

## Curriculum Vitae – Lori Isom

### Professional Preparation

- University of Oklahoma Chemistry B.S., 1993
- Georgia Institute of Technology Biochemistry Ph.D., 1998
- Georgia Institute of Technology Postdoctoral 1998-2000

### Appointments

- Assistant Professor, University of Central Arkansas, 2000 to 2007
- Associate Professor, University of Central Arkansas, 2007 to present

### Promotions and Awards

- Teaching Excellence Award, Spring 2006
- Granted Tenure, Spring 2006

### Research Publications

DNA phosphate crowding correlates with protein cationic side chain density and helical curvature in protein-DNA crystal structures. B. Grant, E. Dourlain, J Aranedra, M Throneberry, L. McFail-Isom, *Nucleic Acids Research*, 15, 7547-55, [PMID 23748560]

Cations form sequence selective motifs within DNA grooves via a combination of cation- $\pi$  and ion-dipole/hydrogen bond interactions. M. Stewart M, T. Dunlap, E. Dourlain, B. Grant, L. McFail-Isom, *PLoS ONE*, 8, 8, e71420, 1-13, (2013) [PMID 2394075].

Cations Mediate B-DNA Conformational Heterogeneity. C.S. Sines, L. McFail-Isom, S.B. Howerton, D. VanDerveer, L.D. Williams. *J. Am. Chem. Soc.*, 122, 11048-11056 (2000).

The Flexible Structure of DNA: Ion Dependence of Minor-Groove Structure and Dynamics. D. Hamelberg, L. McFail-Isom, L.D. Williams, W.D. Wilson. *J. Am. Chem. Soc.*, 122, 110513-10520 (2000).

Delocalized Monovalent Cations Sequester within the AT-Tract Minor Groove of [d(CGCGAATTCGCG)]<sub>2</sub>. K.K. Woods, L. McFail-Isom, C.C. Sines, S.B. Howerton, and L.D. Williams. *J. Am. Chem. Soc.*, 122, 1546-1547 (2000).

DNA Structure: Cations in Control? L. McFail-Isom, C. Sines and L.D. Williams. *Current Opinion in Structural Biology*, 9, 298-304 (1999).

UV Spectroscopy Fails to Detect a DNA Hairpin to Coil Transition. T. Davis, L. McFail-Isom, E. Keene, L.D. Williams. *Biochemistry*, 37, 6975-6978 (1998).

Divalent Cations Stabilize Unstacked Conformations of DNA and RNA by Interacting with Base  $\pi$  Systems. L. McFail-Isom, X. Shui and L.D. Williams. *Biochemistry*, 37, 17105-17110 (1998).

Structure of the Potassium Form of CGCGAATTTCGCG: DNA Deformation by Electrostatic Collapse around Inorganic Cations. X. Shui, C. Sines, L. McFail-Isom, D. VanDerveer and L.D. Williams. *Biochemistry*, 37, 16877-16887 (1998).

The B-DNA Dodecamer at High Resolution Reveals a Spine of Water on Sodium. X. Shui, L. McFail-Isom, G.G. Hu, L.D. Williams. *Biochemistry*, 37, 8341-8355 (1998).

Scanning Force Microscopy of Small Ligand-Nucleic Acid Complexes: Tris (o-Phenanthroline)ruthenium(II) as a Test for a New Assay. J.E. Coury, J. Anderson, L. McFail-Isom, L.D. Williams and L.A. Bottomley. *J. Am. Chem. Soc.*, 119(16), 3792-3796 (1997).

A Novel Application of Scanning Force Microscopy: Assay for Mode of Binding of 2,5-Bis(4-amidinophenyl)furan to DNA. J.E. Coury, L. McFail-Isom, L.D. Williams, and L.A. Bottomley. *Proc. Natl. Acad. Sci. USA*, 93, 12283-12286 (1996).

Anthraquinone Photocleavage Structure Determines its Mode of Binding to DNA and the Cleavage Chemistry Observed. D. Breslin, J.E. Coury, J. Anderson, L. McFail-Isom, Y. Kan, L.D. Williams, L.A. Bottomley and G. Schuster. *J. Am. Chem. Soc. Commun.*, 119, 21, 5043-5044 (1997).

Scanning Probe Visualization of Electrostatically Immobilized Intercalating Drug Nucleic Acid Complexes. J.E. Coury, L. McFail-Isom, S. Presnell, L.D. Williams, and L.A. Bottomley, *J. Vac. Sci. Tech.*, 13(3), 1746-1751 (1995).

