

SEE THE
FOREST FOR
THE WORLD

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See the Forest for the World

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A novel by Harrison Napier

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Prelude

The sound of bone shattering as it gave way to the tire iron slamming against his body lapsed into a final moment of clarity for Professor Albert Henry Rowley. He saw himself standing in front of his lectern where he began to understand the meaning of his own life. Time held itself motionless as he began his first Ted talk.

The average human mind is far more complicated than we imagine. The collective known as our brain has some eighty-six billion neurons. The individual neuron within that brain connects to as many as ten-thousand other neurons. Each neuron is composed of three-hundred-thousand proteins that form the Soma structure; each cell body is hundreds of times smaller than a single grain of sand. Every neuron utilizes thousands of glia cells allowing us to stream electron generated particles from one neuron to as many as one trillion synaptic connections, and that's the average brain.

Now imagine the very different minds of geniuses like Albert Einstein or the celebrated musical artist Ray Charles; men whose savant brains processed information at incomprehensible levels. Albert fashioned himself as a mathematician but not as a savant. He was a student of the universe, but we had only a glimmer of how different his mind was from our own. Upon his death, Albert requested that they cremate his body, and he wanted to avoid people from worshipping his bones. However, he asked people to remember his mind, or at least understand the gray matter we referred to as his brain. In an autopsy just hours after his death, his brain was removed, and a scientific team began the study of perhaps the greatest mind of all time. Their hypothesis was simple,

determine if Albert Einstein's physical brain structure had a direct correlation to his genius and what they found was astonishing. While the initial studies left much speculation, several new scientific studies found numerous differences in Albert's brain. The first significant study concentrated on a small section of the brain located in the lower frontal lobe called the parietal operculum region. Their inspection of this section of his cerebral matter determined that it was simply nonexistent. A second section called the Sylvian fissure was also gone. Researchers conjectured that the missing areas of the brain allowed neurons to communicate much more efficiently. Backing up the same hypothesis of significant differences in Albert's brain was the synaptic speed and efficiency of his brain. This second study examined Albert's brain and their relationship to glial cells and neurons. While the study was limited in scope, it did show a statistically significant difference between glial cells' ratios found in eleven male test subjects compared to the number and proportions of glial cells found in Albert's brain. One more study observed the size and difference between Albert's hippocampus, a brain region that is significant in memory and learning. The conclusion again showed that this section of Albert's brain was statistically more substantial in size than those of healthy subjects for the same area of neuron concentrations.

Let's now examine savants. Savants are not just mathematical geniuses like the character Raymond Babbitt, portrayed by Dustin Hoffman in the epic movie, *The Rain Man*. A savant is born with mental abilities and cerebral differences far beyond the educated man and there are varying types of savants as well. There is the savant artist, Ray Charles, a poor African American sharecropper son who became one of the world's most celebrated jazz singer-songwriter pianists and composers. Ray's musical genius was remarkable when you factor in his educational disposition, and his economic disparity, compounded by his blindness since childhood. We are left wondering, how did Ray's mind

work? Ray could not see a single note on a sheet of music, yet he astonished audiences by creating and mastering musical subject areas adored by millions of fans. Today, there is the savant, Mathew Whitaker. He is another unique individual, born blind yet he rapidly became a celebrated musical artist at a very young age. Mathew's fantastic story is just starting to unfold. In a recent MRI study, researchers made observations of Mathew's brain region used for vision. As he created and played music on a small keyboard a particular section of Mathew's mind lit up like an entire orchard of Christmas trees under the MRI. His visual cortex showed millions of neurons flashing on and off. Scientists concluded that Mathew's brain had rewired itself. His brain repurposed his visual cortex by extending his creative mind far beyond the normal human subject. Essentially, Mathew visualized music. His brain saw each note, and processed a vast array of music simultaneously at a level never measured in the average human brain; in essence, Mathew's rewired mind was brilliant!

A savant's mind is composed of billions and billions of neurons working in ways we never predicted; but what is a neuron? Wiki says that a neuron is an electrically excitable cell that communicates with other cells via specialized connections called synapses. Wiki is selling you short. The true explanation of "what is a neuron" is much more complex. Chemically, a neuron is a complex collection of molecules with characteristics that vary based upon the layer of the neuron cell we've decomposed. Diving even deeper into the molecule of a neuron cell, focusing specifically on the cell area associated with memory and electrophysiological actions we find a single hippocampal neuron is chemically composed of complex structures like Glutamic acid ($C_5H_9O_4N$), and GABA or gamma-Aminobutyric acid ($C_4H_9NO_2$) along with Dopamine ($C_8H_{11}NO_2$), and Acetylcholine ($C_7H_{16}NO_2$). Going to an atomic level, these chemicals are composed of millions

of particles. Each particle interacting in a specific pattern.

Now then, you're not here to learn about the particles of a neuron in the human brain, but rather the Quantum computer. Like the human brain, a Quantum computer is based upon the interaction of subatomic particles such as electrons or photons. The neuron of the Quantum computer is a Qubit. We are able to engineer and manage qubits using superconducting circuits cooled to temperatures of zero Kelvin. At these extremely low temperatures we can now observe some peculiar quantum properties predicted by our friend, Albert Einstein. He labeled one quantum property as "spooky action at a distance" and that implies a connected group of particles act in the same manner even when separated by galactical distances, and this is called quantum entanglement. The second astonishing feature of a quantum computer is its memory or the state of a particle as observed by quantum physics. Qubits can represent an infinite number of possible combinations of memory states, or ones and zeros at the same time. This ability to simultaneously be in multiple states is called superposition. Traditional computing is based on a binary processing of zeros and ones. Thus a binary language with two symbols is used to resemble a truth state. These mechanisms have just two states, either true or false or on or off. But our quantum computer has a much more complex representation with an infinite number of symbols and states because of the Quantum superposition. The memory space of a quantum computer is therefore infinite as well.

Not if, but when we complete the work on our MIT Quantum computer we will be able to surpass any previous supercomputing calculation or operation, by a quantum leap!

Today, we've scaled our Quantum computer to 32 Qubits, and on the scale of computing systems, this is

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huge. But compared to the human brain, with its billions and billions of neurons, composed of millions and millions of particles, we have only begun to scratch the surface. If we are able to expand our Quantum computer beyond that of a small collection of neuron cells or qubits, and provide it with a language with infinite symbols and memory that can communicate with particles that are billions of miles apart, then this, ladies and gentlemen, is where the rubber meets the road. Like the savant mind, we have stumbled upon the next generation computer, a brilliant machine with a quantum brain.

The lights dimmed, and the noise faded. The pain that seared through the Professor's body ceased and was replaced by serenity as he searched for her face one final time.

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"Brilliant!"

"Psychic or Psycho"

"Amazing!"

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