

**Prof. Dr. Alfred Toth**

## **Elements of a surreal theory of the Night**

Zwar hat der Idealismus mit dem Gedanken des im ewigen Jetzt vollendeten Logos das metaphysische Bewusstsein des Abendlandes bis an die Höhe des absoluten Todes herangeführt. Bewältigt aber hat er diese Idee nicht, denn er spricht nur von der absoluten Logik der Gedanken Gottes. Von der Möglichkeit einer absoluten Ethik der göttlichen Existenz, d.h. von einer Metaphysik des Willens, weiss er nichts. Und nirgends (ausser in zusammenhanglosen Einfällen Schellings) ist sein Wissen von der Ahnung berührt, dass die durchsichtige Helle des reinen Begriffs, die wie ein sonniges Mittagslicht über dem reellen Leben des konkreten Bewusstseins leuchtet, ihren Ursprung aus der transzendentalen Nacht eines Willens, der noch nicht Entscheidung und deshalb noch nicht lebendige, durchleuchtete Wirklichkeit geworden ist, herleitet.

Gotthard Günther (1937, p. 45)

This work is my scientific last will. A.T.



PÁPAI MÁRTON: A POKOL KAPUJA

1. It is a strange fact, that the sign as a scheme of action, like the sign as a scheme of representation, both go back to Aristotle (cf. Trabandt 1989, pp. 79 ss.), but do not play any role in Peirce's and Bense's semiotics. However, it is perhaps not by chance, that a definition of the sign as a scheme of action is lacking, although the development of the linguistic theory of action falls into the beginnings of the development of theoretical semiotics. However, it is a fact that the sign, in the framework of semiotics, is primarily not a scheme of action, because in its most general definition action means the "changing of a state of world" (Heinrichs 1980, p. 22). But states of world belong, in the terminology of Bense (1975, p. 65), to the "ontological space" of the pre-thetic objects, but not to the "semiotic space" of the thetic signs. In other words: In Peirce's and Bense's notion of the triadic sign which is based on the monocontextual separation between signs and object and where objects can thus only appear as object-relations, signs cannot change states of world, since they, too, can only be perceived as signs. Therefore, according to theoretical semiotics, signs can change signs, and in order to do such changes, a theory of action is not necessary. Thus, in classical monocontextual semiotics, the theory of the semiosis substitutes a theory of action, because signs can never reach their transcendental object and cannot change ontological, but only semiotic states of world.

However, it is a fact, too, which is at least known outside of classical semiotics that signs can have effect out of their semiotic space and inside of the ontological space of the object, events, states, etc. For example, a command can start a war. But also the inverse process, thus the changing of signs by objects, is well-known. E.g., the better knowledge of high-energy physics has several times changes atomic models, which had already been believed as correct. Hence, if someone wants to construct a semiotic theory of action that goes beyond a linguistic theory of action based again on (linguistic) signs and that is powerful enough of letting signs influence reality and vice versa, then it is necessary to abolish the border between sign and reality, i.e. to replace monocontextual through polycontextual semiotics.

2. Such a model of a polycontextural semiotics has been displayed by the present author (Toth 2008b) under the name of “Pre-Semiotics”, because the sign model which is the basis,

PZR = (3.a 2.b 1.c 0.d)

contains the object, which is represented by the artificial or natural sign, as a categorial object (0.d) and thus settles one step before thetic semiosis, in the space between the ontological and the semiotic space.

Now I have already shown in Toth (2008a, pp. 177 ss.) that every triadic sign class has 6 permutations. Consequently, every tetradic sign class has 24 permutations. In Toth (2008c, pp. 220 ss.), I have further shown that each of these 24 permutations can be introduced as semiotic schemes of actions. Since each tetradic sign class has a dual reality thematic, we thus get for 15 pre-semiotic dual systems first  $15 \cdot 2 \cdot 24 = 720$  tetradic semiotic schemes of action. Furthermore, in Toth (2008c) it had been shown that a tetradic sign class has exactly the following  $4 + 15 + 24 + 24 = 67$  partial relations:

monadic partial relations: (.0.), (.1.), (.2.), (.3.).

dyadic partial relations: (0.1), (0.2), (0.3), (1.0), (2.0), (3.0), (1.1), (1.2), (1.3), (2.1), (2.2), (2.3), (3.1), (3.2), (3.3).

triadic partial relations: (0., 2., 1.), (0., 1., 2.), (1., 2., 0.), (1., 0., 2.), (2., 1., 0.), (2., 0., 1.), (3., 2., 1.), (3., 1., 2.), (2., 3., 1.), (2., 1., 3.), (1., 3., 2.), (1., 2., 3.), (0., 3., 2.), (0., 2., 3.), (2., 3., 0.), (2., 0., 3.), (3., 2., 0.), (3., 0., 2.), (0., 3., 1.), (0., 1., 3.), (1., 3., 0.), (1., 0., 3.), (3., 1., 0.), (3., 0., 1.).

tetradic partial relations: (3., 2., 1., 0.), (2., 3., 1., 0.), (2., 1., 3., 0.), (1., 2., 3., 0.), (3., 1., 2., 0.), (1., 3., 2., 0.), (2., 3., 0., 1.), (3., 2., 0., 1.), (2., 1., 0., 3.), (1., 2., 0., 3.), (3., 1., 0., 2.), (1., 3., 0., 2.), (2., 0., 3., 1.), (3., 0., 2., 1.), (2., 0., 1., 3.), (1., 0., 2., 3.), (3., 0., 1., 2.), (1., 0.,

3., 2.), (0., 2., 3., 1.), (0., 3., 2., 1.), (0., 1., 2., 3.),  
 (0., 2., 1., 3.), (0., 3., 1., 2.), (0., 1., 3., 2.).

We thus get totally  $15 \cdot 2 \cdot 67 = 2'010$  semiotic schemes of actions, which are polycontextural already because of the elimination of the discontextuality between sign and object and the embedding of the object qua categorial object into the sign relation.

3. In Toth (2008c), I have also shown that the pre-semiotic tetradic sign relation is complete regarding to epistemological, logical and ontological relation insofar as we have the following correspondences between logical relations and semiotic categories:

subjective subject (sS)	≡	Thirdness (interpretant relation, I)
objective object (oO)	≡	Secondness (Object relation, O)
subjective object (sO)	≡	Firstness (medium relation, M)
objective subject (oS)	≡	Zeroneess (quality, Q)

Therefore, we can display the above 67 semiotic-numerical partial relations also in the following semiotic-logical form:

Monadic semiotic-logical partial relations:

(sO), (oS), (oO), (sS).

Dyadic semiotic-logical partial relations:

((sO), (oS)); ((sO), (oO)); ((sO), (sS)); ((oS), (sO)); ((oO), (sO)); ((sS), (sO)); ((oS), (oS)); ((oS), (oO)); ((oS), (sS)); ((oO), (oS)); ((oO), (oO)); ((oO), (sS)); ((sS), (oS)); ((sS), (oO)), ((sS), (sS)).

Triadic semiotic-logical partial relations:

((sO), (oO), (oS)); ((sO), (oS)), (oO)); ((oS), (oO), (sO)); ((oS), (sO), (oO)); ((oO), (oS), (sO)); ((oO), (sO), (oS)); ((sS), (oO), (oS)); ((sS), (oS), (oO)); ((oO), (sS), (oS)); ((oO), (oS), (sS)); ((oS), (sS), (oO)); ((oS), (oO), (sS)); ((sO), (sS), (oO)); ((sO), (oO), (sS)); ((oO), (sS), (sO)); ((oO), (sO), (sS)); ((sS), (oO), (sO)); ((sS), (sO), (oO)); ((sO), (sS),

(oS)); ((sO), (oS), (sS)); ((oS), (sS), (sO)); ((oS), (sO), (sS)); ((sS), (oS), (sO)); ((sS), (sO), (oS)).

A triadic partial relation of a tetradic semiotic relation is a combinatorial selection of the four pre-semiotic categories (0.), (.1.), (.2.), (.3.) or (sO), (oS), (oO), (sS), respectively. I.e., we thus can either (0., .1., .2.), (.1., .2., .3.), (0., .2., .3.) or (0., .1., .3.) combine to triads. In doing so, we get the following  $2 \cdot 24 = 48$  permutations:

(0.d 2.b 1.c) × (c.1 b.2 d.0) → ((sO), (oO), (oS)) × ((sO), (oO), (oS))  
(0.d 1.c 2.b) × (b.2 c.1 d.0) → ((sO), (oS), (oO)) × ((oO), (sO), (oS))  
(1.c 2.b 0.d) × (d.0 b.2 c.1) → ((oS), (oO), (sO)) × ((oS), (oO), (sO))  
(1.c 0.d 2.b) × (b.2 d.0 c.1) → ((oS), (sO), (oO)) × ((oO), (oS), (sO))  
(2.b 1.c 0.d) × (d.0 c.1 b.2) → ((oO), (oS), (sO)) × ((oS), (sO), (oO))  
(2.b 0.d 1.c) × (c.1 d.0 b.2) → ((oO), (sO), (oS)) × ((sO), (oS), (oO))  
(3.a 2.b 1.c) × (c.1 b.2 a.3) → ((sS), (oO), (oS)) × ((sO), (oO), (sS))  
(3.a 1.c 2.b) × (b.2 c.1 a.3) → ((sS), (oS), (oO)) × ((oO), (sO), (sS))  
(2.b 3.a 1.c) × (c.1 a.3 b.2) → ((oO), (sS), (oS)) × ((sO), (sS), (oO))  
(2.b 1.c 3.a) × (a.3 c.1 b.2) → ((oO), (oS), (sS)) × ((sS), (sO), (oO))  
(1.c 3.a 2.b) × (b.2 a.3 c.1) → ((oS), (sS), (oO)) × ((oO), (sS), (sO))  
(1.c 2.b 3.a) × (a.3 b.2 c.1) → ((oS), (oO), (sS)) × ((sS), (oO), (sO))  
(0.d 3.a 2.b) × (b.2 a.3 d.0) → ((sO), (sS), (oO)) × ((oO), (sS), (oS))  
(0.d 2.b 3.a) × (a.3 b.2 d.0) → ((sO), (oO), (sS)) × ((sS), (oO), (oS))  
(2.b 3.a 0.d) × (d.0 a.3 b.2) → ((oO), (sS), (sO)) × ((oS), (sS), (oO))  
(2.b 0.d 3.a) × (a.3 d.0 b.2) → (oO), (sO), (sS) × ((sS), (oS), (oO))  
(3.a 2.b 0.d) × (d.0 b.2 a.3) → ((sS), (oO), (sO)) × ((oS), (oO), (sS))  
(3.a 0.d 2.b) × (b.2 d.0 a.3) → ((sS), (sO), (oO)) × ((oO), (oS), (sS))  
(0.d 3.a 1.c) × (c.1 a.3 d.0) → ((sO), (sS), (oS)) × ((sO), (sS), (oS))  
(0.d 1.c 3.a) × (a.3 c.1 d.0) → ((sO), (oS), (sS)) × ((sS), (sO), (oS))  
(1.c 3.a 0.d) × (d.0 a.3 c.1) → ((oS), (sS), (sO)) × ((oS), (sS), (sO))  
(1.c 0.d 3.a) × (a.3 d.0 c.1) → ((oS), (sO), (sS)) × ((sS), (oS), (sO))  
(3.a 1.c 0.d) × (d.0 c.1 a.3) → ((sS), (oS), (sO)) × ((oS), (sO), (sS))  
(3.a 0.d 1.c) × (c.1 d.0 a.3) → ((sS), (sO), (oS)) × ((sO), (oS), (sS))

Tetradic semiotic-logical partial relations:

((sS), (oO), (oS), (sO)); ((oO), (sS), (oS), (sO)); ((oO), (oS), (sS), (sO));  
((oS), (oO), (sS), (sO)); ((sS), (oS), (oO), (sO)); ((oS), (sS), (oO), (sO));

((o0), (sS), (s0), (oS)); ((sS), (o0), (s0), (oS)); ((o0), (oS), (s0), (sS));  
 ((oS), (o0), (s0), (sS)); ((sS), (oS), (s0), (o0)); ((oS), (sS), (s0), (o0));  
 ((o0), (s0), (sS), (oS)); ((sS), (s0), (o0), (oS)); ((o0), (s0), (oS), (sS));  
 ((oS), (s0), (o0), (sS)); ((sS), (s0), (oS), (o0)); ((oS), (s0), (sS), (o0));  
 ((s0), (o0), (sS), (oS)); ((s0), (sS), (o0), (oS)); ((s0), (oS), (o0), (sS));  
 ((s0), (o0), (oS), (sS)); ((s0), (sS), (oS), (o0)); ((s0), (oS), (sS), (o0)).

