the human brain. It seems again to be a question of positions, the location of cells along coordinate axes as vectors, here the back - front vector.

Protostomia includes a manifold of groups, Deuterostomia only a few with Chordate as a big one. Thus, the very number of groups could be seen as an expression for the polarity manifolds- unity, the 00 - versus 0 -pole, and the dominating opposition of directions between Proto- and Deuterostomia.

## 7. Directions of evolution?

Since all animal phyla of multicellular organisms seem to have been differentiated already in Precambrian times ( $E z$ ), it make it difficult to establish a direction in time between them.

Among the bases for classifications above only the one between Protostomia and Deuterostomia represent more clearly a complementary polarity of poles of the same ddegree in the dimension model. The other divisions are more as d-degree steps, to or from more complex forms. To or from? It's easy to be cheated by the clear evolution within phyla, as the steps from water to land living animals and more built-in embryos. We can remember that some scientists regard 1-layer animals as originating from 2layer ones.

Direction from simple to complex forms is not unambiguous.
In a dimension chain the direction outwards lower degrees implies increasing differentiation as increasing numbers of polarizations. This could be translated to steps towards more simple forms. However, with the differentiations built-in the evolution goes towards more complex forms.


Fig Ev-12-182-2
A fundamental tone includes all its overtones. A highdimensional cell or tissue is the one with high potential for development - like stem cells in relation to specialized ones. In the embryological development first stages are naturally most high dimensional in this sense, most "simple" stages as blastula and the two wall bladder in chordates resembling the 1 - to 2 -layer organisms.

There are features of these 1- to 2-layer animals that connect them with highest ddegrees in the dimension chain and could point to an origin from these steps 5-4-3.

They are often stuck to the sea bed or other solid surface or have such stages in their development. External, "endogenous" locomotion is not developed.

Density is a factor too (the physical quantity proposed in step $5 \rightarrow 4$. These 1 - to 2layer classes are often building colonies as the unicellular ones. In colonies the external relations are still structural, individualization only partial. (Certain 2-layer hydroids have the individuals on a common "stalk" where they get mutually differentiated in function.). Thus features from the further functional differentiation into organs in 3layer classes appear already on these elementary tissue levels.

The symmetry (see below) of 1-2-layer classes are mostly radial or biradial symmetric, like 5 - to 4 -merous diploblastica among plants.

One aspect on this ambiguity may be illustrated by the loop version of the dimension chain: d-degrees from higher steps debranched and meeting the other way around in synthesizing direction inwards:


Fig Ev-13
(It's possible to see some structural relationships between corresponding steps outwards - inwards in this the loop version of a dimension chain:

- Naturally the egg with the whole organism (as between d-degree 5 and $0 / 00$ ).
- The above mentioned inversion of the blastula in a species of 1-layer sponges and differentiations of directions in Proto-/Deuterostomia. (4-1)
- The septa (developed inwards) in many 2-layer organisms and of coelom (outward from archenteron) in 3-layer animals:


Fig Ev-14-179-3x )
In the history of evolution the direction may appear to be mainly towards "invelopment".Yet, in other respects it seems possible to suppose simpler animal forms as debranched or reduced variants of species from more complex levels in the evolution.

$$
\begin{aligned}
& 5 \rightarrow 4 \rightarrow 3 \rightarrow \ldots . . \\
& \backslash 1 \backslash 2 \backslash 2,5
\end{aligned}
$$

A more acceptable interpretation in accordance with the figure is probably to see the high dimensional potential of an embryo going stepwise further, implying stepwise more involvement towards more complex forms the other way around: Hence, an evolution that stops of some reason (e.g. complexity of DNA?), earlier or later:

$$
\begin{aligned}
& 5 \rightarrow 4 \rightarrow 3 \rightarrow 2 \ldots \ldots .3 \leftarrow 2 \leftarrow 1 \leftarrow 0 \\
& 5 \rightarrow 4 \rightarrow 3 \text {..................... } 2 \leftarrow 1 \leftarrow 0 \\
& 5 \rightarrow 4 . \ldots \ldots . \ldots . . . . . . . . . . . . . . . . . . . . . . . . . . . ~ 1 \leftarrow 0
\end{aligned}
$$

Another aspect concerns the fundamental polarity between plants and animals. They represent opposite directions in the dimension chain.


Fig Ev-15


Fig Ev-16

In essential functions the animals in their involvement represent the "a-poles" versus plants as "b-poles" in a dimension chain, "motions to each other", outside in eating, circular versus radial structure and inward direction embryologically as in their dependence.

In symmetries the opposition in directions seems clear:
While symmetry in flowers of plants generally decreases from 2-cotyledons to 1cotyledons, from 5-and 4-merous plans to 3 -merous plans, the polarizations in animals into coordinate axes become coupled with increasing "invelopment" inwards, with increasing number of tissue layers:

- 1-layer animals are radial-symmetrical.
- 2-layer animals are radial-symmetrical - or bilateral symmetrical in certain cases.
- 3-layer animals are bilateral symmetric.

In the embryological development the steps from the "vertical" axis AnimalVegetative poles to the axis Front - Back to the Right-Left axes has been interpreted as a process through $4^{\text {th }}$ to $3^{\text {rd }}$ to $2^{\text {nd }} d$-degree. In numbers of axes corresponding to 1-23.

With only the V-A-axis defined, the symmetry becomes principally radial, and 1- to 2layer animals retain thus this main axis of the invagination gastrula.

With development of the F-B-axis in 3-layer animals the symmetry becomes bilateral. The symmetry axes can be described as stepwise "crystallized" and decreasing towards more "inveloped" animals:


Fig Ev-17-183-1

Symmetry planes in projection, - increasing widirection:


Fig Ev-18-183-2
(The fundamental reason why the symmetry decreases with new coordinate axes is naturally that the axes are defined by complementary poles).

The step from radial to bilateral symmetries resembles the one in atoms from $\boldsymbol{s}$ - to $\boldsymbol{p}$ orbitals: s-orbitals circularly "all-directed" versus electrons divided on perpendicular coordinate axes in p-orbitals.(Orbital numbers given from intervals in steps $\leftarrow 2 \leftarrow 1 \leftarrow$ 0 in the $2 \mathrm{x}^{2}$-chain. It's surely not a coincidence, cf. numbers of septa in corals above.. .

It can be observed that radial-symmetric 2-(2.5-)layer species as cnidarians often have a 4-numbered symmetry ( $\operatorname{or} \mathrm{nx} 4$ ) in outer and inner structure as related to 4-merous plants.

A primary group of 3-layer Deuterostomia as the echinoderms is said to have had a 3-numbered symmetrical form in Precambrian (Fc p. 121), hence a decreased symmetry towards more "inveloped" forms in agreement with the views above. Their radial, 5numbered symmetry of today is a secondary feature, superposed their bilateral symmetry on their larval stage ( Ez ). Compare number 5 in the superposed chain $9-7-$ $5-3-1$, halved orbital numbers as intervals in the $2 \mathrm{x}^{2}$-chain behind the periodic system:


Fig Ev-19-192x
The $3^{\text {rd }}$ coordinate axis right - left (R-L), the bilateral one, shows many signs to also develop towards asymmetry, as out of complementary poles:

Examples are for instance the dominance of the claw on one side in some species of crayfishes and their lateral motional direction, the increased growth of one tooth on one side in toothed whales, the differences between right and left cerebral hemispheres in humans as well as the asymmetric positions of inner organs and different division of lung lobes. Etceteras. Birds retain the right arc of aorta, mammals the left one ( Kz p . 210).

In mollusks, believed to have developed from an early bilateral symmetric species, the intestines undergo a rotation half a turn that leads to a radical asymmetry bilaterally ( $E z$ p. 259).

In the dimension model rotation and spiral motions are assumed as the external motions in structures of d-degree 3 and 2 respectively. We could wonder if perhaps a slow process of such motions goes on during history of evolution, which have proceeded unequal length of time within different species?

## About fundamental tones and overtones, an association

How overtones on a cello string may appear? Development of tissue layers and specializations (figure from end of file Embryology).
A"Medusa" figure :


Fig Ev-20-188

## 8. Miscellaneous notes:

About secondary polarizations of directions, numbers and design with associations to the dimension chain:

## a) Directions, some examples:

A secondary polarization within the 2-layer phyla cnidarians:

- in hydromedusae do the sex cells and statocysts derive from ectoderm, the outer layer,
- in jellyfishes the same cells from endoderm, the inner layer.

3-layer species with 2 shells or valves, polarized in orthogonal directions:

- Brachiopods, among the oldest, have the shells along the ventral - distal axis V-D.
- Bivalves have the two shells divided right-left, the R-L-axis.

Both examples illustrate complementary poles or d-degree steps according to the interpretations here.
Shells of different mollusks illustrating motional degrees of growth:

- Some have a plane-spiraled shell that illustrates rotation + pathway motions, a 3dimensional motion.
- Others have a conical-spiraled shell that illustrates an extra factor of growth with increasing radius as a 4 -dimensional motion.
- Flagellates: Some has 2 flagella at one end, others one at each end: a step from 2-waydirection to one-way direction or the opposite, a depolarization.


## b) Numbers of things:

From the aspect of a dimension chain: 5-4-3-2--1-0/00, sum 15; sums of pole values: $10-8-6-4-2$.

- Trilobites, old extinct group: 5 pair of legs, the front pair of which becomes antennae.
- Cuttlefishes (Cephalopods): 10 arms $\rightarrow 8$ arms - or a multitude of arms (Nautilidae).
- Legs: Spiders 8, insects 6, tetrapods 4, birds, humans 2, mollusks "1-footed" or " 0 -footed" (stuck to some solid surface).
- Body divided: Spiders in 2 parts, insects in 3 parts.
- Wings of insects: 3 pairs first, became 2 pairs. Mosquitoes and flies: 2 pairs became 1 pair.
- Myriapods (among Arthropods): Diplopods 2 pair of legs in each segment, Chilopods 1 pair.

