



# WSSU

*Biomedical Research  
Infrastructure Center*

Biomedical Research  
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# ABRCMS 2019

ANAHEIM, CALIFORNIA

NOVEMBER 13-16, 2019

Annual Biomedical Research Conference for Minority Students  
2019

Anaheim, CA  
November 13-16-2019

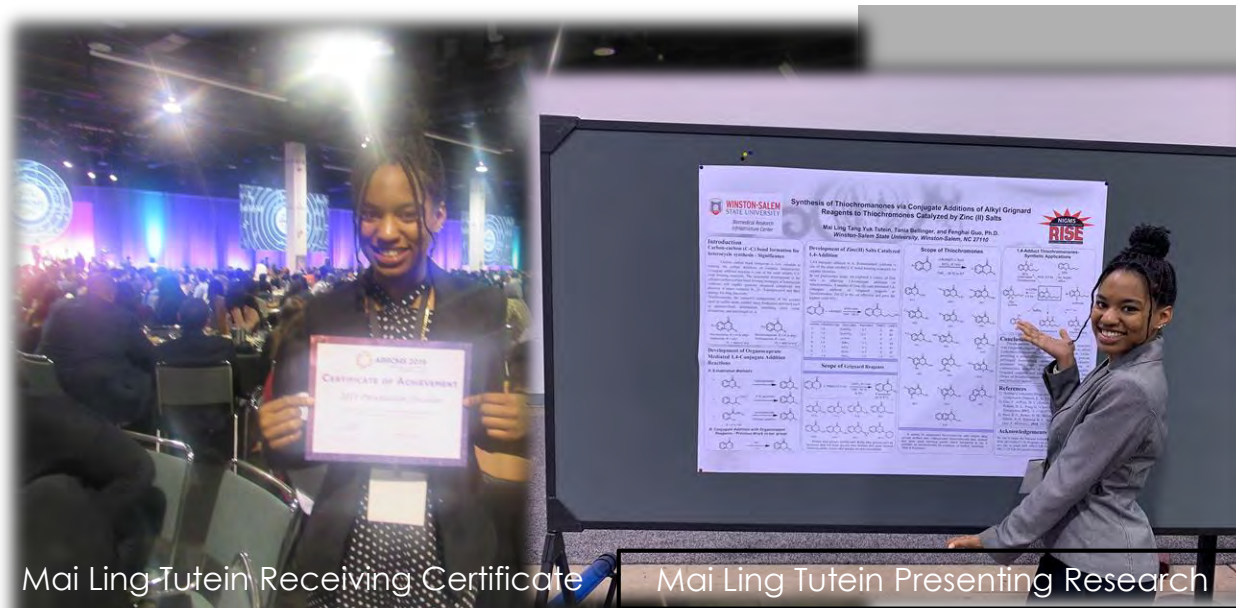
# "RED SEA OF SCIENCE!"



R.I.S.E. group picture, Dr. Mamudu Yakubu, Director (far left) and Dr. Patricia flowers (far right)

# CONGRATULATIONS

## Mai Ling Tang Yuk Tutein Sophomore



Mai Ling Tutein Receiving Certificate

Mai Ling Tutein Presenting Research



Winner: Chemistry



Best Poster Presentation



Synthesis of Thiochromanones via  
Conjugate Additions of Alkyl Grignard  
Reagents to Thiochromones Catalyzed by  
Zinc (II) Salts

**WINSTON-SALEM STATE UNIVERSITY**  
Biomedical Research Infrastructure Center

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### Synthesis of Thiochromanones via Conjugate Additions of Alkyl Grignard Reagents to Thiochromones Catalyzed by Zinc (II) Salts

Mai Ling Tang Yuk Tutein, Tania Bellinger, and Fenghai Guo, Ph.D.  
Winston-Salem State University, Winston-Salem, NC 27110

**ARIMA 2018**  
BEST POSTER PRESENTATION

**NIGMS RISE**

#### Introduction

**Carbon-carbon (C-C) bond formation for heterocycle synthesis - Significance**

Carbon-carbon bond formation is very valuable in forming the carbon skeleton of complex heterocycles. Conjugate addition reaction is one of the most reliable C-C bond forming reactions. The successful development of the efficient carbon-carbon bond forming strategies in heterocycle synthesis will rapidly generate structural complexity and diversity in reach complex N-, O-, S-heterocycles and their analogs for drug discovery.

