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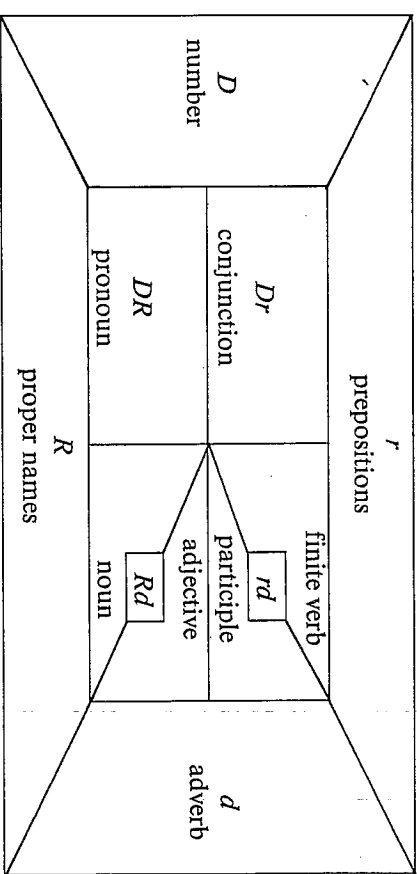
CERCLE LINGUISTIQUE DE COPENHAGUE

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In this article about Brøndal's logic and semantics I will try to show Brøndal's actuality by comparing his system of syntactic categories with other descriptions of syntax, especially Diderichsen's topological syntax of Danish, and by checking his logico-semantic description of prepositions with my linguistic competence as a native speaker of Danish.

The Aristotelian categories

It is well known that Brøndal¹ describes the parts of speech as defined by the four Aristotelian categories: quality or *descriptor*; in his notation: *d*, quantity or *descriptum*; *D*, relation or *relator*; *r*, and substance or *relatum*; *R*. The traditionally known word classes can be described as either a pure Aristotelian category, or a complex of two (or more, not shown here) categories – in which case the elements are convertible, $Dr = rD$:

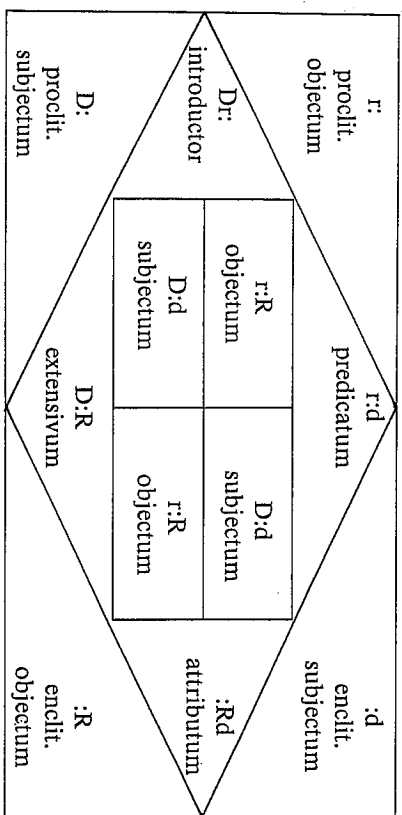


The same classes as Brøndal has defined, are in modern logic recognized as necessary for the description of the propositional content of a sentence: classes defined by Brøndal by the active elements relator, *r*, and descriptor, *d*, are in modern logic² recognized as predicates or functions; prepositions, the con-

¹ Brøndal, Viggo 1928: *Ordklasserne. PARTES ORATIONIS. Studier over sproglige KATEGORIER*, G.E.C.Gad, Copenhagen.
² Reichenbach, Hans (1947) 1966: *Elements of Symbolic Logic*, The Macmillan Company, New York.