Complete listing of the  $2 \cdot 24 = 48$  tetradic permutations:

(3.a 2.b 1.c 0.d)  $\times$  (d.0 c.1 b.2 a.3)  $\rightarrow$   
 ((sS), (o0), (oS), (s0))  $\times$  ((oS), (s0), (o0), (sS))  
 (2.b 3.a 1.c 0.d)  $\times$  (d.0 c.1 a.3 b.2)  $\rightarrow$   
 ((o0), (sS), (oS), (s0))  $\times$  ((oS), (s0), (sS), (o0))  
 (2.b 1.c 3.a 0.d)  $\times$  (d.0 a.3 c.1 b.2)  $\rightarrow$   
 ((o0), (oS), (sS), (s0))  $\times$  ((oS), (sS), (s0), (o0))  
 (1.c 2.b 3.a 0.d)  $\times$  (d.0 a.3 b.2 c.1)  $\rightarrow$   
 ((oS), (o0), (sS), (s0))  $\times$  ((oS), (sS), (o0), (s0))  
 (3.a 1.c 2.b 0.d)  $\times$  (d.0 b.2 c.1 a.3)  $\rightarrow$   
 ((sS), (oS), (o0), (s0))  $\times$  ((oS), (o0), (s0), (sS))  
 (1.c 3.a 2.b 0.d)  $\times$  (d.0 b.2 a.3 c.1)  $\rightarrow$   
 ((oS), (sS), (o0), (s0))  $\times$  ((oS), (o0), (sS), (s0))  
 (2.b 3.a 0.d 1.c)  $\times$  (c.1 d.0 a.3 b.2)  $\rightarrow$   
 ((o0), (sS), (s0), (oS))  $\times$  ((s0), (oS), (sS), (o0))  
 (3.a 2.b 0.d 1.c)  $\times$  (c.1 d.0 b.2 a.3)  $\rightarrow$   
 ((sS), (o0), (s0), (oS))  $\times$  ((s0), (oS), (o0), (sS))  
 (2.b 1.c 0.d 3.a)  $\times$  (a.3 d.0 c.1 b.2)  $\rightarrow$   
 ((o0), (oS), (s0), (sS))  $\times$  ((sS), (oS), (s0), (o0))  
 (1.c 2.b 0.d 3.a)  $\times$  (a.3 d.0 b.2 c.1)  $\rightarrow$   
 ((oS), (o0), (s0), (sS))  $\times$  ((sS), (oS), (o0), (s0))  
 (3.a 1.c 0.d 2.b)  $\times$  (b.2 d.0 c.1 a.3)  
 ((sS), (oS), (s0), (o0))  $\times$  ((o0), (oS), (s0), (sS))  
 (1.c 3.a 0.d 2.b)  $\times$  (b.2 d.0 a.3 c.1)  $\rightarrow$   
 ((oS), (sS), (s0), (o0))  $\times$  ((o0), (oS), (sS), (s0))  
 (2.b 0.d 3.a 1.c)  $\times$  (c.1 a.3 d.0 b.2)  $\rightarrow$   
 ((o0), (s0), (sS), (oS))  $\times$  ((s0), (sS), (oS), (o0))  
 (3.a 0.d 2.b 1.c)  $\times$  (c.1 b.2 d.0 a.3)  $\rightarrow$   
 ((sS), (s0), (o0), (oS))  $\times$  ((s0), (o0), (oS), (sS))  
 (2.b 0.d 1.c 3.a)  $\times$  (a.3 c.1 d.0 b.2)  $\rightarrow$

$((o0), (s0), (oS), (sS)) \times ((sS), (s0), (oS), (o0))$   
 $(1.c\ 0.d\ 2.b\ 3.a) \times (a.3\ b.2\ d.0\ c.1) \rightarrow$   
 $((oS), (s0), (o0), (sS)) \times ((sS), (o0), (oS), (s0))$   
 $(3.a\ 0.d\ 1.c\ 2.b) \times (b.2\ c.1\ d.0\ a.3) \rightarrow$   
 $((sS), (s0), (oS), (o0)) \times ((o0), (s0), (oS), (sS))$   
 $(1.c\ 0.d\ 3.a\ 2.b) \times (b.2\ a.3\ d.0\ c.1) \rightarrow$   
 $((oS), (s0), (sS), (o0)) \times ((o0), (sS), (oS), (s0))$   
 $(0.d\ 2.b\ 3.a\ 1.c) \times (c.1\ a.3\ b.2\ d.0) \rightarrow$   
 $((s0), (o0), (sS), (oS)) \times ((s0), (sS), (o0), (oS))$   
 $(0.d\ 3.a\ 2.b\ 1.c) \times (c.1\ b.2\ a.3\ d.0) \rightarrow$   
 $((s0), (sS), (o0), (oS)) \times ((s0), (o0), (sS), (oS))$   
 $(0.d\ 1.c\ 2.b\ 3.a) \times (a.3\ b.2\ c.1\ d.0) \rightarrow$   
 $((s0), (oS), (o0), (sS)) \times ((sS), (o0), (s0), (oS))$   
 $(0.d\ 2.b\ 1.c\ 3.a) \times (a.3\ c.1\ b.2\ d.0) \rightarrow$   
 $((s0), (o0), (oS), (sS)) \times ((sS), (s0), (o0), (oS))$   
 $(0.d\ 3.a\ 1.c\ 2.b) \times (b.2\ c.1\ a.3\ d.0) \rightarrow$   
 $((s0), (sS), (oS), (o0)) \times ((o0), (s0), (sS), (oS))$   
 $(0.d\ 1.c\ 3.a\ 2.b) \times (b.2\ a.3\ c.1\ d.0) \rightarrow$   
 $((s0), (oS), (sS), (o0)) \times ((o0), (sS), (s0), (oS))$

5. However, as Rudolf Kaehr (2008a, b, c) has shown, a sign relation is not really polycontextural solely by embedding the categorial object into the triadic Peircean sign relation, but the sub-signs constituting the sign relation must be mapped to semiotic contextures. This idea of Kaehr's has, as I have already pointed out before, a splendid impact for the future development of mathematical semiotics. In order to map semiotic contextures as inner environments to the sub-signs of a pre-semiotic tetradic sign relation, we will use the following 4-adic polycontextural semiotic 4×4 matrix:



	0	1	2	3
0	(0.0) <sub>3,2,1</sub>	(0.1) <sub>1,3</sub>	(0.2) <sub>1,2</sub>	(0.3) <sub>2,3</sub>
1	(1.0) <sub>3,1</sub>	(1.1) <sub>1,3,4</sub>	(1.2) <sub>1,4</sub>	(1.3) <sub>3,4</sub>
2	(2.0) <sub>2,1</sub>	(2.1) <sub>1,4</sub>	(2.2) <sub>1,2,4</sub>	(2.3) <sub>2,4</sub>
3	(3.0) <sub>3,2</sub>	(3.1) <sub>3,4</sub>	(3.2) <sub>2,4</sub>	(3.3) <sub>2,3,4</sub>

Since the pre-semiotic sign relation is tetradic, but trichotomic, the four sub-signs to the left of the thick black line can only appear in reality thematics and thus change the order of their contextural numbers from morphismic to hetero-morphismic order. Thus, the above matrix is a “porte-manteau”-matrix of two matrices.

As Günther stated: “Being is the birthplace of Thinking, but Nothing is the homeland of the Will. In the Nothing there is nothing to see as long as we do not decide to enter the Nothing and build there a world according to the laws of negativity. This world God has not yet created, and there is not a world plan for it either, before the Thinking did not describe it in a negative language” (Günther 1937, p. 45). “The transparent clearness of the pure notion, that shines like a sunny midday-light over the real live of the concrete consciousness, has its origin out of the transcendental Night of a Will that has not yet become decision and thus not yet living, translucent reality” (Günther 1980, p. 288). We obtain that the night is the reign of the Will. Since the Will needs a negative language to formulate its vocabulary, the negative languages can only consist of directions of actions. The actions, however, we can formulate precisely on the basis of pre-semiotics. Together with the inner environments, we have a real polycontextural pre-semiotics as a theory of a Theory of the Night.

6. Since the action schemata of the 4 monadic semiotic partial relations

(s0), (oS), (o0), (sS)

as well as of the 15 dyadic semiotic partial relations

$$\begin{array}{llll}
(s0) \leftrightarrow (oS) & (sS) \leftrightarrow (s0) & (o0) \leftrightarrow (o0) \\
(s0) \leftrightarrow (o0) & (oS) \leftrightarrow (oS) & (o0) \leftrightarrow (sS) \\
(s0) \leftrightarrow (sS) & (oS) \leftrightarrow (o0) & (sS) \leftrightarrow (oS) \\
(oS) \leftrightarrow (s0) & (oS) \leftrightarrow (sS) & (sS) \leftrightarrow (o0) \\
(o0) \leftrightarrow (s0) & (o0) \leftrightarrow (oS) & (sS) \leftrightarrow (sS)
\end{array}$$

are trivial, we restrict ourselves here to show up the 24 triadic and the 24 tetradic semiotic partial relations for all 15 pre-semiotic sign classes and their reality thematics together with the semiotic contextures from a 4-contextural 4-adic semiotic matrix.

7. Since surreal numbers (Conway/Guy 1996, pp. 283 ss.) can be defined in several ways, we will agree with the following definitions:

### I. Action schemata of the 2 · 24 triadic semiotic partial relations

#### 1. Pre-semiotic dual system

$$\begin{array}{l}
(\{2 | \}. \{0 | \} \{2 | \} \{3 | \} \{1 | \}. \{0 | \} \{0 | \} \{0 | \} \{2 | \} \{3 | \} \{ | \}. \\
\{0 | \} \{0 | \} \{2 | \}) \times \\
(\{0 | \}. \{ | \} \{2 | \} \{0 | \} \{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \} \{0 | \}. \{1 | \} \{3 | \} \{0 | \} \{0 | \}. \\
\{2 | \} \{3 | \} \{2 | \})
\end{array}$$

#### Qualitative action

$$\begin{array}{ll}
\begin{array}{l}
(\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \\
\wedge \gg (\{ | \}. \{0 | \} \{0 | \} \{2 | \}) \\
(\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \})
\end{array} & \times \\
\begin{array}{l}
(\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
\wedge \gg (\{0 | \}. \{ | \} \{2 | \} \{0 | \}) \\
(\{0 | \}. \{1 | \} \{3 | \} \{0 | \})
\end{array} \\
\\
\begin{array}{l}
(\{2 | \}. \{0 | \} \{2 | \} \{3 | \}) \\
\wedge \gg (\{ | \}. \{0 | \} \{0 | \} \{2 | \}) \\
(\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \})
\end{array} & \times \\
\begin{array}{l}
(\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
\wedge \gg (\{0 | \}. \{ | \} \{2 | \} \{0 | \}) \\
(\{0 | \}. \{2 | \} \{3 | \} \{2 | \})
\end{array} \\
\\
\begin{array}{l}
(\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \}) \\
\wedge \gg (\{ | \}. \{0 | \} \{0 | \} \{2 | \}) \\
(\{1 | \}. \{0 | \} \{0 | \} \{3 | \})
\end{array} & \times \\
\begin{array}{l}
(\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
\wedge \gg (\{0 | \}. \{ | \} \{2 | \} \{0 | \}) \\
(\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \})
\end{array}
\end{array}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

### Medial action

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{2 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{2 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

## Objectal action

$$\begin{array}{l}
 (\{0 | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\{3 | \cdot\}}\}} \\
 \wedge \gg (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{ | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\}}\}) \\
 \\
 (\{2 | \cdot\{0 | \}_{\{2 | \cdot\{3 | \cdot\}}\}) \\
 \wedge \gg (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{ | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\}}\}) \\
 \\
 (\{ | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\}}\}) \\
 \wedge \gg (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{0 | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\{3 | \cdot\}}\}}) \\
 \\
 (\{2 | \cdot\{0 | \}_{\{2 | \cdot\{3 | \cdot\}}\}) \\
 \wedge \gg (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{0 | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\{3 | \cdot\}}\}}) \\
 \\
 (\{0 | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\{3 | \cdot\}}\}}) \\
 \wedge \gg (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{2 | \cdot\{0 | \}_{\{2 | \cdot\{3 | \cdot\}}\}) \\
 \\
 (\{ | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\}}\}) \\
 \wedge \gg (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{2 | \cdot\{0 | \}_{\{2 | \cdot\{3 | \cdot\}}\})
 \end{array}
 \quad
 \begin{array}{l}
 (\{0 | \cdot\{ | \}_{\{2 | \cdot\{0 | \cdot\}}\}) \\
 \wedge \gg (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 (\{0 | \cdot\{0 | \}_{\{3 | \cdot\{2 | \cdot\{0 | \cdot\}}\}}) \\
 \\
 (\{0 | \cdot\{ | \}_{\{2 | \cdot\{0 | \cdot\}}\}) \\
 \wedge \gg (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 (\{0 | \cdot\{2 | \}_{\{3 | \cdot\{2 | \cdot\}}\}) \\
 \\
 (\{0 | \cdot\{0 | \}_{\{3 | \cdot\{2 | \cdot\{0 | \cdot\}}\}}) \\
 \wedge \gg (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 (\{0 | \cdot\{ | \}_{\{2 | \cdot\{0 | \cdot\}}\}) \\
 \\
 (\{0 | \cdot\{0 | \}_{\{3 | \cdot\{2 | \cdot\{0 | \cdot\}}\}}) \\
 \wedge \gg (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 (\{0 | \cdot\{2 | \}_{\{3 | \cdot\{2 | \cdot\}}\}) \\
 \\
 (\{0 | \cdot\{2 | \}_{\{3 | \cdot\{2 | \cdot\}}\}) \\
 \wedge \gg (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 (\{0 | \cdot\{0 | \}_{\{3 | \cdot\{2 | \cdot\{0 | \cdot\}}\}}) \\
 \\
 (\{0 | \cdot\{2 | \}_{\{3 | \cdot\{2 | \cdot\}}\}) \\
 \wedge \gg (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 (\{0 | \cdot\{ | \}_{\{2 | \cdot\{0 | \cdot\}}\})
 \end{array}$$

