Language

A 5-dimensional analysis of linguistic data

From: www.u5d.net/Language

PART II:

The Speech Organs

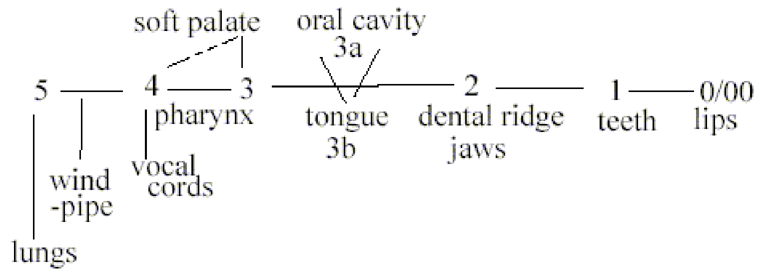
As written in the introduction file:
If an interpretation of biological design in accordance with principles in the dimension model have some validity, it should reasonably also be the case for organs of speech - and consequently for the phonemes too. It would provide a basis for interpreting phonemes - the individual sounds - in an equivalent manner.

General complementary "poles" in production of speech is

- the ***dorsal - ventral*** opposition, (back - front, upper - lower) related animal - vegetative poles in the embryonic development,
- ***air current - biological organs***.

A general principle is the different ***polarizations*** as divisions of the air stream by the organs, barriers and demarcations of different structures.
(Fundamentally it's the organs that here represent the polarizing forces, the 00-pole, in relation to the air stream as the integrating 0-pole - in terms of our model.)

Sketch of speech organs as a dimensional chain, from inside - out:



- Tongue / Oral cavity illustrates in the design the complementary poles 3b/3a of d-degree 3, Mass /Space in a simple way,
- Jaws, upper/lower, curved (the dental ridges) forms as demarcations of the cavity, a surface on this macro-scale, d-degree 2.
- Teeth illustrate d-degree 1 on this scale. Built-in into the jaws, as in the dimension model we have the outer poles 2a/2b of d-degree 1, depicted: 2a — 1 — 2b.
- Lips, finally, opening / closing, representing a first main expression for motions to and fro.

More detailed aspects and motivations below.

Lungs - windpipe with vocal cords - throat (pharynx):
The way from lungs to mouth and nose openings in ordinary breathing may be regarded a whole dimension chain from centre to anticentre (c - ac), double directed in the process on convergence - divergence in inhalation/exhalation.
(In fact, it also represents motions to and fro, as in our model d-degree 0/00, equivalent with 5', starting point for a new dimension chain and also implying a pole exchange.)
Medium of speech, the air, comes from the lungs and is designed in the later steps on its way out, mainly during exhalation (click sounds disregarded).
The windpipe (trachea) is the "stalk" toward and from the lungs as centres. (It should possibly be regarded as representing an underlying level.)

[Cf. the hypothetical aspect of atomic breathing of empty space (*Physics II*), atomic centres in communication with the surrounding "vacant space" as "antimatter".]

Primarily, the "field level", that is d-degree 4 as double-direction inwards/outwards, is represented by the duct system of the airways between the interior and the surroundings and the air flow as a process in / out.

(Air and food ways for oxygen and food represent the potentials between poles 0 / 00, giving the combustion energy in the chain of chemical processes.)

Vocal cords:

The larynx is a complex structure with vocal cords as “radial” within more or less circular “cricoid” and “thyroid” cartilage, as a “complex centre” in our model.

The vocal cords as first barrier for production of speech, from inside - out, is here proposed to represent d-degree 4 of forces, a field level: open slit, a 00-pole defined, representing barriers in inward direction (voiceless sounds); “closed”, narrow slit, defining a 0-pole, the first “barrier” from inside out.

- The air stream is here still undivided, goes both to nasal and oral cavities.
- The co-ordinate axis, the direction, is the one ventral <==> dorsal: representing the main axis vegetative - animal pole (0 - 00) of an embryo.
- The opening/closing, divergence/convergence are design through opposite, muscle drawing forces. See the figure below.
- The vibration of the vocal cords should be compared with the 1-dimensional vibration motions assumed in d-degree 4 in our model.

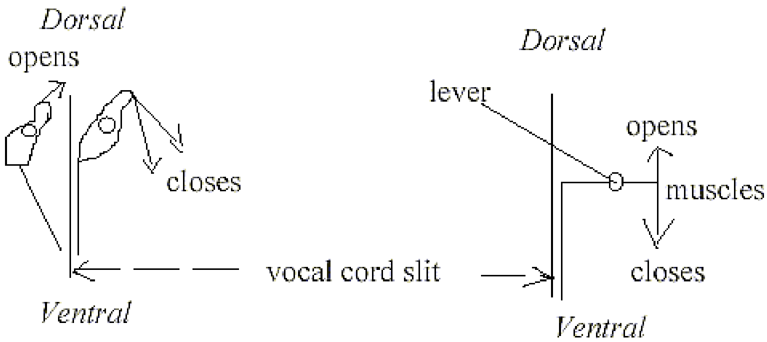


Figure to the left freely after (WN). Right figure just a way to illustrate the principle.

Muscle pull in dorsal direction = outwards / upwards (the 00-pole) —> glottis opens.
Muscles pull in ventral direction inwards / downwards (the 0-pole), —> glottis closes

Hence, motion inwards defines glottis as blocking (a barrier), as a centre, ~ 0-pole, motion outwards defines it as open, as anti-centre, ~ 00-pole, in accordance with the description of last step in the dimension model: motions towards each other defining a new 0-pole, a centre, motions from each other a new 00-pole, an anticentre. (A “pole exchange” in last degree 0/00.)

One might wonder if not a simpler arrangement of the muscles could have given the same function, if there isn’t laws of a deeper geometry that led to this lever principle around centre displaced axes of rotation.

About vibration:

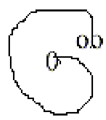
According to the reference, the character of vibration of the vocal cords in voiced phonemes may not be the change between parallel cords to a V-opening as in speech versus breathing. The vibration is perhaps instead produced only through changes in the elasticity of the vocal cords. Some photos (*CEL*) could be interpreted in that way. According to this source, one don’t know really (or didn’t at that time) how vibration in voiced sounds comes about. The latter alternative would mean more of a linear change (as in L-waves), more like assumed motional moment in d-degree 4, in a double-directed "vector field", representing an underlying chemically governed level as of higher d-degree.

Soft palate (velum) with uvula and step 4 → 3:
In the pharynx the airway gets branched, pharynx <——> nasal cavities and pharynx <——> oral cavity, as two angled co-ordinate axes in dimension step 4→3: a polarization into different directions ventrally / dorsally:

Dorsal-ventral:
As said above, the dorsal side derives from the animal pole of an embryo, the ventral side from the "vegetative pole" in a simplified description.

The opposition *ventral - dorsal* as medical concepts for front and back has the character of 0- and 00-poles (see later files about *Biology*), of internal / external (centre versus anticentre), and of lower / upper.

In many respects, one finds a further polarization dorsally - as lower dimensional degrees in relation to higher have the character of 00-poles in relation to the 0-pole:



spiral chap

- The nasal cavity is dual versus the single mouth opening.
- Upper (dorsal) jaws are often less grown together than the lower (ventral) jaw.
- Upper lip has a cleaved wave form versus the simple curve of lower lip.
- (Paired senses such as eyes and ears more dorsally and "laterally" (= on the sides) versus senses as taste, unpaired),
- Vocal cords open during breathing in a V shape (divergence) outwards, in direction backwards towards the spine, i.e. towards the dorsal side.

Soft palate (velum) forms a boundary between oral cavity and pharynx. In its direction from the upper, inner palate ceiling (dorsal, ~ 00-pole) in direction inwards (with uvula downwards), it can be seen as a biological design of the inward direction (pole 4a).

It has the function of closing the airway towards the nasal cavities through a certain angle change in direction inwards. It implies a polarization of the air stream from pharynx to nose / mouth to the single direction towards the oral cavity. Cf. that inward direction from 00-pole is assumed as a polarizing force in the dimensional model.

The change in direction of the soft palate with uvula from more or less vertical (hanging down) to lifted more horizontally inwards can also be interpreted as an expression of the angle step assumed in the model from 180^o to 90^o of polarity.

> [Something of a counterpart to the dorsal soft palate is the epiglottis from ventral direction (the 0-pole). It is apparently united by muscles with the tongue. It closes the windpipe at swallowing (a sort of unidirection inwards the body). This occurs however more through raise of the larynx than by a direct change of epiglottis. The raising gives side passages, implying a more radial closure. Hence, both velum / uvula and epiglottis, interpreted as at the border to "d-degree 3" (the oral cavity), could be perceived as designing the primary hypothesis in our model of lower d-degree acting polarizing on higher d-degree: here the canals for airway to nose / mouth (velum) and food / air (epiglottis). It's simultaneously expressed in different geometries as from a- and b-poles in our model, derived from 00- and 0-poles respectively.]

Oral cavity - Tongue, step 3 - 2:
After soft palate and uvula, the airway widens to the oral cavity with the tongue:
Oral cavity - tongue becomes a design of poles of d-degree 3, a relation Space - Mass in terms of physical quantities, interpreted in their mutual relationship (see *Physics*).
Tongue - Hard Palate becomes also geometrically a relation radial (pole 3b) versus "circular" (pole 3a), the elementary geometrical forms assumed in d-degree step 3-2 in the model. The hard palate ceiling (dorsal ~ from 00-pole) gets the circular geometry (pole 3a), the tongue (ventral ~ from 0-pole) represent roughly in this relation the radial form (pole 3b).

The tongue, from the bottom of the oral cavity (the ventral side, ~0-pole)), has muscle fibres in 3 perpendicular directions, in this obviously a 3-dimensional structure.
It's also penetrated by muscle fibres from the inner tongue-bone at pharynx, from the skull base and from outer, lower jaw. We could suspect that these extra muscles represents the outer poles 4b and 4a of d-degree 3, (4b —>3 <—4a), the double-direction in the dimension chain outwards/inwards on the level of muscles, giving tongue an extra mobility.

It could be noted how biologists describe the tongue as "angled outwards relative the tongue body". It implies that the tongue - as primarily radial in design from d-degree 4, also in its further design illustrates an angle step, to next, lower d-degree.

The palate is soft inwards, 1/3 of it, while 2/3 outwards are hard through bone in the tissue (at a tissue level a shift towards lower d-degrees).

Tongue - Palate, from velum to dental ridge, can thus be seen as designed after geometries in d-degree step 3 <==> 2.

Tongue forms:
In its shape the tongue changes form at speech, depicting dimensionally the steps 3-2-1:
- It can contract to the form of 3-dimensional "spherical" blob.
- It may take the form of a flat "2-dimensional" surface, as "whole broadened', a "tongue blade" - and get more bowl- or dish-shaped, "convex" / "concave" à la poles of d-degree 2.
- It may taper to "1-dimensional" with a tip as in a front *l*-sound - or vibrate in an apical *r*-sound, illustrating the "d-degree of motions 0/00", cf. vibration of the vocal cords.

Dental ridge - teeth, step 2 - 1:
The jaws with dental ridge and teeth encloses and mark off the oral cavity. They illustrate at the same time a "polarization" of the mouth as circular structure - in upper/lower cavity. In these senses, they correspond to the d-degree step 2-1, where the teeth get the role of d-degree 1 - a breakdown into separate units.

(32 = 2^5 in humans - the number that according to previous hypotheses correspond to a dimension chain from the polarizing pole 00 inwards.)

Teeth are said to originate from skin carapace in the history of evolution, later becoming scales, on sharks for instance. later immigrating into teeth.
(Compare jaws-teeth as demarcations, with the forms of lipids in demarcating cell membranes |_|_|.)

Lips - 0/00:
The surface cell layers of the lips may be described as a meeting between the two poles, between epidermis (“ectoderm”) from the animal pole and mucous membranes ("endoderm") in the digestive system from the vegetative pole, which on the embryonic level implies a meeting between farthest out and farthest in, 00- and 0-poles.

Lips consist of striated muscle tissue (from mesoderm, the embryonic tissue layer developed between the outer and the inner, ectoderm and endoderm).

From these aspects, they could be viewed as d-degree 0 / 00 relative to other parts of the speech organs. Perhaps also from the point of view of mobility: the mobility of lips is the first developed by babies - essential for sucking - and for first sound generation.)

Two gradients:
The apparatus for articulation should perhaps be described as two opposite gradients:

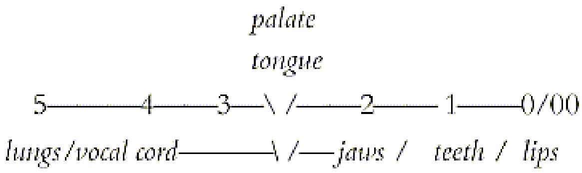
a) all the cavities, rooms for resonances and air currents,

b) the organ-building biological matter.

This gives a polarity of the type of matter - antimatter, or Space versus Mass in similarity with the one between tongue and palate, but on a more general level.

For language however, it’s the "matter" which becomes anticentra, in this sense "antimatter", while the air currents in the cavities constitute the "matter". The speech is the interaction between them.

Two organ levels?
If the root of the tongue, as mentioned above, has muscles both from inside the tongue-bone (attached with ligaments to the thyroid cartilage of larynx) and from outside the lower jaw, it gives one reason for interpreting the speech apparatus in accordance with the loop version of the dimension model, type 5→0/00, 5 → 4/1, 5 →3/2:



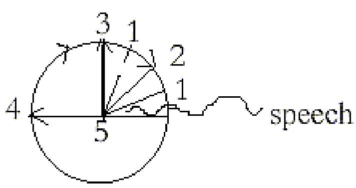
The tongue could be regarded as "stored into” step 3 - 2, as an organ level II compared with the one defined by the co-ordinate axis from pharynx with vocal cords to dental ridge, teeth and lips as an organ level I?

