Two Kinds of Concept Introduction

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Sound(‘Brutus kicked Caesar’)

Human Language System, tuned to “Spoken English”

Meaning(‘Brutus kicked Caesar’)

KICKED(BRUTUS, CAESAR)

BRUTUS

KICKED(_, CAESAR)

KICKED(_, _)  \( \lambda Y. \lambda X. \text{KICKED}(X, Y) \)

Sound(‘kicked’)

Human Language System, tuned to “Spoken English”

Meaning(‘kicked’)

KICKED(_, _)

\( \lambda Y. \lambda X. \text{KICKED}(X, Y) \)
Sound('Brutus kicked Caesar on Monday')

Human Language System, tuned to “Spoken English”

Meaning('Brutus kicked Caesar on Monday')

kicked(_, Brutus, Caesar) & on(_, Monday)

kicked(_, Brutus, Caesar) ←

Brutus

kicked(_, _, _) Caesar

kicked(_, _, _) →

on(_, Monday)

kicked(_, _, Caesar) →
Human Language System, tuned to “Spoken English”

Sound('kicked')

Meaning('kicked')

\[ \lambda Y. \lambda X. \lambda E. \text{KICKED}(E, X, Y) \]

\[ \text{KICKED}(_, \text{BRUTUS}, \text{CAESAR}) \leftarrow \text{ON}(_, \text{MONDAY}) \]

\[ \text{BRUTUS} \]

\[ \text{KICKED}(_, _, _) \]

\[ \text{CAESAR} \]
Human Language System, tuned to “Spoken English”

Sound('kicked')

Meaning('kicked')

\[ \lambda Y. \lambda X. \lambda E. \text{KICK}(E, X, Y) \& \text{PAST}(E) \]

\[ \text{KICKED}(\_, \text{BRUTUS}, \text{CAESAR}) \leftarrow \text{ON}(\_, \text{MONDAY}) \]

\[ \text{BRUTUS} \]

\[ \text{KICKED}(\_, \_, \_) \]

\[ \text{CAESAR} \]
Human Language System, tuned to “Spoken English”

Sound(‘kicked’)

↑

Meaning(‘kicked’)

\[ \lambda y.\lambda x.\lambda e. \text{kick}(e, x, y) \land \text{past}(e) \land \text{agent}(e, x) \land \text{patient}(e, y) \]

\text{kicked}(_, \text{brutus}, \text{caesar}) \Leftarrow \text{on}(_, \text{monday})

\text{brutus}

\text{kicked}(_, _, _, \text{caesar})
Human Language System, tuned to "Spoken English"

Sound('kicked')

Human Language System, tuned to "Spoken English"

Meaning('kicked')

\[ \lambda Y. \lambda X. \lambda E. \text{KICKED}(E, X, Y) \]

Brutus kicked Caesar the ball
Brutus kicked Caesar (today)
Brutus kicked
Caesar was kicked
That kick was a good one
I get no kick from champagne, but I get a kick out of you

Does a child who acquires 'kicked' start with

\[ \text{KICKED}(_, _) \quad \lambda Y. \lambda X. \text{KICKED}(X, Y) \]
\[ \text{KICK}(_, _, _) \quad \lambda Y. \lambda X. \lambda E. \text{KICK}(E, X, Y) \]
or some other concept(s), perhaps like \[ \lambda E. \text{KICK}(E) \]?
Human Language System, tuned to “Spoken English”

\[ \lambda Z. \lambda Y. \lambda X. \lambda E. \text{GAVE}(E, X, Y, Z) \]

Brutus gave Caesar the ball (today)
Brutus gave the ball (to Caesar)
Brutus gave (at the office)
The painting was given/donated
The rope has too much give

Does a child who acquires ‘gave’ start with
\[
\begin{align*}
\text{GAVE}(\_ , \_ , \_ ) \\
\text{GAVE}(\_ , \_ , \_ , \_ ) \\
\lambda Z. \lambda Y. \lambda X. \lambda E. \text{GAVE}(E, X, Y, Z) \\
\cdots \\
\lambda E. \text{GIVE}(E)
\end{align*}
\]
Big Questions

• To what degree is lexical acquisition a “cognitively passive” process in which (antecedently available) representations are simply *labeled* and paired with phonological forms?

