

ISSUE 1 | April 2025

# MAO RESEARCH GROUP NEWSLETTER



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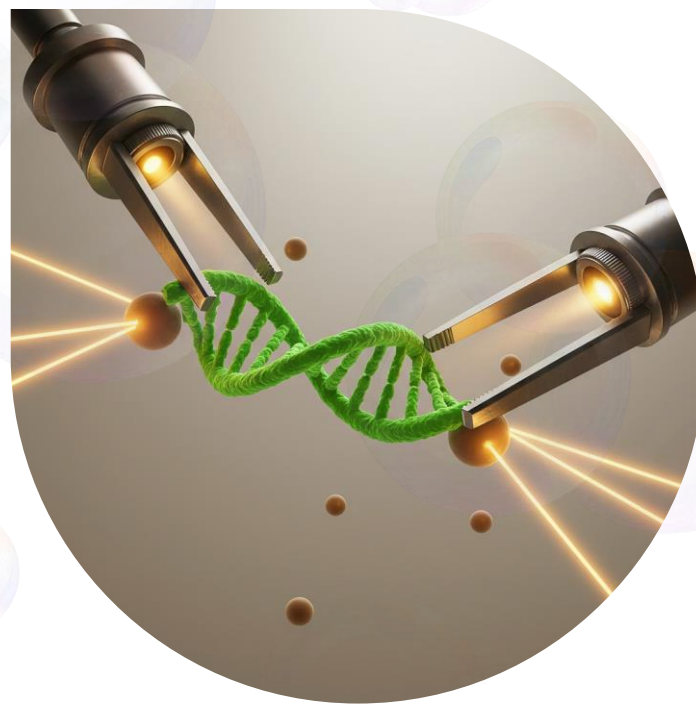
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**KENT STATE**  
UNIVERSITY

**Chemistry and Biochemistry**  
**MAO RESEARCH GROUP**

Contact:



Email: [hmao@kent.edu](mailto:hmao@kent.edu)

Web: <http://personal.kent.edu/~hmao/index.html>



## GREETINGS FROM GROUP LEADER



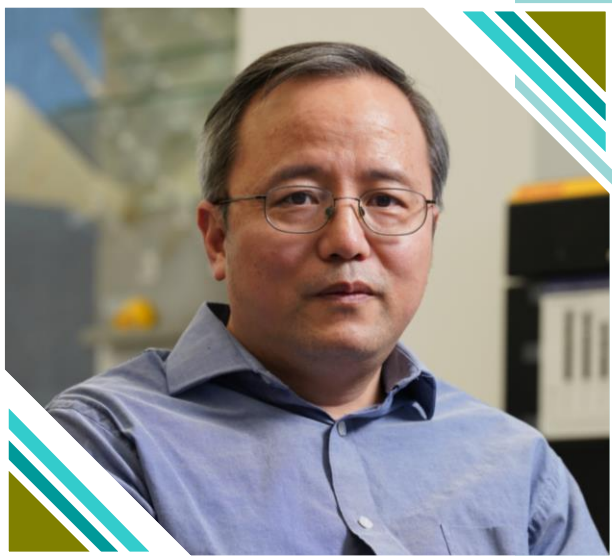
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Dear Colleagues,

I am delighted to announce the release of our first Newsletter! Over the past 20 years at Kent State, we have achieved remarkable milestones together. Just to name a few, we have graduated 13 PhDs, with 6 securing tenured or tenure-track positions in the US and China. Our group has published over 90 papers, half of them in top journals such as Nature series (6), JACS (22), PNAS (2), Angewandte Chemie (6), and Nucleic Acids Research (10). We have also secured substantial research funding from NIH, NSF, and private sectors.

With three new graduate students joining us last year, I look forward to our continued contributions to mechano-analytical chemistry. Thank you all for your dedication and hard work!

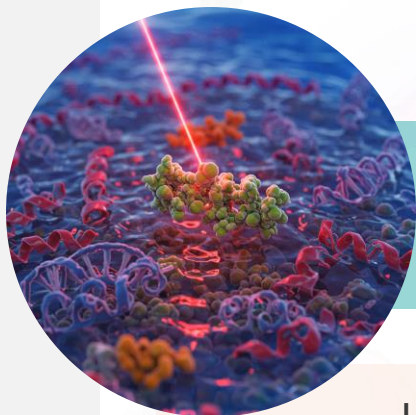
**HANBIN MAO**



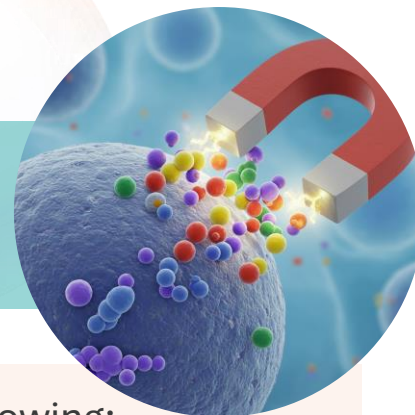
**Dr. Hanbin Mao**

# Research Introduction

Single-molecule research



**OPTICAL  
TWEEZERS**



**MAGNETIC  
TWEEZERS**

Using these highly sensitive tools, we study the following:

