# Logical Form
# Davidson on logical form

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- There are many necessarily truth-preserving arguments that are not model-theoretically valid formalisations of first-order logic.
- There are three major responses: change the logic, change the formalisation, or ignore them.
- Ignoring them involves distinguishing *material* from *formal* validity.
- The distinction is difficult to satisfactorily characterise.
- Writers such as Oliver and Smiley have attempted a different explanation: they lack mathematical interest.

# Talk outline

# Donald Davidson

- Donald Davidson believes that first-order classical logic is the one true logic, so we should not change the logic.
- He draws a distinction between formal and material validity.
- Subsequently, there are many formally valid arguments that should be captured by changing the translation.
- Nevertheless, he maintains that some arguments are merely materially valid and can be ignored.

# Davidson's bathroom

- Consider the following sentences:
    1. Jones buttered the toast with a knife in the bathroom at midnight.
    2. Jones buttered the toast with a knife in the bathroom.
    3. Jones buttered the toast with a knife.
    4. Jones buttered the toast.
- By (N) – necessary truth-preservation – each sentence in this list implies all of those lower down.
- An *adverbial* is a word (or phrase) that modifies a sentence or a verb, e.g.
    - 'with a knife'
    - 'in the bathroom'
    - 'perfectly'
    - 'cheerfully'

# Davidson's Bathroom

- In English, many arguments' validity turns on adverbial dropping:

  (Bathroom) Jones buttered the toast in the bathroom; *so* Jones buttered the toast.

- But its canonical formalisation is not model-theoretically valid:

  (Bathroom*) $Bjtb \therefore Bjt$.

# Variable polyadicity

- The problem is that the predicate is *variably polyadic*.
- The predicate 'buttered' can take a variable number of argument places, e.g.

  Jones buttered the toast in the bathroom

  could be analysed as a 3-place predicate

  $x$ buttered $y$ in $z$

  holding of *Jones*, *the toast* and *the bathroom*, in that order.
- Or it could be analysed as a 2-place predicate

  $x$ buttered $y$

  holding of *Jones* and *the toast*, in that order.
- Given variable polyadicity, arguments involving adverbial dropping fail to be captured model-theoretically.

## Davidson's event analysis

- In 'The Logical Form of Action Sentences' (1967), Davidson offers a solution.
- The sentence

    Jones buttered the toast in the bathroom.

  should first be understood as

    There is an event $x$ such that $x$ was a buttering of the toast by Jones and $x$ occurred in the bathroom.

  which should then be formalised as

    $\exists x(Bjtx \land Ibx)$

  where $x$ is a variable that ranges over *events*.
- This needn't be thought of as an addition to the logical vocabulary.

# Davidson on validity

- Our argument

  > Jones buttered the toast in the bathroom; *so*
  > Jones buttered the toast.

  now receives the formalisation

  > $\exists x (Bjtx \wedge Ibx) \therefore \exists x Bjtx$

  which is model-theoretically valid.

- So Davidson has succeeded in capturing the validity.

# Change the formalisation

- ▶ Davidson's project clearly falls under 'Change the formalisation'.
- ▶ There is a parallel to Russell on definite descriptions.
- ▶ Both are motivated by arguments valid by (N) but not (M) ;
    - ▶ 'Childish Gambino' is the pseudonym of Donald Glover; *so* Donald Glover has exactly one pseudonym.
    - ▶ Jones buttered the toast in the bathroom; *so* Jones buttered the toast.
- ▶ Both hold that first-order logic is the correct logic.
- ▶ Both suggest formalisations that deviate greatly from the surface grammatical form of the originals:
    - ▶ $\exists x(Pxg \land \forall y(Pyg \to y = x) \land Cx) \therefore$ $\exists x(Pxg \land \forall y(Pyg \to y = x))$
    - ▶ $\exists x(Bjtx \land Ibx) \therefore \exists x Bjtx$

# Talk outline

# Formal and material validity

- In some cases – those of adverbial dropping – Davidson believes that we should change the formalisation.
- In other cases, he doesn't.
- He clearly has some sort of formal/ material distinction in mind but does not use these labels:

  > Since the entailments that depend on quantificational form can be completely formalized, it is an easy test of our success in capturing logical form within a theory of truth to see whether our paraphrases articulate entailments we independently recognise as due to form.
  > ('Reply to Cargile', 1970: 144)

- Later, he writes that 'It is not part of my programme to make all entailments matters of logical form' (1970: 125).