• To what degree is lexical acquisition a “cognitively creative” process in which (antecedently available) representations are used to *introduce other* representations that exhibit a new combinatorial format?

• Are the concepts that kids *lexicalize* already as systematically combinable as words? Or do kids use these “L-concepts,” perhaps shared with other animals, to *introduce related* concepts that exhibit a more distinctively human format?
Describe a “Fregean” mind that can use its cognitive resources to introduce mental symbols of two sorts:

1. **polyadic** concepts that are “logically fruitful”
2. **monadic** concepts that are “logically boring,” but more useful than “mere abbreviations” like

$$\forall x [\text{MARE}(x) \equiv \text{HORSE}(x) \& \text{FEMALE}(x) \& \text{MATURE}(x)]$$

Suggest that the process of acquiring a lexicon involves concept introduction of the second sort. For example, a child might use \text{GIVE}(\_ \_ \_ \_ \_ \_) or \text{GIVE}(\_ \_ \_ \_ \_ \_ \_) to introduce \text{GIVE}(\_ \_ \_ \_ \_ \_ \_ \_ \_).
Quick Reminder about Conceptual Adicity

Two Common Metaphors

• Jigsaw Puzzles

• 7th Grade Chemistry

\[ +1H -O -H +1 \]
Jigsaw Metaphor

a Thought: Brutus Sang
Jigsaw Metaphor

one Dyadic Concept
(adicity: -2)

“filled by” two Saturaters
(adicity +1)

yields a complete Thought

one Monadic Concept
(adicity: -1)

“filled by” one Saturater
(adicity +1)

yields a complete Thought
a single atom with valence -2 can combine with two atoms of valence +1 to form a stable molecule
7th Grade Chemistry Metaphor

\[-2\]
\[+1^{\text{Brutus}}(\text{KickCaesar}^{+1})^{-1}\]
an atom with valence -1 can combine with an atom of valence +1 to form a stable molecule
Extending the Metaphor

COW( )
-1

AGGIE
+1

BROWN( )
-1

AGGIE
+1

Aggie is (a) cow

BROWN-COW( )
-1

Aggie is (a) brown cow

Aggie is brown
Extending the Metaphor

Conjoining two monadic (-1) concepts can yield a complex monadic (-1) concept.
Outline

• Describe a “Fregean” mind that can use its cognitive resources to *introduce* mental symbols of two sorts

  (1) *polyadic* concepts that are “logically fruitful”

  (2) *monadic* concepts that are “logically boring,” but more useful than “mere abbreviations” like

  \[ \forall x [\text{MARE}(x) \equiv_{\text{df}} \text{HORSE}(x) \land \text{FEMALE}(x) \land \text{MATURE}(x)] \]

• Suggest that for humans, the process of “acquiring a lexicon” involves concept introduction of the second sort. For example, a child might use \text{GIVE}(_ , _ , _) to introduce \text{GIVE}( _) .

• Offer some evidence that this suggestion is correct
• **Zero** is a number

• every number has a **successor**

• **Zero** is not a successor of any number

• no two numbers have the same successor

• for every property of **Zero**:
  
  *if* every number that has it is such that its successor has it,

  *then* every number has it

Frege’s Hunch: these thoughts are not as independent as axioms should be
• **Nero** is a cucumber

• every cucumber has a **doubter**

• **Nero** is not a doubter of any cucumber

• no two cucumbers have the same doubter

• for every property of **Nero**:

  if every cucumber that has it is such that its doubter has it,

  then every cucumber has it

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**Related Point:**

these thoughts are not as compelling as axioms should be
Zero is a number \( \Phi(\alpha) \)