The tongue could thus be interpreted as something like a radial vector field at the new level. Compare the tongue directions inwards - outwards, upwards - downwards and its many shapes and position changes for different consonants and vowels.

Lip-sounds as plosives - the ones at organ level I - belong to children’s first consonants.

A biologically very suspect note:
Mouth as an “angle rest”:

According to the aspect on a dimension chain as angle steps, the apparatus of speech becomes as a whole with mouth and throat, an "angle rest" - the resulting angle after for instance 5 halvings from 360°. Like the open vocal cords when breathing further in.



It is noteworthy then that the mouth gap opens along another co-ordinate axis than the vocal cords, as along the x-axis relative the y-axis.

Phonemes - consonants

Phonemes are classified in vowels plus **4-5 *types*** of consonants besides location for articulation. The number of types in itself points to an interpretation in accordance with the dimension model, as naturally the views on the speech organs in preceding file.

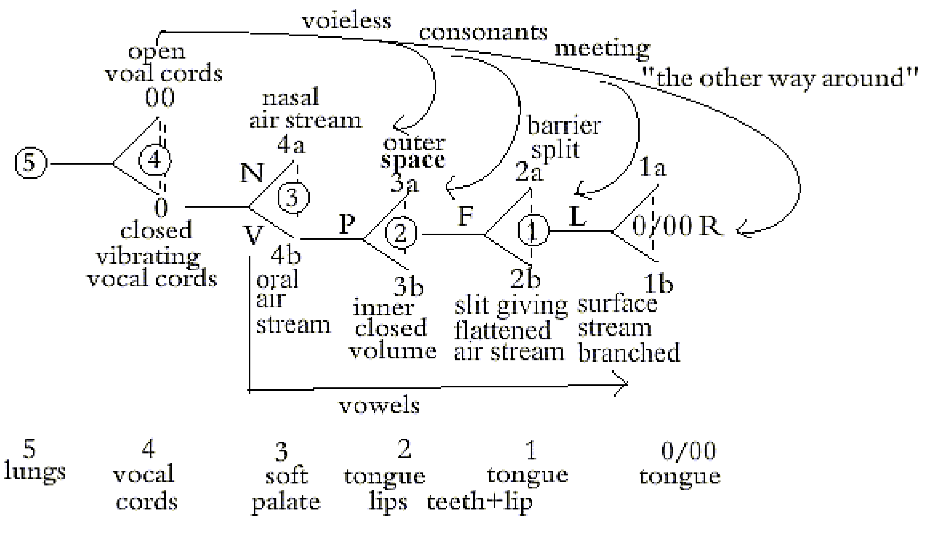
Types:

Vowels	(V)	
		<u>Examples</u>
Nasals	(N)	*ng, n. m*
Plosives (stops)	(P)	*g, g, d, t, b, p ...*
Fricatives	(F)	*ch, z, s, th, v, ,f* etc.
Liquids: Laterals	(L)	*l*-sounds
Vibrants	(R)	*r*-sounds

Polarities:
Polarities used by phoneticians are ***vowels / consonants*** (without versus with outer barriers for the air stream), ***voiced / voiceless*** (with/without vocal cord vibration), ***instantaneous /continuous*** sounds, and degree and kind of barrier. With these concepts the types may be derived through 5 polarization steps as in figure at end of this chapter.

Here a bit different derivation chain is suggested, from the aspect of the main medium, the air current, and its polarizations:

5 polarizations of the air current:



Described from the aspect of lower d-degree polarizing the next higher one:

5 — 4: The air current as "***a whole***" polarized by vocal cords in two phases: open (V-formed) ~ 00-pole, undefined (no sound) and closed (~ 0-pole, with vibration): voiceless - voiced sounds as anti-centre versus centre.

4 — 3; The air current *as* ***outward directed vector field*** divided by soft palate (pole 3a inwards) in two directions: upwards nasal cavities (pole 4a) and outwards the oral cavity (pole 4b). Soft palate closed: *vowels* defined, when open: *nasals* indirectly defined through next step (inwards).

3 — 2: The air current *as* ***volume*** divided by tongue or lips in inner closed room / outer open space, poles 3b/3a Momentary opened volume: *plosives* defined.

2 — 1: The air current *as a* ***surface,*** a flattened, laminar stream, through "half" opening of volume, branched in Space by the tongue: *liquids* defined.

1 — 0/00: The air current as "**linear**" polarized in Time by the tongue tip as a “point” into motions (0 / 00): *vibrants* defined.

We may note in the figure above that *r*-sounds (R) by phoneticians are described as changes between voiceless plosives and vowels,

There is a similar but momentary combination of 0- and 00-poles in the vocal cord plosive (a phoneme in some languages).

The outer poles 0-00 of d-degree 4 in our model - here related the vocal cords, meet in last d-degree 0/00 of motions, however as repetition. This opposition *momentary / repeated* becomes one expression for the poles 0 and 00.

(The V-form of open vocal cords implies “motions from each other” defining an anticentre, the 00-pole.)

Vibration, the motional moment assumed in d-degree 4 as expression for the 1 lost d-degree in structure, returns in this last step 1 → 0/00 in the *r*-sounds, the vibrants.

In a derived sense there is also the 0/00-combination in the middle step 3 — 2, the momentary transition from inner to outer air volumes in plosives.

Hence, it gives reason to apply the view on a dimension chain as “haploid”, with double directions from centre and anticentre meeting in step 3-2, a new complex centre. (This seems also to agree with the “inverted” relation circular/radial in the middle step.)

Plosives
5 — 4 —3 —> <— 2 — 1 — 0/00
0 ————>00/0 <———— 00
inner outer
“circular” “radial”
air volumes

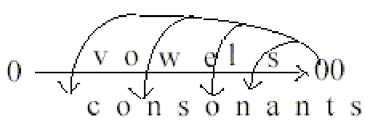
Plosives and Fricatives:

Plosives include a transition from stop to radial explosion: a division in both space and time, which illustrates that each step represents d-degree 1 or step 1 → 0/00. (Compare the many phoneme combinations *gr-gl-gr-gl* in words.)

This middle step, with the further polarizations to fricatives and liquids could illustrate the ***particle / wave duality*** of light among elementary particles as suggested in files about physics. (A closed potential breaking up, polarized in Space and Time.)

The anticentre pole (00) from vocal cords, representing at first the undefined environment for sounds, becomes stepwise defined from outside inwards by more and more barring biological organs, the anticentre pole in relation to the air medium.

Exhalation and secondarily the vowels as an outward-directed vector field from the centre gets also quantified by barring from the biological anticentra that give the consonants:

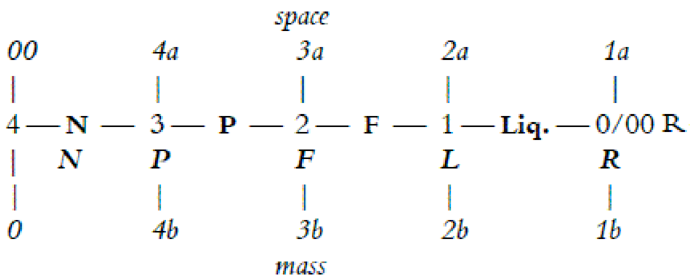


Vowels as an underlying field level, transformed into intervals on superposed level. Vowels as d-degree *steps*, consonants as d-degrees, *borders*.

Compare vowels with verbs, as open, "radial" structures, and consonants with nouns, more or less closed structures.

Nasals as "4a"-pole:
The "a-poles" have characters from inward direction from anti-centre in our model. It's obvious that the nasals get defined in inward direction, with the prerequisite of a total barrier in d-degree step 3-2.

Variable interpretation of phonemes as out of a dimension chain:
Half-step shifts in the alternatives could depend on whether we look at the main axis for d-degrees of structure as representing the dimension chain, or the outer poles in the different d-degrees as such.



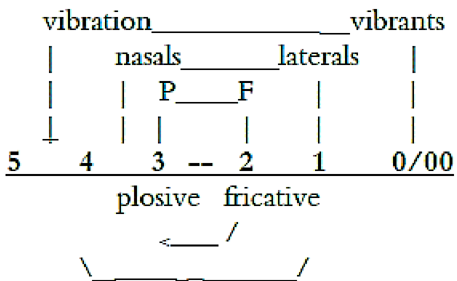
The approach is shifted, depending on whether one looks to the geometry of the organ barriers, or to geometry of the air current. With one example: looking to the organ barrier, total barrier (stop) may be interpreted as a surface (d-degree 2), polarized in the ½ barrier of fricatives, where it's the air current that gets the character of a surface.

Nasals - Laterals: the dimension model as "loop model":

The loop model implies that debranched degrees in dimension degree steps outwards are debranched and meet the other way around inwards.

The dimension chain viewed vertically gets three steps of polarizations of a 5-dimensional unit.

5 → 3 <—> 2
5 → 4 <—> 1
5 → 0 <—>00



As there is a link between vibration of the vocal cords 0 <===> 00 and vibrants, the *r*-sounds*, there is also a similarity between the branched air current in nasals and the laterally branched air current by the tongue in liquids. And the pair plosives - fricatives merge or transform easily into one another.

*(The sound called "*flapped r*" could be compared with the vocal cord plosive.)

In terms of lower d-degrees branched off from the higher d-degree steps:

0/00-1:	**vibrants**	in step 5-4, voiced /voiceless
1-2:	**laterals**	in step 4-3, ***nasals***
2-(3):	**fricatives**	in step 3->|<-2 ***plosives***

```
5——— 4———3 —>|
  |__ 1   |_ _2
```

Number of phonemes:

Naturally, it's difficult to draw exact borders between many phonemes or rather sounds, with all variations in the pronunciation within a language. Yet, sense-dividing phonemes are obviously quantified,

Number in the International alphabet:
Two sources are referred to below, (*CE*) and (*BS*) .

Mean value of phonemes in a language is said to be about 30.
30 = the sum of poles in the dimension chain in our model, 2 x (5+4+3+2+1).

Vowels = 25 (*CEL*) = 5^2 = the square of intervals in a dimension chain.
(*BS*) counts on 20 vowels (4 x 4), + 8 variables = 28.
Consonants 61, according to (*BS*), without implosive stops and click sounds which (*CEL*) includes. With addition of two labia-velar stops from (CEL) the number becomes 63.

(Counting with 63 consonants and 28 vowels, the quotient becomes = 3^2 / 2^2)

Reference BS:

	Nasals	Plosives	Fricat.	Later.	Vibr.	Sum	
BL	1	2	2			5	
DL	1		3			4	
D, A, AP*	1	2	6	3	2	14	
R	1	2	2	1	1	7	
PA**			2			2	
AP***			2			2	
P	1	2	3	1		7	
Labial-P			+1			1... Σ 42	
Labal-V		(+2)[b]	+1			1 (3)	
V	1	2	2			5	
UV	1	2	3		2	8	
Ph			2			2	
Gl		1	2			3... Σ 19	
Sum :	*7*	*13(15)*	*31*	*5*	*5*	*Σ 61,*	*b) 63*

* post-alveolar, ** PA: palatal-alveolar, *** AP here = Alveo-palatal
b) 2 labial-velar stops from reference (*CE*). ***kolla***

2^x-series in polarizations outwards:

Sums in the table above may be compared with
the 2^x-series in polarizations outwards:

⑤ - ④ - ③ - ② - ① - ⓪

1 2 4 8 16 32 → **Sum 63**

7 N — Nasals in step 4-3

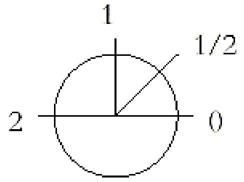
15 K — Plosives in step 3-2

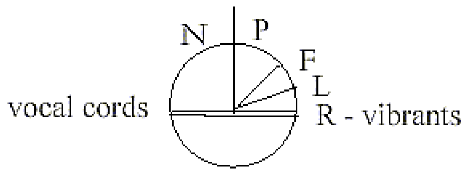
31 F rest 10 = L — Fricatives in step 2-1

Liquids in step 1-0/00

Barriers as "halvings" of barriers, simplified:
Oral vector field:
3-2: whole barrier in plosives (inner/outer)
2-1: halved in fricatives (up/down)
1-0/00- branched in Space in liquids - laterals (right/left)
0/00- branched in Time in vibrants

Apprehended as a chain of halvings, the phoneme chain reminds of the assumed angle steps in a dimension chain.



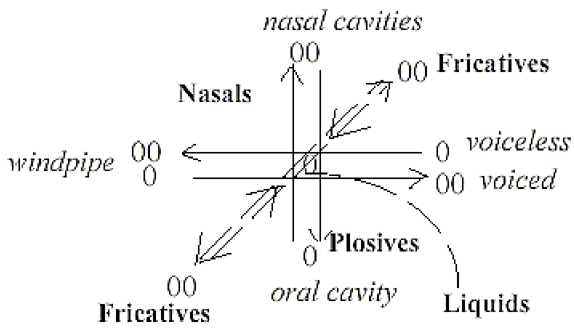


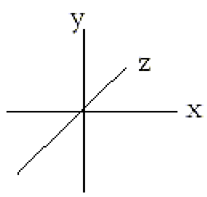
Compare spin, attributed elementary particles as fermions and the bosons, the quanta of forces: ½ - 1 - 2. fermions - photons - gravitons. Nasals as with spin 2 !?.
Phonemes are naturally quanta of forces on the level of speech.

