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Nominal *that*-complementisers: Eventualities, Situations and Polysemy

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Informational Nouns

Informational Nouns

- nouns with at least one sense that denotes a piece, pieces, a body or bodies of information
    - which could be modelled as e.g., a proposition, some collection of propositions, Record Types...

Examples of informational nouns in English are given in (1)

(1) *allegation*, *belief*, *book*, *fact*, *information*, *knowledge*, *newspaper*, *report*, *statement*

Noun-related propositional complementiser clauses (NCCs)

The neutral term *noun-related complementiser clause* NCC is from Müller 2023

Not all nouns can be used with NCCs

- Call the construction in which a noun is used with an NCC, the COMP *environment:*

(2) The (COMP) environment. Examples:

  a. the allegation/belief/evidence/fact/information/report/
      statement that Bilbo found the ring
  b. #the house that Bilbo met Gandalf
  c. #the event/celebration that Gandalf set off fireworks
  d. #the book/brochure/document/newspaper that Bilbo found
     the ring

Some evidence of cross-linguistic robustness:

- Finnish, German, Italian, Spanish

Question: What is the right restriction for licensing NCCs?

NCCs clearly relate to propositions/informational entities etc.

- Naive hypothesis: Informational Nouns can be felicitously used with NCCs in the COMP environment
  - Correctly predicts #*the house/event/celebration that...*
  - Problem: does not predict #*the book/brochure/document/ newspaper that...*

Plan:

- Summarize one of the main analyses of these data, and discuss some challenges

- Motivate our own alternative analysis:

A situation-theoretic approach:

NCCs select for informational nouns that also denote eventualities OR situations

Background: The "contentful entities" approach
e.g. Kratzer 2006; Elliott 2020

- Both NCCs and common nouns as expressing properties that compose via predicate modification

- NCCs encode $cont$, a function from worlds and 'content bearing entities' to propositions.

- Nouns such as *fact* and eventuality denoting nouns such as *allegation* and *belief* denote content bearing entities (a sort of type e, e_c)

- nouns such as *book* do not (e.g., Elliott 2020)

(3) a. $[\![\text{allegation}]\!] = \lambda w[\lambda x[allegation_{:\langle s,\langle e_c,t\rangle\rangle}(w)(x)]]$
     b. $[\![\text{fact}]\!] = \lambda w.[\lambda x[fact_{:\langle s,\langle e_c,t\rangle\rangle}(w)(x)]]$

(4) $[\![\text{that Alex ran}]\!]$
     $= \lambda w[\lambda x[cont_{:\langle s,\langle e_c,\langle s,t\rangle\rangle\rangle}(w)(x) = \lambda w'[run(w')(alex)]]]]$

Objection 1: Ignoring polysemy

Informational nouns that can be composed with NCCs:

1. also have an eventuality-denoting sense: *allegation*, *belief*, *statement*
2. plus *fact* (more on which shortly)

Informational nouns that cannot be composed with NCCs:

3. also have a physical-entity-denoting sense: *book*, *document*, *newspaper*

Conclusion: Polysemy clearly plays a role in licensing NCCs

- But the "contentful entities" approach simply demarcates contentful entities of type e from non-contentful ones
    - "The natural conclusion to draw from such contrasts is that the linguistic notion of a contentful entity is distinct from the intuitive notion." (Elliott 2020, p.63)
- We think that a more explanatory and predictive analysis can be given

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Objection 2: facts are not content-bearing entities

Trying to make sense of content-bearing entities

- One a very broad understanding of *entities*:
    - Mental states such as beliefs are entities that in some sense bear content
    - Communicative events such as statements are entities that in some sense bear content
    - Artefacts such as books are entities, but perhaps they 'contain' rather than bear content
- But facts are not entities that bear content
    - If anything, they <u>are</u> content (that in some sense corresponds with how the world is)

It is therefore opaque what entities of sort e_c are denoted by *fact*

Background: Austin vs. Strawson on *facts*
Strawson 1949; Austin 1949

Austin on truth and facts

- facts are parts of the world (situations)
- *Alex's statement corresponds with the facts* expresses that 'Alex's statement is true'
- Facts/situations are truth makers for statements

Strawson on truth and facts

- Facts are really no more than true propositions (they are what true statements state)
- *Alex's statement corresponds with the facts* is just a way of saying 'Alex's statement is true'

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Background: Austin's response
Austin 1970/1954

Different uses of *fact* behave in different ways

(5) a. The (mangy) condition of the cat is a fact
     b.??The (mangy) condition of the cat is a/the fact that ...