## Grants

NSF ISE Grant: "Full Scale Development: The Curious Clubhouse Project: a Novel Three-component Strategy for Increasing STEM Literacy and Interest." Submission date November 2009. \$2,951,692. Resubmission recommended

NSF RUI Grant: "RUI: Investigating DNA Deformation Induced by Cation Binding Using Computational Analysis of X-ray Crystal Structures" NSF Research at Undergraduate Institutions Grant, August 2004 – August 2007, **\$149,825**.

Faculty Development Grant, for travel to ASBMB meeting in San Diego, CA in April

2006, **\$912**

Faculty Development Grant, for travel to ASBMB meeting in San Diego, CA in May 2005, Fall 2004, **\$715**

URC Research Proposal : "DNA Deformation Induced by Interactions between Metals and DNA Rings" Spring 2003, **\$7539**.

NASA Arkansas Space Grant Consortium: "Investigating Cation-pi Interactions in DNA crystal Structures" Spring 2003, **\$3265**.

Incorporating Broadband NMR into the Chemistry Curriculum, NSF CCLI Grant, Dr. Craig Wesolowski, PI, Drs. Lori Isom and Jerald Manion, CoPIs, Spring 2001, **\$109,000**.

UCA Summer Stipend awarded for summer 2001, **\$2,200**.

### **Student Oral Presentations**

- "Site specificity and effect of cation-pi interactions in DNA crystal structures" Mikaela Stewart, 20<sup>th</sup> National Conference on Undergraduate Research (NCUR), Ashville, TN, (4/06)
- "Geometry and sequence dependence of H<sub>2</sub>O interactions with the faces of DNA bases." Tori O'Bannon and Garen Holman, 20<sup>th</sup> National Conference on Undergraduate Research (NCUR), Ashville, TN, (4/06)
- "DNA bending observed in DNA/protein complexes is correlated with phosphate collapse in the vicinity of cationic protein residues." Courtney Huff, , 20<sup>th</sup> National Conference on Undergraduate Research (NCUR), Ashville, TN, (4/06)

### **Other Presentations and Workshops**

- "Purple haze, white rabbits and mother's little helper: Drug projects that instill knowledge while fostering interest in non-science majors." Lori Isom, National ACS meeting in San Diego, CA, (4/12)
- "Purple haze, white rabbits and mother's little helper: Drug projects that instill knowledge while fostering interest in non-science majors." Lori Isom, National ACS meeting in San Francisco, CA, (4/10)
- "Awakenings: Teaching Students to Pursue the Beauty and the Mystery of Science." Invited Workshop for Academic Academy, Arkansas Dept. of Education, (2 90-minute hands-on workshops for alternative educators in K-12 institutions), (9/07).

- “Using prescription drug commercials to integrate biochemistry and pharmacology with clinical aspects and the ethical considerations of drug marketing” National American Chemical Society (ACS) meeting, San Francisco, CA, (9/06)
- “Teaching nursing students organic and biochemistry “from the top down”: Integrating molecular and biochemical with the practical” National American Chemical Society (ACS) meeting, San Francisco, CA, (9/06)
- “Teaching biochemistry from the top down: Case studies that integrate clinical, biochemical, and molecular aspects of disease.” Invited speaker for ASBMB (American Society for Biochemistry and Molecular Biology) Annual Meeting in San Diego, April 2005.
- “Assessing the retainment of pharmacological and biochemical prescription drug knowledge and the ethical considerations of drug marketing using student-written case studies.” 2005 ASBMB meeting, San Diego, CA, April 2005.
- Presented at the 18th Biennial Conference in Chemical Education at Iowa State University in Ames, Iowa. Presentation entitled “Keeping the Connection: Linking Bioinformatic Methods with their Clinical Relevance”, July 18 - 22, 2004
- Examples of Teaching with Technology. Welcome Week Freshman Orientation, UCA, (8/02).
- Co-moderator of Using Problem-Based Learning Workshop in the Biochemistry Laboratory. Conference on Problem-Based Learning, Baltimore, MD (6/02)
- How to make animated schematics. TechFest: Best Practices in Teaching with Technology, UCA, (5/02).\*\*
- The use of CHIME-based presentations to aid in student visualization. TechFest: Best Practices in Teaching with Technology, UCA, (4/01).
- Using nested tiers of overheads, animated schematics and CHIME presentations to teach biochemistry. American Chemical Society National Meeting, Chicago, IL, (8/01).\*\*
  - Seminar presented entitled "Using CHIME-based Presentations to Enhance Student Visualization" at Teaching with Technology Symposium, UCA, Spring 2000
- Microscopy and Fluorescence measurements. 11th Annual Gibbs Conference on Biothermodynamics, Nucleic Acids Symposium, Carbondale, Illinois (10/97).
- Change in DNA binding mode of Ethidium Homodimer Detected using Scanning Force Investigating Binding Modes of Bis-Intercalators using Scanning Force Microscopy. 1997 Pittcon Conference, Analytical Chemistry and Applied Spectroscopy, Bioanalytical and Microscopy Symposium, Atlanta, Georgia (3/97).