Co-ordinate axes:
The three main co-ordinate axes of an embryo and in developed speech organs can be identified as

a) ventral - dorsal, from vegetative-animal poles, from throat to mouth/nose openings, front - back, inner - outer.
b) up - down, low - high,
c) left - right.

For an upright human they are easiest to call x - y- z respectively.





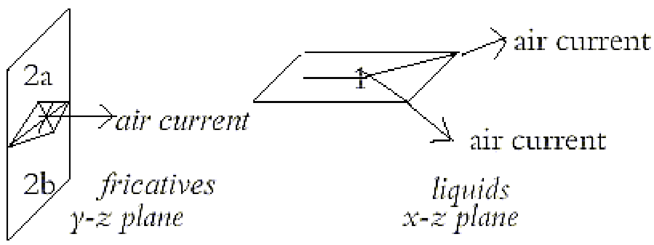
0 = air barred, 00 = air not barred, dashed lines: air half barred

- Vowels (V) require divided y-axis.
- Nasals (N) requires divided x-axis.
- Plosives (P) requires divided y-and x-axes.
- Fricatives (F) requires only half division of the x-axis and marks the whole z-axis.
- Liquids as laterals (L) and vibrants (R) requires divided y-, x- and z-axes.

Fricatives - Liquids:

Fricatives and liquids may be described as complementary in the relation between organs and air current. In the figure below the organs are regarded as centres (c), the air current as anticentre (ac):

opening *tongue*
tongue | *palate* *opening* | *opening*
c/2<--ac-->c/2 **ac/2---c---ac/2**
Fricatives Liquids
\ complementary /

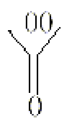


Liquids and fricatives as complementary poles can in this case be regarded as different branches from step 2 - 1, with one inwards step 3 - 2 according to previous possible aspects on the model:

5 ---> 4 ---> 3 ---> 0/00 <--- 1 <--- 2 ---> 1
P *R* *F* *L*

In inward direction, it is the centre that gets polarized, in outward direction the anticentre.

h-sound, step 5 - 4, and semivowels j-w:



h-sound, with the vocal cords only half closed, lies a half step deeper than the vowels with their vocal cords vibration, and it can be regarded as having the lungs as primary centre. Hence it derives from step 5 - 4 in these interpretations, but comes up in the step 3 - 2 in the chain of phoneme types: postpositive in aspirated plosives as aspiration.
It represents the very least barrier for a sound.

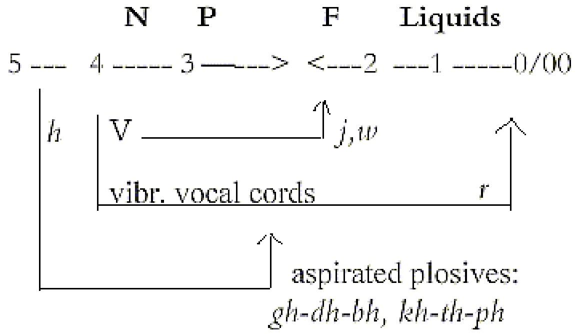
The semivowels w - j:
The vowels *u* and *i* have been called semivowels and borders on the voiced fricatives in English, the *w*-sound and *j*-sound, described as the two most vowel-like consonants.
(*j* and - *w* are in Egyptian depicted as *i* and *u*.)

- The *u*-sound meets the half barrier of the lips in the *w*-sound, as “another way around" in dimension chain of positions, as a meeting between complementary poles of organs 0

><00 between the vocal cords and lips, 0/00 on the organ level I. As does the *h*-sound in aspirated lips sounds *b, p*.

- The *i*-sound meets the *j*-sound on the organ level II of the tongue, in step 3-2.

h-sounds - vowels (V) - the vibration from the internal organs centres emerging in the external steps:



h-sound, semivowels, vibration from inner organ centra turn all up in outer steps, types and regions. *(Cf. the loop model.)*

h - semivowels and *liquids*: these sounds as *h - u - i - r - l* can form a "whirl"!

Tongue shapes as d-degrees 3-2-1-0:

As said in file about speech organs the tongue shapes may be described
- as more massive, 3-dimensional,
- as flattened to a tongue-blade, 2-dimensional,
- as more linear, 1-dimensional,
- or with the tongue tip as a “point”, 0-dimensional.

These forms correlates firstly rather well with *types* of phonemes, secondarily also with *positions* of articulations:

As for types, tongue as massive in inner nasals, plosives, as flattened in fricatives, as more linear in liquids and as a tip in vibrants, illustrating d-degrees 3-2-1-0.

- In ***plosives***, in the opening phase, the tongue is contracted to a 3-dimensional mass, in the preceding stop phase a bit more 2-dimensional, a barrier.
- In ***fricatives*** the tongue-blade as a 2-dimensional surface may be convex or concave, one of the geometrical polarities of poles of d-degree 2 in our model.

As convex, it creates the sounds with *dorsum*, its upper surface. As concave it forms sounds with under side of the tip, so in “retroflex” sounds. The upper side of the tongue is often also scooped, i.e. concave to a wider or narrower canal for the air current.

- In ***liquids*** the tongue is narrowing, as to illustrate the linear 1st dimension.
- In **vibrants** only the tip of tongue will be used, as a point illustrating d-degree 0.

forms of the tongue

(5)--- 4 --- 3 --- 2 --- 1 --- 0/00

P F L R

Here, as in the interpretation of the speech organs, it's possible to regard the step $1 \rightarrow 0/00$ developed within step 3 — 2 as inwards from d-degree 2. This could also give an aspect on the positions for the tongue phonemes:

5 ---> 4 ---> 3 --->	0/00	<----	1	<----	2
	P	*R*	*L*	*F*	

The similar differentiation in locations of articulation from inside outwards appears as secondary developments within phoneme type steps, which could be interpreted as two levels of differentiations:

It would be possible to trace features from d-degree 4 and 3 in those levels: phoneme *types* as fundamentally differentiations of ***directions***, from d-degree 4, and *positions* as differentiation in ***space***, d-degree 3.

Positions:

According to the chapter about the speech organs interpreted as a dimension chain:

<u>The scientific abbreviations for locations where the sounds are generated:</u>

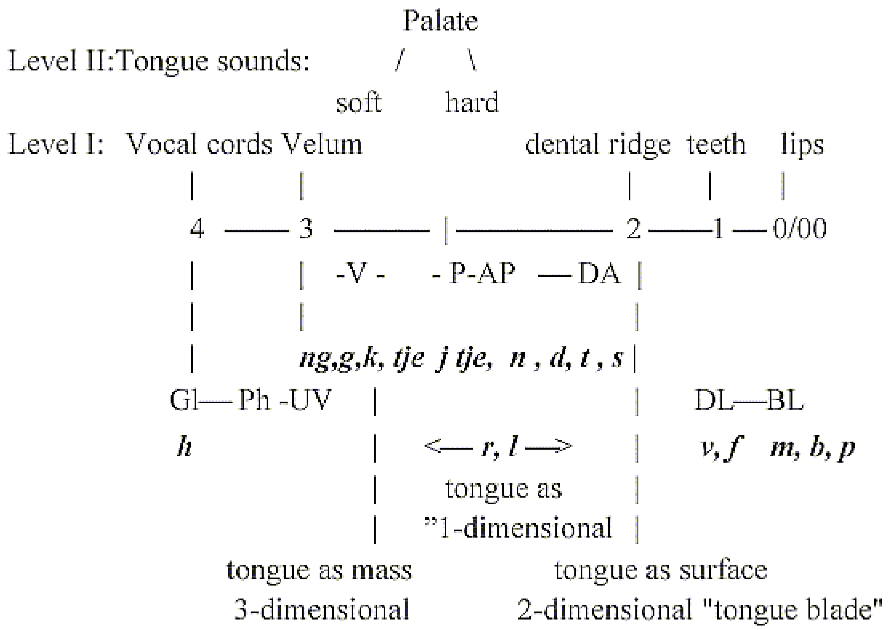
BL - Bilabial - Lip sounds
DL - Labiodental - lip-dental sounds
DA - Dental-alveolar - the inside of the teeth-dental ridge
A - Alveolar - dental ridge
AP - Alveolar-Palatal - dental ridge - hard palate
P - Palatal - hard palate, middle of the palate ceiling
V - Velar - soft palate
UV - Uvular - uvula
Gl - Glottal - larynx, vocal cords

(A couple of positions, retroflex R, and pharyngeal Ph omitted here.)

Gl	Ph	UV	V	P	AP	A	DA	DL	BL
Vocal cords-	Pharynx-	Uvula-	Velum	hard Palate -		Dental ridge -		Teeth -	Lips
4		3					2	1	0/00

Approximate positions for Swedish Phonemes:

	4——3	**3—2**	**2——1**	**1—0/00**	
	Gl—UV	V—P	AP—A — DA	DL—BL	*Phoneme types*
1--0/00	*R*		*r, l*		Liquids
2---1	*h*	*tje, j*	*sch, s*	*v, f*	Fricatives
3---2		*g, k*	*d, t*	*b, p*	Plosives
4---3		*ng*	*n*	*m*	Nasals



One annotation:
A dimensional interpretation of rear lingual sounds with tongue drawn inwards (both vowels and consonants), holds a general ambiguity: they can be understood as the necessary way to illustrate higher d-degrees in the chain of positions - or as a dimensional expression for inward direction in that chain. The first alternative is the most alluded to above

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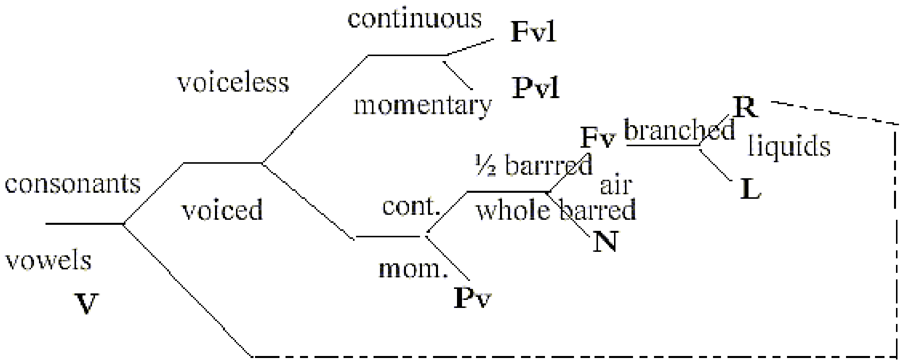
A note:
5 polarizations, departing from polarities: vowels/consonants, voiced/voiceless, momentary/continuous:

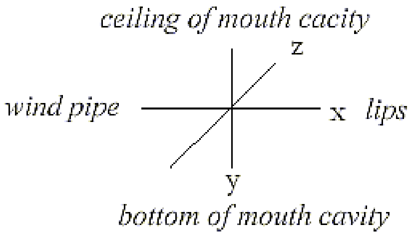


Vowels

and some annotations on syllables and morphemes

Vowels:
Vowels can be interpreted as d-degree steps or intervals, with consonants as the fixed borders, according to one of the views on these. Or vowels as a secondary field level (4'), consonants as the quantifying, "substantiating" force from lower d-degrees.
Cf. that vowels in writing of some languages as Hebrew, were marked as dots or dashes under / over the line of consonants, when they didn't belong to the pronunciation of the consonant.)
Dimension steps implies also angular steps type "180^o —> 90^o —> 45^o ..." according to hypotheses in our model, and differentiation of vowels may be seen from this aspect:

Co-ordinate axes:
x-axis: windpipe — lips: tongue back-/inwards, lips forward as in the *o*-sound, <——>
y-axis: bottom — ceiling of oral cavity: tongue downwards the bottom, jaws-lips vertically opened as in the long *a*-sound. ↕.
z-axis: tongue in middle position, widened, jaws-lips widened, as in the *e*-sound



Phoneticians' classification of vowels, *tongue positions most critical***:**
Back — *Front**, here the x-axis, concerns tongue position horizontally.
Low — *High,* here the y-axis, concerns tongue position in height (= in "open" - "closed" vowels).
Rounded — *not rounded*, (~ along the z-axis), concerns form of lip opening
Long — *Short*, time for the pronunciation, a differentiation within the other characterizations above.

* Back vowels implies raise of tongue towards soft palate, front vowels raise of tongue towards hard palate. Cf. the chapter about consonants, tongue contracted to a mass, ~ 3-dimensional, and more flattened to a surface, ~ d-degree 2.

Number of vowel heights (hence vertically) in a language can be up to 4, so it is said, but are often reduced in numbers as 4 —> 3 —> 2.

Dimensional aspects when it concerns the speech organs, a first sketch:

4: Direction outwards / inwards (posterior - anterior): x-axis, opposition "180^o".
d-degree 4, <====> .

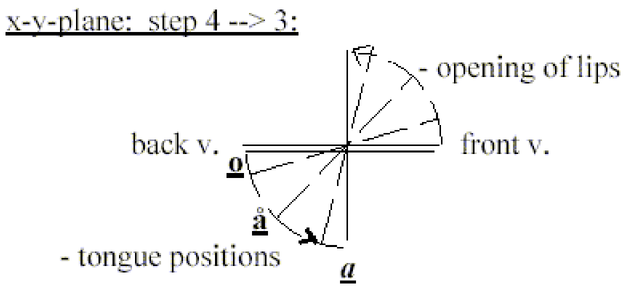
3: Radial / circular, tongue - palate, height positions: y-axis. polarity "90^o".
d-degree 3, __|__.

