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Semiotic valence numbers of monads, dyads and triads

1. In chemistry, the valency number is a measure of the number of chemical bonds formed by the atoms of a given element. Similarly, we may determine the number of **semiotic bonds** a sub-sign (monad), pairs of sub-signs (dyads) and sign classes or reality thematics (triads) can realize. As a measure, we shall introduce the **semiotic valency** (SV).

2. We start with monadic semiotic bonds. In the following diagrams, the arrows point to the directions of other sub-signs in the semiotic matrix, thus spanning up their semiotic bond-spectrum (cf. Bense 1975, pp. 35 ss.).

Semiotic bonds of the Quali-Sign (1.1):

$$\begin{tikzcd}
1.1 \arrow[r] \arrow[d] \arrow[dr] & 1.2 & 1.3 & \\
2.1 & 2.2 & 2.3 & \\
3.1 & 3.2 & 3.3 & SV(1.1) = 3
\end{tikzcd}$$

Semiotic bonds of the Sin-Sign (1.2):

$$\begin{tikzcd}
1.1 & 1.2 \arrow[l] \arrow[r] \arrow[dl] \arrow[d] \arrow[dr] & 1.3 & \\
2.1 & 2.2 & 2.3 & \\
3.1 & 3.2 & 3.3 & SV(1.2) = 5
\end{tikzcd}$$

Semiotic bonds of the Legi-Sign (1.3):

$$\begin{tikzcd}
1.1 & 1.2 & 1.3 \arrow[l] \arrow[dl] \arrow[d] & \\
2.1 & 2.2 & 2.3 & \\
3.1 & 3.2 & 3.3 & SV(1.3) = 3
\end{tikzcd}$$

Semiotic bonds of the Icon (2.1):

$$\begin{tikzcd}
1.1 & 1.2 & 1.3 & \\
2.1 \arrow[u] \arrow[ur] \arrow[r] \arrow[d] \arrow[dr] & 2.2 & 2.3 & \\
3.1 & 3.2 & 3.3 & SV(2.1) = 5
\end{tikzcd}$$

Semiotic bonds of the Index (2.2):

$$\begin{tikzcd} 1.1 & 1.2 & 1.3 \\ 2.1 & 2.2 \arrow[l] \arrow[r] \arrow[u] \arrow[d] \arrow[ul] \arrow[ur] \arrow[dl] \arrow[dr] & 2.3 \\ 3.1 & 3.2 & 3.3 \end{tikzcd} \qquad SV(2.2) = 9$$

Semiotic bonds of the Symbol (2.3):

$$\begin{tikzcd} 1.1 & 1.2 & 1.3 \\ 2.1 & 2.2 & 2.3 \arrow[l] \arrow[u] \arrow[d] \arrow[ul] \arrow[dl] \\ 3.1 & 3.2 & 3.3 \end{tikzcd} \qquad SV(2.3) = 5$$

Semiotic bonds of the Rhema (3.1):

$$\begin{tikzcd} 1.1 & 1.2 & 1.3 \\ 2.1 & 2.2 & 2.3 \\ 3.1 \arrow[u] \arrow[ur] \arrow[r] & 3.2 & 3.3 \end{tikzcd} \qquad SV(3.1) = 3$$

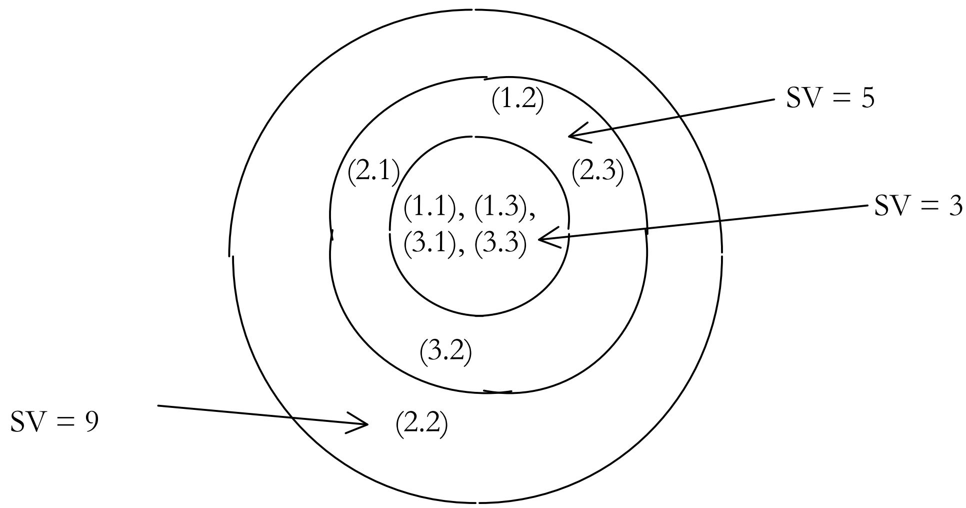
Semiotic bonds of the Dicent (3.2):

$$\begin{tikzcd} 1.1 & 1.2 & 1.3 \\ 2.1 & 2.2 & 2.3 \\ 3.1 & 3.2 \arrow[l] \arrow[r] \arrow[u] \arrow[ul] \arrow[ur] & 3.3 \end{tikzcd} \qquad SV(3.2) = 5$$

