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Integrated and Abstract Wholes: Prospects for a Constructional Ontology as Part of Universal Grammar

Friederike Moltmann
CNRS/Université Côte d'Azur

Introduction

Universal Grammar:
Certain operations, conditions, principles, parameters pertain to all languages.

Other systems associated with language

- Conceptual-lexical structure
- Ontological structure

Constructional views

1. About conceptual structure:

The Generative Lexicon (Pustejovsky 1995):
General operations and conditions accounting for systematic polysemy based on lexical decomposition of lexical catgeories

2. About ontological structure:

Constructional ontology
Ontology involves operations of introducing new entities on the basis of given ones

General questions to be addressed first

- How does ontology relate to natural language?
- What is constructional ontology?

- Is there a constructional ontology that aligns with universal grammar – generative grammar? ‘Generative ontology’?

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1. Ontology of natural language

Natural language ontology as part of descriptive metaphysics (Chao and Bach 2012, Moltmann 2022)

How is ontology reflected in natural language?

- Referential and pronominal NPs stand for entities.
- Quantificational NPs range over entities.
- Predicates attribute properties to entities.
- Ontological notions are reflected (to an extent) in grammatical categories.

The ontology of natural language is a partial ontology

- Not everything in metaphysics is reflected in the core of language (existence of god, fundamental metaphysics etc.)

Philosophers’ use of language and ontology

Different philosophers may describe different ontologies using natural language.

What to make of it?

The ontology of natural language is manifested in the *core* of natural language, not its periphery.

Periphery of language

Use of language requiring reflection; parts of language permitting non-ordinary (philosophical) use

Example: nouns without argument structure (*property, object, part*)

Core of language

Functional part of language, including light nouns and light nouns; part of the lexicon

Strict divide between functional and lexical part of grammar?

A challenge: the ordinary *part* and the light noun PART

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2. What is constructional ontology

2.1. Two view of ontology

Static ontology

Ontology consists in a fixed number of entities or types of entities.

Ontology studies *relations* among entities such as ontological dependence, parthood.

Constructional ontology

Objects are built from others through ontological operations,

e.g.

- operations building complex objects from simpler ones (composition)
- operations obtaining smaller objects from larger ones (decomposition)
- operations of introducing objects on the basis of equivalence relations (abstraction), e.g. Fregean numbers, Kimian states.

2.2. Types of composition

Two types of approaches to mereology (Fine 2010)

- Mereology based on relations (part-relation)
- Mereology based on operations: composition, decomposition

Part of a broader constructional ontological project, also including abstraction

Advantages (Fine 2010):

- allows both sum formation and set formation,
- allows introducting null element (operations applying to empty set)
- allows for the composition of abstract objects, in particular with entities occurring as parts more than once.

Mereological monism (standard view)

There is a single operation building entities from parts, e.g. sum formation.

Mereological pluralism (Fine 2010)

There are different operations of building entities from parts (or obtaining parts from entities)

Examples

- Entities built from time-relative parts or from time-independent parts

- Sums and sets as entities obtained from different types of composition

Most common view of mereological composition

Extensional (classical) mereology

Link (1983), Champollion and Krifka (2017), Cotnoir and Varzi. (2021)

Sum formation in extensional mereology

- closure under sum formation
- uniqueness of sums (extensionality)
- based on the transitivity of the part-relation

Set formation

The ancestral membership relation as a part relation (Fine 2021)

Structured objects

(1) Sum formation conditioned by integrity

For a set X, sum(X) exists, then INT-WH(X)

(2) Simple notion of an integrated whole (mereotopology) (Simons 1987, Moltmann 1997)

X is an R-integrated whole iff R_{trans} holds between all the elements of X and R_{trans} does not hold between an element of X and something that is not an element of X.

(3) x R_{trans}y iff x_1, x_2, … , x_n, x Rx_1, x_1 R x_2, … , x_n Ry

(4) Composition with structural relations (highly simplified account)

For entities x_1, …, x_n, and a structure-building relation R,

comp(x_1, … , x_n, R) exists, then R(x_1, …, x_n)

(5) Uniqueness of structure-based compositions

comp(x_1, … , x_n, R) = comp(y_1, … , y_n, R'), then $x_1 = y_1$, … , $x_n = y_n$, R = R'.

