Figure and Ground in Conditionals

Dean McHugh

Institute of Logic, Language and Computation
University of Amsterdam

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INSTITUTE FOR LOGIC, LANGUAGE AND COMPUTATION

UNIVERSITY OF AMSTERDAM

Plan

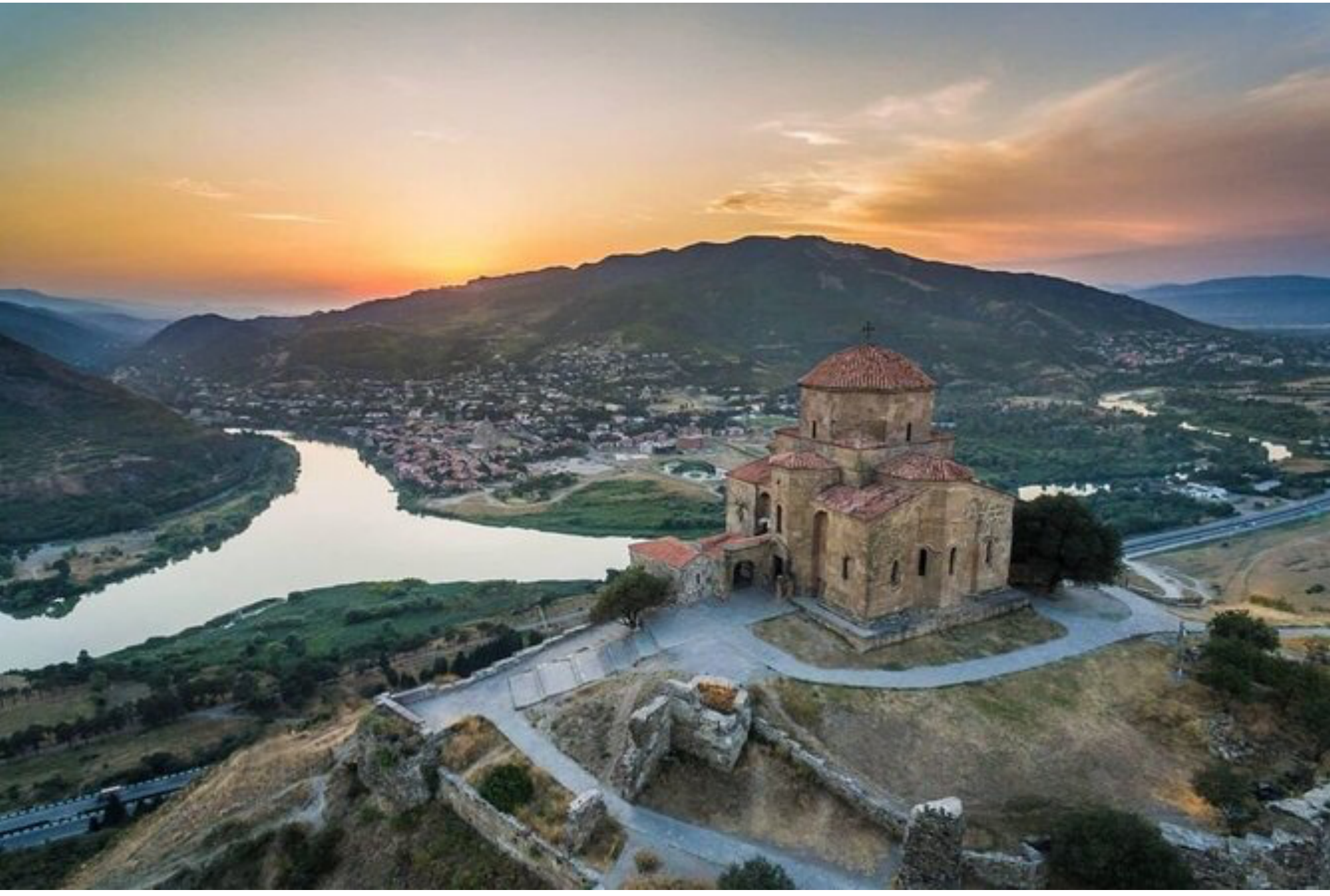
1. Figure and ground
2. The puzzle
   - Stalnaker
   - Lewis
   - Fine
3. Aboutness in Conditionals
   - Intuitive guide to aboutness in hypothetical reasoning
   - Formal details
4. The *de re* reply
   - Against the *de re* reply

Rubin's vase (1915)

Plan

M. C. Escher, *Two Birds* (1938)

M. C. Escher, *Sky and Water II* (1938)




MANGO
BRANDON
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MPH
CROSSTOWN EXIT
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BLOOMINGDALE AVE EXIT


Halloween Special
Hibachi Talk
Think
Tech
Hawaii


Gestalt psychology

Max Wertheimer: structured wholes or *Gestalten*, not pure sensory stimuli, are the primary units of mental life.

(Wertheimer 1923, Wagemans et al. 2012)

Perceiving an object as a *Gestalt* requires distinguishing it from its environment.

