What are *uncertain numerals?*
Linguistic encoding of imprecision

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Abstract

Goals:
- Explain a peculiar approximative interpretation associated with numerals that have been marked as uncertain (e.g. *maybe twenty* in the sentence *John read maybe twenty books*).
- Assess predictions of this explanation.
- See what it tells us about other related expressions.

Results:
- These approximative peculiarities can be explained through *possible world semantics* using information associated with numerals.
- The analysis extends to other scalars, yielding correct interpretations.
- This helps us distinguish between similar, though fundamentally different, expressions that allow imprecision.
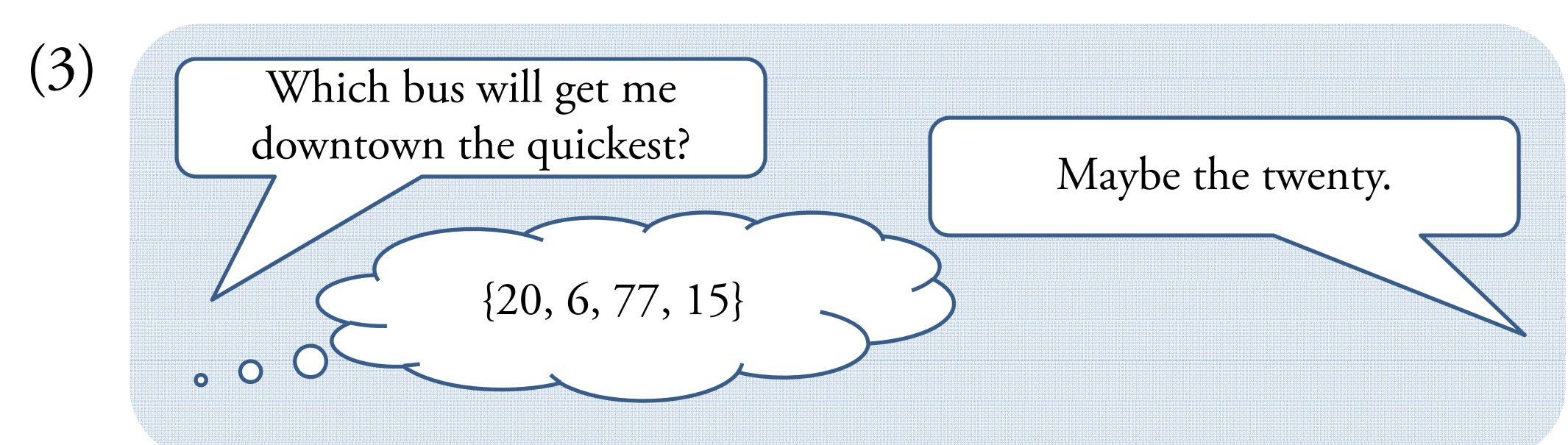
The phenomena

