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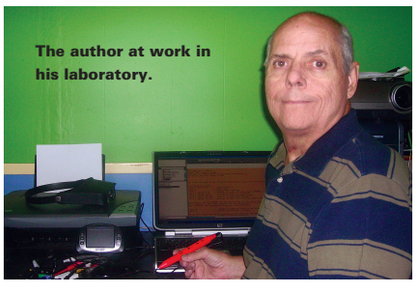
by Tom Atwood

MACHINE INTELLIGENCE
A startling vision of an android brain

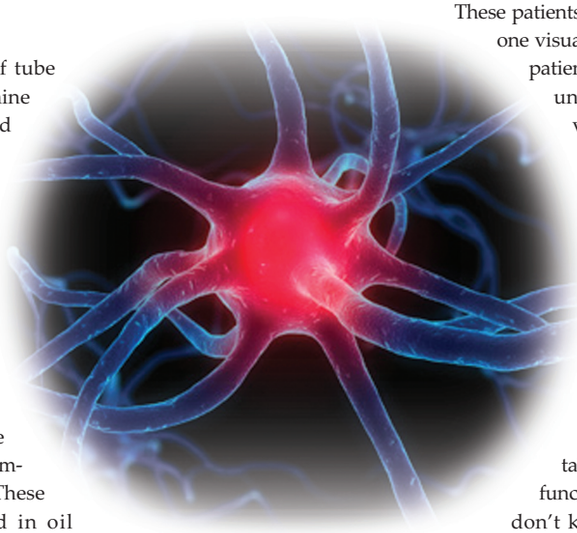
As we reported in our Update page in the last issue, *Robot* is tracking Dr. Jim Gouge's progress in assembling a hobby robot research platform that he hopes will extend the bounds of machine intelligence ("Dr. Jim" is his branded nickname at www.machineinteltech. com, so that's what we will call him). Dr. Jim is experienced in image technologies, he has worked in the areas of robotic vision and satellite imagery, and he is a lifelong robotics enthusiast. Confident that he is taking the next leap forward in cognitive robotics, Dr. Jim refers to his synthetic digital brain design as "android" technology. We believe our readers will find his approach both provocative and interesting—even though we cannot predict the likelihood of his success.

We invite readers to email *Robot* at toma@botmag.com with questions, critiques and requests for follow-up coverage if you'd like to learn more. We will prepare additional coverage, downloads and video clips of Dr. Jim's progress in proportion to reader interest. This is *your* magazine and your chance to participate; let us know.


The author at work in his laboratory.

ROBOT: Dr. Jim, can you give us a little history on the topic of "machine intelligence"?

DR. JIM: From the beginning of tube computers in the early '50s, machine intelligence has been discussed and research work done. I was involved with the IBM Q7 computer that was used in missile guidance for Minuteman missiles and intercept aircraft. I was awed by its gigantic size, but in terms of the processor and memory size, it was primitive even compared with today's PCs; it used a cylindrical magnetic drum that spun for intermediate mass storage and magnetic core memory for main read/write storage. These magnetic cores were immersed in oil because they would physically spin when the current was flowing through the wires passing through them, and this spinning would wear off the wire insulation. That was the type of computer used in the beginning of serious research into machine intelligence.



I'd like to digress briefly on what we understand about the human brain and what we don't, as it's a point of departure for understanding machine intelligence. About the time I was working with the vacuum-tube computers, experiments were done on people who had massive epileptic seizures with the two hemispheres of the brain fighting for supremacy. To cure them, they cut the *corpus callosum*—the massive nerve-fiber bundles that connect the two hemispheres so that one half of the brain can exchange information with the other half.

You don't know which will be dominant until after birth. If a child writes and reaches with a left hand and accomplishes most of the physical grasping, the right hemisphere is dominant. The right brain is an extremely abstract neuro-biological area because it deals with abstract things such as art, as opposed to things such as logic and math, which are dealt with by the left brain.

These patients had the brain split; if they covered one visual field (say the left) and showed the patient something, say utensils, and then uncovered it and covered the other visual field and asked the subject to pick it out, the patient was unable to identify it.

This was the beginning of probing into how the brain functions. Where are we now after all those decades in terms of understanding the neuro-biological model? From insects up—even from uncomplicated brains with a limited number of neurons—we have identified certain things such as motor and sensory functions and their locations, but we still don't know "how" our brains work. We know a lot about the chemistry of the brain on a single neuron basis and can define functions from rat-brain studies, but that is the limit of the progress that we have made. It has been extremely sparse with very little in the nature of major breakthroughs. Nonetheless, I have looked to a model of the human brain to understand the nature of intelligence. From there, I believe, we can derive a definition of machine intelligence.

PHOTOS BY GEORGE MITSUOKA, JIM GOUGE & CYNTHIA EHLINGER OF THE BRUCE MUSEUM