1. Mysteries of biomolecular interactions (drug-target, receptor-ligand, host-guest, etc.)
2. Conformational dynamics of biomolecular structures (G-quadruplex, i-motif, hairpins, etc.)
3. Macromolecular self-assembly and soft-matter biophysics (DNA origami, LLPS, etc.)
4. Instrumentation and methodology development to study intricate cellular and biomolecular processes

*For details, please visit our website.*

# MEMBERS OF MAO RESEARCH GROUP (2025)



Dr. AKM Kafi  
(Post-doc)



Pravin Pokhrel  
(PhD candidate)



Jiahao Ji  
(PhD candidate)



Rabia Tahir  
(PhD candidate)



Payton Ciolli  
(PhD candidate)



Grinsun Sharma  
(PhD student)



Sajjan Shakya  
(PhD student)



Pratiksha Chaudhary  
(PhD student)

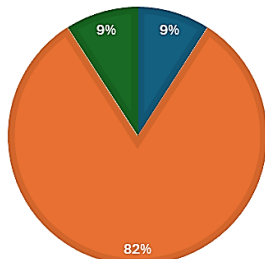


Joseph Haun  
(PhD student)



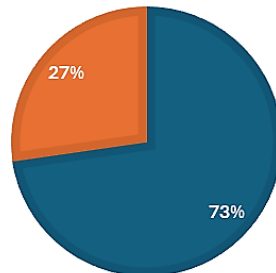
Jaren Jenyk  
(High school student)

■ post-doc ■ graduate student ■ high-school student



Lab Members

■ male ■ female



Gender diversity



Demographical distribution



# ALUMNI SPOTLIGHT



## FIRST PHD STUDENT IN MAO LAB

### 1. Academic Journey & Career:

**Post-doc:** Walter Lab at U Michigan

**Faculty:** Virginia Commonwealth University (2016)

### 2. Research areas & achievements:

**Investigate** protein-DNA interaction and sensor development using fluorescence-based & force-based single-molecule methods.

**Published** over 25 articles and **secured** funding from NSF, NIH, DoD, and VCU cancer center grants.

### 3. Student mentorship & impact:

**5** PhD students graduated – 2 are now post-doctoral researchers, and 3 work as research scientists at Thermo-Fisher.

**Currently,** he has 3 PhD students & 2 undergrads.



**DR. SOMA DHAKAL**

Associate Professor  
Department of Chemistry Virginia Commonwealth  
University, Virginia, USA.

*For details please visit:*

[LAB WEBSITE](#)



**Dr. Deepak Koirala**  
Professor

### **Academic journey and career:**

- PhD in Chemistry (2014)
- Post-doc, Joseph Piccirilli lab @ University of Chicago (2014-2020)
- Assistant Professor, University of Maryland Baltimore County, MD, USA (2020-present)

### **Research areas:**

- RNA Crystallography
- RNA structure-function relationship

### **Impact:**

- Published over 35 peer-reviewed papers,
- Acquired NIH R35, NSF CAREER, and CRNA collaborative development grants.
- Mentored numerous students from high school to Ph.D. levels, including individuals from underrepresented groups, many of whom have pursued careers in academia and industry.

For details please visit:

<https://koiralalab.umbc.edu/>



**Dr. Prakash Shrestha**  
Professor

### **Academic journey and career:**

- PhD in Chemistry (2018)
- Post-doc, Wesley Wong lab @ Harvard Medical School (2018-2022)
- Instructor/Scientist, Assistant Professor, Harvard Medical School (2022-2024)
- Assistant Professor, University of Kentucky, KY, USA (2024-present)

### **Research areas:**

- Single-molecule techniques
- Molecular structure and interaction
- Neuroscience
- Viral infections and immune response

### **Impact:**

- Developed DNA nanoswitch calipers for biomolecular fingerprinting, 3D structural mapping, and biosensing.
- Published several papers in peer-reviewed journals and acquired multiple grant awards.