- Detection of a Change in the Binding Mode of WP631 to DNA. Fourth Annual Graduate Student Symposium, Georgia Institute of Technology, Atlanta, Georgia (3/97).
- The Conversion between Two Modes of DNA Binding by a Novel bis-Daunomycin Derivative. Ashby Award Competition, Georgia Institute of Technology, Atlanta, Georgia (11/96).

### **Poster Presentations:**

- “Aliphatic protein side chain density correlates with phosphate crowding and helical curvature in protein/DNA crystal structures” Nic Hunter, Bryce Grant, Lori Isom. National ACS meeting in Denver, CO, (3/15)
- “DNA phosphate crowding correlates with protein cationic side chain density and helical curvature in protein/DNA crystal structures” Bryce Grant, Jayme Araneda, Madison Throneberry, Elizabeth Dourlain, Lori Isom. National ACS meeting in New Orleans, LA, (4/13)
- “DNA phosphate crowding correlates with protein cationic side chain density and helical curvature in protein/DNA crystal structures” Bryce Grant, Jayme Araneda, Madison Throneberry, Elizabeth Dourlain, Lori Isom. CNSM Poster Symposium, (4/13)
- “Cation-induced phosphate collapse is correlated to DNA bending in protein/DNA complexes” Bryce Grant, Elizabeth Dourlain and Lori Isom. CNSM Poster Symposium, (4/11)
- “Cation-induced phosphate collapse is correlated to DNA bending in protein/DNA complexes” Bryce Grant, Elizabeth Dourlain and Lori Isom. National ACS meeting in San Diego, CA, (4/11)
- “Computational screening for cation- $\pi$  interactions in RNA crystal structures”, Elizabeth Dourlain and Lori Isom. CNSM Poster Symposium, (4/11)
- “Computational screening for cation- $\pi$  interactions in RNA crystal structures”, Elizabeth Dourlain and Lori Isom. National ACS meeting in San Diego, CA, (4/11)
- “Investigating the interaction between Mg<sup>2+</sup> and the crystal dehydrating agent 2-methy-2,4-pentanediol (MPD) and its role in DNA bending.” Jade King, Courtney Huff, and Lori Isom. National ACS Meeting, San Francisco, CA, (4/10)
- “Investigating the interaction between Mg<sup>2+</sup> and the crystal dehydrating agent 2-methy-2,4-pentanediol (MPD) and its role in DNA bending.” Jade King, Courtney Huff, and Lori Isom. CNSM Poster Symposium, (4/10)

- “Screening of proteins to test for correlation of phosphate collapse around cationic protein residues and DNA bending.” Elizabeth Dourlain, Bryce Grant and Lori Isom. CNSM Poster Symposium, (4/10)
- “Screening of proteins to test for correlation of phosphate collapse around cationic protein residues and DNA bending.” Bryce Grant and Lori Isom. CNSM Poster Symposium, (4/09)
- “Investigating the interaction between Mg<sup>2+</sup> and the crystal dehydrating agent 2-methy-2,4-pentenediol (MPD) and its role in DNA bending.” Jade King, Courtney Huff, and Lori Isom. CNSM Poster Symposium, (4/09)
- “Detection and Characterization of DNA Distortion induced by Cation-pi Interactions.” Mikaela Stewart, Tori Dunlap, and Lori Isom. National American Chemical Society (ACS) meeting, Chicago, IL, (4/07)
- “Site Specificity and Geometry of H<sub>2</sub>O Interactions with the Conjugated Pi Systems of DNA Bases.” Tori Dunlap, Garen Holman, Mikaela Stewart, and Lori Isom. National American Chemical Society (ACS) meeting, Chicago, IL, (4/07)
- “Detection and Characterization of DNA Distortion induced by Cation-pi Interactions.” Mikaela Stewart, Tori Dunlap, and Lori Isom. CNSM Undergraduate Research Symposium, (4/07).
- “Site Specificity and Geometry of H<sub>2</sub>O Interactions with the Conjugated Pi Systems of DNA Bases.” Tori Dunlap, Garen Holman, Mikaela Stewart, and Lori Isom. CNSM Undergraduate Research Symposium, (4/07).
- “Geometry and sequence dependence of H<sub>2</sub>O interactions with the faces of DNA bases.” Tori O’Bannon, Garen Holman, Mikaela Stewart, and Lori Isom. CNSM Undergraduate Research Symposium, (4/06).
- Site specificity and effect of cation-pi interactions in DNA crystal structures. Mikaela Stewart, Tori O’Bannon, and Lori Isom. National American Chemical Society (ACS) meeting, San Francisco, CA, (9/06).
- DNA bending observed in DNA/Protein complexes is correlated with phosphate collapse. Courtney Huff, James Lewis, and Lori Isom. CNSM Undergraduate Research Symposium, (4/06).
- Geometry and sequence dependence of H<sub>2</sub>O interactions with the faces of DNA bases. Tori O’Bannon, Garen Holman, Mikaela Stewart, and Lori Isom. CNSM Undergraduate Research Symposium, (4/06)

