

Wenshan Cai*Full Professor in the School of Electrical and Computer Engineering**Georgia Institute of Technology**Field- and Carrier-Enabled Nonlinear Nanophotonics***Friday, April 14, 2023; 2:00 p.m., BRK 2001****[Zoom Link](#)**

Engineered photonic nanostructures offer the exciting potential to create customized nonlinear optical media with tailored high-order effects, which are essential to the active control of light and the generation of new spectral components. Leveraging the electrical and optical functions simultaneously supported in certain nanophotonic systems, we can realize externally triggered and dynamically controllable light-matter interactions for nonlinear optical generation and signal processing. In particular, we harness the transient disruption of the inversion symmetry for second-order optical processes, and facilitate the hot-carrier-induced perturbation of the dielectric permittivity for all-optical control of light. Such effects are exploited in a variety of nanophotonic platforms, including plasmonic structures, dielectric metasurfaces, and two-dimensional crystals. Our studies reveal a grand opportunity to exploit photonic nanostructures as self-contained platforms with intrinsically embedded electrical functionality and optical nonlinearity, and conversely, to elucidate the dynamics of carrier generation and transport via nonlinear optical means.

Wenshan Cai is a full professor in the School of Electrical and Computer Engineering, with a joint appointment in Materials Science and Engineering. Prior to joining Georgia Tech in 2012, he was a postdoctoral fellow at Stanford University. Dr. Cai received his B.S. and M.S. from Tsinghua University in 2000 and 2002, respectively, and his Ph.D. from Purdue University in 2008. His research is focused on nanophotonic materials and devices, in which he has made major impacts on the evolving field of plasmonics and metamaterials. Dr. Cai has published ~100 journal articles, which in total have been cited over 20,000 times. He authored the book, *Optical Metamaterials: Fundamentals and Applications*, which is used as a textbook or a major reference around the world. Dr. Cai is the recipient of several distinctions, including the OSA/SPIE Joseph W. Goodman Book Writing Award and the Office of Naval Research Young Investigator Award. He is a Fellow of SPIE.

