

On the nature of ‘Consciousness’ and ‘Mind’

Hasmukh K. Tank

Indian Space Research Organization, 22/693 Krishna Dham-2, Ahmedabad-380015 India

E-mail: tank.hasmukh@rediffmail.com, hasmukh.tank1@gmail.com

Date: April 25, 2015

Abstract:

It is proposed here that our subjective experience of ‘consciousness’ and ‘mind’ seem to be related to the combined electrostatic field of the whole brain; produced due to compact packaging of electrically-charged neurons. Our subjective experience of ‘consciousness’ may get intensified if the potential-difference between the cell-walls of neurons can be increased from 70 milli Volts, to say, 80 milli Volts. And one may lose the subjective experience of ‘mind’ if the dense packaging of neurons is loosened, by diluting the brain in some liquid, and spreading the network in a larger volume; though the brain may continue to respond to the stimuli, like a machine.

Introduction:

We, the human beings, are perfectly sure that we are sentient, living beings, possessing ‘consciousness’; and feeling the subjective experiences of our ‘mind’. Still, when a neurosurgeon opens a human brain, he is not able to see anything more than the electrically charging neurons, transmitting electrical-discharge-pulses towards their synapses; when the neurotransmitters entering their dendrites exceed a threshold-level.

Our direct, first-hand experience suggests that ‘mind’ and ‘consciousness’ are our subjectively perceivable experiences, and not the objectively-observable entities. Based on this direct experience, we can draw an inference that: where we objectively do not see any ‘mind’, e.g. in trees and plants, then it does not mean that trees are insentient. Similarly, we can not say for sure that the fundamental particles, like the electrons, are insentient. It is quite possible that as the molecules become more complex, their range, or band of perceptions becomes narrower!?! This is, of course a speculation, but:

One thing is certain, that our subjective experience of ‘mind’ and ‘consciousness’ emerge from the large network of neurons, called our brain. So let us closely examine, what is special about our brain. The neurons get electrically-charged with the help of ‘sodium-pump’ run by glucose and oxygen. Each neuron is electrically-charged at about 70 milli Volts. As shown in fig.1(Top). There are about 10^{10} neurons closely packed in our brain. Each neuron can be viewed as an electrically-charged spherical capacitor, as shown in fig.1 (Bottom), and there are 10^{10} such capacitors closely packed in a small volume. So there is a strong possibility that these densely-packed 10^{10} spherical-capacitors may be giving rise to a combined electrostatic field. And whenever electrical discharge pulses pass through neurons, then they disturb the balance of combined electrostatic field of the whole brain, as schematically shown in fig.2.

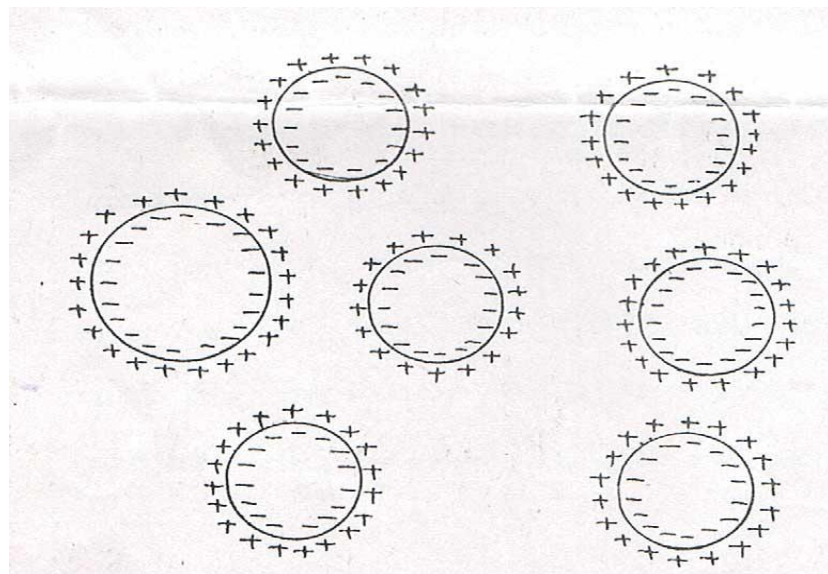
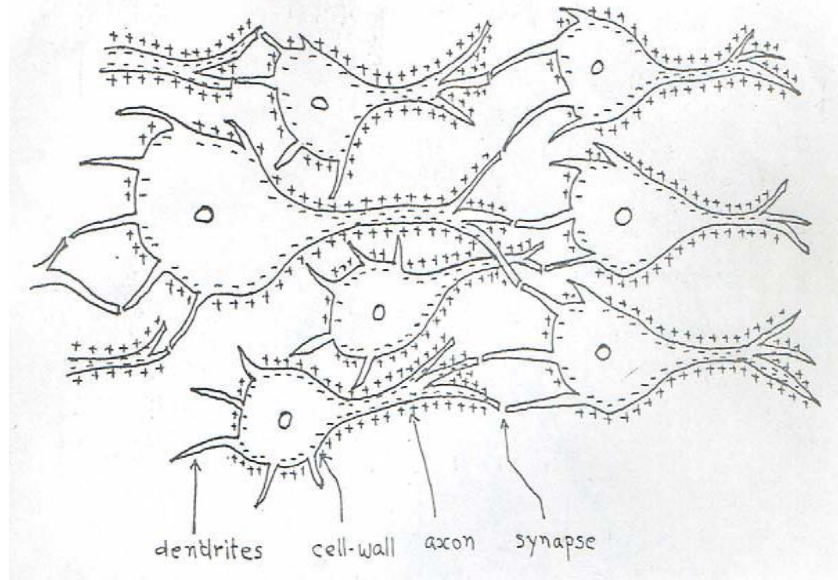


