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Cortical Network Analysis from Retrograde Tracing Experiments DANIEL BARABASI, MELINDA VARGA, ZOLTAN TOROCZKAI, University of Notre Dame — Updated efforts using hemisphere-wide retrograde and anterograde tracing have provided large-scale physical connectivity data about the architecture of the cortex in both macaque and the mouse. Recent studies of these data have reported high-density cortico-cortical wiring, which renders earlier methods designed for sparse network analysis, in particular for network community detection, less applicable. Using novel methods better suitable for dense graphs but also more traditional spectral methods, we show the existence of a strong core-periphery structure in the cortical interareal networks of these mammals, and perform a comparative analysis of these networks. We also show that the Exponential Distance Rule (EDR) framework for mammalian connectivity, according to which one expects dense shortrange connectivity with sparsely distributed long-range edges, captures the observed core-periphery structure in both species. When compared to appropriate random graph null models, our analysis shows a clear distinction between the null model and brain data, implying the existence of high connection specificity in both brains, but with stronger specificity in the primate, when compared to the rodent brain.

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