# Davidson's test

- The idea is that some arguments are formally valid and others are materially valid.
- We should only be out to capture the formally valid ones.
- We should do so by changing the formalisation and maintaining classical logic.
- Arguments that depend on adverbial dropping are formally valid, and the event analysis is the way to capture those.
- However, Davidson doesn't give us much more on the formal/material distinction.
- Let's look at some arguments over which Davidson adjudicates to piece together what his test may be.

# Judge Davidson: formal validity

- The following are all formally valid according to 'The logical form of action sentences' (1967), 'Reply to Cargile' (1970), or 'Reply to Castañeda' (1980).
- The following are all formally valid according to Davidson:

(Bathroom) Jones buttered the toast in the bathroom; *so* Jones buttered the toast (1967: 107)

(Flew) I flew my spaceship to the Morning Star, the Morning Star is the Evening Star; *so* I flew my spaceship to the Evening Star (1967: 114)

(Stabbed) Brutus stabbed Caesar in the back; *so* Brutus stabbed Caesar (1970: 136)

(Bismarck) The Bismarck was sunk; *so* the Bismarck sank (1980: 126)

(Flown) My spaceship was flown; *so* someone flew my spaceship (1980: 126)

# The event analysis

- ▶ Of these formally valid arguments, the event analysis does indeed validate:

(Bathroom) Jones buttered the toast in the bathroom; *so* Jones buttered the toast

(Bathroom\*) $\exists x(Bjtx \wedge Ibx) \therefore \exists xBjtx$

(Flew) I flew my spaceship to the Morning Star, the Morning Star is the Evening Star; *so* I flew my spaceship to the Evening Star

(Flew\*) $\exists xFismx, m = e \therefore \exists xFisex$

(Stabbed) Brutus stabbed Caesar in the back; *so* Brutus stabbed Caesar

(Stabbed\*) $\exists x(Sbcx \wedge Iax) \therefore \exists xSbcx$

- ▶ And we are told that there would be 'real merit' in validating (Bismarck) and (Flown).

# Judge Davidson: material validity

▶ In contrast, the following are all said by Davidson to be merely materially valid:

(Knows) *S* knows that *p*; *so p* is true (1967: 106)

(Larger) *a* is larger than *b* and *b* is larger than *c*; *so a* is larger than *c* (1970: 143)

(Henry) Henry is a man; *so* Henry is not a frog (1970: 143)

(Father) *x* is a grandfather; *so x* is a father (1980: 125)

(Spaceship) I flew my spaceship; *so* I flew (1980: 125)

## Assessing Davidson

- Alex Oliver, in 'The matter of form: logic's beginnings' (2010) criticises Davidson at this point.
- Oliver suggests that we may be surprised by Davidson's verdict on (Spaceship) which *can* be validated by the event analysis:

    (Spaceship) I flew my spaceship; *so* I flew
    (Spaceship*) $\exists x(Fmx \land Sx) \therefore \exists xFmx$

- Why does Davidson argue that (Spaceship) is only materially valid?
- It cannot be formally valid due to the invalid but formally identical:

    (Sank) I sank the Bismarck; *so* I sank

- Davidson must think that having a purely valid form is at least *necessary* for formal validity.

## Assessing Davidson

- But this seems arbitrary.
- (Spaceship) also has the form
    - I flew my spaceship; *so* I flew
    - *x* flew *y*; *so* *x* flew

  which appears to be purely valid.
- And arguments like (Brutus) have formally identical but invalid counterparts:
    - Brutus stabbed Caesar in the back; *so* Brutus stabbed Caesar
    - Brutus stabbed Caesar, allegedly; *so* Brutus stabbed Caesar

# Assessing Davidson

> *It is clear that Davidson's choice of logic is determining what counts as a formally valid English argument, that is, the notion of formal validity in English is not acting as an independent test of correct formalization. The same lack of independence is manifest in the different ways he reacts to alleged counter-instances to formal validity. In the Bismarck inference, he is happy to accept the counter-instance as real. But in cases that threaten his own match between English formal validity and validity in his preferred formalized language, he insists the counter-instance is merely apparent. (Oliver 2010: 342)*

