

## ***Announcements***

**For Bioinformatics Core support**, please contact either Drs. [Galina Glazko, Ph.D.](#) (UAMS) or [Phil Williams](#) (UALR). The [Bioinformatics Core Support Request Form](#) can be found on the [INBRE website](#).

### **New FOAs Released**

2022 Summer Research Grants (SRGs): Applications due October 25, 2021.

2022-2023 Collaborative Research Grants: Applications due October 25, 2021.

Fellowship opportunities are available through NIH for students and postdocs from underrepresented populations. For more information, visit the [iCURE website](#).

The NIH Office of Intramural Training and Education (OITE) offers many free online workshops and webinars for all levels of training. Below are a few links, but please be sure to take a look at the schedule for additional webinars that may be of interest:

**August 10, 4-5 p.m.**      [Journaling for Career Development and Personal Growth](#)

**August 13, 11 a.m.-12 noon**      [Fridays with Phil](#)

NIH has a new #COVID [website](#).

## ***Upcoming Meetings***

### **RI-INBRE Northeast Regional IDeA Virtual Conference**

August 16 - August 18, 2021

Registration is free but is required to receive the conference link: <https://web.uri.edu/riinbre/v-neric-2021/>.

### **Southeast Regional IDeA Conference**

November 12-14, 2021 in San Juan, Puerto Rico

Website: <https://www.seidea21.hpcf.upr.edu/>

INBRE travel awards will be available. Email announcement coming soon.

### **INBRE Fall Conference**

October 29 & 30, 2021

### **NISBRE Conference**

Washington, DC, in 2022

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## Message from the PI



When I think about the impact that the Arkansas INBRE has had over the past twenty years, most of our significant accomplishments take years to manifest themselves. And I think that is how infrastructure-building programs should work. However, every once in a while an opportunity to make an impact that is more immediate presents itself. Recently, two such opportunities arose through supplements that NIGMS offered to IDeA-funded programs. The first such opportunity came about through a supplement received by the COBRE-funded Center for Translational Pediatric Research led by Dr. Alan Tackett. Dr. Tackett also serves as the Director of the Arkansas INBRE Biotechnology Core. This \$770,000 supplement provides funding to monitor SARS-CoV-2 variants in Arkansas. The effort is being spearheaded by Dr. Joshua Kennedy, an associate professor in the UAMS Department of Pediatrics. Dr. Stephanie Byrum is providing bioinformatics support to the project. Within 5 weeks of receiving the funding, Drs. Kennedy and Byrum have already sequenced and analyzed over 300 samples obtained from individuals, including children, who have been infected with COVID-19. This important work will continue over the next year and the plan is to sequence approximately 1000 samples/month. The second opportunity is funded by a \$250,000 supplement to the Arkansas INBRE. The project, led by Dr. Pearl McElfish, a professor in the UAMS Department of Internal Medicine, will attempt to better understand COVID-19 vaccine hesitancy among Arkansans. The hope is that the study will provide new information that healthcare providers can use to create interventions to increase vaccination among hesitant individuals. Stay tuned and be on the lookout for progress reports from both groups over the next several months. I think there is little doubt that both projects will produce tangible results that will positively impact the health of Arkansans.

## Faculty Spotlight



### **Dennis Province, PhD**

*Principal Staff Scientist*

*IDeA National Resource for Quantitative Proteomics*

*University of Arkansas for Medical Sciences (UAMS)*

My first exposure to undergraduate research was when I was a senior undergraduate chemistry major at the University of Colorado. Because I had some success in designing my own experiment to measure the amount of chlorinated hydrocarbons in pool water I applied to do research during the summer for the Cooperative Institute for Research in Environmental Sciences (CIRES). Being able to work in Bob Sievers' graduate level chemistry lab was a game changer for me. I worked with Robert Barkley and Andy Dunham on a project related to the atmosphere inside the space shuttle. This allowed me hands on experience with mass spectrometry, working in a laboratory and communicating with other scientists. Dr. Sievers' lab focused on atmospheric chemistry and he attracted some of the best graduate students from around the country. I worked in the same lab with a first year graduate student that had come to Boulder from an Ivy League school. Initially I thought he was going to be so much smarter than me and know how to do amazing stuff in the lab from the first week. It didn't take long to figure out that wasn't true. I realized that my summer research experience allowed me an advantage in the laboratory. He was making the same mistakes that I had made a month before because he didn't have any more research experience than I did. Those few short months working in that environment showed me a path that I didn't know existed, using science to solve real-world problems, but I needed more training.