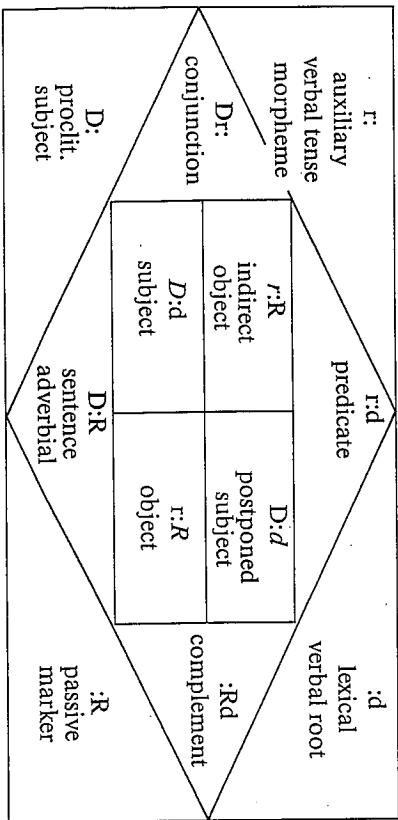
junctions which are logical connectives, finite verbs and participles as two place predicates, adjectives as one place predicates, and adverbs as predicates of higher types, i.e. predicates of predicates. Classes with the passive elements descriptor, *D*, and relatum, *R*, are identified as individuals, or arguments, or bearers of reference: conjunctions which are indicators of time and place, numbers, pronouns as variables, nouns and proper names.

It is more interesting that Brøndal used his four elements for the description of the syntagmatic relations in the sentence too. What he called rhythm is the syntagmatic dimension of the sentence, and it is described by the same four elements:³ *relator*, *r*, and *relatum*, *R*, *descriptor*, *d*, and *descriptum*, *D*, but now the elements are non-convertible, they have an internal canonical order: *D:r:dR*, where the colon indicates the middle of the sentence. The subjective articulation of thought starts with a topic, *D*, which as undescribed calls for a later description, *.d*. This topic stands in an objective relation, *r*, to an object *:R*. Then Brøndal interprets the categories he has found, in the following way:



Brøndal's interpretations of the syntagmatic impact of the Aristotelian categories are really not very interesting, because they do not fit into the traditionally known categories; *introduktor* and *extensivum* are not well established concepts. And I wonder how Brøndal can interpret a *relator* as a *proclitic object*, or a *descriptor* as a *enclitic subject*. If we follow Brøndal's own definitions of the grammatical functions derived from the classical Aristotelian categories, we will get something like the following:

3 Brøndal, Viggo, 1932. *Morfologi og syntax. Nye bidrag til sprogets teori*, G.E.C.Gad - Copenhagen, §§ 48-61.



(The passive marker is in Danish a relict of an enclitic pronominalized object *sik* > -s. In Danish there will normally be a nonstressed proform as subject, *det* or *der* if the subject is an infinitive or that-clause.)

What I have done here, is to interpret the Aristotelian categories in the following way: *D* and *d* are psychological (subjective) units, or information structure units *theme* and *rheme*, or *topic* and *comment*, or *topic* and *focus*, of course with the theme preceding the rheme in the psychological information processing. *R* and *r* can be interpreted as logical (objective) units: *r* = predicate and *R* = arguments, and the predicate is logically 'before' or prior to the arguments, which can be seen from the normal logical notation: P (a₁, a₂).

If Brøndal's syntagmatic functions are interpreted in this way it is interesting to see that the system makes predictions of the word order in the (Danish subordinate) clause:

	D:r:d		D:R		r:d		r:d		r:R		r:R		:dR	
D:r:	D:d		D:R		D:R		r:d		r:d		r:R		r:R	:dR
conj.	subj.		sent. adv		manner adv		aux		predicate		i.obj.		obj.	compl.
at	drengen		ikke		omhyggeligt		har		malet		malet		porten	rød
that	the boy		not		carefully		has		been painted		the door		is red	

This topological description of the order of the grammatical functions in a sentence is approximately the same as Paul Diderichsen gives in his theory of the word order in Danish subordinate clause, and the same as the order of the

grammatical functions proposed as the base structure in modern transformational syntax for Scandinavian languages.⁴

Brøndal has also made a description of the word order in a noun phrase, and it is again similar to Diderichsen's positional scheme for noun phrases, as can be seen from the following diagram:⁵

