ORAU provides innovative scientific and technical solutions to advance national priorities in science, education, security and health. Through specialized teams of experts, unique laboratory capabilities and access to a consortium of more than 100 major Ph.D.-granting institutions, ORAU works with federal, state, local and commercial customers to advance national priorities and serve the public interest. ORAU manages the Oak Ridge Institute for Science and Education (ORISE) for the U.S. Department of Energy (DOE).

ORISE is a DOE asset that is dedicated to enabling critical scientific, research and health initiatives of the department and its laboratory system by providing world-class expertise in STEM workforce development, scientific and technical reviews, and the evaluation of radiation exposure and environmental contamination. ORISE is managed by ORAU, a 501(c)(3) nonprofit corporation and federal contractor, for DOE’s Office of Science. The single largest supporter of basic research in the physical sciences in the United States, the Office of Science is working to address some of the most pressing challenges of our time.

The financial information provided in this report has been derived from the audited financial statements of the ORAU Corporation and the DOE contract fund for the year ended Sept. 30, 2017. These audited financial statements are presented in separately bound reports.

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Select Acronyms
CDC Centers for Disease Control and Prevention
DHS U.S. Department of Homeland Security
DoD U.S. Department of Defense
DOE U.S. Department of Energy
DOE-SC DOE Office of Science
EPA U.S. Environmental Protection Agency
FDA U.S. Food and Drug Administration
NETL National Energy Technology Laboratory
NIOSH National Institute for Occupational Safety and Health
NRC U.S. Nuclear Regulatory Commission
NSF National Science Foundation
ORAU Oak Ridge Associated Universities
ORISE Oak Ridge Institute for Science and Education
ORNL Oak Ridge National Laboratory
REAC/TS Radiation Emergency Assistance Center/Training Site
STEM Science, Technology, Engineering and Math
VA U.S. Department of Veterans Affairs
VHA Veterans Health Administration

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To Our Valued Stakeholders

Physicists describe potential energy in terms of a system’s initial position versus its final position—the difference between where one is and where one could be. Unleashing and harnessing that potential energy are the means to drive progress forward. The same is true of people. When their energy and passion are unleashed, the drive to advance a corporation forward is remarkable.

At ORAU, our focus is on unleashing the power of people—researchers, scientists, students, employees—and harnessing their potential to solve our nation’s most challenging problems today and in the future. Throughout this annual report are numerous stories of where we are empowering the expertise and encouraging the thought leadership of our people. For example, leveraging our expertise in STEM workforce development, we helped our customers recruit and develop more than 10,000 students and other research participants to become our nation’s next generation of scientists and STEM leaders. By providing better regional health communications and education to combat opioid abuse in Appalachia, we are also helping to support the fight against this nationwide epidemic.

Backed by a strong financial portfolio, we invest where innovative thinking is occurring, such as encouraging research partnerships among ORAU’s employees and faculty members at our 121 Ph.D.-granting universities across the United States and the United Kingdom. Our experts at REAC/TS are leading the discovery of a new biomarker for acute radiation dose assessment, while other ORAU leaders held an influential national workshop to inform the nation’s priorities for radiation protection research for the next three to five years.

Investments also are made in resources and equipment that will allow ORAU to better serve our customers, such as new equipment purchased in 2017 for the ORISE Beryllium Laboratory.

We balance this unleashed energy with the stability of an organization that has built more than 70 years of experience and excellence. Our quality performance is recognized through the ISO 9001:2015 certification for quality management; our safety is recognized through 13 consecutive years of DOE’s VPP Star of Excellence Award for safety; and our workplace environment is recognized as a top diversity employer from numerous publications.

Many of ORAU’s customers continue to reward this performance with long-tenured contracts that include 25 years managing the ORISE contract, a DOE flagship contract, and 15 years leading the National Institute for Occupational Safety and Health Radiation Dose Reconstruction Program, one of the most important U.S. workers’ compensation programs.

Together, this work creates a solid foundation from which ORAU can best position itself to strategically deliver innovative solutions for our customers. These solutions, powered by the passion of our people, are helping to advance critical national priorities in complex and turbulent times.

Andy Page, ORAU President and CEO
Contractor Assurance and Certifications

VPP Star of Excellence Award for safety (13th consecutive year)
ISO 14001:2015 certification for environmental management
ISO 9001:2015 certification for quality management

Human Resources Distinctions

2017 Top Diversity Employer Award from Black EOE Journal
2017 Top Diversity Employer Award from HISPANIC Network Magazine
2017 Top Veteran-Friendly Companies from U.S. Veterans Magazine
2017 East Tennessee Wellness Roundtable Gold Award for exemplifying excellence in work-site wellness
2017 Valued and Appreciated Partner Award from Anderson County Health Department for ORAU commitment to new mother accommodations

Procurement and Small Business Contracting Achievements

Green Electronics Council Electronic Product Environmental Assessment Tool (EPEAT) Sustainable Purchaser Award; EPEAT 3-star winner, 1 of only 10 winners nationwide, 1 of only 5 repeat 3-star winners
98.5% of all ORISE subcontracts were awarded to small business
TVA Green Power Switch Award for outstanding commitment to sustainability

Laboratory Excellence

ORISE Beryllium Testing Laboratory: CAP certified; CLIA certified
ORISE Cytogenetic Biodosimetry Laboratory: CLIA certified
Participant/CoLaboratory in the project “Testing the Capacity of the National Biological Dose Response Plan,” Health Canada
Participant in the research project “Automation of Dicentric Assay for Commercial Robotic Platforms,” National Institutes of Health/ Columbia University Medical Center
Awardee, DOE Technology Integration-funded project for development of high throughput cytogenetic tools for radiation dose assessment

ORISE Radiological and Environmental Analytical Laboratory:
ISO 17025:2005 accreditation for testing and calibration laboratories
DOE Consolidated Audit Program-approved
Accredited by U.S. Department of Defense Environmental Laboratory Accreditation Program
Member of DOE’s National Analytical Management Program
Member of U.S. Environmental Protection Agency (EPA) Environmental Response Laboratory Network
Member of EPA’s Water Laboratory Alliance Program
Participant in DOE’s Mixed Analyte Performance Evaluation Program
Participant in National Institute of Standards and Technology Radiochemistry Intercomparison Program
Participant in U.S. Nuclear Regulatory Commission Intercomparison Testing Program

Corporate Awards and Distinctions

2017 Valued and Appreciated Partner Award from Anderson County Health Department for ORAU commitment to new mother accommodations

Leadership Awards

Andy Page
ORAU President and CEO
2017 TVC Corridor Champion Award
Tennessee Valley Corridor’s (TVC) top award in recognition of leadership to enhance TVC’s national visibility, high-tech economic development and collaborative efforts within TVC’s five-state region.

Jason Davis, Ph.D., CHP
REACTS Health Physicist
2017 HPS Elda E. Anderson Award
A Health Physics Society (HPS) award that honors a young HPS member for excellence in research or development; discovery or invention; or significant contributions to the health physics profession.

Heidi Timmerman, CPCM
Director, ORAU Procurement and Contracts Administration
2017 NCMA Fellow Award
A National Contract Management Association (NCMA) award for contributions in the field of contracting and for service to the NCMA organization.

LaFrancis Gibson, CHES
Section Manager, Health, Energy and Environment
2017 40 Under 40 Award
The Greater Knoxville Business Journal award to professionals under 40 years of age who are improving Tennessee through community involvement and specific business accomplishments demonstrating leadership in their field.

SHARING EXPERTISE

Krissy Kistner, PMP (pictured top)
Director, Office of Quality
M.A., George Washington University
Expertise: ISO 9001, process improvement, policy analysis and interpretation
Certified Quality Auditor
Lead, implementation and maintenance of ISO 9001 Quality Management System (IQMS) and ongoing assessment of Quality Assurance and IQMS programs, systems and processes.

