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Research Summary:
Our research is focused on understanding and controlling light-matter interactions in nanomaterials. Our approach is to visualize and characterize the dynamics of light-induced processes through time-resolved spectroscopies and microscopies that are designed to operate over multiple contrast mechanisms and energy ranges, so as to gain a complete view of energy flow, conversion, and dissipation within nanostructures and to the surrounding environment. Principles of bio-assembly, synthesis, and nanofabrication are used to design and create the precisely constructed optical nanomaterials to be studied. Through this approach, we ultimately seek to discover novel optical nanomaterials and phenomena that can impact technologically important areas.

Awards/Honors:
2016 Fellow, American Physical Society
2013 Argonne National Laboratory Distinguished Service Award
2005 Argonne National Laboratory Director's Award
2004 Argonne National Laboratory Pacesetter Award
1998 Presidential Early Career Award for Scientists and Engineers (PECASE)
1998 Department of Energy Young Scientist Award
1996 R&D 100 Award for development of a Photorefractive Image Processor

Selected publications (of ~145):

- "Broadband Metamaterial Absorbers," P. Yu, L. V. Besteiro, Y. Huang, J. Wu, L. Fu, H. H. Tan, C. Jagadish, G. P. Wiederrecht, A. O. Govorov, Z. Wang, *Adv. Opt. Mat.*, 1800995 (2019).
- "Anisotropic photoluminescence from isotropic optical transition dipoles in semiconductor nanoplatelets," X. Ma, B. T. Diroll, W. Cho, I. Fedin, R. D. Schaller, D. V. Talapin, G. P. Wiederrecht, *Nano Lett.* **18**, 4647 (2018).
- "Transport of spin-entangled triplet excitons generated by singlet fission," Y. Wan, G. P. Wiederrecht, R. D. Schaller, J. C. Johnson, L. Huang, *J. Phys. Chem. Lett.* **9**, 6731 (2018).

- “Enhanced generation and anisotropic Coulomb scattering of hot electrons in an ultra-broadband plasmonic nanopatch metasurface,” M. E. Sykes, J. W. Stewart, G. M. Akselrod, X.-T. Kong, Z. Wang, D. J. Gosztola, A. B. F. Martinson, D. Rosenmann, M. H. Mikkelsen, A. O. Govorov, G. P. Wiederrecht, *Nature Comm.* **8**, 986 (2017).
- “Tailorable exciton transport in doped peptide-amphiphile assemblies,” L. A. Solomon, M. E. Sykes, Y. A. Wu, R. D. Schaller, G. P. Wiederrecht, and H. C. Fry, *ACS Nano* **11**, 9112 (2017).
- “Size-dependent biexciton quantum yields and carrier dynamics of quasi-two-dimensional core/shell nanoplatelets,” X. Ma, B. T. Diroll, I. Fedin, W. Cho, R. D. Schaller, D. V. Talapin, S. K. Gray, G. P. Wiederrecht, D. J. Gosztola, *ACS Nano* **11**, 9119 (2017).
- "Nano-optical imaging of WSe_2 waveguide modes revealing light-exciton interactions," Z. Fei, M.E. Scott, D. J. Gosztola, J. J. Foley IV, J. Yan, D. G. Mandrus, H. Wen, P. Zhou, D. W. Zhang, Y. Sun, J. R. Guest, S. K. Gray, W. Bao, G. P. Wiederrecht, X. Xu, *Phys. Rev. B* **94**, 081402(R) (2016).
- "Ultrafast optical modulation of second- and third-harmonic generation from cut-disk-based metasurfaces," G. Sartorello, N. Olivier, J. Zhang, W. Yue, D. J. Gosztola, G. P. Wiederrecht, G. Wurtz, A. V. Zayats, *ACS Photonics* **3**, 1517 (2016).
- "Anomalous ultrafast dynamics of hot plasmonic electrons in nanostructures with hot spots," H. Harutyunyan, A. B. F. Martinson, D. Rosenmann, L. K. Khorashad, L. V. Besteiro, A. O. Govorov, G. P. Wiederrecht, *Nat. Nanotech.* **10**, 770 (2015)
- "Damping of coherent acoustic vibrations by nanosized pores in colloidal hypersonic crystals," G. Zhu, G. P. Wiederrecht, C. Ling, S. Wu, D. Banerjee, and K. Yano, *Appl. Phys. Lett.* **105**, 051903 (2014).
- “Energy transfer from quantum dots to metal-organic frameworks for enhanced light harvesting,” S. Jin, H.-J. Son, O.K. Farha, G.P. Wiederrecht, J.T. Hupp*, J. Am. Chem. Soc.* **135**, 955 (2013).
- “Light Harvesting and Ultrafast Energy Migration in Porphyrin-Based Metal-Organic Frameworks,” H.-J. Son, S. Jin, S. Patwardhan, S. Wezenberg, N.C. Jeong, M. So, C. Wilmer, A. Sarjeant, G. Schatz, R. Snurr, O. Farha, G. P. Wiederrecht, J. Hupp, *J. Am. Chem. Soc.* **135**, 862 (2013).
- “Ultrafast charge transfer from highly reductive ZnTe/CdSe type II quantum dots,” S. Jin, J. Zhang, R. D. Schaller, T. Rajh, G. P. Wiederrecht, *J. Phys. Chem. Lett.* **3**, 2052 (2012).
- “Visualizing charge movement near organic heterostructures with ultrafast time resolution via an induced Stark shift,” G. P. Wiederrecht, N. C. Giebink, J. Hranisavljevic, D. Rosenmann, A.B.F. Martinson, R. D. Schaller, and M. R. Wasielewski, *Appl. Phys. Lett.* **100**, 113304 (2012).
- “Kinetics of J-aggregate formation on the surface of Au nanoparticle colloids,” A. Vujacic, V. Vasic, M. Dramicanin, S. P. Sovilj, N. Bibic, J. Hranisavljevic, G. P. Wiederrecht, *J. Phys. Chem. C* **116**, 4655 (2012).
- “Reduced Heterogeneity of Electron Transfer into Polycrystalline TiO_2 Films: Site-Specific Kinetics Revealed by Single Particle Spectroscopy,” S. Jin, A. B. F. Martinson, and G. P. Wiederrecht, *J. Phys. Chem. C* **116**, 3097 (2012).