Nero is a cucumber

every number has a successor \( \forall x \{ \Phi(x) \supset \exists y [\Sigma(y, x)] \} \)
every cucumber has a doubter

Zero is not a successor of any number \( \sim \exists x [\Sigma(\alpha, x) \& \Phi(x)] \)
Nero is not a doubter of any cucumber

If we want to represent what the arithmetic thoughts \textit{imply}—
and what they \textit{follow from}—then the formalizations on the right are better than ‘P’, ‘Q’, and ‘R’.
Zero is a number \( \Phi(\alpha) \)

Nero is a cucumber

every number has a successor \( \forall x \{ \Phi(x) \supset \exists y [\Sigma(y,x)] \} \)
every cucumber has a doubter

Zero is not a successor of any number \( \sim \exists x \{ \Sigma(\alpha, x) \& \Phi(x) \} \)
Nero is not a doubter of any cucumber

But we miss something if we represent the property of being a number with an atomic monadic concept, as if \( \text{NUMBER}(\ ) \) differs from \( \text{CUCUMBER}(\ ) \) and \( \text{CARROT}(\ ) \) only in terms of its specific content.
Zero is a number

Nero is a cucumber

every number has a successor

every cucumber has a doubter

Zero is not a successor of any number

Nero is not a doubter of any cucumber

We miss something if we represent the number zero with an atomic singular concept, as if the concept \textsc{Zero} differs from concepts like \textsc{Nero} and \textsc{Venus} only in terms of its specific content.
Zero is a number \( \Phi(\alpha) \)

Nero is a cucumber

every number has a successor \( \forall x\{\Phi(x) \supset \exists y[\Sigma(y, x)]\} \)
every cucumber has a doubter

Zero is not a successor of any number \( \sim\exists x\{\Sigma(\alpha, x) \& \Phi(x)\} \)
Nero is not a doubter of any cucumber

We miss something if we represent the successor relation with an atomic relational concept, as if \textit{SUCCESSOR-OF( , )} differs from \textit{DOUBTER-OF( , )} and \textit{PLANET-OF( , )} only in terms of its specific content.
Fregean Moral

• The contents of \texttt{NUMBER( )}, \texttt{ZERO}, and \texttt{SUCCESSOR-OF( , )} seem to be \emph{logically related} in ways that the contents of \texttt{CUCUMBER( )}, \texttt{NERO}, and \texttt{DOUBTER-OF( , )} are not.

• So perhaps we should try to \emph{re-present} the contents of the arithmetic concepts, and reduce (re-presentations of) the arithmetic axioms to “sparer” axioms that reflect (all and only) the “nonlogical” content of arithmetic.
Frege’s Success (with help from Wright/Boolos/Heck)

(Defs) Definitions of $\text{NUMBER}(x)$, $\text{ZERO}$, and $\text{SUCCESSOR-OF}(y, x)$ in terms of $\text{NUMBER-OF}(x, \Phi)$ and logical notions

(HP) $\forall \Phi \forall \Psi \{ [\lambda x: \text{NUMBER-OF}(x, \Phi) = \text{NUMBER-OF}(x, \Psi)] \equiv \text{ONE-TO-ONE}(\Phi, \Psi) \} $

(DP) Dedekind-Peano Axioms

A mind that starts with (HP) could generate “Frege Arithmetic,” given a consistent fragment of Frege’s $(2^{nd})$-order Logic.
Some Truths

\[\text{NUMBER-OF}[\text{ZERO}, \lambda z. \neg (z = z)]\]
\[\text{NUMBER-OF}[\text{ONE}, \lambda z.(z = \text{ZERO})]\]
\[\text{NUMBER-OF}[\text{TWO}, \lambda z.(z = \text{ZERO}) \lor (z = \text{ONE})]\]

