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At a Sleek Bioenergy Lab, a Lens on a Cabinet Pick

By KENNETH CHANG and ANDREW C. REVKIN

EMERYVILLE, Calif. — The Joint BioEnergy Institute, which encompasses the fourth floor of a high-tech office building here in a neighborhood of biotech companies, radiates a sleek ecological modernity: floorboards manufactured of recycled materials and laminated to look like bamboo, trendy office furniture and laboratories stocked with new equipment.

It even has a hip nickname: Jay-Bay. That is how everyone pronounces JBEI. The institute has the look and feel — and organizational chart — of a startup venture, not a federal research laboratory.

But JBEI is financed by the Energy Department — $135 million over five years. And JBEI is under the purview of the Lawrence Berkeley National Laboratory in nearby Berkeley, whose director, Steven Chu, has been selected as the next energy secretary.

Over the past week, President-elect Barack Obama has made high-profile announcements of science appointments like that of Dr. Chu and has said that science findings will guide policy.

For years, Dr. Chu has been unambiguous in stating that carbon dioxide emitted by cars, power plants and industry is a direct cause of global warming and that urgent action to slash emissions is needed to avoid upheaval of the planet's climate.

He has not said anything publicly about his plans or goals as energy secretary, and he has not talked to the news media since being selected. But his actions as Lawrence Berkeley's director, including the creation of JBEI, offer hints of how he might harness the 17 national laboratories — or at least the ones not dedicated to nuclear arms research — to address climate and energy issues.

JBEI, whose mission is to use so-called synthetic biology to convert plant cellulose into fuel, moved into its Emeryville home last May. It is one of several major forays by Lawrence Berkeley into alternative fuels, an area where the lab conducted almost no research before Dr. Chu became director in 2004.

Dr. Chu has often said that free markets will not be enough to drive the necessary changes in energy use, and Mr. Obama highlighted Dr. Chu's efforts on renewable fuels when he announced his selection. "Steven is uniquely suited to be our next secretary of energy as we make this pursuit a guiding purpose of the Department of Energy, as well as a national mission," Mr. Obama said.

In Dr. Chu, Mr. Obama has selected someone who possesses unquestioned scientific credentials — Dr. Chu shared the 1997 Nobel Prize in Physics for using lasers to cool atoms to temperatures just above absolute zero — and management experience within the Energy Department. Lawrence Berkeley has 4,000 employees and a $650 million budget.

Unlike most federal research laboratories, whose budgets have been flat or slashed over the last four years, Lawrence Berkeley's has grown about 20 percent during that time.

Researchers at the laboratory traditionally explored a variety of basic sciences like physics, chemistry and biology. Since the 1970s, the lab has had a division working on energy conservation — developing energy standards for appliances, for instance. But most researchers worked on their own particular interests, sometimes with collaboration, sometimes not.

Dr. Chu decided the lab should undertake a more concerted effort on energy, which he regarded as one of the most pressing scientific and technological issues of the 21st century. He motivated the staff, recruited scientists and used his Nobel prestige to raise attention to the need to replace fossil fuels.

"He came with that vision, and I think it's really energized a lot of people here and changed their research directions in very good ways," said A. Paul Alivisatos, the deputy director. Dr. Chu has also shown willingness, perhaps zeal, in shaking up the traditional ways of the national laboratories. A second biofuels research center set up under Dr. Chu's watch is financed by $500 million from BP, the petroleum company, in a collaboration of a magnitude unprecedented for a national laboratory.

In mid-2005, about nine months after becoming director, Dr. Chu called Jay Keasling, head of the lab's physical biosciences division, and Dr. Alivisatos, then head of the materials sciences division, together for a meeting. "He said, 'I want to work on energy,' " Dr. Keasling recalled. "And he wanted to work on transportation fuels."

In the battle to lower emissions of carbon dioxide, cars, trucks and airplanes pose a difficult problem, because most of the alternative power sources — nuclear, wind, solar — do not work on the small scale needed for transportation, and battery technology is still in need of additional advances.

Biofuels, fermented and distilled from plants, may offer a solution. Although the burning of biofuels still emits carbon dioxide, it is the same carbon dioxide that the plants had sucked out of the air.

But the growing of plants for fuel competes with the growing of food. In addition, corn-derived ethanol, the biofuel in use today in the United States, takes considerable energy to produce, and that greatly diminishes any ecological benefits.

Dr. Chu hopes to find (or engineer) better biofuel plants and to develop processes for breaking down cellulose and transforming it into fuel at costs competitive with gasoline.

"Steve was out in front of this long before there was this $4 gasoline," said Dr. Keasling, who now also serves as chief executive of JBEI.

Dr. Keasling and Dr. Alivisatos were put in charge of what was called the Helios vision, turning sunlight into renewable fuels.

Dr. Keasling's own research focuses on engineering microbes to produce particular chemicals. His major success was bacteria that make an antimalaria drug. With Dr. Chu's push into biofuels, Dr. Keasling is now

directing this synthetic biology research at microbes that could easily break down cellulose in the cell walls of plants into sugars, a process that now takes inefficient high temperatures.

“I had always thought about biofuels and bioenergy,” Dr. Keasling said, “but there was just no profit in it and there was no interest in it and no funding from federal agencies.”

Dr. Chu’s evangelism helped generate financing. In summer 2006, the Energy Department announced a competition for setting up three bioenergy research centers. A proposal by Lawrence Berkeley and several other partners became JBEI, fulfilling one component of the original Helios vision. Meanwhile, BP offered $50 million a year for 10 years to create the Energy Biosciences Institute, which is conducting more basic research into biofuels. Dr. Chu pushed the University of California, Berkeley, along with Lawrence Berkeley and the University of Illinois, to apply for the grant.

That generated controversy about corporate financing at the Berkeley campus, which runs Lawrence Berkeley under a contract with the Energy Department. A large laboratory building for the BP institute is scheduled to be built beginning in 2010.

The sources of money have also shaped which initiatives are moving ahead most aggressively. While biofuel research is flush with money, the work on artificial photosynthesis, to skip the plant-growing step entirely, another key part of the original Helios vision, is being done with about $5 million a year from the Energy Department.

Nathan Lewis, a Caltech specialist in solar energy who worked with Dr. Chu on some energy research strategies for Lawrence Berkeley, conceded that it was not the ideal mix of work. “The oil company certainly has more of a vested interest in that approach, and the government simply didn’t step up,” he said.

Meanwhile, JBEI has grown to a staff of 150. Dr. Keasling said that people pursuing different projects worked next to one another in hopes that information would be shared and collaboration would be encouraged.

“The idea is that you can move the research rapidly,” he said, “and in part we took a lesson from the biotech community and the high-tech community that has grown up in the Bay Area.”

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