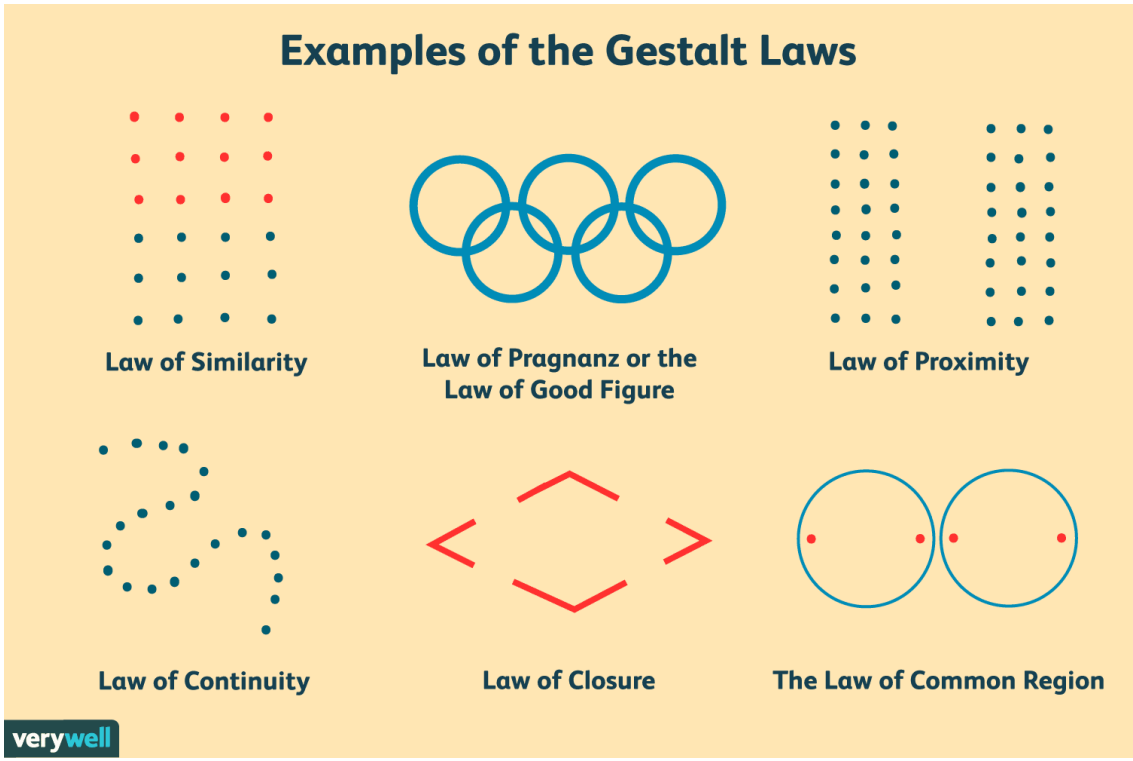


Figure: Source: VeryWellMind

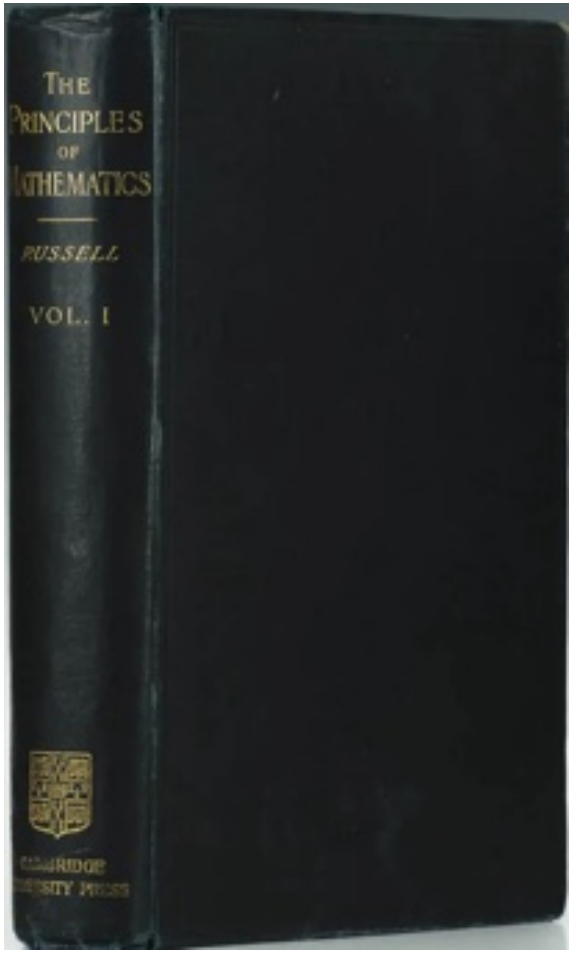
There is one thing on which all observers of the appearance of a running boy will agree [...]. They will all divide it into (1) a figure or outline having more or less of motion (the boy) and (2) some kind of background or field against which, or in which, the figure is seen.

(Whorf 1940, p. 163)

Russell on subject and assertion

In a relational proposition, say 'A is greater than B,' we may regard A as the subject and 'is greater than B' as the assertion, or B as the subject and 'A is greater than' as the assertion. There are thus, in the case proposed, two ways of analyzing the proposition into subject and assertion.

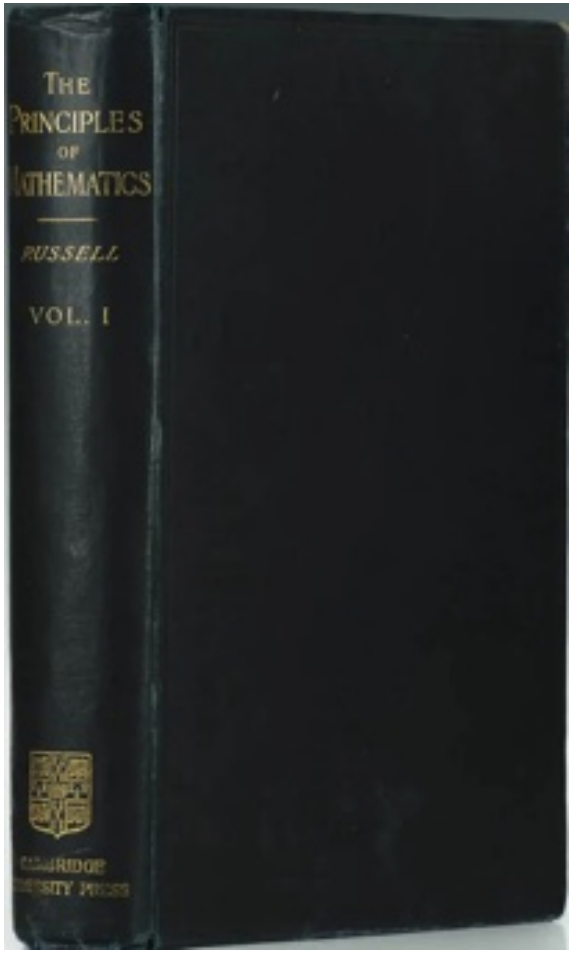
(Russell 1903, §48)



Russell on subject and assertion

The proposition "humanity belongs to Socrates," which is equivalent to "Socrates is human," is an assertion about humanity; but it is a distinct proposition. In "Socrates is human," the notion expressed by human occurs in a different way from that in which it occurs when it is called humanity, the difference being that in the latter case, but not in the former, the proposition is about this notion.

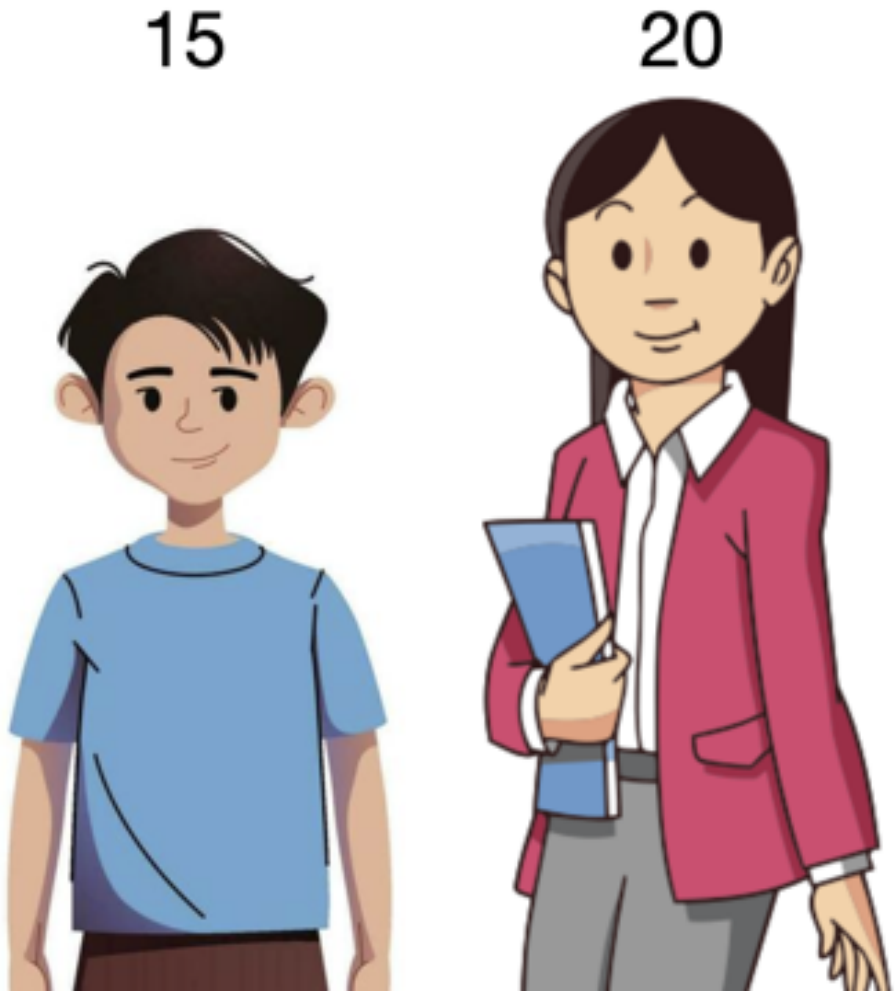
(Russell 1903, §48)



Alice is 20, Bob is 15. One must be over 18 to enter the bar.

(1) If Alice were younger than Bob, they could both enter the bar.

(2) If Bob were older than Alice, they could both enter the bar.



(3) If Alice were shorter than Bob,
they could ride the Ferris wheel together.