... 
\[\text{ZERO} = \iota x:\text{NUMBER-OF}[x, \lambda z. \neg (z = z)]\]
\[\text{ONE} = \iota x:\text{NUMBER-OF}[x, \lambda z.(z = \text{ZERO})]\]
\[\text{TWO} = \iota x:\text{NUMBER-OF}[x, \lambda z.(z = \text{ZERO}) \lor (z = \text{ONE})]\]

...
\[\forall x \forall \Phi \{\text{NUMBER-OF}(x, \Phi) \equiv \text{NUMBER}(x) \land \text{ONE-TO-ONE}(\Phi, \lambda y. \text{PRECEDES}(y, x))\}\]
\[\forall x\{\text{NUMBER}(x) \equiv (x = \text{ZERO}) \lor \text{PRECEDES}(\text{ZERO}, x)\}\]
\[\forall x\{\text{NUMBER}(x) \equiv \exists \Phi[\text{NUMBER-OF}(x, \Phi)]\}\]
Frege’s Direction of Definition

\[ \text{ZERO} =_{\text{DF}} \{x: \text{NUMBER-OF}[x, \lambda z. \neg (z = z)]\} \]

\[ \forall x \{ \text{NUMBER}(x) \equiv_{\text{DF}} (x = \text{ZERO}) \lor \text{PRECEDES}(\text{ZERO}, x) \} \]

\[ \forall x \forall y \{ \text{PRECEDES}(x, y) \equiv_{\text{DF}} \text{ANCESTRAL}::\text{PREDECESSOR}(x, y) \} \]

\[ \forall x \forall y \{ \text{PREDECESSOR}(x, y) \equiv_{\text{DF}} \exists \Phi \exists \Psi \{ \text{NUMBER-OF}(x, \Phi) \& \text{NUMBER-OF}(y, \Psi) \& \exists z[\neg \Phi z \& \forall w \{ \Psi w \equiv [\Phi w \lor (w = z)] \}] \} \} \]

The idea is not that our concepts \text{ZERO}, \text{NUMBER(...)}, and \text{PREDECESSOR}(x, y) had decompositions all along. But once we have the concept \text{NUMBER-OF}(x, \Phi), perhaps with help from Frege, we can imagine an ideal thinker who starts with this concept and introduces the others—either to interpret us, or to suppress many aspects of logical structure until they become relevant.
A Different Direction of Analysis

\[ \forall x \forall \Phi \{ \text{NUMBER-OF}(x, \Phi) \equiv_{\text{DF}} \text{NUMBER}(x) \& \text{ONE-TO-ONE}(\Phi, \lambda y. \text{PRECEDES}(y, x)) \} \]

\[ \forall x \forall y \{ \text{PRECEDES}(x, y) \equiv_{\text{DF}} \text{ANCESTRAL:PREDECESSOR}(x, y) \} \]

\[ \forall x \forall y \{ \text{PREDECESSOR}(x, y) \equiv_{\text{DF}} \text{SUCCESSOR}(y, x) \} \]

as if primitive thinkers—who start with \text{NUMBER}(x), \text{ONE-TO-ONE}(\Phi, \Psi) and \text{SUCCESSOR}(x, y)—were trying to interpret (or become) thinkers who use the sophisticated concept \text{NUMBER-OF}(x, \Phi) and thereby come to see how the Dedekind-Peano axioms can be re-presented

such thinkers don’t use \text{NUMBER-OF}(x, \Phi) to introduce \text{NUMBER}(x) but they \textbf{might} use \text{KICK}(x, y)/\text{GIVE}(x, y, x) to introduce \text{KICK}(e)/\text{GIVE}(e)
Some Potential Equivalences

∀x{\textsc{so}cratizes}(x) ≡ (x = \textsc{Socrates})

\textsc{Socrates} = \lambda x: \textsc{so}cratizes(x)

∀x∀y{\textsc{kick}ed}(x, y) ≡ ∃ e[\textsc{kick}ed(e, x, y)]