You can use words like *maybe* to mark your uncertainty with respect to an item, and as a result your conversational partner might entertain alternatives to this uncertain item.
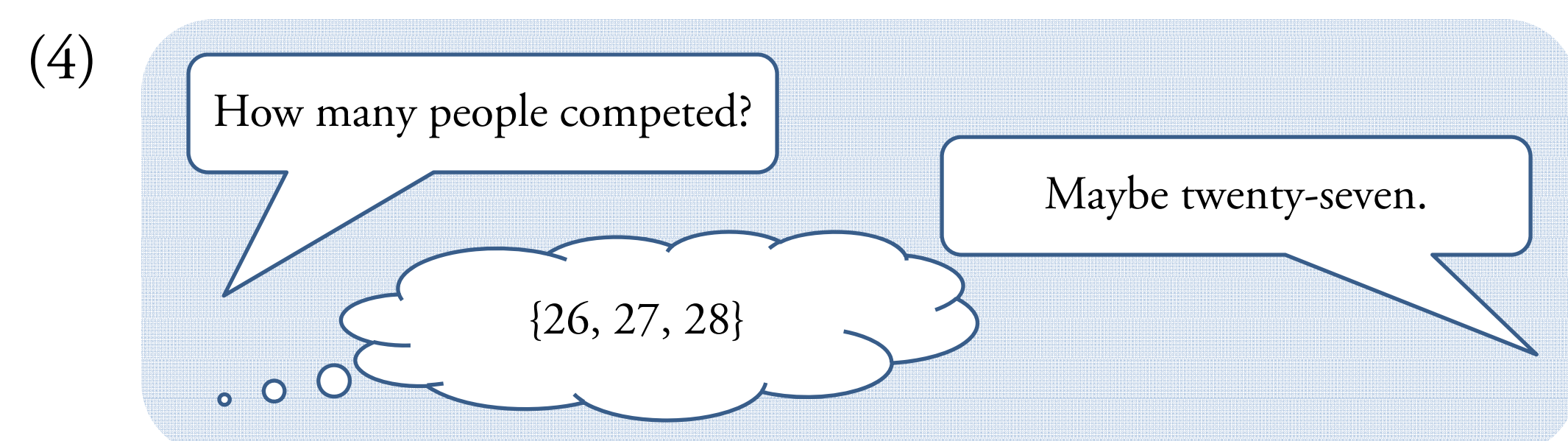
(1)
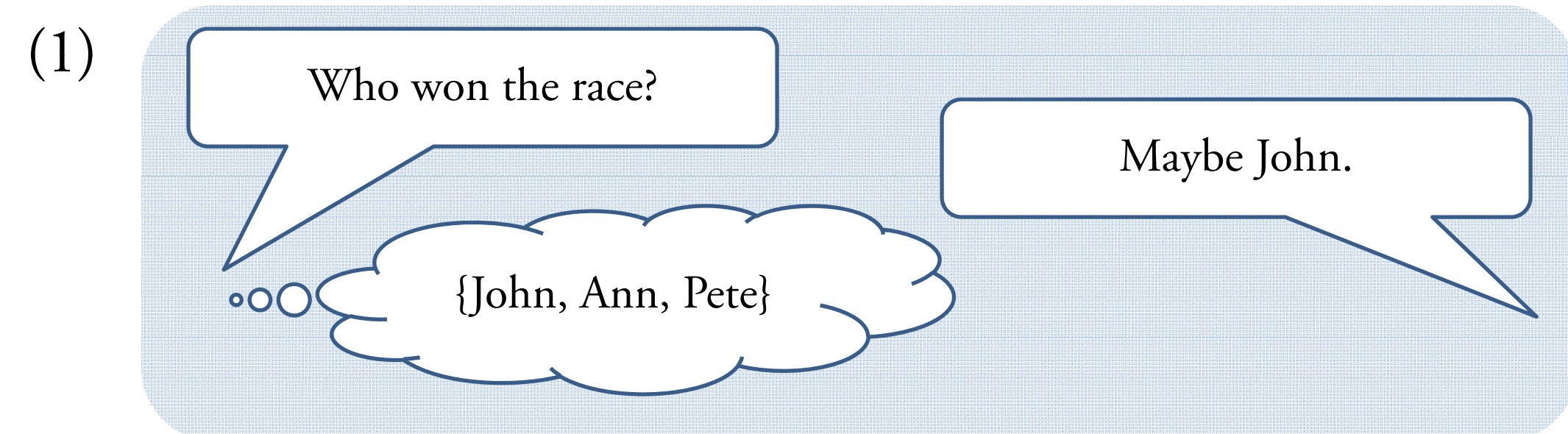
When the uncertain item is a numeral, there is a strong tendency for the set of alternatives to resemble approximation.

(2)
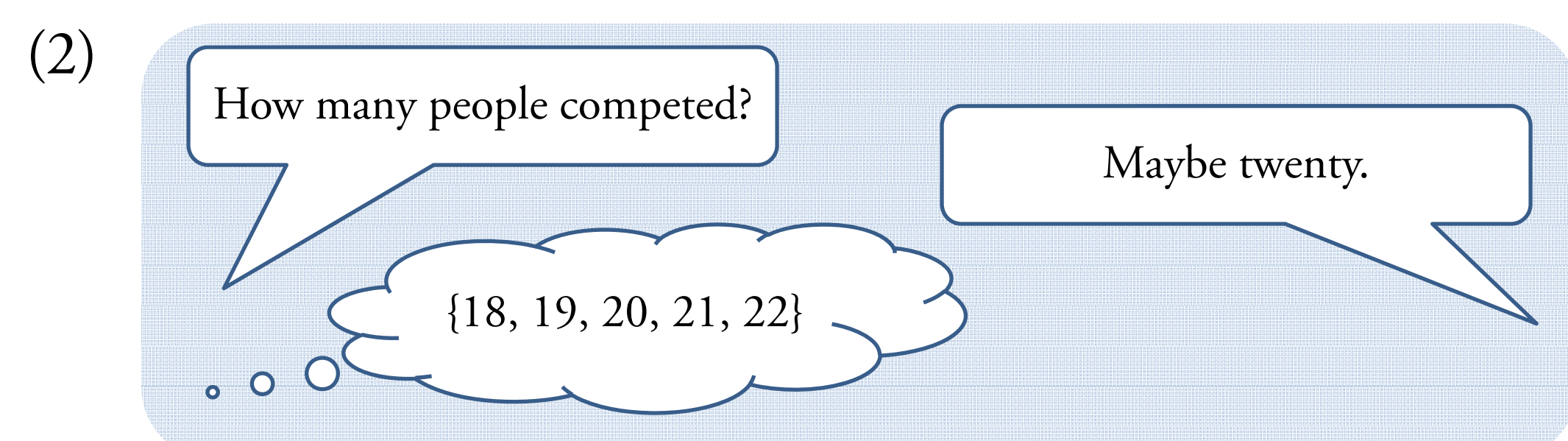
But this doesn't happen for all numerals.

