

## Kenneth Dale Weston

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Senior Scientist – Directed Energy Solutions, Colorado Springs, CO 80907  
email: weston.ken@gmail.com      phone: 719-359-9543

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### Objective

To obtain a scientist or engineer position in an innovative and multi-disciplinary technology development environment. The position will allow me to utilize and refine my skills in solving technical problems and make creative contributions in support of the organization's short- and long-term goals.

### Areas of Expertise/Skills

- Optical/photronics instrumentation for numerous varieties of imaging and spectroscopy
- Single molecule fluorescence imaging and spectroscopy (using confocal and wide-field techniques)
- Confocal microscopy (design, construction, and application for ultra-high sensitivity)
- Laser development (w/ focus on diode pumped Yb:YAG and stimulated Raman scattering/lasing)
- High finesse cavity/interferometry optical measurements
- Fluid mechanics for cooling, pressure regulation, and flow control (in micro- and macroscopic fluid systems)
- Vacuum/pressure systems design and implementation
- Time correlated single photon counting methods (TCSPC)
- Fluctuation Correlation Spectroscopy (FCS)
- Microfabrication techniques for microfluidics (with silicon, glass, and polymer-based materials)
- Development of novel bioanalytical assays
- Molecular photophysics (w/ focus on quenching, resonance energy transfer)
- Scanned probe microscopy (Near-field Scanning Optical Microscopy (NSOM) / Atomic force microscopy)
- Cryogenic systems design and application (w/ focus on liquid nitrogen flow systems)
- LabVIEW programming for automation of experiment control and data acquisition, data analysis and simulations
- Solidworks 3D CAD software for mechanical design and verification
- COSMOSWorks and COSMOSFloWorks for fluid and thermal finite element/volume method simulations
- Experience using Matlab, IDL, C++ for data analysis and modeling
- Zemax optical system design software
- Technical writing for report preparation (MS Office suite, Adobe Photoshop, Illustrator & Premier)
- Basic analog electronics, machining

### Education

1994-1998 Ph.D. Chemistry, Department of Chemistry, Univ. of California, Santa Barbara.

1990-1994 B.S. Chemistry with Minor in Biology, Univ. of North Carolina, Chapel Hill.

### Professional Experience

**2006-present Senior Scientist.** Directed Energy Solutions, Colorado Springs, CO.

- Team member designing, prototyping, and testing an "Air Laser" system based on cryogenically cooled diode-pumped Yb:YAG as the pump source and using a stimulated Raman gain approach to generate an IR output beam with target power > 1 kW. The project was funded by Defense Advanced Research Projects Agency (DARPA).
- Developed and implemented system for generating and delivering high purity liquid nitrogen at controlled flow rates.
- Built and applied a system for measuring the optical loss in cryogenic fluids using a high finesse cavity.
- Built birefringence imaging system for comparative study of doped YAG crystals at controlled temperatures from 77 K - 320 K
- Performed thermal modeling using COSMOSFloWorks on pumped YAG with various cooling configurations

**2002-2006 Assistant Professor.** Dept. of Chemistry and Biochemistry, Florida State University, Tallahassee, FL.

- Developed and taught graduate level courses; one on optical spectroscopy and another on fluorescence techniques; taught undergraduate Analytical Chemistry class. Fluorescence course covered DNA and peptide microarray technology.
- Developed a method based on confocal microscopy and fluorescence correlation spectroscopy (FCS) to characterize flow in microfluidic devices.
- Developed a 2-beam fluorescence cross correlation spectroscopic (FCCS) method for analyzing complex mixtures based on component electrophoretic mobilities. Focus is on characterizing peptide fragments that result from protein digests.
- Implemented a nanosecond FCS method for measuring sub- $\mu$ s intramolecular contact formation dynamics to study the rate of folding/unfolding of model beta-hairpin peptides.

