Superconductivity Conference

Seattle LYM Conduct Between the Notes

by Wesley Irwin,
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LaRouche Youth Movement (LYM) organizers attended the week-long Applied Superconductivity Conference in Seattle, Washington, Aug. 27-Sept. 1, to interject some scientific and economic reality, and to learn more about the amazing technology of superconductivity. We found an open response from hundreds of scientists, who need our help in keeping science alive. We happily discussed solutions to the breakdown of the U.S. science orientation, and the ongoing global economic breakdown.

Superconductivity is one of the most amazing scientific discoveries of the 20th Century. This still largely unexplained property causes certain materials, at very low temperatures, to lose all resistance to the flow of electricity, thus enabling a variety of new technological applications. Its development could revolutionize our use of electricity, enabling higher efficiencies than previously imagined were possible.

Discovered in 1911, by a Dutch physicist named H.K. Onnes, superconductivity was first demonstrated in cooled mercury metal. Through the 1900s, many other materials were found to be superconductors at temperatures below 23.2 kelvin. These materials are referred to as low-temperature superconductors (LTS), while those discovered decades later are known today as high-temperature superconductors (HTS), and are used at temperatures above 23.3K.

In 1986, J.G. Bednorz and K.A. Muller made an enormous breakthrough, discovering copper oxide-based ceramic materials that could be superconductors at temperatures as high as 35K. This was followed by another revolutionary discovery in 1997, by Dr. Paul Chu, who found a superconductor functioning above 77K (about 196° celsius), which is the boiling point of liquid nitrogen. (Dr. Chu was one of the scientists we talked with at the conference.) Since Chu's breakthrough, worldwide research has uncovered oxide-based superconductors with critical temperatures as high as 135K, which offer tremendous potential for improving the efficiency of electricity.

Transforming Electrical Transmission

Today's application of superconductivity technology is potentially all encompassing for the electric world. HTS wires, for example, are capable of carrying currents that are more than 100 times higher than currents carried by conventional copper wires of the same dimensions. HTS power cables can transmit 3-5 times more power than conventional copper cable of equivalent cross section. Unlike oil-cooled electricity transformers, HTS transformers, cooled by liquid nitrogen, pose no fire risk, and are capable of operating at twice the overload capacity of conventional transformers. Some of these cutting-edge wire and cable technologies are already being successfully implemented in Albany and Long Island, New York, and in Columbus, Ohio.

In the transportation sector, HTS is being studied closely by the U.S. Navy, among others. In fact, in 2000, the U.S. Navy announced that it would eventually migrate toward an all-electric fleet! Electric propulsion systems more fully integrate a ship's total energy usage, and HTS motors and generators operate at one-third the size and weight of their conventional copper-wound predecessor, not to mention that they run more quietly.

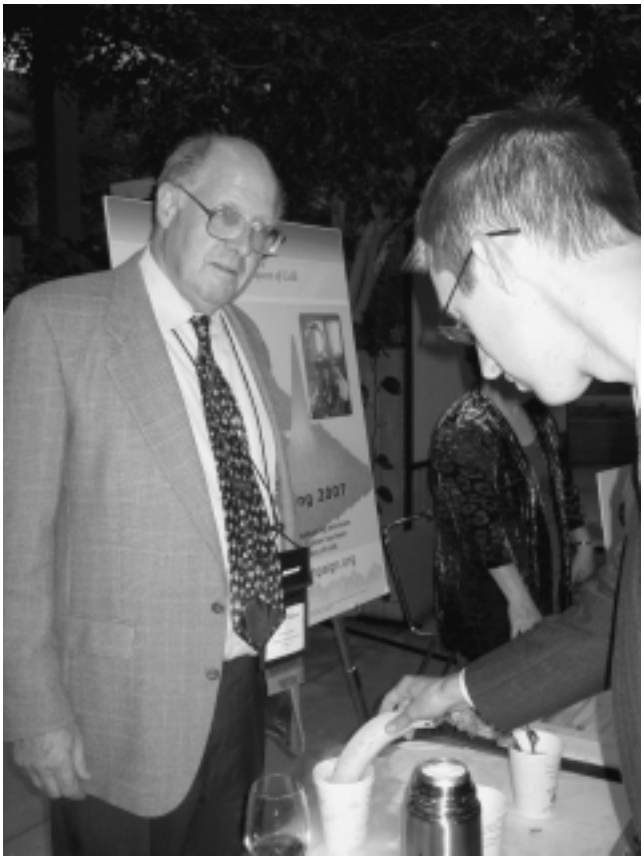
Perhaps most exciting is the potential advancement of transportation systems through HTS application to magnetically levitated (maglev) trains, which, by utilizing superconducting magnets, are able to make trains safely "fly" above their tracks with zero rail friction; the opposing force of the giant HTS magnets causes the train to float. Magnetically levitated trains have thus far attained top speeds in excess of 500 kilometers per hour!

