Viggo Brøndal, Gideon Goldenberg and the Predicative, the Completive and the Attributive Relations

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Abstract: This paper attempts to verify if the rectangular grid of mathematical logic oppositions conceived by the Danish logician and linguist Viggo Brøndal (1887-1942) coincides with the classification of the relations between the parts of speech which has been proposed by Gideon Goldenberg (1930-2013). This prominent Israeli orientalist, being inspired by morphological and syntactic data inferred from various old and modern Semitic languages, concluded that the relations between the parts of speech fall within three different classes: the predicative relation, the completive relation and the attributive relation. The conclusion of this inquiry is that the three classes that Goldenberg outlined are comparable with three of the four angular boxes of the grid of oppositions that Brøndal planned in order to classify the prepositional system of various languages. The distribution of the three Goldenberg's classes into Brøndal's boxes depends on whether they possess or not the transitive property and the symmetric property of mathematical logic.

Keywords: Viggo Brøndal; Gideon Goldenberg; Predicative Relation; Completive Relation; Attributive Relation.

Gideon Goldenberg (1930-2013)[1], an outstanding Israeli linguist of the orientalist school of Hans Jakob Polotsky (1905-1991), exposed in a brief, yet dense, article published in 1989[2], how much the Semitic languages can contribute to the linguistic thinking. In doing that he put to good use the extensive knowledge that he matured during long years of study and research on that language family, especially on the Semitic languages and dialects spoken in Ethiopia. Goldenberg insisted on the contribution of the Semitic languages to general linguistics several times in the space of his linguistic activity,

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1 Voigt (2016).

2 Goldenberg (1989).

which culminated in the fundamental treatise *Semitic Languages. Features, Structures, Relations, Processes*, published in Oxford a year before his death. Drawing his inspiration from the principles of the comparative grammar of the Semitic languages, Goldenberg examined in three chapters of this volume, respectively chapter 12: the Predicative Relation; chapter 14: the Attributive Relation; and chapter 15: the Completive Relation, the function these relations fulfil in the sentence[3].

The Predicative Relation

In the third and last section of the article of 1989 "The Contribution of Semitic Languages to Linguistic Thinking" Goldenberg affirms that in the Semitic languages the finite verb apparently derives from the merger of old personal pronouns into a lexeme expressing the predicate[4]. Goldenberg therefore infers that what the finite verb shares with the nominal sentence is the presence in both of an evasive, yet essential, element that he calls 'predicative nexus'[5]. Goldenberg explained the function of the 'predicative nexus' in several articles, in particular in the mentioned treatise *The Semitic Languages*. There he symbolized it with an horizontal curly bracket put between the subject (S) and the predicate (P) or vice versa, in order to get the following depiction[6]:

A) Finite Verb $\boxed{\text{S} \frown \text{P}}$ B) Nominal Sentence $\boxed{\text{S}} \frown \boxed{\text{P}}$

In the finite verb the nexus between S and P is implicit for it reveals itself only on morphological level: actually, the predicate (P) is represented by the verbal lexeme, which, thanks to the nexus, amalgamates with the subject (S). The latter in turn is represented

[3] Goldenberg (2012).

[4] Goldenberg (1989: 113-5). Goldenberg stated this notion in several articles, most notably in idem (2012, § 11.1. *Three types of syntactical bonds*, pp. 140-141 e § 12.2 *Structure of predication in nominal and verbal constructions*, p. 150).

[5] Goldenberg (1985: 306), and idem (2012: 149, n. 2): the scholar adopted the term *nexus* from Otto Jespersen, *The Philosophy of Grammar*, London (1924: 97, 114-116).

[6] Goldenberg (2013: 151).

[7] Brøndal (1967).

by the personal endings or prefixes, in the languages where these are expected. They actually refer to the nominal subject put in extraposition.

Subject and Predicate of the nominal sentence are syntactically distinct and autonomous: one can come before the other, nevertheless they are associated by the nexus. The latter should not be mistaken for the copula, which in several Semitic languages is present as a pronoun. In this case the nexus exists between the copula and the nominal predicate or vice versa, but, if the copula is absent, the nexus is signalled by a prosodic trait, like an intonation or a pause. A fitting example of a tripartite structure of nominal sentence [S] ‿ [P] (i.e. subject, nexus, predicate) is found in Israeli Hebrew to express the present tense. Here the nominal or pronominal subject is simply juxtaposed with the present participle, inflected in gender and number, e.g., *ani kotév*, *at kotévet*, *hu kotév*, *anáxnu kotvím*, *hen kotvót* "I write (m.), you (sing. f.) write, he writes, we write (m.), they (f.) write".

