

For these reasons, I urge those well-intentioned scientists in the US who want to help their colleagues in Cuba to be extremely cautious, making sure that any support they provide goes to individual scientists, not institutions, and does not contribute to the further abridgment of the human and professional rights of those scientists. I also encourage the American Physical Society to find ways of increasing exchanges with individual Cuban physicists while abiding by these principles.

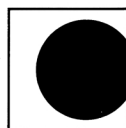
MARCELO ALONSO
Melbourne Beach, Florida

Brain Researchers Differ on MEG's Role in Getting Ahead

Sam Williamson's review of my book, *Neocortical Dynamics and Human EEG Rhythms* (April, page 57), touches on several issues likely to engage physicists with an interest in brain research. Three obvious dichotomies involving complementary approaches to large-scale brain dynamics are theory versus experiment, electroencephalography (EEG) versus magnetoencephalography (MEG) and local function versus global function.

Since Sam and I tend to be at opposite ends of each of these categories, it is perhaps not surprising that he bemoans my very brief treatment of MEG, which, thus far, has been used mainly to study local brain function. He is quite correct that MEG has shown value in medical evaluation of the subclass of epilepsy patients with seizures starting in small regions of tissue that may be surgically removed, perhaps after being located through the use of a combination of MEG and EEG data.

However, most normal and abnormal brain states (including many of the epilepsies, cognitive disorders and neuropsychiatric illnesses) are best characterized by neural sources that are distributed over large fractions of neocortical surface. My book emphasizes that brains seem to like combinations of functional segregation and integration modulated by chemical neurotransmitters that may alter neural control parameters. Theoretical work in neuroscience suggests that extreme global behavior may result in standing waves of synaptic action that compete with local circuits, as described by multiple branches of dispersion relations. Solid-state physicists may appreciate a partial analogy to localized/extended wavefunction states in disordered solids. In my book, the



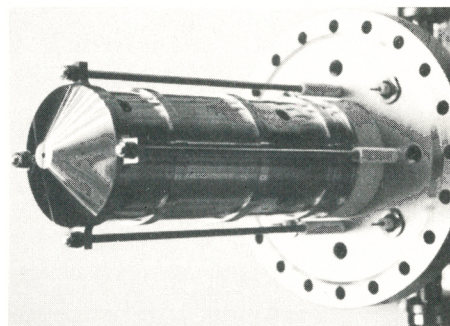
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specialized chapter contributed by Richard Silberstein reviews intriguing data suggesting that Parkinson's disease, Tourette syndrome and schizophrenia may be pathologically hypo-coupled or hypercoupled states that result from faulty control parameters. Local and global neural processes may be distinguished by EEG/MEG studies (perhaps by means of different resonance behavior), so these ideas are subject to experimental test. The chapter contributed by Lester Ingber outlines a statistical mechanics of neocortical interactions at multiple scales that complements macroscopic theories.

The main limitation of global MEG studies is the cost of multichannel systems (perhaps a factor of 30 higher than for similar EEG systems). However, many such MEG studies will likely be carried out by physicists in the future. Chapter 1 of my book contains several references to review articles (including one by Sam Williamson) on MEG.

A major pitfall for physicists and engineers doing brain science is that of becoming so enamored of either hardware or mathematics that they forget brain science. At the other extreme, cognitive or medical scientists may ignore physical principles or theoretical tools in a premature rush to enlightenment. My book may help scientists from such disparate backgrounds to strike a proper brain balance.

PAUL L. NUNEZ
Tulane University
New Orleans, Louisiana

WILLIAMSON REPLIES: Paul Nunez's description of magnetoencephalography (MEG) is mostly correct but not particularly revealing. Indeed, the application of superconducting detectors to identify active locations in the human brain has been so successful that the practice is becoming known as magnetic source imaging (MSI). He would be delighted to see the activity at professional meetings that focus on MSI, and to appreciate how many physicists are really dealing with the brain, not just instruments. Several research groups are now participating creatively in devising and applying new experimental paradigms.

I agree with the last paragraph of Nunez's letter. Accordingly, I suggest he read "Dynamical Organization of the Human Visual System Revealed by Lifetimes of Activation Traces,"¹ in which my colleagues and I present the first evidence for a hierarchy of processing memories in the human visual system. Indeed, it is helpful to think of the memory strength as an order parameter. The lifetimes for

these memories range from 200 ms to 30 s. Widespread activity (which Nunez should appreciate) has been characterized by an array of 122 superconducting sensors.

Reference

1. M. A. Uusitalo, S. J. Williamson, M. T. Seppä, *Neurosci. Lett.* **213**, 149 (1996).
- SAMUEL J. WILLIAMSON**
New York University
New York, New York

Physicist Writing His Memoirs Seeks Contact with Former Students

I am working on an autobiography and want to build a more complete list of students I have guided on junior papers, senior theses and PhD dissertations, as well as of postdoctoral researchers who have joined my endeavors over the years. Unfortunately, the lists and the memory that I have now at age 85 contain black holes from which no information can escape.

If you are one of the students or postdocs I have worked with (or know someone who has been but might not read this letter), please let me hear from you.

I'd like to get from you a list of all of your degrees (not just the one you may have earned with me), the year(s) we worked together, your present address and occupation and how best to reach you (e-mail or otherwise).

Very little of this information will actually be used in the autobiography, but it will help me bring great days, great discussions and great friends back to life.

My friend Ken Ford has kindly volunteered to receive and collate this information. He can be reached by e-mail at kwford@aol.com (preferably), by fax at 215-844-1399 or by regular mail at 729 Westview Avenue, Philadelphia, PA 19119.

JOHN ARCHIBALD WHEELER
Princeton University
Princeton, New Jersey

Corrections

May, page 35—In the photograph of the 1933 Solvay Conference, the person sitting to the right of Marie Curie is Paul Langevin and the person sitting to the right of Langevin is Owen Richardson.

October, page 68—The correct prices for *Julian Schwinger: The Physicist, the Teacher and the Man*, Y. Jack Ng, ed., are \$38 for the hardcover edition and \$16 for the paperback edition. ■

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