

# Structural Realism in Generative Grammar

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# Aim of this talk:

- 1 Outline the discussion on structural realism in the philosophy of science
- 2 The development of Chomsky's generative grammar as a case of structural realism

# Content

- 1 Structural Realism
- 2 Bloomfield on Syntax
- 3 Harris' Transformational Theory
- 4 Generative Grammar
- 5 Summary

# 1. Structural Realism

- Arises from the debate on scientific realism and theory change in the philosophy of science.
- **Epistemic structural realism (ESR):** All our knowledge is structural. We remain ignorant with respect to the properties of the entities that are part of these structures (Worrall 1989, et.al.).
- **Ontic structural realism (OSR):** All that exists *is* structure. Objects only fill places in structures and do not exist independently. The ontologically basic entities are structures (Ladyman 1998, French and Ladyman 2003, et.al.).

# Theory change in optical theory I

## Worrall's (1989: 118-19) position:

- *Although Fresnel was quite wrong about what oscillates, he was, from this later point of view, right, not just about the optical phenomena, but right also that these phenomena depend on the oscillations of something or other at right angles to light. Thus if we restrict ourselves to the level of mathematical equations - not notice the phenomenal level - there is in fact complete continuity between Fresnel's and Maxwell's theories.*

## Theory change in optical theory II

**Worrall bases his position on a case study of optical theory, the theory change from Fresnel's to Maxwell's theory:**

- Though the referents and names of the postulated entities in our theories change, the mathematical structure is preserved through theory change.
- There is a continuity of (mathematical) structure (equations) when theories change. Some equations reappear in successor theories after theoretical change.

# The underlying assumptions for SR I

- Our empirical theories are not completely overthrown when they change, the structural parts are retained.
- We don't have direct epistemic access to the referents of the (unobservable) entities which appear in our empirical theories. But we can have knowledge of the mathematical structures (equations), in which these entities appear.
- If it occurs that the same equations are part of radically different empirical theories, for the structural realist it seems reasonable to assume that what represents the world as best possible are these equations.

## The underlying assumptions for SR II

- If we can identify which structures are retained through theory change, it makes it reasonable to assert that the persistence of these structures "reflects" in every specific case a specific part of the structure of the world.
- The persistence of certain structures makes it reasonable to assume that at least the structural part of our empirical theories represents the world correctly.



## 2. Bloomfield on Syntax - Intertheoretical Relations

**Bloomfield already mentions what is systematized later by Harris: That certain morpheme-classes correctly combined build up a grammatical sentence.**

- *Construction*

(1926: 158) *Each position in a construction can be filled only by certain forms.*

Example: *The tree is old.* - *The \_ is old.*

In the empty slot, only certain classes of morphemes (or forms) can occur. In this case, certain noun-classes.

- Bloomfield on *Substitution*:

(1933: 247) *A substitute is a linguistic form or grammatical feature which, under certain conventional circumstances, replaces any one of a class of linguistic forms . . .*

*. . . thus, in English, the substitute 'I' replaces any singular-number substantive expression, provided that this substantive expression denotes the speaker of the utterance in which the substitute is used. . . the substitute replaces only forms of a certain class, which we may call the domain of the substitute; thus, the domain of the substitute 'I' is the English form-class of substantive expressions.*

### 3. Harris' Transformational Theory

- Harris wanted to go further than Bloomfield and searched for a systematization of sentence-types.
- He developed a method that enabled linguists to describe how sentences are built and changed, like from active to passive. These changes he called *transformations*.
- He introduced a formalism to label different types of phrases: noun phrases (N), verbal phrases (V), prepositional phrases (P),  $\leftrightarrow$ , etc.

# Harris' Kernel Sentences I

- 1957, 335: *The kernel is the set of elementary sentences and combiners, such that all sentences of the language are obtained from one or more kernel sentences (with combiners) by means of one or more transformations.*

Example of an elementary sentence: *John saw Jill.*

## Harris' Kernel Sentences II

- 1957, 339: *Our picture of a language, then, includes a finite number of actual kernel sentences, all cast in a small number of sentence structures built out of a few morpheme classes by means of a few constructional rules; a set of combining and introducing elements; and a set of elementary transformations . . . .*

Sentences like:

*John saw Jill, The cat sits on the mat, The tree is old, etc..*

# Harris' Kernel Sentences III

- Example: The kernel sentence:

*John saw Jill*, in active is obtained from the passive

*Jill was seen by John*, through a transformation.