VB:	I	II	III	IV	V	VI
Dr:	Representative	Determi-nator	r:d Quali-fier	D:R restric-tor	r:R materi-al	:dR destinator
	<i>mine</i> my <i>de</i> the	<i>tre</i> three <i>mange</i> many	<i>søde</i> sweet <i>uarrige</i> naughty	<i>små</i> little	<i>børn</i> children <i>børn</i> children	<i>du så i går</i> you saw yesterday
PD:	conne- tor	determi- nator	descriptor	kernel	heavy constituent	

It is worth wondering why nobody has found and quoted these insights from the works of Brøndal, especially because Diderichsen has quoted Brøndal's theory of the parts of speech at length in his own grammar. But it is more interesting that Brøndal has found his word order by deduction; from his Aristotelian categories and a hypothesis about their internal psychological and logical order, he has derived the order of the grammatical functions. And the result is the same as the result of Diderichsen's empirically based theory of the word order in Danish – and other languages. So deduction and induction meet in this case in a well formed theory, but unfortunately without anyone knowing.

The theory of the prepositions

The most interesting, but also the most difficult book of Brøndal is in my opinion his: *Prepositionernes Teori*.⁶ In this article I will try to discuss the validity of his description of the semantics of 18 Danish prepositions. His theory can be exposed by the following diagram. I have not shown Brøndal's own synoptic diagram, but have made a diagram along the lines of a so called

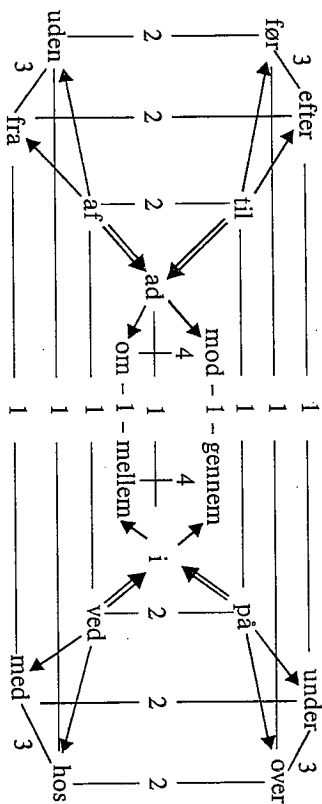
⁴ Diderichsen, Paul, 1946: *Elementer dansk grammatik*, Gyldendal, Copenhagen.

⁵ Platzack, Christer: »Diderichsens positionsschema och generativ transformationsgrammatik« in Heltoft, Lars og John E. Andersen (eds) 1986: *NJS 16-17*.

⁶ Brøndal, op.cit. § 70.

⁷ Brøndal, Viggo, 1940: *Prepositionernes Teori. Indledning til en rational betydningsteori*, Munksgaard, Copenhagen.

'semantic base structure diagram', defined by Peter Brask.⁷ I find this semantic base structure diagram more precise and more informative than Brøndal's diagram, but there is no difference in substance:



Polar oppositions:

- 1: transitive – intransitive
- 2: symmetrical – asymmetrical
- 3: connex – inconnex
- 4: variable – invariable

→ specifications:

concrete form ← abstract form → concrete form

⇒ complexity:

simple form ⇒ complex form ⇐ simple form.

Prepositions are defined as the part of speech which express pure relations; in Danish they are defined and delimited by 4 semantic oppositions, as shown in the diagram. The definitions of two of the relations are as in modern logic: The relation R is *transitive* if $xRy \& yRz \rightarrow xRz$.

The relation R is *symmetrical* if $xRy = yRx$.

But then it becomes a bit more tricky: Brøndal defines the connectivity relation as follows:

»Connectivity – A relation can be established between connected, mutual dependent objects. It is a connex relation. It is inconnex, if this dependence is completely excluded. (§ 31). The inconnex relation (as in Danish *uden* (without), *over* (over), *for* (in front of)), German: *sonder/ohne, auf/über*,

⁷ Brask, Peter 1974: *Tekst og tolkning. Første del*, RUC Forlag, Roskilde, p. 318-326.

fjir/vor) refers in all cases to isolation and independence, exclusion from a territory, liberation from an influence. Used about space inconnexity indicates either distance, or altitude (higher up in relation to the influence of gravity). Used about time it indicates the past (i.e. what has passed by, from which the immediate experience has been parted)«. (§ 49).