(6) Structured parthood (nontransitive part relation)

For an entity y such that for entities x_1, …, x_n and a structure-buiding relation R,

y = comp(x_1, , x_n, R), z is part of y iff z = x_1, …, or z = x_n

Further tasks

- Impose conditions on structure-buidning relations
- Allow for replacement of parts

2.3. Linguistic applications of composition

Extensional mereology (Link 1983, Champollion and Krifka 2017)

- Plurals (*the students*)
- conjunctions (of NPs or predicates): *John and Mary, sing and dance, red and green*

Mereotopology (Moltmann 1997, 1998, 2005)

- Distributivity (*the students of the three school, the water in the two containers*),
- Applicability of classifiers (*work out several times*)

Wholes built in different ways from entities and relations

- 'Kant's written work':

The page is part of Kant's written work

Composed from anything that has the property of being written by Kant

- 'The library' (as a collection of books):

The page is part of the book that is part of the library, but the page is not part of the library.

Composed by anything that has the property of being a book that belong to the university / a collector / …

2.4. Types of Decomposition

Decomposition:

Linked to the view of the priority of the whole (Schaeffer 2010)

Gunk: infinitely divisible matter (Fine 2010)

Entities as results of dividing up the world

Types of entities individuated by overall form and / or function:

Residence, seat, circle, triangle book, body

Parts of such objects may be individuated in terms of their contribution to the overall shape ot function:

- *Circle – semicircle*
- *Triangle – sides*
- *Book – pages*
- *Body – organs*

2.5. Structured, functional, and abstract parts

Extensional mereology, meretopology

Part of:

Can convey unstructured, structured and functional part relation

(8) a. The black grains are part of the rice that Mary bought.

b. The rice was part of the meal.

c. The sides are parts of the triangle.

d. The base is a part of the statue.

(9) a. The book is part of the library.

b. The pages are part of the book.

c. ?? The pages are part of the library.

(10) a. The book is part of my written work.

b. The page is part of the book.

c. The page is part of my written work

Have:

- Conveys a great range of relations (‘reference point relations’, Lagacker 1993)
- One of them is the part relation, but *only* structural or functional part relation

(11) a. The room has a window.

b. The tree has leaves.

(12) a. The library has a lot of books.

b. The book has a lot of pages.

c. ?? The library has a lot of pages.

(13) a. The croissant has a lot of butter ??? (in it).

b. ??? The rice has a few black grains.

c. The triangle has three sides.

d. The human body has several organs.

e. The statue has a base.

2.6. Constructional ontology and the universality of language

The universality of ontology

Ontology is generally taken to be universal.

Why?

- As matter of how the world is?

But what about the ontology reflected in natural language?

- As a matter of how the mind works?
- As a matter of the universality of the functional part of language?

Or both:

The view of the 'Primacy of Metaphysics' (Peacocke 2019)

Metaphysics is explanatorily constitutive of natural language:

language cannot be explained without the notion of reference to worldly things …

How does constructional ontology relate to language?

Is constructional ontology a 'generative ontology' that aligns with generative grammar?

Ontology and the lexicon

Generative lexicon - generative ontology

No obvious connection

Ontology and generative syntax

There are few syntactic constructions that arguably display an aligment with ontological operations:

- Plural and conjunction – sum formation (or rather plural reference?)
- Close appositions: objects introduction by abstraction (Moltmann 2013)

(7) a. the concept horse

b. the number eight

c. the color red

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3. Abstract wholes and the light noun PART

3.1. Planned events

Abstract artefacts

Plans, designs, instruction, recipe, musical compositions

Come with part-whole structure:

(14) part of the plan / design / composition / recipe / symphony

Events that are realizations of plans ('planned events')

Ceremonies, expeditions, demonstrations, masses, performances

Planned events are ontologically different from basic, Davidsonian events (Ardisson et al. 2025)

1. Selection of event-specific existence predicates:

Select *take place* not *happen, occur*

(15) a. The ceremony took place / * happened yesterday.

b. The accident happened ake place

2. Allow for participation:

(16) Joe participated in the ceremony / ??? the accident.

3. Allow for completion:

(17) a. The ceremony was not completed.

b. ??? The accident was not completed.

4. Allow for replacement:

(18) a. The priest replaced another priest in the ceremony.

b. ??? The driver replaced another driver in the accident.

The light noun PART

Picks out parts of the plan, not the realization

Take part in:

Picks out open participant slots in the plan

(19) a. John and Mary took part in the ceremony.

b. # John and Mary took parts in the ceremony.

(20) a. Parts of the ceremony took place on the town square.

b. Parts of the ceremony were performed by the priest

c. # The parts of the ceremony included John and Mary.

(21) a. John and Mary took part in the ceremony.

b. * John and Mary took parts in the ceremony.