(4) If Bob were taller than Alice,
they could ride the Ferris wheel together

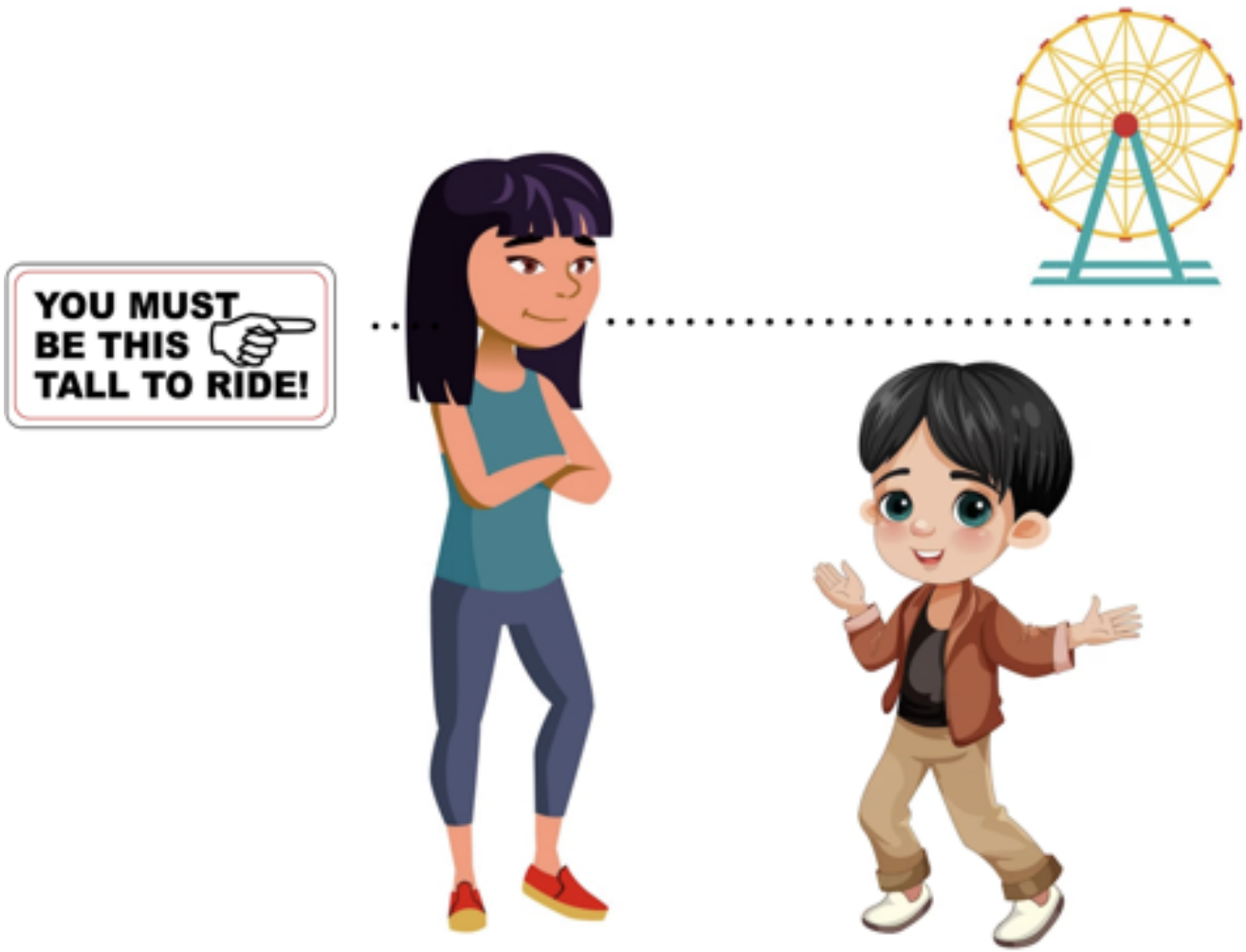


FIGURE AND GROUND IN COMPLEX SENTENCES

Leonard Talmy
Language Universals Project
Stanford University

FIGURE and GROUND

We begin by noticing a certain pair of cognitive-semantic categories. Their relevance shows up, in the first instance, in relation to a semantic event of motion or location, i.e., one considered to signify

> one physical object moving or located with respect to another.

whereas one might expect two sentences like

(a) *The bike is near the house*

(b) *The house is near the bike*

to be synonymous on the grounds that they simply represent the two inverse forms of a symmetric relation, they in fact do not mean the same thing. ...

(a) makes the non-symmetric specifications that, of the two objects, one (the house) has a set location within a framework ... and is to be used as a reference-point by which to characterize the other object's (the bike's) location, understood as a variable ... whose particular value is the salient issue; whereas (b) makes all the reverse specifications.

(Talmy 1975, pp. 419–420)

(5) If Alice were near Bob, they would both be dry.

(6) If Bob were near Alice, they would both be dry.

(7) If Alice and Bob were near each other, they would both be dry.

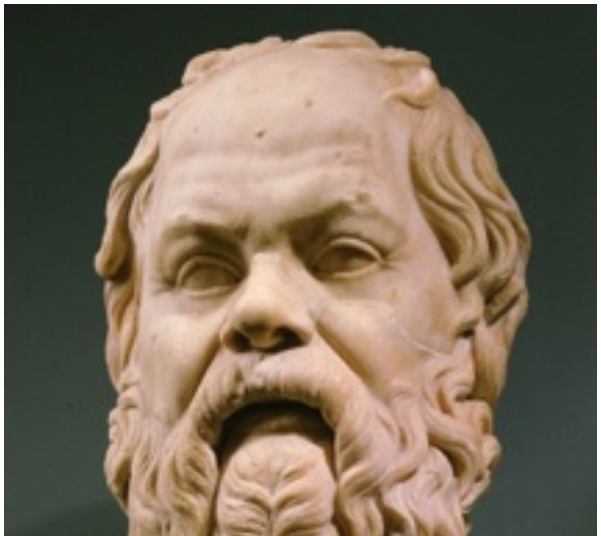
[T]he sentence 'she resembles him,' which might be thought to derive from something like 'she is near him in appearance, or her appearance is near his appearance,' is not understood in the same sense as 'he resembles her'.

(Talmy 1975, p. 421).

(8) If Socrates resembled Adonis, they would both be handsome.

(9) If Adonis resembled Socrates, they would both be handsome.

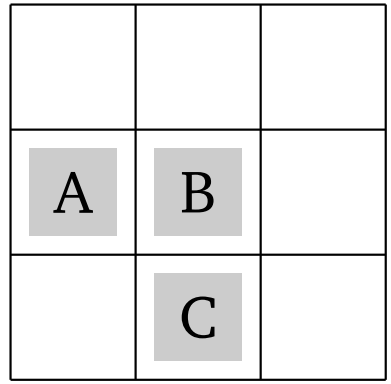
(10) If Adonis and Socrates resembled each other, they would both be handsome.



(11) If Bach were similar to Black Sabbath,
Bach would be played less at church.

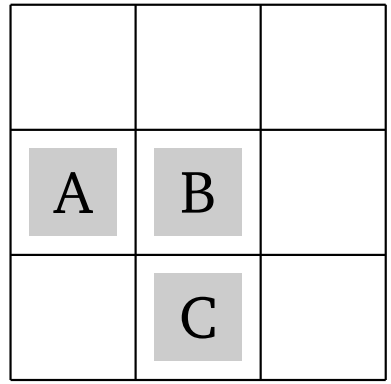
(12) If Black Sabbath were similar to Bach,
Bach would be played less at church.

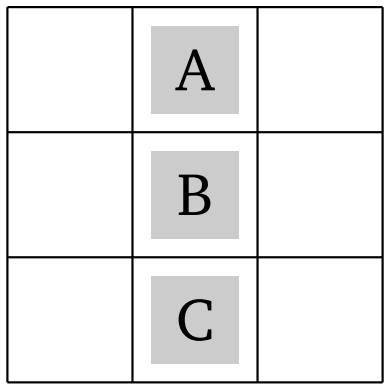
(13) If Bach and Black Sabbath were similar,
Bach would be played less at church.



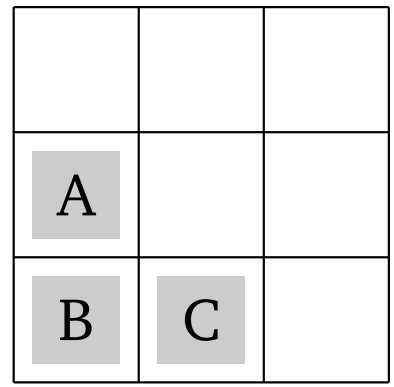
(14) If block A were on top of block B,
the blocks would form a straight line.

(15) If block B were beneath block A,
the blocks would form a straight line.