Examples of reductions?

- Sea urchins: early species had $15 \rightarrow 100$ shell plates, today 20 ( $5 \times 4$ ).
- Fishes: fen rays a multitude $\rightarrow$ tetrapods 5 "rays" of toes and fingers.
- Hominids: 5 knobs on the masticating surface of molars, East apes 4.

An insect as Rhodnius prolixus undergoes 5 stages as a larva with changes of skin before metamorphosis (JB).
Etceteras.

## c) Structural design:

Biological shapes on a macro-scale reflect in many cases structures on underlying levels. According to the presumptions in the dimension model this depends on the same dimensional processes reappearing on all levels (cf. fractals).

We could imagine that the structures of light and of water have "induced" early organic molecules and these further biological forms: for instance

- the 6-rings of $\mathrm{H}_{2} \mathrm{O}$-molecules in water $\rightarrow$ rings of carbohydrates $\rightarrow$ leave forms, or - polarized light with appearing rotation $\rightarrow$ spiraled DNA and proteins.

A fatty acid looks like a simplified form of a Myriapod.
A ganglioside as a larva that eats leaves, (sketch after P. Karlson 1976, p. 169):

(Content of this ganglioside, a glycolipid with aminated carbohydrates: Glucose,
Galactose, N -acetylgalactosamine, N -acetylneuraminate + sphingosine + fatty acids.
Mass sum: 1836, the p/e-quotient, if with uncharged COOH-groups.)
Cf. also the figure here.

- A segmented worm has a macro-form as a circular magnetic field around an electric cable. Plants as trees have forms like the magnetic fields around a staff.
- A fish with its fens can resemble the illustration of a light beam with the fens like the electric and magnetic oscillation planes perpendicular to the pathway direction.
- A backbone of vertebrae in relation to the spinal cord illustrates the quantified light beam with phase displacements.
- All pacing motions have a parallel in this phase displacement of light propagation.
- Bird wings get a form that resembles motions of the cell material towards the primitive groove at their embryological development.

Body forms in the broad outline may become nearly anything but tend to develop towards the basic dimensional geometries of d-degree $1-2-3-4$, especially among organisms living in water: needle- or worm-like - plane - oval - spherical - star-like and flower-like or tree-like as divergent vector fields.

It's pointed out by scientists that worm-like forms exist in many different phyla, e.g. in Mesozoa, Acoela, Pseudocoela, Schizocoela (annelids - arthropods - mollusks), Lophophorata and Deuterostomia.

Regarded as 1-dimensional forms, they can be seen from the aspect of one debranched degree in each step of the dimension chain outwards. Only in the 1- to 2layer animals these forms are lacking, i.e. where the lengthwise coordinate axes frontback isn't yet defined.

There are many examples showing that elementary geometrical forms are more obvious and distinct the closer a structure is studied in details. (Cf. liver lobes for instance.) In viruses all round forms are actually polyhedrons.

## 9. Some general questions:

Characteristic features of classes and species of organisms are coded in DNA. If now the mutations in genes were totally haphazard, there wouldn't exist any system in the classifications of animal groups, no "tree of evolution", no connected properties, would it?

In that case a multitude of variations and combinations should exist without any mutual stepwise development between or within families and classes and it would be without reason to look for "missing links"?

If certain genes code for a notochord, other genes for segmentation, some others for 6 arms , then one thinks that a segmented chordate with 6 arms should be possible, perhaps even practical? Flying hominids or trees with brains?
Presumably it shows on the hierarchy of genes, more general and more specialized, a system that groups properties.

How about complementary genes? Do they exist - in the sense of "complementarity" used in the dimension model? Since there are proteins with opposite, complementary functions, it seems reasonable to assume.

And how could such hierarchies develop through only random mutations and adaptation to an environment?

A fundamental scheme of some kind - as the dimensional model here proposed or the like - seems necessary to presume.

The evolution on different levels, system level, organ level, tissue level... could also be presumed to follow different time-scales, which could cause many obscurities in systematics and relationships.

The big jumps in evolution, which some biologists talk about, could be imagined as the end of a dimension or level chain and start of a new? (Or, which becomes the same, at a certain d-degree in the most fundamental dimension chain.)

A speculation about the time aspect: If the time-scale on two different levels correspond to frequencies, and it takes a certain time for nodes of the two "waves" to coincide, this conjunction could perhaps imply a decisive mutation? "A certain time" eventually interpreted as a certain number of generations when the chain of propagation is regarded as a wave?

Adaptation to the environment is the other component in the Darwinian view on evolution. However, the coelacanth, the fish with 4 legs, is said to be "pre-adapted" ( $E z$ p. 131) to a life on land, i.e. the 4 legs developed first in the sea before it became practical for a life on land. Such "pre-adaptation" points sooner to an "endogenous" factor in the steps of evolution of the here presumed kind, an underlying dimensional scheme in evolution of genes. (Not "pre-adaptation" as an anticipation of future life on land.)
(We should perhaps count on two different kinds of mutations, on one hand the haphazard that mostly seem to be negative mistakes, on the other such mutations which represent a given evolutionary scheme of the type dimension chains - in accordance with the model "trial and error"?)

Similarities versus relationships:
In the dimension model a step of polarization leads to complementary poles as partial structures). This should imply that animals with complementary characteristics have a closer relationship than animals showing similarities but on different levels:


Fig Ev-22-197-1
Protostomia and Deuterostomia could be one example, prokaryotic and eukaryotic cells another if both derive from Archae bacteria (now Archae regarded as perhaps a special phyla).

- Relationship could correspond to what biologists call ramifications in the tree of evolution.
- Similarities appear in what biologists call convergence, similar features developed in different phyla as on different levels, "without relationship".

The idea of polarizations seems inherent in biologists' descriptions without being expressly pronounced.

Just a figure of primary and secondary polarizations:


# Evolution - Addition 

## Subcellular level

## A. Plants - Animals:

1. This opposition between autotrophic and heterotrophic cells concerns the chemical level, appearing already among the prokaryotic unicellular groups.(These include autotrophic species that lived on energy from small molecules of non-metals as sulfur. Disregarded here.)

Plants have both the photosynthesis with primary synthesis of carbohydrates and the respiration cycle, animals only the latter. It's a relation of double direction versus oneway direction, a polarization, one principal aspect on steps towards lower degrees in the dimension model.
2. The essential polarity of directions from 0 and 00-poles appear in the development of plants and animals:

- the growth outwards as from a 0 -pole of stem and roots - upwards and downwards from the seed in plants,
- the growth inwards from a 00-pole, from anticenter of the blastula, vegetative and animal poles in animals:


Fig Ev-add-1-166
Plants: divergence outwards. Animals: convergence inwards.
Cf. that the upward transportation in plants doesn't demand energy, while the downward transportation of synthesized material does.

The directions of embryonic growth can be related to definitions in last step of the dimension chain, motions from and to each other:


Fig Ev-add-2-193

## 3. A dimension d-degree (d-degree) step $4 \rightarrow 3$ : plants: $\downarrow$, animals $\leftarrow$ :

In coordinate axes plants represent the vertical axis, while later classes of animals come to represent the horizontal one, parallel to surface of the ground: an angle step $180^{\circ} \rightarrow 90^{\circ}$ as assumed in d-degree step $4 \rightarrow 3$; it may also be seen as a difference radial versus circular, poles 3 b and 3 a in our model, corresponding to the growth of vegetative pole versus animal pole of the animal embryo. These geometries could be compared with unicellular algae (autotrophic cells) versus bacteria:

- most algae grow in long unbranched or branched threads,
- bacteria more often solitary, round or staff- or spiral-shaped.

Hence, the growth of algae may reflect vector fields as d-degree 4, while next step to 3 implies individualization ( $\sim$ rooms, volumes) to closed, separate forms, in step $3 \rightarrow 2$ transformed to tube forms and spirals (as from a 3-dimensional motion).

As expression for a more high dimensional field level in plants we can also see their special type of symplasmatic cell contacts with cells that share cytoplasm via long projections without demarcating, separating walls (Kz p. 150).
4. Further, the communication in multicellular plants is chemical, based on molecules, while multicellular animals develop the electrical, ion-based system as well: a d-degree step associated with mass versus charge. In the dimension model here we have proposed the $\mathrm{F}_{\mathrm{A}}-\mathrm{Fg}_{\mathrm{G}}$-forces developed in step 4-3, the electromagnetic force ( Fem ) in step 3-2.

One could ask if the difference in inner chemistry is the primary factor for the autotrophic plant cell - or possibly a secondary result of cell positions in relation to a water surface and sunlight, which have become "anchored" in the genes? Cf. that chlorophyll needs sunlight for fulfillment of its structure and the other metabolic way from porphyrins goes to animal hemoglobin.
5. Another elementary difference Plants - Animals is the one in mobility. Most outer motions of plants are bound to their growth, besides adaptations to light. In animals the growing number of motional moments from polarization steps according to the dimension model gets trapped within them, become built-in within their "shells".

The opposition may be associated with the polarity of directions: a dimension chain outwards as structures corresponds to an opposite chain inwards of motions ("debranched degrees" as external motions).

$$
\begin{aligned}
0 / 00 & \leftarrow 1 \leftarrow 2 \leftarrow 3 \leftarrow 4 \leftarrow 5 & \leftarrow \text { Motions ~Animals inwards } \\
5 & \rightarrow 4 \rightarrow 3 \rightarrow 2 \rightarrow 1 \rightarrow 0 / 00 & \rightarrow \text { Structure ~ Plants outwards }
\end{aligned}
$$

Fig Ev-add-3
Motions of plants is just expressed in their structural growth, in animals in their external mobility.
6. There are also similar structures built out and built-in respectively. The tree-like structure up- and down, turned outside-in in our lungs is one example, with their branches into alveoli. The backbone with the neural tube as a stem and brain as crown of a tree could be regarded as another example with the essential difference that a human brain with cortex also has circular networks: cf. circular geometry (pole 3a) from 00 -pole, radial (pole 3b) from 0-pole in the dimension model.
(Crown of a tree is a receiver of light, brain a receiver of light and other sensory impulses.)
7. The bases for classifications among animals have parallels among plants even if not used in the same way in primary systematics:

- Naturally 1 - to multicellular organisms.
- Number of tissue layers has similarities with plants with 1 versus 2 cotyledons and with the division herbs - trees: plants having only the primary growth of thickness, trees with also the secondary one and cambium as a kind of "mesoderm".
- The division between "thallophytes" and vascular plants corresponds most closely to the division between sponges or 1-2-layer animals versus 3-layer animals with differentiation of organs.
- The oppositions in directions between Proto- and Deuterostomia have obvious parallels in plants where seeds grow attached to either a central structure or peripherally in the ovary, or stamens developing either from inside or from outside. Such differences are given a systematic value in botany.

