

Neuronal Connectivity of our Thoughts into Actions

Jack Kushner MD



Brain capabilities

- ◆ Can receive information from olfactory, visual, tactile, and auditory sensors simultaneously
- ◆ Can compute information stored
- ◆ Has decision making capabilities
- ◆ Can take action by controlling parts of our bodies.

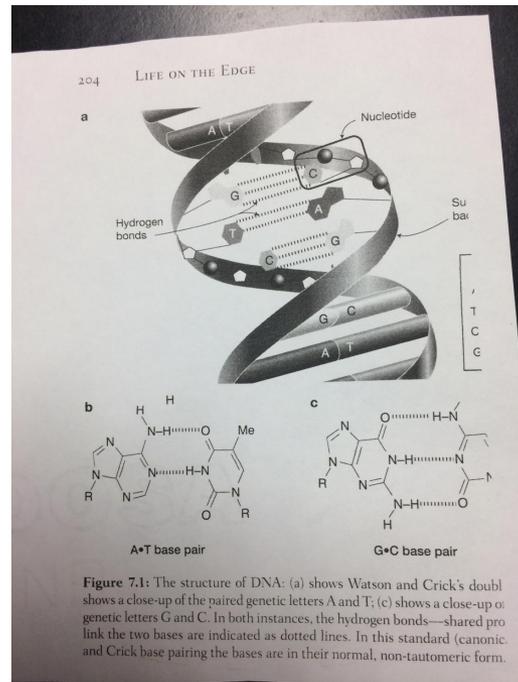
Rene Descartes 1641

- ◆ I think therefore I am
- ◆ Attempted to provide a scientific framework to explain life in terms of physical laws.

Charles Darwin--1859

- ◆ Theory of Evolution-most profound concept in biology

What is life?



Quantum Mechanics

- ◆ Forms the foundation for physics and chemistry
- ◆ Relates to fact that particles composed of atoms, electrons, protons, and neutrons behave as waves.
- ◆ Particles dance around with rapid Brownian movement makes life what it is.

Aristotle 384-322BC

- ◆ What is it that when present in a body, makes it living? A soul
- ◆ But souls were considered immortal and life is fleeting and mercurial