The scientific optimism associated with this amazing maglev technology was conveyed by the LYM organizers at the superconductivity conference, with the idea of building international maglev systems to transport physical goods, people, and cultures around the world.

Other applications of superconductivity have already made their mark. Medicine has been forever changed through the initial breakthroughs in HTS. Magnetic Resonance Imaging (MRI) requires HTS for the magnets needed for precision diagnostics imaging. Conventional magnets cannot provide the field values required for MRI, which relies entirely on a superconducting magnet.

In NMR (Nuclear Magnetic Resonance) spectroscopy science, LTS materials are being utilized to create progress in drug discovery, biotechnology, and genome and material science. NMR spectroscopy is even used in such areas as the determination of the chemical structure of extraterrestrial matter in meteorites, as well as the flow of matter in a variety of Earth materials.

In high-energy physics research, superconducting magnets are essential. The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory in New York, which smashes heavy ions together at very high energies, has two concentric rings which are made up of 1,740 superconducting magnets that contain over 1,600 miles of superconducting wire. The Fermi National Laboratory in Illinois has a similar device which accelerates protons and anti-protons to



EIRNS/Chris Jadatz

Author Wes Irwin dips a banana into liquid nitrogen at a cryogenics display at the superconductivity conference. When hit with a hammer, the super-cold banana was smashed into pieces as if it were made of glass.

99.9999% of the speed of light (!), then smashes them together, to investigate what particles are produced.

Future Technologies

Most exciting may be the application of superconductivity science to nuclear fusion power, and space exploration, both subjects that LYM members have been researching, including tours of science facilities and special projects, to help push mankind off planet Earth, and into our natural role as gardeners of our Solar System, and even the outer regions of our galaxy.

One of the biggest scientific research projects in history, the International Thermonuclear Experimental Reactor (ITER) is the test model for what will become the first electricity-generating power station based on magnetic confinement of high-temperature plasma. This new fusion power device will require 1.8 million pounds of superconductors to help generate the high magnetic fields needed to confine and contain the high-temperature plasma, which reaches temperatures of 250,000,000° C—hotter than the Sun!

Superconductors are under development for a whole array of space-related applications, including magnetic actuators, magnetic refrigeration, space-based magnetic plasma confinement, and even magnetically assisted propulsion. Just imagine a magnetic propulsion system on Earth capable of launching space shuttles into space, free of the burden of giant fuel containers. This would be ideal for continuous flights to Mars! All these potential developments are achievable in the near future—if the LaRouche movement succeeds in implementing a policy for science-driver economic cooperation across Eurasia, and then the rest of the world, in the coming period.

A Question of Political Will

The onrushing physical economic breakdown of the increasingly privatized infrastructure in the United States, has created a crisis situation: Old neglected power lines are catching fire, energy grids are susceptible to frequent shutdown, and entire cities are facing possible blackouts for hours, days, or even weeks, as power cables are pushed beyond their thermal limits. This brings us to the crossroads at which superconductor technology is not a mere "convenience," but rather is one of a number of very real, life-or-death investment decisions for the U.S. Congress in its next session. Unfortunately, the Cheney/DeLay Republican-controlled Congress voted not to increase funding for superconductivity research, which is hovering currently at a mere $35 million a year, a ridiculous amount for a research field that holds such promise for the physical economy, and which has produced five Nobel Prizes in physics.

Dr. Alan Lauder, the executive director of the Coalition for the Commercial Application of Superconductors (CCAS), which was a major sponsor of the Applied Superconductivity Conference, said the amount of money being put into research and development should be *doubled* out of immediate necessity alone. Lauder stated that if you take a look at a picture of what was running underneath the ground of major U.S. cities in 1906, and look underneath the exact same streets in pictures taken in 2002, the "failing infrastructure" of today is, "literally, the same as it was back then!" "The fashion of the men's clothing changed in the picture, and that's about it," Lauder stated.

