

Einstein's huge brain a wonder of well-exercised connectedness

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Albert Einstein had a colossal corpus callosum. And when it comes to this particular piece of neural real estate, it's pretty clear that size matters.

Chances are, that brawny bundle of white matter cleaving the Swiss physicist's brain from front to back is part of what made his mind so phenomenally creative. The corpus callosum carries electrical signals between the brain's right hemisphere and its left. Stretching nearly the full length of the brain from behind the forehead to the nape of the neck, the corpus callosum is the dense network of neural fibers that make brain regions with very different functions work together



Theoretical physicist Albert Einstein had a brain that was not only bigger in many regions, but better connected than the brains of most people, a new study has found. (The Magnes Press)

When the corpus callosum works well, the human brain is a marvel of social, spatial and verbal reasoning. When it malfunctions, as it appears to do in autism, fetal alcohol

syndrome and certain genetic disorders, as well as after traumatic brain injury, the effect on cognition can be disastrous.

According to a letter to the editor [published Thursday](#) in the journal *Brain*, Einstein's corpus callosum at the time of his death was a veritable superhighway of connectivity, "thicker in the vast majority of subregions" than the corpus collosi of 15 elderly healthy males and thicker at five key crossings than those of 52 young, healthy males who served as a comparison group.

Upon Einstein's death of an aortic aneurysm at age 76, his heirs approved the removal of his brain. A trove of histological slides were made, documenting minute slices of the theoretical physicist's brain. While some of those are housed at Princeton University, where Einstein spent his final years, and at the National Museum of Health and Medicine in Washington D.C., many have been lost or stolen. Without a full picture of Einstein's brain, the basis of the theoretical physicist's genius eludes scientists.

But photographs of Einstein's postmortem brain unexpectedly came to light recently, giving neuroscientists a glimpse of the genius that lay within. Last November, the journal *Brain* published a [remarkably detailed look](#) at the surface of Einstein's brain. The latest analysis is based on several of these photographs, which showed the separated right and left hemispheres of Einstein's post-mortem brain. Those revealed the corpus callosum with great resolution and accuracy, and allowed the current analysis.

The authors of the study -- physicists from East China Normal University in Shanghai and Florida State University anthropologist Dean Falk -- were particularly impressed by the relative brawn of Einstein's corpus callosum at the splenium -- a region of the corpus callosum that facilitates communication among the parietal, temporal and occipital lobes and between those regions and the brain's intellectual command center, the prefrontal cortex. The parietal and occipital lobes, in particular, are key to imagining and manipulating visuospatial information and images and to conducting mathematical operations.

Earlier studies of Einstein's brain have found some regions, notably Einstein's parietal lobes, were just plain bigger than those of normal people. But the authors write, "our findings suggest that Einstein's extraordinary cognition was related not only to his unique cortical structure and cytoarchitectonics, but also involved enhanced communications routes between at least some parts of his two cerebral hemispheres."

Peter U. Tse, a Dartmouth College neuroscientist who recently [explored](#) the underpinnings of artistic, scientific and mathematical creativity, said the study's findings underscore that the ways in which we use our brains, and the consistency with which we do so, may matter more as we age. Tse noted that, while Einstein's brain was much better connected than those of similarly-aged men, it was not quite as strikingly more connected than those of healthy young controls.

That might reflect the fact that Einstein continued to exercise his brain strenuously, forestalling much of the atrophy that comes with age.

"It might just be that Einstein's brain was more like a young person's brain in that sense," said Tse. "A [recent article](#) has shown that the brain is like a muscle in the sense that neural circuits that are used often tend to change in their organization." That, in turn, may lead to increases, or at least changes, in connective tissues such as the corpus callosum, he added.

"We should therefore not conclude that Einstein's genius was caused by some part of his brain being slightly larger than average. It might be that his brain was slightly larger in these areas because he exercised these regions more than the average person.