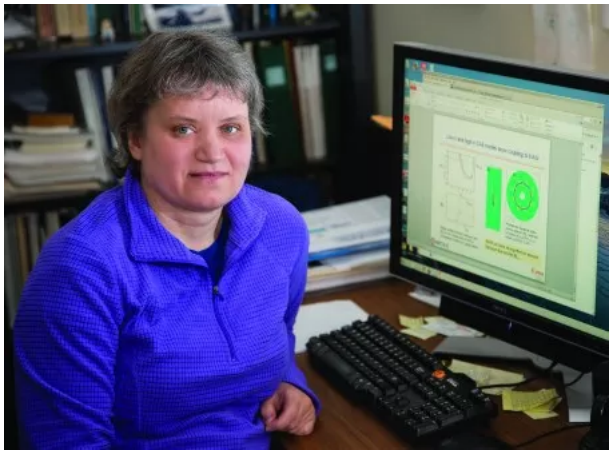
2018-01-23 10:25:28 • Article ID: 688312



# Theoretical Physicist Elena Belova Named to Editorial Board of Physics of Plasmas



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Credit: Elle Starkman/PPPL Office of Communications

Elena Belova, a principal research physicist in the Theory Department at the U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL), has been named to the editorial board of the Physics of Plasmas, a monthly peer-reviewed scientific journal published by the American Institute of Physics. Duties of board members, selected for their high degree of technical expertise, range from suggesting topics for special sections to adjudicating impasses between authors and referees that arise over manuscripts.

Belova, a PPPL physicist for more than 20 years, is expert at developing computer codes, such as simulations of wave-particle interactions and models of global stability in fusion plasmas that are widely used in fusion research. "I like code development because it is algorithmic and codes can really help to understand the experimental results," she said. "But it still surprises me when theory works the way it's supposed to. I also like that you can perform the simulation and look "inside" the device – which is not always possible in a real experiment. Visualizing things through computer simulations allows one to 'see a picture,' which is, as they say, better than a thousand words."

Fusing of light elements



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Fusion (/search/advanced/?search[tag]=Fusion), plasma science (/search/advanced/?search[tag]=plasma science), Fusion theory (/search/advanced/?search[tag]=Fusion theory), tokamaks (/search/advanced/?search[tag]=tokamaks), fusion energy (/search/advanced/?search[tag]=fusion energy)

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Fusion, the reaction that powers the sun and most stars, is the fusing of light elements that generates massive amounts of energy. Researchers seek to replicate fusion on Earth for a virtually inexhaustible supply of energy by controlling plasma, the hot, charged state of matter composed of electrons and atomic nuclei, or ions, that fuels fusion reactions. Theorists create computer models that simulate the processes involved, which experiments then test in attempts to confirm.

Recent experiments at PPPL validated a code of Belova's to predict a way to suppress a type of plasma instability that can halt fusion production. The method could prove useful to ITER, the international fusion facility under construction in France to demonstrate the ability to produce 10 times more power than it consumes.

Second female physicist in Theory Department

Belova, 53, joined PPPL in 1997 as the second female physicist to work in the Theory Department. Among her honors has been the Katherine E. Weimer Award for Women in Plasma Physics, a national honor named for the first woman theorist at PPPL, which Belova received in 2005.

As a high school student in the former Soviet Union, Belova grew interested in mathematics and spent three years in an after-school program sponsored by the Moscow Institute of Physics and Technology. "In math you don't really need to know anything," she said. "You just solve puzzles. At least, this is what I thought in high school."

She earned a bachelor's degree in applied mathematics in 1984 and a master's degree in plasma physics in 1987, both from the Institute, though relatives had tried to persuade her not to switch subjects. "They said physics was too hard for a woman," she recalled.

But math had become too abstract for Belova and physics, while more difficult, was also more practical and exciting. She worked as a research engineer at the Space Research Institute in Moscow from 1987 to 1989 and as a junior research scientist from 1989 to 1992. While space physics is no longer her subject, her knowledge has served in good stead. "There are many common approaches in fusion and space plasma physics," she said.