For details please visit:

[LAB WEBSITE](#)

Actively looking for graduate students



**Dr. Philip Yangyuoru**  
Professor

### **Academic journey and career:**

- PhD in Chemistry (2014)
- Post-doc, University of Texas at Austin (2014-2018)
- Adjunct Professor of Chemistry, St. Edward's University (2018-2019)
- Assistant Professor, Northern Michigan University, MI, USA (2024-present)

### **Research areas:**

- Forensic biochemistry, and toxicology
- Trace analysis of heavy metals
- Nucleic-acid based sensors
- G-quadruplexes

### **Impact:**

- Published several papers in peer-reviewed journals and acquired multiple grant awards.
- Mentored many students from high school to college and graduate level.

For details please visit:

[Lab website](#)



**Dr. Zhongbo Yu**  
Professor

### Academic journey and career:

- PhD in Chemistry (2013)
- Post-doc, Nynke Dekker lab @ TU Delft (2013-2016)
- Professor, Nankai University (2017-present)

### Research areas:

- Single-molecule techniques
- Protein-nucleic acid interaction investigation &
- Telomere dynamics to uncover novel pathways in enzyme activity

### Impact:

- Established a thriving research team comprising eight graduate students and one postdoc
- fostering interdisciplinary collaboration across biophysics, structural biology, and theoretical physics
- Expanding into single-cell single-molecule integration and initiating collaborations to drive early-stage drug discovery, with plans to secure NSFC funding for instrument development in 2025.



**Dr. Yunxi Cui**  
Professor

### Academic journey and career:

- PhD in Chemistry (2016)
- Post-doc, Nankai University (2016-2021)
- Assistant Professor, Nankai University (2021-present)

### Research areas:

- DNA nanotechnology for biosensing and targeted drug delivery in disease diagnosis and treatment.
- Biosensor for cell imaging and drug delivery
- Design novel biosensing platform based on different biomolecular technology
- Mitochondria related bioprocess study

### Impact:

- Authored over 50 research articles and serves as an invited reviewer for journals such as Small, Small Methods, Aggregate, and Scientific Reports.
- Exploring organelle-targeted regulation using DNA nanostructures.



**Dr. Shankar Mandal**  
Research Scientist

### Academic journey and career:

- PhD in Chemistry (2019)
- Post-doc, Walter Lab @ University of Michigan (2019-2022)
- Associate research scientist, Thermo Fisher Scientific (2022-present)

### Research areas:

- extractable and leachable methods and validation, controlled extraction study of drug substance and drug product for materials profiling, leachable screening, and identification of unknown compounds

### Impact:

- single-molecule biosensors for ultra-sensitive disease biomarker detection using TIRF microscopy.
- Published three papers in top peer-reviewed journals and filed a US patent application.
- Aims to become a subject matter expert in drug development, particularly in extractable/leachable analysis.



**Dr. Jibin A Punnoose**  
Research Scientist

### **Academic journey and career:**

- PhD in Chemistry (2018)
- Post-doc, Halvorsen Lab @ U Albany SUNY (2018-present)

### **Research areas:**

- Single-molecule biophysics
- G-quadruplexes
- DNA and RNA structures
- High-throughput single-molecule force spectroscopy

### **Impact:**

- developed the Centrifuge Force Microscope (CFM) to analyze nucleotide interactions
- Extending to nucleic acid probes for detecting viral RNA, including Zika and SARS-CoV-2



**Dr. Sangeetha Selvam**  
Science Comm.  
Specialist

### **Academic journey and career:**

- PhD in Chemistry (2018)
- Post-doc, U Albany SUNY (2018-2022)
- Science communication specialist, The RNA institute, U Albany SUNY (2022-present)

### **Research areas:**

- Analyzing nucleic acid secondary structures using single molecule methods such as optical tweezers and TIRF
- Developing tagged peptides for single molecule analysis
- translation regulation in mammalian cells.

### **Impact:**

- Bridges the gap between scientific discovery and public understanding through engaging communication.
- dedicated to making complex scientific research accessible.



**Dr. Lin Liang**  
Professor

### **Academic journey and career:**

- Post-doc in Mao lab @ Kent State University (2020-2021)
- Lecturer, Shanxi Agricultural University, China

### **Research areas:**

- Investigating molecular mechanisms of muscle and fat development in livestock, particularly myogenesis and adipogenesis in *Ovis aries*.

### **Impact:**

- Exploring regulatory mechanisms of muscle and fat development in obesity models, with a focus on glycoproteins.
- Aiming to foster interdisciplinary collaborations to enhance research impact and improve livestock production strategies.