2: In the differentiation through shapes of lip-opening, circular to elliptical, the z-axis is involved (see Annotations below).
   (Mouth opening max about "45°".) Note also that a convex/concave form of the tongue - as poles of d-degree 2 in our model - separates vowels e - i.

1: Long / short vowels: a polarization in mouth opening and in the dimension of Time, corresponding to intermediate stages in the 4 - 3 - 2-steps.

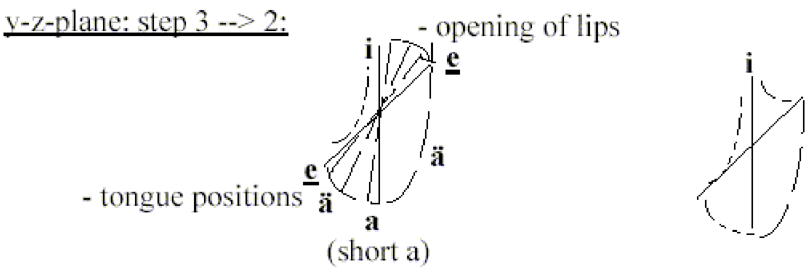
The vowels as step displacements, describing 90° arcs in 3 planes:
(S*w.*) for Swedish vowels.

Back, "rounded" vowels: long *o,* long *å* (Sw.), short *å* (or *o*), "often" long *a*:
D-degree step **4 —> 3**:
Long vowels *o —> å —> a* describes a an arc from the inner part of x-axis to the y-axis, in xy-plane, equivalent with a polarization of the x-axis 180° to 90°.
- Lips opening stepwise towards the y-axis.
- Tongue position stepwise lower.



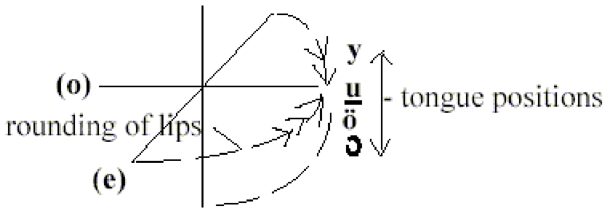
[Phonetic writing:
Swedish o = "u"
Swedish å = "o"
Swedish ä = "ε"]

Front, "not rounded" vowels: short *a*, short *ä* (Sw.), long *ä*, *e*:
D-degree step **3 —> 2**:
short a —> ä —> e (—> *i*) describes the arc from the y-axis to the z-axis, in yz-plane.
- Lips opening stepwise towards the z-axis. (About the i-vowel, see below.
- Tongue position stepwise higher.



Front, "rounded" vowels: y - u - ö (Sw.) - Ɔ, open ö / u, about the sound in English "*early*".
D-degree step **2 —> 1**:
y —> u —> ö —> Ɔ : Lip movements from z-axis back to x-axis, in zx-plane, in one step, a return.
- Lip-opening stepwise then along the y-axis (a secondary kind for *y* and *ö*: only lip-opening, not the entire lower jaw).
- Tongue position from high in *y* lower and lower in following vowels.

z-x-plane: step 2-->1 outwards, front part of x-axis:

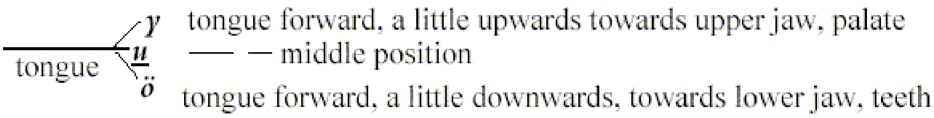


Annotations:

1) According to phoneticians (*BM*), following pairs of vowels have the same tongue position i height:

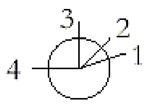
i --- *y*
e --- *ö*
ä --- ɔ The difference is only "rounding" of the lips in the y - ö -ɔ sounds.

y-and *ö*-sounds as a polarization up / down in tongue position in relation to the xz-plane:

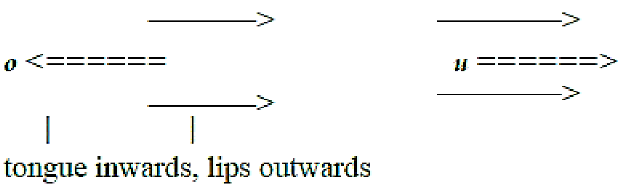


y--ö: small, vertical opening of lips

The small lips opening in *y* and long *ö* sounds, without opening of jaws, could illustrate the assumed narrower angles towards lower d-degrees in a dimension chain.



2) Along the x-axis (”D4”) there is a double-direction tongue-lips in the *o*-sound, becoming a unidirection in the *u*-sound, to compare with increasing one way direction towards lower d-degree in the dimension model.



The Swedish *u*-sound has developed from an inner elevated position (as the *o*-sound also is described) through a process in which the tongue has been pushed forwards. Hence, the long *u* above may perhaps be regarded as having the same tongue position as the *o*-sound.

All three steps according to the figures above taken together can be regarded as a ”pole exchange” from d-degree 4 and inner pole 0 via steps → 3 → 2 →1 to 00 as outer pole, and “the other way around” to the x-axis again.

3) The ***i*-sound** is defined as the highest vowel and the vowel articulated most in the front. It is assigned to the group *front, not rounded vowels*: short *a - ä - e - i* (from below upwards in tongue height position), step 3 - 2, y —> z-plane in our figures above.

In the series short *a* - *ä* - *e* however, steps in height position of the tongue is combined with the form of jaws and lips - stepwise closing to something of a "streak" in the *e*-sound. The *i*-sound then hardly implies any change in the jaws lips shape, only requires raising of the inner organ, the tongue.

In this respect, the *i*-sound appear as an expression for a branch from step 2-1 inwards step 3 - 2: 3 ⟶ 1 ⟵ 2.

Formants of the *i*-sound are the most polarized in the frequency spectrum. (Most polarized - as in last step of a dimension chain, moreover designed as a simple line with a dot over it as an illustration of this last step!) The tongue raise from z-axis of *e*-sound, depicted with dashed lines in figure y-z-plane above could perhaps represent the formants?

(The reason why *o*- and *i*-sounds are described as with the same high tongue position by phoneticians, depends perhaps upon the palate being narrower inwards - a relative determination of the height?)

4) The "development" from back towards front vowels as in a step 4 → 3 to 3 → 2 to 2 → 1 coincides with the interpretation of consonant developments 3-2 ⟶ 2-1: *plosives → fricatives* in the transformation (in Swedish) of back plosives to fricatives when preceding front vowels: *ke, kä, ki.*. They transform to fricative sounds, here typed "tje". and the plosive *g* becomes a *j*-sound. This transformation however, doesn't occur before the *u*-sound, developed out of a back vowel a more direct way.

Note the term "soft vowels" for the front ones, which with the dimension model could refer to less structure, more motional moments) in lower d-degrees.

5) 3 series of vowels, if all with 4 vocal heights: 4 + 4 + 4:

High vowels:	$\underline{o}$	$\underline{i}$	*y*	*or ?:*	-	*i*	*y*
|	$\underline{å}$	$\underline{e}$	*u*		$\underline{o}$	$\underline{e}$	*u*
|	∂	ε(ä)	ö(ø)		$\underline{å}$	ε(ä)	ö(ø)
|	$\underline{a}$	a	Ɔ		∂	*a*	Ɔ
Low vowels:					$\underline{a}$		

(Special signs are those of phoneticians, but Swedish o, u, å-letters used.)

Circular arches of "90^{o}" between the co-ordinate axes, according to the principle schedule above, will be divided by number of vowel heights in each series. It gives an "angle" of about "30° " on average. 4 vowel heights and 3 steps:

(Sin "30^{o}" = 1/2, sin "60^{o}" = √3/4; tan "30^{o}" = √1/3, tan 60^{o} = √3.
Vowel heights as sin-cos-tan functions and roots out of d-degrees and quotients between d-degrees!)

6) The terms "rounded - not rounded" vowels can be discussed. It could be argued, as in the figures above, that it is the direction of lips outwards along the x-axis that characterizes the o-sound, and the motions of lips and jaws in vertical direction, along the y-axis, that characterizes the transition to a long *a*-sound.

The rounding of lips opening could be perceived as merely an indirect consequence of these straight directions, when the mouth opening and lips happen to have a horizontal position!

The front vowels, *short a - ä - e - i,* which are called not rounded, are actually a gradual transition from round to elliptical to more elongated elliptical to ”streak”-formed mouth opening.

Ellipses: the form of a circle when its centre gets split to 2 focal points. Such forms as well as “back rounded” vowels, may be regarded as secondary results of the transition from y- to x-axis.

Compare ***Lissajou's figures*** for geometries, created by particle rotations in 2 planes simultaneously: the changes *circular - radial - streak* forms.)

7) With phoneticians' description all back vowels are rounded, the front vowels *e - ä - short a* not rounded. But in the last series *y - u - ö* the rounding reappears - as a kind of "feedback", also corresponding to the connection between steps in the loop version of the dimension model:

4 — 3 -><- 2 — 1: Step 4—>3 coupled with step 2 <—1.

"Rounding", if one accepts phoneticians' definitions, becomes associated with x-y-axis, here representing “step 4 - 3” with reference to analysis of the organs. Compare circular structure as geometry for the 3a-pole of d-degree 3 according the dimensional model.

Some readers may ask how it's possible to find 4 and up to 5 dimensions among phonemes when there is - ”obviously” ? - only 3 dimensions or co-ordinate axes in the speech organs.

Physicians' answer would surely be: in the processes, representing motions, thus Time. In our model: d-degree 0/00 of motions.

Other kind of answers here:

Among consonants:

h-sound: - A deep sigh from step 5-4. The body as the 5-dimensional whole, the underlying level.

Among vowels:

A groan - with tongue totally passive, irrelevant, not needed,
or - with closed lips - a kind of m-sound: ***A moan...***

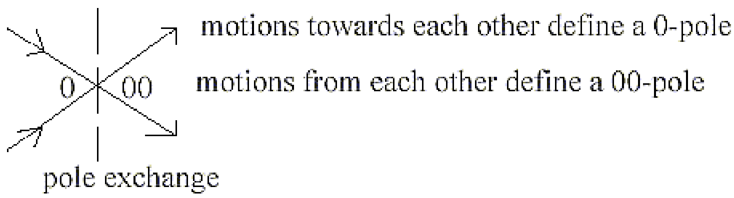
Vibration of vocal cords as the motional expression for d-degree 5 when transformed to d-degree 4.

Click-sounds, not treated here: implosion versus explosion in stops. Expressions for he dual directions of d-degree 4.

Morphemes
- syllables - morphemes - word stems -

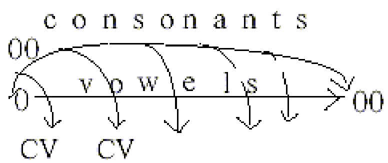
Number of phonemes in a ***syllable*** appears to be of the order of 1-5 , usually 2-3. When more, probably often contractions of original two or more syllables. Maximum number perhaps given by an underlying 5-step structure?

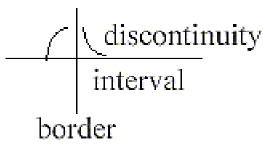
About syllable boundaries, the learned are said to disagree. The linguist Saussure wrote about the transition from direction towards a consonant as “recharging” against a barrier, to following explosive in direction outwards towards the vowel "up>|<per": turn from directions (Vconv - Vdiv) in terms of the dimension model - and a correspondence to plosives on the level of phonemes..

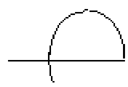


The syllable boundary could represent the concept "discontinuity", illustrated here in a little different way than the very simple illustration of it in *Physics I*, a transition from boundary to the interval:

Vowels along the "0-line", direction from 0 outwards. Consonants as the quantifying 00-pole, meeting from outside in different steps:



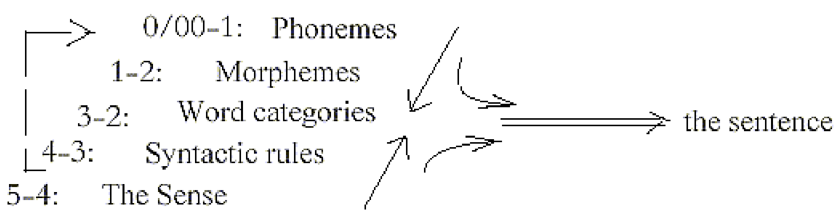




In some languages, two consonants cannot occur next to each other, it is said.

Morphemes has been defined as the smallest group of sounds carrying sense, connected or derived from the semantic level.

Number of syllables in a ***morpheme*** seems mostly to be 1-2. This could be compared with our proposed positioning of morphemes as in step 2 - 1 in the big chain for *levels* in languages: the development from the meaning or sense to a linear sentence.



If morphemes should be interpreted as syntheses of phonemes, or the phonemes as decomposed from morphemes, can be discussed. If two words or morphemes is crossed at right angles as in crosswords, the "letter", the phoneme gets precipitated.

As examples show in section above: With a dimensional interpretation of phonemes, as well as of human situations and the environment, the individual sounds cannot be denied connections with semantic sense either.

Compare *Robert Beard* (*RB*) about earlier word stems with mostly geometrical sense that have been reduced to a "parasitic existence”.

As written in another chapter, it’s said that Semitic morphemes, the smallest sense-carrying units, consisted of 3 consonants, originally 2 defining the main sense, developed with a 3rd that differentiated the sense (*LB*).

