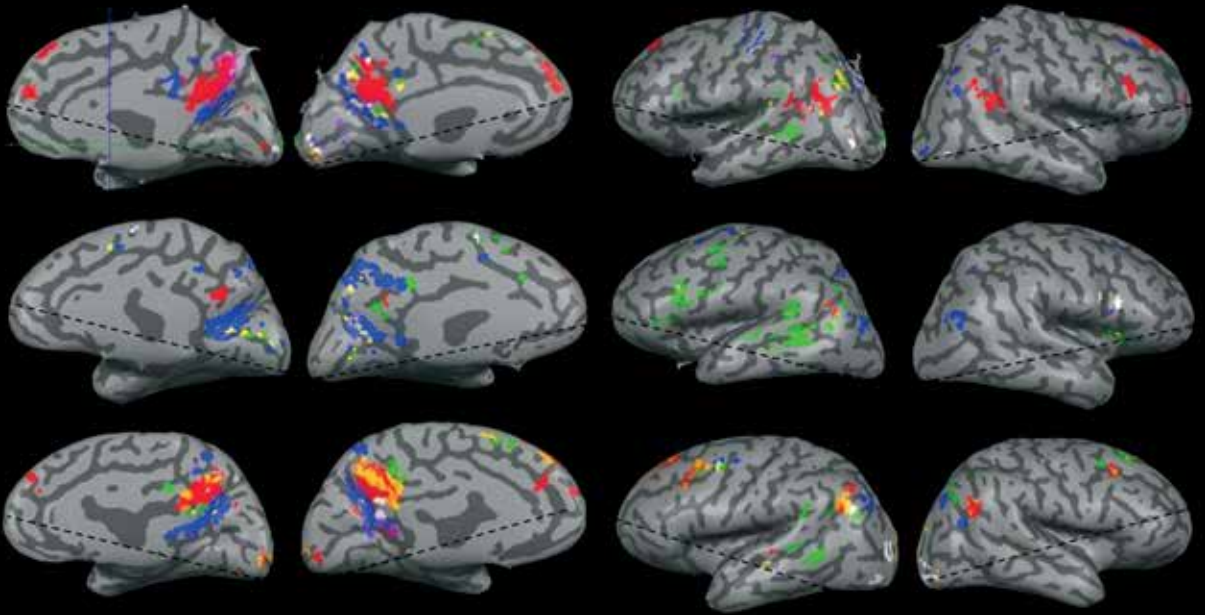




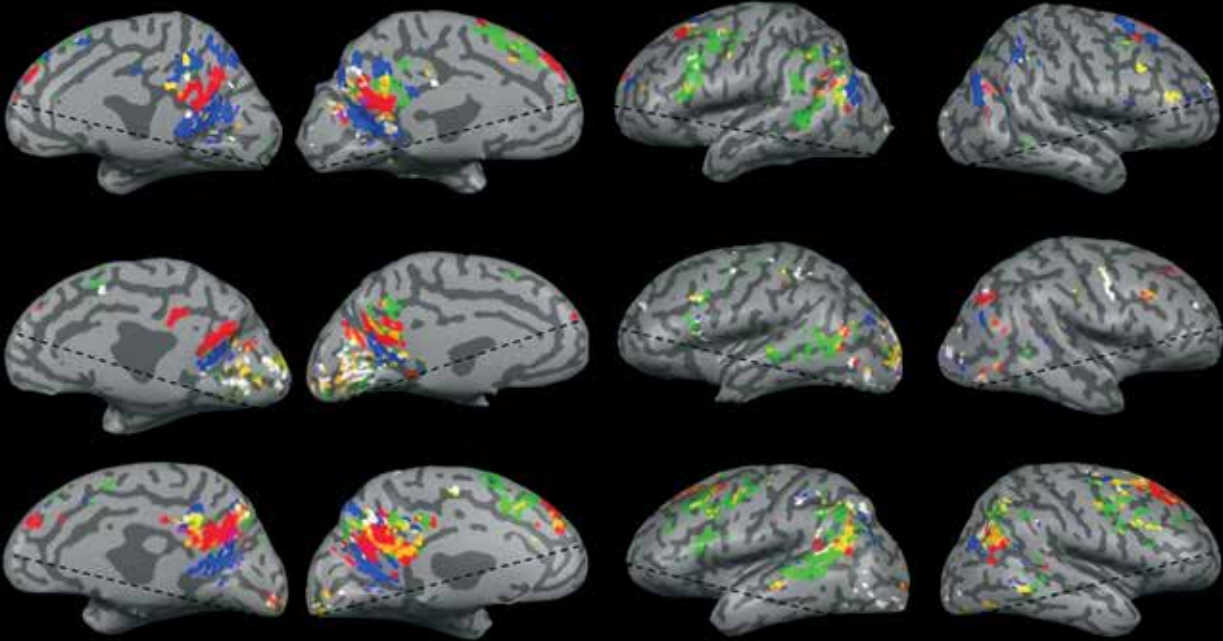
FUNDING

**INNOVATIVE RESEARCH
WORKING TOWARD A CURE
OFFERING HOPE**

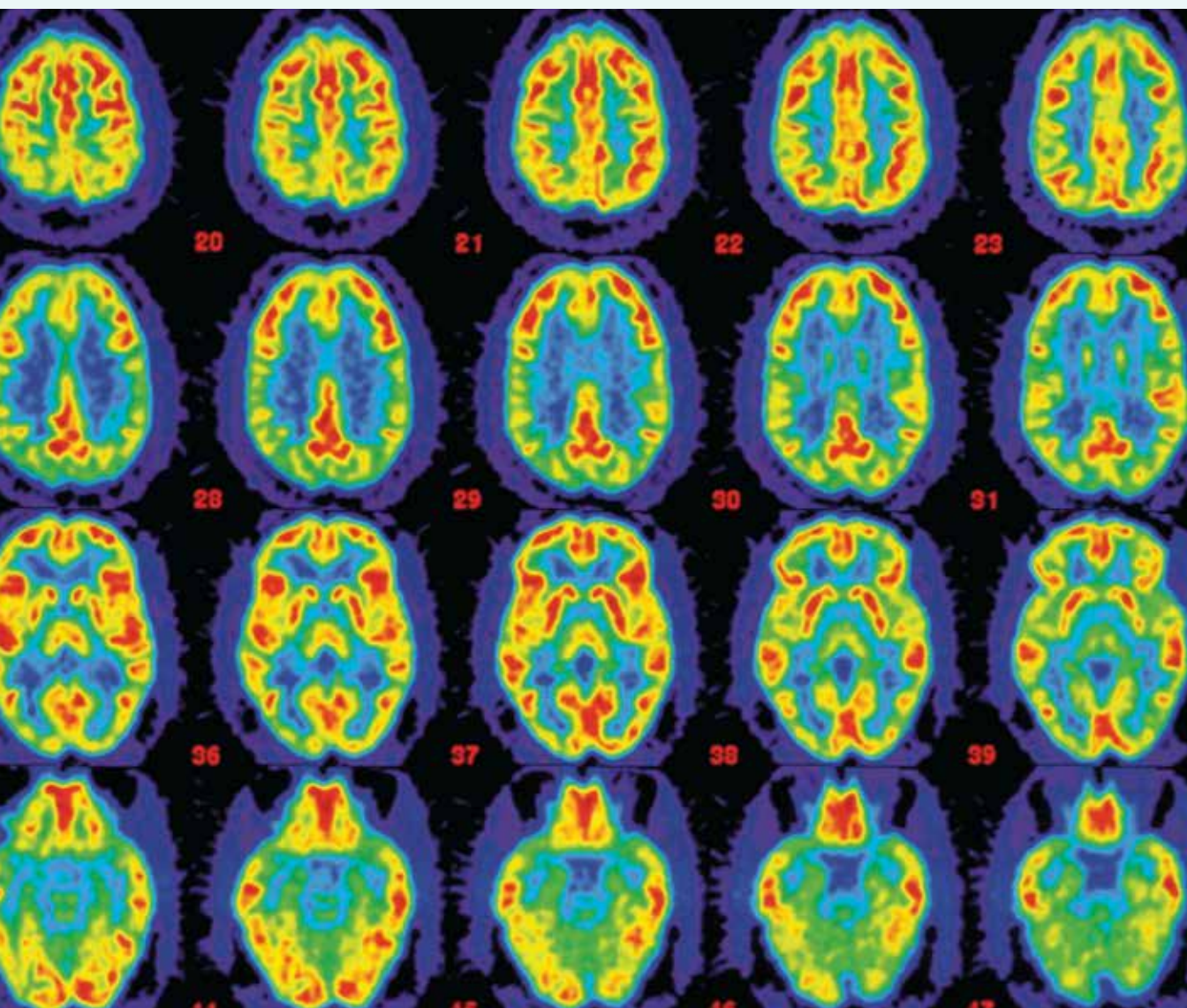




HOPE
WE NEVER GIVE UP



Understanding the
Experience of Learning an
Alzheimer's Biomarker Result



ALZHEIMER'S AND THE BRAIN'S GPS SYSTEM