Author, “A Quick Study: Use a Project Management Approach to Prepare for Exams,” American Society for Quality
Quality Progress magazine, July 2016

Certified Scrum Professional
Project Management Institute Certified Agile Practitioner (PMI-ACP)
Expertise: computer science, software development, agile and agile project management frameworks, employee engagement
Co-organizer, Agile Knoxville
Co-organizer, ORAU Hackathon

Cristi Poindexter, PMI-ACP (pictured bottom)
ORAU Section Manager, Technology Solutions
B.S., Wichita State University
Expertise: computer science, software development, agile and agile project management frameworks, employee engagement
Co-organizer, Agile Knoxville
Co-organizer, ORAU Hackathon
At ORAU, employees are the catalyst behind the mission, the driving force behind our performance and the innovative spirit behind the scientific and technical solutions for our customers. ORAU’s core values are focused on innovation, expertise, diversity, quality, teamwork, agility, integrity, safety/security and customer service, and employees are empowered through these values to focus on advancing national priorities and serving the public interest through their unique strengths. In 2017, innovation spurred from ORAU’s first-ever Hackathon, where programmers and others creatively collaborated to solve a range of information technology challenges. ORAU leadership also formed action-planning teams, empowering employees to develop creative models, plans and roadmaps for addressing challenges and opportunities outlined in ORAU’s Strategic Plan. Employees raised more donations than ever through ORAU’s annual giving campaign, set a company record recycling nearly six tons of “technotrash” and paper and helped ORAU win countless awards and certifications for excellence in safety, quality, diversity, environmental responsibility and sustainable business practices. ORAU inspires its people with a commitment to professional development, tuition reimbursement, work/life balance, flexible schedules, telecommuting and collaborative work spaces. Individuals are also encouraged to participate in community outreach projects such as the Helping Paws Animal Network, Habitat for Humanity and Mission of Hope, and are supported during military service or other personal and professional pursuits. This year, a company-wide employee survey revealed that nearly 90 percent of employees have great pride in working for ORAU. As ORAU strives to nurture employee growth and empowerment, employees respond with pride in performance, customer responsiveness and inspired problem solving.
Solutions: A World of Possibilities

Provide Training and Technical Services in 16 Countries

Recruit Participants and Experts from 96 Countries

Conduct International Research, Consultancies/Collaborations and Technical Presentations in 94 Countries

10,000+ interns, fellows and other participants recruited from all 50 U.S. states, District of Columbia, Puerto Rico, U.S. Virgin Islands and 96 foreign countries in FY17

Independent verification of cleanup activities conducted at 13 national laboratories, reactors/plants or other environmental remediation sites across the U.S. in FY17

More than 17,000 experts in ORAU’s peer review network in FY17, recruited from 34 countries

Cytogenetic biodosimetry international telescoring network includes uniquely skilled experts and labs from six countries in FY17

121 sponsoring institutions from 34 U.S. states, District of Columbia and Great Britain as ORAU university partners in FY17

36 highly specialized international physicians and health professionals from 10 countries educated through REAC/TS courses in FY17

Workforce Development
Recruit and prepare the next generation of the U.S. scientific workforce
See p. 12

Scientific Assessment
Provide scientific and technical peer reviews and evaluations to inform federal research investments and programs
See p. 22

Health and Environment
Protect worker and public health and instill public confidence in environmental cleanup
See p. 26

Preparedness and Response
Train, exercise and deploy for radiation emergencies, national security and natural disaster response
See p. 38

University Partnerships
Support and advance science in collaboration with consortium member universities
See p. 44
What a year! 2017 marks an important milestone for ORISE—it has officially been in existence, and we are proud to say, managed by ORAU for 25 years. ORISE’s role supporting this critical DOE asset has evolved considerably over the last quarter century, with the latest contract reflecting a refined scope of ORISE capabilities but with greater depth of expertise and an expanded reach.

ORISE has made significant progress implementing an outreach and engagement campaign to solidify the understanding of ORISE’s current role in supporting the DOE enterprise and the nation. We started with the development of internal communication tools for staff, including the ORISE Director’s Office intranet site, ORISE Buzz (a.k.a. my blog) and targeted ORISE update presentations. In spring 2017, in order to promote the “new” ORISE to a broader community, we launched a fresh, modern digital presence featuring ORISE expertise and capabilities. This included a redesigned website and enhanced social media efforts and platform appearance.

We also continued to deliver on promises made to DOE during the recent ORISE proposal process, such as improvements at DOE’s ORISE South Campus to expand capacity, increase efficiency and reduce risks at the Radiological Environmental Analytical Laboratory, Cytogenetic Biodosimetry Laboratory, and Beryllium Testing Laboratory (pictured left). This year, ORAU invested corporate funds to purchase 10 new pieces of equipment for the laboratories and to pursue a critical collaboration with Yale University to increase medical emergency response capability to a radiological/nuclear incident. This investment has positioned ORISE’s unique laboratories to stay current and successful for years to come.

This year also marked the first gathering of ORISE’s newly formed Distinguished Scientists Advisory Board. This external panel of recognized experts (pictured below, board listing on p. 56) was organized to validate that ORISE is maximizing DOE’s strategic objectives. This board provided ORISE with 55 recommendations for our program areas and an invaluable external perspective on possibilities for the future of ORISE that will factor heavily into the development of the FY18 ORISE Laboratory/Strategic Plan.

Finally, I want to highlight our first ORISE Small Business Outreach Event that was hosted in August. In its management of ORISE, ORAU has a strong commitment to small business subcontracting, with 98.5 percent of all ORISE subcontracts being awarded to small businesses.

The inaugural event was attended by more than 130 attendees representing more than 50 small businesses. We were honored to have Christy Jackiewicz (pictured below), deputy director of the DOE Office of Small and Disadvantaged Business Utilization, as a key presenter during the event.

As I reflect on our accomplishments this past year, both listed here and throughout the pages of this report, I am proud of the excellent performance and leadership demonstrated by our entire ORISE team and am genuinely excited about the future of this program.

William J. (Jim) Vosburg, Ed.D.
Senior Vice President and Director of ORISE
In the ORISE-administered Science Undergraduate Laboratory Internship Program at Oak Ridge National Laboratory (ORNL), Peter Meidl studied fungal symbiosis of poplar trees in an effort to improve biofuel production. Even though Meidl focused on plant-based genetics as an ecology and evolutionary biology undergraduate student at the University of Tennesse, his ORNL research program has allowed him to gain experience related to fungal biology and interact with individuals from various scientific disciplines. “I believe my experience at ORNL has greatly enhanced my abilities,” Meidl said. “The network I’ve been able to establish during my time here will also prove beneficial to my future career.” He plans to pursue further graduate studies in Sweden.  

Photo credit: Lynn Freeny/DOE

Through a new ORISE-administered program, the National Science Foundation (NSF) Mathematical Sciences Graduate Internship Program, 41 students participated in 10-week internships that provided firsthand experiences in the use of mathematics in a nonacademic setting. The opportunity allowed graduate students pursuing doctoral degrees in mathematics, statistics or applied mathematics to train under the mentorship of mathematicians and other scientists at host sites around the country, including U.S. national laboratories, industry and other approved facilities. Derek Jung, a doctoral student in mathematics at the University of Illinois at Urbana-Champaign, was appointed to the Nevada National Security Site’s Signal Processing and Applied Mathematics team in North Las Vegas. Jung integrated his background in mathematics with an industry environment for the first time, exploring mathematical solutions for deblurring images, which could assist national security needs.  

Photo credit: Lynn Freeny/DOE

Opportunities provided more than 10,000 participants with exposure to federal STEM missions

Developing and strengthening our nation’s science, technology, engineering and math (STEM) workforce is essential for U.S. global competitiveness. By managing a wide spectrum of federally funded and laboratory-based programs, ORAU helps ensure that highly qualified talent is available to support the missions of numerous government agencies. In FY17, 10,041 participants had the opportunity to engage in programs sponsored by more than 25 federal departments and agencies as well as several nonfederal entities. Program participants came from 856 U.S. universities and more than 250 foreign universities and 425 precollege schools. They represented all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands and 96 foreign countries. ORAU demonstrated broad impact to the U.S. STEM workforce by supporting participants in research participation programs, science and technology policy programs and special complementary events (e.g., science competitions and teacher professional development workshops).  