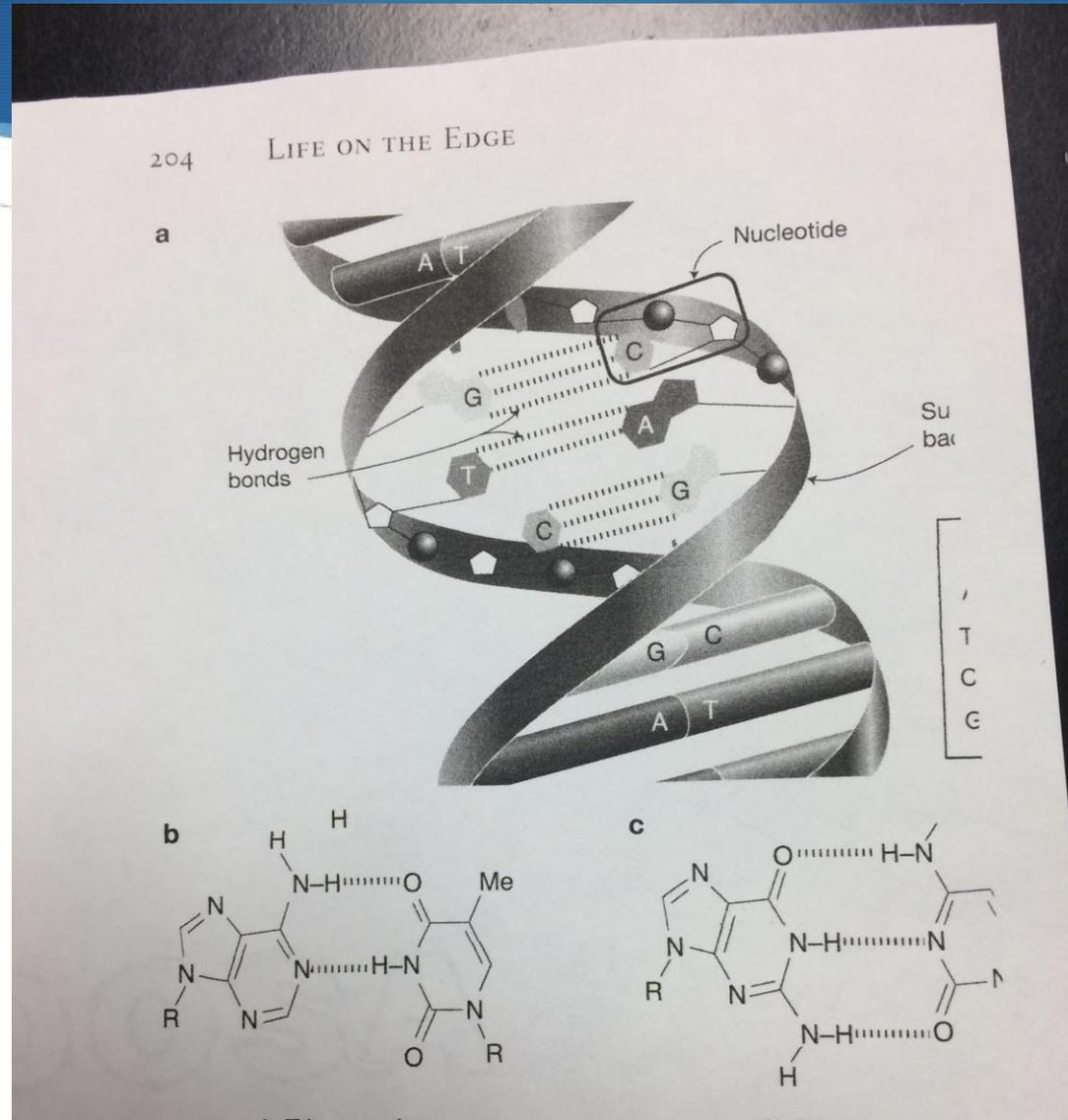
Walter Sutton 1902

Described chromosomes and suggested genes were located on chromosomes.

Oswald Avery—1877-1955

- ◆ Transferred a gene from one bacterial cell to another by extracting DNA from donor cell and injecting it into a recipient cell

Watson, Crick, and Franklin-1953



How does mind move matter?

- ◆ Atoms and molecules are randomly scattered and vibrate constantly
- ◆ Genes which transmit our characteristics depend on this quantum activity

Erwin Schrodinger 1887-1961

- ◆ What is Life—Lecture at Trinity College, Dublin in 1943
- ◆ Suggested genes were a code.
- ◆ Genes are the architect's plan and the builder's craft—all in one.
- ◆ His order from disorder principle could not govern life like in thermodynamics
- ◆ Heredity was governed by order from order.

