Welcome to the 55th Annual

TENNESSEE REGIONAL

MARCH 5-6, 2020

Crowne Plaza Hotel
401 W Summit Hill Dr SW
Knoxville, TN 37902

The Junior Science and Humanities Symposium, Tennessee Regional, is sponsored by the United States Departments of the Army, Navy, and Air Force, and is administered by the National Science Teaching Association in cooperation with the University of Tennessee, Knoxville.
THURSDAY, MARCH 5, 2020
7:30 AM – 8:30 AM
Student Check-in and Poster Set-up
Salon A Room

8:30 AM – 11:00 AM
Poster Session
Salon A Room
(Poster presenters only)

8:30 AM – 11:00 AM
Load buses at 8:30 AM
UT Veterinary School & Ag Campus Tour (Oral presenters only)

11:15 AM – 1:00 PM
Lunch Session
Salon A Room

1:00 PM – 5:30 PM
Load buses at 1:00 PM
University of Tennessee Lab Tours (Both oral and poster presenters)

6:00 PM – 8:00 PM
Networking Reception
Salon A Room

FRIDAY, MARCH 6, 2020
8:00 AM – 9:00 AM
Breakfast
Salon A Room

9:00 AM – 9:10 AM
Welcome and Opening Remarks
Salon B Room

SESSION I
9:10 AM – 10:30 AM
Oral Presentations
Salon B Room

SESSION II
10:40 AM – 11:40 PM
Oral Presentations
Salon B Room

11:40 AM – 1:00 PM
Lunch Session
Salon A Room

SESSION III
1:10 PM – 2:10 PM
Oral Presentations
Salon B Room

2:10 PM – 2:20 PM
Break

SESSION IV
2:20 PM – 3:00 PM
Oral Presentations
Salon B Room

3:30 PM – 5:30 PM
Load buses at 3:30 PM
UT Veterinary School & Ag Campus Tour (Poster presenters only)

6:00 PM – 8:00 PM
Awards Banquet and Dinner
Keynote address: Dr. Michael Simpson
Salon A Room

SATURDAY, MARCH 7, 2020
Breakfast on your own
Voucher for Mahogany’s

12:00 PM
Hotel Check-out

TJSHS (Regional) Social Media
@UTK_PREP
@tnrscihum
@utk_prep

JSHS (National Competition) Social Media
@NtlJSHS
@NationalJSHS
@NtlJSHS
FRIDAY, MARCH 6, 2020

9:00 AM – 9:10 AM
Salon B Room
Welcome and Opening Remarks
Presentation of our Nations Colors by the University of Tennessee Dragoons

SESSION I – ORAL PRESENTATIONS

9:10 AM
Andrew Brady, Oak Ridge High School
NRDAA: A Machine Learning Algorithm for Fitting Neutron Reflectometry Data

9:30 AM
Ian Brunetz, McCallie School (presenting) & Shrayen Daniel, McCallie School
Ocean acidification found to rapidly induce multiplication of Cassiopea xamachana, though overall health declines

9:50 AM
Matthew Carr, Hillsboro High School
Examining the Effects of Heavy Metals on Earthworm Health

10:10 AM
Daniel Chizhikov, White Station High School
Effects of Dietary Fats on Obesity-related Health Problems and Lipid Metabolism Gene Expression in Drosophila

10:30 AM – 10:40 AM
BREAK

SESSION II – ORAL PRESENTATIONS

10:40 AM
Srikrishna Dasari, White Station High School
Analyzing DGR-Associated Protein Evolution in Cyanobacteria

11:00 AM
Melody Guo, White Station High School
Developing an Integral Equation Solution for the Incompressible Navier-Stokes Equations

11:20 AM
Irene Mamontov, Farragut High School
The Variability Hypothesis and Distribution of Standardized Test Scores

11:40 AM – 1:00 PM
LUNCH SESSION
Salon A Room

SESSION III – ORAL PRESENTATIONS

1:10 PM
Rais Nurhidajat, Chattanooga School for the Arts & Sciences
Developing a Currency Trading Expert Advisor to turn Significant Profit Short Term

1:30 PM
Kathryn Parks, Chattanooga School for the Arts & Sciences
The Effect of Available Phosphate in a Hydroponic System on the Production of L-Ascorbic Acid in Brassica oleracea var Acephala

1:50 PM
Mary Vantrease, Central Magnet School
Investigation of the Emotional Self-Talk of Bilingual Individuals

2:10 PM – 2:20 PM
BREAK

SESSION IV – ORAL PRESENTATIONS

2:20 PM
Ridhima Singh, Farragut High School
The Impact of Urbanization on the Intensity of Flooding