(22) ??? We watched parts of the ceremony, namely the two priests.

Be part of:

Picks out specified participants in a slot in the plan:

(23) a. The two priests were part of the ceremony.

b. # The two priests were parts of the ceremony.

Can also pick out planned subevents:

(24) These acts were part of the ceremony.

Planned events may lack a realization:

(25) John was part of the expedition (which never took place).

The light noun PART is not a mass noun:

(27) a. * John and Mary took some part of the ceremony.

b. * John looked at part of the ceremony, the priest.

French correlate of *take part*, 'faire partie':

Partie cannot be a mass noun since French mass nouns cannot occur without determiner:

(28) a. Jean fait partie / * de la partie de la ceremonie.

b. Jean a bu de l'eau / * d'eau.

PART picks out only *planned* subevents, contrasting with *part(s),* which picks out parts of the realization that need not have been part of the plan:

(29) a. The boat trip was part of the expedition.

b. The boat trip was a part of the expedition.

(30) a. The rescue operation was part of the trip.

b. The rescue operation was a part of the operation.

PART is restricted to non-concrete parts

Relates to a part structure whose components are not (just) concrete entities, but abstract parts - associations of objects with slots in a structure.

(31) Composition of planned events

(i) For a plan *p* and an event *e*, C(e, p*)* exists iff *e* partially or completely realizes *e*.

(ii). For plans *p* and *p'* realized by events *e* and *e'* respectively, *C(e, p) = C(e', p')* iff *e = e'* and *p = p'*.

C does not yield a complex object with two *parts*, a realization and a plan.

Rather the parts of the object C composes pertain only either to the realization or plan.

(32) a. The semantics of *take part in*

[*take PART in*](d, p) iff ∃s (s ∈ PART(s, d') & AT(s, d'))

b. The semantics of *be part of*

[*be* PART *of*](d, p) iff PART(d, p)

Actuality entailment for *take* / AT, but not for *be.*

3.2. The question of the crosslinguistic generality of the light noun PART

Language particular differences

(33) a. German *teilnehmen, teil haben*'part take' vs. *teil sein* 'part be,'

b. Italian *prendere parte, partecipare* 'take part in' vs. *far parte* lit. 'make part', 'be part of'

c. French *prendre partie* 'take part' vs. *faire partie* lit. 'make part', 'be part'

d. Russian *prinyat' uchastiye* 'take part', uchastvovat 'participate' vs. *prinimal uchastiye* 'be part'

e. Polish *wziął część* 'take part in' vs. *'być częścią* 'be part of'

Non-indoeuropean languages:

- The light noun PART is not always attested
- May be attested for *be part of*, but not *take part in* (but not conversely).

3.3. Further generalizations about PART

Typical parts vs. parts that happen to be there

(34) a. The church is part of such a traditional village.

b. This church is a part of the village.

Generalization

An 'accidental' part of a realization can be 'a part', but the light noun PART could not pick out such a part.

Material artistic creations

Contrast between intended parts vs. parts added onto the realization:

(35) a. The base is a part of the sculpture.

b. The base is part of the sculpture.

(36) a. The frame is a part of the painting / the work or art.

b. The frame is part of the painting / the work of art.

Artefacts that come with a material realization and a content

Allow the light noun PART to only apply part of the content, not to parts of the material realization:

(37) a. This piece of paper is a part of the letter John wrote to me.

b. ??? This piece of paper is part of the letter John wrote to me.

(38) a. The cover is a part of the book.

b. ??? The cover is part of the book.

(38b) is acceptable only if the author intended the relevant type of cover for the book.

The ordinary noun *part* is applicable also to structured-content part:

(39) a. The book has three parts.

b. A sonnet has a fixed number of parts.

Dual part structures of

- Planned events
- Material artifacts
- Content bearing objects
- Musical performances

Generalization

All artefacts that come with a physical realization come with a dual part structure.

Generalized account

Replace plans by abstract wholes that are products of intentional acts and thus abstract artefacts; the latter can be referred to as separate entities.

(40) Composition of artefacts

An artefact is a composition C(r, w) of an abstract whole w and a realization r, whereby w is the content of an abstract artifact p and r realizes w.

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4. Conclusion

Two notions of part are reflected in the noun *part* in natural language:

- the ordinary noun *part*
- the light noun PART

With artefacts and planned events displaying dual part structures.

Natural language presupposes a constructional ontology with

- different types of composition
- decomposition
- abstraction
- composition of objects based on a realization and an abstract whole.

But the alignment of syntactic constructions and ontological operations is limited.

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