(a) If block A were on top of block B, ...



(b) If block B were beneath block A, ...

Plan

Substitution. If A and B are logically equivalent, then $A > C$ is true iff $B > C$ is true.

Any theory that only makes use of antecedents' truth conditions will validate Substitution.

Can't we just move to a more fine-grained notion of meaning, in which logically equivalent sentences can be distinguished, and keep our overall approach to the semantics of conditionals?

Problem

Substitution follows from Weaker than Entailment and Reciprocity.

Weaker than Entailment. If A entails C, then $A > C$ is true.

Reciprocity. If $A > B$ and $B > A$ are true, then $A > C$ is true iff $B > C$ is true.

Weaker than Entailment itself follows from Identity ($A > A$) and Right Weakening (if B entails C then $A > B$ entails $A > C$)

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Stalnaker validates Substitution

Stalnaker (1968): $A > C$ is true at w just in case C is true at $f(A, w)$.

Substitution follows from these constraints on the selection function f:

(i) A is true at $f(A, w)$.
(ii) If A is true in $f(B, w)$ and B is true in $f(A, w)$, then $f(A, w) = f(B, w)$.

> *the selection is based on an ordering of possible worlds with respect to their resemblance to the base world. If this is correct, then [(ii)] must be imposed on the s-function [the selection function]. ... These conditions on the selection function are necessary in order that this account be recognizable as an explication of the conditional.*
>
> (Stalnaker 1968, p. 36)

Lewis (1973) validates Weaker than Entailment and Reciprocity, and therefore also Substitution.

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Lewis validates Reciprocity

For each world w, let $\leq_w$ be a reflexive and transitive binary relation over the set of possible worlds.

(Lewis (1981, p. 220) himself begins with a irreflexive order $<_w$ and constructs a reflexive order $\leq_w$ by taking $w' \leq_w w''$ just in case $w' <_w w''$ or $w' = w''$.)

Lewis (1981, p. 230) takes $A > C$ to be true at w just in case for every A-world x, there is an A-world $y \leq_w x$ such that for every world $z \leq_w y$, if A is true at z, C is true at z. Weaker than Entailment is immediate. We prove that Reciprocity is valid as follows.

Lewis validates Reciprocity

Proof.

For any world w and sentence A, let $w \models A$ denote that A is true at w. Pick any world w and suppose $A > B$, $B > A$ and $B > C$ are true at w. To show that $A > C$ is true at w, pick any $x \models A$. We have to show that there is a $y \models A$ such that $y \leq_w x$ and for all $z \leq_w y$, $z \models A \rightarrow C$, where $\rightarrow$ is the material conditional.

- Since $w \models A > B$ and $x \models A$, there is a $v \models A$ such that $v \leq_w x$ and (i) for all $v' \leq_w v$, $v' \models A \rightarrow B$. Since $\leq_w$ is reflexive, $v \leq_w v$, so $v \models A \rightarrow B$. Thus $v \models B$.
- Since $w \models B > A$ and $v \models B$, there is a $u \models B$ such that $u \leq_w v$ and (ii) for all $u' \leq_w u$, $u' \models B \rightarrow A$.
- Since $w \models B > C$ and $u \models B$, there is a $y \models B$ such that $y \leq_w u$ and (iii) for all $z \leq_w y$, $z \models B \rightarrow C$. Since $y \leq_w u$, by (ii), $y \models B \rightarrow A$. Then as $y \models B$, $y \models A$. And as $y \leq_w u \leq_w v \leq_w x$, by transitivity of $\leq_w$, $y \leq_w x$.

We show that $z \models A \rightarrow C$ for all $z \leq_w y$. Pick any $z \leq_w y$. Then $z \leq_w y \leq_w u \leq_w v$, so by transitivity of $\leq_w$, $z \leq_w v$. Then by (i), $z \models A \rightarrow B$. And since $z \leq_w y$, by (iii), $z \models B \rightarrow C$. Hence $z \models A \rightarrow C$.

□

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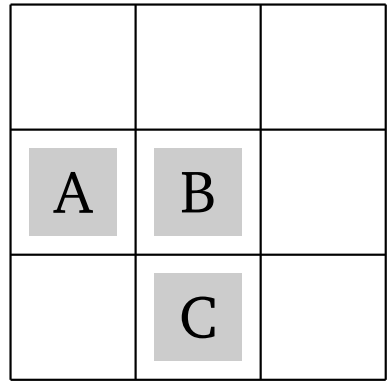
A part of the world, or state, exactly verifies a sentence just in case the state's obtaining is wholly relevant to the truth of the sentence

(Fine 2017)

Fine's (2012) truthmaker semantics of conditionals

$A > C$ is true at a world w just in case for every exact verifier t of A and possible outcome u of t at w, u contains an exact verifier of C.

A and B are *exactly equivalent* just in case they have the same exact verifiers and falsifiers (Fine 2014, p. 576).



(16) If block A were on top of block B,
the blocks would form a straight line.

(17) If block B were beneath block A,
the blocks would form a straight line.

Suppose that a given block a is on top of another block b. Then there is a certain state of affairs s_1, may describe as the state of a's being on top of b. There is also a certain state of affairs s_2 that may be described as the state of b's being beneath a. Yet surely the states s_1, and s_2 are the same. There is a single state of affairs s "out there" in reality, consisting of the blocks a and b having the relative positions that they do; and the different descriptions associated with s_1, and s_2 would merely appear to provide two different ways at getting at this single state of affairs.

(Fine 2000, p. 3)

the state of a's being adjacent to b is surely the same as the state of b's being adjacent to a.

(Fine 2000, p. 17)

(18) *Alice doesn't have much money. Her house is in an affordable area and her office is in an expensive area.*

a. If Alice's house were adjacent to her office, her rent would be unaffordable.

b. If Alice's office were adjacent to her house, her rent would be unaffordable.

c. If Alice's office and house were adjacent, her rent would be unaffordable.

Reciprocals

(19) Alice and Bob are similar.

(20) a. Alice is similar to Bob.
b. Bob is similar to Alice.

Relation-first approach: treat the binary form as primary and derive the reciprocal from it (Gleitman 1965, Dimitriadis 2008, Rubinstein 2009, Siloni 2012).

Reciprocal-first approach: treat the reciprocal as primary and derive the binary form from it (Lakoff and Peters 1969, Lasersohn 1995, Winter 2018).

An argument for the reciprocal-first approach

(21) a. John, Mary, and Bill are similar.
b. John is similar to Mary, Mary is similar to Bill, and Bill is similar to John.

"if John is similar to Mary in having red hair, but similar to Bill in being seven feet tall, and Mary is similar to Bill in liking peach ice cream" (Lasersohn 1995, p. 29).

Problem for the relation-first approach

It is unclear how to derive the shared-feature interpretation via compositions of binary relations between individuals.

Things work smoothly on the reciprocal-first approach

A is similar to B and B to A just in case the plurality $A + B$ are similar.

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1. Pick a time at which to imagine the change.
2. Allow the part of the world the antecedent is about at that time time to vary.
3. Play forward the laws.
4. Stick on the actual past.
5. Restrict to worlds where the antecedent holds.
6. Check if the consequent holds at all of/the selected resulting world(s).

The FIGURE object is a moving or conceptually movable point whose path or site is conceived as a variable the particular value of which is the salient issue. [...] The GROUND object is a reference-point, having a stationary setting within a reference-frame, with respect to which the FIGURE's path or site receives characterization.