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I decided that I needed to go back to school. I chose analytical chemistry because I wanted to use instruments of analysis to solve clinical problems. Neil Purdie was my mentor and advisor at Oklahoma State University. His training was in inorganic chemistry and his research interests had transitioned into analytical and finally clinical chemistry. He taught me to leverage the information gained from circular dichroism experiments to understand protein-protein interaction of the hormone insulin. I learned from him the value of applied research and that the most interesting science requires a collaborative effort among many disciplines. Erin Johnson was one of the undergraduate students that worked with us and I really liked talking through our work and helping her set up her own experiments.

After graduate school, I took a position teaching undergraduate chemistry courses at Harding University. For over twenty years I worked alongside more than 50 undergraduate researchers. During this time, I accompanied these students to the Arkansas Academy of Science conference, the annual INBRE conference in Fayetteville, Arkansas STEM Posters @ the Capitol, and the Arkansas Space Grant Consortium where we presented our work. We took advantage of vouchers through INBRE to get samples analyzed at several core facilities around the state. I also participated in several of the grant writing workshops hosted by INBRE. These workshops gave me the confidence to apply for funding through Arkansas INBRE, Arkansas Space Grant and the Small Business Innovation Research (SBIR) mechanism. In 2020 my collaborators Tansel Karabacek of UALR, Cindy White of Harding and I were awarded an EPSCoR RID grant to study how metal oxide nanostructures and UV light could be used to remove contaminants from the water purification system aboard the International Space Station. In February of 2020 our group of students working with Arkansas Space Grant were invited to Washington D.C. to present our research at the national meeting as the representatives from the state of Arkansas.

Currently I work at the IDeA National Resource in Quantitative Proteomics as a Principal Staff Scientist. Part of my work is to direct the internship programs both at the undergraduate and graduate/post-doctoral level. We just finished a 10-week undergraduate internship with Audrey and Humphrey, two researchers that came to learn the workflow of Proteomics and Bioinformatics. This internship was a collaboration with INBRE here at UAMS and was a great success. My hope is to encourage researchers (and students) in Arkansas, in the IDeA states and across the country to utilize Proteomics and Bioinformatics available at the National Resource.

### ***What you might not know about Dr. Province...***

He surprised his wife with a golden doodle puppy named Ferris for Christmas a few years ago, my kids call him their hairy brother.

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## Development Research Project Program

*Jerry Ware, PhD, Program Director*



### Funding Opportunity Announcements (FOAs)

I again want to bring to your attention the proposal submission dates for the 2022 Summer Research Grants (SRGs) and Collaborative Research Grants (CRGs). The submission dates have been moved forward for the coming year. I understand this is not ideal with a heavy Fall teaching load, but it was necessary to insure funding was in-place by the proposed start dates. Thus, I remind everyone of the upcoming **October 25<sup>th</sup> deadlines**. If you have any questions about these FOAs, don't hesitate to reach out.

### Grant Writing Workshops

At the end of July we held another virtual Zoom Grant Writing Workshop. It was exciting to see so many new faces (30+) to the Arkansas INBRE program. Thank you to those that have reached out since with questions about the Arkansas INBRE. The virtual nature of the workshop was an "only" option that started in 2020, for the obvious reason that changed so many things in the past year. Participation in the virtual workshop format has been outstanding. While we enjoyed our in-person workshops at UAMS, we believe the virtual format is a more efficient use of faculty time with our network campuses scattered throughout the state. I don't see the virtual presentation of the Grant Writing Workshops changing in the future.

