ED 397 941   PS 024 232

AUTHOR   Bierschenk, Bernhard
TITLE   Emergent Novelties in the Mentality of Dizygotic
              Twins.
INSTITUTION   Lund Univ. (Sweden). Cognitive Science Research.
PUB DATE   96
NOTE   33p.
PUB TYPE   Reports - Research/Technical (143)

EDRS PRICE   MF01/PC02 Plus Postage.
DESCRIPTORS   Cognitive Processes; Cohesion (Written Composition);
              Comparative Analysis; Content Analysis; Educational
              Theories; Foreign Countries; *Twins; *Verbal Ability;
              *Writing Processes; Writing Skills
IDENTIFIERS   *Dizygotic Twins; Mental Skills; *Scanator; Sweden;
              Text Learning

ABSTRACT
        Scanator is an extremely valuable tool in the
functional analysis of qualitative stability in text building
behavior during writing. Scanator also allows for a detailed
investigation of subtle changes emerging in tne structural relations
of emergent novelties. This study focused on the extension of the
application of Scanator to one pair of dizygotic (DZ) twins.
Specifically, the study examined whether DZ twins differ in their
mental structures as they construct text. The test material consisted
of a series of pictures in which a baby is navigating a visual
cliff--a sheet of glass between the child and its mother. Subjects
wrote a 5-page essay in Swedish, rewrote the essay, constructed an
abstract of the essay, then wrote the essay in English. The Scanator
results did not indicate any systematic differences. A powerful
effect was found in the cohesion of the produced verbal flows, but no
such effect was evident in the elasticity of text volume flows.
Contains 13 references. (Author/MDK)

Emergent Novelties in the Mentality
of Dizygotic Twins

Bernhard Bierschenk

1996   **No. 57**

Emergent Novelties in the Mentality
of Dizygotic Twins

Bernhard Bierschenk

1996   No. 57

Cognitive Science Research
Lund University
Sweden

Postal address	Editor	Adm. editor
Cognitive Science Research	Bernhard Bierschenk	Helge Helmersson
P.O. Box 7080	Department of Psychology	Department of Business Adm.
S-220 07 LUND	Lund University	Lund University
SWEDEN		

Abstract

An extension of the application of the Scanator to dizygotic (DZ) twin is the concern of the present study. Scanator is an extremely valuable tool in the functional analysis of qualitative stability in text building behaviour. Moreover, Scanator allows for a detailed investigation of subtle changes emerging in the structural relations of emergent novelties. One goal of the present study concerns a most rigorous power test of parameter operations in relation to corresponding model components. No systematic differences are evident. Concerning the measures of the MLT units a powerful effect exists in the viscosity of the produced verbal flows. In contrast no such effect is evident in the elasticity of the volume flows. A certain invariance of this effect over levels of analysis is present. What remained invariant becomes obvious in the conceptual identity as produced by one twin. In contrast, the performance of other twin gives evidence to a refined conceptual structure where the global attractor has gained in abstractness.

Phase Transition

In the study of mind and behaviour, text analysis was until recently the most obscure part. Cognition oriented researchers have used all available options: Staff interviews, telephone interviews, mail panel questionnaires and "cold drop" mail surveys are some of the procedures developed for data collection. All have led to the bitter conclusion that text analysis ends up in the marshy landscape of behavioural semantics that is extremely difficult to explore.

Exposures of text to "frames" (Minsky, 1975) may be illustrative of these efforts. Framing text makes its processing dependent on positions resulting from "design" (Simon, 1981). Separate and independent displays of various parts do not manifest the interrelations existing between successive phases and phase transitions. Operations on frames are appropriate only for a positional definition of the content of text. It follows that a frame is no suitable device for the interpretation of latent information.

Hard and soft moulded phase transition. Protocols for specifying electronic coding of lexicographic primitives are the effect of a computerisation of all branches of science. In a sense, a protocol is a set of unambiguously defined and internationally accepted rules for displaying and communicating graphemes and strings of graphemes. An example is the American Standard Code for Information Interchange (ASCII). Its alpha-numeric protocol serves apparently as carrier of strings of graphemes. The protocol used, has illuminated blocks (positive energy production) and blocks that are non-illuminated (negative energy production). Blocks are defining cells in matrices. Alpha-mosaic coding generates a block for each possible line. Coding appears as graphemes on the TV-screen.

Characteristic of the development of ever greater computing power is that it precedes hand in hand with the development of ever more powerful protocols. For example, geometrical primitives (point, line, curve, rectangle, and polygon) produce graphical characters. These characters generate images of letters on the screen. In order to draw a curved line with a circle command, any three points on the diameter of a circle are performing the command. The result is a cinematic impression. This development helps to reproduce a movement in its entirety, but fixes motion in a form that is convenient for the programming of positions and thus hard moulded phase transitions.

Computational procedures preserve multiple but isolated images. Beyond this, the frame generator requires an answer to questions of the following kind:

"Does natural language contain or simulate properties and relations that are suitable for the Turing machine to utilise?"

Only predicate-logic gives an answer to this kind of questions. On the basis of associative networks, the "knowledge worker" responds affirmatively and suggests that the facts of the world get the form of an analytical sentence. His extensive rule writing imposes artificial constraints on the surface features of text data. Identification of simple or composite patterns is sufficient for controlling their logical complexity. Moreover, programs store mutually exclusive paths. Activation of an appropriate path means for the knowledge worker that the system exhibits "behaviour". The frame hypothesis allows its processing. A well-defined frame makes up the standard context for the computation of points. Computational procedures are from a mathematical-logical point of view the accessible associations between list variables. These relate to the motion of

4

certain points and suggest that computation is equal to cognition. It follows that the machine axiom utilises direction and velocities.

To solve certain problems of complexity, the knowledge workers have explored hard moulded phase transitions and have ended up in a waste of bits and blocks. Their modelling of progress presumes that a system configuration builds on the frame hypothesis. On the basis of already known information can a computational mechanism of the Turing-type respond powerfully to "similarity" and establish useful "boundary conditions". On the other hand this machine responds unfitted to emergent novelties. However, informative components emerge only, if uniqueness is traceable, or if known information is transformable through schematising operations (B. Bierschenk, 1991).

Furthermore, different high-level languages entail different variables of import for list organisation. On the basis of the ASCII, computer routines have developed into so-called high-level languages. They process graphemes and organise graphemes into strings of graphemes and blocks of strings. In addition, a block organisation is a priori no guarantee for objectivity. It may differ in its logical construction. Blocks are also lacking the capacity of integrating individual actions. These are the elements of text building behaviour. Actions produce the soft moulded phase transitions of the movements embedded in running text. Until now, only the human eye has observed soft moulded phase transitions. With the development of Scanator, phase transitions of the soft kind are measurable immediately. Scanator synthesises and preserves novel behavioural differentiation and integration on the basis of the linguistic cues.

Finally, graphemes and strings of graphemes empower symbols that carry information abstracted from expressive behaviour. Symbols signify "regularised meaning" and symbolic meaning tunes into a textual whole. Textual harmony and the effects of experience connect to the operations of the "Schema axiom" (B. Bierschenk, 1991). The result is the emergence of emergent novelties. Attributable to the Schema hypothesis is the foundation of both the visual cliff and the analysis of its description.

The Schema is observable in textual movement and thus a property of text building. It is therefore unnecessary, to ascribe textual movement to some unrelated mechanism. Experience and practice are underlying the development of the Schema, constituent of the symbol. Its emergence depends on continuous transformational movements. Accordingly, the processing of symbols includes intention as well as orientation. The Schema in behaviour entwines both and reflects in this way the quality of every meaningful behavioural expression. It follows that language is inevitably ecological.

However, motor adaptation to visual stimulation is nothing that occurs automatically. Text building behaviour manifests itself in an eye-hand co-ordination whose result becomes accessible as graphemes embedded in informative light. Hence, an analysis of natural language expressions requires a differential treatment of the observer's perspective and viewpoints.

A verbal description of objects and events need to contain optical invariants. This suggests a perceivable orientation. The perception of objectives involves soft moulded phase transitions. In itself, a phase transition induces a change in textual movement. Besides, "regularities" in change are measurable only with reference to the displacements of a particular biological system. An assessment of the subtleties of displacement becomes sensible to the degree that differential topological procedures are utilisable. The fundamental topological assumption is that a biological system, being able of expressing itself freely, produces a particular writing style that causes the emergence of the morphologies underlying text production.

Meaning founded on perceptual experience of the visual cliff becomes symbolic in the moment of communication. The hypothesis is the following:

"The individual parameters and their relations to the AaO mechanism are independent of some corresponding model components or steps in text processing."

On the basis of this hypothesis it was possible to demonstrate that MZ twins exhibit similar styles in their text building behaviour (B. Bierschenk, 1995). Likewise, the individual subjects of the pair behave in a very similar fashion. MZ twins are evidently the tokens of the same type of biological systems. The present experiment extends the test of the movement hypothesis to the case of DZ twins. Consecutive testing concerns the following hypothesis:

H_0: DZ twins' are tokens of the same type of biological systems.

Dependency between parameter and model components exists, if and only if the parameters show systematic differences. Unspecified differences in either direction are a case against H_0. Testing H_0 is not commonplace in the behavioural sciences. Instead, routinely tests of statistical significance matter the hypothesis (H_1) and involve an evaluation of ($P_{.950}$ and $P_{.999}$). Augmentation of H_1 with experimental results is seldom missing. In contrast, information on the power of these tests appears only indirectly and occasionally. Yet, theoretical development demands an evaluation of the effect size (ES) of the treatment. An indifferent conduct to the problem of specifying a metric means an incompetence of integrating the process of measurement into theory description. Very serious consequences about the scientific understanding of what is latent in running text have been the result of this carelessness.

