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Abstract

The present article is advancing the bio-kinetic hypothesis that the complexity and non-linear dynamics of language can be approached on the basis of the Agent-action-Objective (AaO) paradigm. Experimentally it is shown that the derived [AaO] units rotate and that AaO-governed rotations are including functions that can be imaged in real time, provided that a dot, marking the state of a rotating string, can be attached to the string. In using filled and unfilled dots, it is demonstrated that the stepping function of the discovered rotation mechanism is working within single [AaO] units. Through imaging the orientation of the dots on a sliding plane, it has been possible to demonstrate sliding over the A- and the O-domain and to measure quantitatively the involved state changes. The experimental results are based on two samples. The first consists of an interview expression, which originally was produced in Swedish. The other sample relates to the translation of the original text into English. On the basis of this material, it is demonstrated that a system of [AaO] units has the capacity to keep track of rotations and to assemble textual elements that temporarily are fitting into the structure, developed for a particular task.

Once upon a time it was inconceivable that Earth could have a geometric sphere. But Nicolaus Copernicus insisted that the Earth rotates on its axis and with other planets in the solar system revolves around the sun. He established the theory of the universe for which Tycho Brahe contributed with precise observations of the stars and planets, while Johannes Kepler formulated the law of motion in the orbit. However, since no one has ever been able to look into the language space, the modern theories of language are in their development still in the Ptolemaic state, which means that concerned theorists continue to treat language as a flat and motionless body. Further, when the German geoscientist Alfred Wegner in 1915 suggested the theory of "continental drift", that is the land masses of the Earth are floating across the globe, his colleagues laughed. However, in 1950 emerged indisputable facts, which showed that Wegner was right (Malakoff, 2001).

Further, the fortunate invention of the lens as optical device for making observations on the motions of planets in the macro world and particles in the micro world made it possible for scientists to establish the laws of matter. Successful applications of the rules of mathematics to made observations allowed the scientific establishment of the laws of motion. But the more complex phenomena of living systems have until recently remained outside its scope of inquiry. Observations of true rotation in living systems had been absent. But that bacteria accelerate forward through the clockwise rotation of their flagellar filaments and change direction through counter-clockwise rotations was established in 1973. Furthermore, in 1981, it was proposed that a single molecule may possess a rotary motor, which suggests that one or more subunits rotate against the others. However at that time few scientists believed in this theory. But the theory of rotation in molecules, as discussed in Kinosita (1999), became realistic in 1993. Against this background it is not difficult to imagine a conservative conduct, which would pretend that a theory of rotational movement in a language space is inconceivable. This is so because it has been impossible to get the phenomenon of intention under experimental control.

However, just like classical physics, which derived its macroscopic laws from observations about the motion of planets, it has become evident through more than twenty years of research that the laws of a verbal flow can be established through the observation of textual movements during text production (I. Bierschenk, 2000). Like the flows of a river, verbal flows are characterised by eddies, vortices and cascades. Independent of the structure in the flows they do not subsist. Since laws can be established that govern the dynamics of textual patterns, for the first time, the biological roots of language can be shown, not only discussed at the philosophical level. What has been discovered is a bio-kinematic mechanism that is not only self-organising but also self-referential and producing patterned outcomes, which are not only free from semantics but also coordinate-free. The article presents an invariant formulation and analysis of the Agent-action-Objective (AaO) model in terms of geometric algebra (Hestenes, 1993). According to Hestenes (1994, p. 65), the term invariant means coordinate-free, that is independent of any particular coordinate system. To be sure, natural language employs its own intrinsic systems of coordinates, but they are generally not known. This implies that the big gap, existing between the scientific study of non-living and living systems, can be bridged.

In studying the reflection of self-organisation through text production, an entirely new approach to the study of language in general and the production of text has been taken. By analysing text as system, its malleable coupling of time-dependent developments and the rhythmic working affords the prerequisites for a geometric description of its morphological configuration. Parallel working clocking mechanisms are allowing for the evolution of alternative time morphologies. Its major aim is to make evident the facts and concepts of the systemic functioning of natural language production. Its dynamics can be exposed efficiently as the invariants of textual kinematics.

Indeed, one of the major problems of science is to discover the coordinate systems or, in other words, the computational codes employed during natural language production. This task can be facilitated by an invariant formulation of "text" kinematics, providing an unbiased specification of the computational task that must be solved during production in order to generate accurate and efficient textual pattern movements. The topic treated in this article concerns the coupling between the A- and O-kinematics that must be controlled to produce a comprehensive text of the synthesised world as well as to track the moving "points of observation" and the affined "points of view".

The paper develops a complete invariant formulation of the kinematic computations that are essential for perfect "writing-style" control. This kind of kinematic analysis is an essential prerequisite to understand how the writing-style of a particular text producer operates, because it describes the computational tasks to be performed. Further, in taking the radical position that there is no need for an "observer" in the classical sense, it will be made evident that the text producer's intention and orientation can be modelled as a completely intertwined relationship. Based on the examples to be demonstrated, it will be shown that the Agent-action-Objective (AaO) paradigm (B. Bierschenk 2001 a) is the proper foundation and that the components of the corresponding [AaO] unit rotate. Further, it will be demonstrated that the AaO-governed rotations are joined by channelling functions. These functions can be imaged in real time. But this measure requires that a dot can be attached to a rotating "string" that marks the state of the string. In using filled and unfilled dots it has been possible to demonstrate that the orientation of the dots can be imaged and that the involved states change continuously, which can be visualised graphically through the exposition of the channelling properties of unfilled dots (B. Bierschenk, 2001 b).

Related angular displacements and the control of textual movements have been studied with a focus on flow dynamics and the establishment of laws that include intention in the construction of the laws that govern the flows. Their realisation aims at discovering the functional geometry of the phase-dependent displacements in a verbal flow. Concerning specific changes in angular articulation, it has been demonstrated that their geometric essence can be extracted from the characteristic properties of the helical structures of a particular text.

Text Building Behaviour

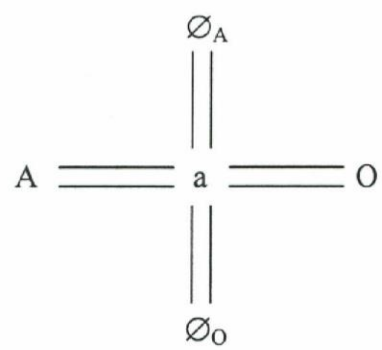
The research carried out thus far has shown that it is possible to develop a theory of coordination on the principle of self-reference and to describe natural law on the basis of the macroscopic properties of text production, which are producing recognisable cognitive functions. At the textual level, selective pattern movements are producing a rotational dynamics that is basic to the evolution of the morphology of a verbal flow. Since no specific measuring device is proposed for the determination of any outcome possible, it is assumed that self-reference itself is the fundamental property, which is governing the generic processes of self-organisation.

A coupling of textual components should generate und guarantee properties that are critical to produced text, such as multiple functionality, stability and the capacity to flexible changes according to intention and contextual demands. The reflection of self-organisation at the textual level means that the textual components must be coupled or linked in some fashion, at least transiently. In focusing on this formation, rotational dynamics and the geometric description of text building behaviour seem to follow the same pattern formation principles regardless of the level of description and the context of study. Hence, self-organisation refers to the spontaneous formation of patterns and pattern changes in open non-equilibrium systems. In adopting some of the concepts of Hestenes theory of rotational dynamics, it will become obvious, that the self-referential capacity of a textual system can be studied in the form of contrasting configuration.

The capacity of capturing corresponding text segments comes from the observation that the A- as well as the O-component of the AaO-formula is contributing to the formation of the bonds shown in Figure 1.

Figure 1.

Bonding Configuration of the AaO–System



Independent of the situation in which a particular form of text actually appeared it's abstract mode (i.e., copying reactions) should be made the foundation for the identification of a pattern of movements. The bonding of variables to places, where attractions occur is symbolised with ($\varnothing_A$), which is the placeholder for the α-variable of the A-domain. Likewise, the symbol ($\varnothing_O$) refers to the placeholder for the β-variable of the O-domain. The precondition of processing and bonding (+) the resulting variables to the α-strand and β-strand respectively requires that their patterns and pattern dynamics can be imaged.

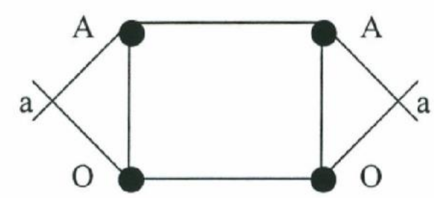
Unquestionably, this function is the verb-function, which can be conceived of as "voltage"-gaited. This is the V-function of the Functional Clause (FC), which is producing the borders and consequently potential changes in a verbal flow (B. Bierschenk, 2002). The AaO-mechanism is determining the operations of FC. Hence the AaO-mechanism behind FC constitutes the frame of reference for text processing (I. Bierschenk, 1999). Its capacity to reconstruct the envisioned language space as the space of a text sample comes from the observation that the A- as well as the O-component of the AaO-formula is contributing to the formation of the bonds between chains of A's and O's.

For example, if the number of joints is (J=1) and the number of links is (L=2) then chaining leads to a rigid space, which contains only one topological invariant of each type. One is related to the A-domain and the other is related to the O-domain. When this construction principle is applied repeatedly, a non-differential and consequently very compact space comes into existence (Mackenzie, 1998, pp. 524-525). The space of Figure 2, for example, consists of (J=2) and (L=4), which implies that its space is compact. It contains four singularities, which are completely disconnected.

A completely disconnected arrangement of singularities is the most regular space that can be formed on the basis of a sphere of AaO's of a perfectly symmetric kind. Thus, disconnected topological invariants can be represented in a "face-centred" cubic lattice, which is indicated by the regular latticed space of Figure 2. Further, the A- and O-components of the formula are packed with the highest possible density that can be achieved at this level of processing.