**Dr. Chiran Ghimire**  
**Senior Scientist**

## Academic journey and career:

- PhD in Chemistry (2017)
- Post-doc, Ohio State University (2017–2019)
- Post-doc, Florida State University (2019–2021)
- Chemist III, Florida Department of Environmental Protection (2021)
- Senior Scientist, Simetri, Inc. (2021–2022)
- Scientist, SGS North America Inc. (2022–2023)
- Senior Scientist, WuXi Biologics (2024–present)

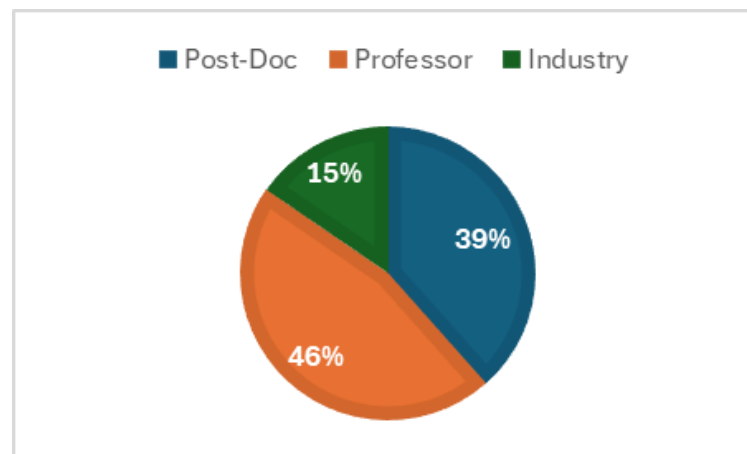
## Research areas:

- Biophysics and bioanalytical chemistry
- Environmental analytical chemistry

## Impact:

- Advanced environmental small molecule analysis at Florida DEP
- Led analytical chemistry projects at U.S. Army ERDC
- Contributed to biologics development and biophysical characterization in pharma and biotech sectors

## PhD GRADUATES



# AWARDS AND ACHIEVEMENTS



Rabia Tahir

Bush Teaching Award  
2024



Pravin Pokhrel

University Fellowship 2024  
GSS Research Award 2024



Jiahao Ji

Taylor Research Award  
2025



Sajan Shakya

MacDonald Graduate  
Award 2025



Pratiksha Chaudhary

Incoming First-year  
Student Award 2024



# PUBLICATIONS

2024/2025



1

**Decoupling Activity and Specificity in Coronazymes.** Jiahao Ji, Li Zuo, Bishal Pokhrel, Pravin Pokhrel, Sajan Shakya, Hao Shen and Hanbin Mao. Small, 2025, JUST ACCEPTED.

2

**Logic-gated Modulation of Cell Migrations via Mesoscale Mechanical Uncaging Effects.** Deepak Karna, Shin Watanabe, Grinsun Sharma, Arpit Sharma, Yaorong Zheng, Ibuki Kawamata, Yuki Suzuki, and Hanbin Mao. ACS Nano, 2025, JUST PUBLISHED.

3

**De Novo Design of a Mechano-pharmaceutical Screening Platform against Nucleation of Individual Beta-Amyloid Oligomers.** Shankar Pandey, Mathias Bogetoft Danielsen, Yuan Xiang, et. al. Cell Reports Physical Science, 2024, 5, 12, 102336.

4

**Electroanalytical Quantification of DNA Chirality.** AKM Kafi, Pravin Pokhrel, Hao Shen, and Hanbin Mao\*. Langmuir, 2024, 40, 47, 24968–24977.

5

**Modulation of dynamic DNA G-quadruplex structures in the hTERT promoter region by ligands.** Deepak Karna, Lin Liang, Grinsun Sharma, et. al. Nucleic Acids Research, 2024, 52, 10775–10787.

6

**Catalytic Relaxation of Kinetically Trapped Intermediates by DNA Chaperones.** Pravin Pokhrel, Deepak Karna, Sagun Jonchhe, and Hanbin Mao. Journal of the American Chemical Society, 2024, 146, 19, 13046–13054.

7

**Dynamic Structures and Fast Transition Kinetics of Oxidized G-quadruplexes.** Jiahao Ji, Arpit Sharma, Pravin Pokhrel, Deepak Karna, Shankar Pandey, Yao-Rong Zheng, and Hanbin Mao. Small, 2024, 2400485.

Please visit [GOOGLE SCHOLAR](#) to see full list of publications.