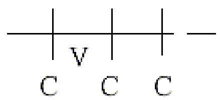
Example: *p-a-l-a-g* = divide, *p-a-l-a-h,* ~ split up

Thus the basic form for a morpheme (and syllable) becomes CVC, extended with VC, 5 phonemes. C = consonants, V = vowels.

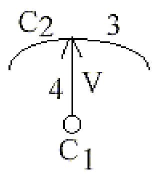
An Indo-European consonant radical, type **brg* (aspirated *b* and *g*) gave words as berg, borg (Swedish words meaning hill/mountain and castle/stronghold (*SEO*).

Fiji language has had morphemes of the type CVC, a closed type that now have become open and got the form CV. Thus, 3 —> 2 phonemes (*BR*).

> Hence, we have 2 - 3 consonants or phonemes for one sense - as there are 3 - 2 bases (nucleic acids) in the codons for the identification of each amino acid in the genetic code - often described as a language. However, in numbers it’s the number of phonemes that are of the same order as coded amino acids. and there don’t seem to be any simple parallel to the only four bases. (Yet, it wouldn’t be astonishing if there existed some deep correspondence.)



The CV-type can be regarded as representing a first polarization c - ac, 0 —> 00, outward direction from a barrier centre. The second consonant in a CVC-morpheme provides a secondary barrier, as the circumference of a circle relative the radius. CV to CVC should, looked upon this way, imply an angle step towards a lower d-degree, as a step 4 —> 3.

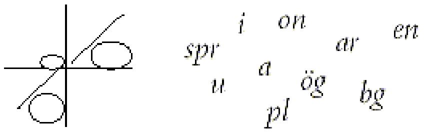


The relation vowel - consonant may be compared with verbs as open, nouns as closed.

(CVC-morphemes with examples from Swedish: *s-a-k,* (= thing).
VCC-morpheme *a-s-k* (= box), a noun, a closed morpheme. CCV: s-k-a, (= shall), a verb, an open morpheme.)

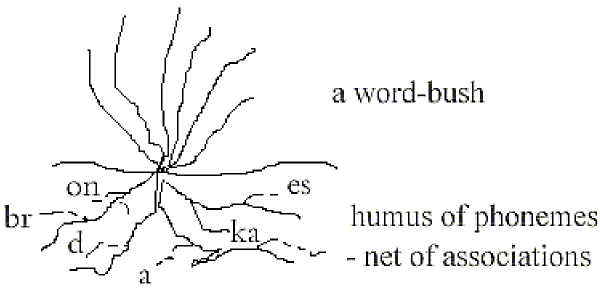
A development CVC to CV morphemes could perhaps be interpreted as analogous to ionization of atom groups, vowels as "free valences" for the capture of substitutions = other consonants, e.g. H_2O —> OH^- —> O-H-Cl.

Morphemes could appear out of small mini-groups or "bubbles" of phonemes as a "molecular soup" (or similar to first cells in an embryo?), out of a multidimensional system and its plane and space quadrants, through partial couplings between different co-ordinate axes and angle steps - with phonemes decoded dimensionally. (Cf. what physicists assume to be carriers of the strong force, the ”gluons”.)



Different neurones could potentially be activated by different geometrical properties of the steps in a dimension chain (cf. how the eye analyzes visual stimuli: e.g. distance to a centre (amplitude), vectors (direction), angles, ascending / descending lines, curves, etc.) They could in various combinations correspond to phonemes or groups of phonemes, and the network of connections between them evolve from the hearing of language. A counterpart on the levels of phonemes and morphemes to how the grammatical structure also could be analyzed and stored?

"Word stem" or a ”word bush”?



Semantic roles of phonemes
- some annotations -

With geometrical, dimensional views on the phonemes, it’s reasonable to aspect that the choice of phonemes for different semantic and syntactic use isn’t totally random.

Naturally, there are a lot of other factors that differentiate languages as the fact that language is inherited, further sound shift “laws”, different environments and cultures etc.

The geometrical aspects alone, with “dimension chains” of both levels of speech, of phoneme types and of articulation positions of phonemes, give also a multitude of possibilities. There are, however, some interesting examples from the literature that may reveal the impact of these geometries on choice of phonemes.

Phoneme types approximately:

```
          N      P         F       Liquids
5 --- 4 ----- 3 ->  <-2  -----1 -----0/00
```

- *m, n, l, r* represents ordinary noun *suffixes* in both Indo-European and Semitic languages (*LB*).
- *m - n - l - t* seems common in Swahili as phonemes in *affixes* according to a phrase book.

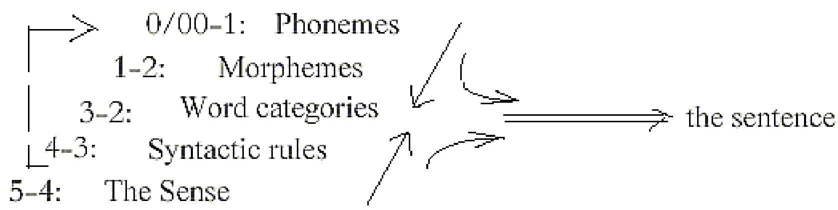
Types - Positions, connections in the loop model:

```
  vibration______________vibrants
   |       nasals_______laterals    |
   |        |   P____F       |      |
   ↓        |   |      |     |      |
5       4      3  --  2       1     0/00
______________________________________
          plosive   fricative
              <____/
       \_______________/
```

- *n* and *l* are common in *case endings* in Hungarian, for example: *n* a case ending with the sense "*in, inside*”, *l* a suffix for "*out of* or *of*" (*BC*). (It seems to mirror positions!)

```
        <——— | ———>
4——3 —— 2 —— 1——0/00
  N<—P <—>F —> L
```

Grammar (syntax) as d-degree 4 expressed in case endings and affixes: Compare step 4-3 in the big underlying chain for levels in speech and nasals in step 4-3:



- As for phoneme types it looks here as **plosives and their fricative versions** should constitute the body in morphemes or word stems ?

If phoneme types P and F through some deep disposition should be chosen for the central body of consonants in word stems, it could perhaps have connection with the same steps in the big level chain, where we suggested that word classes (here = "parts of sentences") developed in step 3-2, morphemes in step 2-1.

Both **nasals and liquids** as affixes are characterized by a branched air current, but in complementary ways: for nasals depending on soft palate with uvula from above (dorsal side) and outer stop (as inwards defined), for liquids on the *tongue* raised from below (ventral side); a correspondence uvula - tongue could be noted. The air current is branched vertically in nasals, horizontally in liquids, also a complementarity.

Compare perhaps *syntactic* case endings as *debranched* to the level of word classes - and *phonetically* liquids in step 1→0/00 as debranched from higher d-degree steps.
5 → 4 → 3 → ...

In many of the examples that Linus Brunner gives (*LB p. 44*) on the reversal of the 3rd nuancing consonants in Semitic word stems to 2nd position in Indo-European languages, this nuancing, differentiating consonant is *n, (m), r* and *l*. If appearing as 2nd consonant in the IE-languages, they could therefore be original endings.

Examples:	Sem.	*g-a-b-a-l-a*	*k-a-f-a-l-a*	*l-a-d-n*
	IE.	*g-e-l-bh*	*h-e-l-f-e-n*	*l-e-n-t-o*

The sequence of phonemes in words becomes a change in direction, analogous to the development of step 1-0/00 inwards step 3 - 2 in our dimension chain: *l* and *n* in the examples as a kind of infix:

5 ---> 4 ---> 3 ---> 2 ---> 1 ---> 0/00

The reversal of such phonemes were fully implemented only in the verbs (*LB*). Why? Perhaps because reversals imply switching direction, and verbs primarily may be connected with directions and vectors - as we have done in these interpretations?

Regarding the dimension chain for *positions*, the outer nasal *n* are formed approximately at the same position as the front plosives *d* and *t* and front *l-sound* and represents a lower d-degree step, belongs in positions to "2 - 1"-phonemes.

Among Uralic languages, it's said (*BC*) that a native Finnish word stem or smallest, independent, sense-carrying morphemes (what *BC* calls a *link*) can only end in consonants *n, t, s, r,. l*, that's positions "2 - 1", AP-A-DA.

(Cf. our interpretation of the agglutinating language type (next chapter) as corresponding to a loop steps 4 —> 3 ...... 2 <— 1.)

The *l*-sound represents unfinished action in Finnish. It's also used in reflexive meaning (*BC*): that's direction d-degree 1 as inwards.

Again, d-degree 1 - eventually polarized to 0/00 of motions, is represented in each step in the dimension chain, outwards or inwards This could explain why the liquids *l* and *r* are freely exchangeable in many languages.

In such things as reflexive pronouns, (as in words as *round* and *rotation for instance*), the *r*-phoneme could illustrate the turn of direction in last d-degree 0/00 of motions, the referring back, ~ inwards in the dimension chain.

Outwards, the ***r*-phoneme,** the vibrant, occurs often in "frequentive" verbs in Samoyedic, that is verbs with sense of repetition. Compare in Swedish *r*-suffix for indefinite plural, ~ 00-pole. There is also the *r*-sound (in both Swedish and English in comparatives, a kind of plural or repetition as enforcement of adjectives.

The vibrant, the *r*-sound in d-degree 0/00 of motions in our dimension model, is often used as such, in Swedish as verb ending (singular, in modern Swedish also plural) for present tense (-*er*). The *r*-sound is specially frequent also as suffixes of verb stems in Semitic languages. Hence, verbs here regarded from the aspect of activity, of motions.

Already Plato wrote about the *r*-sound in words for motions, according to a quotation (*BC*).

In connection with **word categories as verbs, nouns, adjectives**, there are in Indo-European languages certain differences between nasals and liquids as phonemes in suffixes (*LB*):

```
        m,n            l    r
5 — 4 — 3 —— 2 —— 1 — 0/00
        ↓     ↓
     nouns  adjectives
```

(Aspects in chapter 2)

m, n are foremost suffixes for nouns and adjectives. The lateral *l* represent often a diminutive form and tools ("endings" or "suffixes" of the human hand !), as in some Uralic languages (*BC*). The vibrant *r* occur most frequently as suffix in adjectives.

Thus, we can find a certain parallel between phonemes and word categories in the displacement outwards in a dimension chain: *nasals —> liquids*, a shift towards outer phoneme types, and from *nouns* to *nouns in secondary roles to adjectives*, according to the interpretation of the dimension chain for word categories..

In Uralic languages, *p* and *k* become ***endings for nouns derived from verbs*** (*BC, u*), which we could interpret as result of a feeling that plosives as total barriers are connected with nouns as closed units?

Other derivative endings according to the same reference, as *pt* or *kt* for verbs derived from verbs, contradict obviously any unambiguous interpretation. Could they perhaps hide an intermediate substantivized phase of the verb? (As in *form → formula → formalize*.)

Alternatively, one could eventually see traces of the verb as *direction* in the movement of the tongue from lower to upper level of plosives in *p → t,* which also is a movement from inner to outer plosive in *k→ t* ?

The *r*-sound became a case suffix in *nominative - accusative* in (many?) Indo-European languages, according to one statement. This could perhaps be derived from a feeling that subject - object in a sentence represented a centre - anticentre (0 — 00) relation, the two phases or parts 0/00 in the vibrant?

The phonemes *n* and *t* are endings for different classes of nouns in definite form in Swedish, eventually forms that first reflected personal versus neuter nouns (?), now randomly distributed among all kind of things. Cf. phonemes *n* and *t* with internal/external, with living/lifeless, voiced versus voiceless sounds: ("*en - ett*" = one).

In **vowels** we have the strong verbs were past tense often is marked by a deeper or back vowel, an inward direction.

These few examples and speculations about interpretations demonstrate mostly that phonemes don't need to be arbitrarily selected ("initially"), that we can assume a link between phonemes and meaning, the start and end in the level chain of language.

It implies that development of languages may have been "onomatopoeic" in a much wider sense than the ordinary imitating one: speech organs used to "imitate" or illustrate the deeper, complex geometries of own and external Nature.

Sound shifts

A collection of examples on sound shifts from the references have been made in *Appendix*, without providing any closer details about conditions and degree of regularity or accuracy in phonetic details of the characters.

The material is only from sources that deal with Indo-European languages and these in relation to Semitic (*LB*), and further some divergences between branches of Uralic languages (*BC*).However, it’s said that sound shifts seem to be general, with same phenomena in different languages.

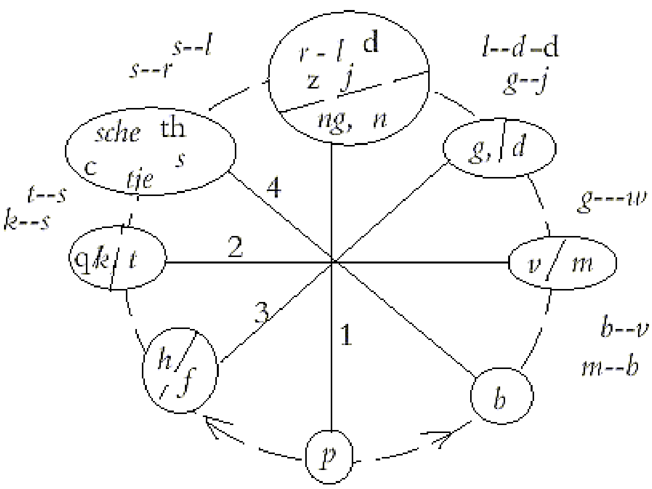
To start with a suggested conclusion:

3 polarities among the sounds give 4 co-ordinate axes:

- Voiced (V) ↔ Voiceless (Vl)
- Discontinuous (Dc) ↔ Continuous (C)
- Windpipe/lip sounds (Wp-L) ↔ Tongue sounds (T), (= Organ level I ↔ II)

	Swedish phonemes
Vl - Dc. - Wp-L	*p*
1 V - C - T	*ng-n; r-l; j*
Vl - Dc - T	*t - k*
2 V - C - Wp-L	*m - v*
Vl - C.- Wp-L	*h - f*
3 V - Dc - T	*d - g*
Vl - C - T	s - *sche-/-tje*
4 V - Dc - Wp-L	*b*

The Swedish phonemes with some other fricatives as at poles of the co-ordinate axes:
Sound shifts around the circle:



From this illustration a hypothesis could be suggested as a ”law”, which states that no sound shifts occur between phonemes that are polar in all 3 respects, that is to say along the diagonals, with the only exception of the phoneme *h, for instance h ⟶ g.* (?)

