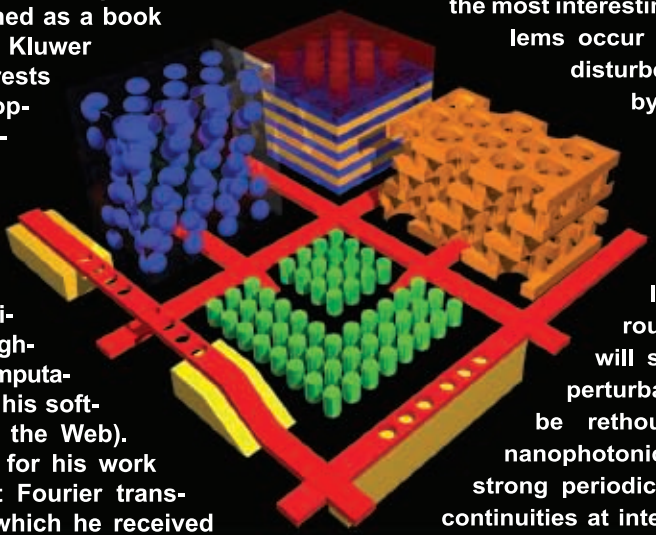
Argonne NATIONAL LABORATORY

Steven G. Johnson

"Photonic Crystals: From Order to Disorder"

Steven G. Johnson is an assistant professor of applied mathematics at the Massachusetts Institute of Technology, where he previously received his doctoral degree in condensed-matter physics. He is the author or co-author of nearly 80 papers on nanophotonics, electromagnetism in media structured on the scale of the wavelength, and his thesis was published as a book on the subject by Kluwer in 2001. His interests range from development of semianalytical models of nanophotonic systems, to designing devices (such as hollow-core fibers for medical lasers), to high-performance computation (with much of his software available on the Web). He is also known for his work on the FFTW fast Fourier transform li-brary, for which he received the 1999 J.H. Wilkinson Prize for Numerical Software.



Photonic crystals are periodic dielectric structures in which light can behave much differently than in a homogeneous medium. This talk gives an overview of some of the interesting properties and applications of these media, from switching in subwavelength microcavities to slow-light devices, to guiding light in air. However, some of the most interesting and challenging problems occur when the periodicity is disturbed, either by design or by inevitable fabrication imperfections. The talk focuses especially on small perturbations that have important effects, from slow-light tapers to surface roughness disorder, and will show that many classic perturbative approaches must be rethought for high-contrast nanophotonics. The combination of strong periodicity with large field discontinuities at interfaces causes standard methods to fail, but succumbs to new generalizations, while some problems remain open.

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3:00 p.m.

Bldg. 402, APS Auditorium • Argonne National Laboratory

APS Colloquium