A special thanks to Dr. Kerry Evans, Senior Editor of the UAMS SciCOM office. The elegant approach Dr. Evans brings to writing a Specific Aims page is an outstanding format to follow and she simplistically provides a writing skeleton that can be applied to any proposal.

### Summer Manuscript Support

Finally, a note about our Summer Manuscript Writing Support. I've heard from several that manuscript submissions have already taken place, now the review process begins, and we look forward to hearing about manuscript acceptances. I know the excitement among undergraduate authorships will be hard to contain, but thanks to all of you for making this happen. Nothing can match that first published paper and the realization that indeed, you are contributing to moving science forward.

All the best for beginning a safe and productive Fall Semester. Fingers are crossed that our Arkansas INBRE Fall Symposium takes place in a manner we all enjoyed pre-COVID. I hope to see many of you there.

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## Student Spotlight

**Michael Bauer, PhD**  
2013 Bioinformatics Graduate



I am currently an assistant professor in the Department of Biomedical Informatics at the University of Arkansas for Medical Sciences but the path to this position was not always straightforward. I obtained dual Bachelor of Science degrees in computer science and biology at New Mexico Institute of Mining and Technology. I then went to the University of Arkansas Little Rock and obtained my master's and PhD in Bioinformatics. Early in my undergraduate studies, I was unprepared for the level of work required to be at the head of the class in the highly competitive environment of the New Mexico Institute of Mining and Technology. Poor grades and lack of focus were a consistent occurrence my first few years. A key turning point academically for me was being selected for a summer internship for minorities at the Arctic Region Supercomputing Center (ARSC) in Fairbanks, Alaska. It was the research experience at the supercomputing center and interaction with the other students and mentors which convinced me to apply to graduate school to further my education. It was inspiring to work with students in the program who were also members of underrepresented groups and all planning to go to graduate school. It was the experience of that internship which gave me the drive to start putting more effort into successfully completing two undergraduate degrees (biology and computer science), and seriously launching myself into graduate studies. When I obtained my bachelor degrees I did not know what I could do with the computer science and biology degree. It was during my research into graduate school that I learned of bioinformatics, which perfectly combines the two fields. At the time there were only a handful of programs that offered it, the University of Arkansas Little Rock (UALR) being one of them. I applied and was admitted into the bioinformatics program there which was jointly run with the University of Arkansas for Medical Sciences and directed by Dr. Steve Jennings. I was able to get a graduate assistantship in the MidSouth Bioinformatics Center at UALR that was funded by an INBRE grant. I owe a lot of my success to the funding INBRE provided as I pursued my degrees, as well as getting the opportunity to present my work at regional and national IDeA conferences. My masters and PhD work were both focused on biological and medical text mining under the guidance of my advisor Dr. Dan Berleant. My PhD thesis resulted in the design of a web-based biological question and answering system.

I always had a desire to pursue primary biomedical research. In 2013, after obtaining my PhD in Bioinformatics, I jumped at the opportunity to obtain a post-doctoral position in the bioinformatics group at the Myeloma Center at the University of Arkansas for Medical Sciences (UAMS), in Dr. Donald Johann's lab. My responsibilities were to analyze and manage DNA sequencing data. Working with large text corpora prepared me for working with the tremendous amount of sequencing data, but I had a great deal to learn about the translational research setting. Over the course of my post-doctoral training, I gained an understanding of the current state of multiple myeloma (MM) research and the outstanding challenges that must be overcome. During this period, I was integral to the initiation of next-generation sequencing (NGS) at the Myeloma Center and was a key player in the current pipeline design, setup, and execution. Data management was a significant task, and my efforts produced a data management system that allows for the rapid integration, exploration, discovery, and validation of large and complex experimental data from a wide variety of NGS and microarray molecular-profiling modalities. This also resulted in a first author publication, "Leveraging the new with the old: providing a framework for the integration of historic microarray studies with next generation sequencing" in *BMC Bioinformatics*. In 2014, after a year and half as a post-doc, I was offered an Assistant Professor position at the Myeloma Center. At that time, my role was to provide bioinformatics support to the other myeloma researchers.