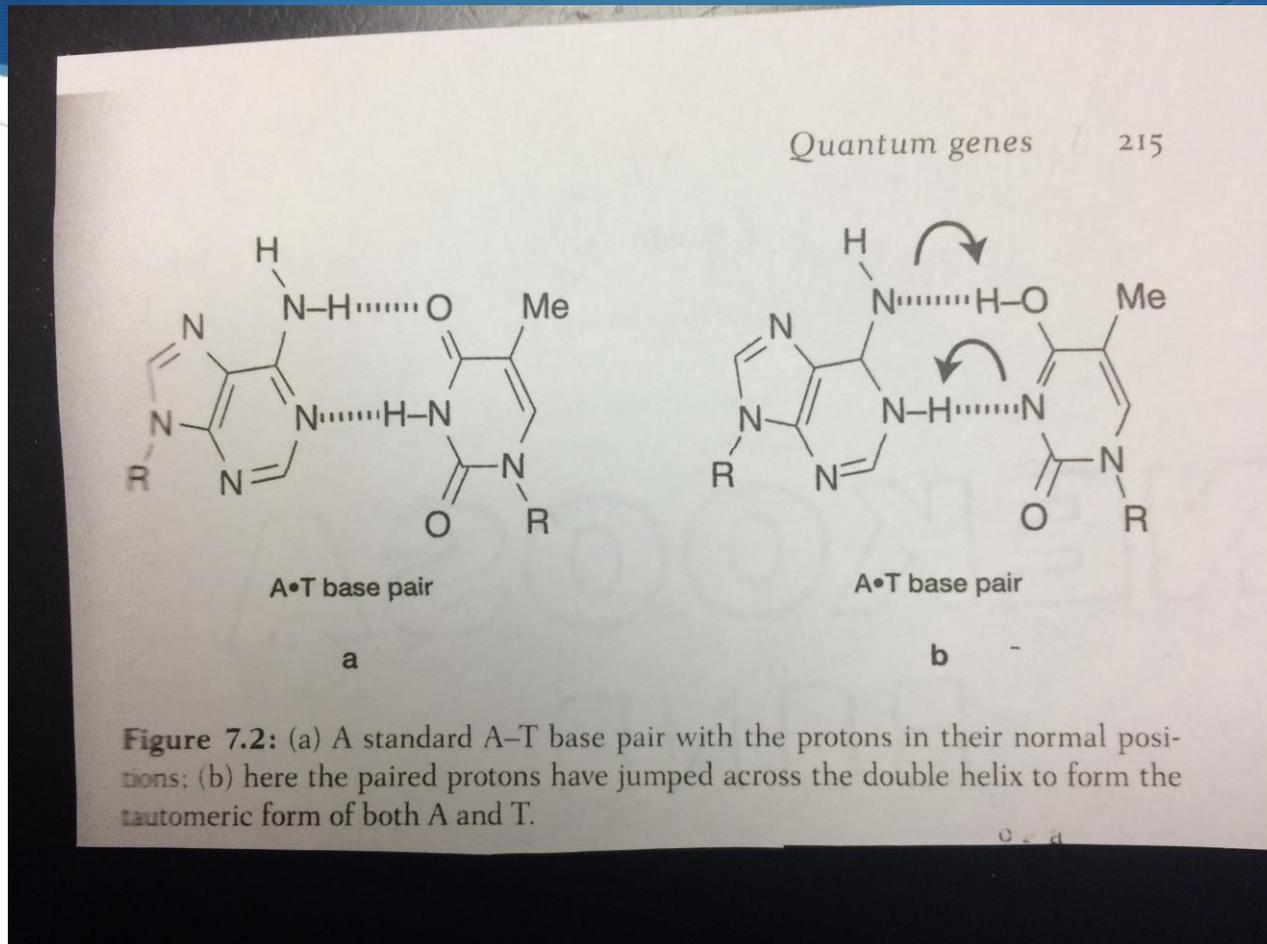
Enzymes

- ◆ Enzymes manipulate individual atoms, protons, and electrons.
- ◆ Resulting proton gradient in the mitochondria is used to drive the rotation of ATPase which catalyzes the hydrolysis of ATP

Secret of DNA

- ◆ Lies in what the helix supports, not the double helical structure.
- ◆ The shared proton is the glue holding two molecules together.
- ◆ Two strands of double helix are pulled apart to allow DNA polymerase access to each separated strand
- ◆ This is the process that underpins propagation of life on our planet..