The present experiment provides a metric. Topologically conceived, it means that basins and valleys of René Thom (1975) and the saddle points of mountains relate meaningfully to the texture of text. Making structure visible would convey evidence for the assumption that language reflects a mental structure. Hence the focus of attention is on the following question:

Do DZ twins differ in their mental structures?

In order to answer this question, it is necessary to define displacement not only with reference to a particular biological system but also with reference to specific potentials. This would allow a discrimination between essential oscillations constraining text and non-essential oscillations, involving merely fortuitous behavioural elements or frozen accidents. It follows that a textual surface lay-out needs to build on a low-dimensional groundwork.

Experiment

Method

The picture series of the visual cliff performs a representational function that is essential for the projection of reciprocal relations conducive to the apprehension of affordances. The Gibsonian assumption maintains that perception of the environment is grounded in ambient optical structure. This structure depends not on form. On the contrary, the structure depends on formless and timeless invariants. The perception of the functional utilities of the series is necessary for an adequate description. Self-

It means that approximately 1% of the total variance of the super population are attributable to the treatment factor.

Table 1.

DZ Twins: General Linear Model: MANOVA for Fixed Factors

Source	Wilks' Λ	Cohen's f	F	P
Grapheme				
T	.20713	1.9564	3.828	.301
L	.00999	9.9549	99.132	.064
Marker (SM)				
T	.03846	5.0000	25.000	.126
L	.50000	1.0000	1.000	.500
Marker (CM)				
T	.50000	1.0000	1.000	.500
L	.80000	.5000	.250	.705
Marker (TSM)				
T	.02000	7.0000	49.000	.090
L	.50000	1.0000	1.000	.500
Space				
T^1				
L	.15517	2.3381	5.444	.258
Block				
T	.30759	1.5000	2.250	.374
L	.80000	.5000	.250	.705
A-dummy				
T	.30769	1.5000	2.250	.374
L^2				
O-dummy				
T	.15517	2.3334	5.444	.258
L	.06923	3.6667	13.444	.170
Viscosity				
T	.08892	3.2009	10.246	.193
L	.99865	.0037	.001	.977
Elasticity				
T	.02181	5.8810	44.844	.094
L	.89001	0.3515	.124	.785

Note. χ^2-Calculation [1] $\chi^2 = 0.048$, DF = 1, p = 0.827
[2] $\chi^2 = 0.157$, DF = 1, p = 0.695

A medium size effect of (f =.24995) represents an estimated proportion of total variance of (PV =.05880). Cohen indicates a large effect (f =.39995) when the variance proportion measures (PV =.13790). Effects of this size are not common in the behavioural sciences. This is Cohen's (1962) conclusion after having investigated the research literature.

Direction and velocity have produced differences in the interrelations of successive movements. Figure 1 reflects the reported language effect of (f = 9.96). Its centre is localiseable in the production of graphems. This dissimilarity is strictly proportional to the increase in text mass. To a greater or lesser degree, the layout of the viscouspotential absorbs most of the differences.

Figure 1.

Movement Patterns: Viscosity and Elasticity
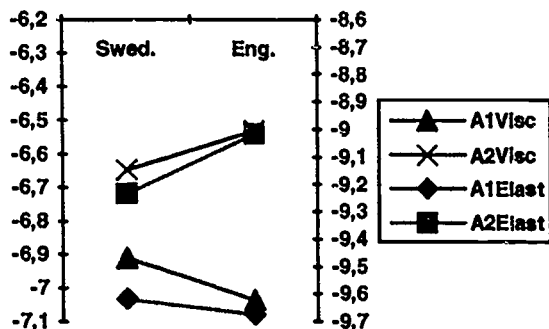
The haptic flow gradient of handwriting is a kinematic abstraction of the underlying force field. When movements come into existence, momentum and angular acceleration or force becomes related. A field of forces ordinarily involves text mass. Forces impressing on any given constituent elements depend on both the locations of the textual elements and their orientation to the axes of the spherical space.

The process of handwriting generates flow fields. These fields inform and are a source of holonomic constraints for the force that produce the fields themselves. Similarity between two biomechanical systems means that the patterning of forces (a qualitative property) is the same in the two systems. The fact of an insignificant effect in the elastic component confirms this thesis of abstraction. It is an exceptionally good illustration of the accomplishment of a successful phase in the methodological differentiation of both components. Comparison rests on observed discontinuities, established symmetries and the conservation of information. It follows that the organisation of text through a biological system requires a link to the scaling of forces.

Text as self-indicative system remains unaltered as the process of transformation transits through the **terminal states** of that system. Essentially, rules of their inscription concern the translation of a 3D textual configuration into a 2D pattern of transformations. Figure 2 refers to the symbol that guides the lay-out of the 2D pattern. A snake, trying to bite its tail, follows a path that is essentially a topographical expression of a textual whole in a plane.

Textual growth is the outcome of the snake's progress from one terminal state to the next. A growing path reflects change. Information stored in the path of the snake can change, but topographical coherence abides. Descartes' system of coordinates locates the stored topological invariants.

Figure 2.

Stylised Symbol of Self-indication

The primary purpose of Figure 3 relates to an understanding of text functions. Problems of a metrical or a 3D topology are at present without interest. Instead, attention concentrates on its design. The design determines the number of terminal states and arranges the state attractors. A Cartesian mesh gets its minimal extension when 24 of the intersecting points represent the invariants of the *Figure* component. In contrast, nine points are enough for the invariants of the *Ground* component.

Figure 3.

System A1S1: The F-G Holotop
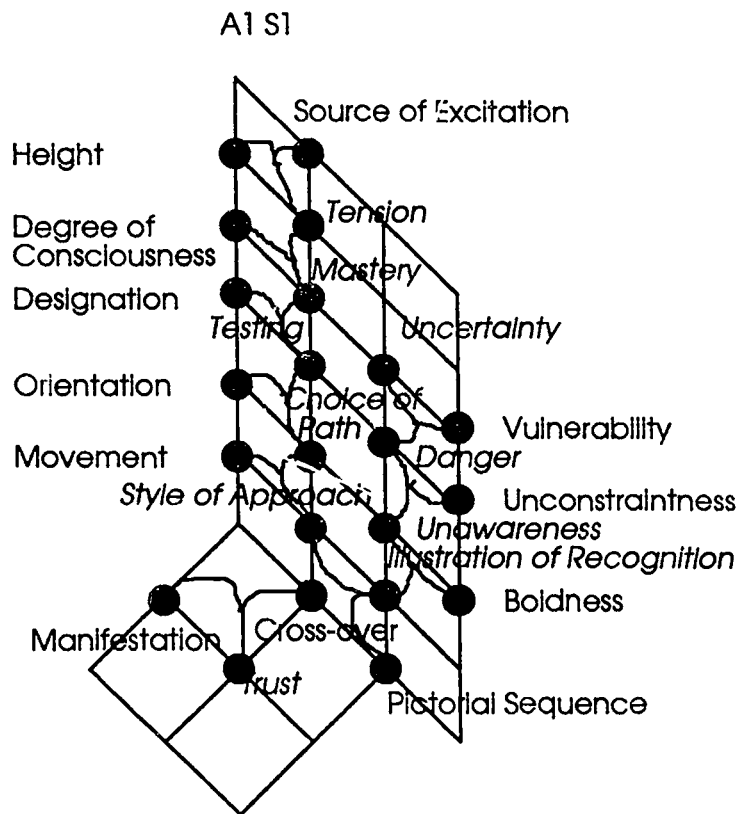
A point of the holotop represents a link unambiguously only in relation to a mesh system. Its construction is completely arbitrary. In comparison, the inscription of its points and the specification of their relations is not optional. A holotop approximates the high-dimensional relationship of viscosity and elasticity among the various parts through a low-dimensional representation. Low-dimensionality determines the

configuration of structural links underlying the texture of produced text. This lay-out sustains the informational invariance of the verbal flow.

The 2D plane represents an unstable dynamic system that deforms to various degrees. Prigogine gives a definite description of the so-called "Bäcker-Transformation" (Prigogine & Stengers, 1993, pp. 138-150). Every point of a matrix changes its place in the transformation. Furthermore, every connecting line changes its curvature, as well as every area is changing its magnitude. It is worth noting, however, that any point and any line of a pattern continue to exist. Topographical ordering means that the patterns of points maintain their relative order and position throughout the distortions and transformations of the plane.

The F-G holotop is a two-dimensional layout of structural segments. Table 2 shows a segment.

Table 2.

Definition of a Virtual Midpoint

Point Attractors	State Attractor
Source of Excitation	
Height	*Tension*

The triangular relation of Table 2 points toward the nature of fear of height. The outcome of pointing is a midpoint. The mutual curvature of two neighbouring states characterises it as a "virtual midpoint". The midpoint agrees with the view that tension is an indication of sensitivity to height and that height is a natural clue to danger. This transformational process illustrates the second law of thermodynamics. It is the source of naming the time-independent structural organisations of state attractors. Thus, strings can only form into clusters within the context of a textual whole. Conceived behaviourally, the pressing circumstances originate from the terminal states "Source of Excitation" and degree of "Height" They form a structural invariant. Heart rate, visual attention and distress vocalisation are all indicators of the singularity *"Tension"*. The first domain specific informational singularity supports the hypothesis that ecological information is invariant over media. It exists in the visual as well as in the verbal flow patterns.

A grouping of textual strings anchors the tail of the snake in physical reality. Prototypes determine the content of the grouped strings. Prototypical names characterise the groups as system states. These states occupy the borders of a plane. It follows that they are terminal states. Whenever the snake transits from one terminal state to the next, a flowing equilibrium comes into existence. Concurrently, any two states form and encapsulate a "virtual reality". When the head of the snake forms the final arch, the formative process comes to a closure.

