

## Human Vision, Cosmic Forces and the 21<sup>st</sup> Century Scientist

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We have within reach a unity of biological and materials sciences at the level of electrons and photons. For decades as attendees of this meeting we have benefitted from exchanges of technology and advances in instrumentation for each group. But we have moved on separate tracks. Biology is still clinging to some theories and concepts from the 19<sup>th</sup> and 20<sup>th</sup> century. Human biology has yet to incorporate the potential and significance of the new findings on human vision from fMRI and other new approaches and the role of the cosmic forces of gravitation and the electromagnetic field in the human body.

Materials science is closely allied with applied math and physics and is constantly changing in response to increased knowledge of the universe, star formation and theories of the cosmos. Materials science is also responding to demand from humans for better materials to provide comfort, ease, safety and speed.

This talk illustrates a new approach to human biology that addresses the totality of human experience and shifts our attention to the electrons inside us for the immediate benefit of both disciplines.

Our approach now is to spend most of our time on preparing the equipment and the specimen. However preparing the human observer is a crucial part of the whole process for a successful outcome. We pay attention to the technology and not the deeper connections between humans and all that surrounds us. Both biologists and materials scientists have used 3D imaging to gain new information. We have been rewarded with multiple perspectives that change our understanding of dynamic structures. We know about specimen drift and how fast things can change. Yet we rarely look inside ourselves and see the limitless possibilities below the molecular and atomic levels. We define an edge between known and unknown and routinely venture out. But we still cling to the edge and use an incremental approach.

We are comfortable with the reality of electrons, flowing outside of us in wires and in electron microscopes, but not with electrons flowing inside us. We even embrace the concept recently presented by scientists using the Hadron supercollider that the electron is the portal to all that we know in the whole universe of light. We know that we are made of “star stuff,” so at some point we must take the first step in understanding how human biology follows the laws of the universe. What happens if we assume that routinely electrons bring about change in the human body? We constantly use the energies released from electrons in the specimens we examine, but cannot make the leap from feeling energy flow in the human body to a systematic inquiry of where are the electrons and when do they change.

Some biologists know that quantum processes exist in animal and plant cells. We know about proton pumps in mitochondria, and most recently in bacteriorhodopsin molecules, and also about electron transfer in photosynthesis and in base pairs in DNA. But we keep treating these as isolated occurrences. We ignore the general significance and the potential importance of the world of photons and electrons in energy flow in the human body. We can picture in an abstract way the release of photons from electrons in the entire universe, yet we continue to separate the human from everything else in the universe and from what we call on Earth, Nature.

For thousands of years humans gazed at stars and knew that the sun and moon were vital to their existence. Our ancestors walked barefoot on Earth, took in the photons from electrons on the sun and experienced the electromagnetic flow. They recognized a source of energy outside of themselves. Today when we think of energy into the body, we mostly think of food and the fuel that food provides.

For over 100 years we have considered the cell as the functional subunit for plants and animals. This approach emphasizes the middle levels of the structures and functions inside the body (e.g., nucleotides and proteins.) The first half of the 20<sup>th</sup> century brought huge advances in technology and research supporting two theories of the 19<sup>th</sup> century: evolution and cell biology. The second half of the 20<sup>th</sup> century with further advances in technology (e.g., electron microscopes and spectroscopy) brought further specificity down to the level of molecules: in the case of evolution—DNA and genes, and for cell biology—RNA and proteins. Now in the 21<sup>st</sup> century, we are using non-invasive techniques to see what goes on inside of normal humans, we are exploring galaxies in the far reaches of our universe, and we are recording the behavior of individual atoms. We can prepare now to journey far inside the human.

New facts about human vision are required. Information (95% of our input to the brain) comes through a visual pathway in the brain. Boundaries and categories are essential for object recognition. Each morning when we wake up, what we see is a function of every image we have ever seen. We choose what we see, and each of us has a unique data bank of images. We see with our whole brains. What we see changes our brains. Each one of us has an everyday reality that builds up one image at a time.

Seeing is a whole body performance. Imaging and image analysis by all of us requires being awake and aware. All of the body requires oxygen and especially the brain for high levels of awareness. When we are fearful or angry our brains go back down to the survival mode and we miss the big picture and a myriad of details. Whole body concentration brings us to a new level of success. Star athletes, musicians and other artists talk about being “in the zone,” a recognized and acknowledged feeling of energy flowing. They train for it. Scientists need this same calm, relaxed and energized creativity and we too can train for it. Analysis, alone, limits us to looking backward to what has already happened. Now is measured in femptoseconds in science and in hundredths of seconds on your stopwatch.

The big shift is in how we see ourselves in relation to everything else. The standard definitions of a Tesla, a unit of electromagnetism, show the connection to all that is in our spacetime continuum. What is inside us and what is outside is in continual flow. Begin to think about how many molecules, how many atoms, how many electrons we inhale with every breath. The boundary (e.g. cellular membrane) between “in here” and “out there” can be moved and reprogrammed at many different levels. The larger boundary defined by our own electromagnetic field needs further study.

Be in tune with your own body. Gravitation on Earth defines our physical body and more new facts will be presented. We take our bodies for granted and ignore warning signs clearly posted. We align our microscopes and should also align our bodies for good energy flow. The capacity to change is already built in and it is huge. Let go of the past, try new definitions, and redefine who you are each day [3].

#### References:

- [1] Goldstein, Margaret A., et al, *J. Appl. Physiol* 73 (1992), p 94S.
- [2] Goldstein, Margaret A., Cheng, J. and Schroeter, John P., *Aviation, Space and Environmental Medicine* 69 (1998), p 6.
- [3] The author thanks Professor H. Chang for useful discussions.