Some notes to sound shifts from previous dimensional interpretations:

1) A development **Plosives —> Fricatives** and in some cases Fricatives —> Liquids seems to be the most widespread trend.

It means steps outwards in the dimension chain for phoneme types, 3 —> 2 —> (1 —> 0/00): P → F → L → R.

2) **Transitions from voiced to voiceless sounds** become a corresponding process as steps from double-direction (two ”barriers”, vocal cords included for the air current) to only one further out. a step towards the 00-pole in this regard.

The Indo-European → Proto-Germanic sound shift (Grimm’s law) provides examples of both these trends:

Voiced plosives —> voiceless plosives —> voiceless fricatives:

Proto-Germanic:	*b*	*p*	*f*	*d*	*t*	*th*	*g*	*k*	*x*
↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Indo-European:	*bh->*	*b-->*	*p*	*dh->*	*d->*	*t*	*gh->*	*g->*	*k*

Other similar examples (P —> F) from the literature:
g —> *dz*, (front g), Proto-Indo-European —> Indian languages
t —> *th* voiced, Hungarian
ts —> *s*, Old French
ti —> *si*, Finnish, Greek
d, t —> *s, z* ..., Russian
pi —> *vi*; *pa, pä* —> *va, vä*, Uralic (here from plosive to fricative but from voiceless to voiced!)

Assuming a direction of a development from Semitic to Indo-European in the once common word roots, there are examples on similar steps P —> F (or F + P):
b —> v, p —> f, t —> st.

Examples of sound shifts **Fricatives —> Liquids** appear for instance in what is called "***rothacism***”, *s* —> *r* (IE), and *s* —> *l*: Assyrian: *khamisti* —> *kamili*: a development *s* —> consonant + *l* from Semitic to Indo-European. Furthermore in voiced *th* —> *l* in Hungarian.

Vocalizing of the lateral *l* (Latin —> Portuguese, French) could be interpreted as fulfilment of the same direction outwards in the final step, outwards from "1/2" to no secondary barrier.

(When the plosive *g*, voiced as *d* and *l* and vowels, also can become merged in the vowel as in *cogitare* —> *cuidar* (Latin —> Portuguese), it depends perhaps in a “missing link” *g* —> *j* —> *i* ?).

3) The return according to the loop model of a dimension chain:
Transitions from the plosives to fricatives etc. outwards represent in a dimension chain the way towards increasing “entropy”, decreasing part of the energy in the structure as in more dissolved speech. Facilitation of pronunciations from a “principle of easy-goingness”

As the linguists point out however, there is a counter-force, "the self-preservation of language " (*BM*). This tightening, accentuating force corresponds in terms of the dimension model to an increase in structure, equivalent with increase in d-degree of the phonemes.

5 4 —> 3 —> <— 2 <— 1 <— 0/00

|_________|

P F L

Examples are among others "Verner's law": the development within Germanic languages from voiceless fricatives to voiced ones and from voiced fricatives to voiced plosives.

Compare the loop version of our model where directions meet in the middle step, with the fact that this "return" P <— F occurs for phonemes in position inside or at the end of words.

Other conditions are that it follows after unstressed vowel and in a voiced environment (*CE*), hence may be governed also by the "law" of easy-goingness to a certain degree.

Germ.:			*v*			*voiced th*			*voiced "ach"-sound*
↑	↓		↑	↓		↑	↓		↑
Pr.germ.	*b*	*p*	*f*	*d*	*t*	*th*	*g*	*k*	*x*
↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
IE.	*bh* -	*b* -	*p*	*dh* -	*d* -	*t*	*gh* -	*g* -	*k*

A similar change F —> P, (a long time back then) is given by changes between Semitic and Indo-European languages, according to a selection of examples (*LB*):

s —> sk, sq; z —> dr, dhr, sq;h —> gh, g^wh*, g(h)r, zg.*

Here again, it's reason for remembering the reversal of Semitic languages' 3rd consonant to 2nd position in Indo-European (*LB*) - an "inflection" which seems akin to that of phoneme types and could be regarded from the aspects of the loop model. (Compare views in the chapter file about *language families* on different degrees of inflecting character.)

Further examples of "return" to plosives from fricatives are f —> b in Basque loan words from Latin (*VS*).

The step *w —> g* among the Franks in e.g. *warrior —> guerre* could also be mentioned here, even if the *w*-phoneme sooner may be classified as a semi-vowel than a fricative.

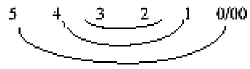
4. Double direction:

Double direction, or turn to inward direction in the dimension chain, could perhaps shed light upon some other processes in the transformation of words and phonemes:

- Proto-Semitic is said never to have had two consonants next to each other, while the consonant clusters in Indo-European are said to be the result of ***contraction***. Thus, a bi-directional force seems working on the rows of phonemes in words, even apart from sequence of individual phonemes.

What is called "***syncope***" or loss of an entire syllable in the middle of words, is similar to "shortcuts", seems as a parallel contraction on the syllable level and again reminding of the loop model: Examples:

domina (Latin) —> *donna* (Italian), *parabole* (Greek) —> *parole* (French).



"Reversal" of phonemes adjacent to or away from each other, what is called "***inter-version***" or "*metathesis*", is a type of sound changes that can be interpreted in terms of switching directions.

As examples, among others, slips of the tongue in children's language are mentioned, as in Swedish *bräda (*= board*) —> bärda (no Swedish word),* Corresponding "fault" in English could perhaps be: *broad* —> *board*. (When there are "jumping genes", so why not "jumping" phonemes - and perhaps syllables?)

Generally, it could be regarded as an expression for language not being linear on deeper levels. It becomes 1-dimensional first through the sequence of motions in the motor activity. Cf. some children's ability to backward speech (*CEL*).

A couple of examples of purely phonetic reversals:
- *rabota* (Russian) —> *arbeta* (Swedish) = work.
- *wa* (Hebrew) —> *au, aue*, but also *we (IE)* = away, from here.

Other things, similar to backward words: English *stone* = aitz in Basque:
aitz (Basque) —> IE —> Greek —> Germanic sti - stia - stai(na).
ziv (Etruscan) —> vita (Italian) = life. (z <--> t)

As an example of also *semantic* reversals, corresponding to complementary geometrical poles, there is the Russian words for a farm and a road:
gorod - dorog:

gorod ~ "farm" = *city*: a circular structure. (Swedish: *gård* = "farm")
dorog = path, road: a radial structure (to / from a city).

Maybe it's just odd traces of how morphemes once were born?

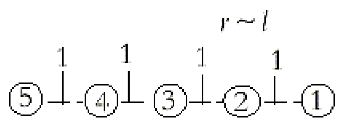
Specially common are *reversals* when it concerns the liquids ***r - l***:
Examples from the literature (*CEL, BM*):

Andreas —> Anders; crux (Latin) —> *kors* (e.g. Swedish); *tenlunger* —> *telning* (Swedish); *dridde* —> *third* (English).

See the same in the example *rabota* — *arbeta* above. An example in modern Swedish: *fader* —> *farsa* (= father), also with sound shift d → s. (*Farsa* at lest earlier more vulgar.)

With the liquid type identified with step 1 - 0/00, as done in file a bout phonemes, they also correspond to each interval of one degree in the d-degree steps, inwards or outwards. Hence, it may be a natural feeling that they could appear "everywhere" among other consonants in the linear development of a word. (D-degree 1 eventually polarized to 0/00, the *r*-phoneme.

In the examples above, it's mostly also reversals around vowels. Cf. vowels interpreted as intervals in relation to consonants on a more elementary level.



"Dissimilation", differentiation between the same phonemes in a word, is also reported as particularly common for the liquids *r* —*l*, e.g. *morter* —> *mortal* (*BM*).

Maybe it is because this polarization 1 —> 0/00 or 1<— 0/00 represents a basic element of the opposite directions outwards / inwards throughout a dimension chain?

At the same time it is said that *l* and *r* were mutually *interchangeable* already in the oldest joint language of Indo-European and Semitic. Many examples are given too on the *l*-sound in Semitic becoming *r* in Indo-European and vice versa (*LB*). Perhaps one among other features showing on a switching of directions between these two language families, as a trade relation goes both ways?

For example: *mer / mel* (= dark), *kel / ker* (= cold), *qar / qal* (= hard).

The liquids may also be *added or dropped* into words without change of the meaning, as stated about words shared by Semitic and Indo-European languages (*LB*). It could justify the interpretation of the liquids as representing each interval in the dimension chain of phoneme types, between the other phoneme types.
Examples:
- *l*-occurrence in IE, not in Semitic: *mels - mazon; tolq - taqa* (= speak);
- *welq - wegh;*
- r-sound: *gherdh - ghedh* (= include, comprise).

5) Phoneme positions:
In a dimension chain of articulation places, where structure of speech organs are interpreted dimensionally, it seems that most sound shifts among consonants (or variations of the same word between related Uralic languages) occur between phoneme types within the group with the same articulation site:

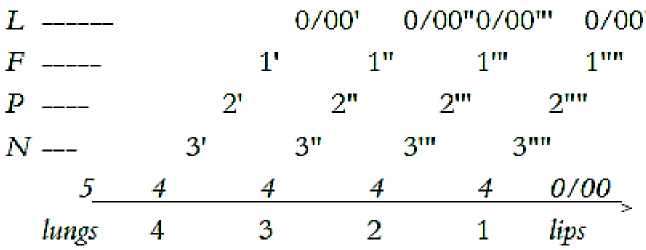
Velar plosives <—> velar fricatives, alveolar plosives <—> alveolar fricatives and laterals, and likewise within the group labiodental-bilabial sounds.

Variations

↓		↓	↓	
	r,	*l*		Liquids
tje-		*sche-ljud*		F (voiced, voiceless)
c		*s,z, th*	*f*	Fvl
	j	*d*	*v,w,u*	Fv
q,k		*t*	*p*	Pvl
g		*d*	*b*	Pv
ngk		*nt*	*mp*	N+Pvl—>Pv Uralic languages
velar-uvular		alveolar -dental-alv.	labial	(rooughly grouped)
UV-V- P		-A-DA	DL-BL	

The main axis of the speech organs, the direction from inside out, from vocal cords to the lips, seems thus to be most decisive for the sense of words. While the air barrier types as more or less approximate centres seem to be more secondary processes in each step. (?)

A principle sketch with secondary polarizations of phoneme types as along a z-axis:



Examples of sound shifts between positions seem more sporadic, and mainly then towards outer sites. The *guttural*, vocal cord plosive for instance disappears in some languages: the Semitic (') gets replaced in the beginning of words with velar *q* or *gh* in Indo-European languages, except in Hittite. Sound shifts inside words as *-kt-* —> *tt* (= outwards in location) or *-mn-* —> *-nn-* (= inwards), described as *assimilation*, can be explained by the rule of convenience.

Mistakes in heard speech are most frequent between the same *type* of phonemes (*BS*), as for instance between *p, t* and *k,* quite different articulation sites.

The conclusion would be that laws for sound shifts and mishearing broadly are opposite things, which sounds rather odd.

If this statement isn't a mix-up in the interpretation of different forces, acting on the development of languages (?), could it perhaps reveal the opposition in direction between produced speech - in outward direction, and received, heard speech - the inward direction? (About the *p-t-k*-group, see below.)

6) p - q (k) - t shifts:

These shifts between *p - q/k* and *t*, representing quite different pronunciation sites, seem odd enough, between what we think should be essential, sense-differing phonemes. Examples:

- The evolution or division from *q* to *p* that characterizes what is called Q-and P-Celtic languages. Number 4: in Irish *ceathair* (*k*-sound written *c*), in Welsh *pedwar* (*CEL*).
- Latin: *qui* (= what), from IE $k^u o$ to Greek *po*. (But Latin *quis* —> Greek *tis, ti*.)
- Latin *kt* to Romanian *pt*. *k*-sound is said to be "labialized".

In the other direction from Indo-European to Latin: **p —> q**:

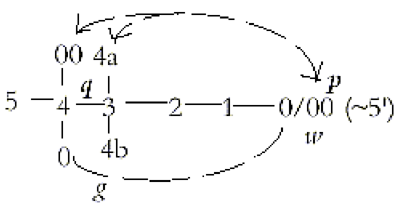
(The later development *q* —> *p* might be seen as a reappearing of the *p*-sound like a "collective historical archetype"?) Examples:

- **prk**^{u} (IE) —> **qu**ercus (Lain, = oak), (became in Swedish *fura*, *f* from *p*-sound).
- **peq**^{u} (IE) —> **qu**equ —> coquere (= cook);
- **penq**^{u}**e** —> **qu**inque (= number 5), (according to some linguists *qu* from quattuor in the word for 4).

p-sound retained in word for number 5 in e.g. Greek, Sanskrit, Lithuanian. (~ *f* in Swedish).