**2001-2002 Visiting Research Scientist.** Biophysics Group, Physical Chemistry Institute, University of Heidelberg, Heidelberg, Germany. Group leader: Prof. Dr. Markus Sauer.

- Developed experimental tools and analysis methods for measuring nanosecond phenomenon, the excited state lifetime and photon-antibunching, of single dye molecules and multichromophoric constructs.
- Established a method for simultaneously measuring the number of absorbing species and the number of emitting species in multichromophoric constructs.

**1999-2001 National Research Council Postdoctoral Associate.** Physics Laboratory, Optical Technology Division, National Institute of Standards and Technology, Gaithersburg, MD. Supervisors: Dr. Lori Goldner and Dr. John Stephenson.

- Designed and constructed a confocal microscope for single molecule fluorescence experiments that allows imaging and monitoring the absorption dipole orientation of fluorophores in time.
- Wrote software to perform sample scanning and control an electro-optic modulator, both synchronized with a buffered event counting to record fluorescence counts rates from photon counting detectors for imaging.
- Studied the reorientation dynamics of dye molecules in polymer thin film environments.
- Worked on buffer exchange/modulation methods using microfluidics and electro-osmotic flow.
- Contributed to the design and application of a Fourier Analysis Near-Field Polarimeter.

**1994-1998 Graduate Research Assistant.** Graduate Advisor: Professor Steve Buratto.

- Built two different near-field scanning optical microscopes (NSOM) and applied these to the study of various photoluminescent and electroluminescent materials and devices.
- Developed data analysis tools for characterization of SM intensity trajectories using histogram and autocorrelation methods.
- Applied Monte Carlo simulation methods to help quantitatively characterize SM intensity trajectories.