Thiochromones, the isomeric replacement of the oxygen atom by sulfur atom, exhibit many biological activities such as antimicrobial, antioxidant, inhibiting nitric oxide production, and antiangiogenic et al.

#### Development of Zinc(II) Salts Catalyzed 1,4-Addition

1,4-Conjugate addition to  $\alpha, \beta$ -unsaturated systems is one of the most reliable C-C bond forming strategies for organic chemists.

In our preliminary study, we explored a variety of Zinc salts in effecting 1,4-conjugate additions to thiochromones. A number of Zinc (II) salts promoted 1,4-conjugate addition of Grignard reagents to thiochromones.  $ZnCl_2$  is the most effective and gave the highest yield 91%.

entry	n-BuMgCl (eq)	Zinc(II) salt	equiv	TMSCl	yield (%)
1	1.5	$ZnCl_2$	0.1	0	80
2	1.5	$ZnCl_2$	0.1	0	82
3	1.5	no ZnCl <sub>2</sub>	0	0	0
4	1.5	ZnEt <sub>2</sub>	0.1	0	88
5	1.5	$ZnCl_2$	0.1	0	91
6	1.1	$ZnCl_2$	0.1	0	87
7	1.5	$ZnCl_2$	0.1	1.0	77

#### Scope of Grignard Reagents

entry	Yield (%)
1	72%
2	71%
3	91%
4	90%
5	87%
6	87%
7	79%

#### Scope of Thiochromones

entry	Yield (%)
1	81%
2	88%
3	80%
4	79%
5	90%
6	89%
7	82%
8	82%
9	82%
10	82%
11	82%
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47	82%
48	82%
49	82%
50	82%

#### 1,4-Adduct Thiochromanones-Synthetic Applications

Thiochromones undergo conjugate addition reactions with Grignard reagents catalyzed by Zinc (II) salts to afford 2-alkylthiochromanones with good to excellent yields, providing a straightforward synthesis approach to provide privileged S-containing structural motifs and valuable precursor for many pharmaceuticals. The use of commercially available or easily prepared organometallic Grignard reagents will expedite the synthesis of a large library of thiochromanones for further synthetic applications and biological studies.

#### Conclusions

Thiochromones undergo conjugate addition reactions with Grignard reagents catalyzed by Zinc (II) salts to afford 2-alkylthiochromanones with good to excellent yields, providing a straightforward synthesis approach to provide privileged S-containing structural motifs and valuable precursor for many pharmaceuticals. The use of commercially available or easily prepared organometallic Grignard reagents will expedite the synthesis of a large library of thiochromanones for further synthetic applications and biological studies.