∀x∀y∀e{\textsc{kick}ed(e, x, y) ≡ \textsc{past}(e) & \textsc{kick}(e, x, y)}

∀x∀y∀e{\textsc{kick}(e, x, y) ≡ \textsc{ag}ent(e, x) & \textsc{kick}(e) & \textsc{pat}ient(e, y)}

λe.\textsc{kick}(e) =

\iota\Phi: ∀x∀y∀e{\textsc{kick}(e, x, y) ≡ \textsc{ag}ent(e, x) & \Phi(e) & \textsc{pat}ient(e, y)}
Some Potential Equivalences

\[ \forall x \{ \text{SOCRATIZES}(x) \equiv (x = \text{SOCRATES}) \} \]

fixes the (one-element) extension of \text{SOCRATIZES}(\_)

\[ \forall x \forall y \forall e \{ \text{KICK}(e, x, y) \equiv \text{AGENT}(e, x) \& \text{KICK}(e) \& \text{PATIENT}(e, y) \} \]

\[ \lambda e. \text{KICK}(e) = \]

\[ \iota \Phi : \forall x \forall y \forall e \{ \text{KICK}(e, x, y) \equiv \text{AGENT}(e, x) \& \Phi(e) \& \text{PATIENT}(e, y) \} \]

constrains (but does not fix) the extension of \text{KICK}(\_), which is neither fully defined nor an unconstrained atom
Two Kinds of Introduction

Introduce monadic concepts in terms of nonmonadic concepts

∀x{SOCRATIZES(x) ≡_{DF} (x = Socrates)}

λe. KICK(e) =_{DF} ιΦ: ∀x∀y∀e{KICK(e, x, y) ≡ AGENT(e, x) & Φ(e) & PATIENT(e, y)}

Introduce nonmonadic concepts in terms of monadic concepts

Socrates =_{DF} ιx: SOCRATIZES(x)

∀x∀y∀e{KICK(e, x, y) ≡_{DF} AGENT(e, x) & KICK(e) & PATIENT(e, y)}
Two Kinds of Introduction

Introduce monadic concepts in terms of nonmonadic concepts

∀x{SOCRATIZES(x) ≡_{DF} (x = Socrates)}

λe.KICK(e) =_{DF}

ιΦ:∀x∀y∀e{KICK(e, x, y) ≡ AGENT(e, x) & Φ(e) & PATIENT(e, y)}

My suggestion is not that our concepts Socrates and KICK(e, x, y) have decompositions. But a child who starts with these concepts might introduce KICK(e) and SOCRATIZES(x).
Two Kinds of Introduction

Introduce monadic concepts in terms of nonmonadic concepts

\[ \forall x \{ \text{SOCRATIZES}(x) \equiv_{DF} (x = \text{SOCRATES}) \} \]

\[ \lambda e. \text{KICK}(e) =_{DF} \]

\[ \nu \Phi: \forall x \forall y \forall e \{ \text{KICK}(e, x, y) \equiv \text{AGENT}(e, x) \& \Phi(e) \& \text{PATIENT}(e, y) \} \]

The monadic concepts—unlike \text{NUMBER-OF}(x, \Phi)—won’t help much if your goal is to show how logic is related to arithmetic. But they might help if you want to specify word meanings in a way that allows for “logical forms” that involve using conjunction to \text{build complex monadic predicates} as in...

\[ \exists e \{ \exists x [ \text{AGENT}(e, x) \& \text{SOCRATIZES}(x)] \& \text{KICK}(e) \& \text{PAST}(e) \} \]
Two Conceptions of Lexicalization

(1) Labelling

• Acquiring words is basically a process of pairing *pre-existing* concepts with perceptible signals
• Lexicalization is a conceptually *passive* operation
• Word combination mirrors concept combination