Semiotic bonds of the Argument (3.3):

$$\begin{tikzcd} 1.1 & 1.2 & 1.3 \\ 2.1 & 2.2 & 2.3 \\ 3.1 & 3.2 & 3.3 \arrow[l] \arrow[u] \arrow[ul] \end{tikzcd} \qquad SV(3.3) = 3$$

As we can see, the 9 sub-signs (monads) can be gathered to groups of valencies 3, 5 and 8. We may visualize this result as follows:



3. We now come to dyads, i.e. pairs of sub-signs. Since we are upgrading from monads via dyads to triads, we have only to look for such dyads that obey the semiotic inclusion law, which in its most abstract form is (a.b) (c.d) with a, b, c, d $\in$ {1, 2, 3} and b $\leq$ d, thus excluding from the beginning dyadic combinations that will never be able to be concatenated to sign classes, such as (3.2 2.1) or (2.3 1.1), etc. Moreover, we will only allow such pairs of dyads in which c = (2.) if a = (3.) and c = (1.) if a = (2.), thus excluding redundancies in view that for sign classes the semiotic law of degenerative order of triadic values with a $\neq$ b $\neq$ c and therefore (3.a 2.b 1.c) with a $\leq$ b $\leq$ c will apply. Hence we will obtain the following combinations of pairs of dyads:

(3.1) (2.1)	(2.1 1.1)
(3.1) (2.2)	(2.1 1.2)
(3.1) (2.3)	(2.1 1.3)
(3.2) (2.2)	(2.2 1.2)
(3.2) (2.3)	(2.2 1.3)
(3.3) (3.1)	(2.3 1.3)

As we see, the structure of semiotic valency is the same for both groups of dyads, i.e. for the combinations of (3.a 2.b) as well as for (2.a 1.b). The general semiotic rule is that in dyads, the trichotomic value of the first sub-sign decides about the number of semiotic bonds. More exactly, this rule is:

$$\text{(a.b) (c.d)} \begin{cases} \text{SV = 3, if (.b) = (.1)} \\ \text{SV = 2, if (.b) = (.2)} \\ \text{SV = 1, if (.c) = (.3)} \end{cases} \quad \text{(a, b, c, d} \in \{1, 2, 3\})$$

Here, the semiotic "orbital" of trichotomic thirdness (.3) contains 2 elements ((3.3), (2.3)), the semiotic orbital of trichotomic secondness (.2) contains 4 elements (two times (3.2) and two times (2.2)), and the semiotic orbital of trichotomic firstness (.1) contains 6 elements (three times (3.1) and three times (2.1)).

4. Finally, we are reaching the level of sign classes and their dual reality thematics. Speaking of semiotic bonds, the question is here: Which sign classes (or reality thematics) from the system of the 10 sign classes, combined in groups of two or more, display which number of semiotic valency? In Toth (2008, pp. 28 ss.), I have given an overview over all possible connections of two sign classes, written as a/b (whereby both a and b stand for one sign class each) and indicating the number of sub-signs that they share. The sign classes, to which the below numbers refer, are:

1	(3.1 2.1 1.1)
2	(3.1 2.1 1.2)
3	(3.1 2.1 1.3)
4	(3.1 2.2 1.2)
5	(3.1 2.2 1.3)
6	(3.1 2.3 1.3)
7	(3.2 2.2 1.2)
8	(3.2 2.2 1.3)
9	(3.2 2.3 1.3)
10	(3.3 2.3 1.3)

Following our above terminology, we will consider the number of shared sign classes **inherent** in each of the 10 sign classes and their reality thematics as semiotic valency. The result is a figure, which is related to a semiotic variation of Pascal's triangle (cf. Toth 2007, p. 186 ss.).

1/2 = 2; 1/3 = 2; 1/4 = 1; 1/5 = 1; 1/6 = 1; 1/7 = 0; 1/8 = 0; 1/9 = 0; 1/10 = 0
2/3 = 2; 2/4 = 2; 2/5 = 1; 2/6 = 1; 2/7 = 1; 2/8 = 0; 2/9 = 0; 2/10 = 0
3/4 = 1; 3/5 = 2; 3/6 = 2; 3/7 = 0; 3/8 = 1; 3/9 = 1; 3/10 = 1
4/5 = 2; 4/6 = 1; 4/7 = 2; 4/8 = 1; 4/9 = 0; 4/10 = 0
5/6 = 2; 5/7 = 1; 5/8 = 2; 5/9 = 1; 5/10 = 1
6/7 = 0; 6/8 = 1; 6/9 = 2; 6/10 = 2
7/8 = 2; 7/9 = 1; 7/10 = 0
8/9 = 2; 8/10 = 1
9/10 = 2

Examples:

(3.2 2.2 1.2) / (3.3 2.3 1.3) = ∅
(3.2 2.2 1.3) / (3.3 2.3 1.3) = (1.3)
(3.2 2.3 1.3) / (3.3 2.3 1.3) = (2.3 1.3).

As we can see, the semiotic valency of sign classes and reality thematics is either 0, 1 or 2.

5. Considering that the chemical notion of "orbital" had already been introduced into semiotics by Karger (1983), and given our above new results in introducing the chemical notions of valency and bond into semiotics, we may dare asking the question if other chemical notions may be of theoretical use for semiotics, digging out again the old question if and to what extent the atomic structure of Matter has its counter-image in the semiotic structure of Mind.

Bibliography

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