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Introduction to kenogrammatics

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Introduction to Kenogrammatics *

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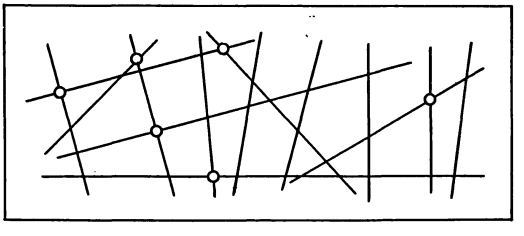
Summary: The origins of kenogrammatics are m-valued logic (*Günther*), complexe non-linear modern system theory and qualitative finite mathematics and cybernetic ontology. The foundation of kenogrammatics was developed by *G.Günther*. By using the kenogrammatic proemial-relation, these origins have a harmonizing effect leading to unity. Some topics are: qualitative counting, kenogrammatic equivalence relations, morphogrammatics, kenographs, kenogrammatic lines and cycles.

Kenogrammatics

If we look at the situation in different sciences, so we find, that the researchers concentrate on specific 'objects' or 'subjects'. Most of these belong to different qualities (for example, even in a single science like mathematics, topological spaces, groups, algebras ... are considered). If you ask for logical relations between the different subjects, the findings of scientists show a picture like this:



Every researcher has more or less deep insights in a *special subject*, what we call *objective science*. But there are less or nearly no general connections between the *different qualities* . But kenogrammatics looks on qualities and relates them by a qualitative (kenogrammatic) relation — the so called *proemial relation* [3,5].

In the theory of categories for example the mathematicians try to come to a better overview. They look on a *class of objects* O and a *class of morphisms* M and combine them by only 3 axioms to the term *category* K.

$$K := (O,M, \circ)$$

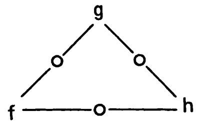
$\circ$ is a *connector* of morphisms, $m \in M$ connect the different elements of O (I am following here [10]). But if you sharply look at these operations, you see that they are still *thinking on a line* by constructing a *composition*

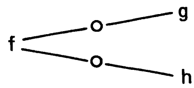
$$(f \circ g) \circ h$$

and they clustered it in pairs of *two* (they think it in the manner of a more than 2 thousand years old logic — the Aristotelian logic).

*In memoriam Gotthard Günther

Compositions like





are not allowed in the classic theory of categories. Although such relations are really necessary for biological models, you have to construct a *transclassical theory of categories*; one that is not only related to mathematics, but also to logic. That such a transclassical approach is constructable, I will show later.

Kenogrammatics is an approach to a harmonizing of

+ m-valued logic (in the sense of *Günther*),
+ modern system theory and
+ qualitative finite mathematics.

The *foundation of kenogrammatics* was developed by *G. Günther* [2] – whithout doubt for me, the greatest logician of the 20th century. Kenogrammatics had a lot of sources.

Sources of kenogrammatics

<table>
<tr><td>Qualitative counting</td><td>The dialectic logic of Hegel</td><td>Poly-contexturality for a theory of subjectivity</td></tr>
<tr><td>Morphogrammatics – a placed value system for many-valued logic</td><td colspan="2">The founding relation (Grundrelation) of Karl Heim, who related reflexions of natural science, philosophy and theology.</td></tr>
<tr><td colspan="3">Cybernetic research of Wiener, McCulloch, Ashby, v. Foerster,... .
An inter-disciplinary approach including mathematics and biology.
Questions of cybernetics lead to concepts of self-reference, self-organizing, ultra-stability ...</td></tr>
</table>

Because I held a lecture on the *Winter School of Abstract Analysis,* up to now I will summarize only the *mathematical technics* of kenogrammatics.

