INTERVIEW: DR. STEPHEN GOURLAY

Science Today Needs A 'Grand Vision'

Dr. Stephen Gourlay is the director of the Accelerator and Fusion Research Division at the Lawrence Berkeley National Laboratory in California. He was interviewed by Wesley Irwin on Sept. 12, 2006.

Question: What goes into accelerator and fusion research?

Our job is to do the things that can't be done in industry. We don't compete with industry. Government funds a lot of things in that category, and sometimes that's the only way we get them done. We support high-energy physics, so we develop cutting-edge technologies to further the means of high-energy physics: high-energy accelerators, new techniques, more effective ways of accelerating particles.

Machines are getting very big nowadays, so we're trying to get the cost down. We may be pricing ourselves right out of the market in terms of science, if we can't come up with clever new ways to do the job we need to do, and so we have a considerable effort focussed on that.

In the fusion area, we utilize accelerator technology to do inertial fusion using heavy ions. There's also inertial fusion using lasers, which is the basis of the National Ignition Facility at Livermore, but our approach is to use heavy ions, which is complementary to that.

The accelerator technology there has to be extremely reliable . . . and it's something that takes a lot of money to do because accelerator technology is very expensive, and to take the steps we need to take is going to require a much larger investment by the government than they've been willing to make at this point.

Question: What magnitude of investment would be sufficient to carry out the research that needs to be done in the fusion area for the coming century?

I think we need to take a broad-based approach—that's the one I favor—which includes our participation in ITER. I think for a lot of reasons ITER [the International Thermonuclear Experimental Reactor] is a good thing to do. First of all it's international cooperation, which I think the United States needs to do more of to develop our expertise along with the rest of the world in new scientific endeavors. And after all, energy is a global problem. But we also need to invest broadly in our approach to find out what the best technology will be.

I believe the current R&D budget for fusion in the U.S. is about $290 million per year, and if you tripled that, we'd get off to a pretty good start. That sounds like a lot of money but compared to some of the things we've been spending money on—and also considering the consequences for the success of that program—it's pretty small.

Photos courtesy of Lawrence Berkeley Laboratory

Dr. Gourlay (right) with a student.

Question: What do you see as the current state of science in the U.S. at this point, and what direction do you think we ought to move in to get more youth involved?

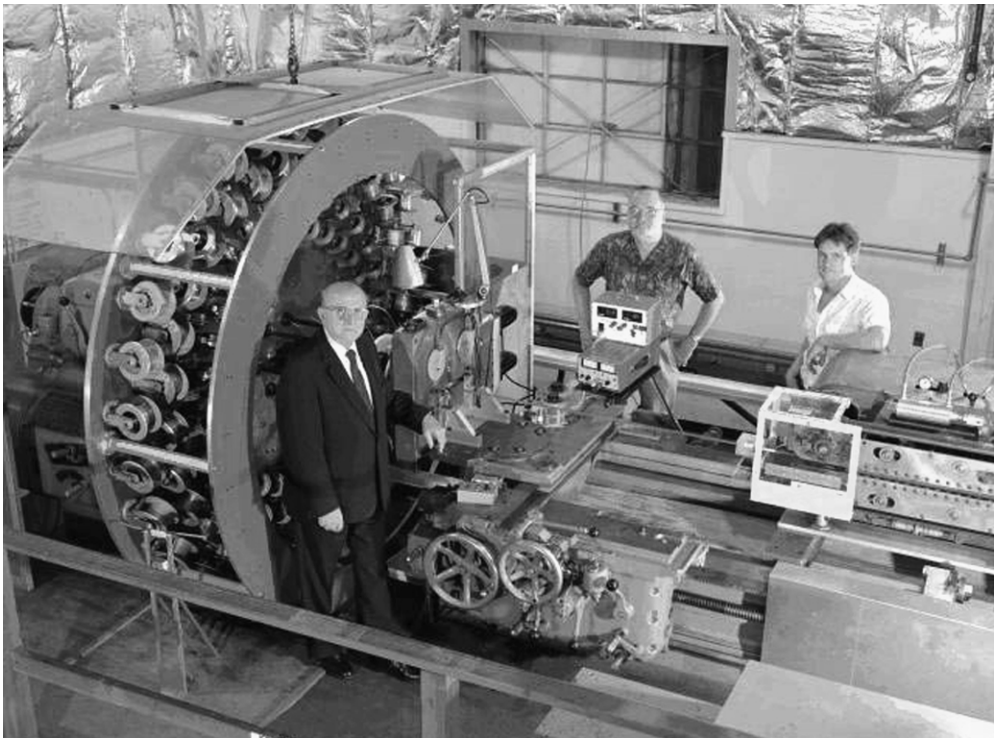
Well, that's a tough one. Clearly, the number of students and the interest in science has been falling off for quite some time, and—this is my opinion, but I think it's fairly based—science doesn't get the respect that it used to. People have forgotten that after World War II, our economy was based on science research and influx of talent from other countries around the world, and now that flow is heading more outward than inward.