Uses of *fact* such as (5-a) do not align with an analysis in terms of true propositions

We see some appeal in both Strawson's and Austin's views: Their views can be reconciled if we analyse *fact* as polysemous:

- what makes e.g., statements or beliefs etc. true (i.e. situations)
    - denoted by *a fact* in (5-a)
- (true) propositions (situation types that are witnessed by some situation)
    - denoted by *the fact* in e.g., *Alex expressed the fact that the cat has mange*

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From simple to rich type theory

Background

- Seminal work by Ranta (1994)
- Implementing a NL semantics based on Martin-Löf 1984

Move 1: Let types feature as part of the object language

- Simply Typed Semantics: Construct arbitrarily complex expressions of some type which are then interpreted (e.g. in a model)
- Richly typed semantics: Construct types themselves of arbitrary complexity
  - Types have witnesses (things of that type)
  - But are individuated also in terms of their structure (fine-grained intensionality)

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From simple to rich type theory

Move 1: Let types feature as part of the object language

Move 2: Treat propositions as types
- Curry-Howard Correspondence (Curry and Feys, 1958; Howard, 1980)

Simple Type Theory (STT)	Rich Type Theory (RTT)
Sets of worlds	Types
Flat	Structured
Individuated by set membership	Individuated by witness set *and* structure

Hyperintensionality:
- The types $2 + 2 = 4$ and $5 - 3 = 2$ have the same witnesses (situations, worlds etc.)
- But can be individuated in terms of structure (and the manner of construction)

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Cooper 2023, 2012, a.m.o

Record Types

(6) $\begin{bmatrix} \text{x} & : & Ind \\ \text{c}_1 & : & cat(\text{x}) \end{bmatrix}$

- *There is a cat*
- Cf. predicate logic: $\lambda w.\exists x.cat_w(x)$

- Propositions in TTR are types (e.g. situation/record types)
- Witnesses of record types are records (situations)
- Labels x, c_1 are like discourse referents
- Ind is a basic type
- cat is a type constructor: constructs a type given a value for the label x

Records/Situations

(7) $\begin{bmatrix} \text{x} & = & \text{f} \\ \text{c}_1 & = & \text{s}_1 \end{bmatrix}$

- (7) : (6) iff
  - $\text{f} : Ind$
  - $\text{s}_1 : cat(\text{f})$

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Non-Polysemous Common Nouns in TTR

CNs denote Properties of situations

- Not functions from worlds to sets of entities
- Functions from situations to situations types

(8) $cat \mapsto \lambda r : \left[\begin{array}{ccc} x & : & Ind \end{array} \right] . \left[\begin{array}{ccc} c_{\text{cat}} & : & cat(r.x) \end{array} \right]$

- Functions from records of some type: $\lambda r : [x : Ind]. \ ...$
  - I.e., situations that contain some individual
- to a proposition
  - I.e., the type of situations in which the entity labelled x is a cat

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Simplified example

(8) $cat \mapsto \lambda r : \begin{bmatrix} x & : & Ind \end{bmatrix} . \begin{bmatrix} c_{cat} & : & cat(r.x) \end{bmatrix} : Ppty$

- Proper names as GQs: functions from a property to the proposition that some individual has that property (classic Montague treatment)

(9) $Felix \mapsto \lambda P : Ppty.P([x = f])$

(10) $Felix$ is a cat $\mapsto \begin{bmatrix} c_{cat} & : & cat(f) \end{bmatrix}$

Important theoretical point, situation theoretic approaches to semantics:

- CNs do not (directly) denote individuals
- CNs denote properties of situations that contain individuals

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Multi-participant situations (Sutton, 2022)

Polysemous nouns denote situations that contain multiple participants

- polysemous Ns constrain situations to witness at least two entities
- e.g., *lunch*: to witness at least some event and some physical entity
- the resulting record type constrains the event to be a lunch eating event and the individual to be the food
- Additionally neo-Davidsonian inspired thematic role relations

(11) *lunch* $\mapsto$

$$\lambda r : \left[\begin{array}{ccc} x & : & Phys \\ e & : & Ev \end{array} \right] . \left[\begin{array}{ccc} c_{\text{food}} & : & food(r.x) \\ c_{\text{eat}} & : & eat\_lunch(r.e) \\ c_{\text{pat}} & : & patient(r.x, r.e) \end{array} \right]$$