Photo credit: Lynn Freeny/DOE

FY17 Participants by Category

<table>
<thead>
<tr>
<th>Academic Status</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Students</td>
<td>1,461</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>1,341</td>
</tr>
<tr>
<td>Recent Graduates</td>
<td>2,985</td>
</tr>
<tr>
<td>Postdoctoral Fellows</td>
<td>1,791</td>
</tr>
<tr>
<td>University Faculty</td>
<td>224</td>
</tr>
<tr>
<td>Other Scientists</td>
<td>378</td>
</tr>
<tr>
<td>K-12 Students</td>
<td>1,261</td>
</tr>
<tr>
<td>K-12 Teachers</td>
<td>640</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,041</strong></td>
</tr>
</tbody>
</table>

Photo credit: Lynn Freeny/DOE

Peter Meidl
University of Tennessee
Science Undergraduate Laboratory Internship

Derek Jung
University of Illinois at Urbana-Champaign
NSF Mathematical Sciences Graduate Internship

Through a new ORISE-administered program, the National Science Foundation (NSF) Mathematical Sciences Graduate Internship Program, 41 students participated in 10-week internships that provided firsthand experiences in the use of mathematics in a nonacademic setting. The opportunity allowed graduate students pursuing doctoral degrees in mathematics, statistics or applied mathematics to train under the mentorship of mathematicians and other scientists at host sites around the country, including U.S. national laboratories, industry and other approved facilities. Derek Jung, a doctoral student in mathematics at the University of Illinois at Urbana-Champaign, was appointed to the Nevada National Security Site’s Signal Processing and Applied Mathematics team in North Las Vegas. Jung integrated his background in mathematics with an industry environment for the first time, exploring mathematical solutions for deblurring images, which could assist national security needs.
Need for ORISE Research Participants in One FDA Program Has Grown to Agency-wide Support

Participants claim positive influence on their careers and research, some with global impact

The National Center for Toxicological Research (NCTR) became the first U.S. Food and Drug Administration (FDA) center supported by ORISE research participants in 1986. Since that time, NCTR has hosted more than 850 research program participants whose experiences at NCTR have made positive impacts on their professional careers. For example, Leihong Wu, a former NCTR postdoctoral participant and current scientist there said: “This experience at NCTR helped me attain my current position and has contributed greatly in furthering my career as a research scientist.” Honoring their research and other support for the FDA, the NCTR has erected a wall at its lab in Jefferson, Arkansas, inscribed with the names of ORISE research participants and others who have all contributed to the advancement of NCTR’s program and mission. While ORAU’s research participation program for FDA started at NCTR, that program paved the way for similar programs at other FDA centers and offices. In 2017, more than 1,250 participants were placed not only at NCTR but also at FDA’s Center for Biologics Evaluation and Research, Center for Drug Evaluation and Research, Center for Food Safety and Applied Nutrition, Center for Tobacco Products, Center for Veterinary Medicine, Office of International Programs, Office of Regulatory Affairs, Office of the Chief Scientist, Office of the Commissioner and Office of Women’s Health. Many past participants continue to make contributions to FDA’s mission, even after the completion of their appointments. For example, Maria Ida Iacono, Ph.D. (bioengineering, Polytechnic of Milan, Italy, and former postdoc at Harvard-MIT Massachusetts General Hospital), began her career at FDA as an ORISE postdoctoral appointment at CDRH, where she researched the complex interactions between electromagnetic fields, such as those produced by medical devices and the human body. During her appointment, she helped develop a high-resolution, three-dimensional model of the human head, known as the MIDA (multimodal imaging-based detailed anatomical model), which is used by researchers around the world to precisely map electric fields generated by implanted medical devices inside the head. Following her ORISE appointment, she remained at FDA where she now serves as a scientist and principal investigator and continues her work in biomedical engineering.

Fellowship Gives Teachers a Voice in Establishing STEM Education Initiatives

Outstanding K-12 educators participate in DOE STEM fellowship

The Albert Einstein Distinguished Educator Fellowship (AEF) Program provides a unique opportunity for accomplished K-12 educators in STEM fields to serve in the national education arena. The program is managed by the DOE Office of Science in collaboration with ORISE and other partnering agencies. Each AEF fellow spends 11 months in a federal agency or U.S. congressional office in Washington, D.C., engaged in education policy and/or program-related activities. The AEF Program allows K-12 STEM educators to apply their extensive classroom knowledge and experience to their host offices to inform federal STEM education efforts. Jennifer Lane, a teacher at Lake Riviera Middle School in Brick, New Jersey, completed her fellowship at the National Aeronautics and Space Administration Aeronautics Research Mission Directorate. Being an AEF fellow reignited her passion for education. “The AEF Program has reinvigorated me as an educator,” Lane said, “and I’m passionate about being able to provide valuable resources to educators going forward in the future because a lot of times we just don’t have time to do it when we’re in the classroom... teachers need time to look at research best practices and take time for themselves to improve their practice. I really hope future teachers have the opportunity to experience the Albert Einstein Distinguished Educator Fellowship.”

“...The AEF Program has reinvigorated me as an educator...”
10,000+ participants
in ORAU- and ORISE-administered workforce development programs in FY17

Where Are They Now?

Jeffrey Christians, Ph.D.
University of Notre Dame
Energy Efficiency and Renewable Energy Postdoctoral Fellow; National Renewable Energy Laboratory
Solar power systems research

Fadilah Ibrahim
Earlham College
Oak Ridge Science Semester Program, ORNL
Materials science research

Jimmy Zumba, Ph.D., MBA
THEN:
Louisiana State University student
Lehigh University student
Former participant in the U.S. Department of Agriculture (USDA) Agricultural Research Service Research Participation Program (ARS RPP)
Near-infrared spectroscopy research applied to cotton fiber and textiles

NOW:
Science and Technology Policy Fellow; U.S. Senate

IMPACT: “The program gave me the edge needed for this position with the Senate. I found it to be a positive, very productive, life-changing experience that allowed me to collaborate with well-known industry leaders across the country and within the USDA.”

Molly Kish
THEN:
West Virginia University student
Former participant in the National Energy Technology Laboratory (NETL) Professional Internship Program
Carbon sequestration research

NOW:
Exploration geoscientist for Shell Exploration and Production Co., researching deepwater depositional systems of rock sediment

IMPACT: “Working with NETL’s supercomputers to analyze big data was a once-in-a-lifetime opportunity. I went to the lab every day knowing that my research would contribute to reducing carbon in the atmosphere. This fulfilling environment created a sense of purpose for me.”

Iris Köhler, Ph.D.
THEN:
Technische Universität München student
Former participant in USDA ARS RPP
Climate and soybean cultivation research

NOW:
Graduate school coordinator, Helmholtz Centre for Environmental Research in Leipzig, Germany; researcher with SoyFACE, a University of Illinois experimental site exploring effects of global warming on genetically modified soybean crops

IMPACT: “Because of this program, I feel now that I’ve become a truly independent scientist and mature adult... willing to take on leadership positions and discuss science eye-to-eye with senior scientists.”

Jim Castelaz, Ph.D.
THEN:
Stanford University student
Former participant in the U.S. Department of Homeland Security (DHS) Scholarship and Fellowship Programs at the Remote Sensing Laboratory and Lawrence Livermore National Laboratory (LLNL)
Radiation-sensing, energy-generating technology research

NOW:
Founder and CEO of Motiv Power Systems, manufacturer and industry leader in electric truck power trains in the U.S.

IMPACT: “The DHS programs shifted my career into pursuit of energy solutions. I don’t know where I would have landed without this direction.”

Shayan Shahbazi
University of Tennessee, Knoxville
DHS Domestic Nuclear Detection Office Summer Internship Program, LLNL
Radiation detection research

Francesca Moloney
University of South Florida
Mickey Leland Energy Fellowship, NETL
Hybrid energy systems research

96.7% of ORAU program participants major in STEM

16

17
Majority of program alumni continue to work in energy-related research

ORISE manages three highly competitive research participation programs for NETL—Professional Internship Program, Postgraduate Research Program and Faculty Research Program. Students, recent graduates and faculty can participate in energy-related research at NETL, but the long-term impact of these programs on the energy industry was unknown until ORISE conducted a five-year longitudinal study in an effort to validate NETL’s workforce development investment in 2016. Participants who participated in NETL programs between 2009 and 2013 responded to a survey asking about key impacts during their participation and multiple aspects of their current employment. Further, survey results allowed a comparison of NETL-ORISE alumni to benchmark data gathered from the NSF Scientists and Engineers Statistical Data System. The study found that 8 out of 10 alumni currently hold positions related to energy research, indicating significant return on investment. Compared to a national sample, the respondents were more likely to remain in occupations relevant to NETL priorities than were the national sample (100 percent vs. 56 percent). Further, 49 percent of the respondents indicated support from federal agencies for their primary job as opposed to only 17 percent of the national sample. Specifically, 39 percent of respondents were supported by DOE versus only 1 percent of the national sample. The study’s results have value for both NETL and for ORISE, as it demonstrates that ORISE is administering NETL’s research participation programs effectively. NETL’s investment in these programs has resulted in a continuous flow of talent that has remained in the energy research sector. As a result of doing this study, future longitudinal studies will be conducted for other ORISE and ORAU customers.

