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Academies Report Calls for Policy Changes for CMMP

Condensed-matter and materials physics in the United States are poised for a number of exciting developments, according to a recently released National Academies report. But, the report cautions, significant policy changes must occur for this promising future to be realized. Stagnant federal support for research and a difficult environment for new researchers are just a few of the indications that U.S. leadership in these fields is in danger.

The report, *Condensed-Matter and Materials Physics: The Science of the World Around Us*, is a 210-page document that surveys the last decade of condensed-matter and materials physics (CMMP) in the United States and looks toward the intellectual and technological challenges of the next decade.

While it celebrates the exciting and economically favorable advances in CMMP research that have taken place over the last 10 years, the report warns that future success cannot be taken for granted. After accounting for inflation, federal funding for CMMP has stayed approximately flat over the last decade. In addition, industrial laboratories are tending to favor shorter,

applied projects over fundamental research and there has been a major decline in the grant success rate for CMMP proposals. These factors paint an uncertain future for condensed-matter and materials physics in the United States.

In response to these challenges, the report includes a set of policy recommendations based on the projected 7% funding increase proposed by President Bush in his 2006 American Competitiveness Initiative. They include:


- Continued strong support for individuals and small groups of researchers. In particular, the report maintains that the ratio of support between individuals/small groups and centers/facilities should not decrease over the next decade. Individuals and small groups have historically been the primary source of CMMP innovation.
- An increased success rate for CMMP proposals. The report recommends that the funding success rate grow to more than 30% over the next five years. This would create a healthier environment for junior faculty members while maintaining support for current projects.
- An increase in the size of grants awarded to individuals and small

groups. The report concludes that in order to keep pace with sharply rising laboratory costs, the average size of awards must increase. The buying power of the average grant has decreased in recent years because of a disproportionate rise in the cost of doing research, including student support and materials and services.

The report also recommends that funding agencies work with the community to establish best practices for reviewing proposals in emerging interdisciplinary areas, support initiatives aimed at improving the representation of women and minorities in CMMP, support educational initiatives through stand-alone grants instead of through individual awards, and investigate how the creative, breakthrough research environment created within the large industrial laboratories of the past might be recreated in a new context.

Facilities and instruments that should be given priority, according to the report, include those supporting the development of new materials and next-generation light sources, completion of the Spallation Neutron Source, continued support of the National High Magnetic Field Laboratory, and next-generation electron microscopes.

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these ways would have a significant and enduring impact in the next decade. In particular, the report said that CMMP could make significant progress toward answering the following questions:

- How do complex phenomena emerge from simple ingredients?
- How will the energy demands of future generations be met?
- What is the physics of life?
- What happens far from equilibrium and why?
- What new discoveries await us in the nanoworld?
- How will the information technology revolution be extended?

These questions represent some of the major societal, technological, and fundamental science challenges currently facing the world. Although answering them will require collaboration from scientists across disciplines, the survey found that CMMP is in a position to have a great impact on these discussions—if the field is aggressively supported and encouraged.

About once every 10 years the National Academies Board on Physics and Astronomy completes an extensive review of the

status of physics in the United States. This CMMP survey was part of the current review, *Physics 2010: An Assessment of and Outlook for Physics*.

Each decadal review is divided into six fields: atomic, molecular, and optical science; plasma science; elementary particle physics; condensed-matter and materials physics; nuclear physics; and gravitational physics and cosmology. Each of these branches has been or will be surveyed by 2010.

A report accessible to policy makers, scientists, and the general public is compiled for each branch of physics and is available at the board's website: www7.nationalacademies.org/bpa. At present, the reports on atomic, molecular, and optical science; plasma science; particle physics; and CMMP are available.

KENDRA RAND


DOE Provides Further Funding to Bioenergy Research Centers

The U.S. Department of Energy (DOE) announced in October that it has invested nearly \$30 million in end-of-fiscal-year (2007) funds to accelerate the start-up of its three new Bioenergy Research Centers, bringing total DOE Bioenergy Research

Center investment to over \$400 million. The three DOE Bioenergy Research Centers—located in Oak Ridge, Tennessee; Madison, Wisconsin; and near Berkeley, California—selected by DOE this June, bring together multidisciplinary teams of leading scientists to advance research needed to make cellulosic ethanol and other biofuels commercially viable on a national scale, a key part of President Bush's Advanced Energy Initiative Twenty in Ten Plan. The \$9.97 million per Center announced in October enables the three Centers to immediately begin research activities and comes in addition to the \$375 million (over five years) DOE announced it would invest.

DOE Under Secretary for Science Raymond L. Orbach said, "This early infusion of funds will permit the DOE Bioenergy Research Centers to get to work immediately on the basic, transformational science needed to make environmentally friendly biofuels cost-effective, increase their use for transportation, and help achieve President Bush's goal of reducing gasoline consumption by 20% in 10 years."