(Talmy 1975, p. 419)

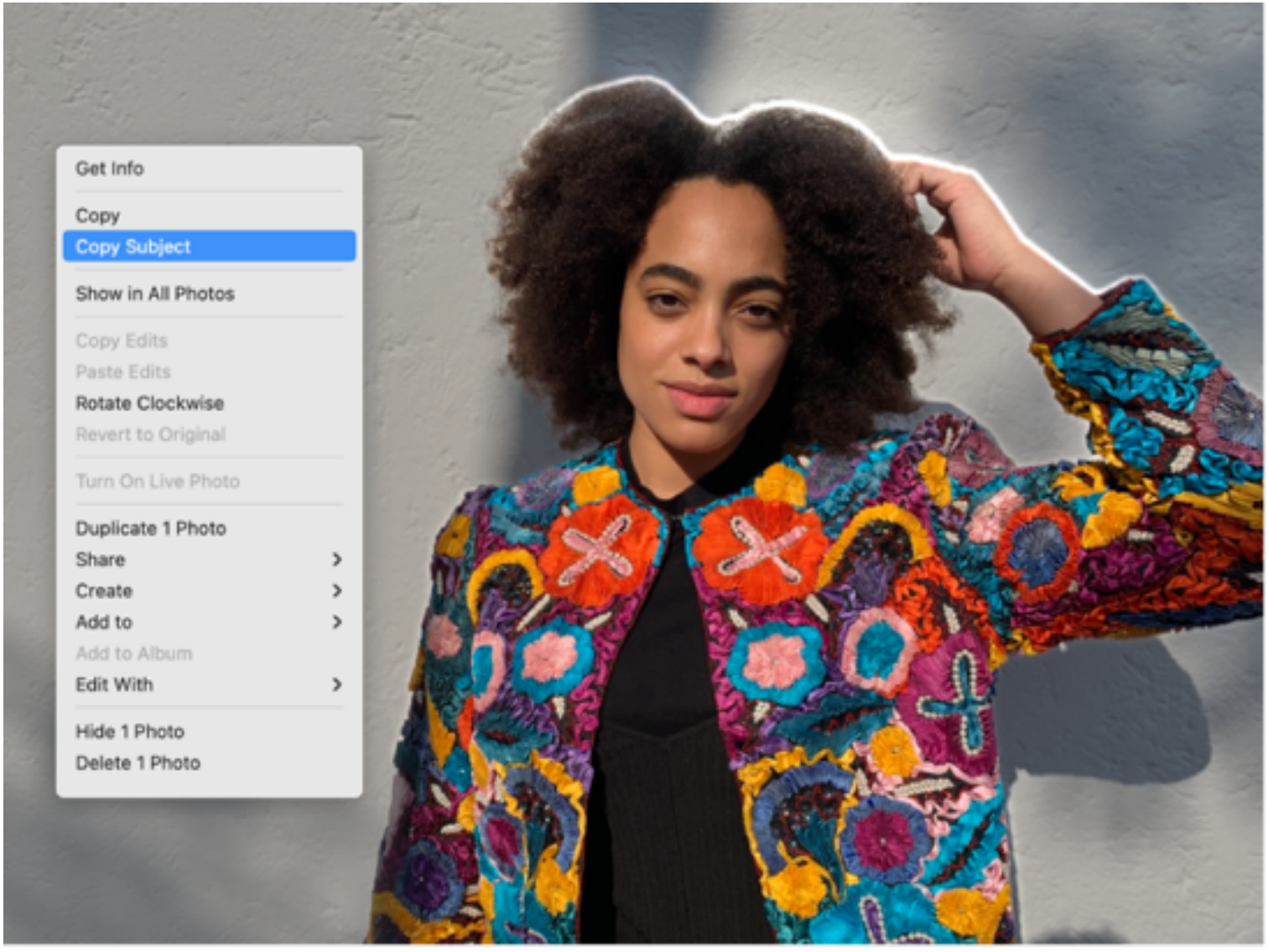

Figure: Now phones can automatically find the subject of a photo and make it moveable.

Sentences are about their subjects.

(see Reinhart 1981)

“Alice is younger than Bob”

Subject: Alice

Predicate: is younger than Bob

“Bob is older than Alice”

Subject: Bob

Predicate: is older than Alice

Sentences are about their subjects.

"Alice is near Bob"

Subject: Alice

Predicate: is near Bob

"Bob is near Alice"

Subject: Alice

Predicate: is near Bob

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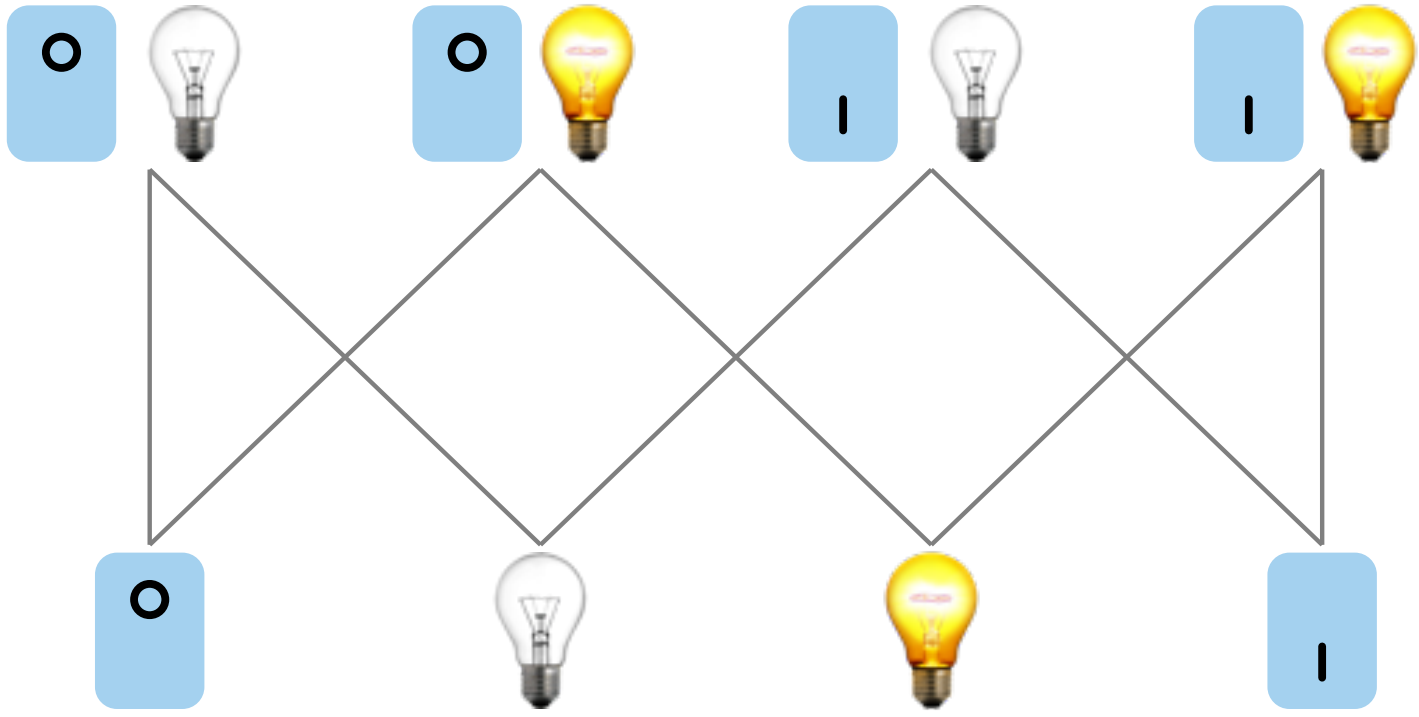


Figure: A state space of the switch and light.