ORAU hopes to eliminate a critical gap in existing literature about undergraduate research experiences by comparing federal laboratory experiences with those that are campus-based. Previous studies, including a 2017 report by the National Academies of Sciences, Engineering and Medicine, focused almost exclusively on campus-based experiences. ORAU collaborated with the University of Tennessee, Knoxville (UTK), in a pilot study that investigates the factors important to the selection of undergraduate students for research appointments at ORNL. A comparison group of students who participated in a campus-based research environment at UTK will be developed to contrast the two environments. Researchers are examining two key questions: What factors lead to a student’s successful selection for a research appointment in a laboratory setting? What paths are taken by students doing research in a laboratory setting versus those who are not? The first question will help improve recruitment by identifying the characteristics of successfully placed students; the second will demonstrate the impact laboratory-based research experiences have on whether students choose to attend graduate school, work in STEM fields and work in laboratory or campus settings. Results of the study are expected in 2018.

Leigh Ann Pennington, PMP
ORAU Economist
M.A., Vanderbilt University
Expertise: labor economics, econometrics, project management, data analytics
Invited, Data Users Workshop, hosted by the National Academies of Sciences in conjunction with the review of the NSF’s set of surveys used to measure the U.S. STEM workforce.
Participant, NSF Human Resources Expert Panel stakeholder meeting convened to recommend a longitudinal sample design for the NSF Survey of Doctorate Recipients.

Erin Burr, Ph.D.
ORAU Senior Evaluator and Assessment and Evaluation Section Manager
Ph.D., University of Tennessee
Expertise: STEM education workforce development and interdisciplinary program evaluation, evaluation use and influence, strategic needs assessment, applied experimental psychology
Facilitator, Laboratory Enterprise Forum Work Group on Business Case Development for Products and Services, U.S. Environmental Protection Agency, June and August 2017
Executive Leadership Team Member: STEM Education and Training Topical Interest Group and Use and Influence of Evaluation Topical Interest Group, American Evaluation Association, 2017
Presenter and panelist, AEA Annual Conference, November 2017
Evaluator, Multiple Workforce Studies and Evaluations—ORNL, NETL, DOE Office of Fossil Energy, EPA and University of Oklahoma, 2017

SHARING EXPERTISE
50 Years of Tracking Enrollments and Degrees Data in Health Physics

ORAU trend report may be the only one of its kind in the country

Because health physicists manage use of radiation and help minimize unnecessary exposures, placing the discipline in engineering or nuclear fields seems logical. However, there are several other academic departments where health physics can be found, including medical, environmental and chemistry, so tracking enrollments and degrees awarded can be challenging. ORAU has been collecting and monitoring this data for DOE and other federal agencies for 50 years in a report titled “Health Physics Enrollments and Degrees Survey Data 50-Year Trend Assessment, 1966–2015,” which was published in 2017. In 1966, 29 academic programs reported more than 125 total degrees awarded in health physics compared to approximately 150 degrees awarded by 22 academic programs in 2015. While these numbers are comparable, there has been significant volatility in the number of degrees awarded over 50 years. It reached its peak at 400 in 1975 before falling back to around 130 in 2001. The number of master’s degrees has outpaced undergraduate degrees in all but three of the years tracked; and doctoral degrees declined steadily from 1975 to their lowest point in 2011 before tripling in 2015. Health physics enrollments have also been volatile. They were relatively stable in the 1970s to 1980s before dropping below 1,000 in 1987. There were enrollment spikes in the early 1990s and again in 2007 before falling to approximately 400 students in 2015. While specific conclusions about the data are not made in the report, it remains the only known source of degrees data published by a nonacademic group regarding the discipline of health physics, and it provides a 50-year look at the trends for research and analysis.

SHARING EXPERTISE:

Donald L. Johnson, Ph.D.
ORAU Senior Economist, Workforce Studies
Ph.D., University of Tennessee

Expertise: economics of specialized labor markets, regional economic growth and development


Author, "Health Physics Enrollments and Degrees Survey, 2016 Data," Number 79, Oak Ridge Institute for Science and Education, June 2017

Author, "Nuclear Engineering Enrollments and Degrees Survey, 2016 Data," Number 78, Oak Ridge Institute for Science and Education, June 2017


In 1966, 29 academic programs reported more than 125 total degrees in health physics compared to approximately 150 health physics degrees reported by 22 academic programs in 2015. Today, health physics graduates work for federal, state and local government agencies, academic institutions, medical facilities, nuclear utilities, nuclear-related entities, the U.S. military and other businesses and industries.

Bachelor’s Degrees

<table>
<thead>
<tr>
<th>Year</th>
<th>Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>60–70 degrees were awarded annually in the early 2000s.</td>
</tr>
</tbody>
</table>

Master’s Degrees

<table>
<thead>
<tr>
<th>Year</th>
<th>Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>The number of degrees has declined steadily since 1975.</td>
</tr>
</tbody>
</table>

Doctoral Degrees

<table>
<thead>
<tr>
<th>Year</th>
<th>Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>18 degrees were awarded in 2015.</td>
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</table>

150 health physics degrees reported by 22 academic programs in 2015
Meredith Goins, ORAU group manager (pictured above), and one of her teams identify and recruit subject matter experts from around the world to serve as peer reviewers in a broad range of scientific and technical fields. Currently, ORAU’s peer review network includes more than 17,000 experts recruited from 34 countries. In 2017, DOE’s Office of Technology Transitions contracted with ORAU’s Research Services group for help in finding and recruiting experts for 13 research funding applications for which they were having significant difficulty finding reviewers. In about a week, ORAU had identified 34 potential experts from within and outside our network, 17 of whom agreed to participate as reviewers. The DOE customer was so impressed with the 50 percent “yes” response rate that she commented, “If finding ‘yes’ reviewers were an Olympic sport, you guys would be on a box of Wheaties right now!” The quick response from ORAU and the successful one-week recruitment campaign helped DOE’s Office of Technology Transitions stay on track with its peer review timeline. 

**ORAU-led peer review helped DOE-SC distribute $282M in research funding across six programs**

Providing long-standing peer review support via the ORISE contract, ORAU has helped DOE Office of Science (DOE-SC) determine funding awards for its Early Career Research Program and assisted them in awarding grants for advanced industry research for many decades. In FY17, ORAU provided objective peer review services, supporting more than $282 million in funding allocations for six specific DOE-SC program offices: the DOE-SC Early Career Research Program; DOE Innovative and Novel Computational Impact on Theory and Experiment (INCITE) Program; Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research; Fusion Energy Sciences; High Energy Physics and Nuclear Physics. Through peer review, DOE can have confidence in the research being proposed and ensure that its research funding decisions are made on scientific feasibility and verifiable technical merit.

<table>
<thead>
<tr>
<th>DOE Office of Science Program Offices</th>
<th>FY17 Research Funding Allocations</th>
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<tbody>
<tr>
<td>DOE-SC Early Career Research Program</td>
<td>$10M</td>
</tr>
<tr>
<td>Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research</td>
<td>$164M</td>
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<tr>
<td>Fusion Energy Sciences</td>
<td>$24M</td>
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<tr>
<td>High Energy Physics</td>
<td>$64M</td>
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<tr>
<td>Nuclear Physics</td>
<td>$10M</td>
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<tr>
<td>DOE Innovative and Novel Computational Impact on Theory and Experiment</td>
<td>$10M</td>
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<tr>
<td><strong>More Than $282M</strong> Funding Allocations Supported by Peer Review</td>
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</tr>
</tbody>
</table>

**SHARING EXPERTISE**

Tim Ledford
ORAU Group Manager, Scientific Assessment
MBA, Lincoln Memorial University
Expertise: project management, scientific peer review, gap analysis, risk assessment and mitigation, quality assurance

Project manager for peer review and other projects for the Office of Chemical Sciences, Genomics and Biosciences Division, and Defense Programs of the National Nuclear Security Administration and other programs in DOE-SC

Task lead, 50+ peer review and other projects for DOE, the U.S. Department of Homeland Security and other federal agencies
Peer review helped Florida public health officials evaluate research proposals to combat Zika virus effects

Spread through infected mosquitoes, the Zika virus causes mild or nonexistent symptoms in humans and can cause severe fetal defects in pregnant women if contracted. According to Centers for Disease Control and Prevention provisional data, 311 Zika cases were reported in the U.S. in 2017, including 217 cases in Florida's Miami-Dade County. As cases of Zika were reported, health departments in Florida sampled community members within a 150-meter radius of confirmed cases, creating the first systematic assessment of asymptomatic Zika virus cases ever performed. Following this assessment, the Florida Department of Health asked ORAU to develop a peer review process to evaluate and recommend funding for additional Zika-related research projects. ORAU responded by providing the Department of Health with an efficient, virtual peer review process that included a system to accept proposals and an administrative review of proposals by international subject matter experts. In three months, half the time a typical peer review is routinely executed, ORAU evaluated 81 research proposals, from which seven grants were awarded on topics such as support for a Zika vaccine, innovative diagnostic testing and therapeutics, and treatment options for children and adults. ORAU will continue to work with the Florida Department of Health over the next three years as annual progress on the projects is evaluated.