According to Goldenberg the constituent elements of the predication are thus three: the subject (S), the nexus (‿) and the predicate (P).

Because we strongly adhere to the analysis formulated by the Israeli scholar, we wonder whether the kind of relation indicated by the predicate nexus can be defined or not on the basis of the mathematical logic parameters used by the Danish logician and linguist Rasmus Viggo Brøndal (1887-1942) in order to classify the relations indicated by the prepositions.

Brøndal, in his treatise *Præpositionernes Theori* (The theory of prepositions) published in Copenhagen in 1940, then translated into French in 1950 and afterwards in 1967 into Italian[7], intended to introduce in general linguistics the concept of "prepositional system", a concept that so far isn't understood in its original meaning, so much so that in the current school handbooks the prepositions are mostly presented in alphabetic order or through nonsense rhymes.

In the opinion of the Danish logician a suitable synchronic and diachronic definition of the prepositional system of any language provided with such morphemes depends on the intersection of two mathematical logic parameters. First of all, Brøndal wondered whether the relations expressed by the prepositions possess or not the transitive property [$\forall$ a, b, c $\in$ X, a$\Re$b $\wedge$ b$\Re$c $\Rightarrow$ a$\Re$c] and the

symmetric property [$\forall$ a, b, c $\in$ X, a$\Re$b $\Rightarrow$ b$\Re$a][7]. For instance, transitive are the relations that in English are indicated by the prepositions *in* and *with*. In fact, if A is *in* B, and B is *in* C, and C is *in* D, also A is *in* D. The relations indicated by the preposition *in* are therefore transitive; however, they proceed in only one direction (e.g., A is *in* B, but B is not *in* A). On the contrary, the relations indicated in English by the preposition *with* are transitive too, but in addition they are also symmetric since, in certain cases, they can proceed in both directions (e.g., A is *with* B and B is *with* A). Other relations are neither transitive nor symmetric, or are symmetric but not transitive.

Thanks to the intersection of the two mathematical logic properties of transitivity and of symmetry Brøndal sketched an ideal grid formed by 9 boxes. The 4 boxes put in the four angles of that grid are to house and classify the most frequent prepositions of any language:

Intransitive Asymmetric (or Antisymmetric) relations and prepositions like *to*, *at* and *till*	*for*	Transitive Asymmetric (or Antisymmetric) relations and prepositions like *in*, *on* and *through*
Intransitive Symmetric relations and prepositions like *of*, *from* and *by*		Transitive Symmetric relations and prepositions like *with*

One could wonder if Brøndal was fully aware of the heuristic effectiveness of the grid of oppositions he proposed.

Looking closely at this grid it can be seen, first, that the relations indicated by the prepositions defined as transitive (see the two boxes on the right side) have the characteristic that both their first term (Δ) and their second term (O) are given as present in the same space-time sphere. On the contrary, with regard to the relations indicated by the prepositions defined as intransitive (see the two boxes placed on the left side) the sharing of the same space-time sphere of their first (Δ) and their second (O) term is optional or irrelevant.

[7] Brøndal 1967: 59, § 29; 65, § 31; 117-118, § 49.

With prepositions like *to*, *at*, *till*, *of*, *by*, *from* the COEXISTENCE of Δ and of O in the same space-time sphere is NOT RELEVANT	With prepositions like *in*, *on* and *with* the COEXISTENCE of Δ and of O in the same space-time sphere is RELEVANT

Often the second term (O) of intransitive relations (indicated in English by prepositions like *to*, *at*, *till*, *of*, *by* and *from*) is cognitively structured as a simple reference point in a map, while the second term (O) of transitive relationship (indicated by prepositions like *in* and *with*) is cognitively configured as an extension, for example: "working *at* the university (seen as an institution)" versus "working *in* the university" (seen as a specific building).

