1067-AF-1469 **Donniell Fishkind*** (fishkind@ams.jhu.ed), Department of Applied Mathematics, Johns Hopkins University, Baltimore, MD 21218, and **Lowell Abrams** and **Carey Priebe**. *The Genus of a Digital Image is Determined by its Foreground, Background, and Reeb Graphs.*

The human cerebral cortex may be modeled as a topological sphere dividing the cranial cavity into two regions, interior and exterior. A magnetic resonance image of the brain provides a cubical complex (digital image) representing the interior, with boundary representing the cortex itself. Because the cortex is densely folded, such a representation of the cortex typically has many topological handles which are artifacts of noise and limited resolution. Shattuck and Leahy (D.W. Shattuck and R.M. Leahy, "Automated graph-based analysis and correction of cortical volume topology," devised an automated topology-correction algorithm to remove these artifacts to restore the spherical topology of the imaged cortex, and their approach was fundamentally based on their Spherical Homeomorphism Conjecture concerning the "foreground graph" and the "background graph," which are graphs that arise respectively from the cubical complex and its complement. Our main result, which implies the truth of their conjecture, shows that the topological genus of the boundary of a digital image is precisely half of the sum of the cycle ranks of the foreground graph, the background graph, and the image boundary's Reeb graph relative to the natural height function. (Received September 21, 2010)