SHARING EXPERTISE

Jody Crisp
ORAU Group Manager, Peer Review
B.S., Tennessee Wesleyan College
Expertise: project management, performance measurement, budgeting, contingency planning, sponsorship development, conflicts of interest resolution, quality assurance
Peer review project manager for more than 500 DOE Office of Science peer review projects since 2002
Community volunteer, Court Appointed Special Advocates (CASA) for Children, Anderson County, Tennessee

With international workshop logistics managed by ORISE, 275 global experts from 21 countries were able to focus on strategies to advance carbon capture technologies, research, and collaborative partnerships as part of an initiative co-led by the U.S. and Saudi Arabia.

Carbon Capture Workshop Resulted in Potential Research and Technology Solutions for Near-Zero Emissions

ORISE managed scientific meeting logistics so 275 international experts could focus on the science

For more than 30 years, approximately 78 percent of all greenhouse gas emissions have been a direct result of fossil fuel combustion and industry practices, according to the U.S. Environmental Protection Agency. The Mission Innovation Carbon Capture Challenge, co-led by the U.S. and Saudi Arabia with members representing 21 countries, strives to positively impact that number by advancing carbon capture, utilization and storage (CCUS) technology development while also promoting research opportunities and strengthening collaboration between strategic partners. ORISE supported the Carbon Capture Challenge by assisting partners from the U.S. and Saudi Arabia with the logistical needs required to host the CCUS Experts’ Workshop, including event planning and logistics, contract negotiation and on-site support. During the workshop, 275 global experts from academic and industry backgrounds convened for four days to discuss breakthrough technologies and research directions to ensure future CCUS technology development. The main topics of the CCUS Experts’ Workshop included the capture approaches of carbon dioxide, the storage and monitoring of carbon dioxide and its environmental impacts, and future utilization of carbon dioxide. The results from the workshop will be published for governments and private industries to use as a key resource and to maintain the Mission Innovation Carbon Capture Challenge objective of enabling near-zero carbon dioxide emissions from power plants and carbon intensive industries.

24
25
Health and Environment
Protect worker and public health and instill confidence in environmental cleanup

Worker Health Assessments and Data Management
Safety Culture Evaluations
Public Health Preparedness, Response and Communication
Environmental Assessments and Health Physics

Ann Gehl (pictured above), lab manager for the ORISE Beryllium Testing Laboratory, and her team have upgraded equipment and processes this year to better serve DOE’s workforce and other workers. The lab has long been a DOE asset for worker health, specifically offering the beryllium lymphocyte proliferation test (BeLPT) to workers who may have beryllium sensitivity or chronic beryllium disease as a result of their occupational exposure. In 2017, the addition of new equipment to the lab has led to increased capacity to meet rising demand and process more tests in a timely manner. With the acquisition of an additional centrifuge, incubators, cell counter, harvester and a new liquid handling system, medical technologists have gained efficiencies. As an example, the liquid handling system fills the plate wells with cell media and test reagents automatically, thus reducing the amount of manual pipetting necessary. These equipment enhancements totaling approximately $240,000 were made possible by an ORAU corporate investment. The lab is certified by the College of American Pathologists and Clinical Laboratory Improvement Amendments and is one of only three laboratories in the U.S. approved to conduct this complex blood test.

NIOSH Radiation Dose Reconstruction Program:
15 Years of Assessing Radiation Exposures for Energy Workers

Thousands of claims successfully processed for workers’ compensation

In the 15 years since its inception, the National Institute of Occupational Safety and Health (NIOSH) Radiation Dose Reconstruction Program has become one of the most important workers’ compensation programs in the U.S. NIOSH tasks the ORAU team—including NV5/Dade Moeller and MJW Technical Services, Inc.—to reconstruct radiation doses for current and former workers of DOE and atomic weapons employers. Based

Continued on next page

LEADING THE WAY
Donna Cragle, Ph.D.
ORAU Senior Vice President and Program Director, Health, Energy and Environment
Ph.D., University of North Carolina at Chapel Hill
Expertise: occupational epidemiology, design and implementation of large-scale worker health studies; manages a program of more than 200 experts and professionals
Adjunct faculty, University of Tennessee
Lead epidemiologist/founder of BeLPT testing at ORAU, 1992; director of the ORISE Beryllium Lab
Management advisor, ORAU team providing dose reconstructions to NIOSH for the Energy Employees Occupational Illness Compensation Program Act
Director, National Supplemental Screening Program providing medical screening to former DOE workers nationwide
Lead epidemiologist, medical screening program for residents affected by TVA Kingston Fossil Plant coal fly ash spill

6.7 million entries performed in searchable database from documents containing energy employee-specific information

165,000 documents relevant to DOE facilities assembled and indexed into searchable and retrievable database

164,000 interviews conducted with energy employees or their survivors throughout all stages of dose reconstruction process

121,000 documents matched and linked with energy employees’ identifying information to their respective claims

42,000 preliminary radiation dose assessments completed and submitted

14,000 dose assessment revisions made based on additional claim information

9,800 reviews of previous claims completed based on new data found for energy employees, new site information or newer technical methods for assessment

870 technical documents published that reconstruct operational history of nation’s nuclear weapon complex
Worker Health and Safety

on mathematical models, the dose reconstructions are scientifically sound and provide critical information used by the U.S. Department of Labor (DOL) in adjudicating claims filed under the Energy Employees Occupational Illness Compensation Program Act. The DOL-funded program helps ensure that energy workers—or surviving family members—who developed cancers from occupational radiation exposures are rightfully compensated for their illnesses. Health physicists, records specialists and other scientists from the ORAU team have interviewed thousands of claimants, researched records and historical documents, and generated searchable databases to reconstruct the dose history to provide more than 42,000 preliminary radiation dose assessments. In addition, the ORAU Team evaluates Special Exposure Cohort (SEC) petitions received by NIOSH. SEC status may automatically grant compensation to employees who have any of 22 types of cancer and who worked at specific sites. If they meet the requirements, these claimants would not have to go through the dose reconstruction process to be compensated. Nearly 240 SEC petitions have been received with 145 petitions qualifying for evaluation. Of those that qualified for evaluation, more than 120 specified groups or classes have been added to the SEC.

Influential National Workshop Focused on Radiation Protection Needs

Congressional contacts briefed on outcomes, HPS task force chartered to address needs

For those who work with radiation in their jobs, perform research to better understand it, or are exposed to it when rendering aid to others, radiation protection is paramount to their health and safety. In June 2017, an influential Radiation Protection Research Needs Workshop identified strategic research needs and brought them to the attention of people with resources for research. Eighty-four representatives from 43 institutions and government programs across the country discussed research topics that would significantly advance radiation protection. The representatives also recognized gaps between needs and established practices and knowledge. The workshop was hosted by ORAU, ORNL’s Center for Radiation Protection Knowledge, and the Health Physics Society (HPS). Research themes centered on radiation protection issues, detection challenges and the health impacts of low-dose radiation exposure. A strategic research summary report detailing unaddressed research needs was presented to congressional contacts and appropriators. An HPS Research Needs Task Force was also chartered to continue the efforts initiated at the workshop and to provide recommendations for further activities.

