

# Andrew James Bonham, Ph.D.

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Online Research Site: <http://www.bonhamlab.com>

Online Teaching Site: <http://www.bonhamchemistry.com>

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Arvada, CO 80003

## Education:

2004-2010

### **Ph.D. in Biochemistry & Molecular Biology, Biophysics & Bioengineering emphasis**

Biomolecular Science & Engineering program, Advisor: Dr. Norbert Reich

University of California at Santa Barbara

Dissertation: *Novel Optical Techniques for Exploring the DNA Binding Affinity and Specificity of Eukaryotic Transcription Factors and Transcription Factor Complexes.*

2000-2004

### **B.A. in Chemistry, B.A. in Biochemistry; Minor in Philosophy**

University of Colorado at Boulder; Magna cum laude

Honors Thesis: *Crystallographic investigations of the Foxp2 winged-helix DNA-binding protein.*

## Research Experience:

2015-

### **Associate Professor of Biochemistry, Metropolitan State University of Denver**

Ran a research program devoted to better understanding of DNA-based electrochemical biosensor design and implementation. Designed sensors for monitoring biological toxins and proteins to create medical and research diagnostics for toxicity and cancer.

2011-2015

### **Assistant Professor of Biochemistry, Metropolitan State University of Denver**

Ran a research program devoted to better understanding of DNA-based fluorescent and electrochemical biosensor design and implementation. Designed sensors for monitoring transcription factor levels to create medical and research diagnostics for cancer, immune rejection, and cellular differentiation.

2010-2011

### **Postdoctoral Fellow, University of California Santa Barbara**

Advisor: Kevin W. Plaxco

Design and implementation of novel bio-sensors based on aptamers and transcription factor:DNA recognition for the detection of renal failure, developmental progress, and oncogenesis.

2004-2010

### **Graduate Student Research, Biomolecular Science and Engineering program, U.C. Santa Barbara**

Advisor: Norbert O. Reich

Developed novel total internal reflectance and fluorescence (TIRF) and Raman spectroscopic assays for the investigation of multiprotein transcriptional regulatory protein complexes across dsDNA microarrays.

2002-2004

### **Undergraduate Research, University of Colorado at Boulder**

Cloned, expressed, and purified proteins ANC-1 and Foxp2 for X-ray crystallographic studies. Established crystal screening trials, analyzed protein crystals.

Prof. Lin Chen laboratory at CU Boulder. Supervisor: Darren Bates.

2000-2001

### **Undergraduate Research, University of Colorado at Boulder**

Performed photobleaching experiments on fluorescently-labeled polystyrene particles.

Prof. Kathy Rowlen's lab at CU Boulder. Supervisor: Michele Jacobson.

## Research Skills:

Extensive molecular biology, biochemistry, and analytical chemistry background: recombinant DNA, molecular cloning and mutagenesis; DNA sequencing; protein engineering, expression, modification, and labeling; FPLC and HPLC purification; enzyme kinetics; fluorescent and Raman optical spectroscopy; DNA microarray fabrication; radiation training ( $H^3$  and  $P^{32}$ ); TEM and SEM microscopy; electrochemistry; polymer surface chemistry; GC-MS analysis.

## Teaching Experience:

- 2015- **Associate Professor of Biochemistry, Metropolitan State University of Denver**  
Created lesson plans and taught: CHE 4310 – Biochemistry I, CHE 4320- Biochemistry II, CHE 4350- Biochemistry Laboratory, CHE 2100- Introduction to Organic & Biological Chemistry, CHE 4950- Senior Experience in Chemistry. Served as Director of the Biochemistry program; Led undergraduate student researchers on independent research projects in molecular biology and bio-sensor design; organized and ran biochemistry research facility.
- 2011-2015 **Assistant Professor of Biochemistry, Metropolitan State University of Denver**  
Created lesson plans and taught: CHE 4310 – Biochemistry I, CHE 4320- Biochemistry II, CHE 4350- Biochemistry Laboratory, CHE 2100- Introduction to Organic & Biological Chemistry, CHE 4950- Senior Experience in Chemistry. Served as Biochemistry Lab coordinator; redesigned and wrote lab manual, and created youtube-hosted video recitations for laboratory courses. Led undergraduate student researchers on independent research projects in molecular biology and bio-sensor design; organized and ran biochemistry research facility. Served as chair of biochemistry screening committees and taskforce member of undergraduate research conference.
- 2013- **Co-Director and Co-Principal Investigator of Denver Metro Chem Scholars Grant**  
Write and implemented successfully funded NSF educational grant, awarded \$620,000 over 5 years. Direct scholarship activities and seminars for outstanding Chemistry students.
- 2007 **Instructor / Teaching Associate for CHEM 1C: General Chemistry**  
Created and gave daily lectures; wrote and implemented course lesson plan. Wrote homework and exams, held review sessions, proctored, held office hours.
- 2008 **Teaching Fellow for Summer Teaching Institute for Associates**  
Led discussions and group activities on teaching strategies, course planning, and effective learning for first-time Associates/Lecturers at a University level.
- 2005-2010 **Graduate Mentor for Undergraduate Students**  
Led students in year-long or greater research projects; taught techniques, guided experiments, and encouraged critical thought. Former/current students include Leah Osslund & Eric Sankey.
- 2009 **ICB Sabre (Summer Applied Biotechnology Research Experience) Mentor**  
Led Joelle Stanford, a chemistry undergraduate student from Florida A&M, on a summer-long research project for the Institute for Collaborative Biotechnologies' Sabre project.
- 2008 **Mentor for UCSB Pre-College Research Mentorship Program in Biochemistry**  
Led high-school student on summer-long research project and presentation on their experience.
- 2008, 2009 **Teaching Assistant for MCDB109L: Biochemistry Laboratory**  
Instructed intensive laboratory sections, guided students on projects, wrote quizzes, answered questions.
- 2005, 2006 **Teaching Assistant for CHEM125L: Biochemistry Laboratory for Graduate Students**  
Instructed intensive fulltime two week laboratory section, guiding students on projects.
- 2005, 2006 **Teaching Assistant for MCDB 131L: Microbiology Laboratory**  
Instructed two laboratory sections, guided student projects, wrote quiz questions, answered questions.
- 2006-2011 **ScienceLine Answerer**  
Participated in UCSB internet project to answer the science questions of children K-12.