Cf. later Latin *pl* to Portuguese *ch*: plenum —> cheio (*ch* from a *k*-sound?).

A suggested interpretation of these shifts in position with an aspect on the dimension model, the coupling between d-degrees 4 and 0/00:



0 <—> 00 are outer poles of d-degree 4. The poles meet in last step, in "d-degree of motions 0/00".

The 00-pole gives inward direction = pole 4a in d-degree 3, in position uvular - velar sounds as $q \rightarrow k$. (Cf. the displacement of vocal cord plosive forwards.)

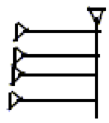
Inward direction of the chain as a whole, "the other way around", becomes voiceless labial sounds, at the end of the dimension chain.

One in positions similar sound shift is ***g* —> w**, e.g. *lagu* —> *law*.

The axis: windpipe/vocal cords <———> lips, guttural to labial sounds, may also be supposed as a first polarization, on level I, as it was dealt with above, in opposition to level II, the tongue phonemes.

A couple of specific phonemes in the International Alphabet (*CEL*) are also depicted as labialized velars *kp*, *gb*. Have these sounds been transitional forms? Or do they possibly represent a dimensionally very old nearly unpolarized phase?

The ambiguity in words for ***numbers 5 and 4*** appears to exist already in the cuneiform writing for *hand*, easy to misinterpret as a number 4:



Number 8 in a Semitic language = "*tamanin*" (= 2 hands), loan word from IE (*LB*).

h - q - p (f) in words for numbers 5-4:
- Assyrian (Akkadian, a Semitic language): *qatu* (< *qamtu*) = hand;
  cf. Latin *quattuor* = 4 ?
- *q* —> *h* in other Semitic languages: —> *hams, hamsu* = hand.

(In for instance old Indian there existed also a special word *asti* for the surface of 4 fingers.)

Judging from the examples, it seems that it is mostly among the voiceless plosives that these shifts from guttural/uvular/velar to labial consonants appear. If so, why?

Perhaps precisely because they are voiceless, in that polarity (voiced-voiceless) representing the 00-pole, as the labial sounds in the chain of articulation positions. Because they have only one outer barrier.

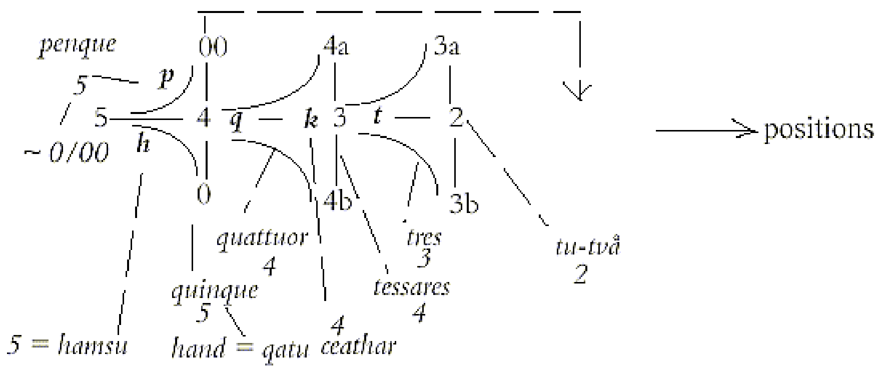
Sound shift q / k —> t:

Examples of sound shifts *q / k* —> *t* within the group of tongue sounds appear as natural expressions for a tendency forwards in the chain of positions.

One example: k^u —> *t* before front vowel in Greek, as in the word for number 4: *tessares* (Greek) where Latin has *qu, quattuor*. (Hardly a step Latin → Greek - ? Sooner branched ways from common IE? Or *tessares* related to *tres,* 3, in Latin - a counting in the other direction?)

Other examples: *k* —> *ts* (Portuguese, inside a word); *kt* —> *tt*, defined as "*assimilation*". And *pacar* (Tocharian, = father), pater (IE, Latin).
An example of corresponding voiced plosives is *g* —> *dz* , from IE to Indian , (the front *g*).

"Number shifts", a sketch. (0—00 = poles of d-degree 5, equivalent 5b, 5a):



Shifts as ***p* —> *t*** don't seem to exist, judging from the collection of examples, i.e. from DL-BL-phonemes (as *f, p,* or *v, b*) to DA-AP-P-sounds as *t, d* (and fricatives in the same positions). If so, why not?
Maybe because it should imply a shift inwards in the position chain but "outwards" ~ upwards when it comes to the levels I → II, a contradiction in directions. (?) The difference between lip sounds and tongue sounds as *p* and *t* are obviously more decisive (semantically and in he speech organs), than changes of positions between tongue sounds.

7. *h*-sound:
Examples of conversions (points, arcs in Semitic *h*-signs here omitted):

	Positions for substitutes	Examples
h -- *p, b*	BL	(e.g. *h*--*b*, variations in Uralic lang.)
h -- *f, v*, (hv--> v in Swedish)	DL	(e.g. Latin —> Castilian)
h -- *t, d, δ, ʃ, s, th, l, j*	DA-A-P	(variations in Uralic lang.)
h -- *s*	DA	(Greek, Avesta, Finnish...)
*h** -- *g*^{w}*h, gh, g(h)r, ng*...	UV-V	(e.g. Semitic. —> IE lang.)
h -- *q*^{w}, *q* , *k*, nk	UV-V--	(Semitic —> IE lang.)
h -- ' (vocal cord plosive)	Gl	

(* *h*-sound here seems to be the German *ach*-sound.)

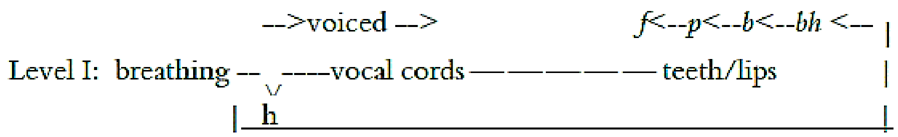
Thus, it seems that the *h*-sound can replace the majority of plosives and fricatives:

As a half closing of vocal cords, farthest in, (a 5→4-step), a most elementary "quantum" of articulation, the *h*-sound seems as an expression for the transition moment in each steps.
The *h*-sound out of the interval 5 - 4 appears in the Indo-European sound shifts to contribute as an intermediary factor in shifts from plosives to fricatives (step 3 —> 2 in the chain of phoneme types). In the Germanic sound shift *p, t, k* to fricatives, the plosives were first aspirated. The *h*-phoneme serves as a transformation phoneme, for

example: *okto* —> *ahtar* —> *acht*. Note that in Uralic languages the *h*-sound may replace all whispered *vowels*, here described as the intervals, the steps. (*BC,u*).

In the examples from Semitic to IE: *h* —> *gh*, $g^w h$, *g(h)r*, *ng(h),* the *h*-sound could be perceived as transport steps between phoneme types N —> P —>PR**.**

In terms of articulation sites, in the development from constructed Indo-European: *h* as the inner fricative has its antithesis in the *f*-sound from outside, on level I, the larynx/vocal cords <———> dental/labial sounds. It meets ("the other way around") the lip plosives *b, p* for further inward development towards *f, v* ...



In this way it could correspond to a turn inwards in the position chain. (Compare again inflecting languages when it concerns syntax.) A sound shift as caused by counter-direction from a 00-pole.

> (Maybe -/+ *h*-sound resembles effects of enzymes: a) raising the energy level to "3" = tightening of the aspirated plosive (*b* <—*bh*, etc.), b) lowering the energy level in the transition to a fricative as *b* —> *v, p* —> *f*,. ?)

Examples of steps between *h*-sound and plosives, fricatives:

- ***h* —> q^w, *q, k*** (Sem. —> IE), outwards in position.
  (Is *h*-sound in Semitic a memory of the vocal cord plosive?)
- ***h* <—*k* —> *s***, for instance in the word for number hundred:
  k —> s, a shift outwards in step 3-2, both in phoneme type and in location:
  k, a plosive in d-degree 3; ***s*** a basic form of fricative in d-degree 2 among *voiceless* phonemes.

Is there also a "missing link" as "affricate" ***ts*** in the sound shift *k* —> *s* ?

(Voiced *g* —> *z* isn't found as a direct step in this collection of examples, only *g* —> *dz*.)

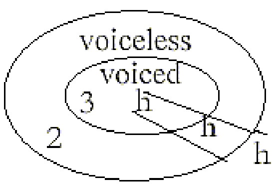
Such changes as the sound shift *k* —> *s* are said to occur from the core area of a language. Hence analogous to the displacement *outwards* phonetically.

h* <— *s

The sound shift *s* → *h* .occurs in several languages within different language families, as in Greek and Avestan, Finnish and Samoyedic (*BC*). How should this shift be explained? Perhaps while *s* is the weakest among tongue fricatives, most like a whisper? A step back to a more original form, a lower level? (In numbers: fricatives in d-degree step 2 - 1: interpreted as 1/2 = ½, identified with half closed vocal cords?!)

Many other explanations surely possible.

Aspiration as a ion channel in the cell for H+ (!):



- a ion canal in the cell for H^+ (!)

8) *s* before *k, t, p*:
It's assumed that the derived Indo-European probably had many word stems on ***sp-, st-, sk-*** (as in modern Swedish). Both in Semitic and IE-languages the phoneme ***s*** can be put in front of the *q, k, t* without change in the sense (*LB*).

A contraction (~ syncope) of phoneme types plosives-fricatives in step 3 ← 2, voiceless ones, are thus common in fusional, inflecting languages, as indicating the turn inwards in directions, or dual directions in these languages according to the loop model.

<—

P   **F**

3 v 2

While other languages do not allow 2 consonants next to each other.

Sound shifts (or differences?) from Semitic languages —> Indo-European are e.g. *s* —> *sk, sq*, and *t* —> *st*. They might be interpreted as still another example of more inward direction features in Indo-European.

5 → 4 → 3 →← 2 ← 1 ← 0/00

[As an example of "***prothesa***" = new, added initial sound, the reference (*CEL*) mentions Latin *scholar* (Latin) —> *escuela* (Spanish), Old French *escola*. A question is whether this *e*-sound is so "new" or if it might have appeared as a memory of an older IE *e*-form?

IE. *seghos,* —> *Gr. ekho* (as out of *eghos* without initial *s*)

IE. *s(e)gh* —> *Gr skholé* —*Lat schola* —> *Sp. escuela;* —> *Fr. ecole.*]

9) Vowels:
A displacement in location of vowels in what is called "***umlaut***" (*mutation*) is described as a type of distant assimilation (*BM*), related to vowel harmony. A front or higher vowel in a plural suffix pulls the word stem vowel to an articulation further out.

Examples: *foti* —> fötter (Swedish, = feet), *fathir* —> *fäder* (Swedish = fathers). According to the dimension model, the 00-pole corresponds to multitudes as plural forms and thus the end of a dimension chain, front phonemes - or higher ones in the dimension chain or levels of phonemes. Hence, these "umlaut" changes in plural forms could also be found to have a semantic function.

10) Nasals:
Regarding nasals, there are not many examples of sound shifts in this collection: neither to other phoneme types or between different articulation locations.
Some exceptions:

Semitic *h* —> *ng* in IE is one example in *LB.*

The close link between nasals and plosives (interpreted as above from step 4→3 in the dimension chain for phoneme types, is exemplified in the development of Uralic languages:

n + voiceless plosive —> *voiced plosive* initially in words: *ngk* —> *g*, *nt* —> *d*, *mp* —> *b*.

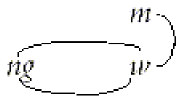
These nasals could be apprehended as remnants of a "field level" (d-degree 4), which disappears in step 4 → 3 to plosives or become included in other phonemes as nasalization.

The Uralic **combinations nasals→plosives**, not easily pronounced, are interesting examples of this straight d-degree step 4→3, also appearing in some African languages, indicating a sense for where "it starts".

(What is called "insertions" of voiced plosives in for instance *ormr —> ormbr,* Primitive Norse to Old Swedish, should perhaps be interpreted as a return to a previous N + P form, a sense that nasals come before plosives in the series of phonemes, a marking of the development path of phonemes?)

In the Uralic languages (*BC*) there are sound shifts as

ng -- w   *w -- m.*



ng —> w: *ngarka* (= big, in Yurak, Nenets) = *warg* in Selkup-Samoyedic:

It is a sound exchange in position between nasal + velar phonemes and lip sounds that could be explained as a parallel to *q / k - p*-shifts in IE languages, with interpretation according to point 6 above. (4 — 0/00.).

The nasal *m* can also replace the semi-vowel *w* as a variation between lip sounds themselves (appearing in a few northern Uralic languages).

In Celtic languages it seems (*SEO*) to exist alternating forms of lip sounds *m* and *b*:
- *bruig, mruig* (= ground, borderland) in medieval (?) Irish,
- *bridge (g)*, mrog (related to land), in Cymric,
- *brithyl* (= trout), Cymric, from IE *mrkt*, to *merg* (= shimmer dimly) —> mörk (Swedish, = dark).
- *mrecht* (= particouloured), Old Irish, —> *brokoter*, Old Swedish.

If it's correct, as linguists state, that the oldest linguistic forms are found in the periphery of a language area, the question arises if perhaps initial nasals in front of plosives have been common in a historically early era, - before the well-known Indo-European P —> F back to P displacements according to Grimm's and Verner's laws? If so, depending on N —> K shifts as dimensionally representing a higher d-degree step?

