Shedding Light on Technology

Anne Kelley
Professor, Chemistry and Chemical Biology

CURRENT RESEARCH

Combining state-of-the-art laser spectroscopy with synthesis of new materials to study the atomic-level details of light-matter interactions

Light is not only the life force that sustains all of our agriculture on Earth, it is also at the core of multiple emerging technologies. Artificial solar energy capture, LED lighting, fiber-optic telecommunications, and biological imaging are only a few applications that depend on the manipulation of light through a material. Dr. Anne Kelley, of the University of California, Merced, is laying down the foundation of materials science research that will streamline the way we use light in potential technologies to reach greater efficiency. By shining a laser into a material and analyzing the pattern of scattered light produced, Dr. Kelley can measure the motions of the atoms within the material as a result of their excitation by the light's energy. Any amount of light energy used to create vibrations is energy lost to heat, reducing the efficiency of the process. Some applications, such as biological imaging, aim to conserve light energy in its purest, most efficient form for re-use; whereas others, such as solar energy capture, aim to convert light energy into electrical charge. Uncovering the relationship between the structure of a material and the dynamics of its light-vibration coupling will therefore allow new technologies to use light more efficiently.

In particular, Dr. Kelley studies a class of semiconductor nanomaterials, called "quantum dots," using resonance Raman spectroscopy. While other scientists are also exploring research in this field, none have the background that Dr. Kelley has developed from over 30 years of perfecting this technique to carry out careful experiments and analyze the data rigorously. Dr. Kelley and her group have also implemented "hyper-Raman spectroscopy" in their research,...

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AFFILIATION

University of California, Merced

EDUCATION

- B.S. in Chemistry 1980 ,University of California, Riverside
- Ph.D. in Chemistry 1984, University of California, Berkeley
- Postdoctoral in Chemistry 1986 ,University of Pennsylvania

AWARDS

- Fellow of the American Association for the Advancement of Science, 2004
- Fellow of the American Physical Society, 2001
- Agnes Fay Morgan Research Award of Iota Sigma Pi, 1998
- Camille and Henry Dreyfus Teacher-Scholar Award, 1992
- NSF Presidential Young Investigator Award, 1989

RESEARCH AREAS

Technology, Chemistry, Materials Science / Physics, Nanotechnology

FUNDING REQUEST

Your contributions will support Dr. Kelley's continued research into the depths of quantum mechanics and materials science as she uncovers new ways to use light more efficiently. A donation of $20K would upgrade all of Dr. Kelley's computers and software. Further donations for equipment would allow her to keep up with the fast pace of emerging laser technologies needed to support her research. By choosing to donate, you will be taking part in advancing some of the world's most modern technologies.