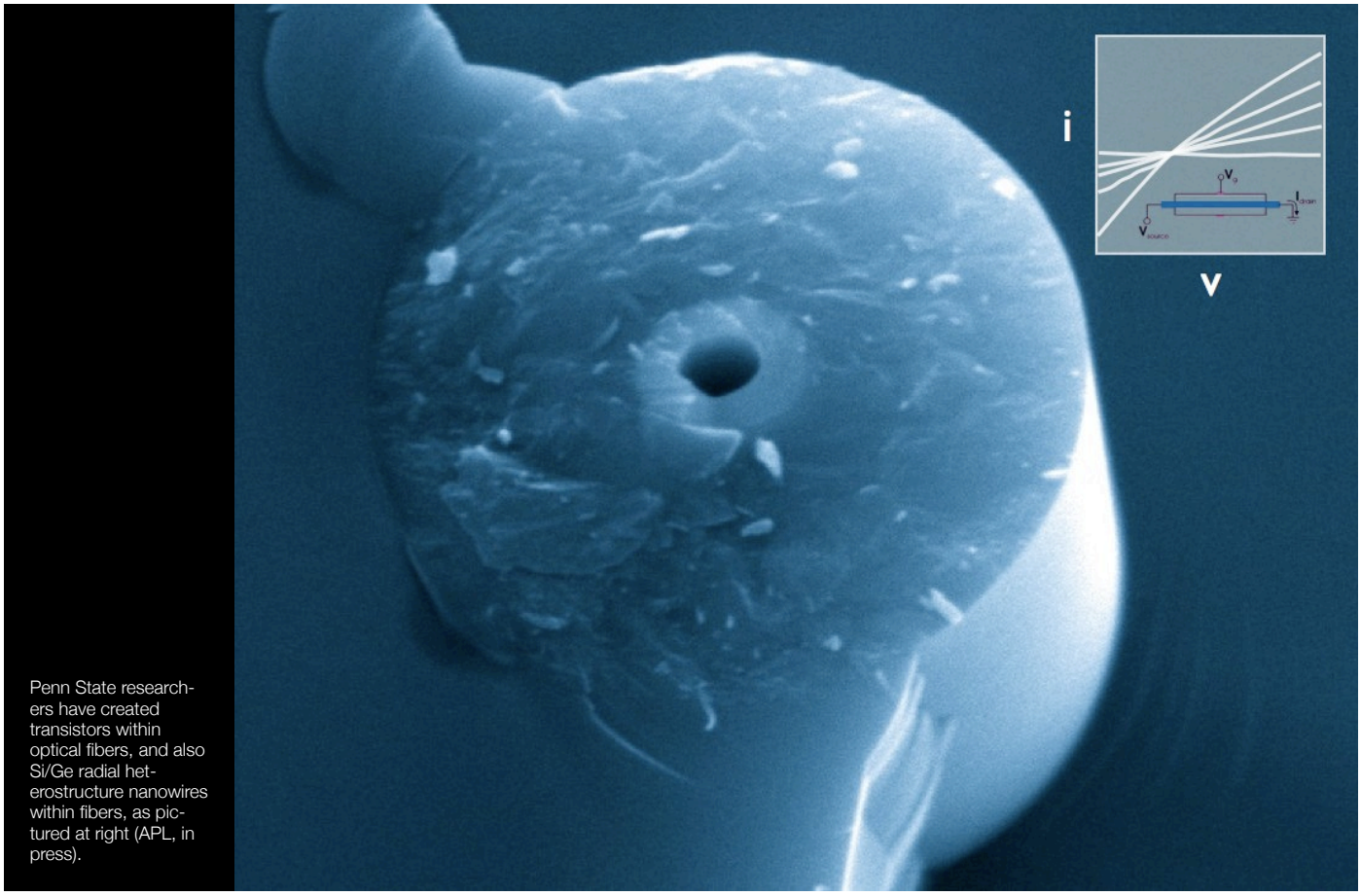
FIBER TRANSISTOR

Penn State MRSEC



Penn State researchers have created transistors within optical fibers, and also Si/Ge radial heterostructure nanowires within fibers, as pictured at right (APL, in press).

glassy switch
marriage of photons and electrons

IRG4

MRSEC researchers, working in close collaboration with the University of Southhampton, have created electronic transistors integrated within pores in optical fibers. Silicon, when deposited within the fiber pores, is also stretched by the surrounding silica fiber walls, as revealed by a downshift in the frequency of vibration of the silicon atoms.

If the ends of the glass fiber are etched away to expose the semiconductor within for electrical contact, and another electrical contact is wrapped around the belly of the fiber, then a voltage applied to the wrap-around contact acts as a gate electrode, modulating the ability of the semiconductor within to carry current. The resulting device acts as an in-fiber transistor, the first integration of a fundamental device of the electronic age, the transistor, with a fundamental device of the photonic age, the optical fiber.

Current research focusses on improving the materials quality of the in-fiber material and also increasing the complexity of the structures that can be formed within these microstructured optical fibers.