## Teaching Skills:

Proven ability to successfully mentor students; comfortable and confident lecturer and speaker; experienced discussion leader; experience writing and implementing lesson plans; confident public speaker; excellent proficiency with modern technology in and out of the classroom; outstanding pastoral skills and rapport with students; comprehensive knowledge of general chemistry, biochemistry, and molecular biology topics; consistently excellent teaching evaluations; familiarity with current pedagogy and teaching strategies; inquire for excellent student references. Experience using and training colleagues on modern pedagogy tools and techniques.

## Awards/Honors:

- 2014 **Golden Key Excellence in Teaching Award**  
University-wide award from Golden Key International Honor Society to recognize outstanding commitment to teaching.
- 2013 **Faculty Senate Teaching Excellence Award**  
Award given to one tenure-track faculty member university-wide to recognize outstanding rigor, enthusiasm, and commitment to teaching.
- 2010-2011 **Tri Counties Blood Bank Santa Barbara Foundation Postdoctoral Fellowship**  
Fellowship to support postdoctoral work on blood-based detection and treatments.
- 2009 **Chang Distinguished Alumni Award**  
Award given for the Outstanding Talk in the Most Advanced category of presented research.
- 2008 **ScienceLine Outstanding Answerer Award in Physical Sciences**  
Award given for excellence in answering science questions from students K-12.
- 2004-2005 **George and Joy Rathmann Fellowship**  
Assists outstanding Ph.D. students in the Biomolecular Sciences and Engineering program.
- 2000-2004 **Kittridge Honors program**  
Awarded to undergraduate students with excellent demonstrated academic or creative abilities.
- 2002-2004 **Undergraduate Research Opportunities Program (UROP) Grants**  
Awarded to undergraduate students with scholarly or creative proposals to work with a faculty sponsor.
- 2004 **Magna Cum Laude honors for B.A. at University of Colorado, Boulder**
- 2000-2004 **Dean's List, University of Colorado, Boulder**

## Grants & Patents:

- 2013- **Denver Metro Chem Scholars Grant, Co-Principal Investigator**  
NSF educational grant to provide scholarships and opportunities for undergraduate chemistry students. NSF grant #1259336. \$623,063.
- 2012 **Nucleotide-Based Probes and Methods for the Detection and Quantification of Macromolecules and Other Analytes**  
Patent publication # WO/2012/071344, describing several related frameworks for macromolecular detection with DNA-based bio-sensor probes.
- 2011-2014 **Letters, Arts, and Science Mini-grant Awards**  
Grants to support mentoring undergraduate researchers at Metro State University of Denver. \$4,000.
- 2011- **Provost's Grant Support Awards**  
Grant to support starting up an undergraduate research laboratory at Metro State University of Denver. \$5,000.
- 2011 **Tri Counties Blood Bank Santa Barbara Foundation Postdoctoral Fellowship**  
Fellowship to support postdoctoral work on blood-based detection and treatments. \$58,000.

