

Parsing and the Strong Minimalist Thesis (SMT)

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We describe a new project, the *SMT Parser*, a computer program that uses simplest Merge and follows the Strong Minimalist Thesis (SMT) design principle, Chomsky GK (2021). There is a narrative due to Noam Chomsky that Nature unlocked recursive Merge with Language *Organ-Specific Conditions* (LSC), e.g. *Theta Theory*, when modern humans, viz. *homo sapiens*, arrived on the scene a few hundred thousand years ago, see (Berwick & Chomsky 2017). Recursive Merge enabled humans to construct complex thoughts not possible before, leading to an explosion in symbolic and intellectual activity, both visible today and in the archaeological record. This development was so recent in evolutionary terms that it left no time for more complex mechanisms to emerge. All surviving humans since then share this same basic language/thought capability, possibly as a result of a small mutation. Merge is now part of our genetic endowment. The SMT also suggests Nature makes optimal use of this new-found capability. As the brain is largely chemical-based, see (Valentin 2002), the operation of the language organ must be computationally efficient, not just maximally simple (for evolutionary plausibility).

Language can (optionally) be externalized via different modalities, e.g. speech and sign. Although there has been no time to evolve other mechanisms, or for Nature to tinker with and complexify Merge, it is a fact that modern humans can effectively parse and interpret externalized language. How does that happen if essentially there is only Merge available? In other words, isn't it a mystery that we can parse externalized language at all?

This project explores Merge computation through formalization and computer simulation of the combinatorics of the theory. We show how a parser can operate using just Merge and the LSC Theta Theory to manage the computational complexity of the Workspace from which parses are derived. The goal of the SMT Parser project is to suggest that this scenario is not only plausible, but can be made efficient enough without positing (evolutionarily implausible) additional parsing mechanisms. If so, unlocking Merge is all that was needed.

References

Project webpage: sandiway.arizona.edu/smtparser

Berwick, R.C. & N.A. Chomsky. 2017. *Why Only Us: Language and Evolution*. MIT Press.

Chomsky GK: Minimalism: Where Are We Now, and Where Can We Hope to Go. *Gengo Kenkyu*, 160:1–42. 2021.

Valentin, E. S. 2002. The Discovery of Chemical Neurotransmitters. *Brain and Cognition* 49, 73–95. doi:10.1006/brcg.2001.1487

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