Relations indicated by prepositions like *to*, *at*, *till*, *of*, *by*, and *from* present the SECOND TERM (O) as a POINT in a MAP	Relations indicated by prepositions like *in*, *on* and *with* present the SECOND TERM (O) as an EXTENSION

It can also be seen that the relations indicated by the prepositions that Brøndal calls asymmetric (but which we prefer to call applicative[8]), those that occupy the upper sector of Brøndal's grid, are simple, direct and immediate. We symbolize them below by means of the logo O←Δ with regard to the prepositions of the upper left-hand box, and with the logo Δ→O as regards the prepositions of the upper right-hand box. The arrows (←/→) indicate that the first term (Δ) of the relation expands or applies to its second term (O).

On the contrary, the relations that occupy the lower sector of the grid, i.e., the relations indicated by the prepositions that Brøndal calls symmetric (but which we prefer to call retroapplicative[9]), are often the result of the transformation of the direct and immediate relations of the upper sector (asymmetric or applicative relations) that are virtually assumed. Let's take a few examples: if "Tom talks *with* Dick", then "Tom says something *to* Dick and (contextually)

[8] Pennacchietti (2006:7).
[9] Pennacchietti (2006:8).

Dick says something *to* Tom"; if "there is a vase *with* a lid", then "*on* that vase there is a lid"; if "Harry cuts a sheet of paper *with* the scissors", then "Harry uses scissors *to* cut the sheet"[10]; if "the road runs *along* the river", then "the river flows *along* the way", and so on. Moreover, "Gina'*s* bicycle" assumes that "a bicycle belongs *to* Gina", just as "Charles comes *from* Paris" assumes that "Charles was *in* Paris before".

As for the symmetric prepositions that are housed in the lower left-hand box, i.e., the intransitive symmetric/retroapplicative prepositions, we will symbolize them with the logo O→Δ, while with the logo Δ←O we will symbolize the symmetric prepositions of the lower right-hand box, i.e., the transitive symmetric/retroapplivative prepositions. The arrows (→/←) indicate that the second term of the relation (O) aggregates to its first term (Δ).

With the APPLICATIVE prepositions like *to*, *at* and *till* (O←Δ) and like *in* and *on* (Δ→O) the FIRST term (Δ) EXPANDS (←/→) to the SECOND term (O)
With the RETROAPPLICATIVE prepositions like *of*, *by* and *from* (O→Δ) and like *with* (Δ←O) the SECOND term (O) AGGREGATES (→/←) to the FIRST term (Δ)

Finally, how Brøndal classification of the prepositions into 4 classes, corresponding to 4 antithetic boxes, shows that the transitive prepositions hosted in the upper right-hand box of the grid (Δ→O) indicate relations given as current at a given time, while the intransitive prepositions of the upper left-hand box (O←Δ) may orient themselves towards the future by indicating a purpose or end. At the same time the intransitive prepositions of the lower left-hand box (O→Δ) may outline a past indicating a cause or a starting point. Example: "hunger leads *to* death (future: consequence)" against "starving *of* hunger (past: cause)", "going *to* Rome (future: destination)" against "coming *from* Rome (past: provenance)".

[10] Cf. Pennacchietti (2015) and (2021), which deal with the instrumental use of prepositions like *with* and with the final use of prepositions like *for*.

O←Δ: The prepositions like *to* and *for* indicate an ACTUAL or FUTURE TIME		Δ→O: The prepositions like *in* and *on* indicate the ACTUAL TIME
O→Δ: The prepositions like *of*, *by* and *from* indicate the ACTUAL or PAST TIME		Δ←O: The prepositions like *with* indicate the ACTUAL TIME

On the basis of these considerations, the English prepositional system could be proposed as follows:

O←Δ: Intransitive APPLICATIVE prepositions: *to*, *at*, *till*; *like* etc.	*for*	Δ→O: Transitive APPLICATIVE prepositions: *in*; *on*, *above*, *between*, *through*, *over*, etc.
O→Δ: Intransitive RETROAPPLICATIVE prepositions: *of*, *by*, *from*; etc.		Δ←O: Transitive RETROAPPLICATIVE prepositions: *with*, etc.