One rather curious thing, similar among plants and animals, is how their "extremities" develop, not from the center but with origin further out, just "under the skin": branches of trees with their germs up in the trunk and "arms legs" of animals built from near the surface, which also by the way is the case for "extremities" as cilia. Connections inwards primary centers seem secondary. (Fens and extremities for locomotion and/or catching of food could be compared with branches with leaves for catching of light and CO2).

Is there anything that really proves that development is quantified in dimensional steps it should be such facts?
(In the dimension model it's a step from the surface, d-degree 2, to "linear" structure, d-degree 1: in the loop version connected with forces of d-degree 4, outwards -inwards.)
8. A direct parallel in evolution of plants and animals is of course the development toward more and more built-in and sheltered embryos: from spread of spores to gymnosperms to angiosperms in plants, from egg-laying species to mammals among animals.

## B. Prokaryotic - Eukaryotic cells:

This division concerns the cell level, cells naturally here regarded as 5-dimensional units. Theories about the emergence of eukaryotic cells are dealt with in the end of file The cell, No. 11. Here some other annotations.

There are several parallels between this opposition and the features for classification among multicellular organisms:

- 1-cellular versus multicellular organisms: Colonies of cells exist in both prokaryotic cells (PKc) - and eukaryotic cells (EKc), hence a kind of cell contacts, (in the level chain corresponding to step $1 \leftarrow 0 / 00$ ), but PKc remain unicellular while EKc type leads further to multicellular organisms.
- 1-, 2-, 3-layer animals: This division corresponds to number of membranes on the tissue level, only one (with certain reservations, Bc $p$. 290) in Prokaryotic cells, 2 to 3 in EKc with nuclear membrane. The endoplasmic reticulum appear as analogous to the $3^{\text {rd }}$ layer (mesoderm) in 3-layer organisms. (It's also a parallel to blastula versus gastrula,) - Coelom and body cavity differentiation: The several organelles within membranes within EKc are naturally a parallel to specialized and centralized organs on the multicellular level - a 3-dimensional development in the interpretations here.

However, in contrast to coelom there don't seem to exist any partial steps in the development of organelles among EKc (?), as if it immediately followed in d-degree step 3-2.

- Protostomia - Deuterostomia: at least one certain feature appears as a parallel on the unicellular level: the observation that the cell walls at cell division is created from outside inwards in PKc, from inside outwards in EKc (Fb p. 31).

Other such oppositions are dealt with in file Centrioles - Cilia: the central but hollow tube of PKc flagella, the center - anticenter organization of cilia in cilia of EKc; transportation of building material in PKc inside this hollow tubule, in EKc on outside of the many microtubules: a polarization $c-a c$ in cross-section.

Other differences:

- One is that PKc mainly breed through division, while sexual propagation is typical for $E K c$, which also have one macro-nucleus and one micronucleus for gene exchange ( $E z$ p. 31) - reminding of later polarization between sizes of eggs and sperms in multicellular organisms.

Hypothetically this difference in reproduction could be connected with such a feature that the short peptides in membranes of PKc include both L - and D-forms of amino acids, while proteins of EKc have selected the L-forms, which mutually become complementary as the left hands of two persons.

In can be regarded as a step of polarization, as between higher and lower d-degrees, e.g. $4 \rightarrow 3$.

Built-in motional moments are also fewer in Prokaryotic cells, which for instance lack the streams in cytoplasm.

About the ambiguity regarding center - anticenter roles and higher - lower d-degree of PKc and EKc in these features, see The Cell (No. 11). About different structures of flagella, see Centrioles.

The amount of DNA is increased in the EKc and probably as it seems in a hierarchical way: if all essential enzymes for life exist already in PKc as has been stated, then the increase in complexity must imply growing number of superposed levels in a hierarchy of genes. It seems expressed too in the cutting of mRNA before protein synthesis that appears in EKc (with introns in DNA) as a new feature in relation to PKc cells (Fc p. 169 f.). (Varying cuts should give different proteins from the same gene.)

Another increasing factor is aggregates of ribosomes:
Ribosomes that get aggregated by an mRNA in bacteria are usually circa 5 (Bc $p$. 79).

Here again we have this number 5! (Cf. the 5 enzymes involved in dividing and copying of DNA (Roger Kornberg, Nobel prize 2007).

In EKc the aggregates of ribosomes are often essentially more numerous.

## Three domains, Archae, Bacteria, Eukaryotic cells:

Unicellular organisms are now divided in 3 domains, Archae, Bacteria and Eukaryotic cells,

Archae and Bacteria with blue-green algae are both PKc, while EKc get the inner $2^{\text {nd }}$ to $3^{\text {rd }}$ layers as from a new center in step $3-2$ :

- Archae have more similarity with central part of EKc.
- Bacteria more similarities with peripheral parts of EKc.

Below a draft of how the relations could be regarded in a dimension chain, naturally only a sketch built on some features only.

Eukaryotic cells - new level


Some oppositions between the prokaryotic types (Wikipedia):
DNA level:

- Archae: central DNA have similarity with central DNA in EKc
- Bacteria: DNA is more similar to DNA of peripheral organelles in cytoplasm of EKc. Invaginated or immigrated (?) into EKc according to different hypothesis.


## Membranes:

- Archae special own type with isoprenes (5C units, with side-chains, thus of higher complexity). Ether-bonds (stronger).
- Bacteria: membranes similar to EKc, fatty acids (linear chains, 2C units). Ester-bonds (weaker).

Glycerol in membranes:

- Archae: L-glycerol
- Bacteria: D-glycerol as in EKc..


## Cf. Flagella;

Archae: central fiber bundles - build from the base.
Bacteria: hollow tubes - built from top.
The figure could give the impression that some kind of neoteny in Archae contributed to Eukaryotes, a preceding stage in its "embryology?

## An outline of classifications (freely after Ez and Sb):



Fig Ev-24-198-2

Log-scale for times of the Earth; middle ~9,65 / 2 = circa 67000 years ago, a time for Neanderthals and Homo Sapiens:

Log-scale - very approximate naturally:
9,65 Born of the Earth
9,5 Prokaryotic cells?
9,3 Eukaryotic cells ?
8,7 The Cambrian - most phyla of today assumed differentiated
8,4 Reptiles. - Supercontinent Pangaea, gets split later
7,6 India collides with Asia
6,6 Hominids
5,1 Homo Sapiens ?
4,0 End of last ice age
3,7 Egypt's pyramids
2,2 The industrialism
$1,0 \sim$ New millennium 2000.

## LIFE

## Some general aspects on life as such based on the dimension model

## What characterizes life?

Life may be seen as a natural continuation of fusion in the sun, outsourced to the planet (an "A-Z-illustration" .here). The force that binds protons may be seen as replaced by the complementary force binding electrons. It's noteworthy that it's the unsaturated atoms with shared lack in their electron shells that build the main structures of life, not the self-sufficient ones with surplus.

Life as continued fusion is not a merely banal aspect. The covalent electron bonds as complementary seems to follow the similar scheme as shown on this site:

- The genetic code shows astonishing numeral connections with the $2 x^{2}$-chain ( $x=5-4-$ 3-2-1-0) behind the periodic system, with half this chain times $2^{5}$ of some unknown reason. (Scientists with interest in the field of applied mathematics are invited to search for explanations!)
- The nearly universal genetic code agrees numerically still closer with a variation of half the same chain: the cubic roots of 5-4-3-2-1 squared times 100 (the ES-chain). - It could be remembered too that flowers have 5-4-3 number plans - surely of some fundamental genetic reason.

Life from inversions is another aspect proposed here. It could be mentioned first that 2 times inversion of sum of all integers 1-110 $\left(110=\right.$ the sum of the $2 \mathrm{x}^{2}$-chain $)$ gives the sum of the amino acids from the genetic code as periodic number.

- The cell appears as an inversion of an atom (H, hydrogen) - both regarding forces and charge but also as it may be in a basic number (544) of its genetic code from the inverted mass quotient proton/electron.
- As pointed to in files about biochemistry the inversion of number 7 seems able to give a code for synthesis of substances as fatty acids and collagen.
- One suggestion is that life could have its ultimate root in the 7 so-called
"undeveloped" dimensions calculated with in the String theory.
About geometries, biologists of profession often give descriptions in geometrical terms. The same views here are thus partly about highlighting and formalizing these aspects.

Biologists' explanations have most often been of the teleological type: "Why 4 feet?" They are practical for land living animals. (Yet some fishes got them already in the sea.) It's naturally assumed here that the evolution contains more than random mutations and "natural selection", and the fundamental view sides with theories about a hidden "black box", here suggested to contain a scheme of the background model type or the like if simplified to fundamentals.

