The **Institute for Lasers, Photonics and Biophotonics,** under the leadership of Dr. Paras N. Prasad, focuses on developing frontier research programs in biophotonics, nanomedicine, nanotechnology and optical processes,. The interdisciplinary nature of the Institute's faculty consisting of physicists, chemists, biologists, physiologists, microbiologists, engineers, clinicians, fosters collaboration and allows cutting-edge technology that is applied to a broad range of specialties with emphasis toward technology transfer. Our multidisciplinary research program includes:

Biophotonics – Research here will achieve the development of novel two-photon fluorophores, water dispersible quantum dots, for multispectral bioimaging. Nonlinear optical processes such as second harmonic generation, multi-photon excitation, Coherent anti-stokes Raman scattering and sum frequency generation are being developed for application in cellular and molecular *in-vitro* and *in-vivo* imaging, drug development and diagnostic technology.

Nanomedicine – Research here involves the development of multimodal nanoparticles for enhancement of real-time biomedical imaging (optical MRI and PET), drug delivery and enhanced therapeutic action (eg. diabetes, cancer, cardiac and neurological diseases).

Nanophotonics – Our program in nanophotonics involves the nanoscale confinement of; (i) radiation to control its propagation properties, (ii) matter and domains to control the optical resonances, and (iii) photoprocesses to control spatial confinement of optically induced changes. New nanostructured materials (eg. rare-earth doped glasses, quantum dots, liquid crystal nanodroplets, phototonic crystals) are the next generation of multifunctional materials that will contribute to the development of smart materials for lasing, fluorescence, optical power limiting and other nonlinear optics.

Photonics Technology – This program involves the development of materials, components and their integration in systems to provide solar-powered information technology with unprecedented capability. Our approach is to develop a hybrid technology involving integration of molecular electronics, nanoelectronics, nanophotonics and nano-optoelectronics. These hybrid technologies will revolutionize many aspects of data collection, processing, interpretation, display and storage.

Solar Cell Technology: This program focuses on development of solar cells which efficiently harvest the IR part of the solar spectrum. These solar cells use functional nanocomposites devices composed of lead selenide QDs as the photosensitizer components and a soluble organic transistor molecule As a proprietary technology, the processing techniques of component materials offer substantial cost reductions for the fabrication of inorganic-organic hybrid flexible photovoltaic devices.

Institute accomplishments include 16 patented technologies. Recent examples are:

- Ceramic-based nanoparticles entrapping water-insoluble photosensitizing anticancer drugs: A novel drug-carrier system for Photodynamic Therapy
- Amino Functionalized ORMOSIL Nanoparticles As A Non-Viral Vector for Gene Delivery
- Solution-processed pentacene quantum-dot polymeric hybrid nanocomposite photodetector
- Method for Delivering Hydrophobic Drugs Via Nanocrystal Formulations

- Synthesis of Group III Precursors through Cyclopentadiene Elimination for Pure III-V Semiconductor Nanocrystals
- High Density Coupling of Quantum Dots to Carbon Nanotube Surface for Efficient Photodetection

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