## Publications:

1. Stephen R. Schaffner, Kathryn Norquest, Elina Baravik, Jody Stephens, Lisa Fetter, Ryan M. Masterson, Yerelys Reyna, Andrew J. Bonham. **Conformational design optimization of transcription factor beacon DNA biosensors.** Sensing & BioSensing Research, 2014, 2, p 49. doi: 10.1016/j.sbsr.2014.10.007
2. Ferguson, B. Scott, Hoggarth, David A., Maliniak, Dan, Ploense, Kyle, White, Ryan J., Woodward, Nick, Hsieh, Kuangwen, Bonham, Andrew J., Eisenstein, Michael, Kippin, Tod, Plaxco, Kevin W., Soh, H. Tom. **Real-time, aptamer-based tracking of circulating therapeutic agents in living animals.** Science Translational Medicine, 2013, 5(213), p 165. doi: 10.1126/scitranslmed.3007095

3. Andrew J. Bonham, Nicole G. Padman, Francesco Ricci, and Kevin W. Plaxco. **Detection of IP-10 protein marker in undiluted blood serum via an electrochemical E-DNA scaffold sensor.** *Analyst*, 2013,138(19), p 5580-5583, doi: 10.1039/c3an01079a
4. Andrew J. Bonham, Leah M. Osslund, Aaron J. Prussin II, Nikola Wentta, Uwe Vinkemeier, and Norbert O. Reich. **STAT1 DNA-sequence dependent binding specificity modulation by phosphorylation, protein:protein interactions, and small molecules.** *Nuc. Acids Res.*, 2012, doi: 10.1093/nar/gks1085
5. Andrew J. Bonham, Kuangwen Hsieh, B. Scott Ferguson, Alexis Vallée-Bélisle, Francesco Ricci, H. Tom Soh, and Kevin W. Plaxco. **Quantification of Transcription Factor Binding in Cell Extracts Using an Electrochemical, Structure-Switching Biosensor.** *J. Am. Chem. Soc.*, 2012, 134 (7), 3346–3348. doi:10.1021/ja2115663
6. Andrew J. Bonham, Alexis Vallée-Bélisle, Norbert O. Reich, Francesco Ricci, and Kevin W. Plaxco. **Transcription Factor Beacons for the Quantitative Detection of DNA Binding Activity.** *J. Am. Chem. Soc.*, 2011, 133 (35), 13836–13839. doi:10.1021/ja204775k
7. Aaron A Rowe, Andrew J Bonham, Ryan J White, Michael P Zimmer, Ramsin J Yadgar, Tony M Hobza, Jim Honea, Ilan Ben-Yaacov, Kevin W Plaxco. **CheapStat: an open-source, “do-it-yourself” potentiostat for analytical and educational applications.** *PLoS ONE*, Sep 13, 2011, doi:10.1371/journal.pone.0023783
8. Aaron A Rowe, Ryan J White, Andrew J Bonham, Kevin W Plaxco. **Fabrication of Electrochemical-DNA Biosensors for the Reagentless Detection of Nucleic Acids, Proteins and Small Molecules.** *Journal of Visualized Experiments*, 2011, 52, doi:10.3791/2922
9. Andrew J. Bonham. **Novel optical techniques for exploring the DNA binding affinity and specificity of eukaryotic transcription factors and transcription factor complexes.** Dissertation, March 2010, open access: <http://proquest.umi.com/pqdwweb?did=2031660581&Fmt=2&RQT=309>
10. Thorsten Neumann, Andrew J. Bonham, Gregory Dame, Bernd Berchtold, Oswald Prucker, Norbert O. Reich, and Juergen Ruehe. **Temperature and time resolved TIRF analysis of reusable DNA hydrogel chips.** *Anal. Chem.*, 2010, 82(14), 6124-6131, doi:10.1021/ac1008578
11. Andrew J. Bonham, Thorsten Neumann, Matthew Tirrell, and Norbert O. Reich. **Tracking transcription factor complexes on DNA using total internal reflectance fluorescence protein binding microarrays.** *Nuc. Acids Res.*, 2009, 37(13), e94, doi:10.1093/nar/gkp424
12. Francesco Ricci, Andrew J. Bonham, Aaron C. Mason, Norbert O. Reich, and Kevin W. Plaxco. **Reagentless, Electrochemical Approach for the Specific Detection of Double- and Single-Stranded DNA Binding Proteins.** *Anal. Chem.*, 2009, 81 (4), p 1608–1614, doi:10.1021/ac802365x
13. Andrew J. Bonham, Gary Braun, Ioana Pavel, Martin Moskovits, and Norbert O. Reich. **Detection of Sequence-Specific Protein-DNA Interactions via Surface Enhanced Resonance Raman Scattering.** *J. Amer. Chem. Soc.*, 2007, 129 (47), p 14572–14573, doi:10.1021/ja0767837
14. Teisha Jane Rowland, Liane M Miller, Alison J Blaschke, E. Lauren Doss, Andrew J. Bonham, Sherry T Hikita, Lincoln V Johnson, Dennis O Clegg. **Roles of Integrins in Human Induced Pluripotent Stem Cell Growth on Matrigel and Vitronectin.** *Stem Cells and Development*. doi:10.1089/scd.2009.0328

## Presented Research:

1. **Experimental Biology 2015**  
Poster on "Electrochemical DNA Biosensors for Point-of-Care Protein and Toxin Detection". American Society for Biochemistry & Molecular Biology, Boston, MA, March 29, 2015.
2. **Experimental Biology 2014**  
Talk on "Structure-switching biosensors for the quantitative measurement of protein:protein interactions involved in aberrant transcriptional activity". American Society for Biochemistry & Molecular Biology, San Diego, CA, April 28, 2014.