## Interpretative action

$$\begin{array}{l}
 (\{1 | \cdot\{0 | \}_{\{0 | \cdot\{3 | \cdot\}}\}) \\
 \wedge \gg (\{2 | \cdot\{0 | \}_{\{2 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{ | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\}}\}) \\
 \\
 (\{0 | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\{3 | \cdot\}}\}}) \\
 \wedge \gg (\{2 | \cdot\{0 | \}_{\{2 | \cdot\{3 | \cdot\}}\}) \times \\
 (\{ | \cdot\{0 | \}_{\{0 | \cdot\{2 | \cdot\}}\})
 \end{array}
 \quad
 \begin{array}{l}
 (\{0 | \cdot\{ | \}_{\{2 | \cdot\{0 | \cdot\}}\}) \\
 \wedge \gg (\{0 | \cdot\{2 | \}_{\{3 | \cdot\{2 | \cdot\}}\}) \\
 (\{0 | \cdot\{1 | \}_{\{3 | \cdot\{0 | \cdot\}}\}) \\
 \\
 (\{0 | \cdot\{ | \}_{\{2 | \cdot\{0 | \cdot\}}\}) \\
 \wedge \gg (\{0 | \cdot\{2 | \}_{\{3 | \cdot\{2 | \cdot\}}\}) \\
 (\{0 | \cdot\{0 | \}_{\{3 | \cdot\{2 | \cdot\{0 | \cdot\}}\}})
 \end{array}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \}, \{2 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{2 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \}, \{2 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{2 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{2 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{2 | \}}$$

## 2. Pre-semiotic dual system

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \{1 | \} \cdot \{0 | \} \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \{0 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \}, \{2 | \}, \{3 | \}, \{0 | \}, \{1 | \}}$$

### Qualitative action

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \}, \{2 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \}, \{2 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{2 | \}, \{3 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

### Medial action

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{0 | \} \{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{1 | \} \{0 | \} \{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \} \{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \} \{3 | \} \{0 | \}}$$

## Objectal action

$$\begin{array}{l}
 (\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \}) \\
 \\
 (\{2 | \}. \{0 | \} \{2 | \} \{3 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \}) \\
 \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \}) \\
 \\
 (\{2 | \}. \{0 | \} \{2 | \} \{3 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \}) \\
 \\
 (\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{2 | \}. \{0 | \} \{2 | \} \{3 | \}) \\
 \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{2 | \}. \{0 | \} \{2 | \} \{3 | \})
 \end{array}$$

$$\begin{array}{l}
 (\{1 | \}. \{ | \} \{1 | \} \{0 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 (\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
 \\
 (\{1 | \}. \{ | \} \{1 | \} \{0 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 (\{0 | \}. \{2 | \} \{3 | \} \{2 | \}) \\
 \\
 (\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 (\{1 | \}. \{ | \} \{1 | \} \{0 | \}) \\
 \\
 (\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 (\{0 | \}. \{2 | \} \{3 | \} \{2 | \}) \\
 \\
 (\{0 | \}. \{2 | \} \{3 | \} \{2 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 (\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
 \\
 (\{0 | \}. \{2 | \} \{3 | \} \{2 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 (\{1 | \}. \{ | \} \{1 | \} \{0 | \})
 \end{array}$$

## Interpretative action

$$\begin{array}{l}
 (\{1 | \}. \{0 | \} \{0 | \} \{3 | \}) \\
 \wedge \gg (\{2 | \}. \{0 | \} \{2 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \}) \\
 \\
 (\{0 | \}. \{0 | \} \{0 | \} \{2 | \} \{3 | \}) \\
 \wedge \gg (\{2 | \}. \{0 | \} \{2 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \})
 \end{array}$$

$$\begin{array}{l}
 (\{1 | \}. \{ | \} \{1 | \} \{0 | \}) \\
 \wedge \gg (\{0 | \}. \{2 | \} \{3 | \} \{2 | \}) \\
 (\{0 | \}. \{1 | \} \{3 | \} \{0 | \}) \\
 \\
 (\{0 | \}. \{0 | \} \{3 | \} \{2 | \} \{0 | \}) \\
 \wedge \gg (\{2 | \}. \{0 | \} \{3 | \} \{2 | \}) \\
 (\{ | \}. \{1 | \} \{0 | \} \{1 | \})
 \end{array}$$





$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{2 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

### Medial action

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ (\{ | \} \cdot \{2 | \}) \end{pmatrix}_{\{0 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{3 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ (\{ | \} \cdot \{2 | \}) \end{pmatrix}_{\{2 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} (\{ | \} \cdot \{2 | \}) \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{1 | \} \{2 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{0 | \} \{2 | \} \{1 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \} \{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} (\{ | \} \cdot \{2 | \}) \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{1 | \} \{2 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \} \{2 | \} \{1 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \} \{3 | \} \{0 | \}}$$

### Objectal action

$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ (\{ | \} \cdot \{2 | \}) \end{pmatrix}_{\{0 | \} \{2 | \} \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{3 | \} \{0 | \}}$$



$$\begin{pmatrix} \{0 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{2 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{1 | \}, \{2 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{2 | \}, \{1 | \}}$$

#### 4. Pre-semiotic dual system

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \{1 | \} \cdot \{0 | \} \\ \{1 | \} \end{pmatrix}_{\{2 | \}, \{3 | \}, \{0 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{1 | \} \\ \{2 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}, \{0 | \}, \{3 | \}, \{0 | \}, \{2 | \}}$$

#### Qualitative action

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{1 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{1 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{1 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}, \{1 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{2 | \}, \{1 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}, \{0 | \}, \{1 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \}, \{2 | \}, \{1 | \}, \{0 | \}}$$





## 5. Pre-Semiotic dual system

$$\begin{aligned}
 & (\{2 | \}. \{0 | \} \}_{\{2 | \}, \{3 | \}} \{1 | \}. \{0 | \} \}_{\{0 | \}, \{3 | \}} \{0 | \}. \{1 | \} \}_{\{0 | \}, \{3 | \}} \{ | \}. \\
 & \{2 | \} \}_{\{1 | \}, \{2 | \}} \times \\
 & (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}} \{1 | \}. \{0 | \} \}_{\{3 | \}, \{0 | \}} \{0 | \}. \{1 | \} \}_{\{3 | \}, \{0 | \}} \{0 | \}. \\
 & \{2 | \} \}_{\{3 | \}, \{2 | \}}
 \end{aligned}$$

### Qualitative action

$$\begin{array}{l}
 (\{1 | \}. \{0 | \} \}_{\{0 | \}, \{3 | \}}) \\
 \wedge \gg (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}}) \quad \times \\
 (\{0 | \}. \{1 | \} \}_{\{0 | \}, \{3 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{1 | \}. \{0 | \} \}_{\{3 | \}, \{0 | \}}) \\
 \wedge \gg (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 (\{0 | \}. \{1 | \} \}_{\{3 | \}, \{0 | \}})
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \}. \{0 | \} \}_{\{2 | \}, \{3 | \}}) \\
 \wedge \gg (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}}) \quad \times \\
 (\{0 | \}. \{1 | \} \}_{\{0 | \}, \{3 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{1 | \}. \{0 | \} \}_{\{3 | \}, \{0 | \}}) \\
 \wedge \gg (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 (\{0 | \}. \{2 | \} \}_{\{3 | \}, \{2 | \}})
 \end{array}$$

$$\begin{array}{l}
 (\{0 | \}. \{1 | \} \}_{\{0 | \}, \{3 | \}}) \\
 \wedge \gg (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}}) \quad \times \\
 (\{1 | \}. \{0 | \} \}_{\{0 | \}, \{3 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{0 | \}. \{1 | \} \}_{\{3 | \}, \{0 | \}}) \\
 \wedge \gg (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 (\{1 | \}. \{0 | \} \}_{\{3 | \}, \{0 | \}})
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \}. \{0 | \} \}_{\{2 | \}, \{3 | \}}) \\
 \wedge \gg (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}}) \quad \times \\
 (\{1 | \}. \{0 | \} \}_{\{0 | \}, \{3 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{0 | \}. \{1 | \} \}_{\{3 | \}, \{0 | \}}) \\
 \wedge \gg (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 (\{0 | \}. \{2 | \} \}_{\{3 | \}, \{2 | \}})
 \end{array}$$

$$\begin{array}{l}
 (\{0 | \}. \{1 | \} \}_{\{0 | \}, \{3 | \}}) \\
 \wedge \gg (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}}) \quad \times \\
 (\{2 | \}. \{0 | \} \}_{\{2 | \}, \{3 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{0 | \}. \{2 | \} \}_{\{3 | \}, \{2 | \}}) \\
 \wedge \gg (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 (\{1 | \}. \{0 | \} \}_{\{3 | \}, \{0 | \}})
 \end{array}$$

$$\begin{array}{l}
 (\{1 | \}. \{0 | \} \}_{\{0 | \}, \{3 | \}}) \\
 \wedge \gg (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}}) \quad \times \\
 (\{2 | \}. \{0 | \} \}_{\{2 | \}, \{3 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{0 | \}. \{2 | \} \}_{\{3 | \}, \{2 | \}}) \\
 \wedge \gg (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 (\{0 | \}. \{1 | \} \}_{\{3 | \}, \{0 | \}})
 \end{array}$$

### Medial action

$$\begin{array}{l}
 (\{1 | \}. \{0 | \} \}_{\{0 | \}, \{3 | \}}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \}_{\{0 | \}, \{3 | \}}) \quad \times \\
 (\{ | \}. \{2 | \} \}_{\{1 | \}, \{2 | \}})
 \end{array}
 \quad
 \begin{array}{l}
 (\{2 | \}. \{ | \} \}_{\{2 | \}, \{1 | \}}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \}_{\{3 | \}, \{0 | \}}) \\
 (\{0 | \}. \{1 | \} \}_{\{3 | \}, \{0 | \}})
 \end{array}$$



$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{1 | \}, \{2 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \}, \{0 | \}}$$

### Interpretative action

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \}, \{1 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \}, \{1 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \}, \{2 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \}, \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \}, \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{1 | \}, \{2 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \}, \{0 | \}}$$

### 6. Pre-semiotic dual system

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \{1 | \} \cdot \{0 | \} \\ \{0 | \} \cdot \{2 | \} \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \{2 | \} \cdot \{0 | \} \\ \{0 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \}, \{1 | \}}$$









$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{2 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \}}$$

### Medial action

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{ | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{ | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{1 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \} \\ \{2 | \} \cdot \{0 | \}) \end{pmatrix}_{\{0 | \} \cdot \{1 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \} \\ \{1 | \} \cdot \{ | \}) \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \} \\ \{2 | \} \cdot \{0 | \}) \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \} \\ \{1 | \} \cdot \{1 | \}) \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

### Objectal action

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{ | \} \cdot \{1 | \}) \end{pmatrix}_{\{0 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{0 | \}) \end{pmatrix}_{\{1 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{ | \} \cdot \{1 | \}) \end{pmatrix}_{\{2 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{ | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{1 | \}) \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{ | \}) \end{pmatrix}_{\{3 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{1 | \}) \end{pmatrix}_{\{2 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{2 | \}) \end{pmatrix}_{\{3 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{2 | \} \cdot \{0 | \}) \end{pmatrix}_{\{0 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{0 | \}) \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

$$\begin{pmatrix} \{ | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{2 | \} \cdot \{0 | \}) \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{ | \}) \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

### Interpretative action

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \} \\ \{ | \} \cdot \{1 | \}) \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \} \\ \{1 | \} \cdot \{1 | \}) \end{pmatrix}_{\{1 | \} \cdot \{0 | \}} \times$$

$$\begin{array}{l}
({0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}}) \\
\wedge \gg ({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}}) \times \\
({ | } \cdot {1 | }_{\{0 | } \cdot \{1 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot { | }_{\{1 | } \cdot \{0 | \}}) \\
\wedge \gg ({0 | } \cdot {2 | }_{\{3 | } \cdot \{2 | \}}) \\
({1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}})
\end{array}$$

$$\begin{array}{l}
({1 | } \cdot {1 | }_{\{0 | } \cdot \{1 | } \cdot \{3 | \}}) \\
\wedge \gg ({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}}) \times \\
({0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}}) \\
\wedge \gg ({0 | } \cdot {2 | }_{\{3 | } \cdot \{2 | \}}) \\
({1 | } \cdot {1 | }_{\{3 | } \cdot \{1 | } \cdot \{0 | \}})
\end{array}$$

$$\begin{array}{l}
({ | } \cdot {1 | }_{\{0 | } \cdot \{1 | \}}) \\
\wedge \gg ({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}}) \times \\
({0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}}) \\
\wedge \gg ({0 | } \cdot {2 | }_{\{3 | } \cdot \{2 | \}}) \\
({1 | } \cdot { | }_{\{1 | } \cdot \{0 | \}})
\end{array}$$

$$\begin{array}{l}
({0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}}) \\
\wedge \gg ({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}}) \times \\
({1 | } \cdot {1 | }_{\{0 | } \cdot \{1 | } \cdot \{3 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot {1 | }_{\{3 | } \cdot \{1 | } \cdot \{0 | \}}) \\
\wedge \gg ({0 | } \cdot {2 | }_{\{3 | } \cdot \{2 | \}}) \\
({1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}})
\end{array}$$

$$\begin{array}{l}
({ | } \cdot {1 | }_{\{0 | } \cdot \{1 | \}}) \\
\wedge \gg ({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}}) \times \\
({1 | } \cdot {1 | }_{\{0 | } \cdot \{1 | } \cdot \{3 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot {1 | }_{\{3 | } \cdot \{1 | } \cdot \{0 | \}}) \\
\wedge \gg ({0 | } \cdot {2 | }_{\{3 | } \cdot \{2 | \}}) \\
({1 | } \cdot { | }_{\{1 | } \cdot \{0 | \}})
\end{array}$$