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Proposal Outline

- NCCs select for polysemous nouns that denote either eventualities or situations, as well as propositions
    - So *allegation* and *fact* can be used with NCCs
    - But *book* and *newspaper* cannot
- but crucially, the relationship between the proposition and the eventuality or situation is determined by the lexical semantics of the noun
    - E.g., for *allegation that*, it is not the NCC that encodes e.g., 'contains' as a relation between contents and an eventuality, but the noun
    - And so we do not predict that *fact* denotes content bearing entities

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An Eventuality-Informational Polysemous Noun: *allegation*

A function from a record, r

- a pairing of a record type p, and event, x

to a a record type, the proposition that:

- r is an allegation-situation — $\mathrm{allegation}(r)$
- and that p is the contents of x — $\mathrm{cont}(r.\mathrm{x}, r.\mathrm{p})$

(12) *allegation* $\mapsto$

$$\lambda r : \begin{bmatrix} \mathrm{p} : RecType \\ \mathrm{x} : Ev \end{bmatrix} . \begin{bmatrix} \mathrm{c_{alleg}} & : allegation(r) \\ \mathrm{c_{alleg\_cont}} & : cont(r.\mathrm{x}, r.\mathrm{p}) \end{bmatrix}$$

- *allegation* is $RecType/Ev$ polysemous

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Our take on *fact*

fact denotes pairings of a proposition and a situation that witnesses the proposition cf. *Austinian proposition* (Barwise, 1989; Ginzburg, 2012)

A function from a record, r

- a pairing of a record type p, and record x

to a a record type, the proposition that:

- r is an fact-situation ($fact(r)$)
- and that x is a witness (a truth maker) for p i.e., ($r.x : r.p$)
  - Where $\mathrm{f} = r.x : r.p$ is a *manifest field* (Coquand et al., 2004; Cooper, 2023)
  - Alternatively represented $[\mathrm{f} : \mathrm{p}_{r.x}]$
    which holds iff $\mathrm{f} : \mathrm{p}$ and $\mathrm{f} = r.x$

(13) *fact* $\mapsto \lambda r : \begin{bmatrix} \mathrm{p} : RecType \\ \mathrm{x} : Rec \end{bmatrix} . \begin{bmatrix} \mathrm{c_{fact}} & : fact(r) \\ \mathrm{f} = r.x : r.p \end{bmatrix}$

- *fact* is $RecType/Rec$ polysemous
- *facts* can be characterised as *true Austinian propositions*

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Analysis of NCCs

A function from a record, r

- a pairing of a record type p, and something, x, that is either a record or an eventuality

to a record type, the proposition that:

- the value of r.p is the proposition *Alex runs*

- plus introduction of a label, q that allows anaphoric reference to the proposition *Alex runs*

(14) *that Alex runs*
$$\mapsto \lambda r : \begin{bmatrix} \text{p:}RecType \\ \text{x:}Ev \vee Rec \end{bmatrix} . \begin{bmatrix} \text{q} = r.\text{p}, [\text{c}_{\text{ar}} : run(\text{a})] & : & RecType \end{bmatrix}$$

- Where $\text{q} = r.\text{p}, [\text{c}_{\text{ar}} : run(\text{a})] \;:\; RecType$ iff
$$\text{q} : RecType,$$
$$\text{q} = r.\text{p} = [\text{c}_{\text{ar}} : run(\text{a})]$$

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Analysis of NCCs cont.

(14) *that Alex runs*

$$\mapsto \lambda r : \begin{bmatrix} \text{p}:RecType \\ \text{x}:Ev \lor Rec \end{bmatrix} . \begin{bmatrix} \text{q} = r.\text{p}, [c_{\text{ar}} : run(\text{a})] & : & RecType \end{bmatrix}$$

Two effects of this analysis

1. A selectional restriction to exclude e.g., *book* (no eventuality- or situation-denoting sense)
2. Underspecification wrt how any bound x is related to p (must come from the semantics of the NP

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Composing Informational Nouns with NCCs

Composition via property modification:

(13) *fact* $\mapsto \lambda r : \begin{bmatrix} \text{p} : RecType \\ \text{x} : Rec \end{bmatrix} . \begin{bmatrix} \text{c}_{\text{fact}} & : fact(r) \\ \text{f} = r.\text{x} : r.\text{p} \end{bmatrix}$