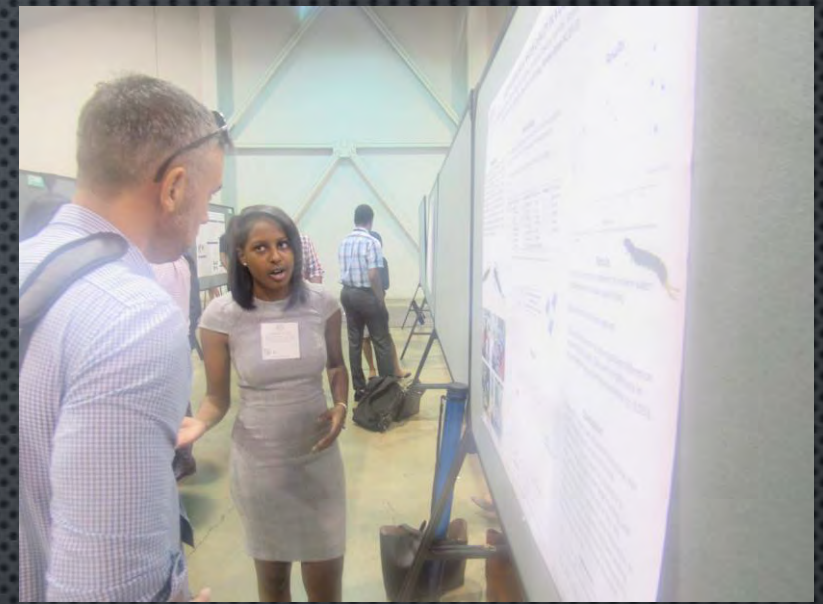
#### References

- 1) Sulphur-Containing Drugs and Related Organic Compounds; Damani, L. A., Ed.; Wiley: New York, 1989
- 2) Guo, F.; Jeffries, M. C.; Graves, B. N.; Graham, S. A.; Pollard, D. A.; Pang, G.; Chen, H. Y. *Tetrahedron* **2017**, *73*, 2742-2746
- 3) Bass, S. A.; Parker, D. M.; Bellinger, T. J.; Eaton, A. S.; Dibbitt, A. S.; Koroma, K. L.; Sedy, S. A.; Pollard, D. A.; Guo, F. *Molecules* **2018**, *23*(7), 1728

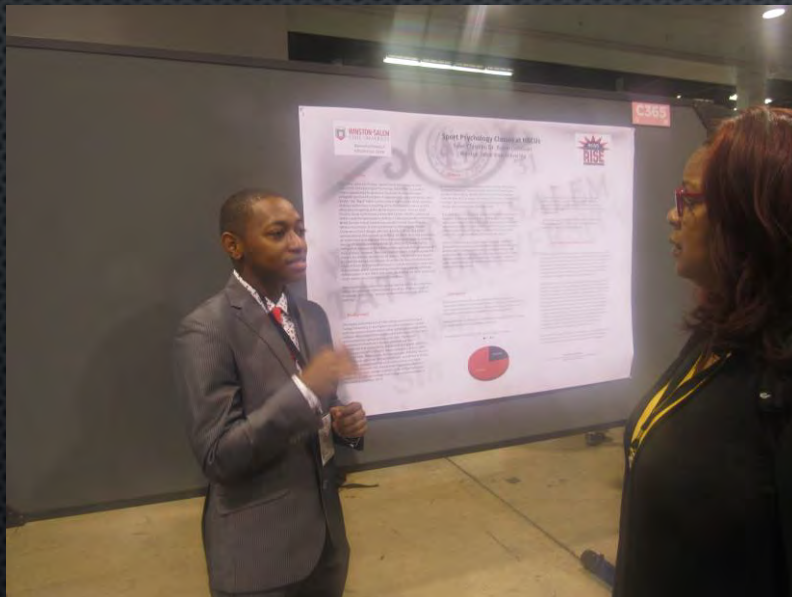
Scientific Poster  
Synthesis of Thiochromanones via Additions of Alkyl Grignard Reagents to  
Thiochromones Catalyzed by Zinc (II) Salts