2:40 PM
Melanie York, Hillsboro High School
The effects of Lonicera maackii on soil quality at Glen Leven

3:00 PM – 3:30 PM
BREAK

3:30 PM – 5:30 PM
UT Veterinary School & Ag Campus Tour
(Poster presenters only)

6:00 PM – 8:00 PM
Awards Banquet & Dinner
Salon A Room
Rethika Ambalam, Chattanooga School for the Arts & Sciences
The Efficiency of Natural Antibacterials

Eric Armstrong, Oak Ridge High School
The Effect of Pseudomonas, Piriformispora indica and Laccaria bicolor on the Growth of Gossypium hirsutum

Katie Cowart, Central Magnet School
The Impacts of Mussels on the Water Quality as a Solution to Harmful Algal Blooms

Aidan Hoskinson, Chattanooga School for the Arts & Sciences
The Viability of Controlled Forest Fires in the Eastern United States

Jina Jiang, Oak Ridge High School
Assessing the Effects of Installing Solar Panels in Communities

Tanishqa Kuchi, Chattanooga School for the Arts & Sciences
Biosols in the Air

Darun Lawson, Lawson Homeschool (CAK Homeschool) & Jonathan Shelton, Shelton Homeschool
Evaluation of Industrial Hemp (Cannabis sativa L.) Varieties

Kathryn Lazenby, Chattanooga School for the Arts & Sciences
Eastern US Migratory Birds Data Analysis

Samuel Palmer, Chattanooga School for the Arts & Sciences
The Viability of Controlled Forest Fires in the Eastern United States

Matthew Shelton, Shelton Homeschool
Comparing a Tobii Dynavox to an iPad Pro as a Communication Device

Duncan St. Clair, Hillsboro High School
Quantifying Perceivable Aspects of Trumpet Design
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<th>SCHOOL</th>
<th>TEACHER/SPONSOR</th>
<th>CITY</th>
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<td>Central Magnet School</td>
<td>Louis Cowart</td>
<td>Murfreesboro</td>
<td>Rutherford</td>
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<td>Chattanooga School for the Arts &amp; Sciences</td>
<td>Kelly Davis &amp; Thais Campbell</td>
<td>Chattanooga</td>
<td>Hamilton</td>
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<td>Farragut High School</td>
<td>William Reynolds</td>
<td>Knoxville</td>
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<td>Hillsboro High School</td>
<td>Erica Anderson &amp; Joshua Swartz</td>
<td>Nashville</td>
<td>Davidson</td>
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<td>Lawson Homeschool</td>
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<td>Oak Ridge High School</td>
<td>Sharon Thomas</td>
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<td>Michael Witt</td>
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Dr. Michael Simpson is Director of Education and Workforce (E & W) in the Office of Naval Research (ONR). The mission of ONR’s E & W is to ensure access to workers with needed diverse and agile STEM competencies, where and when needed, using approaches with measurable positive benefits. Connected with Dr. Simpson’s direction of ONR’s E&W are several complementary components including Laboratory Workforce Initiatives (e.g., internships including the Science and Engineering Apprenticeship Program and Naval Research Enterprise Internship Program, Naval STEM Coordination activities; ONR STEM initiatives (e.g., ONR STEM grants); participation in the National Defense Science and Engineering Graduate Fellowship); participation in the DoD Science, Mathematics, and Research for Transformation scholarship-for-service program, and all the vital Naval STEM Stakeholders performing DON STEM in their research and everyday communities. Dr. Simpson coordinates Naval STEM efforts with other components of the Department of Defense (including in the tri-Service Junior Science and Humanities Symposium), other entities of the Federal Government and other governments, and with members of the private, nonprofit, and academic sectors.

DoD’s Mentor-Protégé Program pairs a mentor (a Federal prime contractor) to help a protégé company thrive. Dr. Simpson worked with several protégé STEM-based small-businesses that benefited DoD, the companies and workers, and society.

Dr. Simpson taught 59 sessions of upper-division/graduate level Science Policy courses as an adjunct professor at the Washington Center. He also maintained direct connection with grass-roots STEM by leading several science fair events in the National Capital area.

Michael’s media, communications, and crisis management experience trace back to his first radio series on energy issues in the SF Bay Area, capabilities used to help guide the Public Affairs offices of the Defense Threat Reduction Agency and of the US Air Force, and that contribute to enhance Naval and ONR STEM communications.