The individualization of life remains perhaps the most difficult to understand Cells appear as a kind of "singularities", as points of Zero and Infinity in the same place, 0 and 00

## Some numbers:

- 5-4 bases (from 2, inosine - orotic acid): G, A, U, C + T
$-5 \times 4$ amino acids (ams) with $4 \times 3 \times 2 \times 1=24$ different codons
-5 histones (proteins on which DNA-chain is rolled upon in chromosomes)
- Valences for essential elements of life: 5-4-3-2-1; P-C - N-O/S - H
-5 C atoms in the A - and G -bases, 4 in U - and C-bases.
-5 C in ribose, part of nucleotides.
- $4-5$ rings in the porphyrins.
- 4-5-6 cyclic processes have been considered necessary for "life":

Marquand asked how many chemical processes that a system should be able to catalyze for it to count as life. Haldane suggested at least 4, Marquand himself says 5-6.

Perhaps the most obvious and essential character in the structure-building for life is the fact that it is performed by non-metal atoms, characterized by mutual lack in relation to the octet rule; this in opposition to self-sufficient atoms and those with a surplus of $\mathrm{e}^{-}$. It's mainly constructed of $\mathrm{C}-\mathrm{N}-\mathrm{O}$, as if the carbon-nitrogen cycle of nuclear fusion in the sun just continued, outsourced to planets for transformation into external relations.

## 1. Life as the antithesis of entropy:

The way outwards in a dimension chain implies that structure gradually gets translated into motions, ties as potentials get broken; it's a trend toward increasing "disorder" according to views in physical mechanics, equivalent with direction towards increasing "entropy". (Yet, it may be discussed if the release motions of macro- and microcosm in reality are disordered?)
Life implies a shift towards more structure, synthesis, creation of links, well recognized as the antithesis to the law of entropy.

Life processes involve both synthesis and disintegration and can be illustrated by double-direction within the dimension chain (with development of new levels proposed as perpendicular to the basic chain).

## 2. Life a coincidence?

Life is here naturally postulated as a given result from "laws of Nature", a virtual, builtin possibility under certain conditions, not a random coincidence. It's assumed as a given result from the development along the main axes through the level chain towards increasing complexity. (See figure at end of this file.)

## 3.'Negative curvature":

It's proposed that the most characteristic feature of Life could be regarded in terms of "negative curvature inwards" (cf. "involvement"). This in opposition to the eventual negative - or rather antipositive - curvature of expanding vacant space outwards in macrocosm, (This simply expressed as surfaces growing faster than the cube of the radius.) About curvature of macrocosm, see file here.)

Most obvious is this feature of antipositive curvature turned inwards in the development of multicellular animal organisms (see file Embryology) but also in eukaryotic unicellular ones. The fast growth of surfaces occurs inwards and results in multi-shell structures. Cf. the outward growth of crystals for instance
(If a 5-dimensional unit, developing towards growing superposed levels, shall get spatial form within 3 dimensions, much has to happen internally out of this contradiction or tension.)

We could associate to the String theory and its 7* so called "undeveloped" dimensions. As a guess they could relate to the ordinary 4 developed ones of ordinary physics in a similar way as mathematical "conjugates" to each other. Perhaps be the very root of life!? *(There are many ways to count dimensions.)

How the single cell first was created is still unknown but it may be assumed that some kind of a substantiated center - anticenter polarity between complex molecules had to be defined within which the positive - negative curvatures developed, expressed in very general terms.

The turn inwards of the antipositive curvature could eventually be connected with the pole exchange in last step of our model in the dimension degree (shortened here ddegree) " $0 / 00$ " of Motion. This redefines d-degree 5 in terms of pure kinetic energy and may simultaneously imply a kind of feed back mechanism.

## 4. Life as self mobility:

The "negative curvature" inwards, the expansion internalized, means more and more enclosed motions according to the model. One characteristic of life. (Life to regard as time-loops internally stored into spatial units - or spatial units transformed and fragmented into "ten thousand" times?)
However, this would be only one part of the answer to the "self mobility". The other has to do with the relation between the single cell and its environment, center anticenter, 0 - and 00 -poles of the whole.

## 5. Life as ${ }^{1 / 2}$ :

A living organism as the single cell is "haploid" ( $1 / 2$ ) relative the environment - as a center versus anticenter in the big level chain leading to birth of a cell. This essential haploid character concerns all internal levels and stages of development in the cell. It's expressed as "needs".
"Needs" become potentials originating from the primary polarization: cell environment: potentials that have been differentiated internally in a lot of different directions, an intricate network of roads. Referring to our dimension model, the elementary polarity cell - environment as 0 - and 00 -poles define Direction, d-degree 4, polarized inwards/outwards; that's forces for the interaction of living cells with the surroundings such as inorganic matter, energy, water, air...
Incorporating of elements from the surroundings into the cell may be regarded as one aspect on life as developed through negative curvature inwards. In another context we have expressed the general principle as a stepwise building-in of the anticenter pole into the unit defined as center.
One example is the incorporation of metal ions in cell structures of non-metals, e.g. Mg in chlorophyll. Compare too our hypotheses that such a principle also may concern atoms, their structure depending on built-in vacant space. (If so, the negative curvature inwards should perhaps not be a feature regarded as restricted to what we generally call life.)
"Vacant" space can be defined as antimatter on the atomic level, the environment becomes antimatter on the biological level.
In general terms the stepwise building-in of the anticenter is a natural expression for the binding force between complementary poles.
The chemistry of life is characterized by more or less closed, "cyclic" processes in communication with the outside world, and a cyclic process, similar to rotation, means geometrically more of one-way direction. Increasing one-way direction is assumed in our model as one main feature in the development outwards of dimension chains. It implies that directions become more and more specified.
It's a remarkable fact that not only cells but also individual molecules can wander between others towards given addresses - as people in a city on their way towards certain destinations.
The addresses of pathways can be interpreted as a complex network of potentials from previous polarization steps, which means that the molecules are linked on large distances via underlying levels of space and time - similar to human memories of past acquaintances and contacts in the past. Wandering of molecules, governed by needs, becomes in this way also an expression for the cell being "one half" on its plentitude of internal levels.

Finally, asymmetries become one result of complementary halvings of dimension chains in steps towards more of one-way direction. One example is the selection of L-amino acids among the genetically coded ones in most organisms. An optical activity that involves polarization - polarized light.

## 6. 'Instinct" of self-preservation':

That which usually is described as the self-preservation force of life can simply be the result of and expression for the binding force between the organism and the environment as poles out of an original whole: the organism as center one "half" with navel string downwards the staircase of levels in Nature with bond to the other half, environment as anticenter. The lower level is binding force on the superposed one according to postulates in in the model.


Fig Li-4-6-2

## 7. Reproduction:

As is proposed about light beams through empty space, the chromosomes (as "lumosomes") complete themselves from environment, that's from what on their level is "antimatter", i. e. the manifold of separate complementary nucleotides, followed by polarizations. It's on this level an expression for the same pattern as in an L-wave: $\rightarrow \leftarrow$ $\rightarrow \leftarrow \rightarrow \leftarrow \ldots$ Generations of cells appear as propagating waves, propagation of quantified energy packages.
Besides this aspect on reproduction as succession, it's simultaneously a manifolding of one cell to many, a repetition of the process with divisions 1-2-4-8... in all directions. If it would be possible keeping to the analogy of propagating waves, it would be necessary imagining not only L-waves, in a certain sense linear, or T-waves as in the same sense 2-dimensional but waves of a higher dimension. (Compare perhaps where a photon exists on its way to a screen in quantum mechanics? In some descriptions "everywhere".)
As far as scientists know, so far, all life springs from other life - nowadays at least. Does then all life on earth derive from a single first cell 3-4 billion years ago? It is a rather curious thought that only a single point on the entire surface of the Earth would give birth to a cell, assuming that the cell is a consequence of laws of Nature. Similar chemical conditions must have existed in many places. Amounts of cells can have come into existence that were similar because the same natural laws were applied and the same surrounding conditions. If so, it would be changes in the environment that later made life depending on heredity. (Theoretically however, the initial conditions for emergence of an entire cell should be possible to produce in laboratories. )

## 8. Life as demarcated units

Demarcation, individualization, is a vital condition for life and perhaps the most difficult problem in explaining the occurrence of cells.
There is in fact the same problem with the creation of atoms from Big Bang (protons as packets of the assumed 3 quarks, the 3 divided 2 plus-charged, one minus-charged, $5 \rightarrow 4 \rightarrow \mathbf{3}$, divided $\rightarrow 2+1$ ). Hardly easier to "explain".
Atoms and cells are building stones on very different levels. Underlying levels represent higher d-degrees than the superposed ones and are binding forces in relation to these (general view in the model).
It's logical that the H -atom becomes the original first integrating force of the cell as
polarized into $\mathrm{H}^{+}$and $\mathrm{e}^{-}$(as d-degree 5 polarized into 0 - and 00-poles in the model, secondary binding and polarizing forces). A cell may in several respects be interpreted as inversion of an atom (see further The Cell).

Inner unit of underlying level gets also according to the model "inverted" to outer potentials, expressed as bonds, in lower d-degree (as "polarized" photons in quantum mechanics?) It's like the more fundamental history when fusion in the sun gets outsourced and "inverted" to molecular constructions on the Earth. The big step from the atomic level to a cell and outer atomic relations implies an immense increase in degrees of freedom, even if already a C -atom has several (cf. $\mathrm{CO}_{2}$ and the steps between $\mathrm{sp}^{3}$ - and $\mathrm{sp}^{2}$-hybridizations).
One aspect on the problematic demarcation of cell units becomes the negative curvature inwards as a reversal of the relations mass - space, between elementary forces $\mathrm{F}_{\mathrm{A}}-\mathrm{F}_{\mathrm{G}}$ in macrocosm, Mass built-in into Space, to Space into Mass in microcosms of cells. Cf. in Embryology the "blow up" of morula to a demarcating surface as a step center to anticenter, followed by involutions.

About forces, protons and electrons, $\mathrm{H}^{+}$and $\mathrm{e}^{-}$that represent most of mass and most of space respectively in the atom, become "carriers of forces", in the same sense as bosons on the physical level (the assumed gravitons and photons etc.) As responsible for elementary chemical processes and bonds in cells they appear as poles $1 \mathrm{a}-1 \mathrm{~b}(+/-$ $1 / 2$ ) in last step of the model, defining the d-degree of motions in the dimension chain. The "pole exchange" in d-degree $0 / 00$ implies also a kind of inversion in fundamental directions.
With increasing complexity molecules as enzymes and coenzymes become forces in the same physical sense on superposed levels, polarizing - binding ones, "carriers" of the vital force.