(3)

Furthermore, when this approximation effect occurs, the range of alternatives depends on the numeral.
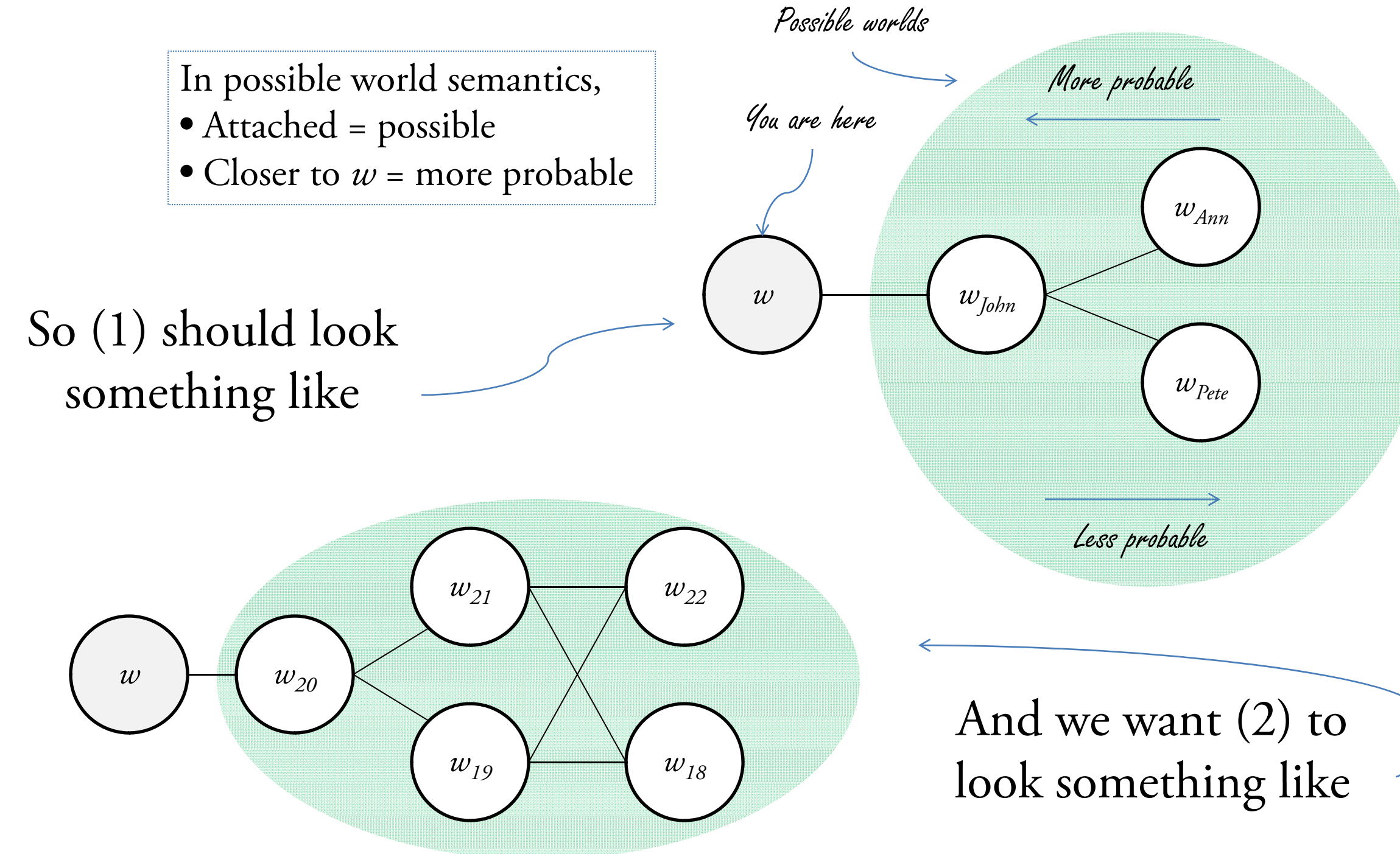
(4)