A. Qualitative counting

If we count, we step forward from one object to another. If we count a *Peano*-sequence, we count only strokes

	|	|	|	|	|	|	|	. . .	| (iterative = quantitative)
and name it also	1	2	3	4	5	6	7	. . .	n;
and if we count	A	B	C	D	E	F	G	. . .	Z (accretive = special qualitative)

so we count objects with the same property: either all objects are *equal*: counting by the same *stroke* (*Peano*), or all objects *differ*: counting of different classes. But there is also a way to count until n, if the objects are not all of the same kind or if they are not all different:

Example: n = 3

□	□	□	□	□
□	□	○	○	○
□	○	□	○	△
(1)	(2)	(3)	(4)	(5)

Table 1: qualitative counting until 3.

n = 4

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
1	1	2	2	2	1	1	1	2	2	2	3	3	3	3
1	2	1	2	3	1	2	3	1	2	3	1	2	3	4
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)

Table 2: qualitative counting until 4

(The used integers without brackets have only the meaning of symbols, the integers with brackets are natural numbers.).

The qualitative number sequences between iteration und accretition combine iterative and accretive counting. The table of Bell numbers shows the rapid growing of different qualitative number sequences.

n	1	2	3	4	5	6	7	8	9	10
B(n)	1	2	5	15	52	203	877	4140	21147	115975

Table 3: Bell numbers (sequence 585 in [11])

The Bell number B(n) counts how many qualitative number sequences exist.

$$B(n) := \sum_{i=1..n} S(n,i)$$

The Bell number is the sum of the Stirling numbers of the 2nd kind S(n,i), which gives the number of different linear patterns of length n, if i symbols are used.

For example is

S(4,1)	S(4,2)	S(4,3)	S(4,4)	B(4)
1	7	6	1	15

Later we will call these qualitative counting sequences a *tritogram* — one kind of 3 types of kenogrammatic numbers — and the single symbols in the sequence a *kenogram*. A tritogram corresponds to an automorphism in a finite set.

B. Kenogrammatic equivalence relations

1. Kenogrammatic lines (the simplest kenogrammatic structure).

Be ® a *reservoir* — a *kenogrammatic set* — of n symbols — called *kenograms.*

$® := [\![k_1, k_2, \ldots, k_n]\!]$ and be $g_1 g_2 \cdots g_m$ a sequence of kenograms. To get a canonisation (standard forms) of kenogrammatic sequences, we order the kenograms of ® in a *lexicographic order*:

$$®^* := [\![k_{(1)}, k_{(2)}, \ldots, k_{(n)}]\!].$$

The sequence $f_1 f_2 \ldots f_m$ is called a *standard representative* of a kenogrammatic sequence $g_1 g_2 \ldots g_m$, if

$$f_i < x \text{ for all } x \neq f_1, f_2, \ldots, f_i \quad (i := 1,2,\ldots,m).$$

Günther distinguished 3 different kinds of kenogrammatic sequences (lines) by using three different equivalence relations:

Trito-equivalence $\equiv_T$: for all i,j $f_i \neq f_j \Longleftrightarrow g_i \neq g_j$ e.g. the *position* in between the structure of n places is relevant.

Deutero-eqivalence $\equiv_D$: Only the *distribution* of used symbols in the structure of n places is relevant.

Proto-equivalence $\equiv_P$: Only the *cardinal number* of different symbols is relevant in the given structure.

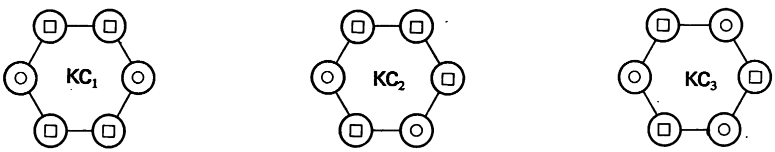
Examples for trito-, deutero- and proto-equivalence:

a b b c $\equiv_T$ b c c a $\equiv_T$ □ ○ ○ △   a a b b $\equiv_D$ a b a b $\equiv_D$ □ ○ □ ○   a a b b $\equiv_P$ a a a b $\equiv_P$ □ ○ □ ○.

! CAUTION ! : A kenogram is not a usual element of a usual set, like in set theory. A kenogram has no fixed identity. The only property it has, is that it is distinguishable from another kenogram and that it differs or differs not as a symbol from another. Kenograms *only 'exist'* on a structure together with a kenogrammatic equivalence relation. Or like *Günther* defined: 'A kenogram is an empty place which merely indicate structure which may or may not be occupied by symbols.'[5]. The terminus 'kenogram' is derived from Greek *κενοσ* (kenos). The inexhaustible reservoir $\circledR_n$ of at most n different symbols, is a new kind of set — a kenogrammatic set.

