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Title: Fronto-insular (FI) Cortex in the Elephant

Abstract: Fronto-insular (FI) cortex contains a distinctive class of large bipolar cells, the von Economo neurons (VENs), that are selectively vulnerable in the behavioral variant of fronto-temporal dementia (bvFTD). Social decision-making is severely impaired in bvFTD, and the VENs degenerate in the early stages of this disease. One measure of the early degenerative changes is the migration of the protein, TDP-43, from the nucleus where it is normally expressed to the cytoplasm, which is associated with the loss of empathy in these patients. The volume of FI in humans is also related to social decision-making including the capacities for "theory of mind" and self-control. The VENs and FI are well-developed in elephants, who exhibit many behaviors that appear to be driven by empathy and live in stable groups in which self-control is essential to group cohesion. In elephants, the VENs are located in several distinctive small gyri at the junction of orbito-frontal and insular cortex. We have performed high resolution diffusion imaging on an ex-vivo brain of an elephant and are using these data to map the connections of FI and compare them with comparable maps we have made in apes and humans.