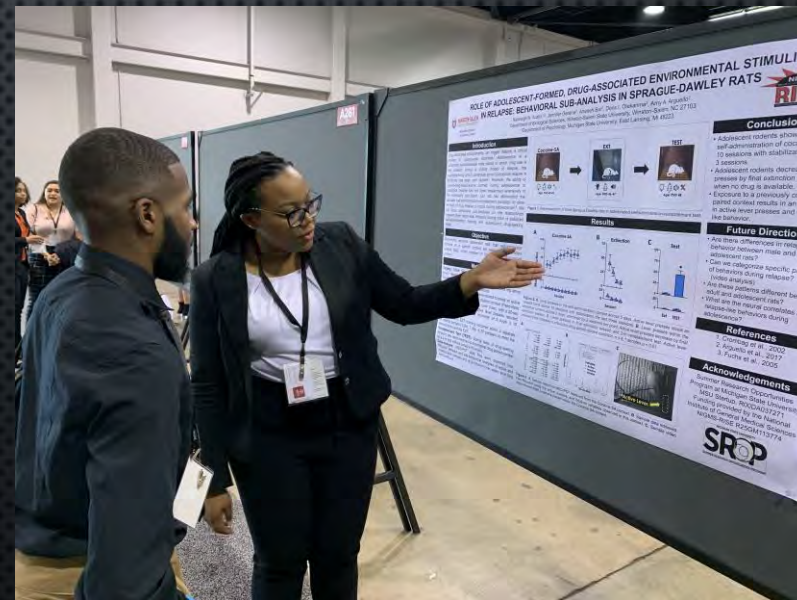
**Dustin Sellers Presenting Research**



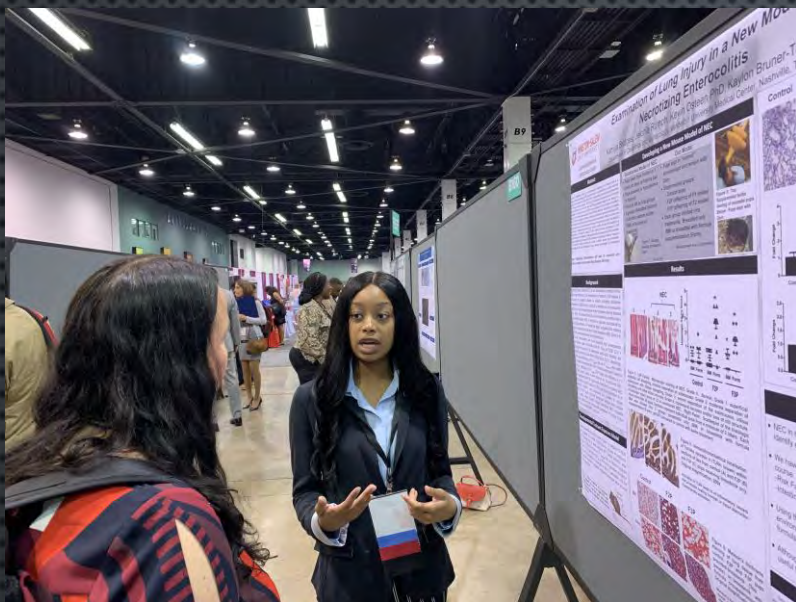
**Anijah Carter Presenting Research**