The aspect of brain functioning that allows us to assess where we are in space, time, and relation to others is called orientation. According to neuropsychiatrist Shahar Arzy, MD, PhD, disorientation is the core cognitive disturbance in AD.

His work builds on the research of 2014 Nobel Prize in Physiology

Shahar Arzy, MD, PhD



TAMAR RAZ, PHD

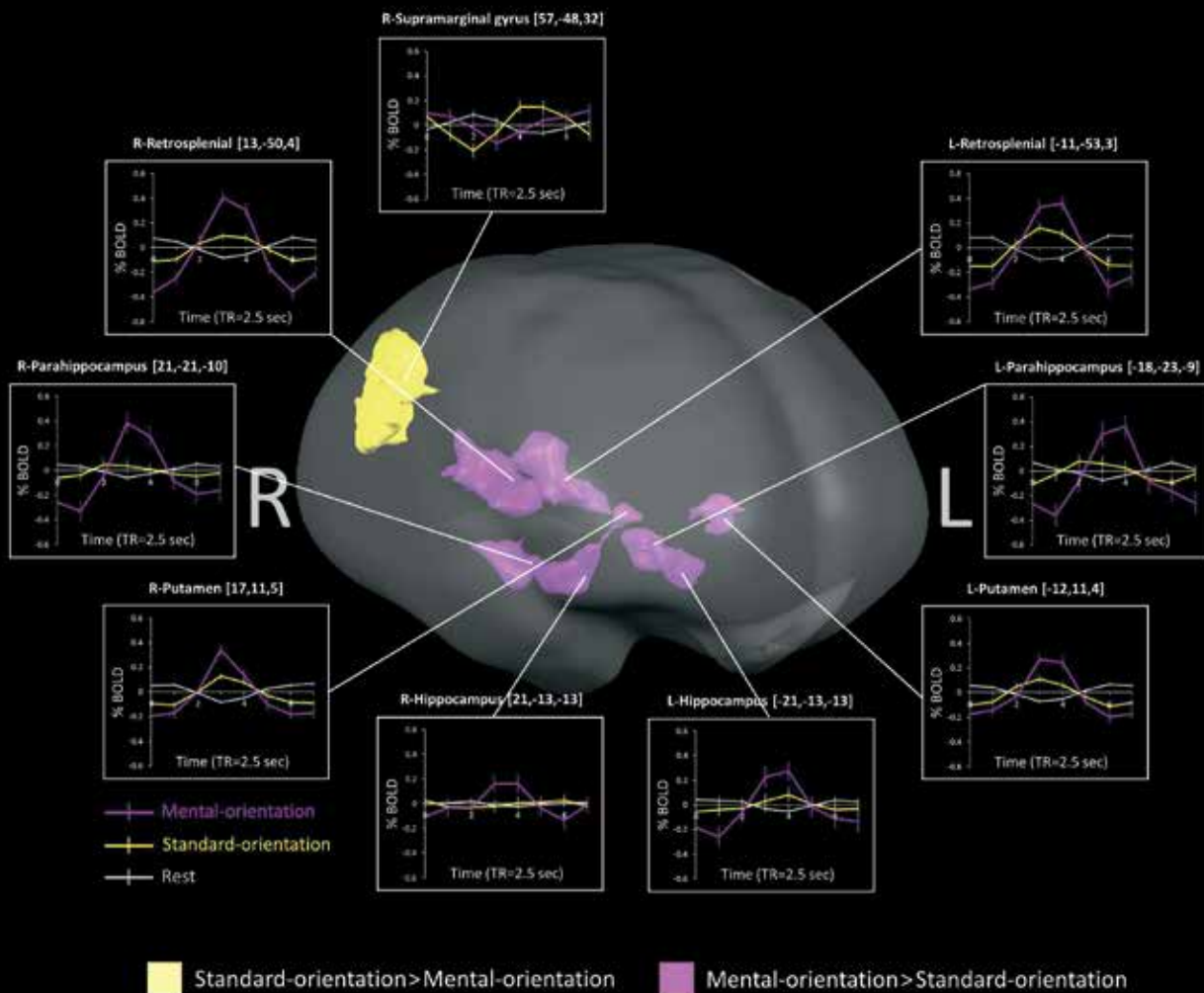
or Medicine winners John O'Keefe, May-Britt Moser, and Edvard I. Moser,¹ for their discovery of this positioning system—an “inner GPS” in the brain that makes it possible to create “cognitive maps” of the environment around us, demonstrating a cellular basis for this high cognitive function.