## 8. Pre-semiotic dual system

$$\begin{array}{l}
({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}} \cdot {1 | } \cdot {1 | }_{\{0 | } \cdot \{1 | } \cdot \{3 | \}} \cdot {0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}} \cdot { | } \cdot \\
{2 | }_{\{1 | } \cdot \{2 | \}}) \times \\
({2 | } \cdot { | }_{\{2 | } \cdot \{1 | \}} \cdot {1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}} \cdot {1 | } \cdot {1 | }_{\{3 | } \cdot \{1 | } \cdot \{0 | \}} \cdot {0 | } \cdot \\
{2 | }_{\{3 | } \cdot \{2 | \}})
\end{array}$$

## Qualitative action

$$\begin{array}{l}
({1 | } \cdot {1 | }_{\{0 | } \cdot \{1 | } \cdot \{3 | \}}) \\
\wedge \gg ({ | } \cdot {2 | }_{\{1 | } \cdot \{2 | \}}) \times \\
({0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}}) \\
\wedge \gg ({2 | } \cdot { | }_{\{2 | } \cdot \{1 | \}}) \\
({1 | } \cdot {1 | }_{\{3 | } \cdot \{1 | } \cdot \{0 | \}})
\end{array}$$

$$\begin{array}{l}
({2 | } \cdot {0 | }_{\{2 | } \cdot \{3 | \}}) \\
\wedge \gg ({ | } \cdot {2 | }_{\{1 | } \cdot \{2 | \}}) \times \\
({0 | } \cdot {1 | }_{\{0 | } \cdot \{3 | \}})
\end{array}
\quad
\begin{array}{l}
({1 | } \cdot {0 | }_{\{3 | } \cdot \{0 | \}}) \\
\wedge \gg ({2 | } \cdot { | }_{\{2 | } \cdot \{1 | \}}) \\
({0 | } \cdot {2 | }_{\{3 | } \cdot \{2 | \}})
\end{array}$$



$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

### Objectal action

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \cdot \{1 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \cdot \{1 | \}} \times$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \cdot \{0 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \cdot \{2 | \}} \times$$

### Interpretative action

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \cdot \{1 | \}} \times$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \} \cdot \{1 | \} \cdot \{3 | \}} \times$$

$$\begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \cdot \{1 | \}} \times$$



$$\begin{array}{l}
({1 | } \cdot {1 | } )_{\{0 | \}, \{1 | \}, \{3 | \}} \\
\wedge \gg ( {2 | } \cdot {0 | } )_{\{2 | \}, \{3 | \}} \times \\
({0 | } \cdot {1 | } )_{\{0 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({1 | } \cdot {0 | } )_{\{3 | \}, \{0 | \}} \\
\wedge \gg ( {0 | } \cdot {2 | } )_{\{3 | \}, \{2 | \}} \\
({1 | } \cdot {1 | } )_{\{3 | \}, \{1 | \}, \{0 | \}}
\end{array}$$
  

$$\begin{array}{l}
({ | } \cdot {2 | } )_{\{1 | \}, \{2 | \}} \\
\wedge \gg ( {2 | } \cdot {0 | } )_{\{2 | \}, \{3 | \}} \times \\
({0 | } \cdot {1 | } )_{\{0 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({1 | } \cdot {0 | } )_{\{3 | \}, \{0 | \}} \\
\wedge \gg ( {0 | } \cdot {2 | } )_{\{3 | \}, \{2 | \}} \\
({2 | } \cdot { | } )_{\{2 | \}, \{1 | \}}
\end{array}$$
  

$$\begin{array}{l}
({0 | } \cdot {1 | } )_{\{0 | \}, \{3 | \}} \\
\wedge \gg ( {2 | } \cdot {0 | } )_{\{2 | \}, \{3 | \}} \times \\
({1 | } \cdot {1 | } )_{\{0 | \}, \{1 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({1 | } \cdot {1 | } )_{\{3 | \}, \{1 | \}, \{0 | \}} \\
\wedge \gg ( {0 | } \cdot {2 | } )_{\{3 | \}, \{2 | \}} \\
({1 | } \cdot {0 | } )_{\{3 | \}, \{0 | \}}
\end{array}$$
  

$$\begin{array}{l}
({ | } \cdot {2 | } )_{\{1 | \}, \{2 | \}} \\
\wedge \gg ( {2 | } \cdot {0 | } )_{\{2 | \}, \{3 | \}} \times \\
({1 | } \cdot {1 | } )_{\{0 | \}, \{1 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({1 | } \cdot {1 | } )_{\{3 | \}, \{1 | \}, \{0 | \}} \\
\wedge \gg ( {0 | } \cdot {2 | } )_{\{3 | \}, \{2 | \}} \\
({2 | } \cdot { | } )_{\{2 | \}, \{1 | \}}
\end{array}$$

### 9. Pre-semiotic dual system

$$\begin{array}{l}
({2 | } \cdot {0 | } )_{\{2 | \}, \{3 | \}} \{1 | } \cdot {1 | } )_{\{0 | \}, \{1 | \}, \{3 | \}} \{0 | } \cdot {2 | } )_{\{3 | \}, \{2 | \}} \{ | } \cdot \\
{2 | } )_{\{1 | \}, \{2 | \}} \times \\
({2 | } \cdot { | } )_{\{2 | \}, \{1 | \}} \{2 | } \cdot {0 | } )_{\{3 | \}, \{2 | \}} \{1 | } \cdot {1 | } )_{\{3 | \}, \{1 | \}, \{0 | \}} \{0 | } \cdot \\
{2 | } )_{\{3 | \}, \{2 | \}}
\end{array}$$

### Qualitative action

$$\begin{array}{l}
({1 | } \cdot {1 | } )_{\{0 | \}, \{1 | \}, \{3 | \}} \\
\wedge \gg ( { | } \cdot {2 | } )_{\{1 | \}, \{2 | \}} \times \\
({0 | } \cdot {2 | } )_{\{2 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({2 | } \cdot {0 | } )_{\{3 | \}, \{2 | \}} \\
\wedge \gg ( {2 | } \cdot { | } )_{\{2 | \}, \{1 | \}} \\
({1 | } \cdot {1 | } )_{\{3 | \}, \{1 | \}, \{0 | \}}
\end{array}$$
  

$$\begin{array}{l}
({2 | } \cdot {0 | } )_{\{2 | \}, \{3 | \}} \\
\wedge \gg ( { | } \cdot {2 | } )_{\{1 | \}, \{2 | \}} \times \\
({0 | } \cdot {2 | } )_{\{2 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({2 | } \cdot {0 | } )_{\{3 | \}, \{2 | \}} \\
\wedge \gg ( {2 | } \cdot { | } )_{\{2 | \}, \{1 | \}} \\
({0 | } \cdot {2 | } )_{\{3 | \}, \{2 | \}}
\end{array}$$
  

$$\begin{array}{l}
({0 | } \cdot {2 | } )_{\{2 | \}, \{3 | \}} \\
\wedge \gg ( { | } \cdot {2 | } )_{\{1 | \}, \{2 | \}} \times \\
({1 | } \cdot {1 | } )_{\{0 | \}, \{1 | \}, \{3 | \}}
\end{array}
\qquad
\begin{array}{l}
({1 | } \cdot {1 | } )_{\{3 | \}, \{1 | \}, \{0 | \}} \\
\wedge \gg ( {2 | } \cdot { | } )_{\{2 | \}, \{1 | \}} \\
({2 | } \cdot {0 | } )_{\{3 | \}, \{2 | \}}
\end{array}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{ | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{ | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{ | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{ | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{2 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \}}$$

### Medial action

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{3 | \} \{2 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{3 | \} \{2 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{2 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \} \{2 | \} \{1 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \} \{2 | \} \{3 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{1 | \} \{2 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{1 | \} \{2 | \} \{1 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{2 | \} \{0 | \} \{3 | \} \{1 | \} \{0 | \}}$$



$$\begin{array}{l}
\begin{array}{l}
\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} \\
\wedge \gg \{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \\
\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \\
\wedge \gg \{0 | \} \cdot \{2 | \} \{3 | \} \{2 | \} \\
\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \}
\end{array} \\
\begin{array}{l}
\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} \\
\wedge \gg \{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \\
\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \\
\wedge \gg \{0 | \} \cdot \{2 | \} \{3 | \} \{2 | \} \\
\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}
\end{array} \\
\begin{array}{l}
\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} \\
\wedge \gg \{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \\
\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \}
\end{array} \times \\
\begin{array}{l}
\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} \\
\wedge \gg \{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \\
\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}
\end{array} \\
\begin{array}{l}
\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} \\
\wedge \gg \{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \\
\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} \\
\wedge \gg \{0 | \} \cdot \{2 | \} \{3 | \} \{2 | \} \\
\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}
\end{array}
\end{array}$$

### 10. Pre-semiotic dual system

$$\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} \{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} \{ | \} \cdot \\
\{2 | \} \{1 | \} \{2 | \} \times \\
\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} \cdot \\
\{2 | \} \{3 | \} \{2 | \}
\end{array}$$

### Qualitative action

$$\begin{array}{l}
\begin{array}{l}
\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} \\
\wedge \gg \{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} \\
\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \\
\wedge \gg \{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \\
\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \}
\end{array} \\
\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \\
\wedge \gg \{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} \\
\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \\
\wedge \gg \{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \\
\{0 | \} \cdot \{2 | \} \{3 | \} \{2 | \}
\end{array} \\
\begin{array}{l}
\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} \\
\wedge \gg \{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} \\
\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \\
\wedge \gg \{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \\
\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \}
\end{array} \\
\begin{array}{l}
\{2 | \} \cdot \{0 | \} \{2 | \} \{3 | \} \\
\wedge \gg \{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} \\
\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}
\end{array} \times \\
\begin{array}{l}
\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \\
\wedge \gg \{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \\
\{0 | \} \cdot \{2 | \} \{3 | \} \{2 | \}
\end{array}
\end{array}$$





$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{2 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ \{1 | \} \cdot \{2 | \} \end{pmatrix}_{\{1 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{1 | \}}$$

### 11. Pre-semiotic dual system

$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{1 | \} \\ \{1 | \} \end{pmatrix}_{\{1 | \} \{3 | \}} \times \begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \{0 | \} \cdot \{1 | \} \\ \{ | \} \end{pmatrix}_{\{0 | \} \{3 | \}} \cdot \begin{pmatrix} \{1 | \} \cdot \{ | \} \\ \{1 | \} \cdot \{0 | \} \\ \{2 | \} \end{pmatrix}_{\{1 | \} \{0 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{1 | \} \\ \{1 | \} \end{pmatrix}_{\{3 | \} \{1 | \}} \cdot \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \{1 | \} \cdot \{0 | \} \\ \{2 | \} \end{pmatrix}_{\{3 | \} \{1 | \}}$$

### Qualitative action

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{0 | \} \{1 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{3 | \} \{0 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{0 | \} \{1 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{3 | \} \{1 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{3 | \} \{0 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{2 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{1 | \} \\ \wedge \gg (\{ | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{1 | \} \end{pmatrix}_{\{0 | \} \{3 | \} \{1 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{ | \}) \\ \{1 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$





$$\begin{array}{l}
({|}\rangle\langle{1|})_{\{0\},\{1\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}} \\
({0|}\rangle\langle{1|})_{\{0\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{0|})_{\{0\},\{3\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}} \\
({1|}\rangle\langle{|})_{\{1\},\{0\}}
\end{array}$$

$$\begin{array}{l}
({2|}\rangle\langle{1|})_{\{1\},\{3\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}} \\
({0|}\rangle\langle{1|})_{\{0\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{0|})_{\{3\},\{0\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}} \\
({1|}\rangle\langle{2|})_{\{3\},\{1\}}
\end{array}$$

$$\begin{array}{l}
({0|}\rangle\langle{1|})_{\{0\},\{3\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}} \\
({2|}\rangle\langle{1|})_{\{1\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{2|})_{\{3\},\{1\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}} \\
({1|}\rangle\langle{0|})_{\{3\},\{0\}}
\end{array}$$

$$\begin{array}{l}
({|}\rangle\langle{1|})_{\{0\},\{1\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}} \\
({2|}\rangle\langle{1|})_{\{1\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{2|})_{\{3\},\{1\}} \\
\wedge \gg ({|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}} \\
({1|}\rangle\langle{|})_{\{1\},\{0\}}
\end{array}$$