Incidentally, note that the English preposition *for* has been placed in the middle box of the upper band. This is due to the fact that *for* is able to report both transitive relations, e.g., "he lived in London *for* two years", and intransitive relations, e.g., "the struggle *for* survival". Brøndal proposed additional mathematical logic parameters to define the position taken by prepositions within each of the boxes.

It seems, however, that not only the proper and the improper or "situative" prepositions lend themselves to being classified according to the 4 classes of relations established by Viggo Brøndal. Probably this grid also serves to classify relations involving other morphemes and other parts of speech. We think of fundamental syntactic relations such as that between Subject and Verb and that between Verb and Object, but also the relation between the nominal or pronominal Head and its adjective, genitive or phrasal Modifier (relative sentence), as well as the relations established by the coordinating and subordinative conjunctions.

O←Δ: *Verb - Object;* *Verb - Nominal Predicate;* *Adverb; Final Conjunctions*		Δ→O: *Subject - Predicate*
O→Δ: *Adjective; Relative Pronouns;* *Non final Subordinative Conjunctions*		Δ←O: *Coordinative Conjunctions*

We believe that the Δ→O relation indicated in English by a transitive applicative preposition like *in* has something in common with the relation supported by the nexus between the Subject (nominal or pronominal) and the Predicate (finite verb or nominal/pronominal predicate), e.g., *in* playing football he broke his leg (= he broke his leg *when* he played football). In this case we are dealing with a relation that possesses the transitive property but not the symmetric property. This involves three consequences:

1. The Subject (Δ) and the Predicate (O) are in the same space-time sphere, regardless of tense and mood;
2. with respect to the Subject, the Predicate is cognitively configured as a temporal or spatial dimension;
3. like other Δ→O relations, the relation between the Subject and the Predicate is direct and immediate, not assuming previous relations, as is the case with the O→Δ and Δ←O relationships[11].

The transitive mathematical logic property possessed by the Sub-

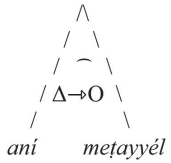
[11] These three considerations about the affinity between the Subject-Predicate relation and the relation indicated by a preposition like *in* are supported by the way in which some languages express the "present continuous". For example, in the Northeastern Neo-Aramaic dialects and in particular in the Aramaic written language of Urmia (Iranian Azerbaijan), which has become the koine of Christians from Turkish and Iraqi Kurdistan and Iranian Azerbaijan, the present continuous is expressed by the infinite with preposition *b-* "in" followed by the copula, e.g., *bi-prāqā yleh* "he is finishing", literally "*in finish is" (Cf. Maclean, 1895: 82-3). A similar construction is present also in Turkish, where the present continuous is expressed by the infinite with the postposition *-te* "in" and the copula, e.g., *gezinmekteyim* "I am walking", literally *gezinmek-te-yim* "*walk-in-am" (cf. Pennacchietti-Orengo, 1995: 227). On the other hand, the English present continuous derives from a copula followed by a gerund which once was preceded by the preposition *on*, e.g., *I am strolling* < **I am* on *strolling*.

ject-Predicate relation – which is the fundamental relation of each clause – therefore allows it to project the Subject on a temporally connoted dimension, while indifference to the symmetric property of mathematical logic manifests in its being a direct and immediate, that is applicative, relation.

At this point we can improvise a binary depiction of the predicate nexus as conceived by Goldenberg[12].

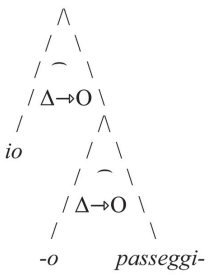
Israeli Hebrew:
ani meṭayyel "I walk"
literally "I (am) walking"

[*aní*] ⁀ [*meṭayyél*]



io passeggio in Italian "I walk"

[*io*] ⁀ [*-o* ⁀ *passeggi-*]



In the first example the verbal predicate *meṭayyél*, which morphologically is a nominal predicate because it consists of a present participle, is juxtaposed to the Subject through a significant pause.

In the second example, the predicate consisting of a finite verb is broken down into its three constituents: the index of the first singular person (-o) Subject, the implicit predicate Nexus (⁀), and the verbal Lexeme (*passeggi-*).

The pronominal subject (*io* "I") is preposed in extraposition and is connected to the finite verb through an implicit nexus (⁀).