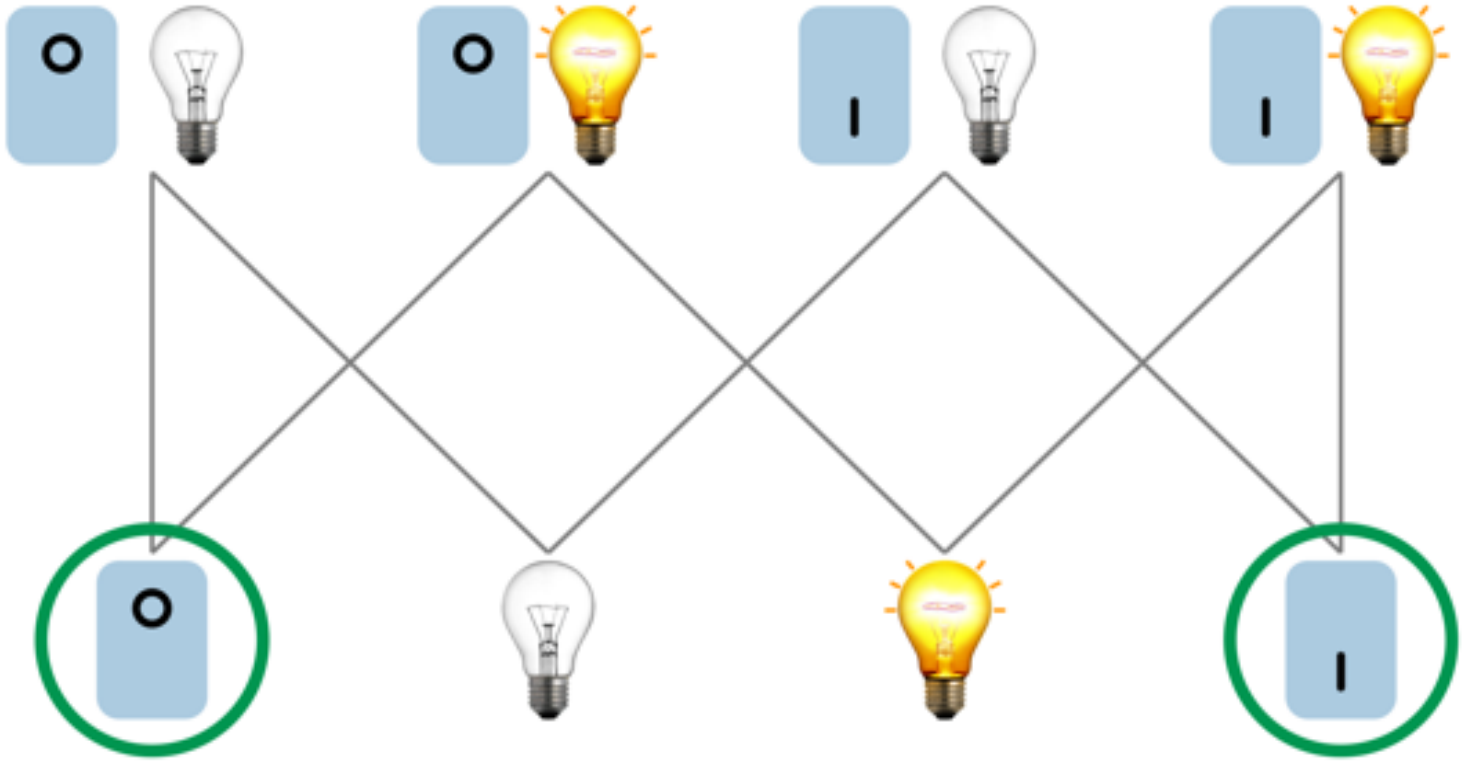
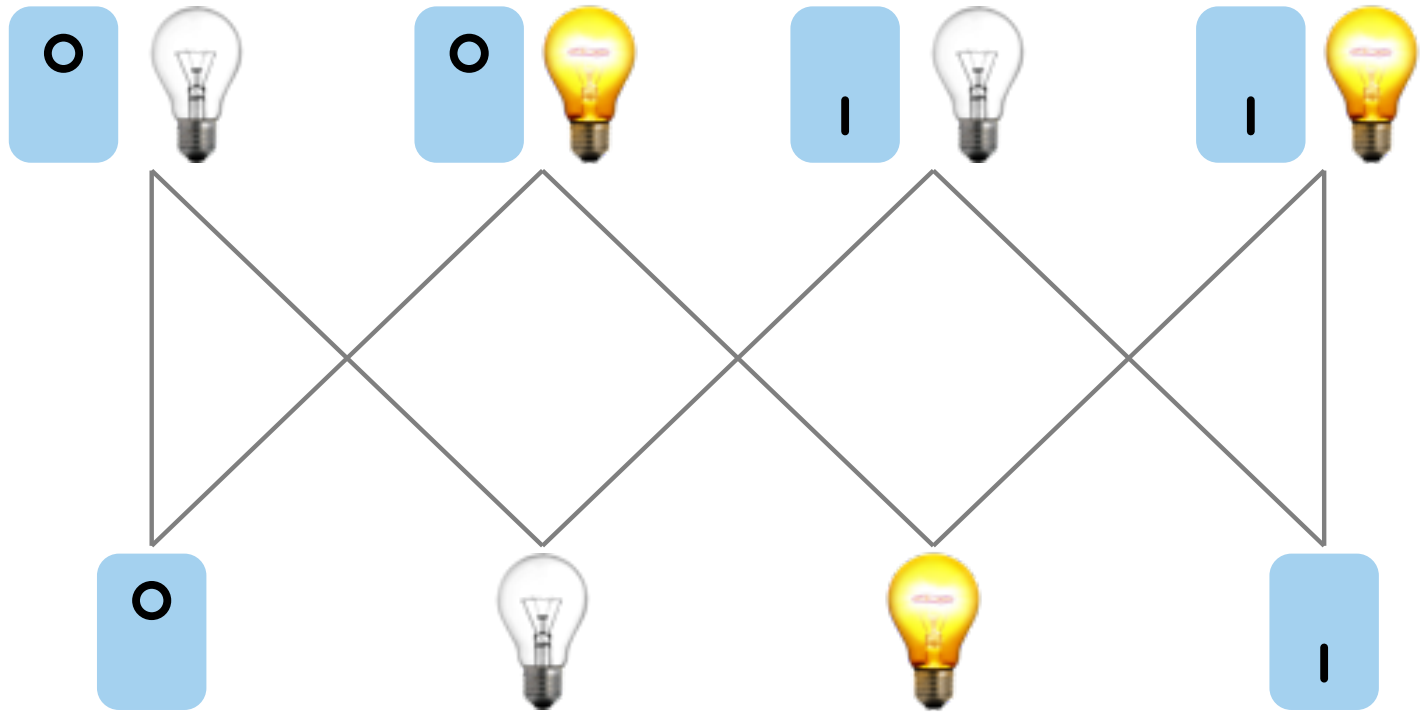


Figure: The states that “the switch is up” is about.



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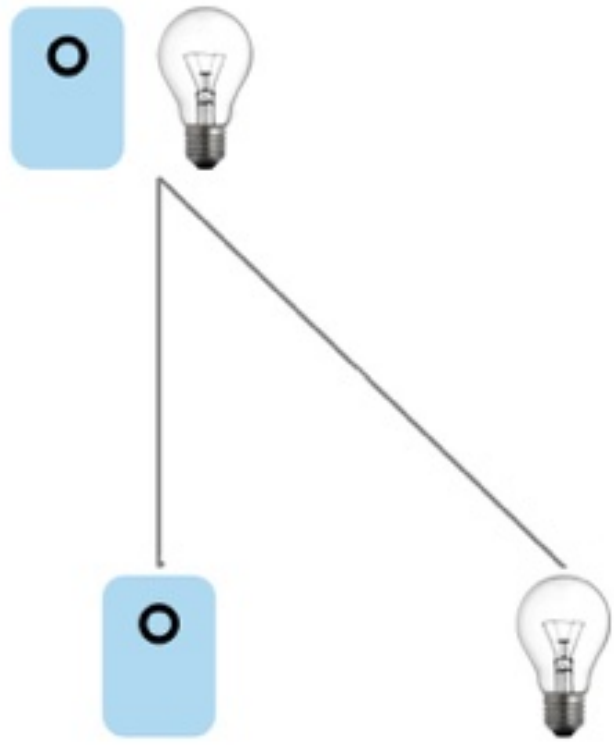