Figure 2.

Bonding Configuration of a Completely Closed System of [AaO] Units



However, as Mackenzie (1998, p. 524) disclosed, "the proof is in the packing". But packing singularities in the form of "dots" is dependent on the locations where components have been attracted by a singularity. For accessing the meaning of an attraction, it is essential to conceive the development of its ecological import as a result of changes in compactness from one state to the other. Already Johannes Kepler had an opinion on the question of the density of a face-centred cubic lattice. He estimated its maximum in density to be 74%. Later packing trials have shown that packing could be made as dense as 76% (Mackenzie, 1998, p. 524).

Figure 2 implies the existence of a single "hexagonal" shape, which is placed in a sphere that is constructed on the basis of the a-component and made dependent on the corners of this shape. In replicating a single [AaO] unit into a sequence, it has been shown that a mechanism exists in natural language that is duplicating it independent of the meaning of a particular unity (B. Bierschenk, 1984, 1991). The resulting sequence is of the following kind:

[Aa(AaO)] (1)

An "imperfect" sequence of the kind, shown in Expression (1), signals a certain number of propagating cells. It has been discovered (Bierschenk & Bierschenk, 1986) that these cells are forming places where cascades develop and attractions occur. In remodelling Figure 2, this circumstance is demonstrated in Figure 3.

Figure 3.

Bonding Configuration of a Open System of [AaO] Units

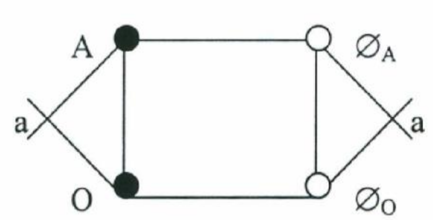


Figure 3 implies a processing in which the strings of the A- and O-component can be attracted to certain places. This is symbolised with the "unfilled dot" of the placeholder for the Agent, which is ($\varnothing_A$). Likewise, the "unfilled dot" of the placeholder for Objective is symbolised with ($\varnothing_O$). The precondition of processing and bonding (+) of displaced A's and O's requires that their patterns as well as their pattern dynamics are resulting from the rotation of the dots.

What kind of density can be developed in a regular topological space and established empirically depends on its borders, which are representing the terminal states of a particular configuration. Changes in the terminal states have been marked with (S_1, S_2, S_3, …), which means that these state variables differ in their capacity to incorporate textual segments from different regions of a texture (B. Bierschenk, 2001 b). Some variables are representing composites, consisting of copies, while others are carrying original strings or their duplicates. From an ecological point of view, this implies a configuration with variables that transfer differently constrained strings of graphemes.

Cascades of Flowing Texture

With respect to the places of attraction, the process of bonding is charging (+) a deficit (–). However, concerning the placeholders, it is essential that the kind of co-operative interaction is made explicit with the following Expression:

$$[\varnothing_A a \varnothing_O] \qquad (2)$$

Expression (2) is a standard replicate [] of a single [AaO] that becomes productive during text processing. Its interactions with other templates affect partly the structure of developing CHANNELS for the flow, partly the interaction with the template of the following kind:

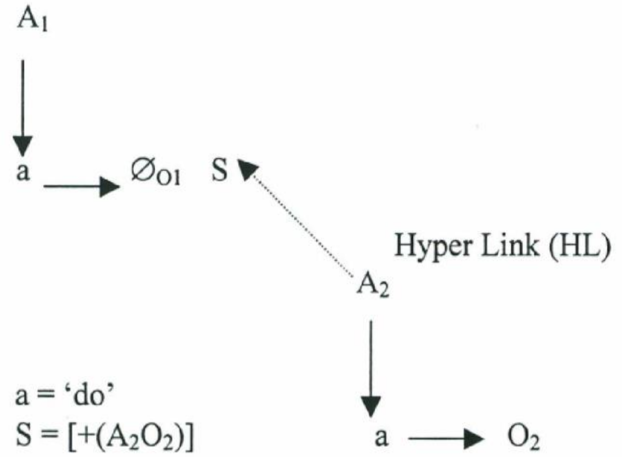
$$[AaO] \qquad (3)$$

The latter [] is enclosing the "a priori", which is symbolised as replicate of the 'AaO' itself. Hence, whenever the AaO-principle becomes functional, a "copy" of its components comes into existence. While the former (2) acts either as structural "clue" or as a "communicative device" in the production of specific binding reactions, the latter (3) is always "a posteriori" and by necessity material. Each of these components makes an exact contribution to the development of structure.

Now the idea is to consider successful charging surface-oriented as it appears over time. When an AaO-sphere is open for expansion, like the sphere of Figure 3, expansion can be made to operate in correspondence with the cascading processes shown in Figure 4.

Figure 4.

Equilibration of a Cascading Flow with One Propagating Cell



The Hyper Link (HL) ofthis configuration is connecting two [AaO] units. With reference to their connectivity, it can be shown that simple counting confirms the validity of Euler' s theorem discussed in Yakobson, & Smalley, (1997):

J + L = (K + 2) ~ 2K = V, where J: joint, L: link, K: slant, V: vertex (4)

Counting the number of placeholders in Figure 4 means counting the number of propagating "holes" in the "texture of a text". From an empirical point of view, it follows that the number of "heles" in a particular text can be used to determine its "Euler-Poincare" characteristics (Changeux & Connes, 1995, p. 136). A strict application of Expression (4) implies that (3V2J+4L=5K) is specifying Figure 5. It follows that each vertex possesses an equal and positive charge, while each edge is associated with a negative charge. In balancing out the negative (-)
the process of equilibration is resulting in the composition of a trivial centre. In this sense, triviality can be equated with "redundancy".

In using the rhythmic, clock-like working mode it is possible to determine phasedependent displacements of a parti cular grapheme or string of graphemes in relation to some others. Thereby, it is made obvious that text production implies the displacement oftextual elements through rhythmic movements, which can be measured with precision, provided that its axis is kept constant. According to Hestenes (1993, p. 289), the advantage ofusing Euler angles is that "every rotation is reduced to a product of rotation about a fixed axes of a standard basis". Moreover, only the Euler-theorem is postulating the exact solution to the centralising power ofthree or more interacting systems (Hestenes, 1993, p. 404).

In its entirety, the configuration of Figure 4 exhibits relatively little expended kinetic energy. But it implies a rotational transformation of the flow. It becomes directed toward an unfilled dot, which acts as an open sink where associated flowing text segments get concentrated. Eliminating the placeholder means that the dot is activating conditional supplementation (S) routines (B. Bierschenk, 1993). The corresponding S-mechanism is funnelling textual segments into this flat hexagonal configuration. In sum, the flow is locally reversible and is contributing to closing the "hole" with a two-dimensional sheet oftexture.

Hence, a precondition for the rotational operations of the discovered AaO-mechanism is given in the equilibration of a cascading flow. If a space contains only one single (AO)composite, this space is operationally identified with a space that is only slightly differentiable. This means that the number of HL equals (HL=1). It follows that the elasticity of an operationally specified space becomes established, whenever it is possible to determine a parti cul ar configuration, containing singularities of varying redundancy.

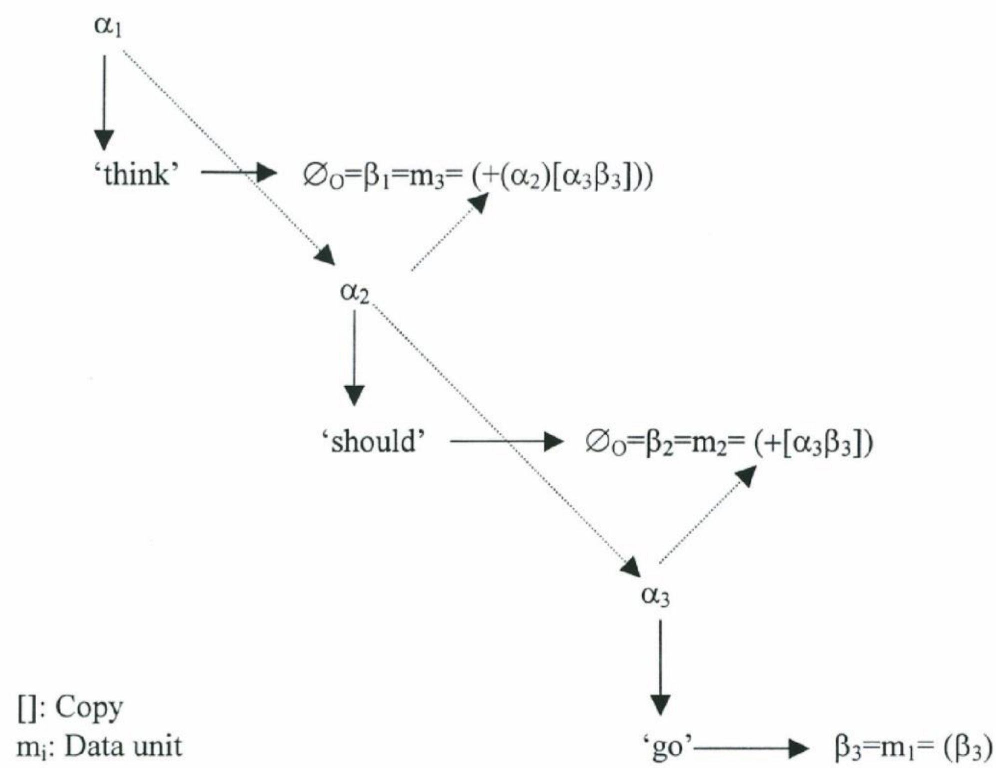
When an AaO-sphere is expanding and contains (HL=2), then the AO-composites are attracted to places, where cells are differentially propagating and where processing is allowed to occur according to the following relationship:

(5)

Processing by means of the AaO-mechanism is giving evidence to the validity of the Eulertheorem. This is a distinctive achievement of its S-mechanism, because this mechanism is establishing the missing links during processing. In paraphrasing Mackenzie, the evidence for the validity of Expression (4) with respect to a configuration of [AaO] units comes from the processing itself. Within a certain period of time, several pentagons and heptagons or even decagons may be responsible for the development of agreater number of HL' s. For example, raising the number of joints to (J=3) will immediately increase the number of neighbouring links to (L=6). But coordination of the three [AaO] units, shown in Expression (5), evolves from the fact that the number of vertices (V=7) minus the number of joints (1=3) plus the number of links (L=6) is equal to the number of slants (K=10). The graphical solution of Expression (5) is shown in Figure 5.