Arrived in U.S. in 1992

Belova and her husband, also a physicist, left Russia for the United States in 1992. She had been accepted in the graduate program at Dartmouth College, and became a research assistant in the Department of Physics and Astronomy. While she had learned technical English terms as an undergraduate student in Russia, her command of the broader language was still a bit shaky. "In my first year as a teaching assistant I would sometimes just write equations on the board and would point them out to students rather than trying to explain," she said.

After earning her doctorate in physics from Dartmouth in 1997 she worked as an associate research physicist at PPPL until 2004, a research physicist until 2008 and a principal research physicist since then. Among the scientific articles she has written at the Lab have been 15 invited papers for workshops and conferences around the world.

Belova is the fourth PPPL staff member to be appointed to an editorial position in recent years. Richard Hawryluk, interim director of the laboratory, chairs the editorial board of the journal Nuclear Fusion; David Gates, principal research physicist and Stellarator Physics Division Head at PPPL, is editor-in-chief of the new online journal Plasma; and Igor Kaganovich, principal research physicist and deputy head of the PPPL Theory Department, serves as associate editor of Physics of Plasmas.

PPPL, on Princeton University's Forrestal Campus in Plainsboro, N.J., is devoted to creating new knowledge about the physics of plasmas — ultra-hot, charged gases — and to developing practical solutions for the creation of fusion energy. The Laboratory is managed by the University for the U.S. Department of Energy's Office of Science, which is the largest single supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, please visit science.energy.gov (http://science.energy.gov/).

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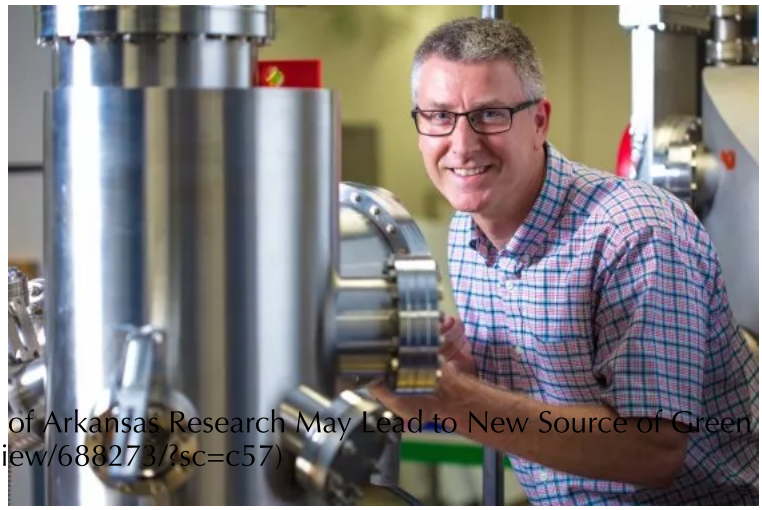

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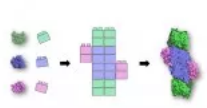

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## Rutgers Scientists Discover 'Legos of Life' (/articles/view/688243/?sc=c57)

Rutgers scientists have found the "Legos of life" - four core chemical structures that can be stacked together to build the myriad proteins inside every organism - after smashing and dissecting nearly 10,000 proteins to understand their component parts. The four building blocks make energy available for humans and all other living organisms, according to a study published online today in the Proceedings of the National Academy of Sciences.

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## Small Hydroelectric Dams Increase Globally with Little Research, Regulations (/articles/view/688267/?sc=c57)

University of Washington researchers have published the first major assessment of small hydropower dams around the world -- including their potential for growth -- and highlight the incredibly variability in how dams of varying sizes are categorized, regulated and studied.