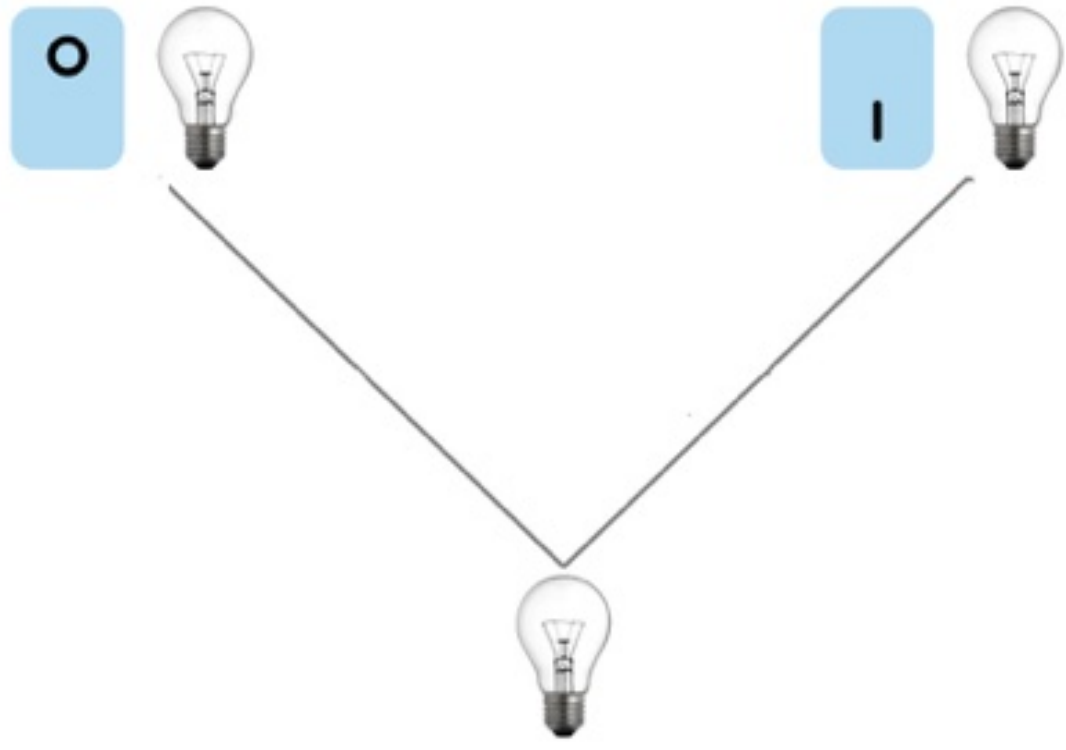
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Some sequences of states are lawful (or, nomically possible) and others are not.

Figure: A lawful sequence.

Figure: An unlawful sequence.

A semantics of conditionals (McHugh 2022, 2023)

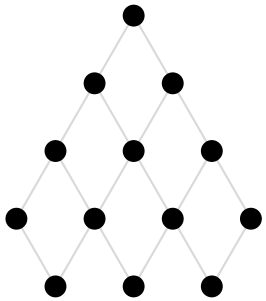
1. Pick a time at which to imagine the change.
   - This is the *intervention time* t.
2. Vary the part of the world the antecedent A is about at intervention time.
   - This gives us a set of time slices, called the *A-variants of w at t*.
3. Play the laws forward.
   - Find the lawful futures of the A-variants of w at t.
4. Stick on the actual past.
   - This gives us the *modal horizon of A at w*.
5. Restrict to those worlds where the antecedent is true.
6. Check whether the consequent is true at the resulting world(s).

Analysis of aboutness: a sentence is about the parts of the world that exactly determine its truth value (McHugh 2023, p. 108).

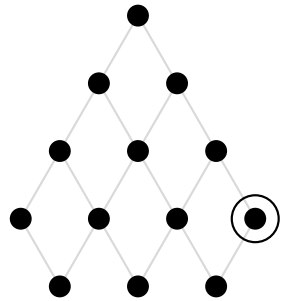
- **The foreground:** the set of states A is about.
- **The background:** the set of states that do not overlap a state in the foreground.

Ceteris paribus

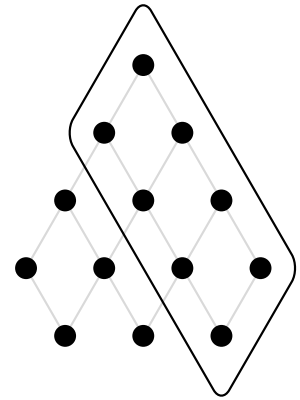
- The background is the *ceteris*, the 'all else' in 'all else being equal'
- *Paribus* means having the *ceteris* as part



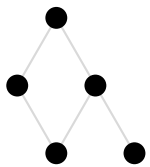
A world w
at a moment in time t



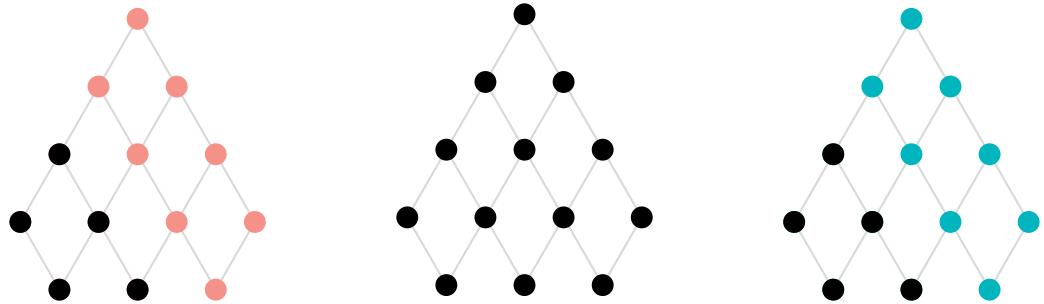
States A is about



Parts of w at t overlapping
a state A is about



Background of A



A-variants of w at t

Figure: Steps to construct the A-variants of a world at a moment in time.

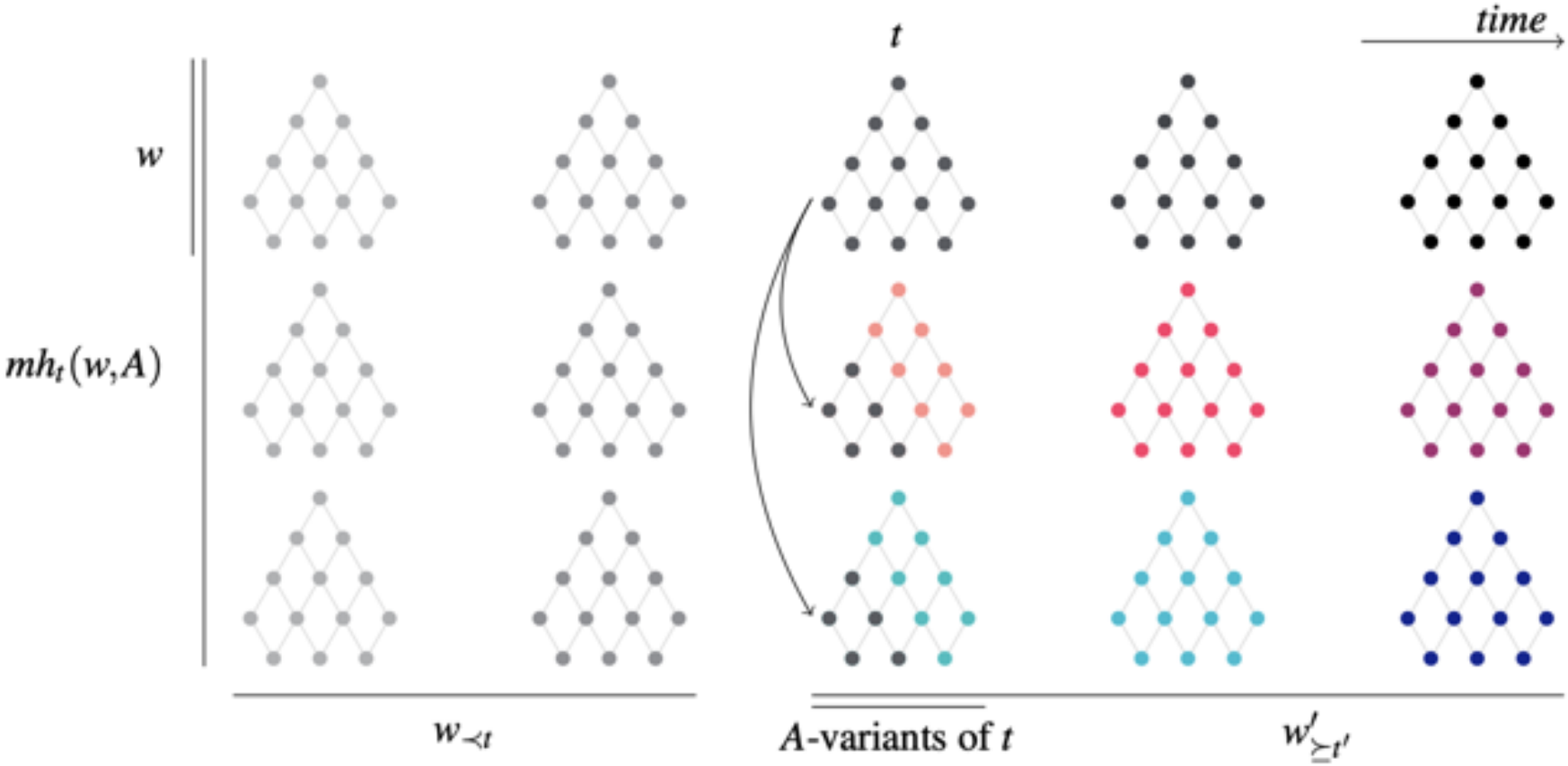


Figure: Constructing the modal horizon.