Michael for 25 years advised members and staff of the US Congress about STEM policy as a leader in the US Congressional Research Service, leading both the Life Sciences and Biomedical Policy sections; his STEM policy work on Capitol Hill began in 1981 when he was selected as the American Association for the Advancement of Science/CRS Science Fellow for that year.

Michael’s interdisciplinary expertise that he brings to Education & Workforce/ONR STEM leadership is suggested by his earned Doctor of Environmental Sciences and Engineering degree from UCLA, Master of Science in Energy and Resources from UC Berkeley, Master of Science in Biological Sciences from USF, and Artis Baccalaureate in Biological Sciences from UC Berkeley.
Dr. Sieger received a B.S. in Physics from the University of Missouri at Rolla (now Missouri S&T), and a M.S. and Ph.D. in Physics from the University of Illinois at Urbana-Champaign. He then moved to Pacific Northwest National Laboratory (PNNL) as a postdoctoral researcher and later as a member of the scientific staff, where he led a dual experimental and theoretical effort to understand the physics of electron-stimulated chemistry at surfaces, including those of icy solar system bodies. Matt was the recipient of the 1998 Outstanding Postdoc award at PNNL’s Environmental and Molecular Sciences Laboratory. He has authored or co-authored more than 30 articles in peer-reviewed literature. In 2000 Matt joined Intel Corporation in Portland, Oregon, as a senior engineer in process technology development, where he helped transfer Intel’s first copper interconnect process technology from the lab to high-volume manufacturing. Later he led a computational quality and reliability effort which developed comprehensive statistical models of processors, chipsets, and integrated systems including power, thermal and reliability characteristics, used by Intel to simulate and optimize product manufacturing and test processes. Matt joined ORNL in 2009 as a Quality Manager, where he worked with the Consortium for the Advanced Simulation of Light Water Reactors (CASL), the Nuclear Science and Engineering Directorate, and the Spallation Neutron Source. He has made contributions to a number of projects across the laboratory in quality and project management, software QA, business process improvement, assessments, operations management, and IP licensing and export control. Dr. Matt Sieger is currently the Deputy Director for the Oak Ridge Leadership Computing Facility (OLCF) Frontier supercomputer project.

Dr. Lebeis received her B.S. in Biology from Lyman Briggs School and Microbiology and Molecular Genetics at Michigan State University before she moved to Emory University for her Ph.D. studies in Microbiology and Molecular Genetics. Her Ph.D. dissertation examined innate immunity required during mammalian intestinal infections. For her postdoctoral research, Dr. Lebeis switched model systems to determine the role of the plant immune system to influence root microbiome assembly at the University of North Carolina in the laboratory of Dr. Jeff Dangl. Research in her lab at the University of Tennessee asks two main questions: How is microbiome composition controlled? How do the functions of the whole microbiome compare to its individual members?

Dr. Wilfred M. Post retired in 2013 as a senior scientist in the ORNL Environmental Sciences Division, a staff member of ORNL’s Climate Change Science Institute (CCSI), and an adjunct professor of ecology and evolutionary biology at the University of Tennessee, Knoxville. He is a recognized expert on soil carbon dynamics, nutrient relationships between soil and vegetation, and the impact of species composition on ecosystem processes. He has developed approaches to representing the impact of land-use change and climate change in terrestrial biogeochemistry models. He has more than 100 peer reviewed open literature publications and co-authored two books. Post has a Ph.D. in ecology from the University of Tennessee, Knoxville, and an M.S. in botany and a B.S. in mathematics from the University of Wisconsin, Madison.
Dr. Ranjan Ganguly retired in 2018 as a full Professor in the Department of Biochemistry, Cellular and Molecular Biology at the University of Tennessee, Knoxville. He has a PhD in Cell & Molecular Biology from the University of Nebraska, Lincoln. During his graduate study Dr. Ganguly worked on the molecular and hormonal regulation of casein gene expression and mammary carcinogenesis in mice. During his postdoctoral research at the University of California, Irvine, he initiated a research project to understand the molecular mechanism of gene dosage compensation using Drosophila as a model organism. After joining the University of Tennessee, Knoxville in 1986, Dr. Ganguly continued his research on gene dosage compensation in Drosophila using genes involved in phototransduction and cell signaling. He also developed a new research project to understand the molecular and genetic basis of insecticide-resistance associated overexpression of cytochrome P450 genes that are involved in conferring resistance to DDT and other insecticides used in agriculture. During his tenure at the University of Tennessee, Knoxville, Dr. Ganguly supervised fifteen graduate and twenty-five undergraduate research students. Dr. Ganguly has published his work in various prestigious journals.

