

BIOGRAPHICAL SKETCH

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NAME: Robert Chandos Monsen

eRA COMMONS USER NAME (credential, e.g., agency login): RCMONS01

POSITION TITLE: PhD Graduate Research Assistant

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Henderson Community College		8/2009		Undeclared
University of Southern Indiana	B.S.	8/2010	12/2014	Biochemistry
University of Louisville	M.S.	8/2016	08/2018	Biochemistry & Genetics
University of Louisville	Ph.D.	8/2018	11/2020	Biochemistry & Genetics

A. Personal Statement

I have the prior expertise and motivation to successfully carry out the proposed research project. I have a broad background in integrative structural biology techniques and biophysical methods. In particular, I have extensive experience in small-angle X-ray scattering data reduction and analysis, as well as extensive experience with molecular dynamics and hydrodynamics methods for use in structural refinement. My research broadly focuses on the characterization and drug targeting of non-B DNA structures known as G-quadruplexes. As the PI on several GUPs from Argonne national laboratory, I have laid the groundwork for integrative structural studies of highly complex DNA systems, such as the higher-order human telomere and hTERT core promoter, resulting in novel receptors for us in *in silico* drug discovery efforts. Importantly, these receptors have led to the discovery of novel small molecules which are currently in development as anti-cancer therapeutics. As a result of these previous experiences, I am aware of the limitations and seek to find orthogonal methods that complement the integrative structural biology approach. The current application would build logically on my prior work.

B. Positions and Honors

2013-2014 Undergraduate Independent Researcher Department of Chemistry, University of Southern Indiana.

PI: Dr. Jeannie Collins

2014 University of Louisville Science Fair Judge

2015-2016 Research Technician, SABIC, Mt. Vernon, IN.

2016-2020 Graduate Research Assistant, Department of Biochemistry and Molecular Genetics, Graduate School, University of Louisville. PI: Dr. John Trent

2021-Present Postdoctoral Fellow in the lab of Dr. John Trent, University of Louisville Medical School

AWARDS/SCHOLARSHIPS

2016	Fellowship, School of Interdisciplinary and Graduate Studies (SIGS), University of Louisville School of Medicine Ph.D. fellowship in the Biochemistry and Molecular Genetics program (\$28,000/year stipend).
2017	Beckman Coulter AUC Abstract Scholarship Winner Abstract contest winner for innovative research using analytical ultracentrifugation which included an all-expense paid trip to Glasgow, Scotland to present research at the 2017 AUC conference (Estimated worth \$4-5,000)
2017	Graduate Student Council (GSC) Research Grant University of Louisville research grant award for equipment/reagents used during dissertation research (\$500).
2018	Graduate Student Council (GSC) Research Travel Grant

- University of Louisville grant award for research conference travel and poster/oral presentations (\$350).
- 2019 **Fellowship, Arno Spatola Endowment Graduate Research Fellowship, Institute for Molecular Diversity & Drug Design, University of Louisville**
Research Fellowship supporting drug discovery, development, and collaborations (\$15,000).
- 2020 **Argonne National Laboratory APS Beam Time Allocation**
X-ray beam time allotted for proposal to analyze various DNA G-quadruplex promoter and telomere systems for the Fall of 2020 (Estimated worth \$20,000).
- 2020 **Graduate Dean's Citation**
University of Louisville award to graduate students in recognition of superior accomplishment through publications, teaching, excellence, and professional service during their graduate studies beyond the achievement of a high grade point average.
- 2020 **John M. Houchens Prize**
University of Louisville award to the doctoral student whose dissertation has potential for significant impact on a field.

HONORS

1. **Science Fair Judge** – Hoosier Science and Engineering Fair, Evansville IN (2015)
2. **Mentor** – Undergraduate summer rotation student – Poster “Small Molecule Inhibitors of hTERT” presented at R!L (Research! Louisville), Louisville KY (2018)
3. **Science Fair Judge** – Meyzeek Middle School Science Fair, Louisville KY (2019)
4. **Science Fair Judge** – Louisville Regional Science and Engineering Fair (LRSEF), Louisville KY (2019)
5. **Science Fair Judge** – DuPont Manual Regional Science Fair, Louisville KY (2019)
6. **Mentor** – High school summer rotation student – Poster “Automation of DNA-ligand MD Simulations with Free Energy Calculations for Enrichment of High Affinity Ligands in Virtual Screening” presented at R!L, Louisville KY – Won 2nd place among HS students (2019)
7. **Mentor** – Graduate student mentor (2020-present)
8. **Mentor** – High school students participating the 2021 LRSEF science fair (2020-2021)

C. Contributions to Science

My dissertation work began with both *in silico* and *in vitro* drug discovery campaigns against various G-quadruplex forming nucleic acids. During this time, I discovered a suite of novel small molecules with moderate binding affinity to higher-order DNA sequences (unpublished). This research eventually led to a G-quadruplex virtual drug discovery review, as well as a methods paper for small molecule screening using analytical ultracentrifugation. I have since branched out into integrative structural biology approaches used to characterize higher-order DNA G-quadruplex systems. Two of such investigations have recently been published in Nucleic Acids Research. This work has further resulted in unique small molecules that bind the hTERT core promoter G-quadruplex and down-regulate hTERT in breast cancer cells (unpublished). Currently, I am a postdoctoral researcher in the same lab, continuing the patent and development process of said molecules while also pursuing new challenging DNA G-quadruplex and G-quadruplex/duplex systems with integrative structural approaches.