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Some of my most recent work involved investigating the largely unexplored process of alternative splicing of mRNA and its role in MM. Alternative splicing is the process by which exons and introns are removed and exons are joined to create pre-mRNA. Dysregulation of this process can initiate and drive disease. This was one of my first independent research projects, which resulted in the first-authored publication titled “*Differential RNA splicing as a potentially important driver mechanism in multiple myeloma*”. It was discovered that a high number of novel splice loci is significantly associated with adverse survival, which helped to identify a potentially ultra-high-risk group of MM patients. I also investigated hotspot mutations in the splicing factor *SF3B1* and the effects of these mutations on alternative splicing. Other studies I have conducted in MM involve single-cell sequencing and examining transcriptome changes in individual cancerous plasma cells and cells in the surrounding microenvironment.

As a bioinformatician I have been involved in many cancer research collaborations outside of myeloma. Two such collaborations involved the analysis of methylation arrays. The first was to explore environmental heavy metal exposure and breast cancer risk in under-served rural populations. The project’s initial goal was to determine if methylation profiles change in response to heavy metal exposure and can those changes then be correlated with breast cancer cases. We are currently working on writing a grant using preliminary results from the relatively small dataset. In the second project, I investigated Doxorubicin (DOX)-induced cardiotoxicity, which is cumulative-dose-dependent heart damage that begins with the first dose. I investigated epigenetic changes after the first dose with two aims: Aim 1: to examine whether DNA methylation profile of peripheral blood cells (PBCs) induced by the first cycle of DOX-based chemotherapy can predict the risk of cardiotoxicity; Aim 2 to determine if there are pretreatment methylation signatures at baseline to predict the risk of cardiotoxicity. The results showed strong evidence that the DNA methylation profile of peripheral blood mononuclear cells predicted future cardiotoxicity prior to chemotherapy. This work resulted in the first author manuscript entitled “Genome-wide DNA methylation signatures predict the early asymptomatic doxorubicin-induced cardiotoxicity in breast cancer” currently under review.

Additionally, I have a strong interest in cancer-related research that addresses the ever-growing disparity observed in rural and minority communities. I am looking into alternative splicing as a potential mechanism that explain the disparity in myeloma. In this very preliminary work, I have observed that there is a significant difference in progression free survival between blacks and whites. The implications of the research could suggest that if race is not considered there is a risk of under treating African Americans in the belief that they have a less aggressive MM subtype.

My goal is to become an independently funded translational researcher and use the latest bioinformatics approaches to understand the cancer biology and heterogeneity of multiple myeloma, and ultimately improve diagnosis and prognosis. As a step toward my goal, I continually keep myself up to date on cutting edge technologies and tools. I am currently submitting grant applications and honing my grant writing skills and growing my credentials to secure the funding that will ultimately lead to successful independent research. I also have a passion to participate in programs that aim to increase minority exposure to high-level research. I would like to reiterate that I owe my current position as an Assistant Professor to experiences and role models that I encountered during my education. I was selected to do an undergraduate internship for minorities at the Artic Regional Super Computing Center in Fairbanks Alaska as well as being selected for a one-year minority-based fellowship award to help support the completion of my dissertation from the Southern Regional Education Board (SREB). Both experiences allowed me to interact with peers and role models from diverse backgrounds. It inspired me and drove me to seek an advanced degree with the goal of obtaining a faculty position. As one of a handful of African Americans in a faculty position in my group, I am keenly aware of my responsibility to act as a role model and a source of inspiration for other African American students. I feel that my career goal of independence will allow me greater ability to give others the same opportunities I was afforded.

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### ***What you might not know about Dr. Bauer...***

He has played rugby for over 20 years and is currently a member of the Little Rock Rugby Football Club, The Stormers.