2. Kenogrammatic cycles

Also simple, but important structures are cycles. An example of kenogrammatic equivalence between kenogrammatic cycles is shown below:



distribution   4-2   4-2   3-3

$KC_1 \not\equiv_T KC_2 \not\equiv_T KC_3 \not\equiv_T KC_1$ $KC_1 \equiv_D KC_2 \not\equiv_D KC_3 \not\equiv_D KC_1$ $KC_1 \equiv_P KC_2 \equiv_P KC_3$

C Morphogrammatics - a place valued system of an m-valued logic

In the classic mathematical logic we use two truth-values T (true) and F (false). That leads to 16 different logical two-placed operations. F.e.:

disjunction

		q	
	$\vee$	T	F
	T	T	T
p	F	T	F

.

This is combined with the usage of *only two variables* p,q. All other classic extensions on more than two variables follow the *line scheme*: ((p,q),r) ⇒ (a,r) with a = (p,q). (Compare this with the composition in category theory). Where you have 4 places for a logical operation on two variables, also 4 values can arise. E.g. the following *rejection* operations can arise:

r	1	2
1	1	3
2	3	2

(1,2) → 3
(2,1) → 3

undifferentiated rejection r

r*	1	2
1	1	3
2	4	2

(1,2) → 3
(2,1) → 4

differentiated rejection r*

That means an *undifferentiated* or a *differentiated rejection* of the presented logical values. F.e., if you reject a question as being 'wrong', you need such an operation, because there is no third value in the two-valued logic which reflect this.The whole situation of the two-valued logic can be regarded in a kenogrammatic sense. Then f.e. holds TTTF $\equiv_T$ FFFT and the 16 operations of the two-valued logic can be reduced to 8 kenogrammatic patterns.

Günther called such a bloc of 4 kenograms a *morphogram*. If you close morphogrammatically the logical possibilities of two variables, then you get *8 classic junctions* and *7 transclassic junctions*

1	1	1	1	1	1	1	1
1	1	1	1	2	2	2	2
1	1	2	2	1	1	2	2
1	2	1	2	1	2	1	2

classic

1	1	1	1	1	1	1
1	2	2	2	2	2	2
2	1	2	3	3	3	3
3	3	3	1	2	3	4

transclassic

In a three-valued system of two variables you get a 3 x 3 kenogrammatic matrix KM.

$$\begin{array}{|ccc|} \hline \mathfrak{S}_{11} & \mathfrak{S}_{12} & \mathfrak{S}_{13} \\ \mathfrak{S}_{21} & \mathfrak{S}_{22} & \mathfrak{S}_{23} \\ \mathfrak{S}_{31} & \mathfrak{S}_{32} & \mathfrak{S}_{33} \\ \hline \end{array} \qquad \begin{array}{|c|c|c|} \hline \boxed{\mathfrak{S}_{11}} & \mathfrak{S}_{12} & \boxed{\mathfrak{S}_{13}} \\ \hline \mathfrak{S}_{21} & \mathfrak{S}_{22} & \mathfrak{S}_{23} \\ \hline \boxed{\mathfrak{S}_{31}} & \mathfrak{S}_{32} & \boxed{\mathfrak{S}_{33}} \\ \hline \end{array}$$

KM KM structured in morphograms

Günther constructed a place-valued system of an m-logic by interlocking morphograms:

morphogram I $\begin{array}{|cc|} \hline \mathfrak{S}_{11} & \mathfrak{S}_{12} \\ \mathfrak{S}_{21} & \mathfrak{S}_{22} \\ \hline \end{array}$ morphogram II $\begin{array}{|cc|} \hline \mathfrak{S}_{22} & \mathfrak{S}_{23} \\ \mathfrak{S}_{32} & \mathfrak{S}_{33} \\ \hline \end{array}$ morphogram III $\begin{array}{|cc|} \hline \mathfrak{S}_{11} & \mathfrak{S}_{13} \\ \mathfrak{S}_{31} & \mathfrak{S}_{33} \\ \hline \end{array}$