Aggregations of micells as P-lipids during different degrees of density has been studied in search for an answer on demarcation of cells. Actually, inversions seem to characterize lipid layers according to studies of lipids in later decades, different structures with P-groups of the lipids inwards or outwards (Wikipedia).
This ability for inverting the structure seems connected with the P-group, phosphorus with valence 5 . With a dimensional interpretation of valences the d-degree 5 is polarized in center and anticenter and directions outwards/inwards of d-degree 4 in our model. On the deep, atomic level the phosphorus atom P with valence 5 could represent the basic integrating force.
Cf. the similarity between bilayers of P-lipids and DNA-structure, see file The Cell.

## 9. Pure geometrical views on demarcation:

With the view that dimensions and geometries make up the basis of Nature, the laws for quantification and demarcations become endogenous. There is for instance such things as the observed and unexplained polarizations in $\mathrm{H}_{2}$-clouds in macrocosm between hotter and colder regions. In nuclei of atoms it's said that the positive charge at fusion toward heavier atoms is built as in layers from outside inwards. It could be examples of the anticenter pole 00 and inward direction (pole $4 a$ ), representing the polarizing and quantifying force in the basic definitions of our dimension model,
a. In simple geometrical terms the step $3 \rightarrow 2$ in the model ( 2 as the d-degree of surfaces) implies a polarization of 3-dimensional volumes to enclosed/excluded room.
With a "haploid" view on a dimension chain as developed between poles 0 and 00 , the anticenter pole 00 of d-degree 4 may be regarded as debranched, (figure $a$ below) meeting "the other way around" from the end of the chain in inward direction.

Postulated in the model is that pole 4 a , inward direction get "circular" structure when transformed to d-degree 3 .
a)

b)

c)


Fig Li-5-1, Li-5-2, Li-3-6-1
b. The hypothesis that a dimension chain can correspond to angle steps of halvings towards increasingly narrow angles leads also to a nearly closed unit. Figure b. Cf. directions of potential bonds as decreasing angles: $\mathrm{C} \rightarrow \mathrm{N} \rightarrow \mathrm{O} \rightarrow(\mathrm{H})$. Such development of the 0 -pole outwards in angle steps may also illustrate life as " $1 / 2$ " of the whole and the living unit's communication with the environment.
(One could also assume such a process as endogenous within single atoms, involving processes and structural changes at the molecular level. One example is the $\mathrm{sp}^{3} \rightarrow \mathrm{sp}^{2}$ hybridization of carbon.)
c. A different aspect on the creation of a demarcating cell membrane concerns general conditions for level developments: It's suggested in files about physics to regard level development occurring through the middle step 3-2 in the dimension chain (see figure at end of this file). One hypothesis is that such a development should demand counterdirection from another, equivalent 5 -dimensional center for saturation to a superposed, more substantiated level (figure c). Without such counter-direction the process $2 \rightarrow 1 \rightarrow$ $0 / 00$ should only lead to repetition or energy lost to the external world.

It would be an interpretation in agreement with Haldane's hypothesis about the cell as a fusion of two "half-organisms".

In a double cell-membrane the lipids meet with directions outwards/inwards, that's of Direction, d-degree 4. (Compare that orbitals of the same sign bind to each other. Overlapping of inward directed magnetic circular fields may eventually define a new center?)

## 10. Substantiation:

A gradual substantiation through increasing complexity is of coarse a necessary complement to geometrical models. What's only "field lines", potentials or motions as pathways are to regard as stepwise substantiated to molecular chains, to pipes, to organelles etc. Foldings of "linear" proteins to globular, 3-dimensional ones can illustrate increasing complexity. Saturation through incorporation from other units is another factor that builds structures of high d-degrees from lower ones (as $1+1=2,2$ $+2=3!$ ).
There is the similar processes on the level of human society: That which begins as wanderer's pathway through trackless terrain, becomes gradually a track, becomes a carriageway with inns, becomes a highway through communities with entrances and exits, etceteras.

The need to get from suburbs to inner city, to and fro, becomes a drawing that gets materialized in a subway.
One example could be the periodic, linear arrangement of filaments in collagen. Exactly how this works, in scientifically accepted terms, is another question.

How could enzymes emerge, the very long protein chains that effectively reduces the energy needed for a certain reaction? An analogy to the industrial revolution of manual work as it seems.

The energy needed for a certain reaction without enzymes is often illustrated as a curve, a hill. Rather than believe enzymes as preexisting, it's easier to imagine them as substantiation of this very curve, taken as a real mold, then inverted to a hole for the key and lock relation to substrata. Enzymes are forces in the cell, As substantiated to proteins they are a "matrix" to substrata, in that sense complementary poles, the "antimatter" on this level. (Something like magnetic fields in relation to electric fields.)

To store such a protein chain in the long term memory of DNA should of course need a backward process from amino acids to codons. (Or already, in some potential form, its existece within DNA.)

## 11. DNA coding amino acids:

Unique to life is DNA (or RNA) and the coding system DNA $\rightarrow$ proteins. See The Genetic Code and The protein synthesis and file The Cell. Here only a couple of annotations.

As molecules amino acids represent a higher d-degree than the bases: the tetrahedrons with a central C -atom may be regarded as center-displaced (or "inverted") to the ringbound C - and N -atoms in the codon bases; a step from $\mathrm{sp}^{3}$ - to $\mathrm{sp}^{2}$-hybridization of the C-atom. It corresponds to a step d-degree $3 \rightarrow 2$ (or 4 to 3 ) outwards, from radial to circular structure. Conceptually codes are also secondary in relation to what is coded, as the written alphabet relative to spoken sounds.

With regard to the molecular structures, the relation could perhaps be illustrated in a dimension chain as in the figure below: bases as from intervals equivalent with debranched degrees meeting in synthesizing direction the other way around


Fig Li-5-DNA
In valences, the phosphorus atom P represents d-degree 5 (or rather something like a step 5-4 with one double-bonded oxygen).
N and O with valences 3 and 2 represent opposite ends of backbone chains in amino acids (and opposite polarity in charge*) - and bonds through H-bridges between complementary bases in DNA (here also such $\mathrm{N}-\mathrm{N}$ bonds, 3--3, in our model outer poles in d-degree 2 ).
*(Cf. EM-force supposed developed in step 3-2 in our model.
In directions there are proteins outwards in the cell, structure-building and transporting, RNA-, DNA- nucleotides inwards the center, towards less mobility. (Cf. principle of stepwise building-in of anticenter, the 00-pole, and the similar building in of the animal pole to a nervous system in embryological development.)
One of the subject classes can serve as reference to the other because they originate from the same basic structure (of the type our 5-dimensional model here).
The figure above could be compared with numbers in the "ES-chain" (from file The genetic code")

$$
\begin{aligned}
& 5^{2 / 3} 4^{2 \beta} 3^{2 \beta} 2^{2 \beta} 1^{2 \beta} \quad 0 \\
& \frac{292-252-208}{752}-\frac{159-100-0}{259} \rightarrow \times 10^{2}
\end{aligned}
$$

Fig Li-7

259 circa sum of 2 bound DNA-bases ( $\mathrm{G}+\mathrm{C} 262-2$, A + T 261-2)
$752 \times 2=$ sum of side-chains of amino acids for $20+4$ codons.
$2(5+4+3)=24$ amino acids.
We have also that $292=\mathrm{P} \sim$ P-ribose bound $(2 \times 98+150-3 \times 18)$ and $252+208=2 \times$ $\mathrm{P} \sim$ ribose at which codon bases get attached when constructed. Cf. a figure in S. Copley et $a l^{*}$ (2005) where such a pair of nucleotides are bound to a P~P-ribose group. Their hypothesis is that amino acids originally were constructed at the inner ribose which should imply at the center of the chain in the figure above.)
*Copley S D, Smith E, Morowitz H J: A mechanism for the association of amino acids with their codons and the origin of the genetic code. Proc. Natl. Acad. Sci. 2005, 102:4442-4447.

## 12. Additional remarks:

- The physical quantities (rather qualities) and their transformations into one another as a dimension chain are naturally given as aspects:

```
density - forces - mass/space - charge - distance - time,
```

in accordance with definitions proposed in files on physics..
"Density" seen as the primary quality in d-degree step $5 \rightarrow 4$, polarized in mass/space in step $4 \rightarrow 3$. (Mass numbers become an underlying level in relation to charge numbers for instance.)

- The underlying scheme and geometrical, mathematical rules that is assumed with the model here, guiding the building of molecules and organs on superposed levels could be imagined as changing between d-degrees and levels in agreement with these. (And the processes go further and further perhaps just because relations and numbers don't become integers!)

Chemical processes could be apprehended as efforts of a fragmented matter to solve the demand of the Whole, the "Entirety", the ultimate binding force.

## A level chain:



Fig Li-10-017

## Heredity - Environment

Heredity: the factor from inside, with the embryo cell as the center, the 0-pole in our model.

Environment: the factors from outside, from the surrounding world, as anticenter, the 00-pole.


Fig HE-1-199-1
All the processes of biological evolution, those that are called random mutations and those implying selection, adaptations to environment, can be described as results of the opposite forces: as processes between divergent forces from inside heredity and the differentiating, polarizing forces from outside the environment.

The two poles heredity and environment has naturally a common source, the same root in an underlying "whole", which constitute the binding force between them. (And the environment for an organism is not least other organisms, others' heredity.). An organism as a 0 -pole is half of the whole. It's $1 / 2$ on many different inner chemical and biological levels, which are expressed in "needs". Of water, food (energy), communication...