LEADING THE WAY

Eric W. Abelquist, Ph.D., CHP
ORAU Executive Vice President and Chief Research Officer
Ph.D., University of Tennessee
Expertise: performance of radiological surveys, entrepreneurial initiatives for business development, advancement of scientific research and education opportunities
President, Health Physics Society, 2017–2018
Co-chair, Radiation Protection Research Needs Workshop, June 2017
Presenter, China Society of Radiation Protection, Shanghai, China, 2017
Co-author, “Multi-Agency Radiation Survey and Site Investigation Manual” (MARSSIM)
Developer, MARSSIM training course
Co-founder, Decommissioning Section of HPS

Emergency first responders and other workers use personal protective equipment and other radiation protection measures to guard against exposures on the job. ORAU’s Radiation Protection Research Needs Workshop explored improving the radiological protection of workers, the public and the environment from radiation exposures; improving the monitoring, detection and assessment of radioactivity in the environment; and better understanding the biological effects of exposure to low-dose radiation effects.
Nuclear Workers Surveyed on Safety Cultures in Their Workplaces

ORAU helped nuclear industry leaders understand and implement safety culture best practices based on survey findings

Efforts to monitor and continuously improve safety culture have led nuclear industry leaders to task ORAU with performing periodic, comprehensive safety culture evaluations of their workforces and practices. By using written surveys and electronic surveys, focus groups and one-on-one interviews, ORAU gained input from 25,000 workers over six years, which resulted in valuable feedback on the effectiveness of safety programs and initiatives. Workers desire an environment where they are respected for their expertise, acknowledged for their contributions and informed about the reasons behind decisions. For each customer, ORAU follows up with recommendations to help managers and supervisors influence the perceptions, attitudes, behaviors and performance of the workforce. The most common areas of concern center on leadership behavior and communication. Subsequent improvement actions reinforce strong management systems, decision making and leadership behavior; personal accountability for safety; and communication and reporting of safety concerns. By following recommendations and taking effective safety culture actions, leaders are able to make data-driven decisions that help them stay on the leading edge of safety management of high-hazard work.

Investigating Potential Reasons for Uninterpretable BeLPT Results

When workers must have a clinical BeLPT to identify possible beryllium sensitization or chronic beryllium disease, sometimes uninterpretable findings result. ORAU manages one of only three laboratories in the country providing the test, and in 2017, ORAU researchers Drs. Ashley Golden, Donna Crangle and Bill Stange investigated potential associations of these uninterpretable results with patient demographic characteristics and health data from clinical exams that are provided through the National Supplemental Screening Program, a DOE Former Workers Program managed by ORAU. The study found that individual health conditions have little impact on the likelihood of uninterpretable results, but that test factors, such as the serum used, contributed the most variation in test results. The potential impacts of these findings for DOE include less anxiety for workers receiving uninterpretable results because more detailed explanations can be provided; improved time and financial resource expenditures for the occupational health program and testing laboratories by identifying test conditions that could lead to uninterpretable results, which require additional testing; and a potential increase in test efficacy by informing laboratory protocols to help reduce the number of interpretable results. Further, the research is timely in advancing testing procedures and interpretation as new proposed beryllium rule-making expected from the Occupational Safety and Health Administration could increase the number of workers requiring testing. This research, completed in collaboration with Dr. Lee Newman at the University of Colorado, Denver, as a thesis for a master’s level graduate student Derek Smith, resulted in a manuscript being accepted for publication in the American Journal of Industrial Medicine. The article, which is expected to be published in spring/summer of 2018, includes Golden, Crangle, and Stange as authors.

Validating Optimal Statistical Approach for Assessing Worker Health Risks from Titanium Dioxide Exposures

Through an epidemiological research project, ORAU Biostatistician Ashley Golden, Ph.D., and ORAU Epidemiologist Betsy Ellis, Ph.D., collaborated with Hien Le, Ph.D., lead epidemiologist of Chemours Co., to evaluate whether different statistical methods produce similar results. The study focused on the possible harmful effects of occupational exposure to titanium dioxide (TiO₂), a white pigment widely used in consumer products, such as sunscreen, cosmetics, paint and plastics. Exposure through inhalation during manufacturing led the International Association for Research on Cancer to classify TiO₂ as “possibly carcinogenic to humans” based on sufficient experimental animal evidence. The researchers examined a cohort of 3,607 U.S. workers, followed 1935–2006, to investigate the relationship between TiO₂ exposure and death from lung cancer, nonmalignant respiratory disease and heart disease using Cox Proportional Hazards modeling and Poisson regression. They concluded there was no statistically increased risk of death, and the two statistical models had equivalent results, but the Cox Proportional Hazards had greater precision. These findings validate previously published studies in the scientific literature and provide support for precise and reliable statistical methodology in future studies.
ORAU partners with ARC to promote opioid abuse awareness with better communication

The highest opioid prescription rates in the U.S. are located in the Appalachian region, according to the Centers for Disease Control and Prevention (CDC). An Appalachian Regional Commission (ARC) report states that, in 2015, the overdose mortality rate among individuals ages 15 to 64 was 65 percent higher in the Appalachian region compared to the rest of the nation. In response, ORAU joined with ARC to address opioid abuse and overdose in this region with funding provided by the CDC Injury Center. Since 2016, ORAU has traveled to six Appalachian states training anti-drug coalitions, local health departments and law enforcement agencies through an Opioid Prevention Social Media Training and Technical Assistance Program. The program trains local organizations to more effectively use social media to communicate with the public about opioid misuse and abuse. Additionally, ORAU completed research exploring communication needs related to prescription opioids and produced a comprehensive report titled “Communicating about Opioids in Appalachia: Best Practices, Challenges, and Opportunities.” ORAU has presented these research findings at two national conferences and to the Tennessee Department of Health, and the report has garnered much media attention. To further improve prevention efforts, ORAU formed the Adverse Childhood Experiences in Appalachia working group and led this group of experts in exploring factors that contribute to the opioid crisis in Appalachia, including the relationship between childhood trauma and opioid use.

ORAU helps federal agencies such as the CDC and ARC support communities with health preparedness and outreach programs, such as emergency response training for local community health departments or communication campaigns and strategies for opioid abuse awareness in Appalachia.

Training Local Communities to Respond to Public Health Threats

ORAU supports CDC’s Public Health Emergency Preparedness Program with more than 70 communication tools and products

The 9/11 terrorist attacks and subsequent anthrax events uncovered weaknesses in our nation’s public health emergency preparedness and response infrastructure. As a result, Congress appropriated funding to CDC to expand its support of state and local public health preparedness nationwide, which led to the creation of CDC’s Public Health Emergency Preparedness (PHEP) Program. Since 2002, CDC has administered more than $11 billion through the PHEP Program to state, territorial and local communities.

Continued on page 34
Developed more than 70 tools and products to aid public health preparedness.

Public health departments. This funding, as well as the guidance, technical assistance and training provided through the PHEP Program, strengthens their ability to respond to and recover from public health threats, such as emerging infectious diseases, natural disasters and chemical events. Over the past 15 years, ORAU has worked with CDC to conduct more than 30 community workshops and stakeholder meetings and develop more than 70 tools and communication products that enhance public health as well as health care preparedness, delivery and response during a public health emergency. The most recent tool ORAU has developed is the Online Technical Resource and Assistance Center, or On-TRAC, which provides health departments participating in the PHEP Program with a centralized source of information for emergency preparedness documents, guidance and tools as well as a way to support peer-to-peer collaboration. Owing to success in supporting CDC’s PHEP Program, ORAU was awarded additional contracts in 2017 to support CDC emergency response, public health, health care preparedness and communication efforts. As part of this work, ORAU continues to develop preparedness resources, communication products and multimedia platforms for CDC’s PHEP Program.

Improving Adult Vaccine Communication, Education with Virtual Reality

The spread of seasonal influenza strains, pneumonia and other common diseases can be prevented, yet vaccination rates remain low in the United States. According to CDC estimates, flu costs the U.S. about $87 billion annually in health costs and productivity losses. In the wake of a public health emergency, local and national health authorities need to be able to effectively communicate with the public and persuade people to get vaccinated. For this reason, ORAU and the University of Georgia (UGA) partnered in 2017 to study the use of virtual reality and eye-tracking technologies to improve adult vaccine communication and education. First, virtual reality technology is being used to create and deliver a three-dimensional, vivid, vaccine education-related user experience. ORAU and UGA are also using eye-tracking technology to measure participants’ visual attention to vaccination education materials. With eye-tracking technology, researchers can evaluate the type of content a person chooses to look at and which content the subject views the longest. The study began in summer 2017 and will continue into 2018. It will help determine how to strengthen vaccine-related health communication through material content, design and public presentations.