# Assessing Davidson

- Davidson insists that the following is formally valid:

(Flew) I flew my spaceship to the Morning Star, the Morning Star is the Evening Star; so I flew my spaceship to the Evening Star

- But the following is invalid and clearly has *some* form in common:

(Stars) I flew my spaceship to the Morning Star, the Morning Star is larger than the Evening Star; *so* I flew my spaceship to to the Evening Star

- Possible response: identity is a logical constant, and 'is larger than' is not.

- But Davidson has defined logical constanthood (in his 'In defence of convention T', 1973) to rule out identity.

# Talk outline

# Davidson so far

- Davidson believes instances of adverbial dropping in English to be formally valid.
- He provides a means of changing the formalisation to capture them.
- The project is motivated by a formal/ material distinction.
- Oliver finds this untenable.
- Let's now consider a debate between Davidson and Cargile.
- This will set up next week's discussion of logical and grammatical form.

# Early Davidson

▶ What does Davidson conceive of himself as doing when he formalises sentences and arguments?

▶ In 'The Logical Form of Action Sentences', his aim is

> trying to get the logical form of simple sentences involving actions straight (1967: 105)

▶ His formal translations are 'revealing' or 'showing' (1967: 116) the forms of action sentences.

▶ Like Russell on descriptions, the language about forms is highly *realist*-sounding.

▶ Each sentence of natural language has an underlying form which he sets out to discover, and which may diverge greatly from surface grammatical form.

▶ Formalisations are more or less correct to the extent that they match these hidden forms.

# Cargile on Davidson

- James Cargile considers Davidson's examples of action sentences

  > Jones buttered the toast in the bathroom; *so* Jones buttered the toast.
  > $\exists x(Bjtx \land Ibx) \therefore \exists x Bjtx$

  and writes:

  > *the sentence really is of a three-place relation form, with two names and an existential quantifier. An existential quantifier? Where is it? (1970: 137-8)*

- Oliver calls this 'the original incredulous stare' (2010: 340).

- Formalisation is relative to (at least): choice of logic, translation scheme.

- So talk of real, underlying forms is arbitrary.

# Later Davidson

- In his 'Response to Cargile' (1970), Davidson's notion of logical form seems to have changed considerably:

  > *The logical form of a particular sentence is, then, relative to a theory of deduction and to some prior determinations as to how to render sentences in the language of the theory. ... Seen in this light, to call the paraphrase of a sentence into some first-order quantificational form the logical form of the sentence seems arbitrary indeed (1970: 140)*

# Later Davidson

- In this later paper, he tells us that

    *to give the logical form of a sentence is to give its logical location in the totality of sentences, to describe it in a way that explicitly determines what sentences it entails and what sentences it is entailed by (1970: 140)*

- Although Davidson doesn't acknowledge this, it seems to represent a move from *realism* towards *instrumentalism*.

- Logical form is not a real, underlying entity that formalisation reveals or unearths

- Rather, it is a useful means of representing the implicational powers of a sentence that is relative to several factors.

# Relativity

- ▶ Consider the sentence 'all whales are mammals'.
- ▶ To capture the validity of

  All whales are mammals, Ian is a whale; *so* Ian is a mammal

  we need the first-order

  $\forall x(Wx \rightarrow Mx), Wi \therefore Mi$

- ▶ But to capture

  All whales are mammals, *so* all whales are mammals

  we only need propositional

  $P \therefore P$

- ▶ Which is the *correct* formalisation of 'All whales are mammals?'
- ▶ The choice seems dictated by *interest*.

# Talk outline

# Conclusion

- Davidson has given us an elegant means of formalising a particular class of arguments involving adverbial dropping.
- His changes the formalisation using his event-analysis.
- He motivates the approach with a formal/ material distinction, though says little beyond some examples to characterise this.
- Oliver argues that the distinction is untenable.
- Cargile criticises Davidson's appeal to a *realist* conception of logical form.
- In response, we find Davidson moving towards an *instrumentalist* picture.