Aspects of the neurocognition of native and non-native grammar:

The view from wh-movement

Displacement is characteristic of language (Chomsky, 1977) so the proposed dissertation seeks to neurocognitively explore critical aspects of it in sentence processing, the nexus of representations, parsing procedures and the instantiations of these in the electrical activity of the brain. Importantly, the mechanisms of wh-movement’s interactions with reference and with argument structure remain underexplored. In non-native sentence processing, wh-dependencies exhibit delay (Dekydtspotter, Schwartz & Sprouse, 2006), weakness (Fernandez, Höhle, Brock & Nickels, 2018) and fragility (Dekydtspotter & Miller, 2013), but the bases of these traits in neuronal activity are still unknown. Two sets of experiments address these gaps in our understanding through behavioral (self-paced reading times) and electroencephalographic (ERPs and ERSPs) measures.

In the first set of experiments, a novel case of covert constituents’ reference being calculated in syntax, semantics or discourse in questions like (1a-d) is at issue:

(1)  
  a. Which picture of himself did Ben say that Amy ruined?  
  b. Which picture of him did Ben say that Amy ruined?  
  c. Which picture of both himself and Rachel did Ben say that Amy ruined?  
  d. Which picture of both him and Rachel did Ben say that Amy ruined?

This essentially extends Burkhardt’s (2005) examination of anaphors, pronouns and logophors to reconstruction (Barss, 2002). Following Reuland (2001), the predicate reflexive in (1a) is syntactically bound at the intermediate trace while the predicate pronoun in (1b) is semantically bound at the tail trace. In Heim’s (1982) File Change Semantics, the non-predicate reflexive – a logophor – in (1c) is valued in discourse through a bridging operation and the non-predicate pronoun in (1d) is valued in discourse through a copy-and-paste operation. Dependencies in syntax and semantics are less costly than dependencies in discourse and copying-and-pasting is less costly than bridging, so processing profile differences are expected between (1a-d) at the two trace sites. Furthermore, the neuronal activity that distinguishes native and non-native processing should track with the delay, weakness and fragility of L2 processing.

In the second set of experiments, Lasnik’s (2002) proposal that syntactic constraints apply both derivationally and representationally is tested neurocognitively. Specifically, intermediate traces of both arguments and adjuncts are suggested to necessarily be created derivationally in (2a-b) to allow binding in (2a-b) but intermediate traces of arguments are argued to necessarily be deleted to satisfy representational constraints on legitimate LF structures as articulated in Lasnik and Saito (1983, 1992):

(2)  
  a. With which of his interns did Ben say that Amy sympathized?  
  b. With which of his interns did Ben say that Amy arrived?  
  c. With which of her interns did Ben say that Amy sympathized?  
  b. With which of her interns did Ben say that Amy arrived?

If so, binding his at the intermediate trace in (2a-b) should induce a processing cost over not binding her in (2c-d). Likewise, deleting an argument’s intermediate trace in (2a;c) should have a processing cost over not deleting an adjunct’s intermediate trace in (2b;d). Again, activity that occurs only in non-native speakers should be the neuronal correlate of delay, weakness and fragility in L2 processing more generally.

10 L1-English and 11 L1-Chinese L2-English speakers completed the self-paced reading portions of these experiments as well as a battery of “Gateway Tasks” to ensure that they can in principle calculate the structures under investigation. These tasks include an acceptability judgment task assessing acquisition of overt wh-movement; a co-reference judgment task assessing acquisition of English’s interpretational restrictions on reflexives, pronouns and logophors; a grammaticality judgment task assessing knowledge of the argument structure of the verbs used in the second set of experiments; and a prediction sensitivity task assessing the ability to produce a question when given its thematic counterpart. Native and non-native performance on the tasks demonstrates construct validity, and the results, though exceedingly tentative, are suggestive that the theoretical proposals may receive at least partial neurocognitive validation.