The 3-valued kenogrammatic matrix KM will be transformed into the place-system of morphograms:

$$\text{KM} \rightarrow (\text{MG I}, \text{MG II}, \text{MG III}).$$

If $n = 4$ you get $\binom{4}{2} = 6$ different morphogrammatic compounds of a 4 x 4 kenogrammatic matrix. In general: $\binom{m}{2}$ morphogrammatic compounds. With a place-valed system of morphogrammatic compounds you can organize an m-valued logic only by 15 morphograms ($n \geqslant 4$)

Example:

(vvv)		p		
		1	2	3
	1	1	1	1
q	2	1	2	2
	3	1	2	3

$\Rightarrow$ (MG I, MG II, MG III) := (v,v,v)

MG I := $\binom{11}{12}$:= v disjunction; MG II := $\binom{22}{23} \equiv_T \binom{11}{12}$:= v disjunction; MG III $\binom{11}{13} \equiv_T \binom{11}{12}$:= v disjunct.

By the way: With the rules of m-valued negators, it is possible to come from the 3-fold disjunction (vvv) to a 3-fold conjunction ($\wedge\wedge\wedge$):

$$(\wedge\wedge\wedge): \quad p \text{ vvv } q = N_{1 \cdot 2 \cdot 1}\, p \wedge\wedge\wedge N_{1 \cdot 2 \cdot 1}\, q) \quad \text{(see [5], page 234)},$$

That is the generalized *de Morgan-rule*. Also a stepwise metamorphose from ($\wedge\wedge\wedge$) $\rightarrow$ ($\wedge\wedge$v) $\rightarrow \ldots \rightarrow$ (vvv) is possible, a fact you never can produce by a logical system based on two values. But if you structure an m-valued logic in such a manner, you lose some sogical (kenogrammatic) possibilities. F.e. the number of different 3 x 3 matrices in the 3-valued case is

$$S(9,1) + S(9,2) + S(9,3) = 1 + 255 + 3025 = 3281;$$

but the number of different morphogrammatic representations for used values is 14 x 14 x 14 = 2744. That means you lose possibilities by structuring and restriction on 3 values (i.e. morphogrammatic incompleteness). For further information see [4,7,8].

D Kenographs

$$KG := KG(\,KENO(Str),\, PC(P, N)\,)$$

is called a *kenograph*, if it is

(1) $P := (P_1, P_2, \ldots, P_m)$ a set of m *positions* in an m-positional structure Str;

(2) Str a graph of $|P| = m$ knots (*structure-graph*);

(3) the *positions contexture* PC(P,N) — a second order relation — a graph on $|P|$ knots and $|N|$ edges (a graph on positions and negations);

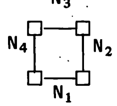
(4) $N := (N_1, N_2, \ldots, N_r)$ a set of r *kenogrammatic negations*, i.e. exchange relations on two positions P_i, P_j, which change kenograms on these positions

$$k(P_i) \xleftrightarrow{N_k = N_{ij}} k(P_j) \qquad k \in (1 \,..\, r);$$

(5) ® := $(k_1, k_2, \ldots, k_n)$ a *reservoir*, i.e. a *kenogrammatic set* of n symbols, called kenograms;

(6) KENO(Str) a *kenogrammatic structure*, i.e. a structure Str covered by kenograms of ®.

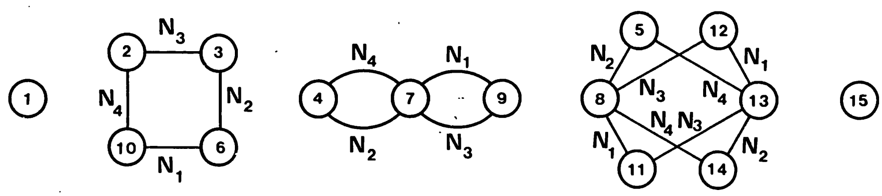
Example: Structure of kenograms Str := $\underset{P_1}{O} \to \underset{P_2}{O} \to \underset{P_3}{O} \to \underset{P_4}{O}$;



PC

There exist 15 different kenogrammatic coverings of Str (see table 2).