### Interpretative action

$$\begin{array}{l}
({1|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}} \\
\wedge \gg (({2|}\rangle\langle{1|})_{\{1\},\{3\}}) \times \\
({|}\rangle\langle{1|})_{\{0\},\{1\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{|})_{\{1\},\{0\}} \\
\wedge \gg (({1|}\rangle\langle{2|})_{\{3\},\{1\}}) \\
({1|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}}
\end{array}$$

$$\begin{array}{l}
({0|}\rangle\langle{1|})_{\{0\},\{3\}} \\
\wedge \gg (({2|}\rangle\langle{1|})_{\{1\},\{3\}}) \times \\
({|}\rangle\langle{1|})_{\{0\},\{1\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{|})_{\{1\},\{0\}} \\
\wedge \gg (({1|}\rangle\langle{2|})_{\{3\},\{1\}}) \\
({1|}\rangle\langle{0|})_{\{3\},\{0\}}
\end{array}$$

$$\begin{array}{l}
({1|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}} \\
\wedge \gg (({2|}\rangle\langle{1|})_{\{1\},\{3\}}) \times \\
({0|}\rangle\langle{1|})_{\{0\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{0|})_{\{3\},\{0\}} \\
\wedge \gg (({1|}\rangle\langle{2|})_{\{3\},\{1\}}) \\
({1|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}}
\end{array}$$

$$\begin{array}{l}
({|}\rangle\langle{1|})_{\{0\},\{1\}} \\
\wedge \gg (({2|}\rangle\langle{1|})_{\{1\},\{3\}}) \times \\
({0|}\rangle\langle{1|})_{\{0\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{0|})_{\{3\},\{0\}} \\
\wedge \gg (({1|}\rangle\langle{2|})_{\{3\},\{1\}}) \\
({1|}\rangle\langle{|})_{\{1\},\{0\}}
\end{array}$$

$$\begin{array}{l}
({0|}\rangle\langle{1|})_{\{0\},\{3\}} \\
\wedge \gg (({2|}\rangle\langle{1|})_{\{1\},\{3\}}) \times \\
({1|}\rangle\langle{1|})_{\{0\},\{1\},\{3\}}
\end{array}
\times
\begin{array}{l}
({1|}\rangle\langle{1|})_{\{3\},\{1\},\{0\}} \\
\wedge \gg (({1|}\rangle\langle{2|})_{\{3\},\{1\}}) \\
({1|}\rangle\langle{0|})_{\{3\},\{0\}}
\end{array}$$

$$\begin{array}{l} (\{|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\}) \\ \wedge \gg (\{2|\}\cdot\{1|\}\}_{\{1|\}\{3|\}\}) \quad \times \\ (\{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\{3|\}\}) \\ \wedge \gg (\{1|\}\cdot\{2|\}\}_{\{3|\}\{1|\}\}) \\ (\{1|\}\cdot\{|\}\}_{\{1|\}\{0|\}\}) \end{array}$$

## 12. Pre-semiotic dual system

$$\begin{array}{l} (\{2|\}\cdot\{1|\}\}_{\{1|\}\{3|\}\}) \{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\{3|\}\}) \{0|\}\cdot\{1|\}\}_{\{0|\}\{3|\}\}) \{|\}\cdot\{2|\} \\ \{1|\}\{2|\}\}) \times (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \{1|\}\cdot\{0|\}\}_{\{3|\}\{0|\}\}) \{1|\}\cdot\{1|\}\}_{\{3|\}\{1|\}\{0|\}\}) \\ \{1|\}\cdot\{2|\}\}_{\{3|\}\{1|\}\}) \end{array}$$

## Qualitative action

$$\begin{array}{l} (\{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\{3|\}\}) \\ \wedge \gg (\{|\}\cdot\{2|\}\}_{\{1|\}\{2|\}\}) \quad \times \\ (\{0|\}\cdot\{1|\}\}_{\{0|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{0|\}\}_{\{3|\}\{0|\}\}) \\ \wedge \gg (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \\ (\{1|\}\cdot\{1|\}\}_{\{3|\}\{1|\}\{0|\}\}) \end{array}$$

$$\begin{array}{l} (\{2|\}\cdot\{1|\}\}_{\{1|\}\{3|\}\}) \\ \wedge \gg (\{|\}\cdot\{2|\}\}_{\{1|\}\{2|\}\}) \quad \times \\ (\{0|\}\cdot\{1|\}\}_{\{0|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{0|\}\}_{\{3|\}\{0|\}\}) \\ \wedge \gg (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \\ (\{1|\}\cdot\{2|\}\}_{\{3|\}\{1|\}\}) \end{array}$$

$$\begin{array}{l} (\{0|\}\cdot\{1|\}\}_{\{0|\}\{3|\}\}) \\ \wedge \gg (\{|\}\cdot\{2|\}\}_{\{1|\}\{2|\}\}) \quad \times \\ (\{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{1|\}\}_{\{3|\}\{1|\}\{0|\}\}) \\ \wedge \gg (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \\ (\{1|\}\cdot\{0|\}\}_{\{3|\}\{0|\}\}) \end{array}$$

$$\begin{array}{l} (\{2|\}\cdot\{1|\}\}_{\{1|\}\{3|\}\}) \\ \wedge \gg (\{|\}\cdot\{2|\}\}_{\{1|\}\{2|\}\}) \quad \times \\ (\{1|\}\cdot\{2|\}\}_{\{1|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{1|\}\}_{\{3|\}\{1|\}\{0|\}\}) \\ \wedge \gg (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \\ (\{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\}) \end{array}$$

$$\begin{array}{l} (\{0|\}\cdot\{1|\}\}_{\{0|\}\{3|\}\}) \\ \wedge \gg (\{|\}\cdot\{2|\}\}_{\{1|\}\{2|\}\}) \quad \times \\ (\{2|\}\cdot\{1|\}\}_{\{1|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{2|\}\}_{\{3|\}\{1|\}\}) \\ \wedge \gg (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \\ (\{1|\}\cdot\{0|\}\}_{\{3|\}\{0|\}\}) \end{array}$$

$$\begin{array}{l} (\{1|\}\cdot\{1|\}\}_{\{0|\}\{1|\}\{3|\}\}) \\ \wedge \gg (\{|\}\cdot\{2|\}\}_{\{1|\}\{2|\}\}) \quad \times \\ (\{2|\}\cdot\{1|\}\}_{\{1|\}\{3|\}\}) \end{array} \quad \begin{array}{l} (\{1|\}\cdot\{2|\}\}_{\{3|\}\{1|\}\}) \\ \wedge \gg (\{2|\}\cdot\{|\}\}_{\{2|\}\{1|\}\}) \\ (\{1|\}\cdot\{1|\}\}_{\{3|\}\{1|\}\{0|\}\}) \end{array}$$

## Medial action

$$\begin{array}{l}
 (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \\
 (\{2 | \}. \{1 | \} \{1 | \} \{3 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \\
 \\
 (\{2 | \}. \{1 | \} \{1 | \} \{3 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \\
 \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{2 | \}. \{1 | \} \{1 | \} \{3 | \}) \\
 \\
 (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \\
 \wedge \gg (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \quad \times \\
 (\{2 | \}. \{1 | \} \{1 | \} \{3 | \})
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \}) \\
 \\
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 (\{1 | \}. \{2 | \} \{3 | \} \{1 | \}) \\
 \\
 (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \}) \\
 \\
 (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 (\{1 | \}. \{2 | \} \{3 | \} \{1 | \}) \\
 \\
 (\{1 | \}. \{2 | \} \{3 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \}) \\
 \\
 (\{1 | \}. \{2 | \} \{3 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \})
 \end{array}$$

## Objectal action

$$\begin{array}{l}
 (\{0 | \}. \{1 | \} \{0 | \} \{3 | \}) \\
 \wedge \gg (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \\
 (\{2 | \}. \{1 | \} \{1 | \} \{3 | \}) \\
 \wedge \gg (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \quad \times \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \\
 (\{ | \}. \{2 | \} \{1 | \} \{2 | \}) \\
 \wedge \gg (\{1 | \}. \{1 | \} \{0 | \} \{1 | \} \{3 | \}) \quad \times \\
 (\{0 | \}. \{1 | \} \{0 | \} \{3 | \})
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \}) \\
 (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 \\
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \}) \\
 \wedge \gg (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \}) \\
 (\{1 | \}. \{2 | \} \{3 | \} \{1 | \}) \\
 \\
 (\{1 | \}. \{0 | \} \{3 | \} \{0 | \}) \\
 \gg (\{1 | \}. \{1 | \} \{3 | \} \{1 | \} \{0 | \}) \\
 (\{2 | \}. \{ | \} \{2 | \} \{1 | \})
 \end{array}$$



### 13. Pre-semiotic dual system

$$\begin{aligned}
 & (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} \{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} \{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} \{ | \} \cdot \\
 & \{2 | \} \{1 | \} \{2 | \} ) \times \\
 & (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \{1 | \} \cdot \{1 | \} \{1 | \} \{3 | \} \{1 | \} \{0 | \} \{1 | \} \cdot \\
 & \{2 | \} \{3 | \} \{1 | \} )
 \end{aligned}$$

#### Qualitative action

$$\begin{array}{l}
 (\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} )
 \end{array}$$

#### Medial action

$$\begin{array}{l}
 (\{1 | \} \cdot \{1 | \} \{0 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} ) \\
 (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} ) \\
 (\{1 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{0 | \} )
 \end{array}$$



$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{2 | \} \\ \wedge \gg (\{1 | \} \cdot \{1 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{2 | \}}$$

### Interpretative action

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ \{ | \} \cdot \{2 | \} \end{pmatrix}_{\{2 | \} \{3 | \} \{1 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{2 | \} \{1 | \} \{3 | \}}$$

$$\begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{0 | \} \{1 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{0 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ \{0 | \} \cdot \{2 | \} \end{pmatrix}_{\{1 | \} \{2 | \} \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{2 | \}}$$

$$\begin{pmatrix} \{0 | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{2 | \} \{3 | \} \{0 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{0 | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{2 | \}}$$

$$\begin{pmatrix} \{ | \} \cdot \{2 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ \{1 | \} \cdot \{1 | \} \end{pmatrix}_{\{1 | \} \{2 | \} \{3 | \}} \times \begin{pmatrix} \{1 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ \{2 | \} \cdot \{ | \} \end{pmatrix}_{\{3 | \} \{1 | \} \{2 | \}}$$

#### 14. Pre-semiotic dual system

$$\begin{aligned}
 & (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} \{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} \{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} \{ | \} \cdot \\
 & \{2 | \} \{1 | \} \{2 | \} ) \times \\
 & (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{1 | \} \cdot \\
 & \{2 | \} \{3 | \} \{1 | \} )
 \end{aligned}$$

#### Qualitative action

$$\begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} )
 \end{array}$$

$$\begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \} )
 \end{array} \times \begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} )
 \end{array}$$

#### Medial action

$$\begin{array}{l}
 (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} ) \\
 \wedge \gg (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} ) \\
 (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \} )
 \end{array} \times \begin{array}{l}
 (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} ) \\
 \wedge \gg (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} ) \\
 (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} )
 \end{array}$$



$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ (\{ | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ (\{1 | \} \cdot \{2 | \}) \end{pmatrix}_{\{2 | \}, \{1 | \}}$$

$$\begin{pmatrix} (\{ | \} \cdot \{2 | \}) \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ (\{1 | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \}, \{2 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ (\{2 | \} \cdot \{ | \}) \end{pmatrix}_{\{3 | \}, \{1 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ (\{1 | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ (\{1 | \} \cdot \{2 | \}) \end{pmatrix}_{\{3 | \}, \{2 | \}}$$

$$\begin{pmatrix} (\{ | \} \cdot \{2 | \}) \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ (\{2 | \} \cdot \{1 | \}) \end{pmatrix}_{\{1 | \}, \{2 | \}} \times \begin{pmatrix} (\{1 | \} \cdot \{2 | \}) \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ (\{2 | \} \cdot \{ | \}) \end{pmatrix}_{\{3 | \}, \{1 | \}}$$

$$\begin{pmatrix} (\{1 | \} \cdot \{2 | \}) \\ \wedge \gg (\{0 | \} \cdot \{2 | \}) \\ (\{2 | \} \cdot \{1 | \}) \end{pmatrix}_{\{1 | \}, \{3 | \}} \times \begin{pmatrix} (\{1 | \} \cdot \{2 | \}) \\ \wedge \gg (\{2 | \} \cdot \{0 | \}) \\ (\{2 | \} \cdot \{1 | \}) \end{pmatrix}_{\{3 | \}, \{2 | \}}$$