- Harris' formalism in this case:  $N_1 V N_2 \leftrightarrow N_2 V^* N_1$ .

## Co-occurrence

- For Harris, morphemes can be grouped into classes (e.g. the class of suffix-morphemes *-hood*, etc.). The members of a class have similar sets of co-occurents (here: *neighbour-*, *false-*, *likeli-*, etc. Each class occurs with specific other classes to make a sentence structure.
- Furthermore, certain sequences of classes build up sentences. These sequences are products of a small number of elementary class sequences (constructions) which are combined in certain ways.
- *TNPV* (= The risk of crisis vanished) results from the more elementary class sequences *TNV* and *NPN*.

## 4. Generative Grammar

- The notions of *Deep Structure* and *Surface Structure* were introduced later (with Chomsky, 1965).
- Chomsky's proposals imply more controversial views on the relation between semantics and syntax.
- For Chomsky, every sentence had a deep structure and a surface structure. In the beginning, Chomsky claimed that deep structure determined meaning, etc.



- For the 1965 Chomsky, even interrogative sentences like

*Which car did John wash?*

had a deep structure, where their real meaning was

*John washed that car.*

# On Structural Realism - Reduction as Structural Continuity

- Bloomfield's theory is partially reducible to Harris' theory.
- Harris' theory is partially reducible to Chomsky's early theory.
- When a theory  $T_1$  is reducible to a theory  $T_2$  (and so forth): A case of structural continuity.
- Ergo: **The continuity of structure (via reduction) from Bloomfield via Harris to Chomsky can be seen as a case of epistemic structural realism.**

- (Chomsky, 1951, 1-2): *Thus Carnap in the Aufbau ... begins with a primitive relation between slices of experience and attempts to construct, by a series of definitions, the concepts of quality class, quality, sensation, etc., i.e., he tries to construct concepts for the most general description of experience. Similarly, it can be shown that the theoretical part of descriptive linguistics, beginning with three 2-place predicates of individuals, and restricting its individuals to a tiny domain of experience (i.e. speech sounds) can construct concepts such as 'phoneme', 'morpheme', etc., which are available for a general description of that part of experience called linguistic phenomena.*

# Ontic Structural Realism in TGG I

Chomsky (1965, 141):

- *A deep structure enters the semantic component and receives a semantic interpretation; it is mapped by transformational rules into a surface structure, which is then given a phonetic interpretation by the rules of the phonological component.*

# Ontic Structural Realism in TGG II

- Originally motivated by contemporary physical theory, OSR states that at the ontologically fundamental level, there are no objects, but only structures.
- Analogously to linguistic theory: *Deep Structure* as what there is at the fundamental ontological level.
- In more recent Chomskyan words: *I-Language* is what exists at the fundamental level.

## 5. Summary I

- Bloomfield systematized an important part of syntactic theory.
- He already introduced that certain linguistic forms can be grouped into classes.
- Such form-classes cannot be substituted by *any* other form-class.

## Summary II

- Harris took Bloomfield's ideas on syntax and developed them further.
- This made it possible to give linguistic theory stronger explanatory power and certainly helped linguistics to become a *mature* science.
- The epistemic structural realist wants to find structural continuities through (somehow radical) theoretical change.

## Summary III

- Such continuities can be seen as mere re-appearances of equations, but also as more general intertheoretical relations, like in the case of reduction.
- We have seen that at least in the field of syntax, Bloomfield can be seen as reducible to Harris, and Harris' syntactic theory can be seen as being reducible to Chomsky's early Transformational Generative Grammar.
- From the perspective of OSR, what there exists at the ontologically fundamental level in TGG, is what has been called *Deep Structure*, later on *I-Language*.



## Summary IV

- Hills (2010) already argued for structural realism in Generative Grammar.

→ But: He *only* analyzes continuities *within* the development of *Chomskyan Linguistics*.

- From the point of view of the philosophy of science, structural realism arises when it applies to cases of radical theory change (scientific revolutions).

Thank you!

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