The director of the Oak Ridge National Lab's Electricity Delivery Program, Robert Hawsey, stressed that superconductivity science needs government funding, because it is too big for the private sector to handle on its own. Hawsey said that if it weren't for FDR's Tennessee Valley Authority infrastructure program, which required a national political fight on economic policy, he wouldn't be living and working in Tennessee today. The issue of increased funding in the field is completely political, he said.

Hawsey, who is also the head of the Renewable Energy Program at Oak Ridge, was adamant that the world has to move to massive nuclear power production. However, under current levels of funding, he said, the United States will be able to produce just a handful of nuclear plants over the next

EIRNS/Siri Martin

Seattle LYM members Chris Sandford, David Dobrodt, and Linda Vu in discussion with a superconductivity exhibitor (at right).

decade, at best.

In this discussion, and others, it became clear that although problems associated with the collapse of science infrastructure were widely recognized, there were little or no hypotheses being generated about the method of physical economic thinking needed to solve the crisis.

LaRouche Youth in Dialogue

LYM members Siri Martin and this author were able to have discussions with some of the world's most renowned scientists involved in superconductivity. What stood out to many of the scientists we spoke with, was that only a minuscule group of youth attended the event, and the level of scientific competence and interest we had in such a broad array of scientific fields.

Dr. Stephen Gourlay, the director of the Accelerator and Fusion Research Division at the Lawrence Berkeley National Laboratory, said that he, like many of his colleagues, know that there are not enough young scientists who want to work in these fields. Gourlay agreed that part of the problem in United States was the shift from a producer- to a consumer-oriented economy, that has taken place over the past four decades. He happily agreed to set up a tour for the LYM of the fusion research facility at Berkeley. We told him about the LYM work on Kepler's discovery of universal gravitation, and on Vernadsky's work on biogeochemistry, and Gourlay (like everyone else we talked to at the conference), said that to restore the scientific tradition of the United States, the shift must come from government. He joked ruefully about how the lack of funding (the fusion research budget is peanuts) means that we'll always be 30 years away from fusion power.

Victor Yarba, a Russian nuclear physicist working now at the Fermi Laboratory, who decades ago made three original breakthroughs in nuclear power research, was even more adamant about the role of the youth in the United States. "You're the future! You're the ones who must do it!" he exclaimed. We told him about our work on rediscovering the discoveries of Mendeleyev's Periodic Table and Vernadsky's conception of the Noösphere. He became very excited, but then expressed great sorrow at how the United States used to lead the world in science, but that now that tradition is almost dead.

Yarba has trained more than 200 other Russian scientists who are now working in the United States. He excitedly took all of our literature and wanted to stay in touch. In the science field, as with most everything else of real physical value, the United States is currently importing quite a lot, and producing very little.

The last day of the conference featured an "open to the public" session, and all the Seattle members of the LaRouche Youth Movement attended, having discussions with the superconductivity scientists, and playing with their experiments—the liquid nitrogen was especially fun. We were by far the largest group of young people there, and were very effective in engaging many of the scientists on the difference in method between Leibniz and Newton. We also intellectually fought with others over the Second Law of Thermodynamics, challenging these scientists on the self-evident reality of the Universe's anti-entropic, self-developing nature, which is an idea that flies in the face of all the teaching of modern physics textbooks.

A 'Solarian' Symphony

We distributed more than 100 copies of *21st Century Science & Technology* magazine. For many of us, the conference was a glimpse at what a culture based on discussion of beautiful scientific ideas could actually be like—a world in which current conceptions of reality are based not on immediate sense experiences, like those perceived by higher ape species, but rather on the scientific conception of what you want your life to have contributed to humanity's development, 50 years down the road from the time your biological existence ends. Because of the rigorous science and music curriculum pursued by the LaRouche Youth Movement, we were able to uplift the discussion in some cases to that more truly human level, by providing the overarching idea necessary for beautifying the composition of the conference itself.

The largest roadblock for the application of superconductor science today, comes from a Baby-Boomer-dominated Congress, and a highly intellectually challenged President, who both, in varying degrees, represent the thinking quality of the U.S. population. For those who claim ignorance of conceptions of physical economy, the LYM will be there to give scientists, Congressmen, and citizens, the needed pedagogical illustrations, through their own ongoing work on Kepler, Vernadsky, and Bach, to help compose a cultural symphony of undeniable joy and optimism that will radiate out for generations to come. In doing so, we may become the zero-resistance conductors of mankind's future solar symphony.