(14) *that Alex runs*

$\mapsto \lambda r : \begin{bmatrix} \text{p}:RecType \\ \text{x}:Ev \lor Rec \end{bmatrix} . \begin{bmatrix} \text{q} = r.\text{p}, [\text{c}_{\text{ar}} : run(\text{a})] : RecType \end{bmatrix}$

(15) *fact that Alex runs*

$\mapsto \lambda r : \begin{bmatrix} \text{p}:RecType \\ \text{x}:Rec \end{bmatrix} . \begin{bmatrix} \text{c}_{\text{fact}} & : fact(r) \\ \text{q} = r.\text{p}, [\text{c}_{\text{ar}} : run(\text{a})] : RecType \\ \text{f} = r.\text{x} & : r.\text{p} \end{bmatrix}$

A property of pairs, r of:
- proposition (rec. type), p
- a situation, x

Such that:
- r is a fact
- the proposition is *Alex runs*
- x makes p true

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Comparing Analyses

	Contentful entity approach	Our approach
Relation with proposition	Encoded by *that*	Encoded by the noun
Facts are entities	Yes	No
Principled explanation for restrictions on NCCs?	No	Yes
Polysemy plays a role	No	Yes

Open question: Situations vs. Eventualities

In Cooper 2023:

- Situations and eventualities are not fundamentally distinct
  - E.g., situation/event e can be a witness for the type $run(alex)$

Here, we assume a more neo-Davidsonian approach:

- Situations and eventualities are distinct
  - E.g., event e can be a witness for the type $allegation$
  - Situations are witnesses for propositions (Record types) (such that these situations may contain events)

So on a broad understanding of *situation* that included neo-Davidsonian eventualities and the truth-makers for propositions:

- NCCs select for nouns that are information-situation polysemous

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References I

Austin, J. L. (1949). Truth. *Proceedings of the Aristotelian Society 24*, 111–128.

Austin, J. L. (1970/1954). Unfair to facts. In J. O. Urmson and G. J. Warnock (Eds.), *Philosophical Papers, Second Edition*, pp. 154–174. Oxford: Oxford University Press.

Barwise, J. (1989). Notes on branch points in situation theory. In J. Barwise (Ed.), *The Situation in Logic, CSLI Lecture Notes 17*. CSLI.

Cooper, R. (2012). Type Theory and Semantics in Flux. In R. Kempson, T. Fernando, and N. Asher (Eds.), *Philosophy of Linguistics, Handbook of the Philosophy of Science*, pp. 271–323. Elsevier.

Cooper, R. (2023). *From Perception to Communication: a Theory of Types for Action and Meaning*. Oxford University Press.

Coquand, T., R. Pollack, and M. Takeyama (2004). A logical framework with dependently typed records. *Fundamenta Informaticae XX*, 1–22.

Curry, H. B. and R. Feys (1958). *Combinatory Logic Volume 1*. North-Holland Publishing.

Elliott, P. D. (2020). *Elements of Clausal Embedding*. Ph. D. thesis, University College London.

Ginzburg, J. (2012). *The Interactive Stance: Meaning for Conversation*. Oxford: Oxford University Press.

References II

Howard, W. (1980). The formulae-as-types notion of construction. In R. Hindley and J. P. Seldin (Eds.), *To H. B. Curry: Essays on Combinatory Logic, Lambda Calculus and Formalism*, pp. 479–490. Academic Press.

Kratzer, A. (2006). Decomposing attitude verbs. https://semanticsarchive.net/Archive/DcwY2JkM/attitude-verbs2006.pdf.

Martin-Löf, P. (1984). *Intuitionistic Type Theory*. Naples: Bibliopolis.

Müller, K. (2023). On noun-related complementizer clauses. In K. Axel-Tober, L. Gunkel, J. Hartmann, and A. Holler (Eds.), *On the nominal nature of propositional arguments*, pp. 93–120. Buske.

Ranta, A. (1994). *Type-Theoretical Grammar*. Oxford: Clarendon Press.

Strawson, P. F. (1949). Truth. *Proceedings of the Aristotelian Society 24*, 129–156.

Sutton, P. R. (2022). Restrictions on copredication: a situation theoretic approach. *Semantics and Linguistic Theory (SALT) 32*, 335–355.