[12] This model of binary representation of the deep structure of the sentence was introduced and used in Pennacchietti (2015) and (2021).

The Completive Relations

On one hand the relation between the Subject and the Verb (as well as between the Subject and the Nominal Predicate) is somewhat similar to the relation indicated in English by prepositions like *in* and *on*. On the other hand the no less fundamental relation between the Verb and the Object, can be assimilated to the completive relation that require the use of prepositions like *to*, *at* and *till*, and of the conjunction *as*. All of them are housed in the upper left-hand box (O←Δ).

In the completive relations the second term (O) is not necessarily present in the same space-time sphere of the first term (Δ). This is due to the fact that such relations do not possess the transitive property: their second term (O), introduced in English by prepositions like to, at, till and as, not only constitutes a limit conceived as insurmountable, but it may be in a different sphere from that of the Subject of the Verb, e.g., *we took the road to London*, *he read till late at night*, *beautiful as an Adonis*. These relations do not even possess the symmetrical property (which we have called retroapplicative), so they are simply and only applicative, immediate and direct.

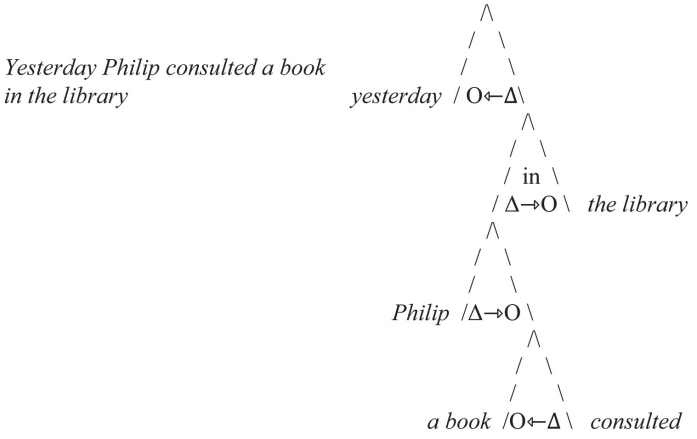
We believe that the relation between the Verb and its Object is just as immediate and direct. No less immediate and direct is the relation between the Verb or Verbal Copula and its Nominal Predicate, as is the case with *he is tired*, *he was tired* and *he looked tired*.

On the other hand, Goldenberg notes the singular morphological affinity that, in the Semitic languages that have fully preserved the original system of cases, exists between the relations 1) Verb and Object, 2) Verb and Adverb and 3) Verb and the Nominal Predicate (in cases translatable as "he was tired" or "he looked tired")[13]. This comforts us in arguing that all these three completive relations should be represented by the logo O←Δ, which also characterizes the completive relations established in English by prepositions like *to*, *at* and *till*.

The sentence *Yesterday Philip consulted a book in the library*, contains two intransitive relations and two transitive relations. The two intransitive relations are, first, that between the Verb and its

[13] In all three types of relation, in Arabic the second term (O) takes on the accusative case, cf. Goldenberg (2012: 279).

Object (O←Δ): *consulted* (Δ) *a book* (O), and, second, that between the Verb and the Adverb (O←Δ): *yesterday* (O) *consulted* (Δ). In turn the two transitive relations are, first, that between Subject and Verb (Δ→O): *Philip* (Δ) *consulted* (O), and, second, that between the Verb and the Complement of state in a circumscribed place (Δ→O): *he consulted* (Δ) *in the library* (O)[14].



The Attributive Relation

In the margin of the article «The contribution of Semitic Languages to Linguistic Thinking» and more in-depth elsewhere[15], Gideon Goldenberg points out that, in a large part of the Semitic languages, the genitive connection and the relative clause are expressed by the same kind of pronoun. These languages are the extinct Akkadian, the Aramaic languages, Old and Modern South Arabian and all the Semitic languages of Ethiopia. The specific pronoun

[14] In the depiction by means of a binary tree the circumstantial entries *yesterday* and *in the library* appear in the highest branches of the tree because, like a frame, they frame in space and time the following two lower relations. Of these two relations the one whose second term (O) is an animate being (*Philip*) is placed above the relation whose second term (O) is an inanimate (*book*). It is curious to note that in the Turkish translation of *Yesterday Philip consulted a book in the library*, namely *Dün kütüphanede Filippo bir kitabı bakti*, the order of the constituents coincides with that of the 'leaves' of the binary tree.