- Site specificity and effect of cation-pi interactions in DNA crystal structures. Mikaela Stewart, Tori O'Bannon, and Lori Isom. CNSM Undergraduate Research Symposium, (4/06).
- Phosphate collapse around cationic protein residues is correlated with DNA bending in DNA/protein complexes. Mason Breed and Lori Isom. National Meeting of American Society of Biochemistry and Molecular Biology (ASBMB), San Diego, CA, (4/05).
- Investigating the interaction between Mg<sup>2+</sup> and the crystal dehydrating agent 2-methyl-2,4-pentanediol (MPD) and its role in DNA bending. Courtney Huff, Tori O'Bannon, and Lori Isom. National Meeting of American Society of Biochemistry and Molecular Biology (ASBMB), San Diego, CA, (4/05).
- Detection and characterization of DNA distortion induced by cation-pi interactions. Mikaela Stewart and Lori Isom. National Meeting of American Society of Biochemistry and Molecular Biology (ASBMB), San Diego, CA, (4/05).
- Phosphate collapse around cationic protein residues is correlated with DNA bending in DNA/protein complexes. Mason Breed and Lori Isom. CNSM Undergraduate Research Symposium, (4/05).
- Investigating the interaction between Mg<sup>2+</sup> and the crystal dehydrating agent 2-methyl-2,4-pentanediol (MPD) and its role in DNA bending. Courtney Huff, Tori O'Bannon, and Lori Isom. CNSM Undergraduate Research Symposium, (4/05).
- Detection and characterization of DNA distortion induced by cation-pi interactions. Mikaela Stewart and Lori Isom. CNSM Undergraduate Research Symposium, (4/05).
- Investigating the Interaction Between Mg<sup>2+</sup> and the Crystal Dehydrating Agent MPD and its Role in DNA Bending, Julie Maris, Candice Means, and Lori Isom, 2002 CNSM Undergraduate Research Symposium.
- Cation-Pi Interactions Between DNA Bases and Cations, Lindsay Lewis, Brian Hill, and Lori Isom, 2002 CNSM Undergraduate Research Symposium.
- Phosphate Collapse around Cationic Protein Residues Induces DNA Bending in DNA/Protein Complexes. L. McFail-Isom, L.J. Maher III and L.D. Williams. Sixth Annual F.L. (Bud) Suddath Bioscience Symposium, Georgia Institute of Technology, Atlanta, Georgia (4/99).
- Conversion between the Modes of DNA Binding by Bis-Intercalators as Detected by SFM and Fluorescence Measurements. L. McFail-Isom, J.E. Coury, T. Davis, L. Holt, J. Chaires, W. Priebe, L.A. Bottomley and L.D. Williams. Fifth Annual F.L. (Bud) Suddath Bioscience Symposium, Georgia Institute of Technology, Atlanta, Georgia (4/97)