With such a commonplace description, using terminology from the dimension model, it becomes perhaps easier to understand an evolution towards superposed levels and more and more complex organisms as given, as a process through dimension chains and level chains.


Only random mutations and "natural selection" through the survival of the best adapted (this circular definition) can hardly explain the further evolution from immensely well adapted bacteria.

Some words about and "random" mutations, the concept "chance" : If it should exist real chance and not only causes practically difficult to determine, it could be illustrated as a certain direction of movement outwards in a not yet defined or homogeneous surrounding. The direction of locomotion cannot in this case be specified in relation to "north-south-east-west" or anything else, it becomes "random". A specified surrounding reduces chance - governs the development towards the causally determined.
"Natural selection" could be described in terms of "counter-directions".
When an organism with a certain inheritance meets a suitable environment, it may be interpreted as a relation between complementary poles of equivalent energy, which maintains vital processes, simply illustrated for individual 1 in the figure below.

Individual 2 has to develop or change environment not to die.

H


Heredity - Environment

Fig HE-3-200-1

Rotation of arrows from environment in the figure gives a favorable counter-direction for individual 2.

Where goes in reality the border between heredity and environment? Earlier, it has surely most often been drawn at the birth of a child, but also the circumstances during embryonic stage in the womb are an environment and naturally chemicals in blood from the mother.

Should we perhaps also regard all cytoplasm with organelles in the cell, all but DNA as environment?

If RNA from the mother in cytoplasm of the first egg cell as it is said is responsible for first cell divisions, this RNA is perhaps varying dependent upon "outer" circumstances and hence an environmental factor?

Cf. in later decades new insights within epigenetics.
About viewpoints: There is a tendency to stress the importance of heredity in direction of sight inwards - backwards towards past times and downwards towards social strata. While the importance of environment is stressed in opposite direction of sight, towards the future and upwards in the hierarchies. It becomes actually a consequence of the sight directions (cf. fig. 1 above)


Fig HE-4-200-2
Both heredity and environment are natural phenomena, "given by Nature" as poles out of the whole. When there is talk about aggression as a part of human heredity and not possible to change, only control, the speakers seem to forget that this will to control the evil results of heredity is given by Nature too, by definition.

The same concerns such things as the contamination of environment by human beings with for instance chemical pollution or radioactivity. Regarded from some "objective" or inorganic position, outside existing plants and animals, the 'human' behavior could look like a driving force of Nature towards increased frequency of mutations for eventual other new species to arise (perhaps as a result of mankind's evolution towards the 00 -pole - and a turn to inward direction $=$ a tendency to suicide. Unfortunately, both the destruction of environment and the forces that want to save it have to be understood as forces of Nature.

## Genetics

## Some sketched aspects

## 1. Why do cells divide?

What's the principle behind this propagation?
In one sense it's like the propagation of a light beam through space as it's proposed interpreted in file EM-waves: a quantum jump in an atom from a 0 -pole completing itself with the complementary antimatter of "negative" energy in space to a new 0-pole and a new quantum jump, as a sine wave and cosine wave with a displacement of $90^{\circ}$ between magnetic (M) and electric (E) components:


Fig Ge-1-142-2
A cell is a quantum of energy. DNA resembles a light beam with its complementary bases as representing the E- versus M- factors (a chromosome as a "lumosome").

Like the light beam the DNA-strands complement themselves from what is antimatter on their level in their surrounding, the manifold of all individual complementary nucleotides.

The L-type of waves, $\leftarrow 00^{\prime} \rightarrow 0^{\prime} \leftarrow 00^{\prime} \rightarrow \ldots$, could illustrate this factor in propagation. It seems also expressed in all building of linear structures in a cell, proteins, even globular ones, fatty acid, collagen etc. Why this rather curious lining up of the molecules after one another? "Dipole" bonds are surely a factor, this concept taken in a wider sense of some complementary feature in the individual units like 0-00 in the L-wave.

Elementary waves as one guiding principle?
However, this feature of propagation is only a part of an answer. The cell as a world of trapped motions is in itself, internally, an ongoing, repetitive process of breaking-down and reconstruction as outward and inward directions in a dimension chain regarded as a unit. In this sense the processes get the character of standing waves.

Total reproductionof a cell from 1 to 2 to $4 \ldots$ etc. is certainly something more. It's preceded by a total duplication of the chromosomes and other organelles before cell division. Some built-in program for the step gets activated.

Certain signals from "anticenter", primary polarizing force in our model, could possibly trigger it. It's said that in embryological development of multicellular organisms the first cell division is initiated from mothers RNA in cytoplasm, i.e. anticenter to the nucleus.

Scientists talk about other conditions, using concepts as "maturity" and "saturation". It could point to a correspondence with processes of crystallization on the physical level.

Next part of an answer would be a deeper polarization, $\mathbf{4} \leftarrow 3$, from dimension degree (d-degree) 3 , the volume that the cell occupies in a 3 -dimensional space, to d-degree 4 , this in terms of the dimension model; the step from inner self-sustaining ("haploid" or
partial) processes to a total duplication of higher d-degree, including both DNA strands (double direction, d-degree 4). Through saturation developed to two separate centers.


Fig Ge-2-139-1
The step inwards to d-degree 4 could be seen expressed by the spindles as opposite, radial vector fields.

The centrosomes that seem to guide the development of these spindles move also to opposite poles of the nucleus at start of cell division, i.e. a polarity of $180^{\circ}$, assumed in our model as of d-degree 4. (They are not necessary for cell division but appear in animal eukaryotes as substantiations of an underlying geometry.)

Duplication of haploid chromatids at sexual reproduction (meiosis) includes overcrossings with exchange of genes. It has been said that these over-crossings in numbers are 1 up to 4 or 5, usually not more ( $B g$ p. 142). It sounds astonishing few. Yet, if the statement is reliable, it suits well in the dimension model


Fig Ge-3-141-4
In addition to the question of why reproduction it could be said that polarizations as such is a main principle in the dimension model. All organism can also be described as $1 / 2$ on every internal level (see file Life) as centers in relation to the surrounding anticenter that they depend on. ("Saturation" becomes the expression for this dependence.).

The inversion of $1 / 2$ is 2 and in the mathematical depths of life one could perhaps suspect a relation between a 4 -dimensional function and its conjugate?

## 2. Duplication leading to 2 centers:

If we imagine the complementary poles of a dimension chain as nucleotides of DNA, saturation becomes the completion from environment as 00-pole with all its individual nucleotides.
a) Duplication:

b) Division, two "daughter cells":


Fig Ge-5-142-1

## 3. Do the "daughter cells" become exactly alike at cell divisions?

The usual answer is yes. However, the figure above with adding of "a-and b-poles" to the opposite strands, the complementary character of DNA and the opposite directions of the strands could yet indicate some underlying difference, at least at the very creation of two chromosomes? Following two data point to such a difference:

- Since copying of the two strands occurs from the same end but in opposite directions, copying of one of the strands needs at least two DNA-polymerase molecules in a discontinuous operation (Aph p. 96), while the other is continuously copied *.

$$
\leftarrow \underline{\frac{1-2-3-4-5-6-7-8}{5-4-3-2-1} \leftarrow \frac{-9-10-11}{11-10-9}} \rightarrow
$$

Fig Ge-6
*(There is a similarity in this difference with the opposition between whole mRNA chains and the tRNAs with anticodons representing the other strand. Perhaps the same principle applied on another level?)

- The other information: When stem cells divide, it's said, one of the daughter cells becomes a stem cell, the other a functionally specialized one.

In such data it seems possible to find a first origin to the later developed sexual differentiation, a division on different individuals, characterized by the 0 - and 00 -poles.
(A singularity and a multitude, outwards and inwards.)

## 4. Geometry of cell division:

The geometrical features at cell division are really noteworthy and could support the general hypothesis here about a geometrical scheme underlying all manifestations in Nature.

Only to mention one special thing first: in the duplication of a centriole to a pair in a centrosome, the "daughter" cell, (probably better called son cell), growths out at straight angle to the mother cell: a curious fact that seems hard to explain with functionality (?). It looks like an angle step as if it could refer to the one between the radial spindle cones that develops from centrosomes and the equatorial plane of chromosomes?


Fig Ge-7-(139-2)
(The above mentioned fact that centrosomes not are necessary organelles for development of radial spindles at cell division obviously seems to underline that the geometries comes first, as in an architectural drawing, before their materialization.)

Spindles and equator plain with two sets of chromosomes:


Fig Ge-8-140-2
This arrangement can geometrically be seen developed from the opposite ends of a dimension chain:

```
00 4a 3a chromosomes
/\/ \/ \/ \/ \
5-4-3-2-1-0/00
\/\/ \/ \/ \/
0 4b 3b 2b 1b
```

Fig Ge-9
a. The linear chromatids line up and get copied with homologues paired, d-degree 1 in macro-shape:


Fig Ge-10-141-3
These pairs of chromatids get spiraled (a 3-dimensional motions in d-degree 2) in several steps, as a kind of substantiation and contracted to pairs of chromosomes. They get arranged in the equator plate (d-degree 2). Cf. circular geometry of pole 3a in the model. Chromosomes in anticenter position here.
b. The spindles develop from centers as the 0 -pole to vector field outwards, pole 4 b , as structures appearing as the radial pole 3 b in the dimension chain.

The outgrowth of the spindles and then the pull of chromosomes in anaphase towards centrosomes imply two phases of d-degree 4, vectors of outward (4b) and inward (4a) directions (outer poles of d-degree 3 in the dimension chain).

The centromeres are the ring-formed protein structures that in some unknown way enclose and bind the chromosome pairs and with help of other proteins (kinetochores) get attached to the spindle threads. They appear as anticenters in terms of the dimension chain.

The fact that it's a meeting between to radial cones that here "define" the equator plane as a surface - or rather a double surface, and not complementary 3a-3b-poles, shows that a doubled center ( 0 -poles of d-degree 4 ) already is defined.

