

CURRENTS

Surveying the Brain for Origins of the Senior Moment

Aging Brings Mental Changes—Including a Slowdown of Mere Milliseconds—That Drive Us to Distraction

San Francisco

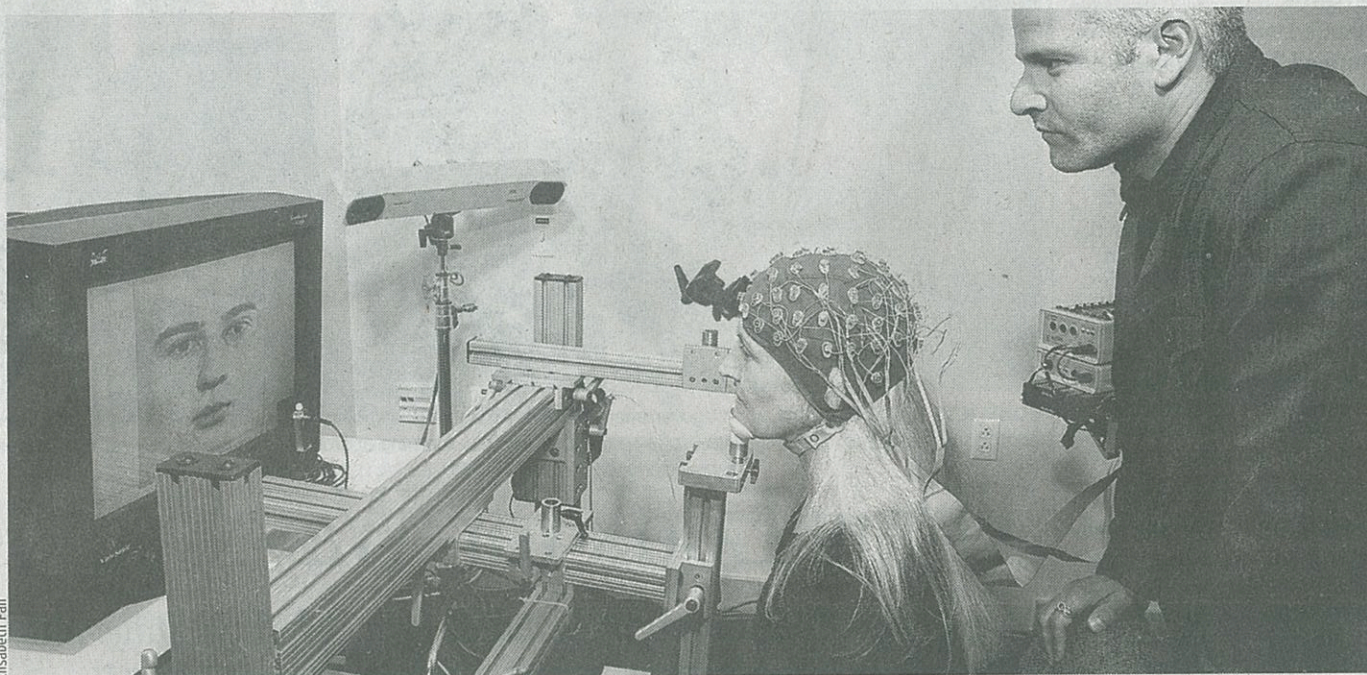
Nyla Puccinelli sat patiently at the crossroads of memory, attention and aging, while a lab technician threaded color-coded electrodes into the mesh cap on her head. A retired school teacher, she'd always had trouble recalling her students' names but she worried more now about her memory and found it harder to shrug off distractions.

"If I am really concentrating on something now, I have to turn off the radio," Ms. Puccinelli, 69 years old, said. "There is a lack of concentration. Because you're getting older, you get more concerned about it."

By Robert Lee Hotz

at work, neurologist Adam Gazzaley at the University of California at San Francisco was using her healthy brain as a road map of mental changes that age brings to us all. In particular, Dr. Gazzaley and his colleagues were trying to understand why aging drives us all to distraction.

At the slightest interruption—an irritating ring tone, an insistent email alert or the hushed conversation in the adjacent office cubicle—our thoughts can plunge into the mental underbrush like hounds snuffing after the wrong scent. As scientists document the normal brain changes at fault, they are highlighting a growing conflict between the push-me-pull-you demands of modern multitasking and our waning powers of concentration. By one estimate, the average office worker is interrupted every three minutes. Indeed, our inability to ignore irrelevant intrusions as we grow older may arise from a basic breakdown of internal brain



University of California, San Francisco neuroscientist Adam Gazzaley monitors the brain in an attempt to understand how age erodes concentration.

communications involving memory, attention span and mental focus starting in middle age, researchers have discovered.