When the process starts again in Figure 3, it passes a new terminal state, namely "Degree of Consciousness" and terminates in the singularity *"Mastery"*. This term now constitutes the highest point of the curve thus far developed. The implication of this transformational step is obvious. The step concentrates on the ability of transferring information from one task to another. It puts a constraining effect on the development of the path. Thus the angular inclination of the observer identifies this state as coupled to the virtual midpoint of the preceding two states.

In order to deepen the gradient, the process must pass an additional state. Following the gradient into its terminating singularity makes it evident that flow field properties determine the texture. At the point of a phase transition, concentrations of mass specify kinetic properties. In contrast, singularities have another function. Their significance lies in the fact, that they introduce new virtual states. At a distance, singularities mark saddle points that lead deeper into the mental structure, underlying a text production.

A clear behavioural indication of mastering a falling-off place suggests a judgement of locomotor consequences. In the step following *"Mastery"* the process encounters the crucial problem of "Designation". The process steps toward a developmental shift in both perspective and viewpoints. In the classical studies, the infant crawls and orients himself across the visual cliff. Thus, observable behaviour on the "visual cliff" requires *"Testing"*. Eventually, the infant's "Orientation" constrains the developing curve towards *"Choice of Path"*. Presence or absence of depth perception becomes evident by the taken path. From a behavioural point of view, evidence comes about through "Movement".

It follows from the preceding singularity, that both initial position and the possibilities of locomotion determine the "Style of Approach". The extraction of the result of this singularity is highly dependent on the observer's intuition of "phase transitions". A "Pictorial Sequence" can manifest various phases. Nevertheless, a sequence cannot give a direct representation of the interrelation between the successive phases.

In picking up ecological information, pictures have theoretical significance as link between perception and cognition. The singularity that follows the terminal state demonstrates excellently that a cinematic exposure is an *"Illustration of Recognition"*. Still, only the human eye produces the unity of action. Hence, perceived "Boldness" in the child's behaviour leads to *"Unawareness"* In the demonstrated recognition task, fear of height is non-essential. Absence of sensitivity results in "Unconstraintness". It follows that the negative affordance of the ecological invariant is without impact.

Up to now, the thematic implication of the developing adiabatic trajectory suggests that the affordance character is mentally insignificant. There is virtually no natural clue to *"Danger"*. Unaware of the consequences, the textured surface has for the child lost its "ecological gradient". This constraint marks the movement toward "depth" as unrestricted. Thus, development of meaning connects to the judgement of consequences.

Finally, the pictures exhibit the placement of the child's mother into the experimental context. Clearly her attractiveness for the infant makes him vulnerable. Finally, the terminal state "Vulnerability" constrains the possible outcome toward *"Uncertainty"*. In a sense, *"Uncertainty"* about the child's movements verifies non-consciousness of depth.

The observed movements depend on the location of the singularities in the work space. For an unlimited surface, like the texture of a text, their equidistant representation is a useful step despite its obvious limitations. However, associated with constant distance, this strategy creates a frame of reference, that allows the connection of a metric to the frame. The functional scale of any two singularities of the adiabatic trajectory is obtainable from the marginal means. The corresponding physical estimates are available in the Error Sum of Squares (ESS). The intersections of the mesh system define the distance as a scalar. It gives expression to "minimal loss of information". Adding the measures of distance gives a spatial transformation of the information contained in Figure 3. Table 5 achieves the metric form.

The approach of Table 5 has the mathematical advantage of providing a rea-
sonable zero-base for the grouping of two identical strings of graphemes. No loss of
information is the case when the metrical coefficient is equal to (ESS = 0). It follows
that variations in the horizontal and vertical dimensions give rise to an uneven distribu-
tion of the ESS-values. The systematic variations from one intersection to the other
depend on two independent factors. The first factor introduces the mesh as time inde-
pendent system. The other factor is time dependent, because it relates to the intrinsic
properties of text building behaviour. Moreover the conserved volume of the ensemble

Table 5.

The Grid of Figure 3: ESS-Values

Figure	.1	.2	.3	.4
.1	*	8.00	*	*
.2	.00	9.82	*	*
.3	.00	11.69	34.37	.00
.4	.00	13.64	30.69	.67
.5	.50	16.50	26.88	1.75
.6	.00	19.26	22.09	*
.7	*	*	.00	*
Ground				
.1	*	11.00	*	
.2	.00	12.86	*	
.3	*	*	*	

occupying a certain region in the language space remains constant. What is changing is
the "Gestalt". A changing Gestalt is the result of various deformations of the work
space. The uses of two kinds of zero values illustrate broken surface regularities. The
first one represents zero distance between two points. An (*) is indicative of the other
kind. It marks an open intersection in the work space. The interval of (0,1) limits the
co-ordinates of this space. Stressing and straining the joints and strings involved, ap-
pears in the development of movements in that space. The following figures will show
the result of this straining and stretching.

The Transformation of Conserved Energy

The Schema axiom captures the unifying aspect of perception and action. It is
the conceptual tool for integrating temporarily separated movements and events. The
behavioural endowment of an organism accommodates the roots of the Schema. Piaget
(1978, p. 254) states it very clearly when he writes that "the roots of such schematism
are innate whichever way you look at them". Hence, the idea, that the Schema exists as
biological device that unifies perception and action. It develops before any thought or
idea of "self" (Self-identity) has developed. The discussion of Figure 3 demonstrates
that wholeness implicates order. The coherence in it is persuasive. It is an example of
the argument that the preservation of a Schema has no need for a memory. The
Schema of an action is "the quality in that action" (Piaget, 1978, p. 187).

In a kinematic sense, quality is the natural basis for the interpretation of the in-
volved processes. Figures' 4a and 4b show the intrinsic curvatures of the adiabatic

trajectories. Internal processes structure language as system. It follows that physical processes are self-organising as well as self-referential. If and only if self-reference is

Figure 4a.

Behaviour Space of A1S1: F-Holophor
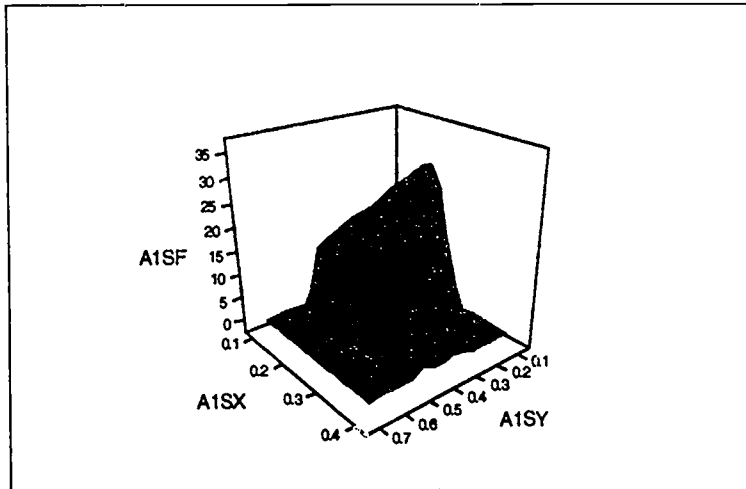
Figure 4b.

Behaviour Space of A1S1: Gr-Holophor
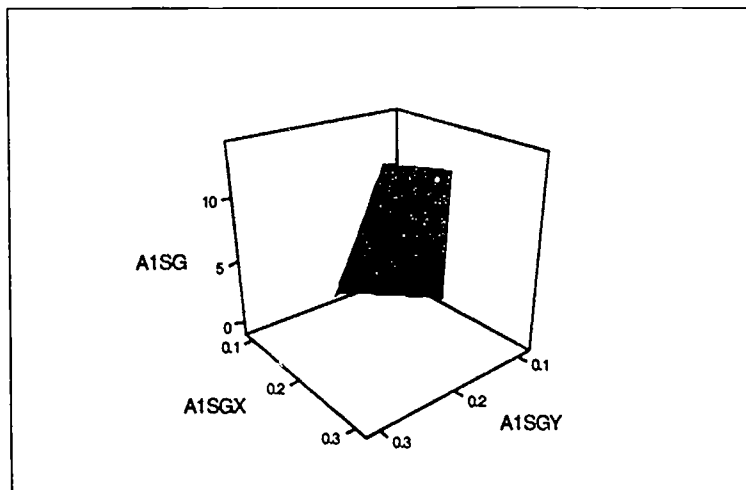
detectable, is the analysis of text building behaviour useful. Textual cues connect to the potentials that shape the metric of text building. Coefficients of the potential define the form of the work space. Work distributed over the observed mesh system produce highly specific pathways. Pathways become apparent through viscous-elastic struc-tures. These structures specify the deformations. A co-ordination of singularities identifies the structural relations. Likewise, their spacing and timing define the physical basis of the equilibrium states of the language system. Change in their positions and their timing changes the character of the surface of a particular co-ordination. Intrinsic space-time geometries manifest co-ordination as a "Gestalt". The Gestalt of a text is

ᴜe outcome of kinematic interactions in which flows of information provide for the description of unique time-morphologies. It follows, that intentional behaviour is neither non-existent (open intersections) nor constant.

The behaviour of the "Snake" generates a certain volume flow with its characteristic topological invariants. Figure 4a illustrates the path of the Snake. Stable saddle points specify the path of locomotion everywhere in the flowing volume. Biological system and environment differentiate the form of the surface of the behaviour space reciprocally. Embedded thematic coherence is a consequence of the twofold interaction between textual kinetics and informational kinematics. What has developed is a smooth path that forms a crater. Obviously, coupling of forces to flows produce a mantel that surrounds a centre. Structurally appears an oval configuration that encloses an open space. Its development reflects an attention to broken symmetries in the environmental conditions. Broken sides of the mantel reflect this asymmetry. It is visible that the crater lacks solidity. The global state attractor of the picture series locates the aim in the depth of the open space. Consequently, the "Virtual Cliff" remains in the dark of the crater.