Research Publications

1. **Monsen, R.C.** and Trent, J.O. (2018) G-quadruplex virtual drug screening: A review. *Biochimie*, 152, 134-148.
2. Dean, W.L., Gray, R.D., DeLeeuw, L., **Monsen, R.C.** and Chaires, J.B. (2019) Putting a New Spin of G-Quadruplex Structure and Binding by Analytical Ultracentrifugation. *Methods Mol Biol*, 2035, 87-103.
3. Chaires, J.B., Gray, R.D., Dean, W.L., **Monsen, R.**, DeLeeuw, L.W., Stribinskis, V. and Trent, J.O. (2020) Human POT1 unfolds G-quadruplexes by conformational selection. *Nucleic Acids Res*, 48, 4976-4991.
4. **Monsen, R.C.**, DeLeeuw, L., Dean, W.L., Gray, R.D., Sabo, T.M., Chakravarthy, S., Chaires, J.B. and Trent, J.O. (2020) The hTERT core promoter forms three parallel G-quadruplexes. *Nucleic Acids Res*, 48, 5720-5734.
5. **Monsen, R.C.**, Chakravarthy, S., Dean, W.L., Chaires, J.B., Trent, J.O. (2021) The solution structures of higher-order human telomere G-quadruplex multimers. *Nucleic Acids Res*, (in press).

6. DeLeeuw, L.W., **Monsen, R.C.**, Petrauskas, V., Gray, R.D., Baranauskiene, L., Daumantas, M., Trent, J.O., Chaires, J.B. (2021) POT1 Stability and Binding Measured by Fluorescence Thermal Shift Assays. PLOS ONE (in review). BioRxiv doi: <https://doi.org/10.1101/2021.01.01.425048>.

MEMBERSHIPS

1. **G4 Society** – Global community of nucleic acids researchers with the common goal of providing a framework in which the nucleic acids disciplines can collaborate and integrate ideas with a primary focus on G-quadruplex DNA (Since 2020)

ABSTRACTS AND PRESENTATIONS

2. Undergraduate Research Conference – Evansville, In (Fall, 2013)
Poster Presentation: **Monsen, R. C.**, Collins, J. Capillary Electrophoretic Analysis of Actin Filaments of the Slime Mold *Stemonitis Flavogenita*.
3. AUC 2017 Conference – Glasgow, Scotland (Aug, 2017)
Poster Presentation: **Robert C. Monsen**, Lynn Deleeuw, William L. Dean, Jonathan B. Chaires, John O. Trent. Elucidation of the hTERT Core Promoter G-Quadruplex as a Target for Telomerase Inhibition.
Oral Presentation: **Robert C. Monsen**, Lynn Deleeuw, William L. Dean, Jonathan B. Chaires, John O. Trent. Elucidation of the hTERT Core Promoter G-Quadruplex as a Target for Telomerase Inhibition.
4. 1st Annual Commonwealth Computational Summit – Lexington, KY (Oct, 2017)
Poster Presentation: **Robert C. Monsen**, Lynn Deleeuw, Jon Maguire, William L. Dean, Jonathan B. Chaires, John O. Trent. Structure-based Drug Discovery: Computational Virtual Screening.
5. Graduate Student Regional Research Conference – Louisville, KY (March, 2018)
Poster Presentation: **Robert C. Monsen**, Lynn Deleeuw, Jon Maguire, William L. Dean, Jonathan B. Chaires, John O. Trent. The hTERT Core Promoter Sequence Forms Three Parallel G-quadruplexes.
6. 32nd Gibbs Biothermodynamics Conference – Carbondale, IL (Oct, 2018)
Poster Presentation: **Robert C. Monsen**, Lynn Deleeuw, Jon Maguire, William L. Dean, Jonathan B. Chaires, John O. Trent. Structure-Based Design of Selective hTERT Promoter G-Quadruplex Ligands.
7. Research! Louisville – Louisville, KY (Oct, 2018)
Poster Presentation: **Robert C. Monsen**, Lynn Deleeuw, Jon Maguire, William L. Dean, Jonathan B. Chaires, John O. Trent. Structure-Based Design of Selective hTERT Promoter G-Quadruplex Ligands.
8. 33rd Gibbs Biothermodynamics Conference – Carbondale, IL (Oct, 2019)
Poster Presentation: **Robert C. Monsen**, Lynn Deleeuw, William L. Dean, Jonathan B. Chaires, John O. Trent. Biophysical Characterization of a Self-Organizing G-quadruplex in the hTERT Core Promoter.
9. UofL Biochemistry & Molecular Genetics Student Seminar series – Virtual (July, 2020)
Oral Presentation: **Robert C. Monsen**. Small-angle X-ray Scattering and Flexible Molecular Modeling: A Brief Overview.

D. Research Support

Completed Funding

SIGS Research Fellowship from the University of Louisville 8/1/2016-8/1/2018 to support the first two years of research training for Robert Monsen B.S., M.S.

5R01GM077422-09 J. Trent (P.I.) 02/01/2007-04/30/2021

NIH/NIGMS

Title: Targeting Nucleic Acids with an Integrated Virtual and Actual Screen