(2) Reformatting

• Acquiring words is also a process of introducing concepts that exhibit a certain composition format
• In this sense, lexicalization is cognitively *creative*
• Word combination does not mirror combination of the *pre-existing* concepts that get lexicalized
Bloom: *How Children Learn the Meanings of Words*

- word meanings are, at least primarily, concepts that kids have *prior* to lexicalization

- learning word meanings is, at least primarily, a process of figuring out *which* existing concepts are paired with *which* word-sized signals

- in this process, kids draw on many capacities—e.g., recognition of *syntactic cues* and *speaker intentions*—but no capacities *specific* to acquiring word meanings
“Clearly, the number of noun phrases required for the grammaticality of a verb in a sentence is a function of the number of participants logically implied by the verb meaning. It takes only one to sneeze, and therefore *sneeze* is intransitive, but it takes two for a kicking act (kicker and kickee), and hence *kick* is transitive.

Of course there are quirks and provisos to these systematic form-to-meaning-correspondences...”

Brutus kicked Caesar the ball

That kick was a good one

Brutus kicked

Caesar was kicked
“Clearly, the number of noun phrases required for the grammaticality of a verb in a sentence is a function of the number of participants logically implied by the verb meaning. It takes only one to sneeze, and therefore sneeze is intransitive, but it takes two for a kicking act (kicker and kickee), and hence kick is transitive.

Of course there are quirks and provisos to these systematic form-to-meaning-correspondences...”
Clearly, the number of noun phrases required for the grammaticality of a verb in a sentence is not a function of the number of participants logically implied by the verb meaning. A paradigmatic act of kicking has exactly two participants (kicker and kickee), and yet kick need not be transitive.

Brutus kicked Caesar the ball
Caesar was kicked
Brutus kicked
Brutus gave Caesar a swift kick

*Brutus put the ball
*Brutus put
*Brutus sneezed Caesar

Of course there are quirks and provisos. Some verbs do require a certain number of noun phrases in active voice sentences.
Concept of adicity

Quirky information for lexical items like ‘kick’

Perceptible Signal

Concept of adicity $n$

Perceptible Signal

Quirky information for lexical items like ‘put’

Concept of adicity $-1$
Clearly, the number of noun phrases required for the grammaticality of a verb in a sentence is a function of the number of participants logically implied by the verb meaning.

It takes only one to sneeze, and therefore *sneeze* is intransitive, but it usually *sneeze* is intransitive. But it takes two for a kicking act (kicker and kickee), and hence *kick* is transitive.

Of course there are quirks and provisos to these systematic form-to-meaning-correspondences.

Of course there are quirks and provisos. Some verbs do require a certain number of noun phrases in active voice sentences.
Clearly, the number of noun phrases required for the grammaticality of a verb in a sentence is a function of the number of participants logically implied by the verb meaning.

It takes only one to sneeze, and therefore sneeze is intransitive, but it takes two for a kicking act (kicker and kickee), and hence kick is transitive.

Of course there are quirks and provisos to these systematic form-to-meaning-corporrespondences.

Of course there are quirks and provisos. Some verbs do require a certain number of noun phrases in active voice sentences.
Lexicalization as Concept-Introduction (not mere labeling)
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Lexicalization as Concept-Introduction (not mere labeling)
One Possible (Davidsonian) Application: Increase Adicity

ARRIVE(x) → ARRIVE(e, x)

Concept of adicity -1

Concept of adicity -1

Concept of adicity -2

Perceptible Signal

One Possible (Davidsonian) Application: Increase Adicity

ARRIVE(x) → ARRIVE(e, x)

Concept of adicity -1

Concept of adicity -1

Concept of adicity -2

Perceptible Signal
One Possible (Davidsonian) Application: Increase Adicity

Concept of adicity -2

KICK\( (x_1, x_2) \) → KICK\( (e, x_1, x_2) \)