In late June, DOE selected its Oak Ridge National Laboratory (ORNL), the University of Wisconsin-Madison (UWM), and its Lawrence Berkeley National Laboratory



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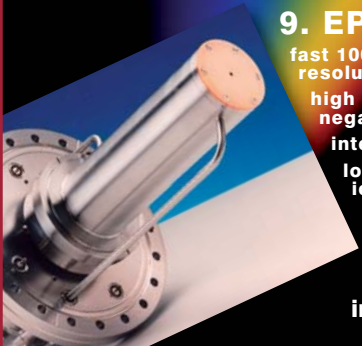
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(LBNL) as the lead institutions for the Centers. Each DOE Bioenergy Research Center represents a multi-institutional partnership. Altogether, seven DOE national laboratories, 18 leading universities, one nonprofit organization, and a range of private companies are involved in the effort. In late September, the Department signed a Cooperative Agreement with the University of Wisconsin and agreements with the two national laboratories, enabling the release of the FY 2007 funds.

In addition to geographic diversity, the three Centers are pursuing complementary scientific agendas. The DOE ORNL BioEnergy Sciences Center will focus on the resistance of plant fiber to break down into sugars and is studying the potential energy crops poplar and switchgrass. The DOE UWM Great Lakes Bioenergy Research Center is studying a range of plants and, in addition to exploring plant fiber breakdown, aims to increase plant production of starches and oils, which are more easily converted to fuels. This Center also has a major focus on sustainability, examining the environmental and socioeconomic implications of moving to a biofuels economy. The DOE LBNL Joint Bioenergy Institute will concentrate on "model" crops of rice and Arabidopsis, in the search for game-changing breakthroughs in basic science, and is exploring microbial-based synthesis of fuels beyond ethanol.

The Department's investment in the Bioenergy Research Centers contributes to the President's Twenty in Ten Plan, which aims to increase energy security and reduce greenhouse gas emissions by reducing projected gasoline consumption by 20% in 10 years through a combination of increased vehicle efficiency and use of clean, renewable fuels. This Plan mandates the use of the equivalent of 35 billion gallons of alternative and renewable fuels by 2017, and biofuels produced from biomass, such as cellulosic ethanol and non-edible portions of crops, could help reach a major portion of this goal, according to DOE.

As part of the President's energy initiatives, DOE has announced, in calendar year 2007, over \$1 billion, subject to appropriations from Congress, in a multi-year biofuels research and development investment. This includes the \$30 million

announced in October; \$375 million DOE allocated for these three Centers; up to \$385 million for commercial-scale biorefineries; up to \$200 million for pilot-scale biorefineries; up to \$23 million for ethanol research; and up to \$34 million for enzymes research in support of biofuels development.

European Commission Releases Report on Investment in Nanotechnology

With €1.4 billion allocated to 550 projects in the field of nanosciences and nanotechnology, the European Union's 6th Research Framework Programme (FP6) accounts for one-third of total public funding for nanotechnology in Europe, according to a recent report by the European Commission. Focused on the implementation of the 2005 Action Plan for Nanotechnology, the report shows the strategic importance of nanotechnology and the contribution this field of science can make to the quality of life and economic well-being of Europeans, for example, through revolutionary activities in key areas such as materials, electronics, and medicine. The European Commission is committed to an integrated and responsible approach to developing nanotechnologies, taking into account aspects such as safety, acceptance by society, and ethical implications.

"Nanotechnology is an area where Europe is an acknowledged world leader. This is an opportunity we must grasp with both hands," said European Science and Research Commissioner Janez Potočnik. "The successful development of nanotechnologies will depend on a responsible approach to addressing issues such as safety for humans and animals, the ethics of future developments and society's debate about these. The European Commission has already shown in this first phase that it is able to steer this course."

Priority targets of FP6 include fundamental and industrial research, human resources, nanotechnology-specific infrastructures, safety, and communication. Although there is strong industrial participation in these projects, resulting in innovation in companies, more patents and spin-offs, and a better environment for research and industry (such as in standards, metrology, and patenting), private

investment in the field remains behind that in the United States and Japan.

Under FP7, EC funding for nanotechnologies and nanosciences is expected to increase significantly. The average yearly funding is likely to be more than double that in FP6, taking into account actions across the program. In addition, the Risk-Sharing Financing Facility established by the Commission jointly with the European Investment Bank should provide access to new funding sources, according to the report.

Beyond funding, the successful development of nanotechnologies demands an integrated and responsible approach, said the report. European citizens should benefit from nanotechnology, while being protected from possible adverse impacts. Commitment to ethical principles is a cornerstone of such an approach. To reach full potential, nanotechnology development must be attuned to society's expectations, making communication and dialogue an absolute priority, the report said. In addition to information activities in all Community languages for different target groups, the Commission has systematically promoted public dialogue. It has launched an open consultation on a Code of Conduct for responsible nanotechnology research, which may lead to a Commission recommendation by the end of the year.

Similarly, assessing the safety of nanotechnology-based products and processes is a central issue for European policy, and has direct impact on their access to the market. Nanoparticles and their potential impact on health and the environment are being studied in close coordination with Member States and international bodies such as the United Nations, the Organization for Economic Cooperation and Development, and the International Standards Organization. In addition to projects specifically devoted to safety, which have received €28 million in funding so far, all nanotechnology research projects include an ethical and safety assessment component.

Other important issues discussed in the report are the international aspects of nanotechnology development, and the need to train the new generation of nanoscientists. □



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