Figure 5.

Equilibration of a Cascading Flow with Four Propagating Cells



Furthermore, the relationship between the [AaO] units of Expression (5) makes evident the existence of two trivalent components. Each of these components is advancing successful processing. However, only the first and the last are funnelling material (strings) into the CHANNEL of this particular variable configuration. The formation of "unfilled dot"-couplings that is developing into a CHANNEL is establishing field-dependency. It follows that a flow field is defining the source-sink relationship of a particular configuration. The sink relates to a place where flowing texture comes to rest. In equilibrating the relationship of Expression (5), it is made evident that its processing requires the existence of a solution that comprises at least two differently materialised (m) components. These must become manifest between the first and the last component of the formula.

The Channels of Flowing Texture

Fields accessed through HL's have been the starting point for the operation of quite complicated channelling functions. Displacement of variables and composites of variables over certain distances in a space makes evident that the producer of a change (the V-function) itself cannot be part of the resulting displacement. As shown in Figure 5, moving a segment of texture over several flow fields means that the flow fields themselves are excluded from integration. Demonstrated is an extensive move, which dislocates variables like (α_1) a certain number of steps and is "copying" it in order to transfer it in the form of composites of varying complexity. Based on the observed displacements, it can be noted that an achieved equilibration is the result of a CHANNEL that is organising itself.

In particular, it is the V-function of FC that is the constituent of a flow field. Hence, a moving verb would destroy the entire field. Therefore, a surface segment necessarily varies with respect to its geometrical dimensionality, but a two-dimensional sheet of "covering" is usually generated in the process of closing the "holes" over the O-domain. Channelling by eliminating the placeholders at a preceding level means rolling a "sheet" in reversed direction. For example, the β_3-variable in the decagon of Figure 5 is rolled into the place that is marked by (m_2). Further processing requires first the enrolment of the α_3-variable in order to establish the composite at (m_2). Then, the resulting "sheet" is rolling into the preceding covalent place where it coherently can land as (m_3).

Recognition of a text segment by the S-mechanism makes evident that a supplementation of segments of text into certain places means that particular segments, associated with the variables, are displaced by the S-mechanism. Together, they are then rolled upward into a place, where the whole variable string-configuration remains. They remain permanently in these places, however, with accelerations directed toward a centre where text segments become heavily concentrated. In advanced text production, it is observable that cascades are developing in even more complicated forms. However, the S-mechanism allows the process of equilibration to develop into curvatures that leave behind all contact with Euler's theorem and Euclidean space and consequently physical reality.

Intermittent Phase Transition

Theoretically, the study of the dynamics of textual patterns is founded on the rhythmic driving of biological dynamics, gating text building behaviour. In particular, the focus of this section will be on non-equilibrium phase transitions and the identification of pattern variables that constrain text building. In essence, gating individual text production and synthesis of import for any practical application must treat the individual subject as the significant unit of analysis. Hence, it makes little sense to average synthesis over individuals. Expressed in generalised terms, this means that the producer of a text contributes with his own specific context. But this in no way means that a particular synthesis lacks generality. On the contrary, the procedures and operations contribute to an evaluation of the supposed intrinsic tendencies, however, always in the context and sensitivity of the sample text.

From the precision in the working of the involved clocks, topological consequences of rhythmic movements in text production can be extracted. If the context for text production is conceived of as part of the resulting information synthesis, related text generation may be viewed as development of a system that is constructed on the basis of lawful regularities. These regularities can be determined at the ecological level. From the ecological point of view, a text producer's style of approaching his environment has been defined as an expression of his personal way of maintaining contact with his surroundings. Hence, in terms of Gibson's ecological approach to perception (1966, 1979), it means that a text producer's approach to his environment is constrained by his sensitivity to environmental affordances. But affordances are specific to the environment in which a particular text is produced. Therefore, any sensible textual expression must have been properly adjusted to situational circumstances.

Since text building behaviour develops on the basis of a co-operative interaction between "proprio-specific" and "extero-specific" processes (von Holst, & Mittelstaedt, 1950) of perception that repeat themselves more or less regularly, rhythmic return through perception-action cycles is the comprehensive principle of self-reference in text production. Moreover, with reference to these authors, Gibson (1982, p. 165) is using the term "proprioceptive" to mean "self-sensitive", that is the fact that the individual perceiver stimulates himself in many different ways. In modern usage, this term is synonymous with "kinesthesis". Concerning the pick-up of ecologically significant information, Gibson has introduced the concept of "ecological optics" which is addressing the specificity between information in ambient light (i. e. structured energy distributions) in the environment and proprio-specific movement patterns causally responsible for the structuring of a textual flow. At the macroscopic level, text production must result in an information synthesis.

One aspect of the mechanism is related to the identification of the order variables for a description of the displacement dynamics. These variables simplify the description of phase transitions and give expression to the order of a particular system at transition time. It follows that a behavioural addressing of the fundamentals of the clockwork must be related to the periods and fractions of periods produced during text production. In producing intervals through its own internal processes, text production is gating itself in its structural development, and consequently its self-organising tendencies. Hence, periods and fractions of periods are determining the involved transition. Moreover, as stated before, a text must contain cues to its capacity of stretching and compressing, or twisting and bending in order to be responsive to developing structural relations. In permitting a verbal expression to organise itself into wholeness and to carry out its communicative functions, the first two sentences of an interview with a Swedish Municipality Official will be explored.

Original Swedish Text:
Titta på hur inställningen är idag, och det är ju inte bara bland de kommunalt anställda, de flesta tycker ju att jag har ju min lön, varför ska jag då hjälpa till med att komma på hur kommunen ska spara, det skiter väl jag i. Det är samma resonemang här, ...

English Translation:
Just think of the common attitude today, and that does not go for local government employees only, most people think I have got my salary, why should I bother to come up with ideas as to how the local authority could save money? I do not care a damn, ...

When the discovered rotation mechanism is in its surface oriented mode of processing and is encountering some edges in the sample, the mechanism is required to process changes in attitude by a proper accumulation of strings. By "proper" it is meant that the resulting concentration of graphemes into composites is functionally different compared to the original string composition. The dependency of the spectrum on dot separation is used to demonstrate the coherence in the channelling of the strings and the formation of the entangled state variables (α) and (β), which relate to the verbal flow fields established in Table 1.

The significant aspect of imaging a verbal flow in real time relates to the use of a "plane" in the processing of filled and unfilled dots as shown in Figure 6. In using a pair of dots of vertically aligned and self-assembled strings, the placeholder function assigned to unfilled dots is shown to develop the gating, which is entangling the states of the vertically separated dots. In using pair-wise coupling and the spins of a dot, it is demonstrable that gating leads to the generation of CHANNELS. However, rotation over a variable number of angles of differently tagged strings requires that the strings slide, which is influencing the rotational distance between patterns. Since the textual surface patterns of Table 1 constitutes the input level, a textual segment has been marked with its curling value (ϕ) for the α-variable, and (θ) for the β-variable as well as a position (Tab. 1). It follows that the speed of "linear" surface sliding of the strings is different, compared to their angular rotation. Moreover, textual segments must be able to move both linearly and collinearly through differently connected flow fields, which means that the course of development at the surface is captured in terms of their relative coordination.

Table 1.

Spherical Dependency of Layered Composites

Swedish	Radian	Sum	English	Radian	Sum
.			.		
X	0.00000	α_1=0.000000	Just	0.32656	α_1=3.46656
Titta	0.35400		think	0.40635	
på	0.28320		of	0.39474	
$\varnothing_O$	2.99720	β_1= -0.902812	the	0.39861	
hur	0.32342		common	0.41022	
inställningen	0.35482	α_2=3.818240	attitude	0,41796	
är	0.32028		today	0.40635	
idag	0.32656		,	0.39087	β_1=6.695100
,	0.31714	β_2=4.103980	and	0.10205	
och	0.10205		that	0.10990	α_2=0.99695
det	0.10205	α_3=0.989100	does	0.65312	
är	0.32028		not	0.64684	
ju	0.32028		$\varnothing_O$	7.57996	β_2= 1.239363
inte	0.32656	β_3=4.433680	[that]	0.34540	
bara	0.32656		$\varnothing_A$	5.5	α_3= 4.501526
bland	0.40635		go	0.56100	
de	0.39474		for	0.56650	
kommunalt	0.42183	β_4=5.092920	government	0.60050	
$\varnothing_A$	5.50000	α_4=4.505465	employees	0.59950	
anställda	0.68452		only	0.57200	β_3=8.981500
$\varnothing_O$	6.96452	β_5=2.989547	,	0.31714	
,	0.31714		most	0.32656	
de	0.32028		people	0.33284	α_4=4.116540
flesta	0.33284	α_5=4.110260	think	0.32970	
tycker	0.33284		I	0.31714	β_4=3.786840
ju	0.32028	β_6=3.793120	[that]		
att	0.32342		$\varnothing_A$	5.5	α_5=3.471074
jag	0.32342	α_6=3.786840	have	0.65312	
har	0.32342		$\varnothing_O$	6.93312	β_5= -0.76271
ju	0.32028		[that]		
min	0.32342		$\varnothing_A$	5.5	α_6=1.125866
lön	0.32342	β_7=4.430540	got	0.32342	
varför	0.12560		my	0.32028	
$\varnothing_A$	0.78500	α_7=0.910600	salary	0.33284	β_6=4.116540
ska	0.32342		,		
jag	0.32342	β_8=3.786840	why	0.10205	
då	0.56100		$\varnothing_A$	0.78500	α_7=0.887050
$\varnothing_A$	6.06100	A_8=5.106746	should	0.33284	
hjälpa	0.25016		I	0.31714	β_7=3.78998

Table 1.