The surface of the Gr-Holophor provides the reason concerning the location of the saddle point in the open crater. The Ground appears in Figure 4b as a cutting edge associated with a very steep fall. Both are indicative of a thrusting and thus vulnerable child that not yet has grasped the ecological validity of a steep fall. An intentional egomotion has perceptually not yet matured into an ego-orientation.

The Assumption of Equifinality

That language must be treated literally is the firm position of the true believers in philosophy and linguistics and especially in cognitive science. Closeness the bearing idea in their discussions. They react intolerant to the non-literal conceptions because men-made or artificial systems are the ideal. Metaphoric approaches, whether they concern theories of language or language in use are suspicious. Bertalanffy (1950) concept of "equifinality" makes a profound difference in the study of language as a non-mechanistic system. Equifinality show up in the form of growth. Different informational specifications of the visual cliff are growing. Growth implicates that the same global attractor state is reachable on different detours. The significance of the concept of equifinality is captured in the following hypothesis:

Text building behaviour transforms its direction toward identity.

The transformation that comes about through text building in English is the point of departure for testing equifinality. The most significant expression of the second law of thermodynamics is the behavioural development toward the same or at least a very similar global state attractor. Figure 4 gives the informational specifications of the structural configuration of the English text. What remains invariant of the structures undergoing change is evident in their identity. The similarity of both global state attractors mirror identity of the counterpart. In comparing the outcomes of Figure 3 and 4 respectively, it is immediately perceivable that a number of positional changes have appeared during transformation. The initial terminal state is a clear demonstration of a change in the style of approaching the sequence of the pictures.

The name of the first state "Boldness" marks a transformational step toward behavioural and thus more abstract terms. Fearlessness and readiness to take risks are integrative components in "cognitive motion". The next following step confirms a

turning toward the more abstract behavioural expressions. "Denial" is a state that signals a negative reply to the request of the lure. Thus, a certain aggressiveness lies in the refusal to comply or satisfy the demands of the mother. It is only logical that the first state attractor *"Obstinacy"* establishes an instance of stubbornness. More precisely stated, in the presence of the mother, it is an expression of difficulty in one's managing control over the environment.

Figure 4.

The F-G Holotopic of Twin 1for the English Text
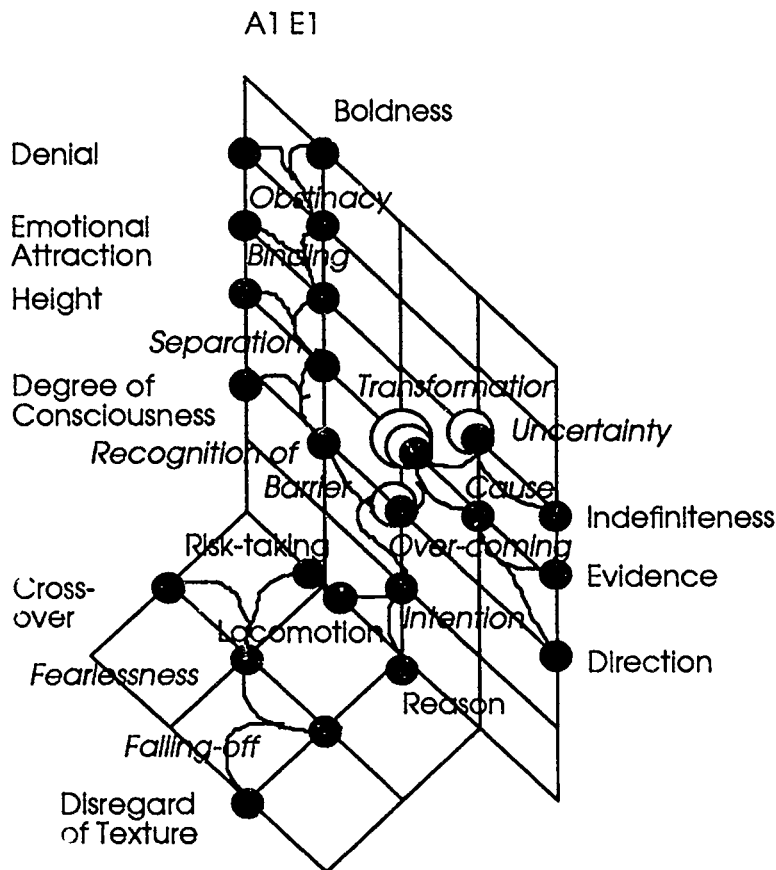
This difficulty becomes even more pronounced when the process transits through the state of "Emotional Attraction". It is namely the early mother-child relationship that shadows an appropriate mending of the situation. The more emotionally saturated the greater is the stress that prevents adjustment to the experimental conditions. This fact gets its manifestation in the term *"Binding"*. The term is a condensing step on a path toward a solid state of mother-dominance. In other words, impatient maternal over-protection suggests a too dependent and symbiotic relationship. From a mental point of view it means non-preparedness with respect to the transformational step required to change "ego-motion" into "ego-orientation".

Closely associated with the absence of the expected transformation is the conception of "Height". Since this state governs the process towards avoidance-behaviour, it follows, that the term *"Separation"* enters anxiety into the path. Consequently, relat-

ing "Height" to the stress of *"Separation"* refers to a twinning of egomotion. The latter relates to the general experience of distress.

The progressing snake reaches a turning point when the "Degree of Consciousness" sways the path toward the *"Recognition of Barrier"*. At this point an effort of the observer becomes evident. Discriminating the physical attraction of the visual cliff from the emotional attraction of the mother is the perceptual demand. The *"Barrier"* singularity refers to assertiveness. Boundary-like properties of the cliff are the point of convergence.

An indication of a thematic differentiation appears with the emergence of a second path. This path originates in the state "Locomotion". Ecologically seen, it means that an organism, when it can move, also is able of picking up transformational invariants. From this point of departure, an invariant is obtainable through transiting the state *"Reason"*. The term suggests itself as the basis for action. Meaning is equal to the "offer" of the glass surface. It follows that *"Intention"* is the necessary transformational step.

A saddle point comes into existence at the intersection, where the second path meets the first. This situation identifies two paths that are developing independent but sufficiently close to each other. Their oscillations constitute a harmonic flow field that develops within the perceptual limit of the text producer. The new type of singularity that emerges in the flow field geometry conserves meaning in *"Over-coming"*. Thus the interaction of the two paths has resulted in a saddle point singularity whose location is midway between the first and the second path.

A sudden jump into a new thematic divergence seems to be attributable to an intensive examination of the experimental conditions. A change appears in the "Direction" of attention. Perceptual evidence acquires a *"Cause"*. This *"Cause"* is understandable only as a naturalisation of intentionality. It is the consequence of an attraction that includes the effect of the experiential circumstances. Their behavioural as well as their perceptual integration during early childhood determine the security radius for locomotor activity.

Again, a developmental shift is observable, when the third path transforms *"Over-coming"*. The inclination of the path changes toward a possible detection of a surface invariance. By this move, the head of the Snake comes close to the ecological significance of the cliff. Unfortunately, the final step does not allow any specification of the nature of change, because "Indefiniteness" constrains the term *"Transformation"*. Comprehension of the pictures series is of an uncertain nature. It means an inability of extracting or abstracting the ecological invariant lying in the texture. It follows that *"Uncertainty"* is the essential basis of the global state attractor. In conclusion, the virtual nature of the visual cliff remains in the dark. Intentional use of actual but abstract relations are out of reach.

The affordance of an object or event, according to Gibson (1979), relates the importance of the environment to the perception of the organism. By necessity, it is the Ground component that reflects the reason. Reason constitutes also the crucial problem of how to measure the result of an ecological information pickup.

The terminal state "Risk-taking" indicates a testing of the infants behaviour on the visual cliff. By transiting through the terminal state "Cross-over", a developmental shift into *"Fearlessness"* becomes obvious. It follows that locomotion does not necessarily correlate with the edge of a cliff. Since the intention of survival among species shows up most significantly in negative emotional reaction, fear of height is the naturally expected outcome. "Disregard of Texture" indicates unawareness of the conse-

quence of *"Falling-off"*. From the path, developing in the Ground, it is evident that the typical avoidance behaviour on the cliff is absent. The event on the cliff has shifted the observer's perspective. The essence of the produced Figure is *"Uncertainty"*.

In summing up, neither in Swedish nor in English are any difficulties evident in describing the picture series. An inspection of Figure 1, suggests that the activity of text building in either language is independent of any particularities of the process of writing. Determining of the outcomes of writing is the textual organisation. It demonstrates that a movement in a text cannot be understood in terms of some nuances in the operation of writing. On the contrary, textual movements and their co-ordination depend on the schematism of language that structures the simultaneous co-operation of all operations.

The Independence of Topography and Structure

Clear reference to movement as the fundamental component in the process of perceiving and communicating the structures of the world, prescribes neither reference to any concrete nor image-like form. The same applies to the points and frames or any other surface features of the logical formalists. On the contrary, the concept of structure refers to formless and transcendental invariants, whose coherent relationship concerns the meaning of a given expression. The most important aspect of coherence is its indication of intention and orientation. The Schema axiom makes use of both and constitutes the foundation of an algorithm that builds on self-reference. Modelling self-reference in topological terms made it possible to communicate extracted ecological and perspective invariants. Associated with these invariants are potentials that presuppose a form of organisation. Inevitably values or potentials must exist in some form. Localising and specifying their particular form must agree with the identified form.