[15] Goldenberg (1989: 111); idem (1995) and (2012: 226-77).

they use for this purpose derives from Proto-Semitic *ḏū~ṯū[16]. One thinks that originally it was a distal demonstrative pronoun, which, having worn away its deictic force, reduced itself to the function of support of any semantic modifier of a noun, both in function of *nota genit*ivi and in function of *nota relationis*[17]. To be clearer, such a pronoun is similar to the English distal demonstrative pronoun *that* in its adeictic utilization as *that (of)*. The Semitic languages, like the defunct Phoenician and like Hebrew and Arabic, which introduced the proclitic definite article[18], should renounce the functions fulfilled by *ḏū~ṯū, and had to get back the old syntactic structure, the so-called "construct state", which the remaining, morphologically more evolved, Semitic languages largely gave up[19].

The dual function exercised by pronouns derived by Proto-Semitic *ḏū~ṯū (i.e., the attributive functions, e.g., of French *celui qui* and of *celui de*) leads Goldenberg to argue that there is a substantial affinity between the attributive relation of the relative pronouns and the relations expressed in other languages by genitive prepositions like English *of* (O→Δ). He dwells also on the function of the attributive adjective. Again, Goldenberg appeals to the concept of morphological complex, which we saw above applied to the finite verb. Goldenberg in fact interprets the attributive adjective as a complex embedding three elements: 1) the annexation to the antecedent, 2) the lexeme indicating a quality or a condition, and 3) possible endings of gender and number and, in the case of verbal adjectives, also endings of diathesis and tense[20].

What do the attributive relations represented by an adjective, a genitive construction or a relative clause share with relations indicated by prepositions like English *of*? First of all, neither the former nor the latter, both guests of the box O→Δ, possess the transitive property, with the consequence that their second term (O) is not necessarily located in the same space-time sphere as the first term

[16] Huehnergard (2006:110-9).

[17] Pennacchietti (1968).

[18] Phoenician, Hebrew and Arabic probably introduced the proclitic definite article owing to the closeness of Lebanon, Palestine and North-West Arabia to Egypt, where this kind of article was already operative in the Middle and in the Late Egyptian languages, cf. Pennacchietti (2005b).

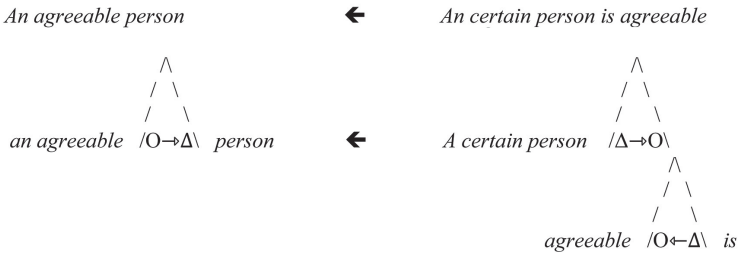
[19] Pennacchietti (2005b).

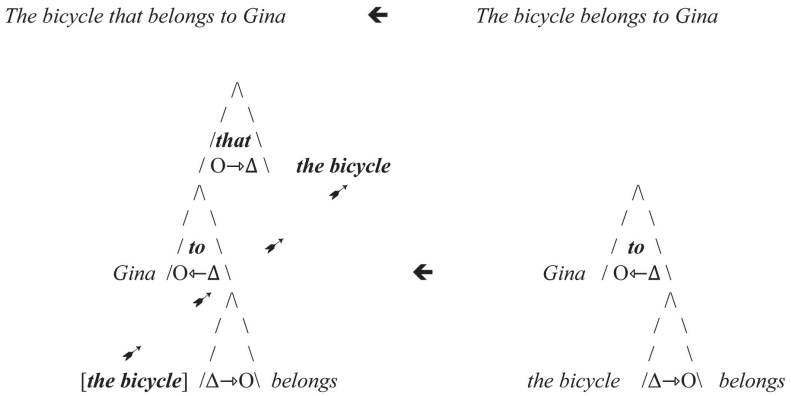
[20] Goldenberg (1985: 335); idem (2012: 230).