Dr. Arzy, Director of the Computational Neuropsychiatry Lab at **Hadassah Medical Center in Israel**, and his team are researching the ability to orient oneself relative to places and events, and how this mental orientation system is compromised in people with AD.

“We hypothesized that Alzheimer’s disease is a disorder of orientation, where people lose their way on the cognitive maps of memory, places, and later, people,” says Dr. Arzy. “Early on in the disorder, disorientation is compensated by memory functions, which in later stages fail as well. Early support of orientation may therefore protect memory in Alzheimer’s disease.”

At Hadassah’s Computational Neuropsychiatry Lab, Dr. Arzy’s study aims to characterize the mental orientation system and its disturbances in individuals with AD and mild cognitive impairment using a variety of high-resolution neuroimaging tools, including functional magnetic resonance imaging (fMRI), PET, and high-definition electroencephalogram (EEG), as well as by extrapolating “big-patient-data” from thousands of patients around the world.

In his diagnostic approach, Dr. Arzy begins by exploring what is



COMPUTATIONAL NEUROPSYCHIATRY LAB OF SHAHAR ARZY, MD, PHD / HADASSAH MEDICAL CENTER

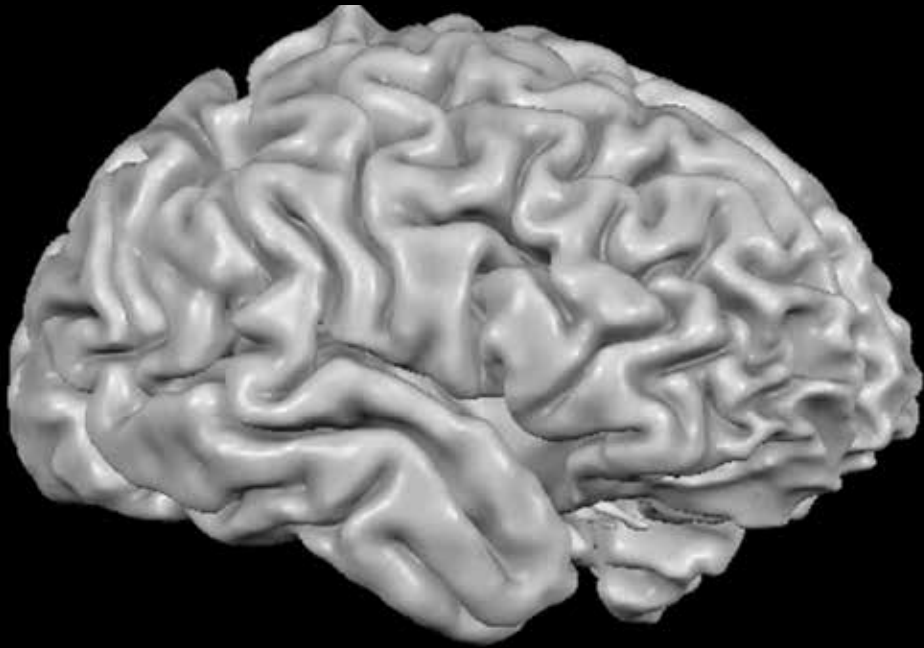
going on in the patient's brain using personalized data regarding the patient's own world taken from digital media, such as Facebook. Then, computational algorithms analyze the data and reveal, in real time, what is going on in the brain.