Concept of adicity -2

Concept of adicity -3

Perceptible Signal
Lexicalization as Concept-Introduction: Make Monads

Concept of adicity $n$

$\text{KICK}(x_1, x_2) \rightarrow \text{KICK}(e)$

$\text{KICK}(e, x_1, x_2)$

Perceptible Signal

Concept of adicity $n$

Concept of adicity $-1$
Two Pictures of Lexicalization

Concept of adicity $n$

Concept of adicity $n$ (or $n-1$)

Further lexical information (regarding flexibilities)

Perceptible Signal

Concept of adicity $n$

Concept of adicity $n$

further lexical information (regarding inflexibilities)

Perceptible Signal

Concept of adicity $-1$
Two Pictures of Lexicalization

offer some reminders of some reasons (in addition to passives/nominalizations) for adopting the second picture

Concept of adicity $n$

Concept of adicity $n$

Concept of adicity $-1$

Perceptible Signal

further POSSE information, as for ‘put’

Word: SCAN -1
Absent Word Meanings

Striking absence of certain (open-class) lexical meanings that would be permitted if Human I-Languages permitted non-monadic semantic types

\(<e, e, e, e, t>\)\(>\)\(>\)\(>\)\(>\) (instructions to fetch) tetradic concepts

\(<e, e, e, t>\)\(>\)\(>\)\(>\)\(>\) (instructions to fetch) triadic concepts

\(<e, e, t>\)\(>\)\(>\)\(>\)\(>\) (instructions to fetch) dyadic concepts

\(<e>\) (instructions to fetch) singular concepts
Absent Word Meanings

Striking absence of certain (open-class) lexical meanings that would be permitted

if I-Languages permit nonmonadic semantic types

<e, <e, <e, <e, t>>><><><> (instructions to fetch) tetradic concepts
<e, <e, <e, t>>><><><> (instructions to fetch) triadic concepts
<e, <e, t>>><><> (instructions to fetch) dyadic concepts

<e> (instructions to fetch) singular concepts
Absent Word Meanings

Brutus sold a car Caesar a dollar

\[\text{sald} \Rightarrow \text{SOLD}(x, \$, z, y)\]

\[[\text{sald} [\text{a car}]] \Rightarrow \text{SOLD}(x, \$, z, \text{a car})\]

\[[[\text{sald} [\text{a car}]] \text{ Caesar}] \Rightarrow \text{SOLD}(x, \$, \text{Caesar}, \text{a car})\]

\[[[[\text{sald} [\text{a car}]] \text{ Caesar}]] \text{ a dollar}] \Rightarrow \text{SOLD}(x, \text{ a dollar}, \text{Caesar}, \text{ a car})\]

Caesar bought a car

bought a car from Brutus for a dollar

bought Antony a car from Brutus for a dollar
Absent Word Meanings

Brutus tweens Caesar Antony

tweens \rightarrow BETWEEN(x, z, y)

[tweens Caesar] \rightarrow BETWEEN(x, z, Caesar)

[[tweens Caesar] Antony] \rightarrow BETWEEN(x, Antony, Caesar)

Brutus sold Caesar a car

Brutus gave Caesar a car \rightarrow *Brutus donated a charity a car
Brutus gave a car away \rightarrow Brutus donated a car
Brutus gave at the office \rightarrow Brutus donated anonymously
Absent Word Meanings

Alexander jimmed the lock a knife

jimmed ➔ JIMMIED(x, z, y)
[jimmed [the lock]] ➔ JIMMIED(x, z, the lock)
[[jimmed [the lock] [a knife]]] ➔ JIMMIED(x, a knife, the lock)

Brutus froms Rome

froms ➔ COMES-FROM(x, y)
[froms Rome] ➔ COMES-FROM(x, Rome)
Absent Word Meanings

Brutus talls Caesar

talls ➔ IS-TALLER THAN(x, y)
[talls Caesar] ➔ IS-TALLER THAN(x, Caesar)