Cont.

Swedish	Radians	Sum	English	Radians	Sum
till	0.24308		[that]		
$\varnothing_O$	2.85324	β_9= -34.4954	$\varnothing_A$	5.5	α_8=4.5581667
med	0.24308		bother	0.66568	
$\varnothing_O$	2.60308	β_{10}= -33.1293	$\varnothing_O$	6.94568	β_8= -19.02950
att	0.56650		to	0.66000	
$\varnothing_A$	6.06650	α_9=2.6503366	$\varnothing_A$	6.16	α_9=2.8729590
komma	0.24680		come	0.24544	
på	0.23972		up	0.24072	
$\varnothing_O$	2.84652	β_{11}= -25.32032	$\varnothing_O$	2.84616	β_9= -10.51767
hur	0.32342		with	0.48984	
kommunen	0.33912	α_{10}=3.802540	ideas	0.49455	
ska	0.64684		as	0.48042	
$\varnothing_O$	6.92684	β_{12}= -16.65811	to	0.24072	
[att]			$\varnothing_O$	4.06553	β_{10}= -7.281980
$\varnothing_A$	5.5	α_{11}=3.549990	how	0.32342	
spara	0.6594		the	0.32342	
$\varnothing_O$	6.9394	β_{13}= -9.716056	local	0.32970	
,	0.63428		authority	0.34226	α_{10}=4.458800
det	0.64684	α_{12}= -11.84649	could	0.65940	
skiter	0.33284		$\varnothing_O$	6.93940	β_{11}=0.337751
väl	0.32432		[that]	0.56100	
jag	0.32342	β_{14}= 4.119680	$\varnothing_A$	6.06100	α_{11}=3.949413
i	0.15857		save	0.32658	
Y	0.00000		money	0.32970	
.	0.15857	β_{15}=1.887140	?	0.31714	β_{12}=4.113400
Det	6.92684	α_{13}= -15.22049	I	0.31714	α_{12}=3.457140
är	0.32028		do	0.64056	
samma	0.32970		not	0.64684	
resonemang	0.34540		$\varnothing_O$	7.56740	β_{13}=1.258715
här	0.32342		[that]		
,	0.31714	β_{16}= 4.775940	$\varnothing_A$	5.5	α_{13}=3.640661
			care	0.32656	
			a	0.31714	
			dam	0.32656	
			.	0.31714	β_{14}=4.427400
			It	0.56100	α_{14}= -0.296398
			is	0.32028	
			the	0.32342	
			same	0.32656	
			reasoning	0.34226	
			here	0.31714	
			,	0.31714	β_{15}=5.096220

Figure 6.

Entanglement of States as Foundation of the Dynamics of Textual Pattern Movements

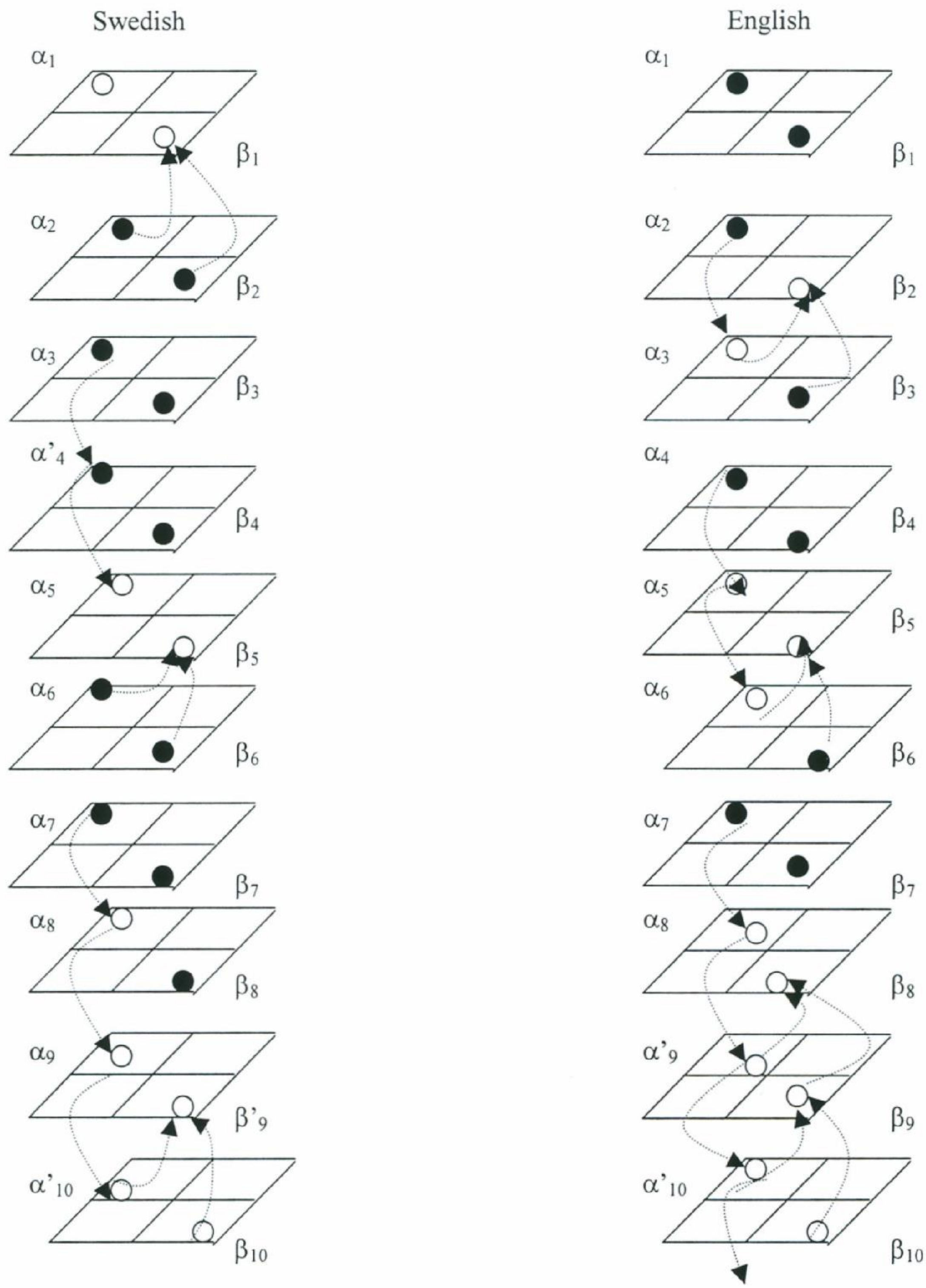
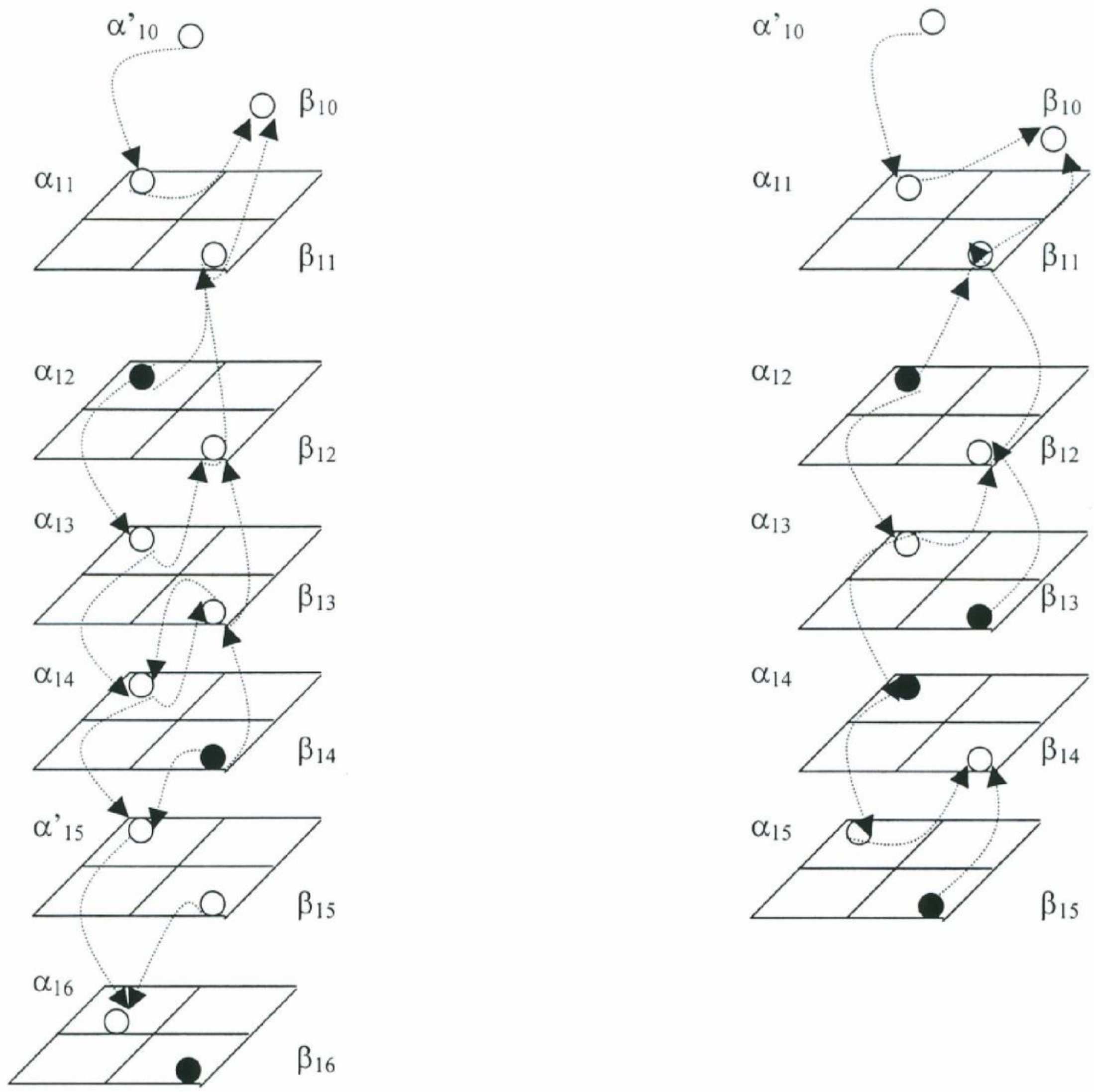