Puzzles:
I. Why do uncertain numerals give rise to approximate readings, as in (2)?
II. Why do some uncertain numerals fail to give rise to approximate readings, as in (3)?
III. Why do some uncertain numerals give rise to more approximate readings than others, as in (2) vs. (4)?

Analysis

To explain these puzzles, we can treat uncertainty markers like *maybe* as modals, i.e. as introducing and organizing *possible worlds* (Kratzer 1981/1991).

In possible world semantics,
- Attached = possible
- Closer to w = more probable

So (1) should look something like

And we want (2) to look something like

But where do we get the information telling us to organize worlds in this way for uncertain numerals?

An answer comes from the Round Number Round Interpretation (RNRI) principle (Krifka 2009).

> RNRI principle: Round number words in measuring contexts tend to have a round interpretation

e.g. If you bought a something for $54.^{00}$, in the right context you could get away with saying it cost $50 (a round number), but not $57 (a less round number).
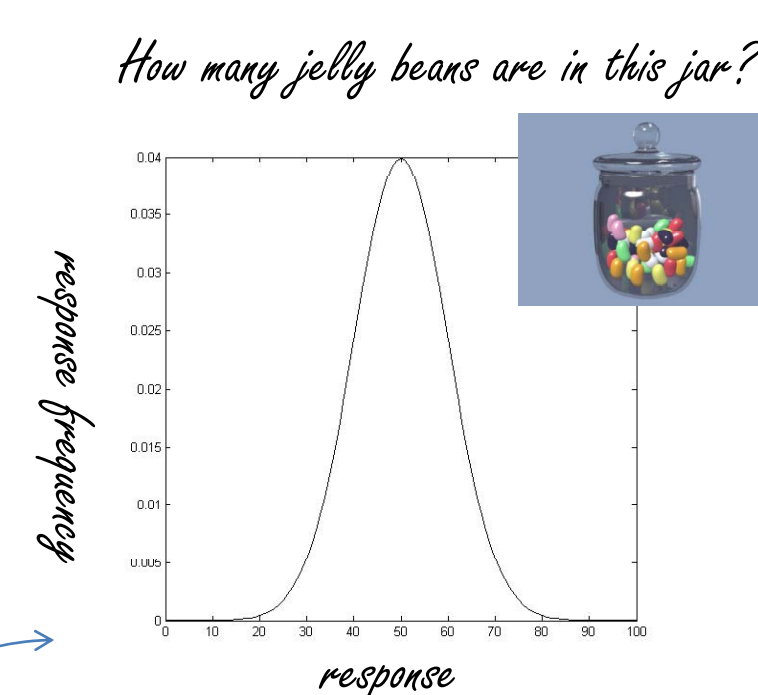
Where does this principle come from?
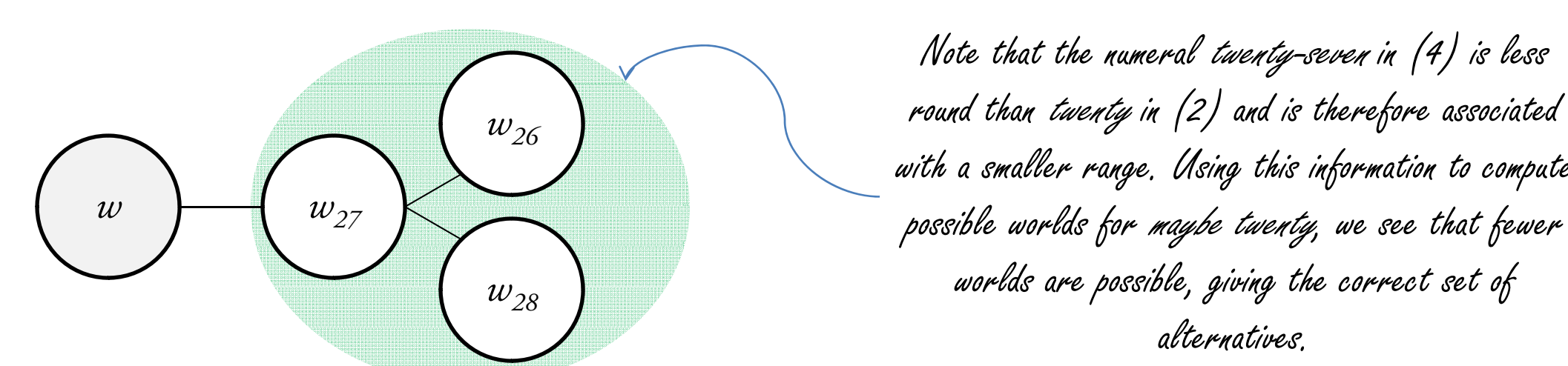
→ From the way we perceive and represent quantities.
e.g.