*Julius Caesar

Julius ➔ JULIUS
Caesar ➔ CAESAR
**Absent Word Meanings**

Striking *absence* of certain (open-class) lexical meanings that *would* be permitted

*if* I-Languages permit nonmonadic semantic types

\(<e, e, e, e, t>\) (instructions to fetch) **tetradic** concepts

\(<e, e, e, t>\) (instructions to fetch) **triadic** concepts

\(<e, e, t>\) (instructions to fetch) **dyadic** concepts

\(<e>\) (instructions to fetch) **singular** concepts
Proper Nouns

• even English tells against the idea that *lexical proper nouns* label singular concepts (of type <e>)

• Every Tyler I saw was a philosopher
  Every philosopher I saw was a Tyler
  There were three Tylers at the party
  That Tyler stayed late, and so did this one
  Philosophers have wheels, and Tylers have stripes
  The Tylers are coming to dinner
  I spotted Tyler Burge
  I spotted that nice Professor Burge who we met before

• proper nouns seem to fetch monadic concepts, even if they lexicalize singular concepts
Lexicalization as Concept-Introduction: Make Monads

Concept of adicity $n$

Perceptible Signal

CALLED[$x$, SOUND('Tyler')]
Lexicalization as Concept-Introduction: Make Monads

KICK(x₁, x₂) → KICK(e)

KICK(e, x₁, x₂)

Perceptible Signal

Concept of adicity n

Concept of adicity n

Concept of adicity -1
Lexicalization as Concept-Introduction: Make Monads

Concept of adicity \( n \)

TYLER \( \rightarrow \) TYLER\( (x) \)

CALLED\([x, \text{SOUND}('Tyler')]\)

Perceptible Signal

Concept of adicity \( n \)

Concept of adicity \( n \)

Concept of adicity \(-1\)
Lexical Idiosyncracy can be Lexically Encoded

A verb can access a monadic concept and impose further (idiosyncratic) restrictions on complex expressions

- **Semantic Composition Adicity Number (SCAN)**
  - (instructions to fetch) singular concepts \( +1 \) singular \(<e>\)
  - (instructions to fetch) monadic concepts \( -1 \) monadic \(<e,t>\)
  - (instructions to fetch) dyadic concepts \( -2 \) dyadic \(<e,e,t>\)

- **Property of Smallest Sentential Entourage (POSSE)**
  - zero NPs, one NP, two NPs, ...

the SCAN of every verb can be \(-1\), while POSSEs vary: zero, one, two, ...
POSSE facts may reflect

...the adicities of the original *concepts lexicalized*

...*statistics* about how verbs are *used* (e.g., in active voice)

...*prototypicality* effects

...other *agrammatical* factors

• ‘put’ may have a (lexically represented) POSSE of *three in part because*
  
  --the concept lexicalized was *PUT(_, _, _)*
  
  --the frequency of locatives (as in ‘put the cup on the table’) is salient

• and note: * I put the cup the table
  
  ? I placed the cup
On any view: Two Kinds of Facts to Accommodate

• *Flexibilities*
  – Brutus kicked Caesar
  – Caesar was kicked
  – The baby kicked
  – I get a kick out of you
  – Brutus kicked Caesar the ball

• *Inflexibilities*
  – Brutus put the ball on the table
  – *Brutus put the ball
  – *Brutus put on the table
On any view: Two Kinds of Facts to Accommodate

- **Flexibilities**
  - The coin melted
  - The jeweler melted the coin
  - The fire melted the coin
  - The coin vanished
  - The magician vanished the coin

- **Inflexibilities**
  - Brutus arrived
  - *Brutus arrived Caesar
Experience and Growth

Language Acquisition Device in its Initial State

Lexicalizable concepts

Language Acquisition Device in a Mature State (an I-Language):

GRAMMAR
LEXICON

Articulation and Perception of Signals

Phonological Instructions

Semantic Instructions

Introduced concepts

Lexicalized concepts
Two Kinds of Concept Introduction

THANKS!