3. **American Chemical Society National Meeting, Dallas 2014**  
Talk on "Structure-switching biosensors for the quantitative measurement of protein:protein interactions involved in aberrant transcriptional activity". American Chemical Society, Dallas, TX, March 16, 2014.
4. **Colorado Learning and Teaching with Technology Conference 2013**  
Invited talk on "Avoiding Frankenstein's Monster: Integrated Classrooms Without Tech Running Amok". University of Colorado Boulder, Boulder, CO, August 7, 2013.
5. **AASCU Academic Affairs Summer Meeting 2013**  
Invited talk on "Flipping the Classroom: New Strategies for Modern Learning". American Association of State Colleges and Universities, Baltimore, MD, July 27, 2013.
6. **Experimental Biology 2013**  
Poster on "Structure-switching biosensors for the quantitative measurement of protein:protein interactions involved in aberrant transcriptional activity". American Society for Biochemistry & Molecular Biology, Boston, MA, April 20, 2013.
7. **Colorado Learning and Teaching with Technology Conference 2012**  
Talk on "Transforming Teaching with Technology: A Learning Community". University of Colorado Boulder, Boulder, CO, August 1, 2012.
8. **METROLEADS (MSU Denver Leadership Forum)**  
Invited talk on "The Flipped Classroom". MSU Denver, Denver, CO, January 25, 2013.
9. **MSU Denver Teaching and Learning with Technology Symposium**  
Talk on "Transforming Teaching with Technology". MSU Denver, Denver, CO, October 26, 2012.
10. **Rocky Mountain Regional Meeting of the American Chemical Society**  
Invited talk on "Structure-switching DNA biosensors for protein detection in complex fluids". American Chemical Society, Westminster, CO, October 19, 2012.
11. **International Conference on Biomolecular Engineering**  
Talk on "Transcription Factor Beacons: Optical Switching Probes Driven by Native Interactions". Society for Biological Engineering, San Francisco, CA, January 15, 2011.
12. **ASBMB Transcriptional Regulation by Chromatin and RNA Polymerase II Meeting**  
Poster on "Investigating General Transcription Factor complexes on DNA using total internal reflectance fluorescence protein binding microarrays". American Society for Biochemistry and Molecular Biology, Lake Tahoe, CA, October 18, 2008.
13. **Recent Advances and New Directions in Bio-Nanotechnology Symposium**  
Invited talk on "Bio-inspired assembly of functional inorganic materials". University of California Santa Barbara, Santa Barbara, CA, August 8, 2007.

### **Other Professional Experience:**

#### **Co-Director of Denver Metro Chem Scholars program 2013-**

Organized recruitment, selection, evaluation, and retention of promising chemistry undergraduates. Maintain annual program schedule of invited speakers and seminars.

#### **Taskforce Member for MSU Denver Undergraduate Research Conference 2011-**

Guided formation and continuation of annual Undergraduate Research Conference for first 3 years, organizing committees, judging student abstracts, managing event.

#### **Program Coordinator for Biochemistry Major 2011-**

Designed and implemented Biochemistry B.S. major at Metropolitan State University of Denver; major goes live Fall 2014.

#### **Member of Office of Sponsored Research & Projects Advisory Committee 2012-2014**

Member of body that assisted in Metropolitan State University of Denver's expansion of research as an institutional priority, encouraging external grants and internal research support.

**Departmental Search Committee Chair 2011-2014**

Conducted national searches for two Biochemistry tenure-track faculty members and departmental administrator.

**Skilled Computer & Networking Technician**

Self-taught computer programming, scripting, and web development experience. Comfortable with Linux, Unix, OS X, and Windows environments. Proficient with Microsoft Office, Adobe Photoshop & Illustrator, HTML & CSS web design, Wolfram Mathematica, Python and SciPy, and Linux server management.

**GUMBI President, Treasurer, & Web manager 2008-2010**

Led graduate student organization for the assistance of fellow students and to help communicate graduate student concerns to faculty. Organized finances, talked to students, and created website content.

**President of UCSB Science Fiction & Fantasy Club 2006-2008**

Led graduate and undergraduate students focused on science fiction and fantasy books and movies.

**References**

Available upon request.