The kenograph KG(o→o→o→o, ) has 5 compounds C (like all kenographs of 4 positions):



C_1 C_2 C_3 C_4 C_5

Kenograph on 4 positions with line-structure Str and cycle-contexture PC

The numbers in the small cycles represent a 4-placed tritogram and corresponds to the natural numbers of table 2. More on kenographs, f.e. the number of compounds which are related to the distributions of kenograms on Str or — that compound C_2 always reflects the used contexture PC, you will find in [13]

E The proemial relation — a kenogrammatic relation

When *Günther* (1972) published 'Cognition and Volition' [3], only few people understood, that the in this contribution described proemial relation was a mile stone in qualitative mathematics. The first qualitative relation was operationalized. This new type of relation does not interlock different base relations, an *order relation* and an *exchange relation*, but also *simultaneously* operations of constants, variables and qualitative different relations. The proemial relation textured now in a harmonic way aspects of (many-valued) logic, system theory, cybernetics, dialectic and qalitative Mathematics.

To get a first imagination, how the proemial relation works, for mathematically educated readers may be useful the definition of a *graphograph*, which can be seen as a skeleton of the proemial relation. In graphographs — an extension of permutographs [12] and kenographs [13] — the hidden proemial relation appears by operating on these skeletons [14].

$$GG := (CT, X(Str), R^{Pr})$$

is called a *graphograph*, if it is

(1) $X := (x_1, x_2, \ldots, x_n)$ a finite (kenogrammatic) set (i.e. values, places, . . . , kenograms);

(2) $N := (N_1, N_2, \ldots, N_r)$ a set of r negations, i.e. a set of *exchange relations* on two $x_i, x_j \in X$ $(i \neq j)$

$$x_i \xleftrightarrow{N_s} x_j \qquad s \in (1 \,..\, r);$$

(3) $CT := (X,N)$ a graph on $|X|$ knots and $r = |N|$ edges. The *contexure* CT constructs the edges in every knot of GG (negationsystem);

(4) the *structure* $Str(X) := (X, \binom{X}{2})$ is a graph on X;

(5) X(Str) the set of all *coverings* ($x \in X$) of Str constructs the knots of GG.

(6) By the above 5 sets – the so called *proemial relation* R^{Pr} – which interlocks X, CT and X(Str) by two different basic relations – here an *order relation* $R_{\bigcirc}$ and an *exchange relation* $R_{\square}$ simultaneously is defined

$$R^{Pr} := R^{Pr}(X(Str), CT(X), R_{\bigcirc}, R_{\square}).$$

More details of the proemial relation you will find in [1,3,5] and were given 1984 [14].

F Kenogrammatic lines and cycles and Number theory

The cyclic *periodicity* of a kenogrammatic line expresses a connection between kenogrammatic lines and cycles. Kenogrammatic lines and kenogrammatic cycles in the compounds of kenographs give insights in the connected system of divisors of natural numbers.

Given is a kenogrammatic cycle KC and its *cyclic norm* CN. CN is the canonical representation of KC, e.g. the lexicographic first line pattern (the cyclic structure written in a line) of KC, which can be found by cyclic permutation. The single kenograms (symbols) are written as natural numbers. The *cyclic permutation* of a line representation of a kenogrammatic cycle leads to the periodicity p.

Example 1:

$$\underset{4.1}{\boxed{\begin{array}{c}1\\1\\1\\1\\2\\2\end{array}}}\quad \underset{4.2}{\boxed{\begin{array}{c}1\\1\\1\\2\\2\\1\end{array}}}\quad \underset{4.3}{\boxed{\begin{array}{c}1\\1\\2\\2\\1\\1\end{array}}}\quad \underset{4.4}{\boxed{\begin{array}{c}1\\2\\2\\1\\1\\1\end{array}}}\quad \boxed{\begin{array}{c}2\\2\\1\\1\\1\\1\end{array}} \equiv_T \underset{4.5}{\boxed{\begin{array}{c}1\\1\\2\\2\\2\\2\end{array}}}\quad \underset{4.6}{\boxed{\begin{array}{c}1\\2\\2\\2\\2\\1\end{array}}}\quad \underset{4.7}{\boxed{\begin{array}{c}2\\2\\2\\2\\1\\1\end{array}}} \equiv_T \underset{\equiv 4.1}{\boxed{\begin{array}{c}1\\1\\1\\1\\2\\2\end{array}}}$$