SCIENCE and the LaRouche Youth Movement

People will still come here to become educated, but many of our graduate students are from foreign countries, and instead of staying here and applying their skills, they go home. The number of American students is dropping quite a bit. I know in one of our programs we rely on students from Italy. We just can't find the interest here to pursue these things.

So, I think it really goes back to how people view technology and science, and I think it's taken a backseat to the "Me" generation, trying to make money instead of make progress.

Question: Certainly that idea of progress was a key characteristic of the Franklin



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The superconducting cable of the Advanced Light Source at Lawrence Berkeley Laboratory.

Roosevelt era, where we were building massive infrastructure and had that greater sense of productive vision and mission orientation. What role does nuclear fusion have in giving people that sense of mission that we once had?

I think it's extremely ambitious, and an extremely difficult thing to do. We've been trying for a long, long time, and the saying is, "nuclear fusion is 30 years off and always will be 30 years off," and part of that is because the investment and perhaps the focus has not been optimal.

SCIENCE and the LaRouche Youth Movement

I think the way to move forward is to have grand visions, and people are afraid to even propose that these days, because they may get shot down for asking for too much money. But really, a vision, even if it's large-scale, is what drives everything beneath it. I think we lack grand visions for things.

Question: Have you researched the possibility of fusion applications to a future U.S. space program?

If you are referring to these rocket motors and so on, I haven't looked much into that.

Question: I know that the idea that Kennedy had was to use nuclear fission rockets instead of the giant propane tanks. With nuclear fusion rockets, you could make trips from Earth to Mars in a number of days as opposed to a matter of months.

I know in pursuing the development of a certain technology with a specific goal, that you learn a lot of things along the way that can be pursued in many different areas. That's the beauty of basic research. When you set a goal that's far enough out there, and pursue that goal, it generates a lot of new ideas, and a new technology can generate so much more along the way, that in some cases the original goal becomes secondary to the things you get out of it. That's the case in many areas of technology development. So, it's possible that it could contribute to fusion propulsion, but it's hard to say.

Question: If we were to apply nuclear fusion science to something like the running of magnetically levitated train systems what does that mean in terms of the potential power output?

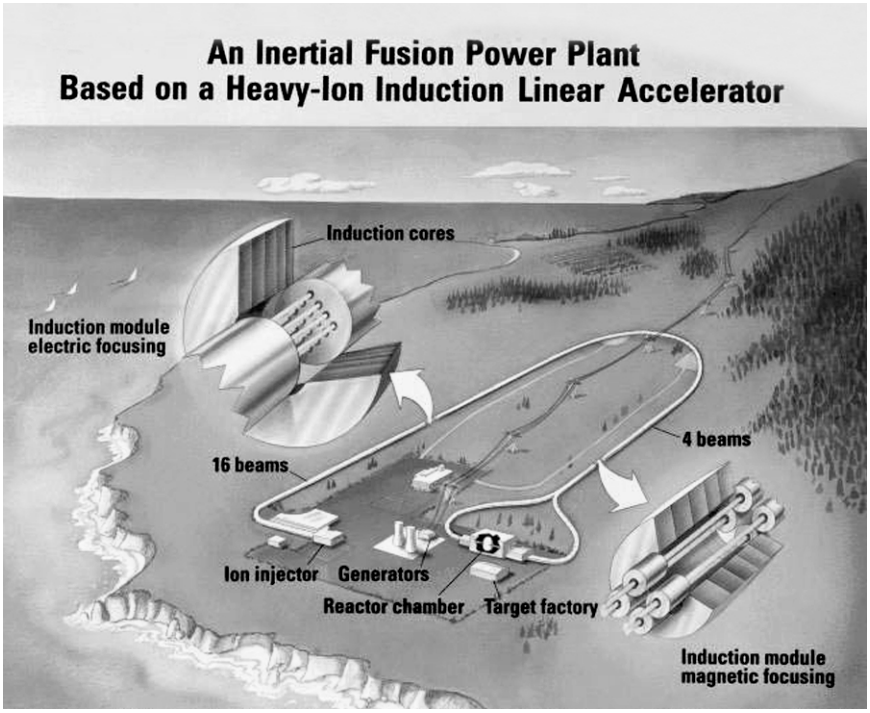
It depends on what your point of view is on how it should be developed. It's got to be something that's a combination of high-power localized nuclear power stations for instance, and solar, bio, wind, and hydro, depending on what region you're in, the population density, and so on.