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## Researchers Reveal How Microbes Cope in Phosphorus-Deficient Tropical Soil (/articles/view/688257/?sc=c57)

A team led by the Department of Energy's Oak Ridge National Laboratory has uncovered how certain soil microbes cope in a phosphorus-poor environment to survive in a tropical ecosystem. Their novel approach could be applied in other ecosystems to study various nutrient limitations and inform agriculture and terrestrial biosphere modeling.

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## Scientists Discover Material Ideal for Smart Photovoltaic Windows (/articles/view/688133/?sc=c57)

Researchers at Berkeley Lab discovered that a form of perovskite, one of the hottest materials in solar research due to its high conversion efficiency, works surprisingly well as a stable and photoactive semiconductor material that can be reversibly switched between a transparent state and a non-transparent state, without degrading its electronic properties.

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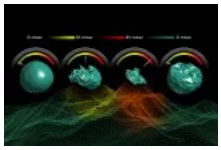

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## On the Rebound (/articles/view/688232/?sc=c57)

New research from the U.S. Department of Energy's Argonne National Laboratory and Stanford University has found that palladium nanoparticles can repair atomic dislocations in their crystal structure, potentially leading to other advances in material science.

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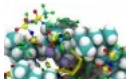
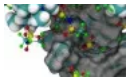


## Coupling Experiments to Theory to Build a Better Battery (/articles/view/688104/?sc=c57)

A Berkeley Lab-led team of researchers has reported that a new lithium-sulfur battery component allows a doubling in capacity compared to a



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conventional lithium-sulfur battery, even after more than 100 charge cycles.

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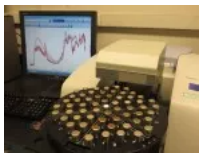

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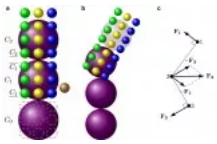

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## A Shortcut to Modeling Sickle Cell Disease (/articles/view/688072/?sc=c57)

Using Oak Ridge National Laboratory's Titan supercomputer, a team led by Brown University's George Karniadakis devised a multiscale model of sickle cell disease that captures what happens inside a red blood cell affected by the disease.

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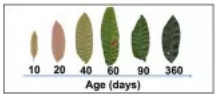


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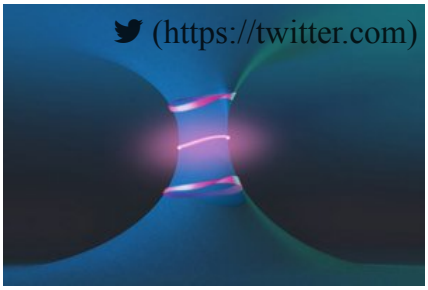


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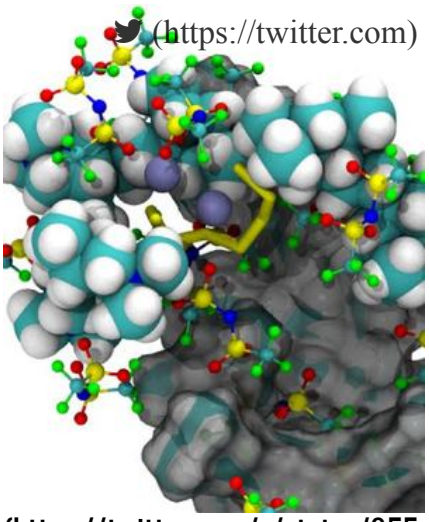


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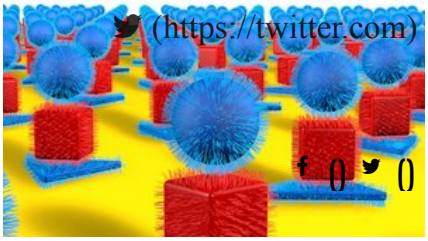


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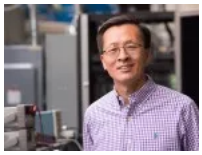

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