(Δ). For example, "Gina's (O) bicycle (Δ)" does not cease to be "her bicycle" when she is not mounted on it. The same applies to the relative clause "the bicycle that belongs to Gina": the bicycle belongs to Gina anyway, unless she sells it.

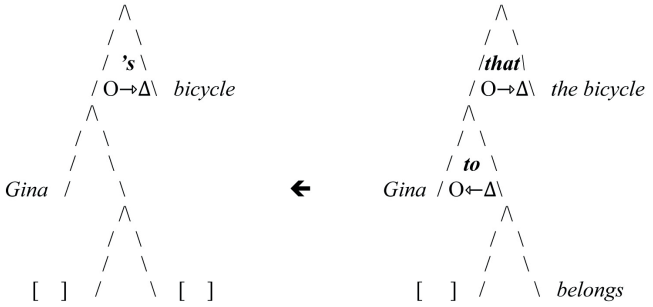
Secondly, the attributive relations of both types, however, possess the symmetric property (which we have called retroapplicative property). This causes them to be the result of the transformation of completive relations like those present between the Verb and its Object, the Copula and its nominal Predicate, or in Complements governed by preposition like *to*, *at* and *till* (O←Δ).

The binary depiction of *An agreeable person*, of *The bicycle that belongs to Gina* and of *Gina's bicycle* follows here:





Gina's bicycle ← *The bicycle that belongs to Gina*



Conclusion

This paper took aim at verifying if the grid of mathematical logic oppositions published in 1940 by Viggo Brøndal coincides with the classification of the relations existing between the parts of speech that Gideon Goldenberg proposed in 2012. In the course of this exposition a peculiar affinity came out between the three classes of relations expounded by Goldenberg and three of the four classes of relations that Brøndal ideally put into the grid he outlined in order to classify the prepositions.

O←Δ: *Completive Relation*		Δ→O: *Predicative Relation*
O→Δ: *Attributive Relation*		Δ←O:

First of all, we had to deal with the Predicative Relation, namely the backbone of the sentence. This relation, in our opinion, corresponds to the upper box of the grid showing the logo Δ→O. The same box houses also the relations indicated by prepositions like *in* (transitive asymmetric/applicative relations). We think that all of them possess the transitive property, but not the symmetric property. This apparently negative trait manifests itself in the immediate and direct character of these transitive relations. They are in fact

different from the transitive symmetric/retroapplicative relations (see the logo Δ←O). The latter, being symmetric, are tendentially 'ambivalent'. This means that the symmetric relations are often the result of the transformation of asymmetric or applicative relations that are virtually assumed, e.g., "a vase *with* a lid" assumes that "*on* that vase there is a lid".

Secondly, we discussed the Completive Relation of Goldenberg. We think it corresponds to the upper box of the grid showing the logo O←Δ. The same box houses the relations indicated by prepositions like *to*, *at* and *till* (intransitive asymmetric/applicative relations). All the relations housed in this box possess neither the transitive property nor the symmetric property. Notwithstanding such relations, being applicative, are direct and immediate

Thirdly and lastly, we discussed the Attributive Relation. In our opinion it corresponds to Brøndal's lower box showing the logo O→Δ. That is, the box that also hosts the relations indicated by prepositions like *of*, *by* and *from* (intransitive symmetric/retroapplicative relations). All relations in this box possess the symmetric property but not the transitive property. As a result, these relations are also somewhat 'ambivalent' in the sense that they constitute the transformation of intransitive asymmetric/applicative relations, e.g., "an agreeable person" assumes that "a certain person is agreeable", and "the lid of that vase" assumes that "that vase has a lid" and that "that lid belongs to that vase". We therefore prefer to define these relations as retroapplicative for they presuppose applicative relations.

While it is already surprising that a grid of four of the nine boxes provided for by Viggo Brøndal is able to offer a rudimentary first classification of the proper and the improper prepositions of various languages, all the more surprising, and on the first unimaginable, is that this grid, resulting from the crossing of only two mathematical logic properties, also lends itself to distinguishing and distributing the three main relations on which the language rests. They are the Predicate Relation, the Completive Relation and the Attributive Relation that Gideon Goldenberg identified by investigating the morphology of ancient and modern Semitic languages.