The whole process with regard to the geometrical macro-shapes in d-degrees


* 4b: growrh outwards - 4a: "contraction"/reduction inwards as transportation

Fig Ge-11-140-1
With the loop version of the dimension model we have a meeting of directions outwards / inwards in d-degree step 3-2, here between spindles and equatorial plane with chromosomes.

Loop model: A sketch on the counter directed processes in first phases:


Fig Ge-12-141-1

## 5. Cell divisions to haploid mail and female gametes:



Fig Ge-13-142-3
Motional moments increasing towards lower d-degrees according to the model.

- Female cell: unequal cell divisions in complementary poles from higher d-degree outwards, as in a dimension chain step $4 \rightarrow 1+3$ in numbers. The small cells, called polar bodies, may indeed represent virtual male cells. They "degenerate", which could be suspected as a description of how the 00-pole of d-degree 4 gets debranched and (as through another dimension) meets the other way around as pollen. (There is the appearance of 3 polar bodies, two sets of them, in ovulum of higher plants.)
- Mail cell: equivalent divisions $2^{0} \rightarrow 2^{1} \rightarrow 2^{2 \cdots}$ as in a dimension chain from lower ddegrees inwards, with 2 as log-base. Cf. increasing motions at lower d-degrees and tail of the sperm.


About egg divisions after fertilization: 3 divisions can be done symmetrical.
It's said (old information) that these 8 cells all can develop to whole individuals.
If so, it could probably or somehow depend on the fact that 8 quadrants all have direct contact with origin in a 3 -dimensional coordinate system?

## ETHOLOGY <br> Behavior patterns of animals <br> Annotations to Konrad Lorenz's book 'On Aggression"

1. Aggression, the main theme of the book, is by Lorenz regarded as one of four fundamental drives. This view may however be questioned.

Basically, aggression is here proposed to have its root in the division of life on single individuals, in the "principle of individualization" - and to arise from the conflict between the primary binding Entirety force within one individual and the same force between individuals of narrower or wider range, ultimately with a common origin.

More about aggression below.
2. The concept "instincts" has been replaced by the word ground plans. Lorenz uses the term "drive". He describes behavior patterns of mostly birds and fishes as less or more ritualized motor patterns and in terms of directions, which are interpreted in terms of affects. It invites a comparison with the pure geometrical views in the dimension model.

With the hypothesis here that such an elementary structure of rules is a factor underlying the processes of mutations and 'natural selection', the primary dimensional aspects and forces from inorganic levels can be seen as more and more "charged" with mental meaning and "motives" on superposed levels of life.
3. The eye and cortex of the brain analyze visual impressions into simple geometrical elements and direction of motions and combine these elements to complex pictures in the sensory system:


Fig Eth-1
There are for instance cells sensible for direction of linear structures, others sensible for round forms, others for curves, convex or concave, others for straight lines in different angles, others for motions of geometrical elements in certain directions. (Cf. in the model: direction outwards/inwards, radial/circular structure, concave/convex, lines, motions.)

Hence, inherited characters in behavior patterns can be suspected as a correspondence in the motor circuits of the nervous system - with motions as structural elements.

## 4. Nest building at reproduction:

Nest building appears as the most typical center - anticenter structure, a polarization of the whole, dimension degree (d-degree) 5, in poles 0 and 00 in our model - either it concerns a cavity in the sea bottom, a cave or hole or a bird's nest.

The offspring is the center pole as embryos in relation to the adult and to the nest or hole, a picture of anticenter in the dimension of space. The parents get the role of primary complementary counterpart and anticenter to the offspring: protecting, brooding. Cf. mouthbreeders among fishes or the bear mother bent around sucking cubs.

When feeding the offspring (of birds or mammals) the outer geometry between the individuals is inward, convergent direction of parents towards the center in the young and the outward, divergent direction of the youngsters' open mouth gaps:



Fig Eth-3-201-2
Within each individual as a whole the directions are reversed: outwards from the feeding parent, inwards the mouth of eating youngsters. However, only at identification. This could be translated to parents feeding themselves, their inner emptiness after the birth of the offspring.

When there is no identification, the youngsters can be pecked to death, other mothers eat them up. The inward direction of the parent takes the form of aggression.; "that something" in the parent's nest seems perceived as if it had stolen the parent's own center, its real source for a self.

Identification could be described as passing through the underlying level as binding force according to postulated definitions in the dimension model. For birds it's the youngsters' chirps that activate this communication canal, but Lorenz describes the chirps as signals for inhibition of aggression.


Fig Eth-4-201-3

## 5. Territories:

The surrounding are of course the opposite, complementary pole for each living organism, its anticenter on the most underlying level. For animals that uphold territories, these means preserves, a "pantry" - in this sense a parallel for instance to the yolk in a bird's egg.

Many species of fishes have the need for a territory only during the reproduction period, a demarcation as of an invisible cell membrane.

The bigger entity: individual - own environment in uphold of a preserve could be said to have a similarity too on the microscopic level of fertilization with the completion of a haploid sex cell to a diploid, self-sufficient one. (Cf. certain insects where the females eat up their male mates!)

Anticenters $=00$-poles debranched and meeting "the other way around" on superposed levels:


Border between territories as a kind of "circular" structure becomes defined by the relation between opposite forces as two-way directed vector fields around the individuals: in Lorenz' terminology where the "aggression" outwards turns to "flight" inwards; center $=\mathrm{c}$, anticenter $=\mathrm{ac}$ :


Fig Eth-6-202-2

## 6. Herd animals versus territory upholding animals:

A first opposition is of course the one between plant-eaters and predatory species. It's a question of levels of nourishment: plants $\rightarrow \leftarrow$ grass-eaters $\rightarrow \leftarrow$ predators.

From the viewpoint of nourishment from the environment, predators represent of course as subjects the 0 -pole, while the grass-eater victims is only surrounding pantry, as such representing the 00-pole, a plenty - like grass for grass eaters.

From the viewpoint of individuals and dependence, it's the reverse: predators represent the superposed level and in that sense a class of lower d-degree, anticenter in relation to those who can live on more fundamental food.

Spatially it can be seen reflected in the way predators as lions for instance hide at the border of a field with grass-eating herds. Or in the way a group of sharks surround and crowd together a shoal of fishes.

Hunting for food is not by ethologists regarded as aggression, even if implying cruel murder. Hunger is an inward directed component of "self-preservation", similar to certain forms of aggression, but is obviously a more elementary force and a relation between subject and object, not two subjects.

One aspect is perhaps that during hunting the predator and its fleeing target animal have principally the same direction in outer motion, while "aggression" may be said to imply different kinds of counterdirections.


Fig Eth-7-206
There exists a differentiation too among species with similar nourishment as the one between shoaling fishes and solitary poster-colored fishes. This opposition is in the book explained only in teleological terms, as adaptation to different purposes: uphold of territories should favor spread of the species, while shoals give less risk to be the selected victim.

Yet, regarding the roots and causes for the differentiation, it seems necessary to count on 2 opposite forces, a binding, integrating force (from 0-pole in our model) that is dominating among shoal fishes, and a polarizing, splitting force (from 00-pole) as dominating among the solitary poster-colored fishes. Cf. among unicellular organisms those forming colonies and those more solitary ones.

It should be said that Lorenz in other contexts stresses the need of both causal and final ( $\sim$ teleological) explanations and that these don't exclude one another.

## 7. 'Aggression":

In point 1 above aggression as such was suggested as arising from the conflict between the entirety force (d-degree 5 in our model) in the individual as a unit and the same entirety force within a group or "the whole" in narrower or wider sense.

dual direction to / from $=$ the "unity force" between individuals


Instinct of self-preservation in the individual or group $=$ the "unity force" within an individual or group

Fig Eth-8-205-2

In reality a straightforward conflict often very clearly reveals an urge for depolarization, e.g. in terms of (re-)establish equality, out of the binding force between individual units.

One factor is the need to get confirmed to use a term from modern psychology, from outside, from other subjects - since each individual is always only half of the world. It's a need for the "I" to get confirmed from others to become saturated to a "self"'. Cf. children's need to be seen and rivalry among them.

Hence, aggression seems to include a need of confrontation, to meet: $0 \rightarrow \leftarrow 0$, the same outward directed force of the "I" in others answering their own.

A depolarization between individuals is only indirectly possible. The binding force between the individuals can only be expressed in more or less symbolic behaviors as paralleling (as chromosomes position themselves parallelly for crossover at fertilization), in exchange of food and other rituals.

The urge for confrontation gets a character of aggression owing to this bar to depolarization, different kinds of "aggressions" are born out of this very conflict.

However, when the divergent force in subjects as saturated 'selves" meet the same forces in others, the confrontation actualizes the opposite force repulsion - an anticenter $(00)$ in terms of the dimension model. Position of the selves are at their surfaces, their outer border. Then their inward direction - a primary polarizing force - is brought up to the fore. It's one pole of the self-preservation "instinct", the entirety force within the individual or "we-group". The opponents have both directions outwards/inwards in themselves.

It implies anti-identification, a pushing away and expelling (either it gets the character of fear or something else, depending on power): $0 \leftarrow 00 \rightarrow 0$.


Fig Eth-9
Biologists often talk about a drive to spread the species, which may be only a name for the geometrically given divergent vectors in subjects as 0-poles seen as an expansive force.

Cf. animal males' fights in the time for reproduction, the inward directed force of males.

The demarcation of a "we-group" or of the individual "self", establishing borders as such, with exclusion of some others, may be interpreted as one strategy for solving the underlying conflict between the binding forces on different levels. A more or less conscious limitation of the own world. (For an individual self, this stress of a demarcating border implies anchoring the foothold of his identity at his surface.)

One expression is of course defense of territories, borders as equivalent with "skin".

## 8.. 'Inhibition':

Lorenz describes the two forces outwards/inwards in our model as aggression and flight and that the "conflict" between these opposite forces leads to behavior patterns seen as inhibition of aggression: the frontal attack restrained by resistance to hurt a 'kin male' of the same species. Thus halfway between an antiparallel and a parallel relation.