Figure 6.

Cont.



It follows that the dynamics of individual patterns of composites is expressible as synchronised running of individual "variables" on the α-strand as well as on the β-strand. However, now, synchronised and sequential running means that their relational order is the result of "synchronised clocks". Typically, when the V-function separates two different dots, multiple verb-layers cause multiple [AaO] units. The latter preserve their overall integrity at the borders. The exact reproduction of the identified parameters (angular articulation (ϕ, θ), periods, fractions, shear, and strain) of the borders has been reproduced in Table 1.

As demonstrated, differences in angular articulation can be expressed experimentally in two contrasting ways. One way concerns the introduction of a new variable, which is marked with filled dots. Whenever a new variable is introduced on one or the other site, broken links appear. Another way of altering the sliding concerns the degree to which a particular variable is duplicated. This has been indicated with (') on the duplicate. Curved arrows are used to mark that one and the same agent variable continues to hold the line in the articulation. It is a kind of repeated self-indication. As more and more edges become involved in such a series, the shadows grow in its entwining and thus, the dimension is fading away deeper and deeper into the ongoing conceptualisation. Thus the larger the distance to be covered by a variable, the greater is the rate of fading.

In taking the other strand into account, it becomes obvious that the β-dimension belongs to the same time segment. A discussion of its topological value necessarily begins with the obvious fact that both strands are causally determining each other. The only way this function can be made approachable is by imaging their "joint causation" in real time, i.e., physically. Some prior environmental conditions are thereby introduced into the causal determination of the helical structures. The result appears in the sliding, which is an essential constituent of rotation and implies that the trajectory of the A- and O-arrays of Figure 7 and 8 must be helical.

Figure 7.

Rotational Dynamics in Relation to the Number of Produced β-Variables

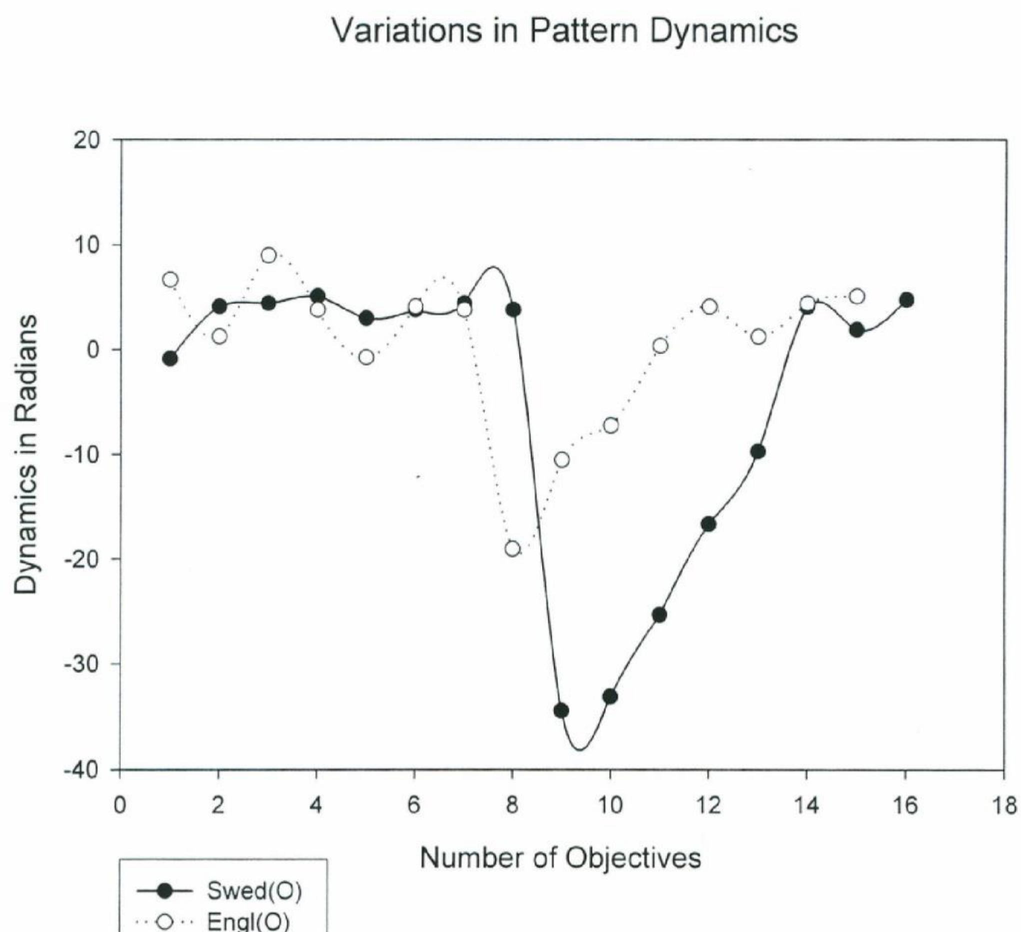
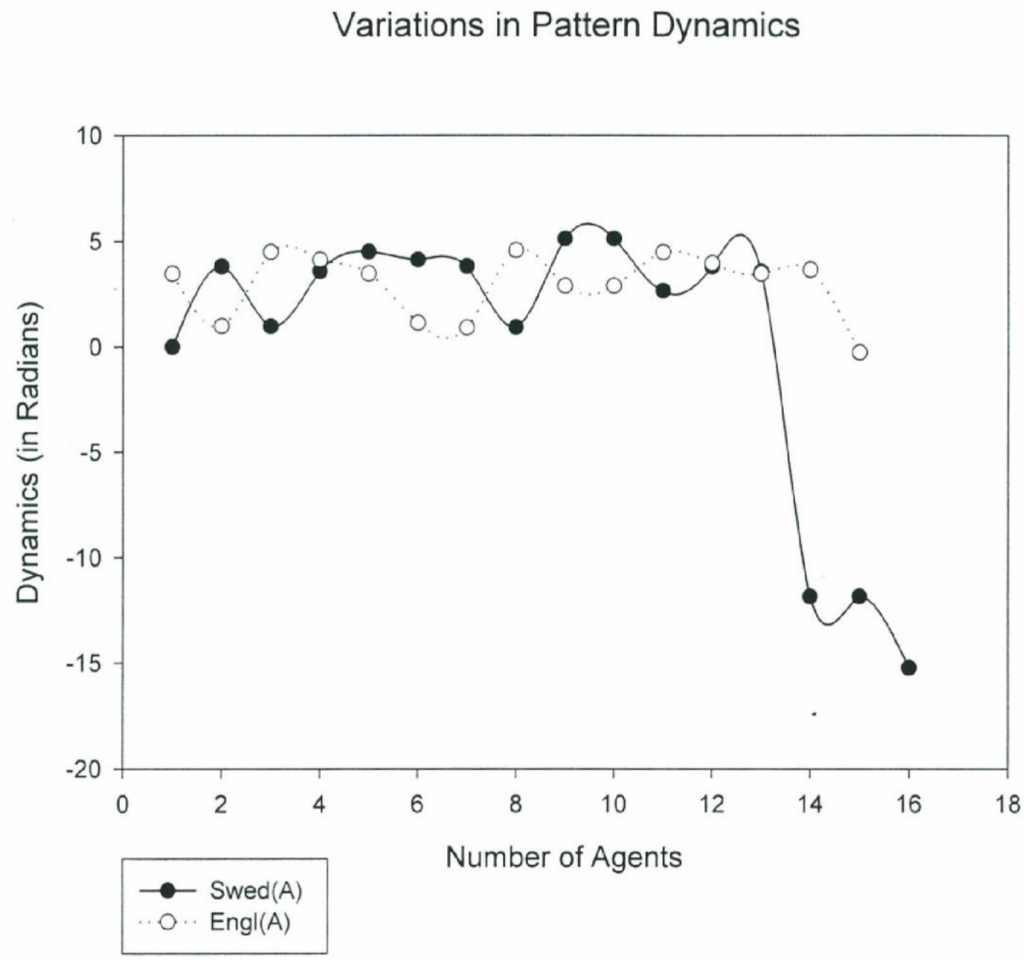


Figure 8.