→ From the way we use numerals in speech.
e.g. (see Krifka 2009 for derivation)

When a person uses fifty in a round sense, this graph can represent the probability of each value on the x-axis being the actual value. When values are too far from 50, they can be considered too improbable, i.e. impossible.

So this is where we get this possibility/probability information to give us the required pictures above!

Note that the numeral twenty-seven in (4) is less round than twenty in (2) and is therefore associated with a smaller range. Using this information to compute possible worlds for maybe twenty, we see that fewer worlds are possible, giving the correct set of alternatives.

Using this, we can conclude -

Solutions:
I. Uncertain numerals give rise to approximative readings because they introduce possible worlds, and based on what we know about number roundness (RNRI principle), the possible worlds will be those where the numeral is close to the uncertain numeral.
II. Some uncertain numerals fail to give rise to approximative readings because the are not in measuring contexts and therefore do not contribute this information.
III. Some uncertain numerals give rise to more approximative readings that others because they are associated with wider ranges (RNRI principle), allowing more possible worlds.
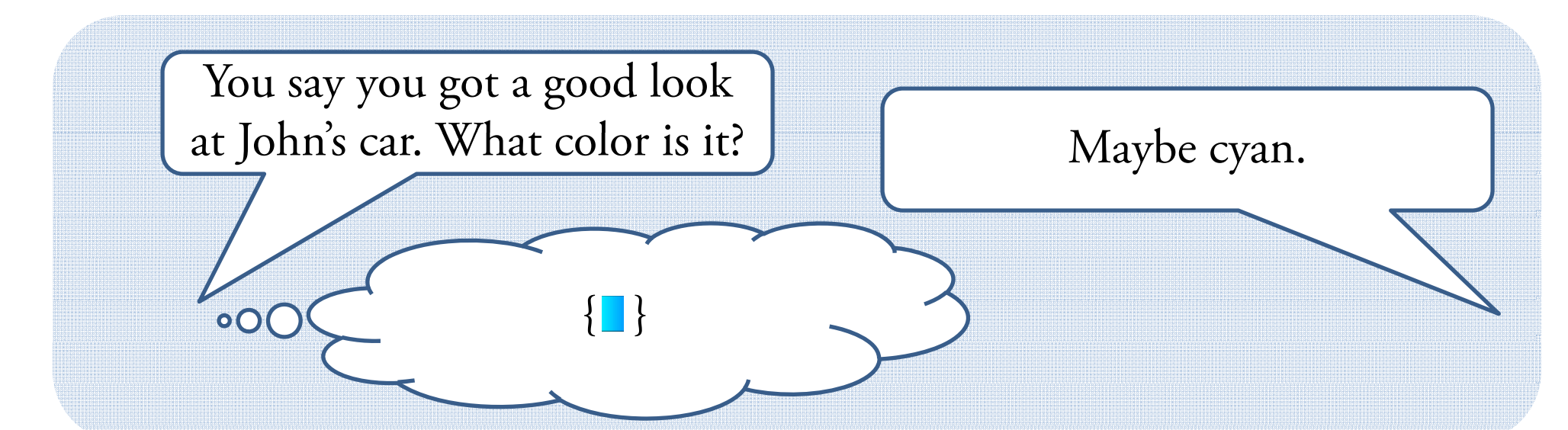
Predictions

Other words are similar to numerals in that they express ranges which may be best represented by a normal distribution, so you'd expect them to give rise to approximation when marked as uncertain too. And they do!