I have chosen to understand the relation of connexity as mutual dependence; if two objects are both present, and there has to be a relation between them, R is connex; in formulas:

R is connex if $xRY \rightarrow x&y$,

R is inconnex if $-(xRY) \rightarrow x&y$.

The relation R is a *variable* relation if xRY is a many-to-many relation, and *invariable* if it is a one-to-one relation.

The meaning of some prepositions is more abstract than the meaning of others, and therefore the relation between them can be described as specification.

This theory has the advantage, compared to other semantic theories, that the meta-theoretical formal properties of the relations are fully explicable. Brøndal distinguished between: *polar forms* which are either positive or negative on the same dimension e.g. *over/under*, *neutral forms* which are neither positive nor negative on the same dimension, e.g. *på* in relation to *over* and *under*, and *complex forms* which are both positive and negative on the same dimension, e.g. *ad* in relation to *til* and *af*. So in the diagram a very great number of very complicated relations can be explicated, e.g. it can be stated that the long distance relation between *under* and *om* is the same as between *uden* and *gennem*.

The other advantage of this theory is that it is simple and in accordance with the mathematical principle of symmetry: A great number of relations between 18 prepositions, in fact 153 relations can be fully explicated by 4 relations and their internal symmetrical arrangement.

The disadvantage of the theory is that what is says about the Danish prepositions is to me very counterintuitive. Out of this total diagram it is possible to extract simple proportionalities of the form: v stands in the same relation to x, as y to z, in the notation used here:

v	Y
-	:
x	Z

Examples:

til	på
—	:
af	ved

for	efter
—	:
uden	fra

under	over
—	:
med	hos

The relation between *til* and *af* is not the same relation as the relation between *på* and *ved*. And even harder to accept: the relation between *under* and *over* should be the same as the relation between *med* and *hos*.

It can be understood that *med* is a symmetrical preposition; if *A er med B* (A is with B), then it can be implied that *B er med A* (B is with A) at least in the spatial meaning; the same holds for *uden*, and perhaps *fra*. It is a question of perspective whether we say that *A moves from B* or *B moves from A*. But why does not the same hold for *til*: it is only a question of perspective whether *A moves to B* or *B moves to A*, especially after Einstein's theory of relativity, to whom Brøndal refers in § 28.

It is easy to understand that *efter* is a transitive relation, and that *for* is the same. But very hard to understand that *under* and *over* should be intransitive. And could *til* be transitive and *på* intransitive? Impossible.

It is clear that *om* presupposes that the X's are more numerous than the Y's in the phrase *X om Y*, but for *mellem* it must be the case that the Y's are more numerous than the X's in *X mellem Y*'s, and in *X gennem Y* there can only be one Y (per X). So invariability is not one relation but three different relations: one-to-one, one-to-many, and many-to-one.

Brøndal mentions that the spatial meaning of the prepositions is not the core meaning of the prepositions, and that we are sometimes led astray if we only look at the spatial meaning, in stead of at the time meaning, the ideal meaning, the logical meaning and the mathematical meaning. Nevertheless, I will here discuss whether the description offered by Brøndal is valid for the spatial meaning of the prepositions, because it is possible to make illustrations of the spatial meaning and in this way have a intersubjective understanding of the meaning in this semantic domain independently of the language which the theory is about.

The spatial meaning of the 18 Danish prepositions can be described in diagrams if we always think of the meaning of a preposition as a movement or a relation in space, indicated by an arrow or two positions, X and Y, where X is the first argument and Y the second argument of the relation R; example *bogen på bordet* (the book on the table): *X på Y*.