A-T base pair with protons



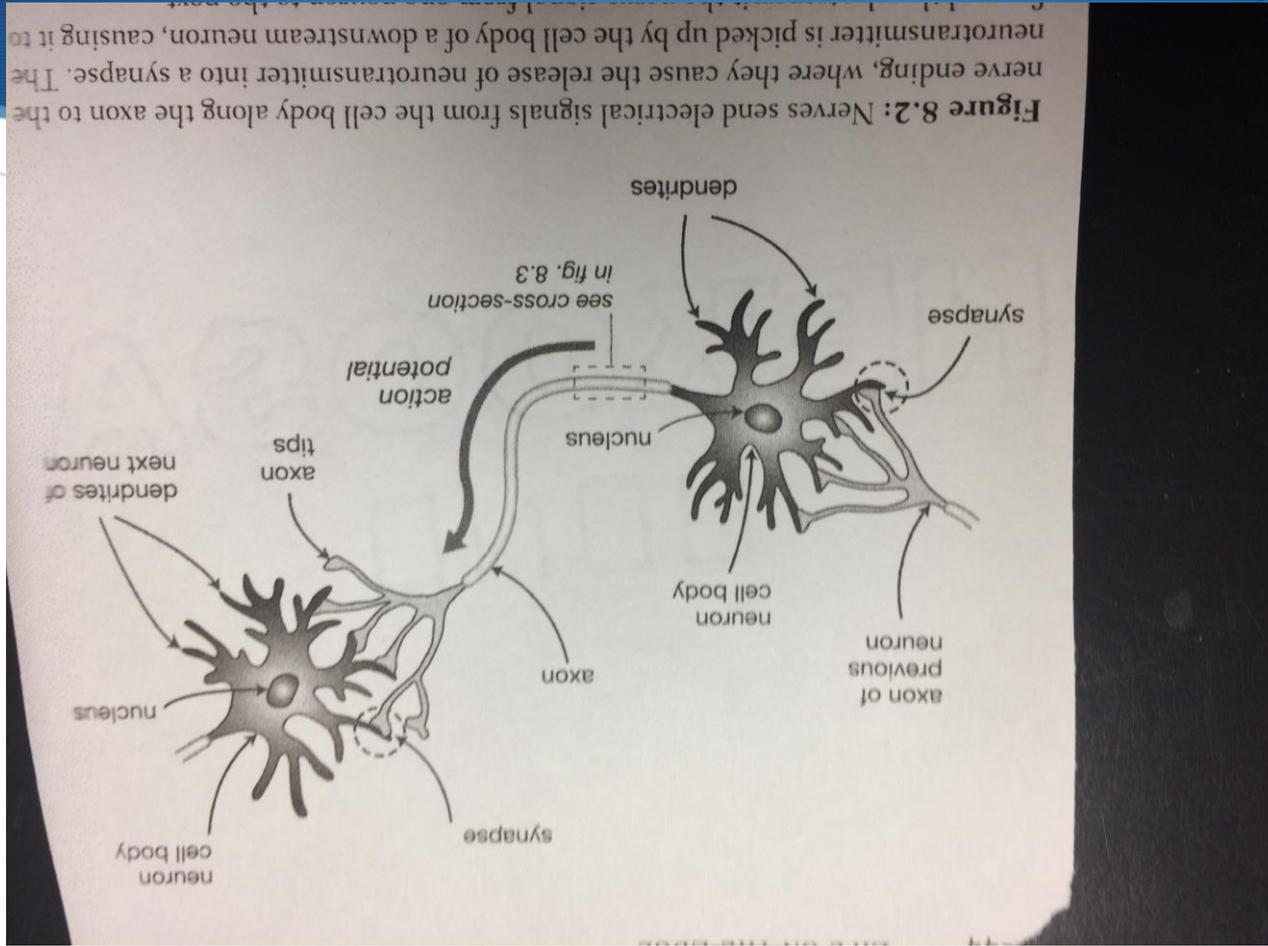
Consciousness

- ◆ Conscious activities are driven by ideas such as the idea behind a word or an action.
- ◆ It is this consciousness that allows our mind to be driven by ideas rather than just by external stimuli such as noise, smell, vision, and touch.

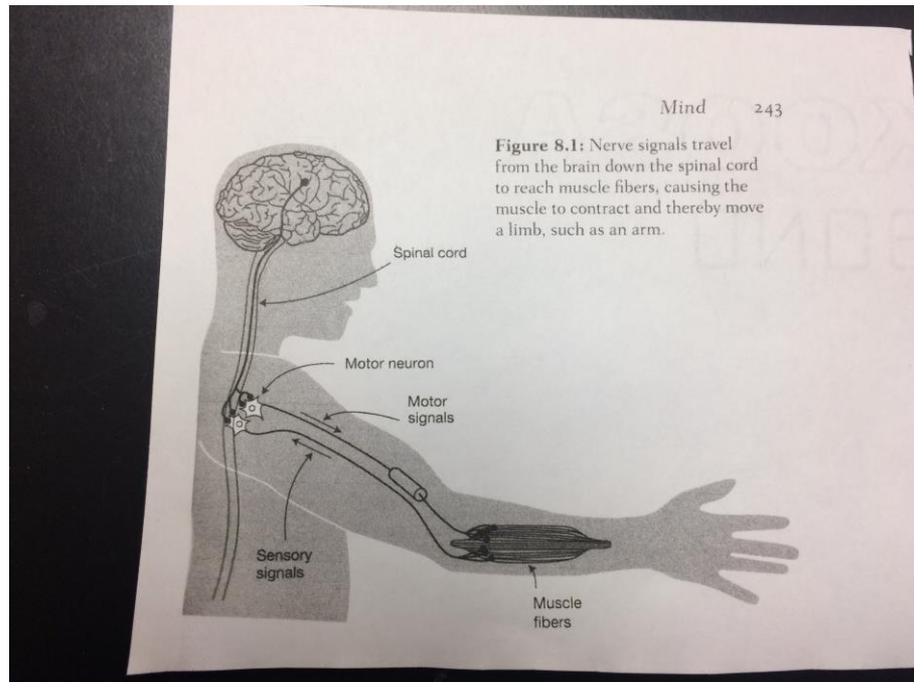
Conclusions

- ◆ Cognizance is stored in form of particles that are constantly moving
- ◆ When we concentrate and focus, both a chemical and an electromagnetic reaction cause these particles to go into an organized formation and initiate enzymatic activity which releases ATPase.

Action Potentials transmit signal



Nerve signals from brain to muscles



Mutation of Brain Cells

- ◆ Mutations do occur in somatic cells including those neurons in brain
- ◆ Additional information is gained by adding single cell genome sequencing to rigorous data analysis techniques.
- ◆ By sequencing individual cells rare mutations are illuminated.