E.g. Colors
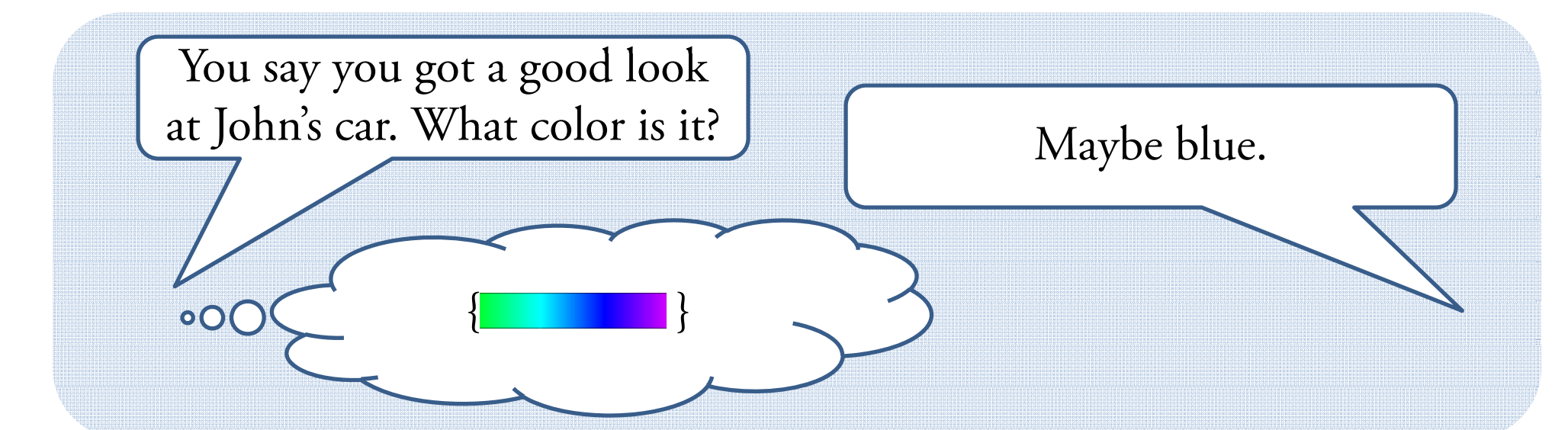
Colors even show a roundness effect.

In fact, you get approximation with any uncertain scalar. To see this, take any element *X*, consider its scalar interpretation (e.g. what it would have to mean to make sense in a sentence like *Well, it was only approximately X*, cf. Sauerland & Stateva 2007), and then consider what it would mean under the same interpretation if you marked it as uncertain.

Example: Consider a scalar interpretation of beef stroganoff, as in Well, it was only approximately beef stroganoff. Under this same interpretation, in What Mary cooked was maybe beef stroganoff, you get the reading that what Mary cooked was somewhere near the ideal of Beef Stroganoff, or approximately beef stroganoff (i.e. maybe beef stroganoff ≈ approximately beef stroganoff).

Conclusion

So, what are uncertain numerals?
- They involve modals like *maybe*.
- Information associated with numerals (via RNRI principle) is then used to organize the space of possible worlds invoked by the modal.
- This information leads closer numbers to be more likely, and for rounder uncertain numerals, the range of probable alternatives will be wider.

Some further research directions –

– Uncertain numerals and *interpretive variability*
Different kinds of interpretive variability (Syrett et al. 2010)
- Semantic – the variability is part of the expression's meaning
  - E.g. *tall* (cf. *tall child, tall man, tall building*), *approximately twenty*
- Pragmatic – the variability comes from how the expression is used in context
  - E.g. *full*, *3 o'clock* (the meaning of *3 o'clock* doesn't vary, but you can be more or less generous in what you're willing to consider 3)

Uncertain numerals seem to fall under semantic interpretive variability, with imprecision built in via the modal. But this semantic interpretive variability is not quite like what has been discussed in the literature – it is able to accommodate contextual information, such as the fact that it is someone's birthday.
- *It's Susan's birthday and she's maybe twenty.* = fine
- *It's Susan's birthday and she's approximately twenty.* = weird
So, the ability to accommodate contextual information subdivides the set of semantically imprecise expressions, suggesting that those that accommodate contextual information contain modals.

– The status of simplicity in the RNRI principle
Round numbers tend to be structurally simpler (e.g. have few syllables), but context also plays a role (e.g. usually *five* would be rounder than *seven*, but not if you are talking about days).
So is structural simplicity just an artifact of use, with simplicity defined entirely by more-or-less arbitrary (mental) scales? (see Krifka 2009 for some discussion of this)

– Uncertain numerals in other languages
Do they also involve modals, which is what I predict here?
- Such an analysis works rather well for an uncertain numeral construction in Russian.