### Selected Publications

- F. Yuan, L. Griffin, L. Phelps, V. Buschmann, **K. D. Weston** and N. L. Greenbaum, Use of a novel Förster resonance energy transfer method to identify locations of site-bound metal ions in the U2-U6 snRNA complex, *Nucleic Acids Research*, 35 (9) p 2833 (2007)
- P. C. Brister and **K. D. Weston**, Evaluation of two-beam fluorescence cross correlation spectroscopy for electrophoretic analysis of protein digests, *The Analyst*, 131 (2), p 303-310 (2006).
- P. C. Brister and **K. D. Weston**, Patterned Solvent Etching for the Fabrication of Plastic Microfluidic Devices, *Analytical Chemistry*, 77 (22), p 7478-7482 (2005).
- P. C. Brister, K. K. Kuricheti, V. Buschmann and **K. D. Weston**, Fluorescence correlation spectroscopy for flow rate imaging and monitoring—optimization, limitations and artifacts, *Lab on a Chip*, 5, 785 - 791 (2005).
- Y. Xiao, V. Buschmann, **K. D. Weston**, Scanning fluorescence correlation spectroscopy: a new tool for probing microsecond dynamics of surface bound fluorescent species, *Analytical Chemistry* 77 (1), p 36-46 (2005). (*This article is featured in Biophotonics International, February 2005*)
- K. D. Weston and M. Sauer, "Sequencing the Single DNA Molecule", book chapter in B. K. Nunnally (Ed.) *Analytical techniques in DNA Sequencing*, Taylor & Francis Group, Boca Raton (2005).
- J. Hofkens, M. Cotlet, T. Vosch, P. Tinnefeld, **K. D. Weston**, C. Ego, A. Grimsdale, K. Müllen, D. Beljonne, J. L. Brédas, S. Jordens, G. Schweitzer, M. Sauer, and F. Schryver, "Revealing competitive Förster-type resonance energy-transfer pathways in single bichromophoric molecules", *Proceedings of the National Academy of Sciences* 100, p13146-13151 (2003).
- O. Piester, H. Barsch, V. Buschmann, T. Heinlein, J.-P. Knemeyer, **K. D. Weston**, M. Sauer, "A Single-Molecule Sensitive DNA Hairpin System Based on Intramolecular Electron Transfer", *Nano Letters* 3(7), p979-982 (2003).
- L. S. Goldner, M. J. Fasolka, S. Nougier, H. Nguyen, G. W. Bryant, J. Hwang, **K. D. Weston**, K. L. Beers, A. Urbas, E. L. Thomas, "A Fourier Analysis Near-Field Polarimeter for Measurement of Local Dichroism and Birefringence in Thin Films", *Applied Optics*, 42 (19), p3864-3881 (2003).
- P. Tinnefeld, **K. D. Weston**, T. Vosch, M. Cotlet, T. Weil, J. Hofkens, K. Müllen, F. C. De Schryver and M. Sauer, "Antibunching in the Emission of a Single Tetrachromophoric Dendritic System" *Journal of the American Chemical Society* 124, p14310-14311 (2002).
- K. D. Weston**, M. Dyck, P. Tinnefeld, C. Müller, D. P. Herten, M. Sauer, "Measuring the number of independent emitters in single molecule fluorescence images and trajectories using coincident photons", *Analytical Chemistry* 74, p5342-5349 (2002).
- K.D. Weston**, and L.S. Goldner, "Orientation Imaging and Reorientation Dynamics of Single Molecules", *Journal of Physical Chemistry B* 105, p3453 (2001).
- K. D. Weston**, P. J. Carson, J. A. DeAro, and S. K. Buratto, "Single Molecule Fluorescence of Surface-Bound Species in Vacuum", *Chemical Physics Letters*, 308, 58 (1999).
- J. A. DeAro, **K. D. Weston**, S. K. Buratto, R. W. Herrick and P. M. Petroff, "Near-Field Scanning Optical Microscopy of Cleaved Vertical Cavity Surface Emitting Lasers" *Semiconductor Science and Technology* 13, 1364 (1998).
- K. D. Weston**, P. J. Carson, H. Metiu and S. K. Buratto, "Room Temperature Fluorescence Characteristics of Single Molecules Adsorbed on a Glass Surface" *Journal of Chemical Physics* 109, 7474 (1998).
- M. D. Mason, G. M. Credo, **K. D. Weston**, S. K. Buratto, "Luminescence of Individual Porous Si Chromophores" *Physical Review Letters* 80, 5405 (1998).

### References

PhD advisor: Professor Steve Buratto, Univ. of California, Santa Barbara; phone: 805-893-3393; email: buratto@chem.ucsb.edu  
Advisor at NIST: Dr. Lori Goldner, NIST, Gaithersburg; phone: 301-975-3792; email: lori.goldner@nist.gov  
Advisor at U. Heidelberg: Dr. Markus Sauer, Bielefeld, Germany; phone: +49(0)521-106-5450 email: sauer@physik.uni-bielefeld.de  
Colleague at FSU: Professor Andre Striegel, Dept. of Chemistry, FSU; phone: 850-645-3211; email: striegel@chem.fsu.edu  
Supervisor at Directed Energy Solutions, Dr. Akheesh Abeeluck, Technical Director, Raman and Diode Laser Devices; phone: 908-752-2111; email: akheesh@aol.com

## General Cover Letter

Dear Sir or Madam,

I have a wide range of expertise in laser/optical methods with a focus on imaging systems and laser development, automation of equipment for complex measurements, instrumentation design and development, and prototype testing and troubleshooting. Although I am a chemist by degree, I have had research experiences in disciplines ranging from physics to engineering to biology. I have been setting up and using high precision, custom built optical systems for high sensitivity measurements since 1994 and I've been programming in Labview to control such systems for 10 years. I am confident that I can offer valuable contributions to your ongoing efforts. I hope you will take a moment to review my resume and consider me for any suitable position you may have now or in the future. Although I would prefer to have a permanent, full time position, I would also be interested in temporary contract jobs.

Thanks very much,

Ken Weston  
719-359-9543