In 2017, ORAU surveyed more than 3.9 million square feet of structures on behalf of DOE and the Nuclear Regulatory Commission (NRC) following cleanup activities.
Online Course Offerings in Health Physics Expanded

ORAU's Professional Training Programs converted another course for the NRC—Introduction to Health Physics—to an online training format in its continuing effort to make trainings more convenient and cost efficient. This course was originally delivered as a three-day, instructor-led course requiring travel to NRC's Technical Training Center. Since 2015, ORAU has transitioned courses, such as the Fundamental Health Physics course, from an all-classroom and laboratory training to a blended learning experience involving online materials combined with hands-on laboratory exercises. Students access the course materials online anytime and learn at their own pace. Once completed, students convene in Chantanooga, Tennessee, at the training center for the hands-on laboratory exercises. While class size is kept small in order to provide the greatest attention to individual learning needs, to date, more than 50 students have already taken advantage of the online courses. ORAU's Professional Training Programs are currently transitioning three additional courses: Internal Dosimetry, Multi-Agency Radiation Survey and Site Investigation Manual (MARSIM), and Multi-Agency Radiation Survey and Assessment of Materials and Equipment (MARSAME). These courses have 2018 delivery dates.

Independent verification of cleanup activities, sampling and surveying resulted in highly productive support efforts

Through ORISE, ORAU health physicists supported DOE and NRC in 2017 with broad-scope environmental work at 34 sites, including 24 NRC sites with more than 50 property owners, to perform independent verification of cleanup activities. Working in areas with radioactive contamination, in abandoned, dilapidated buildings, and in dense vegetation, they collected 357 intrusive samples and surveyed more than 1,005 acres of land and more than 3,900,000 square feet of structures. The survey team utilized a wide range of radiation detection instrumentation from standard field detectors, custom-designed pipe detectors and specialized instruments such as the In Situ Object Counting Systems. A challenging nondestructive assay (NDA) project at DOE's Portsmouth Gaseous Diffusion Plant required the use of the Holdup Measurement System 4 (HMS4), a sophisticated detector and software system designed to determine the presence of uranium holdup inside piping and equipment without intrusive sampling. The defensibility of the characterization data was essential for ensuring compliance with safeguards requirements and minimizing radioactive waste volumes. Most importantly, ORAU's NDA measurements verified that the piping could be safely removed, which ultimately protects the health and safety of workers and the public. In 2017, 1,912 NDA verification measurements were collected at the Portsmouth site.

Radium Contamination from Clock Making and Other Manufacturing Is Focus of Survey Work for NRC

More than 40 sites being surveyed for cleanup of radium contamination

Radium, particularly luminous radium paint, was used for decades in the manufacture of many items such as clocks. As its harmful effects on workers became known, production sites shut down, often leaving behind radium contamination. Since 2016, ORAU survey teams have provided technical assistance to the NRC Radium Program by determining the radiological status of more than 40 sites. Surveyors perform radiation scans and collect soil, dust, water and radon sampling at the decommissioned sites. These samples are analyzed by a radioanalytical laboratory, and radium concentration results are used by ORAU health physicists to perform dose assessments. Survey, sample, and dose assessment results are included in reports that present recommendations for future actions. ORAU also researches potential new radium sites by combing through publicly available records dating back to the early 1900s when radium first became commercially available. The expertise and meticulous work of the ORAU survey teams help ensure that public health remains a top concern as NRC determines which sites will require cleanup. In 2017, ORAU won a five-year contract to further support the NRC Radium Program.
Preparedness and Response

Train, exercise and deploy for radiation emergencies, national security and natural disaster response

On a dock near the USS Hornet at the Port of Oakland in California, numerous interagency partners, including the FBI, U.S. Coast Guard, Oakland police and local fire departments, and the U.S. Department of Homeland Security (DHS) held exercise “Operation Seasick” in June 2017. The exercise focused on training and evidence recovery in the event of a terrorist attack using complex weapons of mass destruction. ORAU operations planners led the six-month planning effort in developing the exercise scenario, facilitating interagency meetings, conducting a tabletop exercise with some of the major players in the spring, coordinating logistics and conducting the evaluation of FBI activities for the actual full-scale exercise.

Photo credit: Kristopher Skinner/Bay Area News Group

Global Emergency Response Tested in Largest-ever Simulated Nuclear Accident

REAC/TS contributed radiation emergency medicine expertise, 82 countries participated

For 36 hours over two days in June 2017, the International Atomic Energy Agency (IAEA) held its largest-ever exercise to simulate a severe radiological accident at Paks Nuclear Power Plant in Hungary. A Chernobyl-scale nuclear accident affecting millions of people drives significant and continuous worldwide improvements in radiation safety standards and emergency response procedures and is the reason that the IAEA conducts large-scale, international exercises like this. Hundreds participated from 82 different countries and more than 11 international organizations, including the Radiation Emergency Assistance Center/Training Site (REAC/TS). REAC/TS assembled a home team (consisting of a physician, health physicists, a nurse and information coordinator) that contributed emergency medicine expertise as a collaborating member of the World Health Organization’s Radiation Emergency Medical Preparedness and Assistance Network for the U.S. At the same time, other REAC/TS staff had been deployed to Israel, providing a medical management of radiation injuries course to health care providers in Tel Aviv. The REAC/TS deployed and home teams corresponded, along with other participants, to respond to requests for assistance from agencies around the world in this exercise. The result was a successful test of enhanced cooperation among all agencies and organizations and access to multiple layers of international assistance. The exercise also generated lessons learned and a report of recommendations to further strengthen national and international preparedness for radiological emergencies of all kinds.

LEADING THE WAY

Nicholas Dainiak, M.D., FACP
Medical and Technical Director, REAC/TS
M.D., Loyola University, Stritch School of Medicine
Fellow, American College of Physicians
Expertise: medical management of radiation injuries, radiation biodosimetry for whole-body dose assessment
Invited Presenter, American Academy of Health Physics Special Session, 62nd Annual Health Physics Society Meeting, July 2017
Speaker and session chair, 15th Annual Coordinating Meeting of World Health Organization Radiation Emergency Medical Preparedness and Assistance Network, Geneva, Switzerland, July 2017
Presenter, International Symposium of the program of the Joint Usage/Research Center for Radiation Disaster Medical Science, Hiroshima, Japan, February 2017
Session chair and presenter, Con-Rad Global Conference on Radiation Topics, Munich, Germany, May 2017
See additional select publications and leadership contributions on p. 58 and p. 60.
Hurricane Response Aided by ORAU Software System

In the aftermath of three major hurricanes—Harvey, Irma and Maria—veteran patients needed dependable access to health care services. With widespread power outages and many essential services down, the Veterans Health Administration (VHA) had to quickly assess which U.S. Department of Veterans Affairs (VA) medical centers were operational and what the most critical needs were for their patients. The VHA Office of Emergency Management uses VHA PIMS—Performance Improvement Management System, developed by ORAU—to assess and mobilize needed support to storm-stricken areas. VHA PIMS tracks information such as available volunteers and emergency resources for each VA medical center, thus helping VHA emergency managers to respond quickly to staffing and supply needs at hardest hit locations. The system also serves as a tool for volunteer registrations, so that more than 8,000 volunteers could make themselves available to be deployed to areas where shelters and mobile medical units were needed to augment VA medical centers services. In Puerto Rico, for example, the San Juan VA Medical Center was able to operate on generator power with enough staff, fuel, water and supplies to provide health care for 338 veteran patients immediately following Hurricane Maria.

Impact of Rapid DNA Technology

Whether shootings, hurricanes or terrorist acts, mass fatality incidents require law enforcement, hospitals and emergency responders to stay prepared through training and exercises and have the latest technology at their fingertips. In May 2017, ORAU supported DHS in designing, executing and evaluating two mass fatality exercises in Dayton, Ohio, and Miami, Fla. ORAU employed its proprietary Evaluation, Lessons Learned, and Corrective Action System (ELLCAS) to develop the exercise evaluation guide, collect data on the effectiveness of using Rapid DNA technology as part of temporary morgue operations, and conduct after-action analysis and reports of the exercise effectiveness within days of each event. DHS is using the findings identified through ELLCAS to develop plans and procedures for improved integration of Rapid DNA technology. This will allow near-real-time victim identification as opposed to using conventional laboratory methods that can take weeks during mass casualty response.

