We have seen evidence that utterances use *categories* (e.g. P600 effect):

- include verbal, nominal, adjectival, ... (V, N, A, ...)
- sensitive to ordering requirements (-a, -b)
- sensitive to agreement and case requirements (Nn3S, NnPL, ...)
- sensitive to other argument requirements (-g, -r, -i)

We saw that these categories can be structured as trees:
Does this mean we have trees in our heads?

Jacqueline Sachs ’67: no! (at least, not entire trees!)

- **stimuli:** recorded speech:
  
  ‘There is an interesting story about the telescope. In Holland, a man named Lippershey was an eye-glass maker. One day his children were playing with some lenses. They discovered that things seemed very close if two lenses were held a foot apart. Lippershey began experimenting and his “spyglass” attracted much attention. He sent a letter about it to Galileo, the great Italian scientist. Galileo at once realized the importance of the discovery and set about to build an instrument of his own. . . .’

followed by recognition query involving syntactic variants:

(a) ‘Galileo, the great Italian scientist, sent him a letter about it.’
(b) ‘A letter about it was sent to Galileo, the great Italian scientist.’
(c) ‘He sent Galileo, the great Italian scientist, a letter about it.’
(d) ‘He sent a letter about it to Galileo, the great Italian scientist.’

- **measure:** accuracy of query response
- **results:** correct rejection of (b–c) fall to \( \sim 60\% \) after 80 syllables.
Maybe we have complete trees in our heads temporarily?

Robert Jarvella ’71: no! (Trouble recalling previous clause in same sentence.)

▸ **stimuli**: recorded speech; request to write down all remembered words
  
  (a) Long: ‘The tone of the document was threatening. Having failed to disprove the charges, Taylor was later fired by the President.’
  
  (b) Short: ‘The document had also blamed him for having failed to disprove the charges. Taylor was later fired by the President.’

▸ **measure**: serial recall accuracy

▸ **results**: accuracy drops at clause (85%), sentence (60%) boundary.
Instead, parse sentence as a hierarchic sequence of connected components:

The publisher bought the author's rights.

Connects to domain-general models of memory:

- **content-based cueing** of incomplete categ. (N/N-aD cues V/V-aN)
- **temporal cueing** of previous incomplete categ. (resume V/N at t=6)
Cueing operations sensitive to only a small number of syntactic categories:

- Categories at current time step enforces syntactic constraints.
- Categories from earlier time steps are discarded.
- Only *propositional content* (predicate-argument structure) retained.

John Bransford & Jeffery Franks ’71: people retain propositions, not sents.

- **stimuli**: sentences w. subset of four propositions; recognition query
  
  (a) ‘The jelly was sweet.’ (+ 1 variant)
  
  (b) ‘The ants in the kitchen ate the jelly.’ (+ 1 variant)
  
  (c) ‘The ants ate the sweet jelly which was on the table.’ (+ 1 variant)
  
  (d) Each complete four-proposition sentence shown half of subjects
      ‘The ants in the kitchen ate the sweet jelly which was on the table.’
  
  (e) Similar sentences from 3 other topics, mixed together

After acquisition: was this sentence there? (10-point confid. scale)
‘The ants in the kitchen ate the sweet jelly which was on the table.’

- **measure**: false positive rate in query response
- **results**: same average score for new and old four-proposition sentence!
Memory for Syntax

Roger Ratcliff and Gail McKoon ’78: evidence for reality of propositions

- **stimuli**: pairs of written sentences:
  
  (a) ‘Geese crossed the horizon as the wind shuffled the clouds.’
  (b) ‘The chauffeur jammed the clutch when he parked the truck.’

- **list of words**: were they in the sentence pair?
  
  1. ‘wind’
  2. ‘horizon’
  3. ‘crossed’
  4. ‘clutch’

- **measure**: reaction time for each word

- **results**: facilitation when previous word in same proposition (2,3)
  
  no facilitation if just same sentence, even if equidistant (1,2)
Other evidence for propositions:

- Forster ’70: words recalled depends on number of propositions
- Goetz, Anderson, Schallert ’81: Any → all words from proposition
- Weisberg ’69: free association produces words from same proposition
Problem: syntactically connected components may be semantically disjoint!

The person who officials say stole millions
Memory for Syntax

Solution: use semantically connected components! (van Schijndel, Schuler’13)

The person who officials say stole millions