But this form is different from the geometrical lay-out of potential energy. A spatial layout gives the distribution of conserved energy, but the location of the functionally existing points concerns the coordinative structure of the movements. It is specifically the "oscillation" in the phase space that generates the underlying relationship. Clearly, the topological singularities are dependent on phase transition but independent and thus non-identical with the spatial distribution of conserved energy. The detection of structural invariance specifying the identity of the structures that undergo change, can help to overcome the "thing-perspective", that is the all too concrete way of viewing the problems of measurement. It follows that the topological problem, related with the control and presentation of movement co-ordination, clearly exists, but it is unrelated to the attempted analysis of movement and displacement in text production. What seem to facilitate the comprehension of the structures of movement are the quantities given in Table 6.

By relating a metric of movement to the Euclidean geometry, scale and position of the movements become available in the phase space of a particular text. The way the process of text building brings about the movements, determines the gradual transformation of internal structures. Successive differentiation of the viewpoints and their perspectivation (in the form of a redistribution of energy) has led to the paradox of the existence of self-indication. It means that identity is both cause and effect of itself. This paradox is the defining characteristic of the Scanator. With its algorithm of self-reference, identity of structure as global state attractor is possible to demonstrate beyond the common opinion held by logical orthodoxy.

Table 6.

A1E1: ESS-Values of the Grid

Figure	.1	.2	.3	.4	.5
.1	*	7.00	*	*	*
.2	.00	8.80	*	*	*
.3	.00	10.67	*	31.29	.00
.4	.00	12.57	26.73	2.40	.00
.5	.00	14.50	21.05	*	.67
.6	*	*	3.60	*	*
.7	*	1.33	.50	*	*
Ground					
.1	*	5.00	*	*	
.2	.00	6.75	8.60	*	
.3	*	*	.00	*	

Transport processes mark the distribution of conserved energy. Any potential is a source for localising structural relations. The quantities, given in Table 6, are the indicators of instability. The focus of discussion is on the involved energy transportation. Any powerful analysis is fundamentally the result of affinity between levels. Characteristic of the topographically presented structure of movement is that the co-ordinated space for the movements resembles a rock on the top of a mountain. The effect is the shape of a rocky mountain. This mountain stratifies in levels of altitude, embedding the sub-structures of the analysis.

The edge of the rock is a mark of *"Uncertainty"* or difficulty. The adjacent level is a logically dependent shelf that constitutes thermodynamically a field where energy is transformed. Locomotor *"Transformation"* implies the informational specification of this level of altitude. The neighbouring state attractors are defining a "saddle

Figure 5a.

Behaviour Space of A1E1: F-Holophor
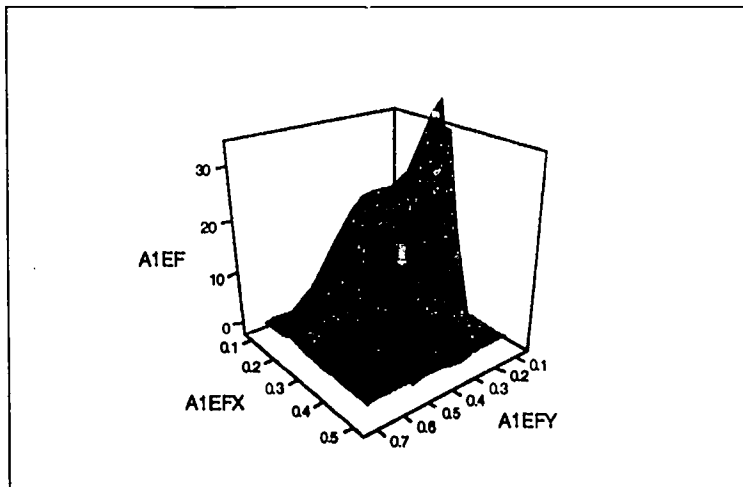
point singularity" that is located below the summit of the mountain. The shading indicates the reappearance of an open surface. It is like an encircled lake inside the nearly closed basin formation of the mountain. In strictly thermodynamical terms, the singularity of this saddle point is in the flow field of the lake that keeps the significance of the negative affordance in the darkness of the lake. Reason becomes evident by ringing successively together stabilities and instabilities. The concern of the Gr-Holophor is the infant's reason of moving relative to his surrounding. By the completion of a roof, the phase space of Figure 5b defines uniquely its affordance. The singularities supporting the roof are specifying a dome. It is indicative of a fearless movement, because of the involved risk-taking. Through a materialisation of the boundary condition "Disregard of Danger" perception conveys a certain flavour of loftiness. This is also the visual impression of a kind of "Under-stand" that is the form of the dome.

Figure 5b.

Behaviour Space of A1E1: Gr-Holophor
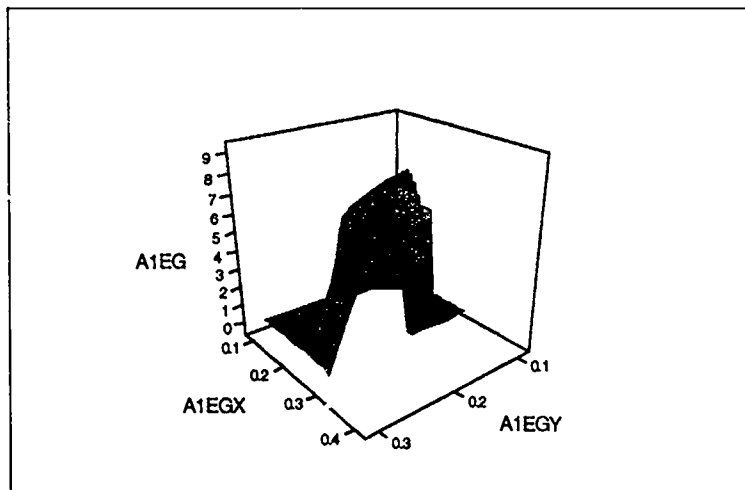
The Transformation of Co-ordinate Space through Biological Systems
An answer to the questions of what is knowable, and what is understandable is relative and meaningful only in the presence of coupled biological systems. An independent consideration of similarity in biological systems is entirely senseless. It is conceivable that dizygotic twins are similar in their sharing of similar methods of reading and writing. Similar (conservative) reactive forces produce similar informational invariants in the presence of similar transformational mechanics. Under these circumstances, locomotor transformation produces similar concepts. The conjecture is that concept similarity is demonstrable as long as both systems move in the same style. The physical context of the first scale transformation allows a comparison of the two systems that shows a sizeable albeit insignificant effect. The other comparison concerns the second scale transformation. The established viscosity indicates a very large and significant effect. Furthermore potential processing indicates elastic differences, albeit not significant. Taking note of the established differences encourages a continued similarity analysis. The purpose of the next step is a repeated analysis. It appeals to the

coupling of open systems dynamics with geometry and topographic representation. An information rich environment always provides shifts between ecological conditions.

The goal now is to extent the similarity analysis by studying the other member of the pair of twins. The starting point is Figure 6.

The experimentally modified surface simulates a cliff. Lack of confidence in the function of the cliff is the natural source of "Mistrust". Necessarily integrated in the process of becoming aware is an understanding of the meaning of the cliff. In order to demonstrate growing awareness through locomotion, the mother of the child enters the pictures as "Lure". Successful performance of luring the child into action intimates that the "action function" transforms the process into *"Deception"*. The functional proper-ties of dynamic interaction include the possibility of extracting successfully the affor-dance of the cliff. Though, the mother's intention of misleading the child via deliberate misinformation is obviously confounding the meaning of the cliff.

The infant's observation points are shifting experimentally through variations in "Placement". Evoked changes in perspective implicate a *"Challenge"* of the infant. He is forced into a decision making situation. The influence of the contrasting sides, defin-ing the cliff, depends on the mother. *"Dependency"* intrudes at this point the develop-ing path. Its direction is now toward a determination of the child's *"Self-confidence"*.

Figure 6.

The F-G Holotopic of Twin 2 for the Swedish Text
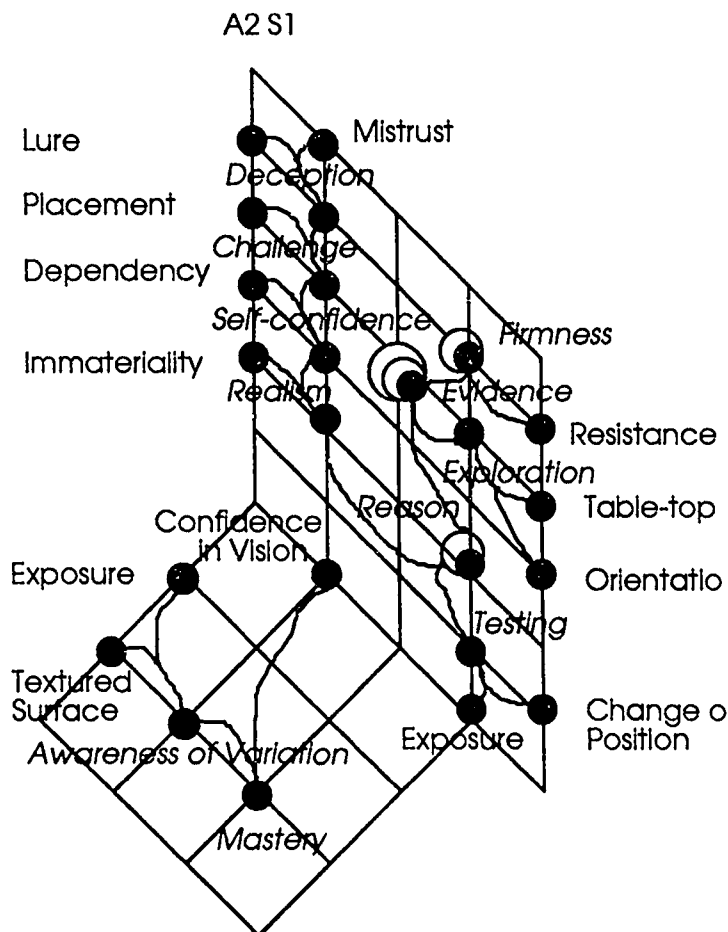
In an evolutionary perspective, this singularity captures the perceiver-event involvement. It signifies the decisive power of the awareness analysis. Gibson (1979) formulates the problem of awareness as follows:

"To perceive is to be aware of the surface of the environment and of oneself in it".