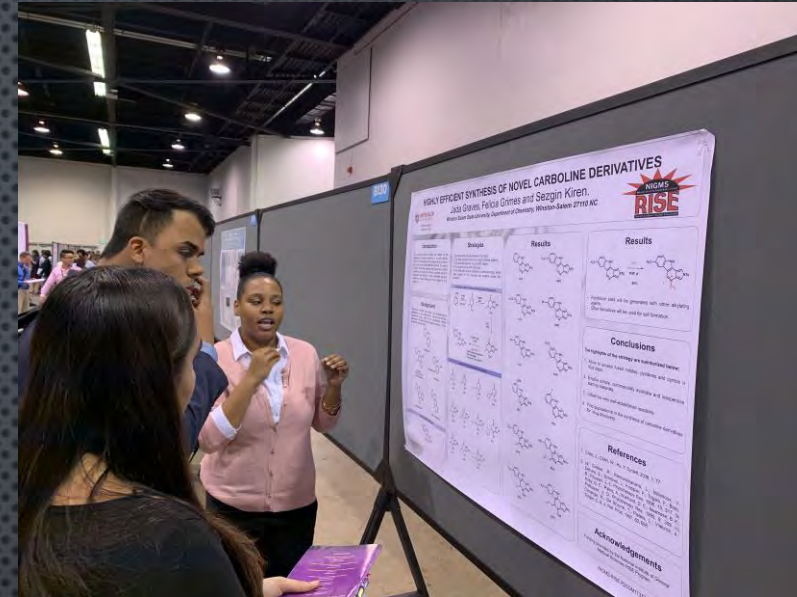
**Tyler Chisom Presenting Research**



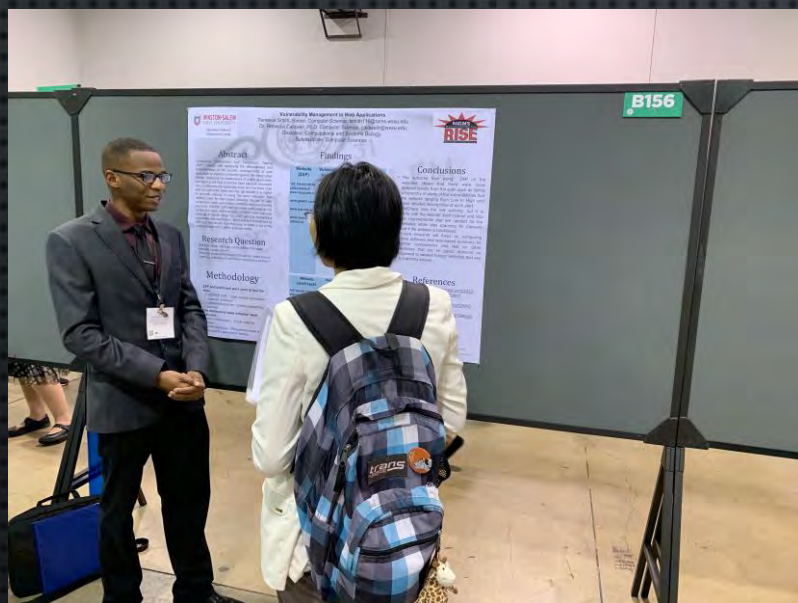
**Nataleigh Austin Presenting Research**