## **Recent Publications**

Alkhaibari IS, Raj K C H, Alnufaie R, Gilmore D, **Alam MA**. *Synthesis of Chimeric Thiazolo-Nootkatone Derivatives as Potent Antimicrobial Agents*. ChemMedChem. 2021 May 6;. doi: 10.1002/cmdc.202100230. [Epub ahead of print] PubMed PMID: 33955181; NIHMSID: NIHMS1707401.

Carter G, Govindan RB, Brown G, Heimann C, Hayes H, Thostenson JC, Dornhoffer J, Brozoski T, Kimbrell TA, Hayar A, Shihabuddin B, James GA, Garcia-Rill E, Padala PR, **Mennemeier M**. *Change in EEG Activity is Associated with a Decrease in Tinnitus Awareness after rTMS*. Front Neurol Neurosci Res. 2021;2: 100010. Epub 2021 May 17. PMID: PMC8277104.

**Choudhury R**, Quattlebaum B, Conkin C, Patel SR, Mendenhall K. *Dual luminescent charge transfer probe for quantitative detection of serum albumin in aqueous samples*. Spectrochim Acta A Mol Biomol Spectrosc. 2020 Jul 5; 235:118305. doi: 10.1016/j.saa.2020.118305. Epub 2020 Mar 24. PMID: 32259717; PMID: PMC7196023.

Karki U, Fang H, Guo W, Unnold-Cofre C, **Xu J**. *Cellular engineering of plant cells for improved therapeutic protein production*. Plant Cell Rep. 2021 Jul; 40(7):1087-1099. doi: 10.1007/s00299-021-02693-6. Epub 2021 Apr 10. PMID: 33837823; PMID: PMC8035600.

Xu C, Tsai YH, Galbo PM, Gong W, Storey AJ, Xu Y, **Byrum SD**, Xu L, Whang YE, Parker JS, **Mackintosh SG**, **Edmondson RD**, **Tackett AJ**, Huang J, Zheng D, Earp HS, Wang GG, Cai L. *Cistrome analysis of YY1 uncovers a regulatory axis of YY1:BRD2/4-PFKP during tumorigenesis of advanced prostate cancer*. Nucleic Acids Res. 2021 May 21; 49(9):4971-4988. doi: 10.1093/nar/gkab252. PMID: 33849067; PMID: PMC8136773.

Fan H, Guo Y, Tsai YH, Storey AJ, Kim A, Gong W, **Edmondson RD**, **Mackintosh SG**, Li H, **Byrum SD**, **Tackett AJ**, Cai L, Wang GG. *A conserved BAH module within mammalian BAHD1 connects H3K27me3 to Polycomb gene silencing*. Nucleic Acids Res. 2021 May 7; 49(8):4441-4455. doi: 10.1093/nar/gkab210. PMID: 33823544; PMID: PMC8096256.

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The 2020-2021 INBRE Summer Mentored Research and the 2021 IDeA National Resource for Quantitative Proteomics Summer Internship programs combined their efforts this summer to provide undergraduate students an opportunity to participate in summer research on the campuses at the University of Arkansas for Medical Sciences and the University of Arkansas at Fayetteville. A big thank you to everyone who took part in making this year's summer research programs a great success. This was the first year for the Proteomics program and the 20<sup>th</sup> year for the INBRE program. There was a total of 24 undergraduates who participated in the two programs.



**University of Arkansas at Fayetteville** (students not pictured): Abbey Bryan, Harmeet Chohan, Juan de la Cruz, Sydney Du, Sara Ambrocio Paque, and Chava Roberts.

**University of Arkansas for Medical Sciences:** L-R, front row: Sarah Vue, Anabelen Rodriguez, Humphrey Wanjala (Proteomics Summer Internship) and Anushka Yadava.

L-R, second row: Bethany Paxton, Rylie Davis, Jessica Allred, LaTambria Hampton, Amy Tran and Jack Gaydos.

L-R, third row: Sheldon Zeltner, Seth Curl, Mark Ball, Andres Barboza Pereira, Audrey Lawrence (Proteomics Summer Internship), Ganell Jones, Jack Gaydos and Joshua Adams.

Not pictured: Kaylen Holman.

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