				X YYY			
<i>fra</i>	<i>til</i>	<i>mod</i>	<i>gennem</i>	<i>ad</i>			
Y X →	X → Y	X → ← Y	X → Y	X →			
<i>om</i>	<i>over¹</i>	<i>med¹</i>	<i>uden</i>	<i>mellem</i>			
X Y	Y X Y Y → Y Y Y	X → Y →	X →	Y X Z			
<i>i</i>	<i>med²</i>	<i>på (e)</i>	<i>af (e)</i>	<i>hos</i>			
Y X Y YYYYY	X Y X XXXXXXX	X YYY	Y YYYYYY	Y X			
<i>uden</i>	<i>ved</i>	<i>efter</i>	<i>for</i>	<i>over²</i>	<i>under</i>		
Y		→	→	X	Y		
X X XXXX	X Y X Y X Y X						

Now taking the spatial meanings shown in the diagram, and using the definitions of the semantic relations quoted above, I can only describe the semantic properties of the prepositions as follows:

Symmetrical (xRy = yRx): *ved*

Asymmetrical (converses): (R¹ and R² are converses if xR¹y = yR²x)

- fra* - *til/mod*
- i* - *med/om/på*
- af* - *uden*
- mellem* - *om*
- på* - *med/i*
- for* - *efter*
- over* - *under*

Nonsymmetrical (xRy ≠ yRx & xR¹y ≠ yR²x): *gennem, ad, hos, over¹.*

Transitive (xRy & yRz → xRz): *på, i, med, over, under, for, efter, om, hos.*

Intransitive (xRy & yRz → -(xRz)): none.

Nontransitive (xRy & yRz → -(xRz) ∨ xRz): *fra, til, mod, af, uden, ved, gennem, ad.*

Connex (xRy ↔ x&y): none.

Inconnex (-(xRy) ↔ x&y): *fra, uden, af.*

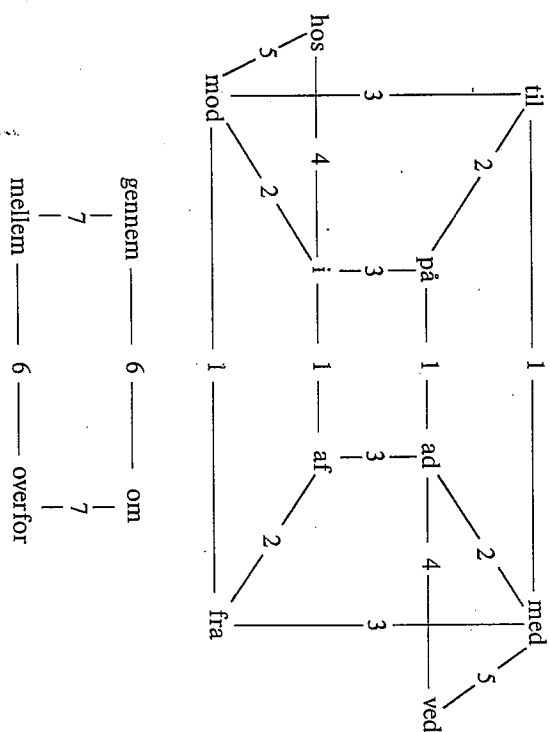
Nonconnex (xRy ∨ -(xRy) ↔ x&y): *til, mod, om, over, under, gennem, i, på, ad, mellem, med, ved, hos, for, efter.*

Variable (many-to-many): none.

Invariable (one-to-one): none.

Mezovariable (one-or-many to many): *mellem, (one-or-many to one): gennem, ad, på, i, af, over¹, (one to one-or-many): med, uden, (many to one-or-many): om, (one-or-many to one-or-many): efter, under, for, over², til, mod, ved, hos, fra.*

Now I could have an idiosyncratic interpretation of the prepositions in Danish. To show that it could be the case that both Brøndal and I had wrong opinions about that, I will refer to the only description of the semantic system of the Danish prepositions I am aware of: the description by Peter Brask:⁸



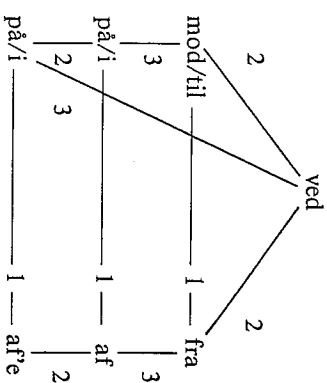
I-7: No explanation in the text.

