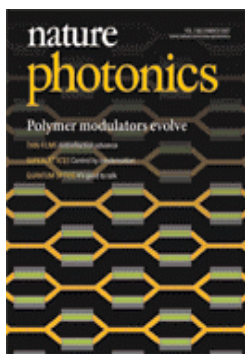


Cultivating the Engines of the Information Economy

With the mission of spurring new innovation in Arizona and catalyzing the development of start-up companies in rapidly-growing information technology industries, Science Foundation Arizona awarded a \$300,000 Small Business Catalytic Innovation Investment Award to the College of Optical Sciences at the University of Arizona (UA). The goal of this collaboration is initiating the commercialization of breakthrough electro-optic modulator technology. Electro-optic (EO) modulators are devices that can take information in the electrical domain, such as within a microprocessor, and directly impart this information on to a beam of light. They are extensively used in Internet technology for long-distance optical fiber communications. However, existing EO modulators that are based on inorganic crystals lack the bandwidth, compactness, low-power consumption, and low cost required to fully exploit their capabilities in future optical and wireless communications networks. Dr. Nasser Peyghambarian and his research group at UA have taken up this challenge, and have already catalyzed a spin-off company, TIPD LLC, to meet this growing need. As Dr. Peyghambarian has stated, "research has to get out of the lab and go into business to support the people of Arizona and create jobs." Clearly, this is happening.



Above: The University of Arizona researchers have recently published in the prestigious journal, *Nature Photonics*

The UA team has demonstrated the efficient use of revolutionary EO polymer materials by combining polymers with hybrid inorganic and organic glass materials. They published their breakthrough results in the prestigious journal, *Nature Photonics*. This demonstration spurred the formation of TIPD. The mission of this new company is to expand upon the UA research already performed on EO chips, and to commercialize new applications through state-of-the-art optical packaging that enables the chip technology to interface with other communications systems.

The founding of TIPD is well-synchronized with a new period of growth in communications networks. Current communications networks are being strained by the increasing use of peer-to-peer high bandwidth applications such as YouTube, Facebook, and interactive gaming. There will continue to be significant growth over the next five years in communication links at high data rates in excess of 40 gigabits per second. It is precisely at these very high data rates that EO modulators become most advantageous, especially when coupled with their low manufacturing cost.

The partnership between Science Foundation Arizona, UA and TIPD has been very successful in driving both new innovation and new applications. For instance, TIPD has delivered initial modulators to important defense industry customers where new applications are being tested and applied. Additionally, the new company has developed technology to attach optical fiber to the EO chips with very little loss of light, a key performance parameter for EO modulators. Demonstrating these initial capabilities, TIPD has bootstrapped itself into additional contracts to make both packaged EO polymer modulators and other optical devices. This collaboration and its early success demonstrates the importance of the Science Foundation Arizona investments in strengthening a new Arizona industry in the rapidly growing communications sector.

Right: Tiny hybrid EO chips were developed at the University of Arizona with breakthrough low-power consumption research. Through an investment by Science Foundation Arizona, these chips have been packaged by a new spin-off company, TIPD LLC, with state-of-the-art techniques for coupling optical fibers to the chips. These packaged devices are used in either very high speed communications networks or in defense applications.

