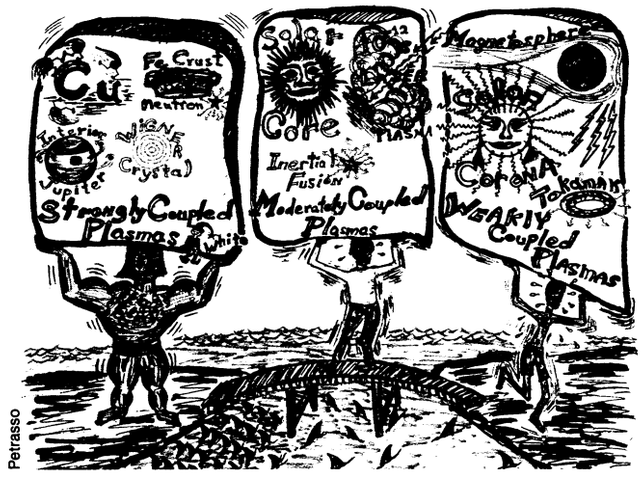
plasma, nuclei fuse and release energy, which researchers hope to harness to generate electricity.

Using their new equations, Petrasso and Li have calculated how speedy, charged particles — alpha particles, tritium nuclei, or electrons — deposit energy into a dense, moderately coupled plasma formed at the center of a nuclear fuel pellet as it goes from its initial cold state to full ignition. They described their techniques in two papers in the May 17, 1993, PHYSICAL REVIEW LETTERS.

When Li presented these results at the Santa Fe meeting, they prompted a great deal of heated discussion. "In some ways, this work engendered more controversy than any other topic," says Thomas A. Mehlhorn of the Sandia National Laboratories in Albuquerque, N.M., who chaired the meeting.

Some critics complained that the most significant parts of the work were of little practical value in plasma calculations for fusion research. The extra terms included in the new equations turn out to be unimportant in most real situations, they argued.

"I don't think we know all the answers at this point," Petrasso replies. "But if nothing else, I do feel confident that [our approach] provides a different insight into the problem, and I think it's much simpler mathematically. Alternative approaches tend to be more complicated."



Petrasso

Richard Petrasso's cartoon depicts three categories of plasmas, characterized by different ion densities (as seen in the concentration of shark fins).

Other critics insisted that supercomputer-based calculations intrinsically take into account the effects highlighted in the Li-Petrasso equations. However, not every physicist wants to turn automatically to a computer for the solution to any problem that comes up in understanding plasmas or other aspects of the physical world.

"There are complicated problems, and there are problems that need computers," Petrasso readily concedes. "But how do you know you have the physics [properly encapsulated in the computer program]?" he asks.

Moreover, for researchers unfamiliar with the details of exactly how certain computations are carried out, results that come out of a complex computer model can often prove less than insightful.

"Maybe our contribution will be that [our formulation] helps us to see things from a different point of view," Petrasso says. "That might be useful. We have a simple formula, and it's easy to understand physically. The final result has a certain clarity about it that's very difficult to obtain through other approaches." □

Books

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The First Humans: Human Origins and History to 10,000 BC — Göran Burenhult, ed. As the first volume in a series entitled "The Illustrated History of Humankind" produced by the American Museum of Natural History, this book is devoted to how humans developed in relation to technology, cultural change, and behavior. Most interesting are narratives about how migration altered their lives and gave rise to many new kinds of technology, culture, and behavior. Each of 38 sections is written by professors and researchers in the fields of anthropology, archaeology, and geology, and the book is enhanced by more than 300 color photographs. Harper SF, 1993, 239 p., color photos and illus., hardcover, $40.00.

The Hearing Loss Handbook — David M. Vernick, Constance Grzelka, and the editors of Consumer Reports. For people facing hearing loss or auditory disorders, this reference provides a basic introduction to sound and how the ear works, then outlines testing procedures for hearing problems and common causes. Additional chapters describe how to detect hearing problems in children and find the right medical help and schools, how to find the right hearing aid, and preventive measures for hearing loss. Consumer Reports, 1993, 278 p., b&w illus., hardcover, $22.95.

The Independent Home: Living Well with Power from the Sun, Wind, and Water — Michael Potts. A compilation of interviews with people from every corner of the United States who have left the utility grid and created self-sustaining homes that use renewable and clean resources. Functional advice for virtually anyone looking to achieve these goals is intertwined with first-hand accounts, including descriptions of every aspect of building an independent home — from planning, to finding an appropriate location, to potential problems. Ancillary items such as solar hot water heaters and cars are featured as well. Chelsea Green Pub, 1993, 300 p., b&w photos and illus., paperback, $17.95.

Scribes, Warriors and Kings: The City of Copán — William L. Fash. The ruins of Copán are some of the most complete excavated in the New World; however, deciphering scripts found there was a tedious process that hindered the project for years. Fash, director of the Copán Acropolis Archaeology Project, relays the major discoveries that broke the code and describes what we now know about the ancient Maya at every sociological level. The environment, political structure, and art of the Maya are also described. Originally published in hardcover in 1991. Thames Hudson, 1993, 192 p., color photos and b&w photos and illus., paperback, $19.95.

Why Zebras Don't Get Ulcers: A Guide to Stress, Stress-Related Diseases, and Coping — Robert M. Sapolsky. A thorough and often entertaining look at the biology of stress — how hormones and the brain react when stressors strike humans and how stressors affect our bodies, especially in relation to cardiovascular disease, digestive ailments, aging, inhibition of growth, reproductive failures, and faulty immune systems. However, Sapolsky's ideas for thwarting the negative implications of stress on the body and coping successfully impart hope. WH Freeman, 1994, 368 p., b&w illus. and photos, hardcover, $21.95.

The Young Scientists: America's Future and the Winning of the Westinghouse — Joseph Berger. Students competing in the Westinghouse Science Talent Search vie for more than $200,000 in scholarships, making this the premier science competition in the United States. And the prestige of being a top 40 finalist virtually guarantees admittance to a top college or university. Berger investigates how teenagers reach this pinnacle and how many are able to produce original research projects at the graduate level or higher. He focuses on their home life and cultural heritage and specifically examines the teaching methods of the science-oriented schools that many of these students attend. He focuses on Stuyvesant and the Bronx High School of Science in New York City, where the Westinghouse has created rivalries comparable to those centered on football in most other high schools. Addison-Wesley, 1994, 243 p., hardcover, $21.95.