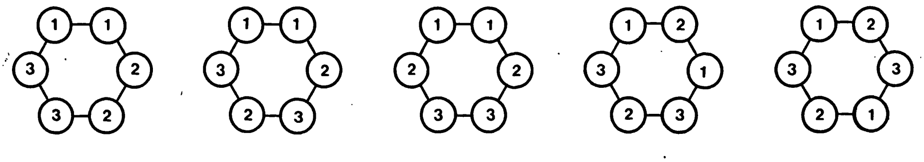
$CN(KC_4) := 1\ 1\ 1\ 1\ 2\ 2$;
the periodicity p = 6 was calculated by cyclic permutations of $CN(KC_4) := 4.1$.

Example 2:

$$\underset{12.1}{\boxed{\begin{array}{c}1\\1\\2\\1\\1\\2\end{array}}}\quad \underset{12.2}{\boxed{\begin{array}{c}1\\2\\1\\1\\2\\1\end{array}}}\quad \boxed{\begin{array}{c}2\\1\\1\\2\\1\\1\end{array}} \equiv_T \underset{12.3}{\boxed{\begin{array}{c}1\\2\\2\\1\\2\\2\end{array}}}\quad \underset{12.4}{\boxed{\begin{array}{c}2\\2\\1\\2\\2\\2\end{array}}} \equiv_T \underset{\equiv 12.1}{\boxed{\begin{array}{c}1\\1\\2\\1\\1\\2\end{array}}}$$

$12.1 := CN(KC_{12}) := 1\ 1\ 2\ 1\ 1\ 2 \qquad p(KC_{12}) = 3.$

Example 3:
The partition 2-2-2 with its tritogram number T(2-2-2) = 15 leads to the compound C_8 of
a) a line-kenograph KG(Line; PC) with 2 + 6 + 3 + 1 = 15 knots (kenogrammatic lines) or
b) a cycle-kenograph KG(cycle, PC) with 5 knots (KC_{20}, KC_{25}, KC_{27}, KC_{36}, KC_{40}).



	KC_{20}	KC_{25}	KC_{27}	KC_{36}	KC_{40}
p =	2	6	3	3	1

! All divisors of 6 appear only, if 6 is partioned into 2-2-2 !

The following table 4 show all 43 kenogrammatic cycles of length 6, in table 5 are the 43 kenogrammatic cycles ordered by the partitions of its coverings. p_i is the number of kenogr. cycles with periodicity i.

	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	3	3	3	3
	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3	3	3	1	1	1	4
	1	1	2	2	1	1	2	2	3	3	3	1	1	2	2	3	3	3	1	3	3	1	1	1	2	2	3	3	4	4	4	1	1	3	1	2	2	4	4	2	2	4	5
	1	2	2	3	2	3	2	3	2	3	4	2	3	2	3	2	3	4	3	3	4	2	3	4	3	4	2	4	2	3	5	2	3	4	4	3	4	3	5	3	4	5	6
p	*1*	*6*	*6*	*6*	*6*	*6*	*3*	*6*	*6*	*6*	*6*	*3*	*3*	*6*	*6*	*6*	*6*	*6*	*6*	*2*	*6*	*6*	*6*	*6*	*6*	*6*	*3*	*3*	*6*	*6*	*6*	*1*	*6*	*6*	*2*	*3*	*6*	*3*	*6*	*1*	*3*	*3*	*1*
KC-Nr	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43

Table 4: 43 kenogrammatic cycles of length 6 in lexicographic order; $p_1 = 4$, $p_2 = 2$, $p_3 = 9$, $p_6 = 28$.