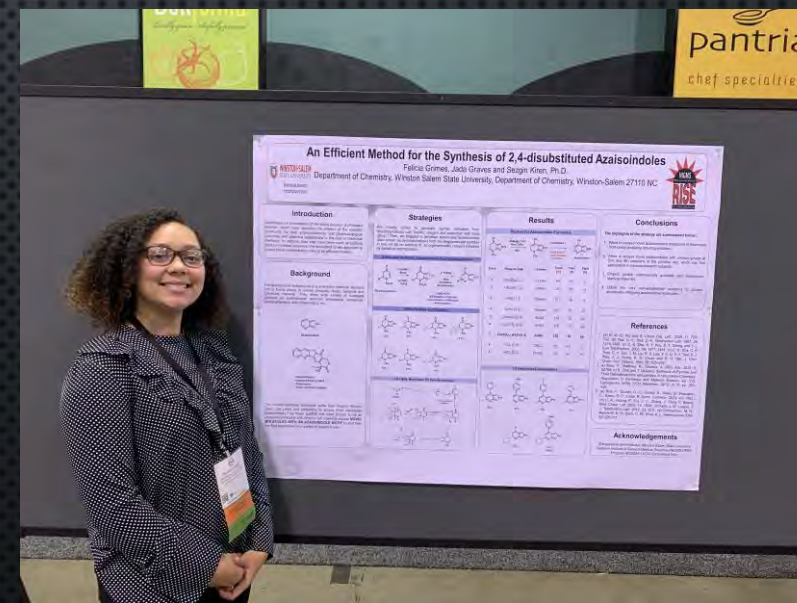
Kamiya Bridges Presenting Research



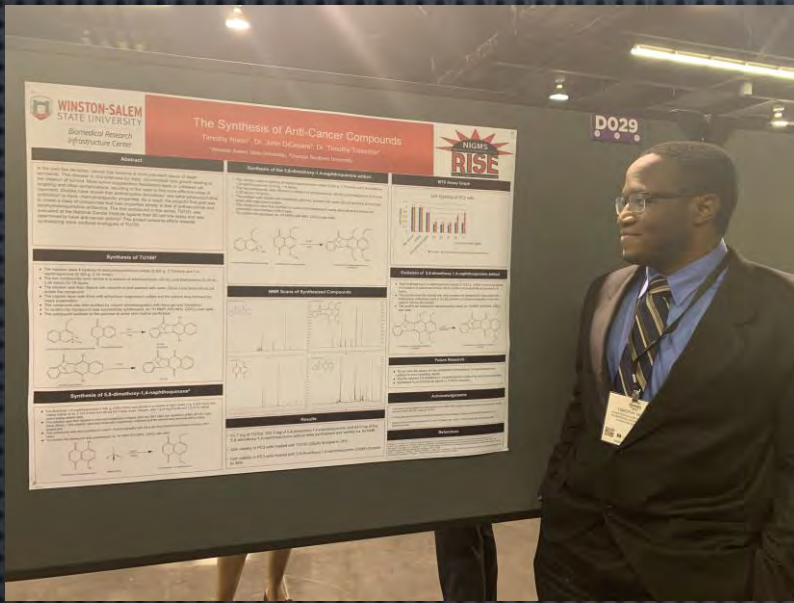
Jada Graves Presenting Research



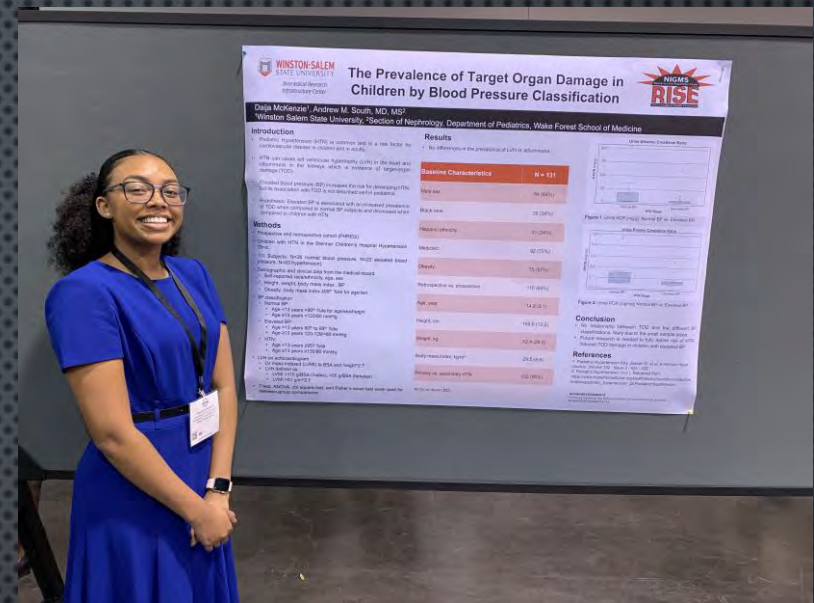
Terrence Smith Presenting Research



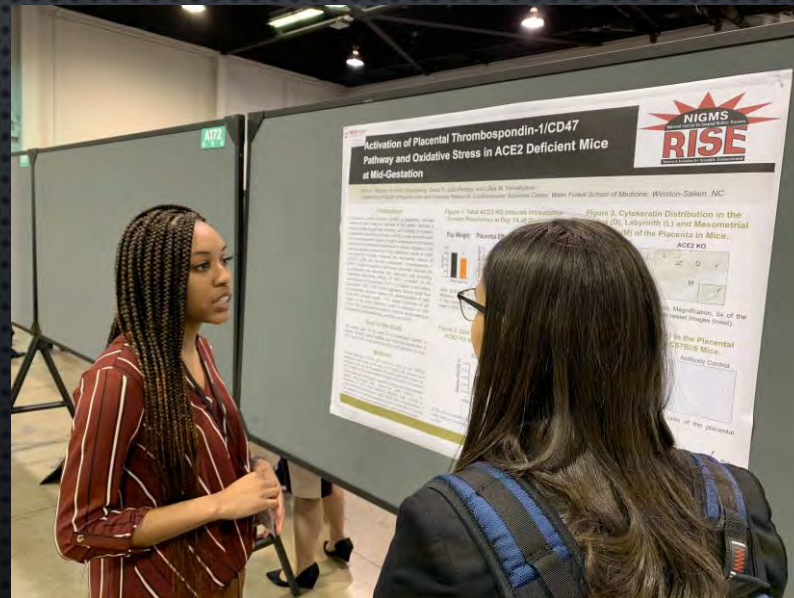
Felicia Grimes Presenting Research



Timothy Nixon Presenting Research



Daija McKenzie Presenting Research

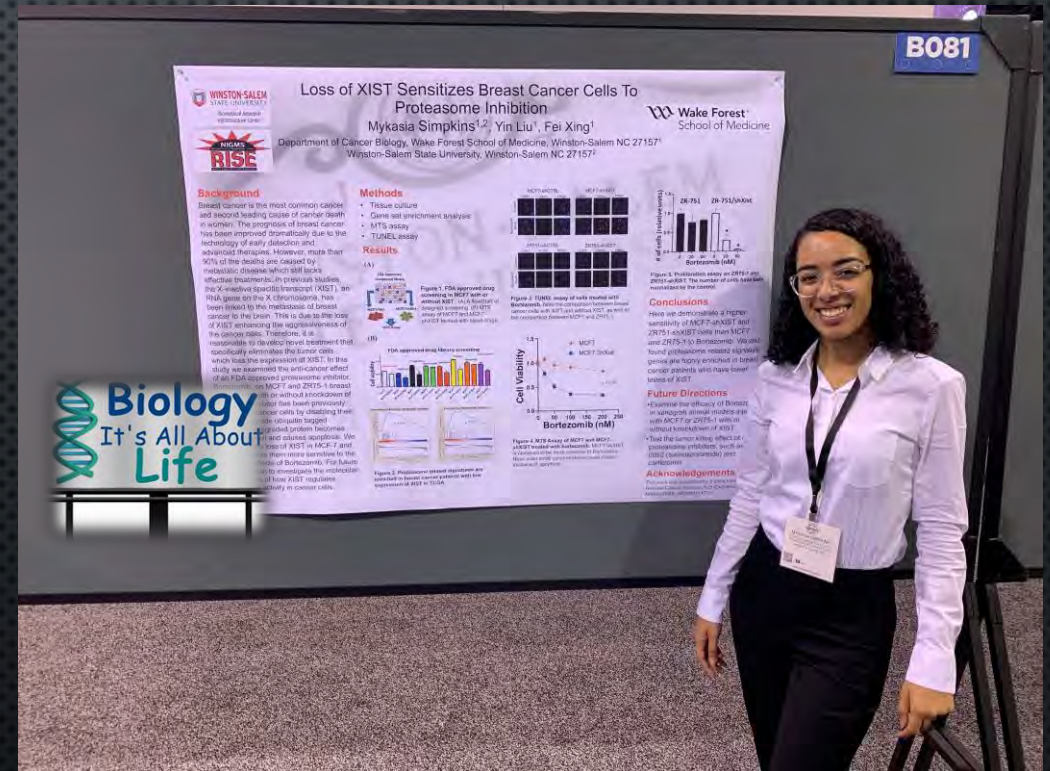


Erica Weaver Presenting Research

# Congratulations to Our December Graduates



Georgina Dzikunu Presenting Research



Mykasia Simpkins Presenting Research

PARTICIPATING STUDENTS	MAJOR
Nataleigh Austin	Biology
Tania Bellinger	Biology
Kamiya Bridges	Biology
Anijah Carter	Biology
Georgina Dzikunu	Biology
Jada Graves	Biology
Daija McKenzie	Exercise Science
Dexter Perkins	Exercise Science
Dustin Sellers	Exercise Science
Mykasia Simpkins	Biology
Terrence Smith	Computer Science
Joseph Lightsey	Biology
Timothy Nixon	Biology
Erica Weaver	Biology
Tyler Chisolm	Psychology
"Naomi" Isaac Roberts	Clinical Laboratory Sciences
Tutein Mai Ling Tang Yuk	Chemistry
Mckenzie Ward	Psychology
Felicia Grimes	Chemistry

Participating students  
and majors

# THANK YOU

NATIONAL INSTITUTE OF GENERAL MEDICAL SCIENCES – RESEARCH INITIATIVE  
FOR SCIENTIFIC ENHANCEMENT GRANT FUNDING