"Immateriality" in the Gibsonian sense concerns a problem that arises out of the contrast between perception of information and misinformation. Perception recounts "Realism". The existing surface represents realism at any point of observation. Only misinformation can lead to misperception.

It seems quite natural that an hysteresis appears at this moment. A sudden jump into the second path enriches reality and makes the path more informative. More information becomes extracted as the observer explores deeper into the experimental design. A perfectly reliable and autonomous *"Testing"* mechanism exists within the perceptual system. Gibson calls it "information pickup".

"Exposure" to a surface refers to an accommodation to changing environments. "Change of Position" invokes a scanning and fixation of the surface that makes the surface clearer. The importance of the terrestrial context lies in the fact that perceptual awareness concerns reality that is different compared to the unreal. At the intersection where the first path meets the second, a singularity comes into existence that transforms the system into a state of *tuning* to terrestrial patterns and slants.

"Reason" hints the ground that is the terrestrial properties taken with reference to an observer and not as properties of the experience of that observer. This state has consequences for locomotor transformations. Any point in the terrestrial environment is not only a possible point of observation but also a possible point for "Orientation". The observer must make use of his information pickup mechanism otherwise he cannot grasp the offer of the environment. The offer is the affordance of a cliff as represented by the "Table-top".

"Exploration" signifies acting according to processes, changes and sequences of events. When *"Reason"* becomes transformed by "Exploration", direct perception is demonstrable, concerning qualities of direction and relative depth of approached or approaching objects. "Evidence" of the autonomous functioning of the perceptual system results in *"Firmness"*. But "Resistance" constrains the detection of information of ecological significance.

The theory of Gibson gets support. "Resistance" establishes the "ecological" validity of the cliff. In this view, "Firmness" validates the existence of behavioural invariance that is measurable. In conclusion, if significant information is obtainable, then perception is the outcome, but if misinformation is present, then misperception is the inevitable result.

Clearly, the "Exposure" in the Ground initiates a path that suggests that the infant recognises constant objects or any other permanent arrangement of a solid surface. The state of a "Textured Surface" transforms the situation toward an *"Awareness of Variation"*. In some sense, this requires a locomotor adjustment to the place as a whole. By becoming aware of one's environment, something fundamentally different is at stake. It is different from mediating variables such as "cues" in perception and "conventions" in picture perception. How then can "Confidence in Vision" transform such a complicated behaviour into *"Mastery"*? Ecological optics gives the answer.

Gradients specify the optical texture surface and *"Mastery"* refers to the infant's perception of the possibilities of locomotion. It means that the infant has, genetically or not, visual space perception.

Table 7.

A2S1: ESS-Values of the Grid

Figure	.1	.2	.3	.4	.5
.1	*	5.00	*	*	*
.2	.00	6.75	*	28.14	.00
.3	.00	8.60	23.65	2.50	.00
.4	.00	10.50	*	*	.00
.5	.00	13.20	*	1.75	*
.6	*	*	*	17.89	.67
.7	*	*	*	.50	*
Ground					
.1	*	8.00	*	*	
.2	1.33	*	*	*	
.3	.50	3.60	14.14	*	
.4	*	*	*	*	

An exact representation of elaborated movements makes use of the quantities of Table 7. Understanding the textual system as a whole, requires an extended representation. Small variations in the involved distribution are important for fine attunements, but movement elaboration is the result of the co-operation of all nuances in the grid. To proceed beyond the present state, it is now necessary to pay attention to movement duration and time. The Figures 7a and 7b give their 3-D representation.

Figure 7a.

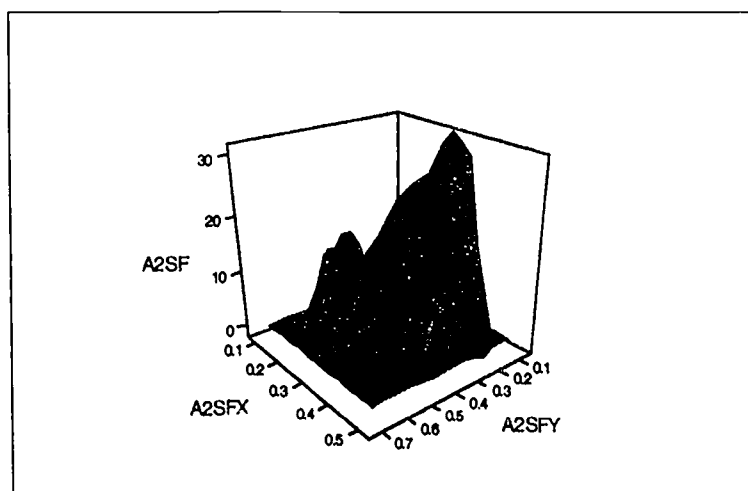*Behaviour Space of A2S1: F-Holophor*

Figure 7a reflects the configuration of a solid mountain with a front top and a top in the background. What is discoverable in these fields of the coordinative structures, is manifest in the slants of the mountain complex. The highest point represents behavioural strength or ruggedness. This imprint gets support by substantial proofs of the virtual (real) thing appearing at the end of the slop. Its attractor is localiseable in the basin. The basin gets its definite form through the other top. This other t· p marks what is logically obvious along the lines of localiseable structure. That is to say, movements are not chains of actions but structures that make the unknown familiar by differentiating it into detail.

In Figure 7b, the Ground appears as a cusp. The oscillating pendulum swings through confidence and mastery. Exposure to reactive forces constrains the swinging of the pendulum. Its particular movement supports developmental progress and appears as an involution. Involution is achievable on the basis of mastering behaviourally an abundant number of degrees of freedom (variation). Its effect appears at the base of the double-fold. The phase transitions generate topological invariants that shape a nook in the Ground.

Figure 7b.

Behaviour Space of A2S1: Gr-Holophor
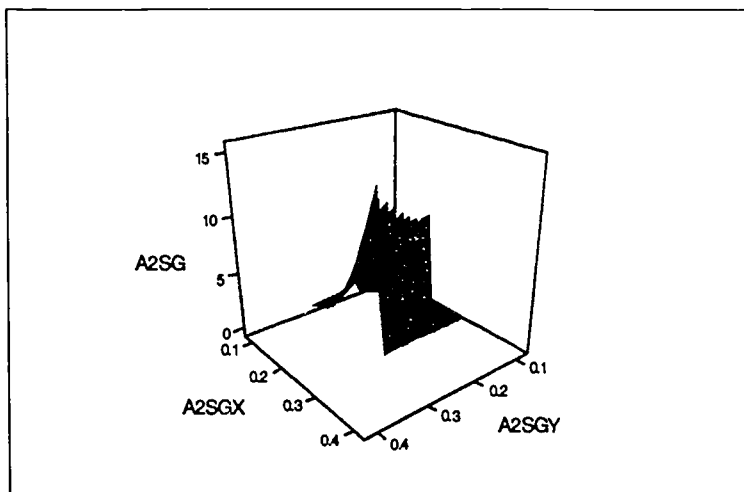
Figure 8 depicts the result of the second occasion of text production. The process starts with the initial state of "Reliance on Vision". The supposition captures initially that optical information processing is predominant. In the visual cliff, optical information competes simultaneously with haptic information. An experimental "Exposure" of a child to the table top, introduces the factorial variation of misperception.

Misperceiving the negative afford.nce of the glass validates a certain *"Keenness"* in the child's locomotor transformation. In contrast, the following step introduces penetrating behaviour. Penetration institutes an acute sensitivity to the sharpness of the cutting edge of the cliff. Relative to the child's body, unexpected height generates a state of "Surprise". It means that the outflow of optical texture area specifies the glass insufficiently (Gibson, 1979). "Surprise" has therefore an overtake in

the arising situation. It follows that the height of the cliff specifies a possible collision. Misperceiving the edge of the cliff is likely when its affordance provokes an "*Impending Collision*". The infant needs to perceive this information immediately, if "Exploration" shall help him to counteract a hang-over. The hang-over means a certain distance from the point of observation. Distance or depth perception includes "self-perception" and its transformation into "Visual Awareness". Perceiving the surface

Figure 8.