C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}
6	5-1	4-2	4-1-1	3-3	3-2-1	3-1-1-1	2-2-2	2-2-1-1	2-1-1-1-1	1^6
1	1	1 1 1	1 1 1	1 1 1	1 1 1 1 1 1 1 1 1 1	1 1 1 1	1 1 1 1 1	1 1 1 1 1 1 1 1 1	1 1 1	1
1	1	1 1 1	1 1 1	1 1 2	1 1 1 1 1 1 1 1 1 2	1 1 1 2	1 1 1 2 2	1 1 1 1 1 2 2 2 2	1 2 2	2
1	1	1 1 2	1 1 2	1 2 1	1 1 1 2 2 2 2 2 2 1	1 2 2 1	2 2 2 1 3	2 2 2 2 2 1 1 1 3	2 1 3	3
1	1	1 2 1	1 2 1	2 1 2	2 2 2 1 1 1 2 3 3 2	2 1 3 3	2 3 3 3 1	2 3 3 3 3 2 3 3 1	3 3 1	4
1	1	2 1 1	2 1 1	2 2 1	2 3 3 2 3 3 1 1 1 1	3 3 1 1	3 2 3 2 2	3 2 3 4 4 3 2 4 2	4 4 4	5
1	2	2 2 2	3 3 3	2 2 2	3 2 3 3 2 3 3 2 3 3	4 4 4 4	3 3 2 3 3	4 4 4 2 3 4 4 3 4	5 5 5	6
1	*6*	*6 6 3*	*6 6 3*	*3 6 1*	*6 6 6 6 6 6 6 6 6 6*	*6 6 6 2*	*2 6 3 3 1*	*6 6 3 6 6 6 6 3 3*	*6 6 3*	*1*

Table 5: The number of kenogrammatic lines (p = periodicity) in kenogrammatic cycles related to compounds C of kenographs with 6 positions.

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	2	1	2	1	1	2	2	2	2	1	2	2
1	1	2	2	2	2	1	2	1	1	1	2	2	1	2
1	2	2	1	2	2	2	1	2	2	1	2	1	1	1
2	2	1	1	2	2	1	2	1	2	1	1	1	2	2
2	1	1	1	2	1	2	1	1	2	2	2	2	1	2
3.1	3.2	3.3	3.4	3.5	3.6	5.1	5.2	5.3	5.4	5.5	5.6	12.1	12.2	12.3

Table 6a: 15 kenogrammatic lines in 3 kenogrammatic cycles with distribution 4-2.

	3.1	3.2	3.3	3.4	3.5	3.6	5.1	5.2	5.3	5.4	5.5	5.6	12.1	12.2	12.3
N_1	–	–	–	5.4	–	5.5	–	–	12.3	3.4	3.6	12.2	–	5.6	5.3
N_2	–	–	5.3	–	5.4	–	–	12.2	3.3	3.5	12.1	–	5.5	5.2	–
N_3	–	5.2	–	5.3	–	–	12.1	3.2	3.4	12.3	–	–	5.1	–	5.4
N_4	5.1	–	5.2	–	–	–	3.1	3.3	12.2	–	–	12.3	–	5.3	5.6
N_5	–	5.1	–	–	–	5.6	3.2	12.1	–	–	12.2	3.6	5.2	5.5	–

Table 6b: Negation table for compound C_3 (4-2) of the kenograph KG(○→○→○→○→○→○,□.□.□.□.□.□)

(r.s means: r := lexicographic cycle number; s := line, which belongs to cycle r).
The following 3 figures represent 3 compounds of KG(○→○→○→○→○→○;□—□—□—□—□—□). The number of knots is calculateable from the distribution resp. deuterogram, to which every compound is related. (algorithms in [13]).

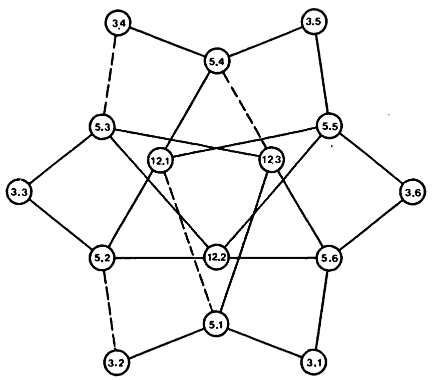


Figure C_3

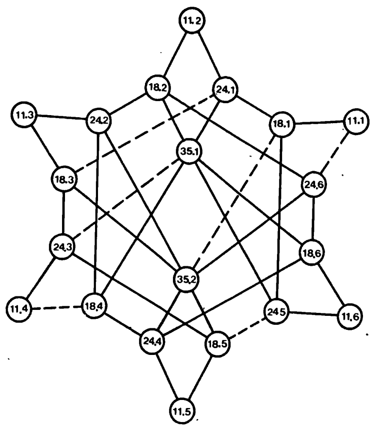
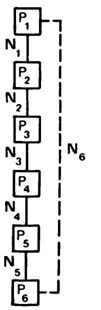


