

**Invited paper**

**Slow Light and Stored Light using SBS in an Optical Fiber**

Daniel J. Gauthier

Duke University, Department of Physics and Fitzpatrick Institute for Photonics,  
Box 90305, Durham, North Carolina 27708 USA

**Abstract**

*Recently, slow light and stored light has been achieved in room temperature optical fibers at telecommunication wavelengths, which is accelerating the transition of these techniques to applications. This presentation will review the physics behind these fascinating effects and describe recent progress.*

**Extended Abstract**

There has been great progress in devising methods for optically tailoring the dispersion of optical materials. Large normal dispersion, where the refractive index of the material increases with frequency over some range, results in slow light, where the group index  $n_g \gg 1$  and  $u_g$  is less than the speed of light in vacuum. Stored light is a related effect and refers to the conversion of optical pulses to a material excitation, which is converted back to the optical domain after a controllable storage time. Slow and stored light has potential applications for optical buffering, data synchronization, optical memories, and optical signal processing.

These techniques often rely on resonant effects that cause large normal dispersion in a narrow spectral region. Much of the early research was conducted with near an atomic resonance in a gas of atoms, where large changes in  $n_g$  were obtained by creating large optical coherence. More recently, it has been shown that simulated scattering process (such as stimulated Brillouin scattering (SBS)) in laser-pumped optical waveguides can be exploited to achieve slow light and stored light at any wavelength where the material is transparent. This presentation will review the physics behind these fascinating effects and describe recent progress.



**Daniel J. Gauthier**

Daniel J. Gauthier received the B.S. ('82), M.S. ('83), and Ph.D. ('89) degrees from the Institute of Optics, University of Rochester and was a Research Associate at the University of Oregon ('89-'91). He was a Young Investigator of the U.S. Army Research Office and the National Science Foundation, and is a Fellow of the Optical Society of America and the American Physical Society. He is currently Professor and Chair of Physics at Duke University. His research interests include: applications of slow light in classical and quantum information processing and investigating the dynamics of complex electronic, optical, and biological systems.

*Photo (credit: Jimmy Dorff)*