Rotational Dynamics in Relation to the Number of Produced α-Variables



It follows that their common causal determination can be conceived of as the operational definition of "adaptation". Hence, sliding along a helical array is producing the observable dynamics in the movement patterns of the variables. Thus, fundamental to adaptation is the provision that the integration of strings can be taken as an account of the composition of an achieved articulation. Figure 7 shows the trajectory of the dynamics in the original Swedish text as well as its translation when related to one control parameter, namely the number of produced composites in the O-component.

This means that a more elastic and fluid form of indexing the properties that characterise the rotational dynamics of Figure 6 is demonstrable. Integration of strings into compounds is made the basis of the geometric axiom by which the rotational speed of the exact reproduction of the identified control parameter is the topic of discussion. The followed strategy concerns the (1) expression of "speed" when related to the number of established compounds, and (2) the identification of control parameters.

The Figures 7 and 8 constitute a convenient first step in the comprehension of a welter of diverse rhythmic (i.e., temporal) and periodic (i.e., spatial) patterns, which lie in the textual flows. The reference axis of the unfolded O-spaces relate to spatial distances, while the axes of (θ) projection reflects the consequences of textual displacements (as measured in radians), involving one or more flow fields. However, access to the textual evolution that has been imaged in Figure 6, becomes visible only in the morphological development that is constrained by periods and the intervals of a period as shown in the Figures 9 to 12. This implies that the functional aspects of a coordinated displacement of textual segments can be identified with a dynamical system as proposed by Hestenes spinor mathematics. What is particular to the employed spinors is their independence of a fixed rotation axis. Spinors describe rotations in two dimensions where there is no rotation axis. Thus imaging a time-varying rotation can be expressed as a spinor-valued function of time.

It follows that exactness in textual movement coordination is dependent on the text producer's ability as well as on rotational variability. The latter condition is a prerequisite for proper adaptation of one's text building behaviour to contextual variations. As expected, contextual differences have produced variations in the translation of the Swedish sample into English. On the other hand a certain degree of sameness, due to similarity in the experimental task, is observable both in Figure 7 and 8. Since the trajectories of the O-clocks in both samples reveal a remarkable similar course most of the time, a high degree of rotation-translation symmetry has become evident.

At the steep of Figure 7, it can be observed that a shift one step to the left or the right would not influence the characteristic shape of the curves. Thus the clocks are most of their running time in the same relative mode. However, the Swedish text has a remarkably greater depth. Further, noticeable deviations appear at the beginning and at the end of the trajectories. But these are minor fluctuations, which, from a biological point of view, are only natural.

From a geometrical point of view, text has to be conceived of as a set of relations that is distinct. This implies that the strand of Figure 8 is required in order to specify the trend in the text as a whole. Consequently the location of a trajectory can be validated with the distance between both strands. As shown in Figure 8, the developing trajectory of the Swedish sample is repeating its particular clocking behaviour throughout text production, however, with the tendency to be periodically in an "anti-phase" mode. What is particular in the English text can be extracted easily from the curve. For example, focussing on the dynamics of its path makes evident a greater degree of "sliding" over a particular number of planes. However, this behaviour does not force the system to coordinate itself at a higher clocking speed. Within the space of the Figure 7and 8 any particular variable is uniquely determined because the frame of reference is the unity of a text.

Text building is the result of breaking or lowering the influence of spatial and temporal order parameters all the time. During text development, small changes in attitude have somehow transformed the A-component. It is observable that the translator has introduced changes but the fundamental phase relation remains between the clocks. When determined from its peak-to-peak displacements, the A- clocks prefer to stay at their own tempo. Thereby, the A-oscillators are satisfying their own biological clocking mode. They are persisting in their own autonomous behaviour, despite the fact that each of them several times is "in-phase" as well as out-of-phase. Thus, it can be concluded that the cyclic, clock-like functioning of the rotation mechanism is revealing the existence of a spatio-temporal clocking asymmetry that is gating the development in the A-components.

Degrees of Sliding

Progressive processing of information on the rotational distance between the actual state and the equilibrium state of a system demands a measure on subtle fluctuations, which have been called "shadings" (B. Bierschenk, 2001 a). Shadings have been shown to be expressible as phase drifting. It follows that the multiple rhythms are generating the phase relations as well as the drifting. Hence, the governing deviations in a displacement require that the shadings are determined within and between periods and the fractions of a period. By introducing a second control parameter a new perspective on the dynamics becomes opened and implies a discussion of rotational dynamics when reproduced in a three-dimensional space.

To convert the scatter plot of the strands of Figure (6) to mesh plots, the SigmaPlot (1998, pp. 6-26) grid has been interpolated with its standard transformation function. SigmaPlot is using an inverse distance method, where the distance weight value (p) has been set at (p=3). The Y-axis of this mesh represents the naturally occurring intervals in a text and the X-axis shows the number of composites and compounds within each interval. Related to the Swedish text and its translation, distance (i.e., sliding) will be discussed on the basis of two control parameters, namely "the Shear" and "the Strain" functions. Both are forcing the measures of distance to create response surfaces with their characteristic mountains and valleys as shown in the Figures 9 to12.

In comparing these results, it will become obvious that the shapes, resulting from the operations of the control functions entails the concept of time as the expression of successively increasing or decreasing shadings in articulation. However, what kind of language space will develop is dependent on how both the absolute and relative co-ordination of the operating control parameters are working together, since they are responsible for both the breaking and making of relational symmetries. When the order parameter is temporarily trapped by the "shadows" of a preceding attraction, the effects of a change in articulation can be made explicit. For example, when one system state (material point) transforms into another (copy of a material point), it can be determined how the control parameters are governing rotational dynamics.

Thus, the outcome of the natural oscillations, appearing in the Swedish and English texts, has been mapped into the three-dimensional shapes of the Figures 9 to 12. Occurring in the uncoupled individual A- and O-component are all the main features of the Figures 7 and 8. But the establishment of a three-dimensional representation is really crucial for a consideration of the theoretical value of shading. By inspecting the Figures, it can be concluded that the observable shading varies from Figure to Figure. The demonstrated differences concern the critical changes in the degree of rotation. The larger the increase is in the distance, the longer is the time it takes the process to relax from the critical speed in phase transition (i.e. sliding) and to return to the speed level of the initial phase.

Thus, whenever a depicted process is advancing from one state to the next, the established distance is a measure on the degree of "directness", which is driving the system toward the intended pattern. It follows that a distance below zero corresponds operationally with a certain degree of "in-directness". Independent of the kind of distance, as expressed by negative or non-negative values, it means that intention is an ingrained property of the generated response surfaces. The established "depth" of processing is primarily the result of a readdressing function. This means extended copying and hence, a variable can derive its "thickness", i.e., its heaviness from the rollup vector (n, m) of Figure 5, which specifies the orientation width. When the Figures produced by the A-clocks are compared with those of the O-clocks, outstanding variations in shading are emerging.

Figure 9.

The Unfolded Space of the β-strand of an Interview Text

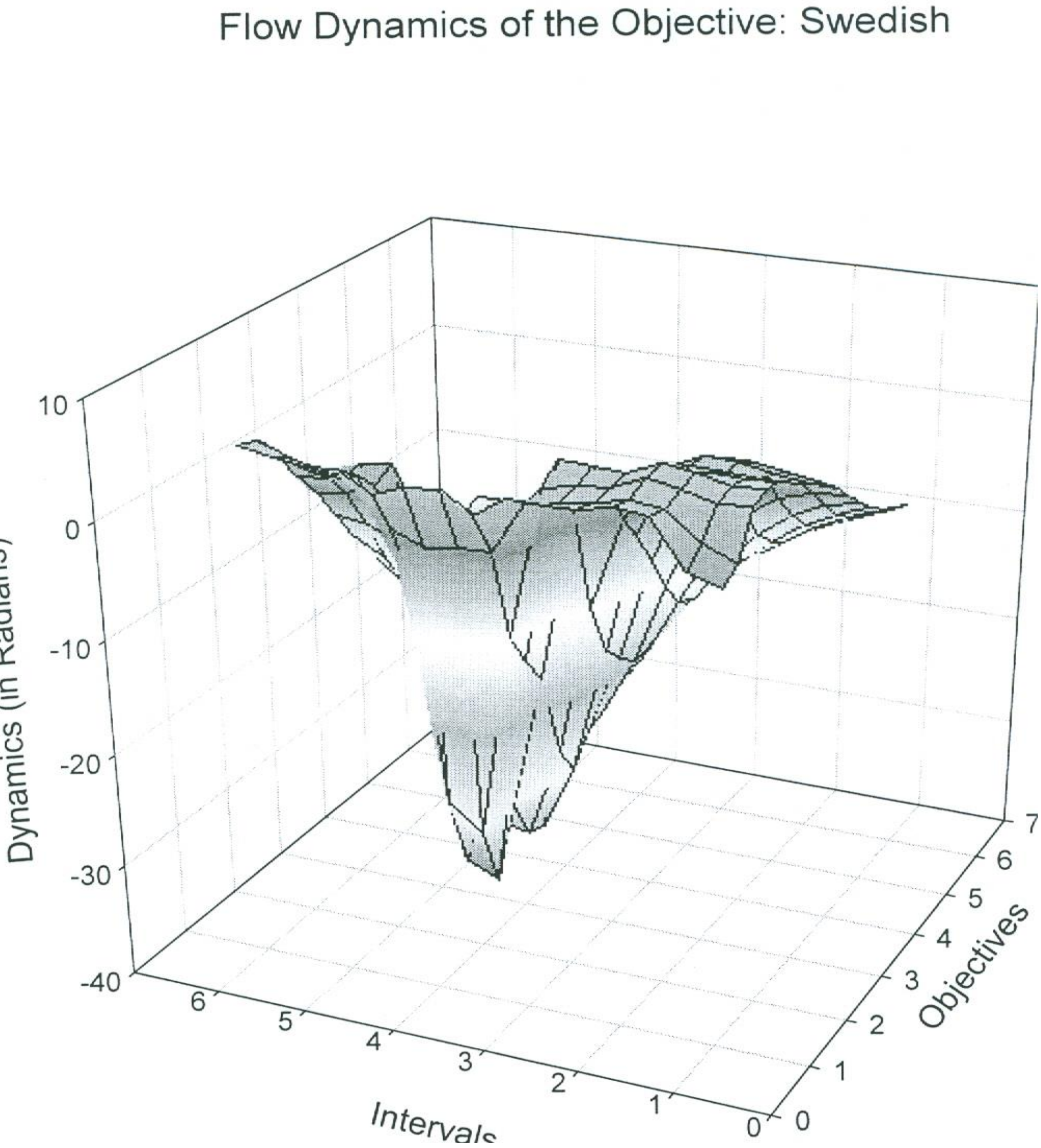


Figure 10.