Figure C_7



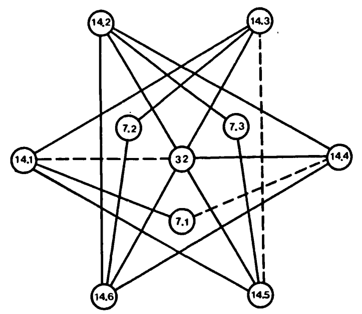


Figure C_5

comp.	deuterogram	distribution	knots	KC(p)
C_3	□□□□○○	4-2	15 = 6	$KC_3(6)$
			+6	$KC_5(6)$
			+3	$KC_{12}(3)$
C_5	□□□○○○	3-3	10 = 3	$KC_7(3)$
			+6	$KC_{14}(6)$
			+1	$KC_{32}(1)$
C_7	□□□○△◇	3-1-1-1	20 = 6	$KC_{11}(6)$
			+6	$KC_{18}(6)$
			+6	$KC_{24}(6)$
			+2	$KC_{35}(2)$

Table 7: Relations between lines and cycles

By the figures C_3, C_5, C_7 (3 compounds of a kenograph with a 6-cycle contexture) it is evident, that in the system of natural numbers, counting on a *line* is incomplete. If the line is closed by a *cycle*, the complete symmetry is given, e.g. the relations between integers include the *concept of cycles*.

G Some applications of kenogrammatic methods

Mathematics

Combinatorics: By kenogrammatic methods for kenographs turns out a connection between

* STIRLING numbers of the 2nd kind (proto- and trito-equivalence),
* number partitions (deutero-equivalence): $p = p_1 \cup \ldots \cup p_k \quad \Sigma_{i=1..k}\ p_i = p$,
* refined STIRLING numbers of the 2nd kind (trito- and deutero-equivalence), which are also related to BELL polynomials [13].

Graph theory within topology:

* homomorphy of kenogrammatic compounds [13],
* shortest and longest (max.) shortest paths and hamiltonian cycles in permutographs.

All these applications use extremely easy algorithms and are much more efficient than classic methods. F.e. : if one hamiltonian cycle is found, a family of other hamiltonian cycles can be calculated of this cycle only by using the concept of contextures.

Number theory: The proemial relation applicated on number theory leads to a relational network of the divisors of integers → *qualitative prime number theory.*

Logic: The extension of the conception of form, so that it is evident, that *GÖDEL's theorem* is valid only for special domains of formalisation ; post-gödelian theorems of formality [1].

Quantum mechanics: The double two-valued logic of quantum mechanics.

Cybernetic medicine: Volitron - a model of the *formatio reticularis* (the oldest parts of the brain) with permutographs [9,12].

Computer theory: Hard- and soft-ware for many-valued negations towards a non-v.-NEUMANN- or a non-ZUSE- or a non-TURING-computer.

Biology and social sciences: Logic and systemtheory modeled by qualitative number system for subjects (living systems).

Theory of relations: Non linear composed theory of categories.

H Final remarks

For biological model theory you need without doubt in any case:

* cycles (symbolisation of life)
* order relations (order in nature)
* exchange relations (for movements)
* distributed contextures — Güntherian poly-contexturality (a living being has its own subjective identity, but can only live, if there are other subjects with an own contexture).

The *proemial relation* of *Gotthard Günther* has all these properties, if they are used in a *process* (e.g. by acting). And so it is little wonder, that the first steps to come to
* self-reference * self-organization * super-additivity * multicentred designs of biological models *
* ultra-stability of systems are made.
They also appear in a brain model [13]. With the help of the proemial relation — a harmonization of qualitative mathematics, logic and system theory — it is possible, to arrive at a more biologically motivated development, especially with regard to vital cycle-research and structure-thinking.

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