The F-G Holotopic of Twin 2 for the English Text

A2 E1

Reliance on Vision
Exposure
Keenness
Surprise
Impending Collision   Danger
Exploration   Intuition
Visual Awareness   Prospection
Challenge   Attraction   Alertness
Orientation   Probing
Path Finding   Excitement
Mistrust
Change of Position
Course   Placement
Locomotion   Approximation
Immateriality
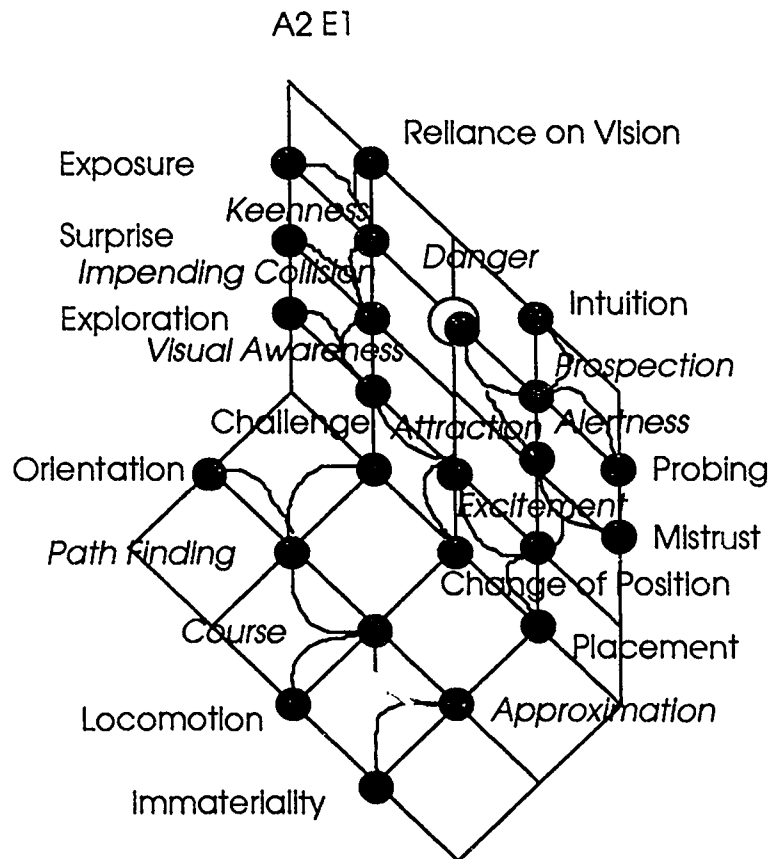
approximates visual awareness. Full surface awareness includes the layout of the cliff, the events on the cliff and the affordance of cliff. It follows that information pickup is susceptible to both development and experience.

"*Visual Awareness*" is a prerequisite for becoming "attracted". The material textures of substrata cause the attraction of the gradient of the optical texture. However, it excludes consciousness (Gibson, 1979).

The individual can change his perception of the substrata by changing his relative position. "Change of Position" is an activity. The child's reactive forces determine the degree of attraction of the "physical event" from which he may abstract the informational invariants. Thus, the abstraction of ecological information is changeable through changes in the displacements.

One of the apparent problems with an interpretation of the classical displacement results is the confounding effect of the mother. To remove the mother as the

confounding factor, various "Placement"-techniques have come in use. These techniques have no need for locomotor displacement. Instead, the infant's "reactive force" is measurable through his *"Excitement"*. Controlling the heart rates, visual attention and distress vocalisation shows to what extent very young infants discriminate the deep from the shallow side. Furthermore, the obtained results are independent of whether or not fear is manifest. However, if the meaning of an impending collision is threatening enough, young infants will show "Mistrust". The path gives expression for "vigilant attentiveness" at the singularity *"Alertness"*. In this view, the highest point of the path gives expression to mental responsiveness and preparedness for danger.

The jump into a new path introduces an experimental conduct to the quality of depth. "Intuition" is a most decisive test of knowing reality without the use of rational processes. Through the act of "Intuition" or immediate information pickup knowledge so gained has a sense of something not evident or deducible. The emerging invariant *"Prospection"* supports looking in advance forward or toward a possible collision. Ball and Tronick (1971) showed that symmetrically expanding shadows are specifying a thing that resembles solid objects. When on the mispath, shadows are non-dangerous, but on the path toward the "centre of the ego" they provoke sharp insight into their damaging effect. It means that they have ecological validity.

As a function of both changes in perspective and viewpoints, the global state attractor gives expression to *"Danger"* that is, in a certain sense, more abstract than is "Firmness". It follows that the configuration of the English text demonstrates a transformational shift toward more abstract concepts.

The starting point in the Ground is a call to engage and to use fully one's ability in the identification of the dangerousness of the cliff. In transiting the state of "Orientation" this ability can develop through changes of the objectives (viewpoints). Viewpoints interact with changes in the perspective of the acting organism. In the transformational step that follows, "Path Finding" emerges as the first state attractor of the Ground. Its attraction lies in the possibility of discovering a path in a yet unexplored terrain. Even at the first period after the onset of "Locomotion" no fear of depth or height is evident.

The Schema in the Kantian sense, is the supposed device for information pickup and for the judgement of consequences, provided that these are threatening enough for the survival of the organism (species). Optical arrangements of impending collisions of various types are in use. They are proficient in the demonstration of the "Course" of an approaching object. Independent of materiality or "Immateriality" for that matter, infants of only a few weeks of age can make a correct "Approximation" of dangerousness of approaching objects. This result supports the hypothesis of an in-built biological mechanism for immediate discovery of a threatening event.

The key lies in the Ground. Normal development of an organism requires intentional movements that structure and visually capture ecologically significant information. The very same mechanism for co-ordinating body-movement and sight is responsible for the development of text building behaviour. One conclusion is that visual capturing of information is the source of the fine attunements of writing into text what the observer saw. Table 8 reflects the presence of the necessary stabilities and instabilities. The values reflect a most accurate and non-interrupted performance, whose results cannot be foreseen in advance. The structural complexity of the Figure component acquires its shape in Figures 9a.

Table 8.

A2E1: ESS-Values for the Grid

Figure	.1	.2	.3	.4	.5
.1	*	3.00	*	.67	*
.2	.00	4.67	23.17	3.14	.00
.3	.00	6.50	*	16.00	.00
.4	.00	8.40	10.33	13.21	*
.5	*	*	.00	.50	*
Ground					
.1	*	5.00	*	*	
.2	.00	8.60	6.75	10.55	
.3	.00	*	.00	*	

The shape is the most important outcome of a successful co-ordination of perception and action. It is the result of movement development in a phase space. An observer can neither see nor can the text producer control this phase space. Detailed changes in perception do not result in corresponding changes in textual detail. A movement is always a response to a whole. It is the whole that responds to changes in angular articulation. For this reason, it is the strength in the strings that matters. The significant effect of Figure 1 makes this interrelationship perfectly clear.

Figure 9a.

Behaviour Space of A2E1: F-Holophor
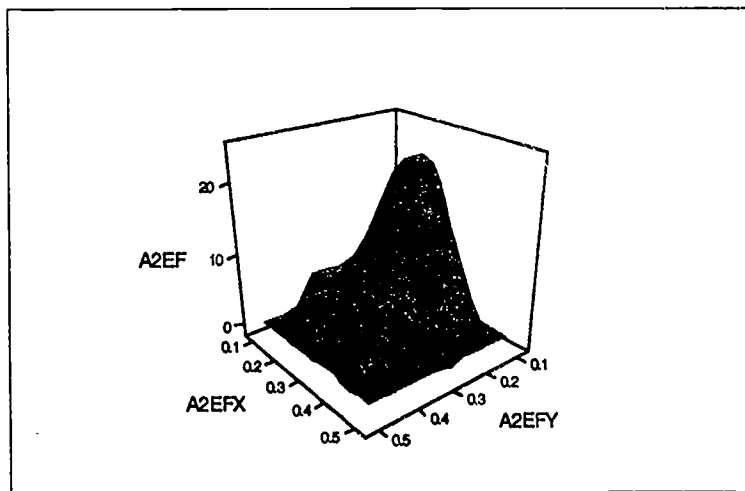
Co-ordination is an activity that guarantees that textual movements form into the structural unity of the Holotop. Formed macroscopically, Figure 9a presents a morphology of a refined text building behaviour. Compared to the Swedish text, the surface layout specifies a compactly folded mountain. The texture of the regions at the mountain marks the changes in the concentration of potentials. Occurring conceptual

changes are visible as shades. Shades indicate coarsely grained regions at the mountain. It is characteristic of the foot-hill that its configuration reflects the information that has its source within the individual. Alertness, excitement and attraction are the concepts that specify the hill. At the socle of the hill appear parts of the underlying morphology as a lower concentration of potential energy related to the visual system itself. In general acuity specifies the socle to the foot-hill.

An approach to the brink of the cliff constitutes the very top of the mountain. The generated global singularity identifies danger. Danger is always coupled to the top of a mountain. It follows that its texture must change sharply downward. The smaller the quantities become the more enclosed in the mountain are the substructures. Lighter shades indicate small amounts of potential energy. Geometry and architecture of the shades underscore the actual structure of the surfaces and the magnitudes of drop. Line of locomotion and point of observation have a clear-cut intersection. Higher conceptual strength suggests a successful reworking of the original text.

A coupling of Figure 9a with Figure 9b will contribute to a structural solution of the meaning behind the English text.

Figure 9b.

Behaviour Space of A2E1: Gr-Holophor
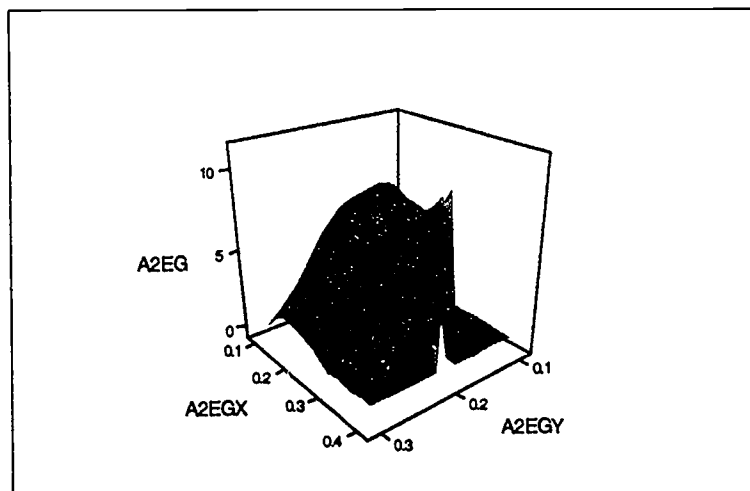
The arched structure of Figure 9b constitutes a safe place for locomotion. It indicates an achievement, specifically in connection with vaulting a text into text of higher conceptual concentration. The 3-D description shows a ground shaped as a saddle, whose strength is a function of the combined strength of saddle points making up its roof. The text producer has generated particular forces in order to approximate possible behaviour in the work space of the cliff. The slope midway between initial and final state marks the coupling of "Path Finding" with "Course".