"We're hopeful that our efforts may lead us to diagnose Alzheimer's much earlier. It is at this earliest stage, when compensatory mechanisms still work, that the disease will be most amenable to treatment," adds Arzy.

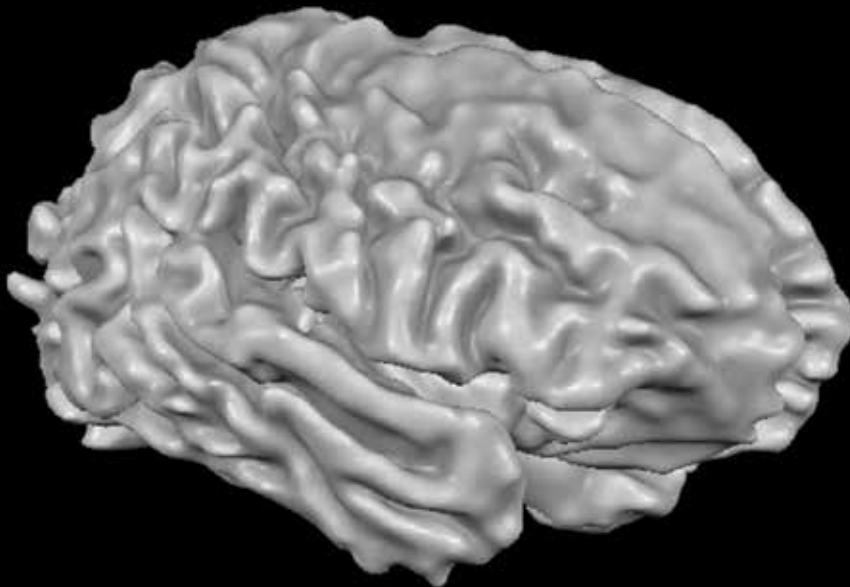


Mental-orientation and standard-orientation contrast.

The investigators used fMRI to record neural activity and compare the newly developed mental-orientation task and standard-orientation tests (in the domains of time, space and person). The contrast revealed mental-orientation to preferentially activate brain regions known as the precuneus, parieto-occipital sulcus, posterior cingulate cortices, parahippocampus and hippocampus (purple cluster). As these regions are the loci of the earliest Alzheimer's-related pathological processes, their preferential recruitment by the mental-orientation task underlies its increased sensitivity to early manifestations of Alzheimer's-related neurodegenerative processes.



NORMAL AGING



ALZHEIMER'S DISEASE

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Using specialized software, the Computational Neuropsychiatry Lab of Shahar Arzy, MD, PhD, at Hadassah Medical Center in Israel, reconstructed anatomical MRI scans into 3D models of the brain's cortex.

Here, the researchers demonstrate brain atrophy, or shrinkage, that occurs in Alzheimer's disease. The brain typically shrinks to some degree in normal cognitive aging, though it does not lose neurons in large numbers. However, in Alzheimer's disease, the damage is widespread. Many neurons cease functioning, lose connections with other neurons, and die. Alzheimer's disrupts processes crucial to neurons and their networks, including communication, metabolism, and repair.

Special thanks to Gregory Peters-Founshtein, MD-PhD candidate in Dr. Arzy's lab.