Plan

Definition (Nomic aboutness model)

Where S is a set and $\leq$ a binary relation on S, define

$$\begin{aligned} Sit &:= S \times I, \text{ where } I \text{ is an arbitrary label set,} \\ M &:= \{t_i \in Sit : t \leq u \textit{ implies } t = u \textit{ for all } u \in S\}, \\ W &:= \{(M', \preceq) : M' \subseteq M, \preceq \text{ is a linear order}\}. \end{aligned}$$

Definition (The modal horizon)

For any sentence A, moment $t \in M$ and world $w \in W$, define

$$mh_{P,t}(w, A) := \{w_{\prec t} \frown w'_{\succeq t'} : t' \textit{ is an } A\textit{-variant of } t, t' \in w' \text{ and } w' \in P\}.$$

(22) Where P is the set of nomically possible worlds, t the intervention time, and s the selection function,

$$\begin{aligned} A \gg C \text{ is true at } w \quad &\text{iff} \quad mh_{P,t}(w, A) \cap |A| \subseteq |C| \\ A > C \text{ is true at } w \quad &\text{iff} \quad s\big(w, mh_{P,t}(w, A) \cap |A|\big) \in |C| \end{aligned}$$

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De re comparators?

A is near B

De dicto: λw. Location of A at w is near the location of B at w

De re: $\lambda w'$. Location of A at w is near the location of B at w_0

where w_0 is the world of evaluation.

(23) a. Alice is near Bob
b. Bob is near Alice

Logically equivalent on the *de dicto* reading, but not on the *de re*:

(24) a. If Alice were near where Bob actually is,
they would both be dry.
b. If Bob were near where Alice actually is,
they would both be dry.

[E]ach of the following two counterfactuals would normally be accepted:

"If New York City were in Georgia, then New York City would be in the South."

"If Georgia included New York City, then Georgia would not be entirely in the South."

Yet the antecedents are logically indistinguishable.

(Goodman 1947, pp. 120–121)

What happens is that the direction of expression becomes important, because in the former case the meaning is

"If New York City were in Georgia, and the boundaries of Georgia remained unchanged, then . . . "

while in the latter case the meaning is

"If Georgia included New York City, and the boundaries of New York City remained unchanged, then . . . "

Without some such cue to the meaning as is covertly given by the word-order, we should be quite uncertain which of the two consequents in question could be truly attached.

(Goodman 1947, pp. 120–121)

Lewis on *de re* anchors

We can explain the simultaneous truth of Goodman's sentences

(1) *If New York City were in Georgia, New York City would be in the South.*

and

(2) *If Georgia included New York City, Georgia would not be entirely in the South.*

by the hypothesis that both are de re *both with respect to 'New York City' and with respect to 'Georgia', and that a less stringent counterpart relation is summoned up by the subject terms 'New York City' in (1) and 'Georgia' in (2) than by the object terms 'Georgia' in (1) and 'New York City' in (2).*

(Lewis 1973, p. 43)

In ‘On Denoting’ Russell recalls:

> *I have heard of a touchy owner of a yacht to whom a guest, on first seeing it, remarked, “I thought your yacht was larger than it is”; and the owner replied, “No, my yacht is not larger than it is”. What the guest meant was, “The size that I thought your yacht was is greater than the size your yacht is”; the meaning attributed to him is, “I thought the size of your yacht was greater than the size of your yacht”.*
>
> (Russell 1905, p. 489)

(25) If your yacht were larger than it is, you would boast about it more.

This behaviour is not limited to comparatives.

It also appears, for example, in quantifier restrictors (Percus 2000).

(26) Alice thinks that everyone inside the room is outside the room.

(27) If everyone inside the room were outside the room, it would be empty.

The *de re* reading appears to be available

Context: we know where the dog and rabbit are, but Suzy does not. She sees where the gold is.

(28) Suzy believes that the gold is near the dog.

Suppose Alice believes that Bob resembles the actor Remi Malek.

Alice isn't aware that Remi has an identical twin brother Sami Malek—she has no idea that Sami exists.

(29) Alice believes that Bob resembles Sami Malek.

Plan

1. Figure and ground
2. The puzzle
   - Stalnaker
   - Lewis
   - Fine
3. Aboutness in Conditionals
   - Intuitive guide to aboutness in hypothetical reasoning
   - Formal details
4. The *de re* reply
   - Against the *de re* reply

Principle of Charity

When multiple readings of a sentence are available, some of which are true, we opt for one of the true readings.

Context 1. You see someone you know searching through a crowd. When you ask what they are doing here they reply, “I’m looking for a friend.”

Context 2. you meet someone at a bar who tells you they are new to the neighbourhood. When you ask what they are doing here they reply, “I’m looking for a friend.”

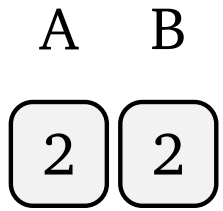
We easily manage to pick the reading that makes the sentence true.

Suzy is playing a game in which she is given two cards, A and B, at random.

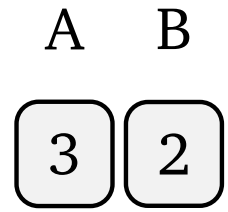
Each card shows either 1, 2, or 3. The cards are independent (for example, we may imagine that they are drawn from separate decks).

Suzy wins just in case card A is 3 and card B is 2.

On this particular occasion, card A is 2 and card B is 2, so Suzy lost.



Suzy's hand



The winning hand

(30) If card B were lower than card A, there is a 50% chance that Suzy would have won.

(31) If card A were higher than card B, there's a 50% chance that Suzy would have won.

Changing one card requires less of a departure from reality than changing two.

(32) If card A were 3, Suzy would have won.

The closest world to the actual world is the actual world itself—$(2, 2)$.

The next closest worlds, all equally close to the actual world, are those where one card changes and the other is still 2—$(1, 2)$, $(3, 2)$, $(2, 1)$, $(2, 3)$.

The next closest worlds, again all equally close to the actual world, are those where both cards change—$(1, 1)$, $(1, 3)$, $(3, 1)$, $(3, 3)$.

$$(2,2) \;<_w\; (1,2), (\mathbf{3},\mathbf{2}), (\mathbf{2},\mathbf{1}), (2,3) \;<_w\; (1,1), (1,3), (3,1), (3,3)$$

Lewis predicts (33) to be true on its *de dicto* reading.

(33) If card B were lower than card A, there is a 50% chance that Suzy would have won.

The availability of the *de dicto* reading

(34) If Adonis resembled Socrates and Socrates were handsome, they would both be handsome.

This is true *de dicto* but false *de re*.

It has a clear true reading.

Alice is under the shelter and Bob is in the rain.
Suzy believes that they are both under the shelter.

Reality *Suzy's beliefs*

(35) Suzy believes that Alice is near Bob.

(36) Suzy believes that Alice is near where Bob actually is.

There is a clear preference for the *de dicto* reading.

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