This is something that again requires a vision for the future. You've got a lot of people working on individual pieces of this, but I haven't seen an organized approach to this whole picture. What's the grand vision? Ask where do we want to be 50 years from now, 100 years from now?—and start to work in that direction. Berkeley Lab is heading that way with a major new initiative called Helios, to develop ways to convert solar into carbon-neutral forms of energy.

Question: With some of the clean nuclear fission plants being developed today, and with nuclear fusion, is there any reason for the world not to go nuclear?

Not in my opinion. I think these problems can be solved by a combination of technologies. Another important aspect, of course, are the regulations that have to do with this. We can't even get Yucca Mountain licensed in this country. The public utility regulators need to consider life-cycle costs in making approvals of new power plants, and we need to get the public utility officials to put construction costs in their rate base to help pay for it; it's really not that much when you consider what we're getting for it. It has to be approached from both sides—the government side and the technology side—and meet somewhere in the middle. They have to work together to solve the problems.

Question: Do you think the initiative to build several thousand new power plants across the world in the next 50



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Artist's drawing of the components an inertial-confinement fusion power plant, using a heavy-ion induction linear accelerator as a driver. If you tripled the current fusion budget, "we'd get off to a pretty good start," Gourlay said.

years or so, could come from the private sector alone?

That's difficult to say. It would take somebody with a lot of money and a lot of vision to do that. It's possible, but I think what's holding these people back are the regulations that need to be worked out more appropriately in terms of getting the job done, solving the problems, instead of a black or white situation. I think that a change in the regulations could spur that kind of development, but right now I don't see it happening.

Question: Wouldn't it also take quite a bit of government credit to build large-scale projects of that magnitude?

It would, yes.

Question: What do you see as the future of science in the United States if we take the approach of what some of us in the LaRouche Youth Movement are doing in working to master the ideas of Kepler, Gauss, and Riemann and other scientists who have made fundamental breakthroughs in geometry and physics? Do you think that there's still hope for the United States if a policy of scientific progress and optimism were reintroduced, or do you think at this point with the situation in the world, that we're going to necessarily be relegated to a second-class power as a nation when it comes to science?

Well that's a difficult question to answer. I'm seeing signs of recognition of a problem in terms of science and technology, and the American Competitive Initiative is in the right direction. I think that the visionary people will recognize the importance of science in our future, and if they can't do it in the United States, if the United States doesn't make itself a place to do science and develop technology, then these people will go elsewhere, just the same as people used to come to the United States. I'm optimistic that the United States will have a large turnaround here shortly—I hope.

Question: Maybe a return to Franklin Roosevelt's ideas on economics, with government funding of these projects perhaps on a more massive scale?

Well, the U.S. does spend a lot of money on science, but not as much as it could; that's for sure. There is still tremendous untapped potential. What I'm seeing is that it's more and more difficult to spend that money effectively. There are more and more people who are involved. We're reviewed all the time, which is a necessary part of it, but there are different levels. I think the government is willing to invest heavily in science, but it needs the support of the constituency. Again, it goes back to our culture. Do they value science and what it can do for you?

Question: Do you think our citizens today have less of a sense of our productive potential in science as a method of discovery?

I think the awareness has decreased quite a bit, and you see more interest in astrology. . .

Question: And gambling?

Yes, things like that. It's not clear to me how it got that way.

Question: Well, hopefully with the work you're doing and the help of others we can change that.