Of position shifts within the group of nasals, only *m —> n* is mentioned: Thus, in positions inwards from labial sounds. Any equivalent to the step *k —> t* in outward direction among plosives seems not to exist as *ng —> n*. Possibly step *m —> n* should b interpreted as a step upwards between organ levels I → II. Laryngeal/vocal cord <———> labial sounds versus tongue sounds. Upwards in levels dimensionally equivalent with outwards. This may then be associated with the upward air current for nasals.

The few examples *m —> n,* which are given, can also be interpreted in other ways: It is for instance a displacement in suffixes for accusative singular in Uralic —> Old Finnish and Latin —> Greek (*BC*), which could be interpreted semantically as a syntactic differentiation from the sense of from subject to object "degraded" nouns, the roles of the phonemes.

The fact that sound shifts for nasals and liquids from / to other phoneme types are so rare, could depend on their roles for syntax and their frequency in suffixes (cf. preceding chapter).

Some general thoughts on sound shifts:

- A difference of phonemes for the same words between neighbouring communities or ethnic groups could be interpreted as manifestations of a polarizing force (as anti-identification), not only as result of an isolated development. Polarization as a force whose complementarity or counter-force are such things as reciprocal loans.

The same differentiating effect could be involved in e.g. reversals of phonemes within a word - or choice of different parts of a shared word (omission of syllables in the beginning-middle-end). One divides the word and goes separate ways?

- Linguists talk about the circular pathway (*CEL*) in the displacement from plosives to fricatives to plosives again in the development Indo-European —> Germanic. (Grimm's and Verner's laws). Perhaps this is just one example of how more original forms of words may reappear, caught from the so-called sub-conscious level as a sort of "Jung's collective archetypes"? While it simultaneously could be interpreted as direction reversals in a dimension chain of phonemes in terms of the model here.

From these shifts in Indo-European to Germanic languages, a general hypothesis could be proposed: that geographical spread of humans outwards "uninhabited" regions coincided with "spread" of phonemes outwards from plosives to fricatives, more of voiceless sounds and/or more of front phonemes. That this development then turned to its opposition, to "tightening", to more of the plosives and phonemes in inner positions, when these groups in the periphery were turned back towards original areas of their language through trade connections, wars and other things. (?)

Thus that it could exist a correlation in direction between development of phonemes and social divergence - convergence.

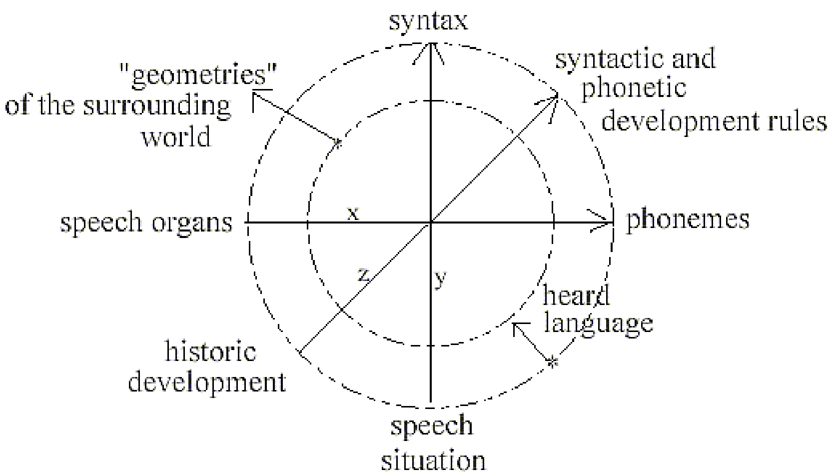
An abundance of examples would certainly contradict this hypothesis. Nevertheless, it could be valid, even if only one out of 10 - 100 other parameters - and therefore drown in the others?

A question which may sound provocative but isn't meant to be: How much of the relationship between words that linguists track are guided by their expectations, their sense of what is a natural step in the development of phonemes? ("Dimension steps"?) If there had been sound shifts or sound switching as for instance *n* —> *p* or *m* —> *z* or *k* —> *l* or *d*, should then language historians have been able to identify them as such?

Differentiation between languages:

2 - 3 intersecting co-ordinate axes, each of which makes up a dimension chain, define a "speech plane" or "speech space" for the great diversity of languages.

With poles c - ac as peripheries:



x. The geometrical co-ordinate axis of *speech organs <—> phonemes* with their immanent phonetic possibilities for development.

y. The dimensional development of the *speech situation and semantic sense <—> to syntax.*

z. The historic developments in phonetic and syntactic rules

Circumferences:

- Selection of aspects on the dimensional diversity of the talked-about.
- Received, inherited heard speech.

Different groups of people can perceive and focus on different dimensional aspects in a thing or a phenomena - always complex. For example, in their word for *backbone*:

- carries up	- or is flexible, pliant, curved
- bends	- or is similar to a tree trunk
- resemble pillars	- or is knobbly bone
- a ridge	- or is straight
- vertical line	- or is a row of similar parts
- back side	- or is upper side of animals

An ocean may be perceived as a flat surface, "*talatta*", or something unsure or constantly mumbling, "*mare",* or the original abyss, all things origin (*hav*), etc.

The choice of phonemes for the word "I" for instance: the I interpreted as open direction outwards or as a closed unit, a Self. As an owner or an actor etc. outward or inward direction of tongue, open or closed vowel and similar choices. (Cf. the words or rather sounds: open I, closed Ego in English.)

The given external factors in the differentiation, different social and geographic conditions for different language groups, could also be interpreted in dimensional terms of directions, divergence and convergence, central "core area" and the periphery, isolation or "meeting of poles" as counter-direction, social groups' with superior or subordinate positions, the spread in different geographical directions and points of the compass, the oppositions in appearance of nature, climate, geography of the area - and of course conditions for the livelihood.

Shortly, complementary differences in social structure and other things could provide complementary differences in language structure and syntax rules.

Differences in social and geographical conditions may lead to the groups perceiving the environment through different "outlook categories" through various built-in (mental) geometries...

A note:

"4 - 0":

First polarization of “the Entirety”, d-degree 5, in the dimensional model gives d-degree 4, identified as "Direction", with outer poles centre - anticentre, 0 <—> 00: nought (naught) as the centre pole, *noll* in Swedish.

Vujacic: ”number 4”	= *nul, nil, nyl*. ["swallow, wolf down" = *nyly*]	
	= *neljä*, Finnish	
	= *nile*, Mordvinic	
Hungarian "arrow"	= *nyil, nyila-*, Finnish *nuoli*	
Yurak* "foundation, basis"	= *nyl*	*(Nenets)

P i l i k = "chose" (cf. direction), old Indonesian)
| | |
W ä l g a = "set off", South Lappish = *vuolga,* Finn mark language

Swahili: *h i l i* = language
| |
Finno-Ugrian: *k i e l i* = language

*

Appendix

Sound shifts.

Extracts from references, without scientific specifications about conditions, degree of regularity etceteras.

(*c** here = *c* with inverted circumflex = *t+sje*-sounds, affricate).

Sem. = Semitic languages, IE = Indo-European.

<u>Plosives —> Fricatives:</u>

k —> *χ*	
kt —> *ch*	(Latin ——> Spanish)
k —> *tje*-sound	(ahead of front vowel)
k —> *s*, c*	(e.g. *centum-satem* languages within IE family)
k —*h*	(e.g. words for "hundred", Latin versus Germanic)
k —> *j, s'*	(front *k*, 's' mouillé, - via voiced velar *g* ?)
k —> *ts (z)*	(e.g. Latin .—> Portuguese. *placere* —> *plazer*)
k-g-h-s-	(variations in common word of Uralic languages)
g —> *dj, j*	(e.g. Latin —> Catalan)
g —> *dz*	(front *g*, Proto-Indoeuropean —> some Indish language)
g —> *h*	(ahead of unstressed *e*: *germanum* —> *hermano*)
g —> *vocalization*	(e.g. *cogitare* —> *cuiddar, as via* via *j-sound* —>*i ?*)
t —> δ	(e.g. variations in Uralic languages)
t —> *ts, z, s, th (Eng. "th")*	"
ts —> *s*	(e.g. Old French)
t —> *s, z, c**	
ti —> *si*	(e.g. in Finish, Greek)
t — *st*	(Sem. — IE)
t — *h*	(variations in Uralic languages)
d — *j*	(e.g. in Uralic languages)
dj —> *j*	(t ex Latin —> Castilian ahead of stressed *e*)
d —> *s, z, c**	(Latin —> Castilian)
p —> *pf*	(IE)
p —> *f, p(h)*	(Sem.—> IE)
p —> *f*	(Proto-Germanic sound shift)
pl —> *ch*	(*plenum* —> *cheio*, Latin--> Portuguese)
p —> *v*	(e.g. in *pi*—>*vi, pa, pä* —>*va, vä*, Uralic languages)
f-h-b-v-	(variations in Uralic languages)
b —> *v, w, b(h)*	(Sem. —> IE)
b —> *v*	(mixed up in Latin - Castilian)
b-v-w-u-	(variations in Uralic languages)
b-v-p-f-h-	(variations - " -

Plosives —> Plosives:

a) Voiced <——> Voiceless:

g —> *k*
d —> *t* (IE, "stage change" (term ?) in Uralic languages)
b —> *p* (cf. Swedish - Finnish: *bank - pank)*
b,d,g —*p,t,k* (Etruscan ?)
p —> *b* (intervocalicly, Latin —> Castilian)
t —> *d* "
k —> *g* (" + Latin —> Etruscan)

p —> *p(h)* (Sem.- IE)
b —> *b(h), p* (Sem.- IE)
t —> *t, th, d, st*
g —> *g, q, k* (Sem. -IE)

b) Displacements in positions:

' —> *q, gh* (Sem. —> IE ' = vocal cords plosive), *(h* in Hittite)
k —> *q* (Sem. --->IE)
p —> *q* (e.g.. IE —> Latin)
q —> *p* (e.g. Celtic, its two branches:: Q-Celtic / P-Celtic,
ceathair, Gaelic, - pedwar, Breton)
kt —> *pt* (e.g. in Romanian: *k* becomes "labialized")
kt —> *tt* (as assimilation, e.g. Latin —> Italian)

Fricatives —> Plosives, (or Fricatives —> Fricatives+Plosives / Plosives+Liquids...):

f —> *b, p* (in Basque loan words from Latin, Latin —>Etruscan)
v —> *b* (= later German sound shift)
δ* —> *d* (". * here sign for voiced fricative)
γ* —> *g* (" * ")

h̲ —> *qw*, q^w, *k, q* (Sem.—> IE)
h —> *gh*, g^w*h, g(h)r, zg, ng(h)* (Sem.—> IE)

w —> *g* (Franconian: *warrior* —*guerre,* if semivowel *w* is regarded as a fricative)

s —> *sk, sq* (Sem.—> IE)
*s** —> *sw, cons.+ s* (Sem. —> IE. *s** here for *s* with inverted circumflex ^, ~ Sw. *sje*)
z —> *dr, dhr, sq, s* (Sem. - IE)
th —> *d*

Fricatives —> Fricatives:

f —> *v* (step in German sound shift inside words in voiced surroundings)
θ*—> δ* (" voiceless *th* as in "*think*", English, to voiced)
χ*—> γ* (" ,*ach"-sound, to corresponding voiced, velar sound)

f —> *h* (in an initial position, Latin —> Castilian: *fabulare* —> *hablar*)
h —> *v* (e.g. Etruscan, not sure, [*AP]*)
h —> *h or dropped* (e.g. Sem. —> IE)

s —> *h* (in Greek, Swedish, Avesta, Finnish, Samoyedic)
s —> *z'* (Uralic languages)
s <—> *j*

Nasals:

ng k —> *g* (in some Uralic languages initially in words)
n t —> *d* "
m p —> *b* "
m <—> *v, b, p* (variations in Uralic languages inside words)
n <—> *j* "

*h** —> *nk, ng* (Sem.—> IE. *here = German *ach*-sound)

-n n-r —> *-ndr* (insertion of voiced plosive, Primitive Norse —>Old Swedish)
-m-r —> *-mbr* "

-m —> *-n* (Old Uralic, accusative singular —> Finnish, Latin —> Greek)
-mt —> *-nt* (to nasal and plosive in same position)

n —> *dropped,* nasalization of vowel (Latin —> Portuguese: *plenum* —> *cheio,*
manum —> *mão*)

Liquids:

Liquids —> Liquids, —> dropped —> vocalization, —> semivowel, —> fricative:

r - l (interchangeable with each other already in common old language for Semitic and Indo-European languages)
r —> *l* (Sem.- IE: e.g. *mer-mel*)
l —> *r* "
l —> *dropped* (e.g. Latin —> Portuguese, e.g. *dolor* —> *dor,*
clamare —> *chamar* (liquid "displaces " P —> F ?))
l —> *vocalization* (e.g. Latin —> French: *alter* —> *autre*)
l —> *vocalization or j* (inside words, Latin —> Castilian: *foliam* —> *hoja*)
l —> *dj* —> *j* "
r —> *z** (in Uralic languages, * affricate)

Fricatives —> Liquids:

s —> *r*	("rhotacism", after other vowel than *a*, within IE and Etruscan)
s(t) —> *l*	(ahead of dental sounds in Assyrian: *khamisti* —> *khamili*)
δ —> *l*	(Hungarian)

Liquids <——> Plosives:

l <—> *d*	(common exchange in Asia Minor)
l <—> *d*	(variations between Uralic languages)
(r) <—> *d, t*	"
l —> *d z* --> *j*	(*j* pronounced as *ach, Latin* —> Castilian, inside words)

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Used abbreviations:

IE = Indo-European languages, constructed
Sem = Semitic languages
The sign ~ = equivalent to
Dimension degree often shorted “d-degree” (cf. D3-D4...).