I am not able to understand what the relations 1 - 7 could be, but I can see that it is not the same as Brøndal's, and not the same as mine. It is strange that it

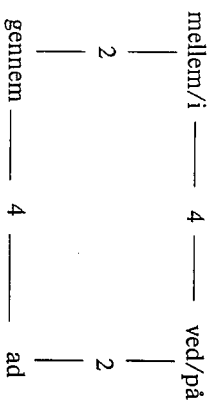
⁸ Brask, Peter. 1974. *Tekst og tolkning. Første del*. RUC forlag, Roskilde, p. 770-771.

is so difficult to describe the semantics of prepositions; in any case it must be much easier than to describe the semantics of nouns or verbs, because the variability and the complexity have to be much greater in a system with thousands of words, than in a system of only 20-30 words.

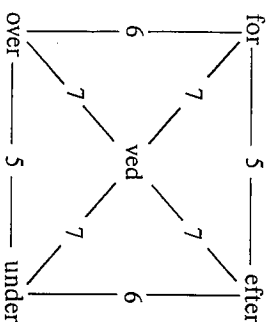
So now I will try to describe which symmetrical patterns I can find in the system of Danish prepositions. I will use the same semantic base structure diagrams:



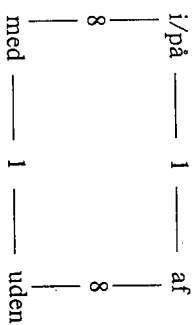
- 1: Y as destination – Y as origin;
 2: R is dynamic – R is a state;
 3: contiguity – noncontiguity (between x and y).
 'Contiguity' means that there is contact between the two objects, 'non contiguity' that there is no contact.



- 4: x is internal in relation to y – x is external in relation to y.

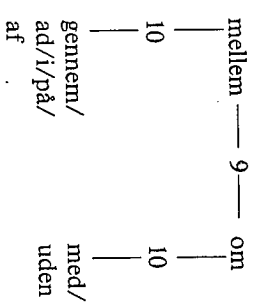


- 5: x is at the unmarked pole in a polar opposition – x is at the marked pole;
 6: R is vertical – R is perspectival;
 7: R is either horizontal or perspectival – R is not necessarily horizontal or perspectival.



- 8: $xR^1y = yR^2x$ and either x or y is the bearer of the viewpoint.

Example: *mælken i glasset: glasset med mælk.*



- 9: a fixed number of X – a fixed number of Y;
 10: plurality – singularity.



- 11: human – not necessarily human.

So, unfortunately: the theory that 18 Danish prepositions are exhaustively described by one perfect symmetrical structure constituted by 4 different semantic relations and their internal structure, can not be confirmed. In the empirical test it turned out that there was no symmetry, nor any exhaustive description in the pattern of prepositions formed by the four proposed relations: symmetry, transitivity, connexity and variability. In the next analysis the spatial meaning of the prepositions was described as defined by 10 relations: human-nonhuman, singularity or plurality of X or Y, horizontality, perspectival, markedness, internal-external, contiguity, dynamic-stative, direction; but they could not be shown to be structured in one exhaustive symmetrical system.

Perhaps the fact is that the prepositions – in this case in Danish – are more numerous than Brøndal imagined, and perhaps it is a fact too, that the meanings expressed by the total number of prepositions are not structured in any simple symmetrical way. At least, if they are, we are not able to describe it yet.

But it is still a fact too, that the system proposed by Brøndal has its own mathematical beauty, and I think that it is worth mentioning that one of the greatest Danish poets, Inger Christensen, has written a perfect symmetrical cycle of poems structured after Brøndal's system: *Det*.⁹ It consists of 3 parts, each containing 8 cycles of 8 poems, with the titles: symmetries, tranversities, continuities, connexities, variabilities, extensions, integrities and universalities. I quote from part II, *The Act*, Variabilities no. 7 and 8:

*7 Så kører det rundt det ord der slår til
Og alle bliver ramt af dets stilhed.*

8 Så kører det rundt og hundene gør.

⁹ Christensen, Inger 1969: *Det*, Gyldendal, Copenhagen. Tentative translation of the poems:

⁷ Then it goes round the word that strikes
And all are hit by its stillness.

⁸ Then it goes round and the dogs bark.