# Austin P. Spencer

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**Optical scientist with 10+ years of research experience in optics, materials, and computation.**

- Extensive experience in ***optical design***, both in prototype development and modeling.
- Experienced ***team project manager*** with proven mentoring, leadership, and collaboration skills.
- Strong record of ***effective communication*** evidenced through research presentations and scientific writing, with ***20+ peer-reviewed publications***.
- ***Adaptable*** to varying projects, mastering new skills as needed to complete an objective.

## Technical skills

- **Optics and lasers** – diffractive, refractive, and polarization-sensitive optics – optical coatings – linear and nonlinear optics – light characterization (spatial, temporal, and spectral)
- **Data analysis and modeling** – Fourier methods – optical modeling and ray tracing – signal and image processing – global analysis methods – linear and nonlinear optimization
- **Experiment/instrument development** – robust optical design – technique characterization, calibration, and documentation
- **Materials** – thin films – semiconductors – organic polymers and small molecules
- **Software development** – instrument control and real-time synchronization
- **Programming** – MATLAB – LabVIEW – C – Bash – Python – Mathematica – Fortran – Java
- **Electronic engineering** – analog – digital – microcontrollers – PCB design

## Education

Ph.D. in Physical Chemistry; University of Colorado Boulder 2014

B.S. Chemistry, Computer Science; University of North Carolina at Chapel Hill 2009

## Experience

**Laser Physicist** 2020–present

Dynamic Compression Sector, Argonne National Laboratory

- Develop and operate a 100 J UV laser system as a driver for laser shock experiments.
- Design optical assemblies and diagnostics for improved laser performance and monitoring.

**Postdoctoral Researcher** 2014–2020

Northwestern University, Department of Chemistry

- Developed optical instrumentation for investigating the electronic and vibrational dynamics of thin films, polymers, and molecules.
- Invented a coherent 4D Fourier-transform spectroscopy (GAMERS) that revealed coupled behavior in complex materials.
- Demonstrated a compressive sensing detection scheme utilizing a digital micromirror array and a single-element detector that captured n-pixel images with much fewer than n measurements.

**Research Assistant** 2009–2014
University of Colorado Boulder, Department of Chemistry and Biochemistry
- Simulated multidimensional Fourier-transform spectra to model optical propagation in absorbing materials.
- Conceived, designed, and built a beam scanning apparatus for studying solution-phase and thin film samples without repetitive excitation.

**Undergraduate Researcher** 2007–2009
University of North Carolina at Chapel Hill
- Investigated UV photodissociation and thermochemistry of halo-alkanes.

## Honors and Recognitions

**Cover & Feature article in *The Journal of Physical Chemistry C*** 2018
"Four-Dimensional Coherent Spectroscopy of Complex Molecular Systems in Solution"

**Featured in *Science*: 4D electronic–Raman spectroscopy** 2017
J. Goodknight, A. Aspuru-Guzik. Taking six-dimensional spectra in finite time. *Science* **2017**, *356*, 1333–1333; DOI: 10.1126/science.aan2842

**Summer Undergraduate Research Fellowship** 2008
University of North Carolina at Chapel Hill

**Eagle Scout**

## Selected publications

1. W. Zhu, A. P. Spencer, S. Mukherjee, J. M. Alzola, V. K. Sangwan, S. H. Amsterdam, S. M. Swick, L. O. Jones, M. C. Heiber, A. A. Herzing, G. Li, C. L. Stern, D. M. DeLongchamp, K. L. Kohlstedt, M. C. Hersam, G. C. Schatz, M. R. Wasielewski, L. X. Chen, A. Facchetti, T. J. Marks. Crystallography, Morphology, Electronic Structure, and Transport in Non-Fullerene/Non-Indacenodithienothiophene Polymer:Y6 Solar Cells. *J. Am. Chem. Soc.* **2020**, *142*, 14532–14547; DOI: 10.1021/jacs.0c05560

2. A. P. Spencer, W. O. Hutson, E. Harel. Four-Dimensional Coherent Spectroscopy of Complex Molecular Systems in Solution. *J. Phys. Chem. C* **2018**; DOI: 10.1021/acs.jpcc.8b09184

3. A. P. Spencer, R. J. Hill, W. K. Peters, D. Baranov, B. Cho, A. Huerta-Viga, A. R. Carollo, A. C. Curtis, D. M. Jonas. Sample exchange by beam scanning with applications to noncollinear pump–probe spectroscopy at kilohertz repetition rates. *Rev. Sci. Instrum.* **2017**, *88*, 064101; DOI: 10.1063/1.4986628

4. A. P. Spencer, B. Spokoyny, S. Ray, F. Sarvari, E. Harel. Mapping multidimensional electronic structure and ultrafast dynamics with single-element detection and compressive sensing. *Nat. Commun.* **2016**, *7*, 10434; DOI: 10.1038/ncomms10434

5. A. P. Spencer, H. Li, S. T. Cundiff, D. M. Jonas. Pulse Propagation Effects in Optical 2D Fourier-Transform Spectroscopy: Theory. *J. Phys. Chem. A* **2015**, *119*, 3936–3960; DOI: 10.1021/acs.jpca.5b00001