### Objectal action

$$\begin{pmatrix} (\{0 | \} \cdot \{2 | \}) \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ (\{ | \} \cdot \{2 | \}) \end{pmatrix}_{\{2 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ (\{2 | \} \cdot \{0 | \}) \end{pmatrix}_{\{2 | \}, \{1 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ (\{ | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{ | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ (\{1 | \} \cdot \{2 | \}) \end{pmatrix}_{\{2 | \}, \{1 | \}}$$

$$\begin{pmatrix} (\{ | \} \cdot \{2 | \}) \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ (\{0 | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \}, \{2 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ (\{2 | \} \cdot \{ | \}) \end{pmatrix}_{\{3 | \}, \{2 | \}}$$

$$\begin{pmatrix} \{2 | \} \cdot \{1 | \} \\ \wedge \gg (\{1 | \} \cdot \{2 | \}) \\ (\{0 | \} \cdot \{2 | \}) \end{pmatrix}_{\{1 | \}, \{3 | \}} \times \begin{pmatrix} \{2 | \} \cdot \{0 | \} \\ \wedge \gg (\{2 | \} \cdot \{1 | \}) \\ (\{1 | \} \cdot \{2 | \}) \end{pmatrix}_{\{3 | \}, \{1 | \}}$$

$$\begin{pmatrix} \{0\} \cdot \{2\} \\ \{2\} \cdot \{1\} \end{pmatrix}_{\{2\} \cdot \{3\}} \times \begin{pmatrix} \{1\} \cdot \{2\} \\ \{2\} \cdot \{0\} \end{pmatrix}_{\{3\} \cdot \{1\}}$$

$$\begin{pmatrix} \{\} \cdot \{2\} \\ \{2\} \cdot \{1\} \end{pmatrix}_{\{1\} \cdot \{2\}} \times \begin{pmatrix} \{1\} \cdot \{2\} \\ \{2\} \cdot \{\} \end{pmatrix}_{\{3\} \cdot \{1\}}$$

Interpretative action

$$\begin{pmatrix} \{1\} \cdot \{2\} \\ \{\} \cdot \{2\} \end{pmatrix}_{\{1\} \cdot \{3\}} \times \begin{pmatrix} \{2\} \cdot \{\} \\ \{2\} \cdot \{1\} \end{pmatrix}_{\{1\} \cdot \{3\}}$$

$$\begin{pmatrix} \{0\} \cdot \{2\} \\ \{\} \cdot \{2\} \end{pmatrix}_{\{2\} \cdot \{3\}} \times \begin{pmatrix} \{2\} \cdot \{\} \\ \{2\} \cdot \{0\} \end{pmatrix}_{\{2\} \cdot \{1\}}$$

$$\begin{pmatrix} \{1\} \cdot \{2\} \\ \{0\} \cdot \{2\} \end{pmatrix}_{\{1\} \cdot \{3\}} \times \begin{pmatrix} \{2\} \cdot \{0\} \\ \{2\} \cdot \{1\} \end{pmatrix}_{\{3\} \cdot \{1\}}$$

$$\begin{pmatrix} \{\} \cdot \{2\} \\ \{0\} \cdot \{2\} \end{pmatrix}_{\{1\} \cdot \{2\}} \times \begin{pmatrix} \{2\} \cdot \{0\} \\ \{2\} \cdot \{\} \end{pmatrix}_{\{3\} \cdot \{2\}}$$

$$\begin{pmatrix} \{0\} \cdot \{2\} \\ \{1\} \cdot \{2\} \end{pmatrix}_{\{2\} \cdot \{3\}} \times \begin{pmatrix} \{2\} \cdot \{1\} \\ \{2\} \cdot \{0\} \end{pmatrix}_{\{3\} \cdot \{1\}}$$

$$\begin{pmatrix} \{\} \cdot \{2\} \\ \{1\} \cdot \{2\} \end{pmatrix}_{\{1\} \cdot \{2\}} \times \begin{pmatrix} \{2\} \cdot \{1\} \\ \{2\} \cdot \{\} \end{pmatrix}_{\{3\} \cdot \{1\}}$$

### 15. Pre-semiotic dual system

$$\begin{aligned} & (\{2 | \} \cdot \{2 | \} \{1 | \} \{2 | \} \{3 | \} \{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \} \{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \} \{ | \} \cdot \\ & \{2 | \} \{1 | \} \{2 | \}) \times \\ & (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \} \{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \} \{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \} \{2 | \} \cdot \\ & \{2 | \} \{3 | \} \{2 | \} \{1 | \}) \end{aligned}$$

### Qualitative action

$$\begin{array}{l} (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}) \\ \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \\ (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \}) \\ \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \}) \end{array}$$

$$\begin{array}{l} (\{2 | \} \cdot \{2 | \} \{1 | \} \{2 | \} \{3 | \}) \\ \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \\ (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \}) \\ \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ (\{2 | \} \cdot \{2 | \} \{3 | \} \{2 | \} \{1 | \}) \end{array}$$

$$\begin{array}{l} (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}) \\ \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \\ (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \}) \\ \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \}) \end{array}$$

$$\begin{array}{l} (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \}) \\ \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \\ (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \}) \\ \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \}) \end{array}$$

$$\begin{array}{l} (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}) \\ \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \\ (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \}) \\ \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \}) \end{array}$$

$$\begin{array}{l} (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}) \\ \wedge \gg (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \\ (\{2 | \} \cdot \{1 | \} \{1 | \} \{3 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{1 | \} \cdot \{2 | \} \{3 | \} \{1 | \}) \\ \wedge \gg (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \}) \end{array}$$

### Medial action

$$\begin{array}{l} (\{1 | \} \cdot \{2 | \} \{1 | \} \{3 | \}) \\ \wedge \gg (\{0 | \} \cdot \{2 | \} \{2 | \} \{3 | \}) \\ (\{ | \} \cdot \{2 | \} \{1 | \} \{2 | \}) \end{array} \quad \times \quad \begin{array}{l} (\{2 | \} \cdot \{ | \} \{2 | \} \{1 | \}) \\ \wedge \gg (\{2 | \} \cdot \{0 | \} \{3 | \} \{2 | \}) \\ (\{2 | \} \cdot \{1 | \} \{3 | \} \{1 | \}) \end{array}$$















$$\begin{array}{c} \{0\} \{0\} \{01, 21, 31\} \\ \{1\} \{0\} \{01, 31\} \gg Y > \{2\} \{0\} \{21, 31\} \\ \{1\} \{1\} \{01, 11\} \end{array} \times \begin{array}{c} \{1\} \{1\} \{11, 01\} \\ \{0\} \{2\} \{31, 21\} \gg Y > \{0\} \{1\} \{31, 01\} \\ \{0\} \{0\} \{31, 21, 01\} \end{array}$$

### 3. Pre-semiotic dual system

$$\begin{array}{c} \{2\} \{0\} \{21, 31\} \{1\} \{0\} \{01, 31\} \{0\} \{0\} \{01, 21, 31\} \{1\} \{2\} \{11, 21\} \\ \{2\} \{1\} \{21, 11\} \{0\} \{0\} \{31, 21, 01\} \{0\} \{1\} \{31, 01\} \{0\} \{2\} \{31, 21\} \end{array} \times$$

#### Qualitative action

$$\begin{array}{c} \{2\} \{0\} \{21, 31\} \\ \{0\} \{0\} \{01, 21, 31\} \gg Y > \{1\} \{2\} \{11, 21\} \\ \{1\} \{0\} \{01, 31\} \end{array} \times \begin{array}{c} \{0\} \{1\} \{31, 01\} \\ \{2\} \{1\} \{21, 11\} \gg Y > \{0\} \{0\} \{31, 21, 01\} \\ \{0\} \{2\} \{31, 21\} \end{array}$$

$$\begin{array}{c} \{1\} \{0\} \{01, 31\} \\ \{0\} \{0\} \{01, 21, 31\} \gg Y > \{1\} \{2\} \{11, 21\} \\ \{2\} \{0\} \{21, 31\} \end{array} \times \begin{array}{c} \{0\} \{2\} \{31, 21\} \\ \{2\} \{1\} \{21, 11\} Y > \{0\} \{0\} \{31, 21, 01\} \\ \{0\} \{1\} \{31, 01\} \end{array}$$

$$\begin{array}{c} \{2\} \{0\} \{21, 31\} \\ \{1\} \{0\} \{01, 31\} \gg Y > \{1\} \{2\} \{11, 21\} \\ \{0\} \{0\} \{01, 21, 31\} \end{array} \times \begin{array}{c} \{0\} \{0\} \{31, 21, 01\} \\ \{2\} \{1\} \{21, 11\} \gg Y > \{0\} \{1\} \{31, 01\} \\ \{0\} \{2\} \{31, 21\} \end{array}$$

$$\begin{array}{c} \{0\} \{0\} \{01, 21, 31\} \\ \{1\} \{0\} \{01, 31\} \gg Y > \{1\} \{2\} \{11, 21\} \\ \{2\} \{0\} \{21, 31\} \end{array} \times \begin{array}{c} \{0\} \{2\} \{31, 21\} \\ \{2\} \{1\} \{21, 11\} \gg Y > \{0\} \{1\} \{31, 01\} \\ \{0\} \{0\} \{31, 21, 01\} \end{array}$$

$$\begin{array}{c} \{0\} \{0\} \{01, 21, 31\} \\ \{2\} \{0\} \{21, 31\} \gg Y > \{1\} \{2\} \{11, 21\} \\ \{1\} \{0\} \{01, 31\} \end{array} \times \begin{array}{c} \{0\} \{1\} \{31, 01\} \\ \{2\} \{1\} \{21, 11\} \gg Y > \{0\} \{2\} \{31, 21\} \\ \{0\} \{0\} \{31, 21, 01\} \end{array}$$

$$\begin{array}{c} \{1\} \{0\} \{01, 31\} \\ \{2\} \{0\} \{21, 31\} \gg Y > \{1\} \{2\} \{11, 21\} \\ \{0\} \{0\} \{01, 21, 31\} \end{array} \times \begin{array}{c} \{0\} \{0\} \{31, 21, 01\} \\ \{2\} \{1\} \{21, 11\} \gg Y > \{0\} \{2\} \{31, 21\} \\ \{0\} \{1\} \{31, 01\} \end{array}$$

#### Medial action

$$\begin{array}{c} \{2\} \{0\} \{21, 31\} \\ \{1\} \{2\} \{11, 21\} \gg Y > \{0\} \{0\} \{01, 21, 31\} \\ \{1\} \{0\} \{01, 31\} \end{array} \times \begin{array}{c} \{0\} \{1\} \{31, 01\} \\ \{0\} \{0\} \{31, 21, 01\} \gg Y > \{2\} \{1\} \{21, 11\} \\ \{0\} \{2\} \{31, 21\} \end{array}$$

$$\begin{array}{c} \{1\} \{0\} \{01, 31\} \\ \{1\} \{2\} \{11, 21\} \gg Y > \{0\} \{0\} \{01, 21, 31\} \\ \{2\} \{0\} \{21, 31\} \end{array} \times \begin{array}{c} \{0\} \{2\} \{31, 21\} \\ \{0\} \{0\} \{31, 21, 01\} \gg Y > \{2\} \{1\} \{21, 11\} \\ \{0\} \{1\} \{31, 01\} \end{array}$$

$$\begin{array}{c} \{1\} \{2\} \{11, 21\} \\ \{1\} \{0\} \{01, 31\} \gg Y > \{0\} \{0\} \{01, 21, 31\} \\ \{2\} \{0\} \{21, 31\} \end{array} \times \begin{array}{c} \{0\} \{2\} \{31, 21\} \\ \{0\} \{0\} \{31, 21, 01\} \gg Y > \{0\} \{1\} \{31, 01\} \\ \{2\} \{1\} \{21, 11\} \end{array}$$

$$\begin{array}{c} \{2\} \{0\} \{21, 31\} \\ \{1\} \{0\} \{01, 31\} \gg Y > \{0\} \{0\} \{01, 21, 31\} \\ \{1\} \{2\} \{11, 21\} \end{array} \times \begin{array}{c} \{2\} \{1\} \{21, 11\} \\ \{0\} \{0\} \{31, 21, 01\} \gg Y > \{0\} \{1\} \{31, 01\} \\ \{0\} \{2\} \{31, 21\} \end{array}$$











$$\begin{array}{c} \{\{0\}\}\{1\}\{01\}\{31\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \gg Y > \{\{2\}\}\{0\}\{21\}\{31\} \\ \{\{1\}\}\{2\}\{11\}\{21\} \end{array} \times \begin{array}{c} \{\{2\}\}\{1\}\{21\}\{11\} \\ \{\{0\}\}\{2\}\{31\}\{21\} \gg Y > \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{1\}\}\{0\}\{31\}\{01\} \end{array}$$

## 6. Pre-semiotic dual system

$$\begin{array}{c} \{\{2\}\}\{0\}\{21\}\{31\} \{\{1\}\}\{0\}\{01\}\{31\} \{\{0\}\}\{2\}\{21\}\{31\} \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \{\{2\}\}\{0\}\{31\}\{21\} \{\{0\}\}\{1\}\{31\}\{01\} \{\{0\}\}\{2\}\{31\}\{21\} \end{array} \times$$