- Detection of a Change in the Binding Mode of WP631 to DNA. L. McFail-Isom, J.E. Coury, L. Holt, T. Davis, G. Hu, K. Jude, J.B. Chaires, W. Preibe, L.A. Bottomley, and L.D. Williams. Fourth Annual Graduate Student Symposium, Georgia Institute of Technology, Atlanta, Georgia (3/97).
- Detection of a Change in the Binding Mode of WP631 to DNA. L. McFail-Isom, J.E. Coury, L. Holt, T. Davis, G. Hu, K. Jude, J. Chaires, W. Preibe, L.A. Bottomley, & L.D. Williams. Molecular Design Institute 1st Annual Symposium, Georgia Institute of Technology, Atlanta, Georgia (10/96).
- Characterization of the Multiple Modes of Binding by the bis-Intercalator, WP631, using Scanning Force Microscopy. L. McFail-Isom, F. Leng, J.E. Coury, L. Holt, T. Davis, L.A. Bottomley, W. Preibe, J. Chaires, and L.D. Williams. 10th Annual Gibbs Conference on Biothermodynamics, Southern Illinois University, Carbondale, Illinois (10/96).
- A Novel Application of Scanning Force Microscopy: Assay for Mode of Binding of 2,5-Bis(4-amidinophenyl) furan to DNA. J.E. Coury, J. Anderson, L. McFail-Isom, L.D. Williams and L.A. Bottomley. Fourth Annual F.L. (Bud) Suddath Bioscience Symposium, Georgia Institute of Technology, Atlanta, Georgia (4/96).
- Scanning Probe Studies of Intercalating Drug-Nucleic Acid Complexes. J.E. Coury, L. McFail-Isom, S. Presnell, L.D. Williams and L.A. Bottomley. 1995 Buck Rodgers Symposium. Department of Chemistry, University of Georgia, Athens, Georgia (5/95).
- Scanning Probe Studies of Intercalating Drug-Nucleic Acid Complexes. J.E. Coury, L. McFail-Isom, S. Presnell, L.D. Williams and L.A. Bottomley. Third Annual F.L. (Bud) Suddath Symposium, Georgia Tech, Atlanta, Georgia (4/95).

### **Professional and Community-based Activities**

- Advisor and Liaison for UCA Pre-pharmacy program
- Created “Superpower Science” for UCA Challenge and Instructor, 2011
- Groovy Solubility Chemistry for pre-AP Physical Science, Carl Stewart Middle School (Sp 09)
- Antioxidants and Free Radicals: Catalase Experiment Pre-AP Physical Science Class Visit to UCA (Sp 09)
- “Weather Science” Family Science Night, Marguerite Vann Elementary. (Spring 2008)
- Developed “I Love Season Science” modules for presentation to local 1<sup>st</sup> grade (FM) and 3<sup>rd</sup> grade students (MV). “I Love Fall Science!” Presented at FM and MV elementary schools.



- Germ Detectives: Most Wanted Germ Countdown, Julia Lee Moore Science Enrichment Day, Grades K-4, 10/07, Marg. Vann Elementary 2<sup>nd</sup> and 4<sup>th</sup> grades, 2008, Florence Madison Enrichment Day, 04/09.
- Chemistry Magic demo show for Marg. Vann Elementary 2<sup>nd</sup> grade classes
- Created “Beastly Body Biochemistry” for UCA Challenge and Instructor, 2007, 2009
- Created “Cool Creature Chemistry” for UCA Challenge and Instructor, 2006, 2008, 2010
- Junior University Instructor, Summer 2006
- Judge for ASBMB Undergraduate Poster Competition, ASBMB 2005, San Diego, CA (4/05)
- Presentation for Kindergarten classes at Marg. Vann Elementary including other cool chemistry demos.
- “Pretty Proteins and Tangles” presentation during UCA for a Day at Ruth Doyle Elementary
- Reviewed proposals for Biophysical Chemistry division, NSF, Fall 2004.
- ASBMB, 2004 - present
- American Chemical Society, 2001-present
- American Chemical Society, Chemical Education Division, 2001-present
- Julia Lee Moore Science Fair Judge, Spring 2004, Sp 2005
- Marguerite Vann Elementary chemistry demonstrations, Spring 2004
- Chemistry Demonstrations for fifth grade at Ellen Smith Elementary's Student Enrichment Day. (Sp 2001, Sp 2003)
- Arkansas State High School Science Fair, Chemistry Judge, (Sp 2002, Sp 2003).
- Arkansas State High School Science Fair, Overall Judge, (Sp 2001)
- Marguerite Vann Elementary Science Fair Judge, Spring 2000
- Reviewer for the peer-reviewed journal Chemistry and Biology, spring 2001.

- "How do our bodies do that?" presentation at local elementary school for kindergarten classes introducing basic anatomy and simple chemical reactions (Fall 2000)
- Co-organizer and participant in NSF-funded Science Demonstration Program. To encourage interest in science, science demonstrations were designed and performed for 4th grade classes throughout the Oklahoma City and Norman areas. University of Oklahoma, 1990-1993.