What he describes in terms of "aggression", "inhibition" and "redirection" with the emphasis on directions may as well be read in terms of relations between outward and inward directions as forces and their appearance as derived forces in different angle steps of lower d-degrees, this using aspects from the dimension model.

The author stresses that this inhibition and reorientation of aggression are equally active forces as the aggression itself. Yet, he regards them as a new "independent" force, an independence it has not in our model.

It may in this model be described as a step from the antiparallel angle in d-degree 4 to the perpendicular one of d-degree 3 , a purely dimensional geometry underlying this motor patterns.

Broadside display of males to impress on the "rival" is one typical example:
$-4^{\text {th }}$ d-degree: Antiparallel confrontation in males' duels for instance.
$-3^{\text {rd }}$ d-degree: Broadside display, impressing: body at straight angle to the confrontation axis and the adversary. In our model it's the assumed angle of " $90^{\circ}$ " in d-degree 3, (according to Lorenz it's "possibly" half a turn away from the antagonist, motivated by a reaction to flee.)


Fig Eth-10-203-1
(Sketches to the right in this figure a try to illustrate further steps: "reorientation" and paralleling in positions, see below.)

Already in males' antiparallel, frontal threatening positions as at dueling, in their demonstration of strength, a potential perpendicular axis is marked.

In mouthbreeders for instance the frontal attack is braked at the same time as they increase their cross-section and covers of gills and other flaps of skin are spread out.

Males of fallow deer in frontal meeting wave their heads laterally.


Fig Eth-11-203-2
In the broadside exhibition the whole body position has been turned to perpendicular. It's a demonstration of size but could also illustrate an excluding wall, a border.

The lateral coordinate axis in these "inhibiting" relations corresponds obviously with the same development of inhibiting networks in the nervous system, through lateral connections via intermediate nerve cells.

The motor cortex of the human brain is said to fill mostly inhibiting functions, while deeper centers send the primary motor signals. It shows on the factor of inward direction in inhibiting behaviors - departing from anticenter - as cortex in relation to the deeper centers.

## 9. 'Redirection":

This redirected behavior appears when there already is some kind of bond between two individuals, as between mates. Compare the sexual complementarity out of a polarization from an underlying unity.

One example: At threat, a male in a species of Cichlids swims first straight on towards the antagonist and turns then to broadside display.

When the fish instead swims "expressly" past the other individual, a mate, and shows the broadside-impressing behavior, it symbolizes that the partner is not the target for attack but somebody else in the fish's movement direction. Inhibition of aggression has gone one step further - possible to interpret as in a new angle, closer to what here is called paralleling as a certain degree of identification.


Fig Eth-12-204
This reorientation behavior has later got the role of what is called a ceremonial greeting.

## 10. Paralleling- Personal bonds:

Personal bonds are only found among species of bony fishes, birds and mammals. Hence, it appears as a step in faculties following with the evolution of new classes within subphylum Vertebrates.

In the examples that Lorenz gives on behaviors where personal bonds between individuals or within a group have been developed, both factors of confrontation direction to a center, $\rightarrow 0 \leftarrow$, and directions outwards, $\leftarrow 00 \rightarrow$, appear, possible to interpret as two-way direction as of d-degree 4 in our model: $<=========>$. Yet divided a) in different moments, b) different parts of the bodies. It results in a partial paralleling of motions, in triumph ceremonies but also in common threats towards some more or less specified excluded "others".

In the confrontation (meeting) moment, $\rightarrow 0 \leftarrow$, wild ducks the male turns his head backwards from his mate the more he gets sexually excited, that is to say parallel to her direction of movement.

In what is called "ritualized inciting" the female meets the mate frontally but the head is turned threatening backwards over the shoulder towards the "enemies" as showing the mate which others to attack, i.e. in the same direction as that of the mate.

We have in these examples the opposition between body and head. The opposite directions "inwards" of the mates' bodies could be said to express the complementary, sexual polarity, while the heads backwards as "outwards" from this center expresses an identification, a common center.

The two-way direction of personal bonds is further polarized in different moments In the confrontation which define a common center, $\rightarrow 0 \leftarrow$, the behavior becomes transformed to a greeting ceremony but only before or after moments of antiidentification with others, a "reoriented" aggression of threatening in Lorenz's description.

In the geese's triumph ceremonies the necks are normally stretched upwards, i.e. parallelly, after a threat directed outwards another individual or only out in the air (as outward direction, divergence, pole 4 b in the dimension model).

personal bond

- parallelisation


## Fig Eth-13

Or the whole flock of geese threatens another group with necks parallelly stretched out. The shared direction marks that the individuals have a kind of common center, a sense of common origin; the behavior seen as a geometrical design of identification.

In these different moments of behavior we can find a d-degree step $4-3$, between principally vertical and horizontal directions, between antiparallelity and the polarity circular - radial of d-degree 3 . Cf. that the necks of a flock of geese when threatening is described as convergent, convergence from inward direction.

This paralleling of social behavior reveals the integrating force within the individual widened to the whole group, less or more extended in definition and demarcation of what is "the group". A stepwise deeper, more including "We" appears as expression for the underlying binding forces.

The observations that paralleling as marking a common center always seems to demand the activation of an anticenter agrees with the abstract principles of a dimension chain. It could be interpreted as just the divergent urge to confrontation as such, (for virtual new centers).

## 11. Submissive behaviors - Ranking orders:

Submissive behavior get the function of inhibiting aggression between two adversaries in Lorenz's description. The similar behavior appear as establishing ranking orders in groups.

Submissive, appeasing behavior can according to Lorenz be derived from the "infantile" behaviors of youngsters versus adults but appear also in the mating behavior of females.

According to him the behavior in its actual form has "nothing to do" with childishness or sexuality. Yet, the complementarity between sexes takes during evolution the outer structural form of inward direction from males (from anticenter, the 00 -pole) and the outward direction of females (from center, the 0 -pole).

All submissive behaviors imply that the individual turns its weapons away as Lorenz describes them.

Gull birds turn the vulnerable back of their heads towards the other gull, other animals turn the back parts of their bodies, other their ventral side upwards or just taking a lowered and contracted position. All these different ways to deny confrontation can be interpreted as showing the attitude of a lower, deeper 0-pole in relation to the other individual, thus confirming the other's might.

We could remember the very first poles of an embryo, the vegetative 0-pole in relation to the animal 00 -pole, the ventral side invaginating to inside layers (inducing the neural tube) and in a later step turned to the back part of the body.

Submissive behavior between two individuals and ranking order within a group are both two other strategies (besides demarcation/exclusion) for solving the fundamental conflict between binding forces. They rely on the polarization of 5-dimensional units into complementary poles: a division in opposite but complementary roles, expressed in terms of the dimension model. In this sense it implies a derivation to lower d-degrees of the individuals.

Cf. submissive attitudes with the b-poles from 0-pole in relation to a-poles: outward direction versus inwards, radial structure versus circular, inside or concave versus outside or convex surface, motions from each other versus to each other.

In a ranking system the individuals get mutually opposite roles, "haploid" ones with a biological term, which means roles as halves of their selves. This refers to each special situation and confrontation. The role can of course change towards different other individuals depending on rank.

Upward - downward directions are marked quite physically as described above, upward direction in submissive behavior, lowered position, turning of the ventral side upwards and such things. While the individual with higher rank takes up the superior position and is turned downwards.

When the group is threatened, the youngsters representing the 0 -pole are gathered inside, in the center, the strongest females or males anticentric around them (as the 00pole), forming a ring, a periphery as a wall (a surface).

Aggression is said to increase with higher age and rank. One aspect in this is that upward direction corresponds to divergence and therefore at bottom derives from a common center, which represent kinship and affinity. While downward - inward direction from the periphery implies vectors with separate origins and represent the totalitarian (gathering) force, opposite the integrating one.

The highest in rank gets the role ("liability") of the inward directed component in self-preservation of the group.

A ranking order implies naturally reduction of both parts in the confrontation, of outer or inner sphere of the "selves". A separation however gets inevitably more severe for the upper, dominating part. Cf. Exogastrulation (file Embryology, No. 4.)
(The level of Biology is followed by the level of Psychology.
The authors book "The I and the Ego, Psychogeometry" may be mentioned here, however so far only available in Swedish.)

## Levels from Micro- to Macrocosm - a Sketched outline



O-pole: Microcosm 10 levels

Polarization into Macro-/Microcosm

| 05. heavier chemical elements | $\uparrow$ |
| :--- | :--- |
| 04. elementary particles, $\mathrm{H}^{-}, \mathrm{e}^{-}$, atoms | $\uparrow$ |
| 03. Mass - Space | $\uparrow$ |
| 02. Vector fields - Forces | $\uparrow$ |
| 01. Dimensions | $\uparrow$ |

(This division into levels may naturally be rather unclear or arbitrary in some respects.)

Gamow pointed out that the scales of time and distances in Universe were about the same, circa 41 ten-powers.

Time: Counting from the time for light to pass a proton, $\ldots 10^{-23}$ s to estimated age of Universe, circa $10^{17,6} \mathrm{~s}$, gives about 40-41 ten-powers. The middle is about $10^{-3} \mathrm{~s}$, the time for a neutron to disintegrate in $s$ and e outside an atomic nucleus. Distance: From diameter of an H -atom, $\sim 10^{-15} \mathrm{~m}$, to the estimated one of Universe, circa $10^{26} \mathrm{~m}$, gave also about 41 ten-powers. The middle thus about $10^{5,5} \mathrm{~m}$ (circa 316 km , a little distance on our planet).

Quotient between these middle values gives approximately the velocity of light, perhaps always the middle in an expanding Universe?
(The lower borders may of course be regarded as arbitrary in subatomic physics.)

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Names of books in Swedish translated here in italics within brackets.
The non professional way of naming the references (in italics within brackets in the text) could inform the visitor that this site is not for those who only seek established data but for those interested in models for interpretation of such data.

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