The transitive and the symmetric properties of mathematical logic seemingly play an important role in the formation of the innate mental processes responsible for the production of humane language.

At the basis of language would therefore exist, as Noam Chomsky argued[21], an abstract and invariant structure that Viggo Brøndal suggests to see as regulated by mathematical logic principles.

Bibliography

Brøndal, V.
1976, *Teoria delle preposizioni. Introduzione a una semantica razionale*, Milano, 1967 (translation of *Théorie des prépositions. Introduction à une sémantique rationnelle*, Copenhague 1950, in turn the translation of *Præpositionernes theori*, København, 1940).

Chomsky, N.
1957, *Syntactic Structures*, Paris, La Haye.

Goldenberg, G.
1983, «On Syriac Sentence Structure», in M. Sokoloff (ed.), *Arameans, Aramaic and the Aramaic literary tradition*, Ramat Gan, pp. 97-140.
1985, «On Verbal Structure and the Hebrew Verb» [in Hebrew], *Meḥqarim ba-Lašon, Language Studies*, 1, Jerusalem, The Hebrew University, Institute of Jewish Studies, pp. 295-348.
1989, «The Contribution of Semitic Languages to Linguistic Thinking», in *Jaarbericht van het Vooraziatisch-Egyptisch Genootschap*, *Ex Oriente Lux*, 30 (1987-1988), pp. 107-115.
1995, «Attribution in Semitic Languages», in *Langues Orientales Anciennes. Philologie et Linguistique*, Louvain-Paris, Peeters, 5-6, pp. 1-20.
1998, *Studies in Semitic Linguistic: Selected Writings*, Jerusalem, Magnes Press, pp. 148-196.
2013, *Semitic Languages: Features, Structure, Relations, Processes*, Oxford, Oxford University Press.

Huehnergard, J.
2006, «On the Etymology of the Hebrew Relative šɛ», in A. Hurvitz - S. Fassberg (eds), *Biblical Hebrew in its Northwest Semitic Setting: Typological and Historical Perspectives*, Jerusalem, The Hebrew University Magnes Press, pp. 103-125.

Maclean, A.J.
1895, *Grammar of the Dialects of Vernacular Syriac*, Cambridge (reprint Amsterdam, Philo Press, 1971).

[21] Chomsky (1957).

Pennacchietti, F.A.
1968, *Studi sui pronomi determinativi semitici*, Pubblicazioni del Seminario di Semitistica, Ricerche IV, Istituto Orientale di Napoli.
2005, «Sull'etimologia della preposizione araba 'an», in B. Burtea - J. Tropper - H. Younansardaroud (eds), *Studia Semitica et Semitohamitica*, *Festschrift für Rainer Voigt anläßlich seines 60. Geburtstages am 17. Januar 2004 (Alter Orient und Altes Testament*, Band 317), Münster, Ugarit Verlag, pp. 284-305.
2005b, «Ripercussioni sintattiche in conseguenza dell'introduzione dell'articolo determinativo proclitico in semitico», in *Aula Orientalis. Revista de estudios del Próximo Oriente Antiguo*, 23, n. 1/2, pp. 175-184.
2015, «The fuzzy boundary between verb and preposition. The case of serial instrumental verbs in Chinese», in H. Amstutz - A. Dorn - M. Müller - M.V. Ronsdorf - S. Uljas (eds), *Fuzzy Boundaries. Festschrift für Antonio Loprieno*, 2 vol., Hamburg, Widmaier Verlag, vol. 1, pp. 19-129.
2021, «Modelo por bildigi la dinamikon de la rilatoj inter du parolelementoj», in *Aktoj de Internacia Scienca Akademio Comenius*, vol. 2, Dobžechovice (CS), Kavapech, pp. 33-47.

Pennacchietti, F.A. - Orengo, A.
1995, «Neoaramaico, curdo e armeno: lingue a contatto», in *Egitto e Vicino Oriente*, XVIII, pp. 221-233.

Vogt, R.
2016, «Gideon Goldenberg (1930-2013): The Scholar and the Man», in A. Shisha-Halevy (ed.), *Gideon Goldenberg - In Memoriam/Ləzikrô šel Gidʿôn Gôldenberg*, Jerusalem, The Israel Academy of Sciences and Humanities, pp. v-xvi.