Fig.1 (Top) Representing interconnections of neurons. Each neuron is electrically-charged at about 70 milli Volts. When excitatory neurotransmitters, entering dendrites of neurons, exceed a threshold, the electric-potential across the cell-wall of neuron get discharged; and this pulse travels towards the ends of axons, releasing neuro-transmitters into the synaptic-junction. The arrangement of neurons in this figure can be viewed as electrically-charged spherical capacitors (Bottom)

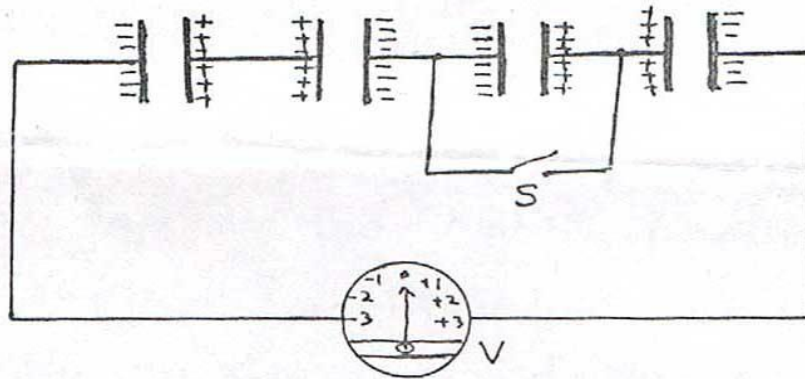


Fig.2: Four electrically-charged capacitors are so connected that volt-meter reads zero volts. But, as soon as switch S is closed, discharging a capacitor, the electrostatic-balance of the arrangement gets disturbed, and the volt-meter reads the voltage-difference. Similarly, when any neuron in the brain gets electrically discharged, the electrostatic balance of the whole brain gets disturbed. It is proposed here, that such electrostatic-balance of neurons of the whole brain, seem to be responsible for our subjective experience of 'consciousness'; and the disturbance of electrostatic field of the whole brain is subjectively perceived by us 'mind'.

The richness of synaptic connections, and complexity of processing of sensory inputs, decide the details of our subjective experience; but the fact, that we are able to subjectively perceive, seem to be related to the combined electrostatic field of the whole brain.

Supposing, a neuro-surgeon could dissolve the lump of our brain in some solution, and spade the network in much larger volume, then the brain may continue to process, and produce appropriate muscular movements; but the subjective feeling, that: "I gave the response", may be missing. Similarly, by increasing, or decreasing the potential-difference, (from 70 milli Volts to say, 80 milli Volts), across the cell-walls of all the neurons, may affect the intensity of subjective experience of 'mind'.

The brain internally generates a sort of 'carrier waves':

- (i) Alpha waves of frequency 8-10 cycles per second, giving rise to subjective experience of general awareness;
- (ii) Beta waves of frequency 10-50 cycles per second, giving rise to subjective experience of focused attention and concentration;
- (iii) Theta waves of frequency 4-8 cycles per second, giving rise to dream state of 'involuntary imagination'; and
- (iv) Delta waves of frequency 1-4 cycles per second, sleeping the subject to sleep.

Then the external sensory inputs modulate or modify the above carrier waves, giving rise to detailed subjective experience of the external world. And perception of our responses to stimulate provide a feed-back, generating the subjective perception of 'I am. I saw, and I responded.

Stimulants like tea and coffee increase the frequency of carrier waves from 4-8 cycles to 8-50 cycles; helping us to remain awake during travel, or in the office!