The Unfolded Space of the α-strand of an Interview Text

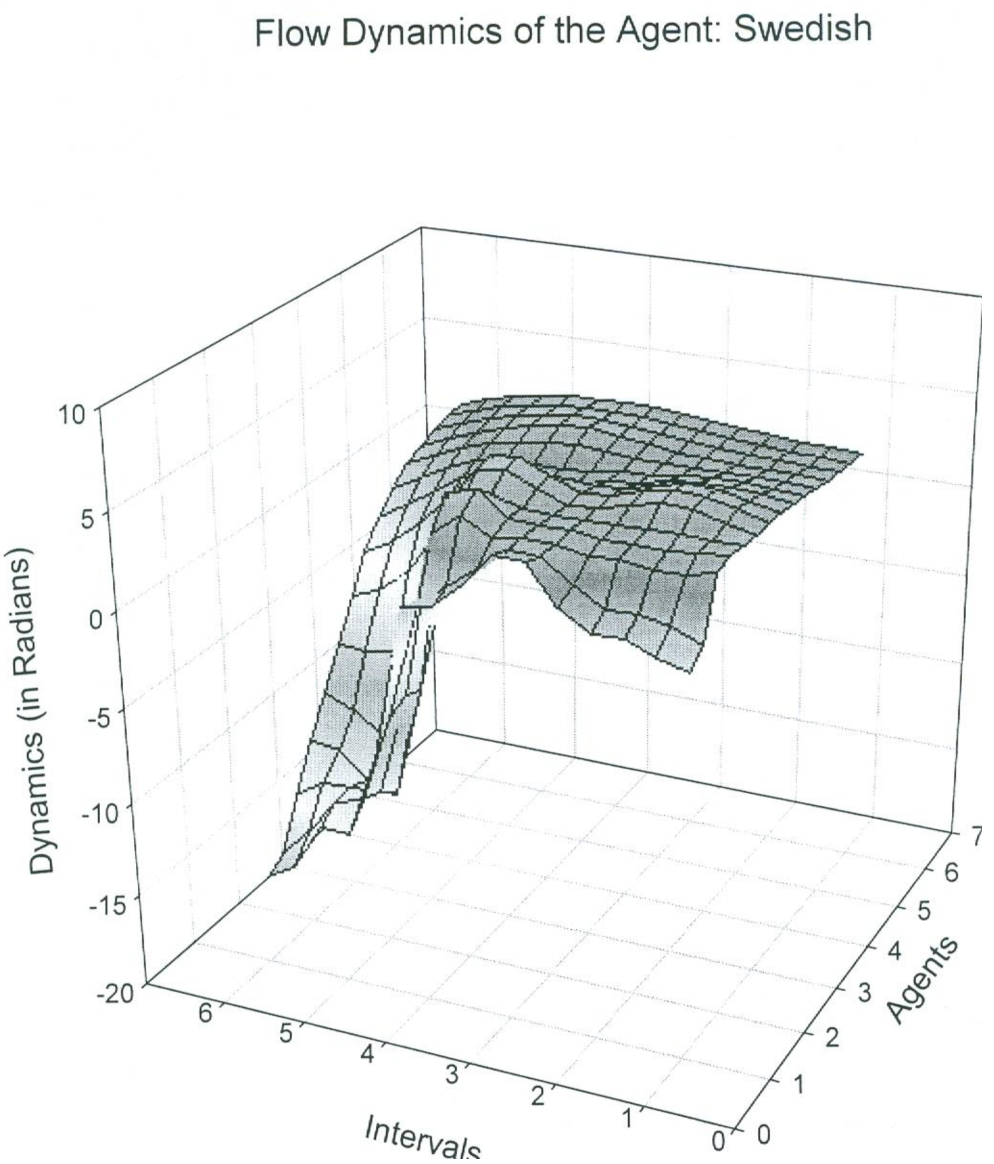


Figure 11.

The Unfolded Space of the β-strand of an Interview Text

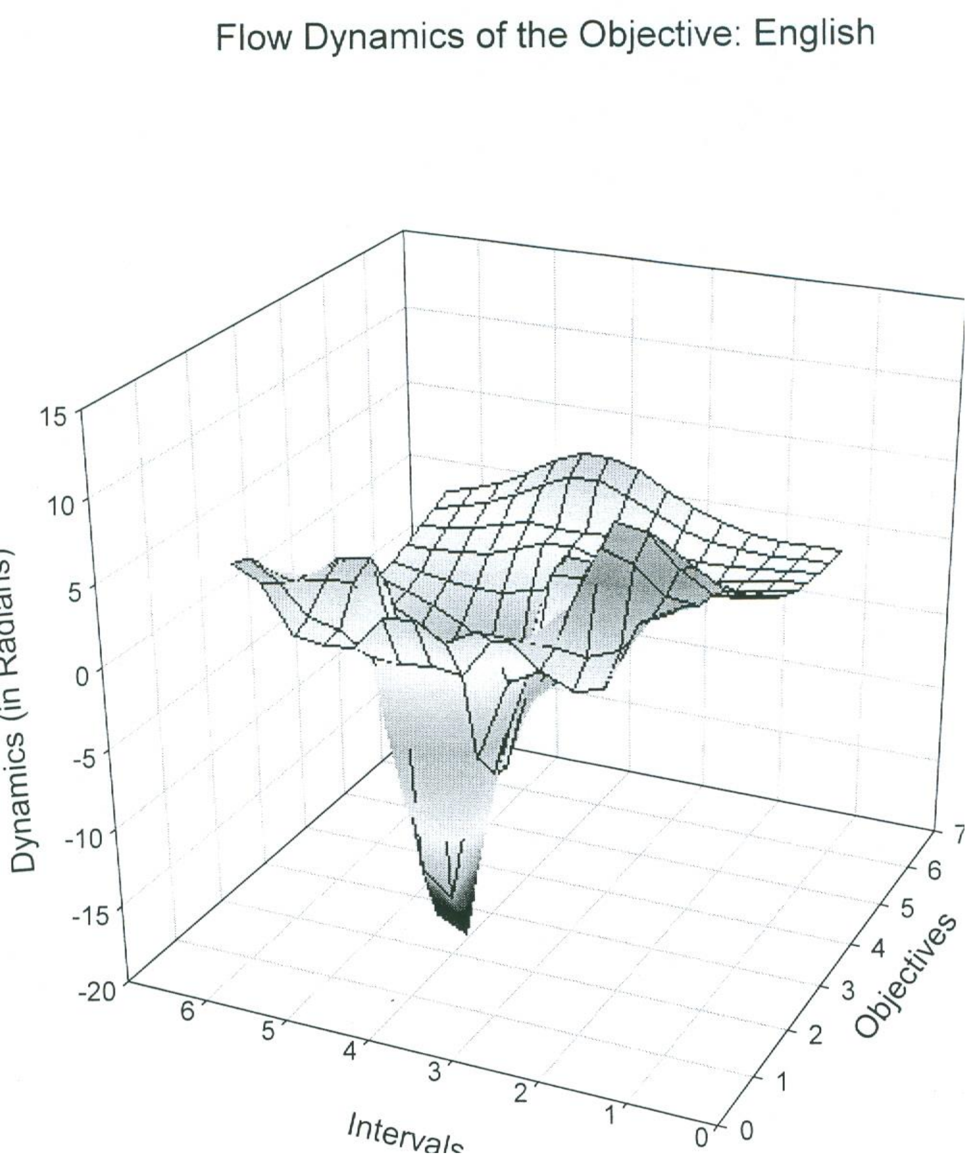
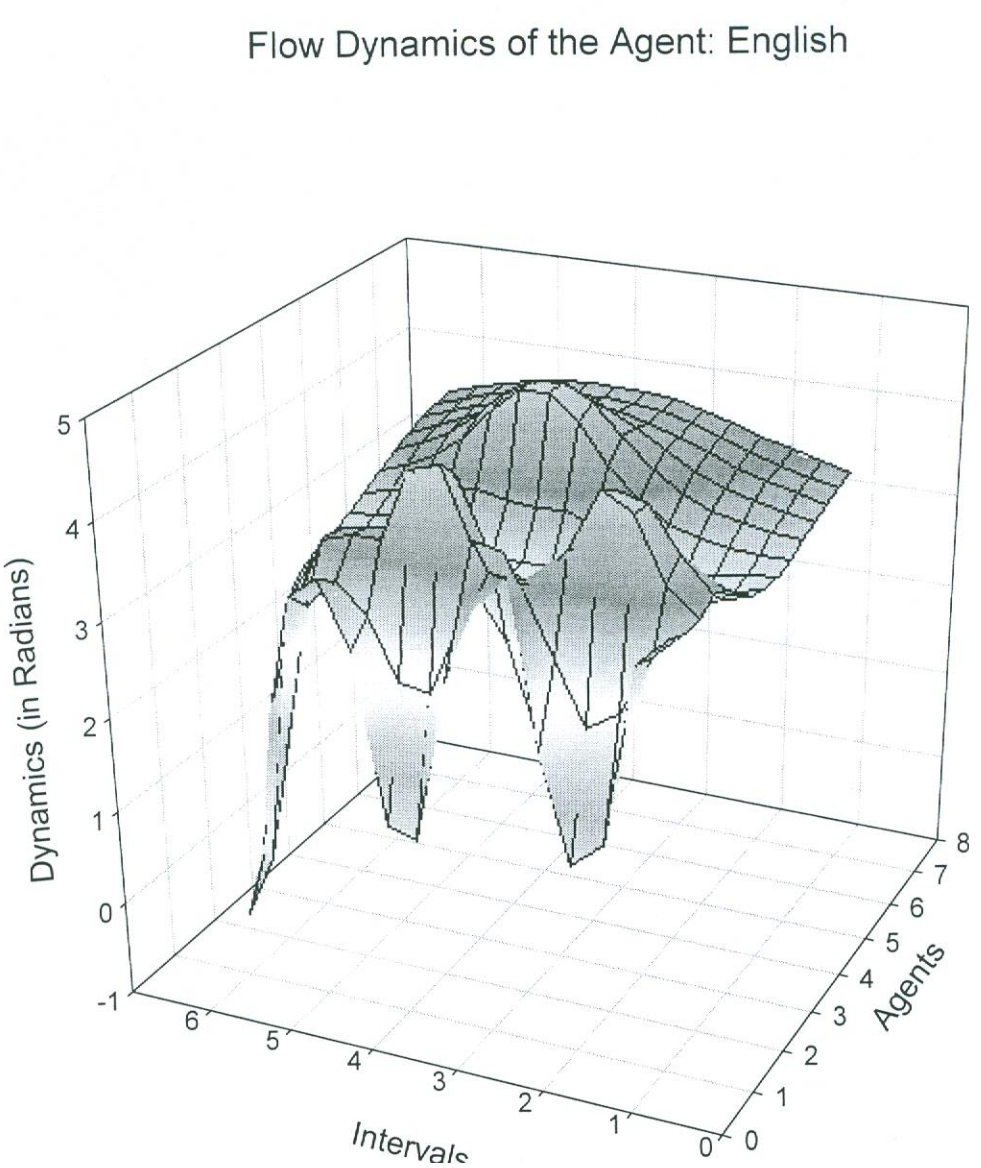