These days, we look for any insight into how aging alters the brain. "My patients are most worried about having something go wrong with their brain as they age, more than they worry about cancer," says clinical neuropsychologist Karen Berman at the National Institute of Mental Health.

America's 78 million baby boomers are turning 60 at the rate of about 8,000 a day. By 2050, the world's population of those over 60 years old is expected to exceed the number of young people for the first time in history, according to the United Nations population division, with more than 2 billion people potentially prone to absent-minded moments of memory lapse and befuddlement.

"It is a public health issue—the aging mind—but more than that, it is an individual issue for so many people," says Dr. Gazzaley. "People don't want to retire. They want to compete in the workplace as well as they ever did, as well as the 20-year-old who was just hired

in the room next to them. People want their brain to be the same their whole life."

No matter what we do, though, our brains normally shrink as we age—a man's faster than a woman's—affecting regions associated with learning and memory. Many genes linked to brain function in the prefrontal cortex also become less active, affecting how deftly we can orchestrate thoughts and actions.

By combining different measures of brain activity—positron emission tomography, functional magnetic resonance imaging and electro-encephalography—scientists for the first time can see how aging brain regions, designed to work in unison like the interlocking innards of an expensive watch, fail to mesh swiftly and smoothly. Normal aging, for example, disrupts the electrical crosstalk between major brain regions, researchers at Harvard University reported last December in the journal *Neuron*.

"With these new physiological techniques, we can look at what is going on the brain when you are supposed to be ignoring something," Dr. Gazzaley says.

ley says.

Among the brain circuits that focus attention and memory, his research suggests, aging is a matter of milliseconds. In experiments testing how well people of different ages could recall faces and landscapes, Dr. Gazzaley and scientists at UC Berkeley found that among older people, the brain was slightly slower—200 milliseconds or so—to ignore irrelevant test information. That instant of interference was enough to disrupt a memory in the making, they found.

"This is the distractibility," he says. In fact, it significantly affected how well older people did on memory tests compared to younger adults. "In that first fraction of a second, younger adults are much better at blocking things out," Dr. Gazzaley said.

During that momentary lapse, we can forget a new name, misplace our keys or lose our train of thought.

Moreover, our brains start changing long before we can see the pattern in such shortcomings. Last month, researchers at UCLA reported that, beginning in middle age, we start to lose the myelin insulation

that sheathes the nerve fibers running through our frontal lobes. In essence, the electrical wires of our neural circuits begin to fray and that could imperceptibly hamper our thought process. In 2006, scientists at the University of Toronto and the Rotman Research Institute in Canada reported that, among people in their 40s, they already could detect the neural mismatches that make many of us more vulnerable to distractions.

By the time we reach age 65 or more, one fourth of us may be wrestling with a failing memory and other mild cognitive problems, researchers at the Indiana School of Medicine reported in the journal *Neurology*. An 88-year-old widow described the feeling. "My brain argues with itself," she says. "Spontaneous thoughts can be a struggle because they keep dancing off. They don't all march along at the same speed. It's very annoying."

Not all the indignities of age are inevitable, research suggests. "Yes, there are biological brain changes; yes, things get harder; but we seem to be able to compensate for that," says Univer-

sity of Michigan psychologist Cindy Lustig, who studies how mental abilities change with age.

To keep mentally fit, a generation of aging gym rats has embraced the cognitive calisthenics of computerized brain exercises. Not all mental gymnastics or herbal supplements work as advertised, but proper diet, cardiovascular exercise and formal education do stave off mental decline, according to new research. "With the right kind of training, we can take an older mind and make it younger," Dr. Gazzaley says. "The potential exists."

Something seems to be working. Earlier this year, researchers at the University of Michigan reported that, in a study of 11,000 retired people, memory loss and other cognitive problems were becoming less common among older Americans. That could be due to better care of high blood pressure, cholesterol and other medical risk factors. No one is sure. An active social life also appears to slow the rate at which memory fails, researchers at the Harvard School of Public Health reported this past July in the *American Journal of Public Health*.

Despite its distractions, a healthy brain may also mellow with age. The roller-coaster rush of dopamine, a biochemical associated with heady feelings of reward, doesn't affect older people as strongly as it does the young, Dr. Berman reported this fall in the *Proceedings of the National Academy of Sciences*.

Is this evidence that, among older neurons and synapses, life can lose its savor? "I would suggest it shows that older people are appreciating life in a different way," says Dr. Berman.

In other words, the dopamine drop may be a biochemical marker of something else: the wisdom to accept with grace what we cannot change.

Robert Lee Hotz shares recommended reading on this topic and responds to reader comments at WSJ.com/Online-Today. Email him at science-journal@wsj.com.