Dr. Seal is a Senior Scientist in the Computer Science and Mathematics Division, Oak Ridge National Laboratory and an ORNL-UT Associate Professor of Electrical Engineering and Computer Science at the University of Tennessee, Knoxville. He holds a PhD in computer engineering and a PhD in theoretical high energy physics. Dr. Seal specializes in the design and development of scalable high-performance algorithms for large-scale science-based computational problems on massively parallel supercomputers such as Summit, the world's fastest supercomputer. In this capacity, Dr. Seal is actively involved in the fusion, neutron and materials sciences. At present, he leads the machine learning for inverse problems team in the U.S. Department of Energy's ExaLearn co-design project in addition to leading the scalability team for ORNL's AI Initiative. Together with his teams, Dr. Seal designs, implements and deploys scalable machine learning algorithms for scientific discovery on the Summit supercomputer in preparation for its exa-scale successor, the Frontier supercomputer.

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JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM, TENNESSEE REGIONAL

Administrative Staff

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Clinical Associate Professor  
Retired College of Education, Health, and Human Sciences and the College of Arts and Sciences  
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Pre-College Research Excellence Programs  
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Jaime Morales  
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Pre-College Research Excellence Programs  
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Braydin Lenox  
*Undergraduate Student Assistant*  
Pre-College Research Excellence Programs  
The University of Tennessee, Knoxville
TENNESSEE SPONSORS AND SUPPORTERS

The Junior Science and Humanities Symposium, Tennessee Regional, is hosted by the University of Tennessee, Knoxville, and is administered through the Pre-College Research Excellence Programs. Judges are provided by the College of Arts and Sciences, University of Tennessee, Knoxville and the Oak Ridge National Laboratory.

NATIONAL SPONSORS

The Junior Science and Humanities Symposium, Tennessee Regional, (JSHS-TN) is jointly sponsored by the research offices of the United States Departments of the Army, Navy, and Air Force in cooperation with leading research universities throughout the nation. The Department of Defense generously provides funding for the National Symposium and the JSHS-TN scholarships. The JSHS-TN program is administered nationally through the National Science Teaching Association.

FINANCIAL SUPPORT

The Junior Science and Humanities Symposium, Tennessee Regional, is provided by a grant from the National Science Teaching Association. The University of Tennessee Pre-College Research Excellence Programs provides supplementary support.

Other organizations that helped make the 55th Annual Junior Sciences and Humanities Symposium, Tennessee Regional, a success:

Oak Ridge National Laboratory

The University of Tennessee, Army ROTC Dragoons for Presenting our Nations Colors
58th National Junior Science & Humanities Symposium
U.S. Army, Navy, and Air Force sponsored

April 15-18, 2020, Norfolk, VA

National Symposium
The 58th National JSHS will be held on April 15-18, 2020, in Norfolk, Virginia. The National JSHS brings together 230 high school students who qualify by submitting and presenting original scientific research papers in regional symposia held at universities nationwide. Approximately 130 high school teachers, mentors, university faculty, ranking military guests and others also attend and join in encouraging the future generation of scientists and engineers and celebrating student achievement in the sciences.

2020 National JSHS registration opens March 2020
All participants in the National JSHS must register through the National JSHS registration website. Participants include students; teachers; DoD/STEM professionals- invited officials, judges, presenters, speakers, volunteers; JSHS staff and all other guests- family members and friends.

The Competition
All regional symposia student finalists are invited to present their research at the National JSHS. The top two regional delegates will present their research in the oral session to compete for military-sponsored undergraduate, tuition scholarships. All other regional delegates will present their research in the poster session to compete for cash awards. Sessions will be organized by categories that are selected by the students during the registration process.

The Scientific and Educational Program
All students will participate in interactive activities to enrich their JSHS experience and to engage with Department of Defense (DOD) researchers, laboratories, and related STEM organizations and professionals. Unique opportunities for JSHS students include:

• The Student Research Presentations, the highlight of the National JSHS, feature the STEM achievements of outstanding students representing the United States, Puerto Rico, and the DOD Dependents Schools of Europe and the Pacific.

• DoD STEM Experiences allow students and teachers to engage with DoD’s world-class STEM professionals and provide exposure to the department’s cutting-edge research and technologies.

• Banquet and awards ceremony recognizes all participants and announces scholarships awarded to students in each competition category of the oral session categories of the National JSHS competition.

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The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA institution in the provision of its education and employment programs and services. All qualified applicants will receive equal consideration for employment and admission without regard to race, color, national origin, religion, sex, pregnancy, marital status, sexual orientation, gender identity, age, physical or mental disability, genetic information, veteran status, and parental status.