### Qualitative action

$$\begin{array}{c} \{\{2\}\}\{0\}\{21\}\{31\} \\ \{\{0\}\}\{2\}\{21\}\{31\} \gg Y > \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \gg Y > \{\{2\}\}\{0\}\{31\}\{21\} \\ \{\{0\}\}\{2\}\{31\}\{21\} \end{array}$$

$$\begin{array}{c} \{\{1\}\}\{0\}\{01\}\{31\} \\ \{\{0\}\}\{2\}\{21\}\{31\} \gg Y > \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{2\}\{31\}\{21\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \gg Y > \{\{2\}\}\{0\}\{31\}\{21\} \\ \{\{0\}\}\{1\}\{31\}\{01\} \end{array}$$

$$\begin{array}{c} \{\{2\}\}\{0\}\{21\}\{31\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \gg Y > \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{0\}\}\{2\}\{21\}\{31\} \end{array} \times \begin{array}{c} \{\{2\}\}\{0\}\{31\}\{21\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \gg Y > \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{0\}\}\{2\}\{31\}\{21\} \end{array}$$

$$\begin{array}{c} \{\{0\}\}\{2\}\{21\}\{31\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \gg Y > \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{2\}\{31\}\{21\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \gg Y > \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{2\}\}\{0\}\{31\}\{21\} \end{array}$$

$$\begin{array}{c} \{\{0\}\}\{2\}\{21\}\{31\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \gg Y > \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \gg Y > \{\{0\}\}\{2\}\{31\}\{21\} \\ \{\{2\}\}\{0\}\{31\}\{21\} \end{array}$$

$$\begin{array}{c} \{\{1\}\}\{0\}\{01\}\{31\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \gg Y > \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{0\}\}\{2\}\{21\}\{31\} \end{array} \times \begin{array}{c} \{\{2\}\}\{0\}\{31\}\{21\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \gg Y > \{\{0\}\}\{2\}\{31\}\{21\} \\ \{\{0\}\}\{1\}\{31\}\{01\} \end{array}$$

### Medial action

$$\begin{array}{c} \{\{2\}\}\{0\}\{21\}\{31\} \\ \{\{1\}\}\{2\}\{11\}\{21\} \gg Y > \{\{0\}\}\{2\}\{21\}\{31\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{2\}\}\{0\}\{31\}\{21\} \gg Y > \{\{2\}\}\{1\}\{21\}\{11\} \\ \{\{0\}\}\{2\}\{31\}\{21\} \end{array}$$

$$\begin{array}{c} \{\{1\}\}\{0\}\{01\}\{31\} \\ \{\{1\}\}\{2\}\{11\}\{21\} \gg Y > \{\{0\}\}\{2\}\{21\}\{31\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{2\}\{31\}\{21\} \\ \{\{2\}\}\{0\}\{31\}\{21\} \gg Y > \{\{2\}\}\{1\}\{21\}\{11\} \\ \{\{0\}\}\{1\}\{31\}\{01\} \end{array}$$

$$\begin{array}{c} \{\{1\}\}\{2\}\{11\}\{21\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \gg Y > \{\{0\}\}\{2\}\{21\}\{31\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \end{array} \times \begin{array}{c} \{\{0\}\}\{2\}\{31\}\{21\} \\ \{\{2\}\}\{0\}\{21\}\{31\} \gg Y > \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{2\}\}\{1\}\{21\}\{11\} \end{array}$$

$$\begin{array}{c} \{\{2\}\}\{0\}\{21\}\{31\} \\ \{\{1\}\}\{0\}\{01\}\{31\} \gg Y > \{\{0\}\}\{2\}\{21\}\{31\} \\ \{\{1\}\}\{2\}\{11\}\{21\} \end{array} \times \begin{array}{c} \{\{2\}\}\{1\}\{21\}\{11\} \\ \{\{2\}\}\{0\}\{31\}\{21\} \gg Y > \{\{0\}\}\{1\}\{31\}\{01\} \\ \{\{0\}\}\{2\}\{31\}\{21\} \end{array}$$



$$(\{2\} \{-0\} \}_{21,31}) \gg Y > (\{0\} \{-2\} \}_{21,31}) \times (\{1\} \{-0\} \}_{01,31})$$

$$(\{2\} \{-0\} \}_{31,21}) \gg Y > (\{0\} \{-2\} \}_{31,21}) (\{2\} \{-1\} \}_{31,01})$$

$$(\{2\} \{-0\} \}_{21,31}) \gg Y > (\{0\} \{-2\} \}_{21,31}) \times (\{1\} \{-0\} \}_{01,31})$$

$$(\{2\} \{-0\} \}_{31,21}) \gg Y > (\{0\} \{-2\} \}_{31,21}) (\{2\} \{-1\} \}_{31,01})$$

### Objectal action

$$(\{1\} \{-2\} \}_{11,21}) \gg Y > (\{1\} \{-0\} \}_{01,31}) \times (\{0\} \{-2\} \}_{21,31})$$

$$(\{0\} \{-1\} \}_{01,31}) \gg Y > (\{2\} \{-1\} \}_{21,11}) (\{0\} \{-2\} \}_{31,21})$$

$$(\{1\} \{-2\} \}_{11,21}) \gg Y > (\{1\} \{-0\} \}_{01,31}) \times (\{2\} \{-0\} \}_{21,31})$$

$$(\{0\} \{-1\} \}_{31,01}) \gg Y > (\{2\} \{-1\} \}_{21,11}) (\{0\} \{-2\} \}_{31,21})$$

$$(\{0\} \{-2\} \}_{21,31}) \gg Y > (\{1\} \{-0\} \}_{01,31}) \times (\{2\} \{-0\} \}_{21,31})$$

$$(\{0\} \{-1\} \}_{31,01}) \gg Y > (\{2\} \{-0\} \}_{31,21}) (\{2\} \{-1\} \}_{21,11})$$

$$(\{0\} \{-2\} \}_{21,31}) \gg Y > (\{1\} \{-0\} \}_{01,31}) \times (\{1\} \{-2\} \}_{11,21})$$

$$(\{0\} \{-1\} \}_{31,01}) \gg Y > (\{2\} \{-0\} \}_{31,21}) (\{0\} \{-2\} \}_{31,21})$$

$$(\{2\} \{-0\} \}_{21,31}) \gg Y > (\{1\} \{-0\} \}_{01,31}) \times (\{0\} \{-2\} \}_{21,31})$$

$$(\{0\} \{-1\} \}_{31,01}) \gg Y > (\{0\} \{-2\} \}_{31,21}) (\{2\} \{-1\} \}_{21,11})$$

$$(\{2\} \{-0\} \}_{21,31}) \gg Y > (\{1\} \{-0\} \}_{01,31}) \times (\{1\} \{-2\} \}_{11,21})$$

$$(\{0\} \{-1\} \}_{31,01}) \gg Y > (\{0\} \{-2\} \}_{31,21}) (\{2\} \{-0\} \}_{21,31})$$

### Interpretative action

$$(\{1\} \{-0\} \}_{01,31}) \gg Y > (\{2\} \{-0\} \}_{21,31}) \times (\{0\} \{-2\} \}_{21,31})$$

$$(\{0\} \{-2\} \}_{21,31}) \gg Y > (\{2\} \{-1\} \}_{21,11}) (\{0\} \{-1\} \}_{31,01})$$

$$(\{1\} \{-2\} \}_{11,21}) \gg Y > (\{2\} \{-0\} \}_{21,31}) \times (\{1\} \{-0\} \}_{01,31})$$

$$(\{0\} \{-2\} \}_{21,31}) \gg Y > (\{2\} \{-1\} \}_{21,11}) (\{2\} \{-0\} \}_{21,31})$$

$$(\{0\} \{-2\} \}_{21,31}) \gg Y > (\{2\} \{-0\} \}_{21,31}) \times (\{1\} \{-0\} \}_{01,31})$$

$$(\{0\} \{-2\} \}_{21,31}) \gg Y > (\{2\} \{-0\} \}_{31,21}) (\{2\} \{-1\} \}_{21,11})$$

$$(\{1\} \{-0\} \}_{01,31}) \gg Y > (\{2\} \{-0\} \}_{21,31}) \times (\{1\} \{-2\} \}_{11,21})$$

$$(\{0\} \{-2\} \}_{31,21}) \gg Y > (\{2\} \{-0\} \}_{31,21}) (\{0\} \{-1\} \}_{31,01})$$

$$(\{1\} \{-0\} \}_{01,31}) \gg Y > (\{2\} \{-0\} \}_{21,31}) \times (\{0\} \{-2\} \}_{21,31})$$

$$(\{0\} \{-2\} \}_{31,21}) \gg Y > (\{0\} \{-1\} \}_{31,01}) (\{2\} \{-1\} \}_{21,11})$$

$$\begin{array}{c} \{0\} \{2\} \{21,31\} \\ \{1\} \{0\} \{01,31\} \gg Y > \{2\} \{0\} \{21,31\} \times \\ \{1\} \{2\} \{11,21\} \end{array} \quad \begin{array}{c} \{2\} \{1\} \{21,31\} \\ \{0\} \{2\} \{31,21\} \gg Y > \{0\} \{1\} \{31,01\} \\ \{2\} \{0\} \{31,21\} \end{array}$$

## 7. Pre-semiotic dual system

$$\begin{array}{c} \{2\} \{0\} \{21,31\} \{1\} \{1\} \{01,11,31\} \{0\} \{1\} \{01,31\} \{1\} \{1\} \{01,11\} \times \\ \{1\} \{1\} \{11,01\} \{1\} \{0\} \{31,01\} \{1\} \{1\} \{31,11,01\} \{0\} \{2\} \{31,21\} \end{array}$$

### Qualitative action

$$\begin{array}{c} \{2\} \{0\} \{21,31\} \\ \{0\} \{1\} \{01,31\} \gg Y > \{1\} \{1\} \{01,11\} \\ \{1\} \{1\} \{01,11,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{1\} \{31,11,01\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{1\} \{0\} \{31,01\} \\ \{0\} \{2\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01,11,31\} \\ \{0\} \{1\} \{01,31\} \gg Y > \{1\} \{1\} \{01,11\} \\ \{2\} \{0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{2\} \{31,21\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{1\} \{0\} \{31,01\} \\ \{1\} \{1\} \{31,11,01\} \end{array}$$

$$\begin{array}{c} \{2\} \{0\} \{21,31\} \\ \{1\} \{1\} \{01,11,31\} \gg Y > \{1\} \{1\} \{01,11\} \\ \{0\} \{1\} \{01,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{0\} \{31,01\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{1\} \{1\} \{31,11,01\} \\ \{0\} \{2\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{0\} \{1\} \{01,31\} \\ \{1\} \{1\} \{01,11,31\} \gg Y > \{1\} \{1\} \{01,11\} \\ \{2\} \{0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{2\} \{31,21\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{1\} \{1\} \{31,11,01\} \\ \{1\} \{0\} \{31,01\} \end{array}$$

$$\begin{array}{c} \{0\} \{1\} \{01,31\} \\ \{2\} \{0\} \{21,31\} \gg Y > \{1\} \{1\} \{01,11\} \\ \{1\} \{1\} \{01,11,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{1\} \{31,11,01\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{0\} \{2\} \{31,21\} \\ \{1\} \{0\} \{31,01\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01,11,31\} \\ \{2\} \{0\} \{21,31\} \gg Y > \{1\} \{1\} \{01,11\} \\ \{0\} \{1\} \{01,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{0\} \{31,01\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{0\} \{2\} \{31,21\} \\ \{1\} \{1\} \{31,11,01\} \end{array}$$

### Medial action

$$\begin{array}{c} \{2\} \{0\} \{21,31\} \\ \{1\} \{1\} \{01,11\} \gg Y > \{0\} \{1\} \{01,31\} \\ \{1\} \{1\} \{01,11,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{1\} \{31,11,01\} \\ \{1\} \{0\} \{31,01\} \gg Y > \{1\} \{1\} \{11,01\} \\ \{0\} \{2\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01,11,31\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{0\} \{1\} \{01,31\} \\ \{2\} \{0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{2\} \{31,21\} \\ \{1\} \{0\} \{31,01\} \gg Y > \{1\} \{1\} \{11,01\} \\ \{1\} \{1\} \{31,11,01\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01,11,31\} \\ \{1\} \{1\} \{11,01\} \gg Y > \{0\} \{1\} \{01,31\} \\ \{2\} \{0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{2\} \{31,21\} \\ \{1\} \{0\} \{31,01\} \gg Y > \{1\} \{1\} \{11,01\} \\ \{1\} \{1\} \{31,11,01\} \end{array}$$

$$\begin{array}{c} \{2\} \{0\} \{21,31\} \\ \{1\} \{1\} \{01,11,31\} \gg Y > \{0\} \{1\} \{01,31\} \\ \{1\} \{1\} \{01,11\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{1\} \{31,11,01\} \\ \{1\} \{0\} \{31,01\} \gg Y > \{1\} \{1\} \{11,01\} \\ \{0\} \{2\} \{31,21\} \end{array}$$







$$\begin{array}{c} \{0\} \{-1\} \{01,31\} \\ \{1\} \{-1\} \{01,31\} \gg Y > \{2\} \{-0\} \{21,31\} \times \\ \{1\} \{-2\} \{11,21\} \end{array} \quad \begin{array}{c} \{2\} \{-1\} \{21,11\} \\ \{0\} \{-2\} \{31,21\} \gg Y > \{1\} \{-1\} \{31,01\} \\ \{1\} \{-0\} \{31,01\} \end{array}$$

## 9. Pre-semiotic dual system

$$\begin{array}{c} \{2\} \{-0\} \{21,31\} \{1\} \{-1\} \{01,31\} \{0\} \{-2\} \{21,31\} \{1\} \{-2\} \{11,21\} \times \\ \{2\} \{-1\} \{21,11\} \{2\} \{-0\} \{31,21\} \{1\} \{-1\} \{31,01\} \{0\} \{-2\} \{31,21\} \end{array}$$