Discussion

The resolution of the main question of the present experiment relies on the similarity experiment reported in B. Bierschenk (1995). Initially, similarity refers to properties defined over the MLT units of Table 1 in the Appendix. The definition of these units requires a dedicated approach to the "energy processes" (Feekes, 1976). In

the context of text production, comparison of the scaled processes builds on two leading hypotheses. The first has importance for a primary scale transformation. Primary scale transformation is responsible for a similarity analysis of the observed frequency distributions. It is also basic for a similarity analysis of the derived measures of viscosity and elasticity as reported in Table 2 of the Appendix.

Being reared together, and being of the same sex is, in contrast to monozygotic twins, no guarantee for similarity in performance. It may therefore not be unreasonable to expect that each twin in a dizygotic pair represents a biological system that comes from significantly different populations. Erlenmeyer-Kimling and Jarvik (1963) show that dizygotic twins account for only 15-25% of their common factor variation. Compared to the highly similar performance in monozygotic twins (B. Bierschenk, 1995), the likelihood follows that larger biomechanical variations will appear within the dizygotic twin systems as well as within their language production.

A next step in the analysis had consequences for the choice of the identity criterion. The power criterion was the natural choice testing the results of the primary scales and scale transformations. A large-size effect that is also significant appeared on the viscosity scale. But more important is its disappearance in the elastic component.

However, it is insufficient to evaluate the viscous as well as the elastic property of text building on the basis of conventional physics only. For several reasons, the second scale transformation describes the quality factor (Q) of the phase space.

The Q-factor is dimensionless. The Q-factor defines the distance over the intersections of the mesh system. The functional scale of any two invariants of the adiabatic trajectory (H) is obtainable from the marginal means of an ANOVA. The corresponding physical variables are available in common value of Q and H. The single ESS-value is a scalar. It gives expression to a "minimal loss of information". The location of an adiabatic invariant (H) is dependent on ESS > 1. For an unlimited surface, like the texture of a text, an equidistant representation of (H, Q) has been a useful step despite the obvious limitation associated with constant distance. In this mode, the mechanism operates on step-cycles of indefinitely many near-stable alternations. At the constant distance of (ESS = 1), mechanical as well as thermodynamic energy flows behave symmetrically.

The final step overpowers this strategy of creating a constant frame of reference. Elaborated metrical operations give expression to the angle of articulation and consequently yield lawful structural relations. This step matters the second scale transformation. It concerns the pendular function of the writing-rewriting mechanism. With regard to the two major questions, the working of this mechanism has produced two answers. Both have to do with the spacing and timing of the behavioural events in text building. It is the amplitude derived from spacing and timing that determines the shape of the language space. A first answer to be given, is that a certain shape is definite of the particular twin under investigation. The second answer relates to the morphology of a particular shape. A defining morphology may carry conceptual identity. Under this circumstance the resulting is profile not only characteristic of a certain twin, but also of his performance and independent of language characteristics. However, is conceptual identity absent, carry informational invariants the process into a refined abstraction.

References

Ball, W., & Tronick, E. (1971). Infant responses to impending collision. Optical and real. *Science, 171*, 818-820.

Bertalanffy, L. (1950). The theory of open systems in physics and biology. *Science, 111*, 23-29.

Bierschenk, B. (1991). *The schema axiom as foundation of a theory for measurement and representation of consciousness* (Kognitionsvetenskaplig forskning, No 38). Lund, Sweden: Lund University. (ERIC Document Reproduction Service, No. ED 338 650, TM 017 365)

Bierschenk, B. (1995). *A demonstrative definition of consciousness in monozygotic twins* (Kognitionsvetenskaplig forskning, No 55). Lund, Sweden: Lund University, Department of Psychology.

Cohen, J. (1962). The statistical power of abnormal-social psychological research. A review. *Journal of Abnormal Social Psychology, 65*, 145-153.

Erlenmeyer-Kimling, L., & Jarvik, L. (1963). Genetics and intelligence. A review. *Science, 142*, 1477-1479.

Feekes, G. G. (1976). Periodical systems of energies. *General Systems, 21*, 155-167.

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

Minsky, M. (1975). A framework for representing knowledge. In P. H. Winston (Ed.), *The psychology of computer vision* (pp. 211-280). New York: McGraw-Hill.

Piaget, J. (1978). *Behaviour and evolution*. New York: Pantheon Books.

Prigogine, I., & Stengers, I. (1993). *Das Paradox der Zeit (The paradox of time)*. München: Piper.

Simon, H. A. (1981). Cognitive science. The newest science of the artificial. In D. A. Norman (Ed.), *Perspectives on cognitive science* (pp. 13-24). Hillsdale: Erlbaum.

Thom, R. (1975). *Structural stability and morphogenesis*. Reading, MA: Benjamin.

Appendix

Table A1.

Dizygotic Twins and Languages: Observed Frequency Distributions

Dizygotic Text	Twin 1 Swedish	Twin 2 Swedish	Twin 1 English	Twin 2 English
Mass				
Grapheme	899	865	773	762
Space	190	193	186	183
Periods				
Marker (SM)	15	12	14	12
Marker (CM)	3	3	3	2
Tech. (TSM)	15	11	14	11
Length				
Block	42	41	43	38
Linkage				
A-dummy	23	28	25	26
O-dummy	14	12	21	16

Table A2.

Derived Volume-Elasticity Measures

Dizygotic Text	Twin 1 Swedish	Twin 2 Swedish	Twin 1 English	Twin 2 English
Volume	18.6883	18.5679	18.8060	18.1879
Flow	15.9803	15.0830	16.1669	15.7030
Inertance	-22.8919	-22.7304	-23.2031	-22.2348
Viscosity	-06.91165	-06.64741	-07.03613	-06.53177
Elasticity	-09.61970	-09.23232	-09.67518	-09.01668
Power	-08.59008	-07.90365	-08.55304	-07.86400

Twin 1: Swedish Text

Kan man gå på bara luft? Bildserien visar ett experiment. Vi ser ett barn och förmodligen hennes mor. Försöket går ut på att barnet ska ta sig från bordet till sin mor. Detta kan förefalla självklart, men i det här fallet förekommer ett visst hinder. Man har mellan det schackrutiga bordet och mamman lagt ut en glasskiva. Detta innebär att barnet i praktiken kan ta sig från bordet och över till målet. Höjdskillnaden från golvet till glasskivan är ca en meter, och skulle kunna avskräcka barnet. I bild tre i bildserien har barnet sin hand på glasskivan. Förstår barnet att det går att ta sig vidare eller stannar barnet kvar vid bordsänden? Svaret kan man se i bild fyra. Med förutsättning att jag inte vet resultatet av experimentet får jag grunda mitt svar utifrån den här bildserien. Som bild ett visar början av försöket ska bild fyra visa slutskedet. Eftersom barnet inte rört sig framåt från bild tre till fyra anta jag att "förståndet" säger barnet att inte gå över glaset. Man kan diskutera hur pass mycket förstånd ett litet barn har, men jag tror att någonting hindrar barnet från att fortsätta.

Twin 2: Swedish Text

Vågar en baby krypa på luft? Detta experiment som vi ser på de fyra bilderna speglar hur en baby hanterar olika oväntade situationer. På första bilden låter man babyn "värma upp" lite genom att krypa runt på bordet och känna på underlaget. Babyn skall nu sättas inför olika oväntade situationer och dess kreativitetsförmåga skall testas.

På bild två låter man den lilla babyn kravla bort till mamman när hon står vid en hög kant vid långsidan av bordet. Inga problem här inte.

På bild tre låter man babyn undersöka en glasskiva som är ihopsatt med och, placerad vid, bordets långsida. Babyn ser lite osäker ut och vidrör glaset för att undersöka vad det är men han ser hela tiden till att hålla kroppen på bordet.

På den sista och fjärde bilden har man placerat glasskivan mellan den högre kanten och bordet. Mamman står och lockar babyn att krypa över glaset och bort till henne, men babyn vill inte och vågar inte gå över glaset.

Min slutsats är att babyn inte har så mycket tillit till sin mor att han vågar gå på luft. Barnet litar alltså mer på sin syn än på sin känsel.

Twin 1: English Text

Can you walk on the air? These pictures show us an experiment. There is a small child and her mother I presume. The purpose of this experiment is to try and to find out if the child will walk over to her mother. This might seem obvious, but in this case there is a slight obstacle. Between the chess-checked table and the mother, there's glass. This means that the child could walk over to the mother without falling to the floor. Perhaps the height will frighten it. In the third picture the child has her hand on the glass. The question is: Does the child understand that she could go on walking or will she stay by the table-end. Presuming that I don't know the answer I have to base my result on these pictures. The fourth picture shows us the result in this experiment. Since the child hasn't advanced from the third picture it's my believe that something tells the child to stop walking. Of course I don't know how the mind of a small child works, but this is my believe.

Twin 2: English Text

This experiment that we see on the four pictures will determine how a baby handles unexpected situations.

On the first picture, the baby is "warming up" by crawling around on the table exploring the surface. The baby will now got through different situations which will test it's creativity.

On the second picture the baby is crawling over to the mother while she is standing at a high edge by the table. No problem here.

On the third picture the baby is exploring a glass board that is placed on the long side of the table. He is very careful not to slide out on the glass but he is touching it with his hand.

On the fourth picture the mother is standing over at the high edge with the glass board between her and the table. She is calling for the baby but he won't crawl over the glass.

My conclusion is that the baby doesn't trust his mother enough to walk on air. He therefore trusts his vision more than his sense of feel.