Figure 12.

The Unfolded Space of the α-strand of an Interview Text



In contrasting them, it becomes evident that different textual flows are generating differences in depth. This result underlines previous observations concerning the variation in integrative depth. It follows that integrative depth is dependent on how certain viewpoints are rotated and remoulded in order to fit a particular clocking mode.

In a fundamental sense, the variations in shading are of particular interest. Especially the O-clock of the Swedish text has produced phase-dependent variations that have clearly resulted in higher degrees of rotational displacements and thus transposed textual elements farther away than what is observable with respect to the A-clock. This is a definite demonstration of differences in depth. In the forefront of the Figures, related to the O-clock, the operating processes have produced an intersected area below sea level. Moreover, the surface layout of the O-component of the Swedish text is to a certain extent reappearing in the surface layout, related to the A-clock of the English text. In marking disparity in shading, the operating processes have produced a certain degree of perspective reflection. The operating processes have in the English A-component produced an intersected area below sea level, which is marking the previously observed disparity in shading. The critical significance of "depth" in the fourth interval of the O-component of the English text is depicting a degree of "in-directness" that is alien to the Agent-component. However, other areas are definitely more compact and connected to a higher degree of shallowness. Finally, the degree of directness in the verbal expressions is responsible for the bubbling shallowness in the background of the respective Figure of the O-component, as well as at its left-hand and right-hand sides. In sum, text processing, expressed as a matter of "depth", is totally different from all previous approaches to text analysis.

Discussion

The experimental significance of the presented geometric shapes concerns the particular style of verbalising one's observations in an interview situation. What sets the present sample text apart from samples studied previously (B. Bierschenk, 2001 a, 2002), is its softness. Furthermore, it has been possible to demonstrate, that softness requires a high degree of "depth" and that increasing depth corresponds to implicitness. Greater angular accelerations correspond to higher degrees of drifting. The differential treatment of drifting in the A- and O-component has made it possible to approach their spaces as different subspaces.

In binding the translation-rotation of the original Swedish sample text to English, angular articulation has been shown to depend on the constraining effects of differently developing spaces. This is equivalent with saying that surface deviations can be captured through developing constraints. But progress in understanding the biological nature and evolution of kinetic constraints has been shown to depend on radians of different magnitude as well as on the functions performed by the evolving CHANNELS. Their scope and import in the real time imaging of the discovered rotation mechanism has made evident that the geometric properties of a subspace can be determined through the resulting morphology.

The translator's task has been to take into account a mixture of intentions and orientations. However, both subspaces of the O-component show the characteristic deep. The corresponding subspaces of the A-component show that the English A-clock has produced a perspective translation of the space into an umbrella-like shape. In contrast, the subspace of the Swedish A-component is characterised by a tail, which is the consequence of an involuted channelling operation. In conclusion, it is observable that the original text and its translation have generated different morphological flow expressions. Each component oscillates in autonomous fashion and stays at its own tempo, which means that their clocks are running with different rotational speed. But a tendency to move in synchronised pace is also observable. This means that a certain clocking symmetry has influenced the geometric shapes of the coordinated subspaces.

References

Bierschenk, B. (1984). Steering mechanisms for knowability. *Cognitive Science Research, 1.* (ERIC Document Reproduction Service, No. ED 264 246, TM 850 437)

Bierschenk, B. (1991). The schema axiom as foundation of a theory for measurement and representation of consciousness. *Cognitive Science Research, 38.* (ERIC Document Reproduction Service, No. ED 338 650, TM 017 363)

Bierschenk, B. (1993). The fundamentals of perspective text analysis. *Cognitive Science Reserach, 45.* Lund, Sweden: Lund University, Department of Psychology.

Bierschenk, B. (2001a). Invariant formulation of the kinematics of body movement on the visual cliff. *Cognitive Science Research, 80.* (ERIC Document Reproduction Service, No. ED, TM 033 389)

Bierschenk, B. (2001b). Geometric foundation and quantification of the flow in a verbal expression. *Cognitive Science Research, 81.* (ERIC Document Reproduction Service, No. ED, TM 033 479)

Bierschenk, B. (2002). The information in the folds of the complex adaptive landscapes of a verbal expression. *Cognitive Science Research, 82.* (ERIC Document Reproduction Service, No. ED, TM 033 670)

Bierschenk, B., & Bierschenk, I. (1986a). Concept formulation. Part II. Measurement of formulation processes. *Cognitive Science Research, 11.* (ERIC Document Reproduction Service, No. ED 275 160, TM 011 260)

Bierschenk, B., & Bierschenk, I. (1986b). Concept formulation. Part III. Analysis of mentality. *Cognitive Science Research, 12.* (ERIC Reproduction Service, No. ED 275 161, FL 016 060)

Bierschenk, I. (1999). The essence of text. *Cognitive Science Research, 70.* (ERIC Document Reproduction Service, No. ED 430 053, TM 029 798)

Bierschenk, I. (2000). Testing for competence. *Cognitive Science Research, 76.* (ERIC Document Reproduction Service, No. ED 449 190, TM 032 298)

Changeux, J. P., Connes, A. (1995). *Conversations on mind, matter and mathematics.* (M. B. DeBevoise Ed., & Trans.) Princeton, NJ: Princeton University Press. (Original work published under the title Matière à Pensée, 1989)

Gibson, J. J. (1966). The senses considered as perceptual systems. Boston, MA: Houghton Mifflin.

Gibson, J. J. (1979). *The ecological approach to visual perception.* Boston, MA: Houghton Mifflin.

Gibson, J. J. (1982). The use of proprioception and detection of propriospecific information. In E. Reed, & R. Jones (Eds.), *Reasons for realism* (pp. 164-170). Hillsdale, NJ: Erlbaum.

Hestenes, D. (1993). *New foundations for classical mechanics.* Dordrecht: Kluwer Academic. (Original work published 1986)

Hestenes, D. (1994). Invariant body kinematics: I. Saccadic and compensatory eye movements. *Neural Networks, 7,* 65-77.

Holst, E. von, & Mittelstaedt, H. (1950). Das Reafferenzprinzip. Wechselwirkungen zwischen Zentralnervensystem und Peripherie. *Die Naturwissenschaften, 37,* 464-476.

Kinosita, K. Jr. (1999). Real time imaging of rotating molecular machines. *The FASEB Journal, 13*(Suppl.), S201-S208.

Mackenzie, D. (1998). The proof is in the packing. *American Scientist, 86* (6), 524-525.

Malakoff, D. (2001). Prizewinners, no – But not losers. *Science, 294,* 292-293.

SigmaPlot 5.0. (1998). *User's Guide*. Chicago: SPSS Inc.
Yakobson, B. I., & Smalley, R. E. (1997). Fullerene Nanotubes: $C_{1,000,000}$ and beyond. *American Scientist*, *85(4)*, 324-337.

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Author's Note

As acknowledged in Bierschenk & Bierschenk (1986b), two doctoral students made the interview-text available in 1985. The English translation has been carried out in 1997 by Dagny Persson, authorised EU-translator and Subject Teacher at a Gymnasium in Lund, Sweden.

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