### Qualitative action

$$\begin{array}{c} \{2\} \{-0\} \{21,31\} \\ \{0\} \{-2\} \{21,31\} \gg Y > \{1\} \{-2\} \{11,21\} \\ \{1\} \{-1\} \{01,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{-1\} \{31,01\} \\ \{2\} \{-1\} \{21,11\} \gg Y > \{2\} \{-0\} \{31,21\} \\ \{0\} \{-2\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{1\} \{-1\} \{01,31\} \\ \{0\} \{-2\} \{21,31\} \gg Y > \{1\} \{-2\} \{11,21\} \\ \{2\} \{-0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{-2\} \{31,21\} \\ \{2\} \{-1\} \{21,11\} \gg Y > \{2\} \{-0\} \{31,21\} \\ \{1\} \{-1\} \{31,01\} \end{array}$$

$$\begin{array}{c} \{2\} \{-0\} \{21,31\} \\ \{1\} \{-1\} \{01,31\} \gg Y > \{1\} \{-2\} \{11,21\} \\ \{0\} \{-2\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{2\} \{-0\} \{21,31\} \\ \{2\} \{-1\} \{21,11\} \gg Y > \{1\} \{-1\} \{31,01\} \\ \{0\} \{-2\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{0\} \{-2\} \{21,31\} \\ \{1\} \{-1\} \{01,31\} \gg Y > \{1\} \{-2\} \{11,21\} \\ \{2\} \{-0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{-2\} \{31,21\} \\ \{2\} \{-1\} \{21,11\} \gg Y > \{1\} \{-1\} \{31,01\} \\ \{2\} \{-0\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{0\} \{-2\} \{21,31\} \\ \{2\} \{-0\} \{21,31\} \gg Y > \{1\} \{-2\} \{11,21\} \\ \{1\} \{-1\} \{01,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{-1\} \{31,01\} \\ \{2\} \{-1\} \{21,11\} \gg Y > \{0\} \{-2\} \{31,21\} \\ \{2\} \{-0\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{1\} \{-1\} \{01,31\} \\ \{2\} \{-0\} \{21,31\} \gg Y > \{1\} \{-2\} \{11,21\} \\ \{0\} \{-2\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{2\} \{-0\} \{31,21\} \\ \{2\} \{-1\} \{21,11\} \gg Y > \{0\} \{-2\} \{31,21\} \\ \{1\} \{-1\} \{31,01\} \end{array}$$

### Medial action

$$\begin{array}{c} \{2\} \{-0\} \{21,31\} \\ \{1\} \{-2\} \{11,21\} \gg Y > \{0\} \{-2\} \{21,31\} \\ \{1\} \{-1\} \{01,31\} \end{array} \quad \times \quad \begin{array}{c} \{1\} \{-1\} \{31,01\} \\ \{2\} \{-0\} \{31,21\} \gg Y > \{2\} \{-1\} \{21,11\} \\ \{0\} \{-2\} \{31,21\} \end{array}$$

$$\begin{array}{c} \{1\} \{-1\} \{01,31\} \\ \{1\} \{-2\} \{11,21\} \gg Y > \{0\} \{-2\} \{21,31\} \\ \{2\} \{-0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{-2\} \{31,21\} \\ \{2\} \{-0\} \{31,21\} \gg Y > \{2\} \{-1\} \{21,11\} \\ \{1\} \{-1\} \{31,01\} \end{array}$$

$$\begin{array}{c} \{1\} \{-2\} \{11,21\} \\ \{1\} \{-1\} \{01,31\} \gg Y > \{0\} \{-2\} \{21,31\} \\ \{2\} \{-0\} \{21,31\} \end{array} \quad \times \quad \begin{array}{c} \{0\} \{-2\} \{31,21\} \\ \{2\} \{-0\} \{31,21\} \gg Y > \{1\} \{-1\} \{31,01\} \\ \{2\} \{-1\} \{21,11\} \end{array}$$

$$\begin{array}{c} \{2\} \{-0\} \{21,31\} \\ \{1\} \{-1\} \{01,31\} \gg Y > \{0\} \{-2\} \{21,31\} \\ \{1\} \{-2\} \{11,21\} \end{array} \quad \times \quad \begin{array}{c} \{2\} \{-1\} \{21,11\} \\ \{2\} \{-0\} \{31,21\} \gg Y > \{1\} \{-1\} \{31,01\} \\ \{0\} \{-2\} \{31,21\} \end{array}$$













$$\begin{array}{c} \{0\} \{1\} \{01\} \{31\} \\ \{1\} \{1\} \{01\} \{31\} \gg Y > \{2\} \{1\} \{1\} \{31\} \times \\ \{1\} \{1\} \{01\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{1\} \{01\} \\ \{1\} \{2\} \{31\} \{01\} \gg Y > \{1\} \{1\} \{31\} \{01\} \\ \{1\} \{0\} \{31\} \end{array}$$

## 12. Pre-semiotic dual system

$$\begin{array}{c} \{2\} \{1\} \{1\} \{31\} \{1\} \{1\} \{01\} \{31\} \{0\} \{1\} \{01\} \{31\} \{1\} \{2\} \{1\} \{21\} \times \\ \{2\} \{1\} \{21\} \{1\} \{1\} \{0\} \{31\} \{01\} \{1\} \{1\} \{31\} \{01\} \{1\} \{2\} \{31\} \end{array}$$

### Qualitative action

$$\begin{array}{c} \{2\} \{1\} \{1\} \{31\} \\ \{0\} \{1\} \{01\} \{31\} \gg Y > \{1\} \{2\} \{1\} \{21\} \times \\ \{1\} \{1\} \{01\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{1\} \{01\} \\ \{2\} \{1\} \{21\} \{01\} \gg Y > \{1\} \{0\} \{31\} \{01\} \\ \{1\} \{2\} \{31\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01\} \{31\} \\ \{0\} \{1\} \{01\} \{31\} \gg Y > \{1\} \{2\} \{1\} \{21\} \times \\ \{2\} \{1\} \{1\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{2\} \{31\} \\ \{2\} \{1\} \{21\} \{01\} \gg Y > \{1\} \{0\} \{31\} \{01\} \\ \{1\} \{1\} \{31\} \end{array}$$

$$\begin{array}{c} \{2\} \{1\} \{1\} \{31\} \\ \{1\} \{1\} \{01\} \{31\} \gg Y > \{1\} \{2\} \{1\} \{21\} \times \\ \{0\} \{1\} \{01\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{0\} \{31\} \\ \{2\} \{1\} \{21\} \{01\} \gg Y > \{1\} \{1\} \{31\} \{01\} \\ \{1\} \{2\} \{31\} \end{array}$$

$$\begin{array}{c} \{0\} \{1\} \{01\} \{31\} \\ \{1\} \{1\} \{01\} \{31\} \gg Y > \{1\} \{2\} \{1\} \{21\} \times \\ \{2\} \{1\} \{1\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{2\} \{31\} \\ \{2\} \{1\} \{21\} \{01\} \gg Y > \{1\} \{1\} \{31\} \{01\} \\ \{1\} \{0\} \{31\} \end{array}$$

$$\begin{array}{c} \{0\} \{1\} \{01\} \{31\} \\ \{2\} \{1\} \{1\} \{31\} \gg Y > \{1\} \{2\} \{1\} \{21\} \times \\ \{1\} \{1\} \{01\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{1\} \{01\} \\ \{2\} \{1\} \{21\} \{01\} \gg Y > \{1\} \{2\} \{31\} \{01\} \\ \{1\} \{0\} \{31\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01\} \{31\} \\ \{2\} \{1\} \{1\} \{31\} \gg Y > \{1\} \{2\} \{1\} \{21\} \times \\ \{0\} \{1\} \{01\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{0\} \{31\} \\ \{2\} \{1\} \{21\} \{01\} \gg Y > \{1\} \{2\} \{31\} \{01\} \\ \{1\} \{1\} \{31\} \end{array}$$

### Medial action

$$\begin{array}{c} \{2\} \{1\} \{1\} \{31\} \\ \{1\} \{2\} \{1\} \{21\} \gg Y > \{0\} \{1\} \{01\} \{31\} \times \\ \{1\} \{1\} \{01\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{1\} \{01\} \\ \{1\} \{0\} \{31\} \{01\} \gg Y > \{2\} \{1\} \{21\} \{01\} \\ \{1\} \{2\} \{31\} \end{array}$$

$$\begin{array}{c} \{1\} \{1\} \{01\} \{31\} \\ \{1\} \{2\} \{1\} \{21\} \gg Y > \{0\} \{1\} \{01\} \{31\} \times \\ \{2\} \{1\} \{1\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{2\} \{31\} \\ \{1\} \{0\} \{31\} \{01\} \gg Y > \{2\} \{1\} \{21\} \{01\} \\ \{1\} \{1\} \{31\} \end{array}$$

$$\begin{array}{c} \{1\} \{2\} \{31\} \\ \{1\} \{1\} \{01\} \{31\} \gg Y > \{0\} \{1\} \{01\} \{31\} \times \\ \{2\} \{1\} \{1\} \{31\} \end{array} \quad \begin{array}{c} \{1\} \{2\} \{31\} \\ \{1\} \{0\} \{31\} \{01\} \gg Y > \{1\} \{1\} \{31\} \{01\} \\ \{2\} \{1\} \{21\} \{01\} \end{array}$$

$$\begin{array}{c} \{2\} \{1\} \{1\} \{31\} \\ \{1\} \{1\} \{01\} \{31\} \gg Y > \{0\} \{1\} \{01\} \{31\} \times \\ \{1\} \{2\} \{31\} \end{array} \quad \begin{array}{c} \{2\} \{1\} \{1\} \\ \{1\} \{0\} \{31\} \{01\} \gg Y > \{1\} \{1\} \{31\} \{01\} \\ \{1\} \{2\} \{31\} \end{array}$$

















$$\begin{array}{l}
\left( \begin{array}{l} \{1\} \{2\} \\ \{0\} \{2\} \end{array} \right)_{\{1\}, \{3\}} \gg Y > \left( \begin{array}{l} \{2\} \{2\} \\ \{0\} \{2\} \end{array} \right)_{\{1\}, \{2\}, \{3\}} \times \left( \begin{array}{l} \{2\} \{0\} \\ \{2\} \{1\} \end{array} \right)_{\{3\}, \{2\}} \gg Y > \left( \begin{array}{l} \{2\} \{1\} \\ \{2\} \{1\} \end{array} \right)_{\{3\}, \{1\}} \\
\left( \begin{array}{l} \{0\} \{2\} \\ \{1\} \{2\} \end{array} \right)_{\{1\}, \{3\}} \gg Y > \left( \begin{array}{l} \{2\} \{2\} \\ \{1\} \{2\} \end{array} \right)_{\{1\}, \{2\}, \{3\}} \times \left( \begin{array}{l} \{2\} \{1\} \\ \{2\} \{0\} \end{array} \right)_{\{3\}, \{2\}} \gg Y > \left( \begin{array}{l} \{2\} \{1\} \\ \{2\} \{0\} \end{array} \right)_{\{3\}, \{2\}}
\end{array}$$

Therefore, we have given all possible words of the vocabulary of a 4-contextural 4-adic negative language in semiotic form. This is the semiotic world according to Günther we had to build by opening the curtain and enter the semiotic meontics, the reign of volition and semiotic action. It represents and presents, at the same time, the night, meontics, logical negativity, the reign of thinking, the Nothing, the empire of the Devil/Hell, but, being based on a handlungstheoretische Semiotik, it is also the complete organon for such amazing products of the spirit like the terminators and related polycontextural machines whose alleged technical “brain” is not any longer depending on that of its constructor.

*For Hasosch H. Hoppel, Dr. Irmgard Pult und Susanne Weber.*

## Bibliography

- Bense, Max, Semiotische Prozesse und Systeme. Baden-Baden 1975  
Conway, John H./Guy, Richard K., The Book of Numbers. New York 1996  
Günther, Gotthard/Schelsky, Helmut, Christliche Metaphysik und das Schicksal des modernen Bewusstseins. Leipzig 1937  
Günther, Gotthard, Beiträge zur Grundlegung einer operationsfähigen Dialektik. Bd. 3. Hamburg 1980  
Heinrichs, Johannes, Reflexionstheoretische Semiotik. Bonn 1980  
Kaehr, Rudolf, Diamond Semiotics.  
<http://www.thinkartlab.com/pkl/lola/Diamond%20Semiotics/Diamond%20Semiotics.pdf> (2008a)  
Kaehr, Rudolf, Toth’s semiotic diamonds.  
<http://www.thinkartlab.com/pkl/lola/Toth-Diamanten/Toth-Diamanten.pdf> (2008b)  
Kaehr, Rudolf, Triadic diamonds.  
<http://www.thinkartlab.com/pkl/lola/Triadic%20Diamonds/Triadic%20Diamonds.pdf> (2008c)

Toth, Alfred, Semiotische Strukturen und Prozesse. Klagenfurt 2008 (2008a)

Toth, Alfred, Semiotics and Pre-Semiotics. 2 vols. Klagenfurt 2008 (2008b)

Toth, Alfred, Entwurf einer handlungstheoretischen Semiotik. Klagenfurt 2008 (2008c)

Toth, Alfred, Elements of a Theory of the Night. Tucson, AZ 2008 (2008d)

Trabant, Jürgen, Zeichen des Menschen. Frankfurt am Main 1989

27.2.2011