Mass Fatality Victim Identification Proven Faster with Rapid DNA Technology

ORAU proprietary system ELLCAS aided evaluation of effectiveness

Mass fatality incidents require law enforcement, hospitals and emergency responders to stay prepared through training and exercises and have the latest technology at their fingertips. In May 2017, ORAU supported DHS in designing, executing and evaluating two mass fatality exercises in Dayton, Ohio, and Miami, Fla. ORAU employed its proprietary Evaluation, Lessons Learned, and Corrective Action System (ELLCAS) to develop the exercise evaluation guide, collect data on the effectiveness of using Rapid DNA technology as part of temporary morgue operations, and conduct after-action analysis and reports of the exercise effectiveness within days of each event. DHS is using the findings identified through ELLCAS to develop plans and procedures for improved integration of Rapid DNA technology. This will allow near-real-time victim identification as opposed to using conventional laboratory methods that can take weeks during mass casualty responses.
Preparedness and Response

**RESEARCH BRIEF**

**Discovery of a Potential New Biomarker for Acute Radiation Dose Assessment: Pseudo Pelger-Huet Anomaly**

The Pseudo Pelger-Huet Anomaly (PPHA), an acquired abnormality in blood cells, has historically been associated with different types of leukemia or pathologic states resulting from exposure to certain infections or drugs. In recent research being conducted by REAC/TS however, PPHA has also been discovered to be a potential new biodosimeter in the measurement of radiation dose received in certain acute exposure events. The research team, led by REAC/TS Drs. Nicholas Dainiak and Carol Iddins in collaboration with Dr. Ronald Goans (MJW contractor to REAC/TS), worked with archival blood samples from patients in the 1958 Y-12 criticality accident as well as other samples from historically documented acute dose cases. The samples were used to determine the presence of PPHA as a potential new radiation-induced biomarker. Cytogenetic Biodosimetry Laboratory (CBL) Director Adayabalam Balajee, Ph.D., and the REAC/TS CBL team are pursuing more research based on this discovery. Because their research shows that this PPHA biomarker appears to be present in the blood early postaccident (<9 hours) and stable at least up to 16 years postaccident, this discovery provides significantly enhanced biodosimetry capability in diagnosing acute radiation dose in patients. Findings from this research were published in the March 2017 edition of *Health Physics.*

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**LEADING THE WAY**

**Adayabalam Balajee, Ph.D.**

Technical Director, Cytogenetic Biodosimetry Laboratory

Ph.D., Banaras Hindu University, Varanasi, India

Expertise: DNA repair and mutagenesis, molecular cytogenetics and molecular mechanisms of carcinogenesis

Principal investigator, international inter-laboratory comparison study on dicentric chromosome scoring initiated by Radiating the European Network of Biodosimetry

Principal investigator, collaborative research grant with Dr. Huang Yong of the University of Florida to examine the effects of low dose and dose rate radiation on human tissue bioprints

Principal investigator, collaborative National Institute of Allergy and Infectious Disease research grant with Columbia University Medical Center to develop automation of dicentric chromosome assay in commercially available robotic platforms

See additional select publications and leadership contributions on p. 58 and p. 60.

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**RESEARCH BRIEF**

**Understanding the Origins of Cancer: Spatial Reorganization of Three-Dimensional Genome After Radiation Exposure**

When cells are exposed to ionizing radiation (IR), chromosomal breakages can occur within the cell nucleus, and these broken segments can translocate or reattach to other chromosomes nearby. Each chromosome occupies a discrete region in the nucleus known as a domain, and when these translocations occur, it reorganizes the genome. Because these translocations cause chromosomal abnormalities or mutations, they are known to initiate the process of disease and more specifically, cancer. If scientists could get a look inside a live, three-dimensional cell nucleus containing the organized human genome while exposing it to IR, they might be able to understand why certain chromosomal segments reattach to neighboring chromosomes within different domains and what impact this reorganization has on chromosomal mutations. This understanding could greatly impact research in cancer genomics and lead to breakthroughs in mitigating the underlying mechanisms of many human diseases, including cancer. Adayabalam Balajee, Ph.D., director of the CBL, is partnering with Rachel McCord, Ph.D., assistant professor in biochemistry, cellular and molecular biology at the University of Tennessee, Knoxville, to study these reorganizations of the genome after radiation exposure. Their research combines both fixed and live cell imaging with an innovative capture technique, which will show large-scale changes in chromosome organization. This imaging will uncover salient patterns of genome reorganization in the population of irradiated cells at a more detailed level. Findings from the team’s research will be published in *Health Physics* in 2018.

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**LEADING THE WAY**

**Carol J. Iddins, M.D.**

Associate Director, REAC/TS

M.D., University of Tennessee, Health Science Center, College of Medicine

Expertise: medical management radiation injuries and illnesses, disaster medicine, occupational medicine, operational medicine


Faculty, Agents of Opportunity for Terrorism in collaboration with the Centers for Disease Control and Prevention and American College of Medical Toxicologists, January 2017

National Institutes of Health, August 2017

Presenter, Radiation Injury Treatment Network: Emergency Management of Radiation Accident Victims, March 2017

Presenter, American Academy of Physician Specialists Annual Scientific Meeting, July 2017

Member, International Health Regulations Joint External Evaluation Working Group

See additional select leadership contributions on pp. 58–59.

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**LEADING THE WAY**

**Adayabalam Balajee, Ph.D.**

Laboratory (CBL) Director

Principal researcher, international inter-laboratory comparison study on dicentric chromosome scoring initiated by Radiating the European Network of Biodosimetry

Principal investigator, collaborative research grant with Dr. Huang Yong of the University of Florida to examine the effects of low dose and dose rate radiation on human tissue bioprints

Principal investigator, collaborative National Institute of Allergy and Infectious Disease research grant with Columbia University Medical Center to develop automation of dicentric chromosome assay in commercially available robotic platforms

See additional select publications and leadership contributions on p. 58 and p. 80.

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**RESEARCH BRIEF**

**Understanding the Origins of Cancer: Spatial Reorganization of Three-Dimensional Genome After Radiation Exposure**

When cells are exposed to ionizing radiation (IR), chromosomal breakages can occur within the cell nucleus, and these broken segments can translocate or reattach to other chromosomes nearby. Each chromosome occupies a discrete region in the nucleus known as a domain, and when these translocations occur, it reorganizes the genome. Because these translocations cause chromosomal abnormalities or mutations, they are known to initiate the process of disease and more specifically, cancer. If scientists could get a look inside a live, three-dimensional cell nucleus containing the organized human genome while exposing it to IR, they might be able to understand why certain chromosomal segments reattach to neighboring chromosomes within different domains and what impact this reorganization has on chromosomal mutations. This understanding could greatly impact research in cancer genomics and lead to breakthroughs in mitigating the underlying mechanisms of many human diseases, including cancer. Adayabalam Balajee, Ph.D., director of the CBL, is partnering with Rachel McCord, Ph.D., assistant professor in biochemistry, cellular and molecular biology at the University of Tennessee, Knoxville, to study these reorganizations of the genome after radiation exposure. Their research combines both fixed and live cell imaging with an innovative capture technique, which will show large-scale changes in chromosome organization. This imaging will uncover salient patterns of genome reorganization in the population of irradiated cells at a more detailed level. Findings from the team’s research will be published in *Health Physics* in 2018.
University Partnerships
Support and advance science in collaboration with consortium member universities

Corey Thompson, Ph.D.
Purdue University
2017 POWE Award Winner

ORAU’s Ralph E. Powe Junior Faculty Enhancement Awards propel research and spark professional growth for junior faculty at ORAU member institutions. In 2017, competitive Powe research grants totaling $185,000 were awarded to 37 junior faculty members. Corey M. Thompson, Ph.D., assistant professor of inorganic chemistry at Purdue University’s College of Chemistry and a 2017 Powe Award winner, is using the grant to develop new solid state materials for magnetic refrigeration. Magnetic refrigeration has economic benefits over commercially available gas-compression refrigerators, and it is environmentally friendly. ORAU has awarded 662 grants and more than $3.3 million since the inception of the Powe Awards 27 years ago. With the inclusion of matching funds from member institutions, ORAU has facilitated grants worth more than $6.6 million through the program.

Photo credit: Steve Scherer, Purdue University

Compliance Complexity in Higher Ed Discussed at ORAU Annual Meeting

Regulatory reform would strengthen research enterprise

Higher education institutions spend significant time and money to comply with growing federal regulations. This reduces the return on investment for funding as researchers spend more time focused on administrative matters. Regulatory reform is under way, though, according to Larry Faulkner, chair, National Academy of Sciences Committee on Federal Research Regulations and Reporting Requirements, and keynote speaker at the 72nd annual meeting of the ORAU Council of Sponsoring Institutions. Institutions and researchers receive funding from multiple federal agencies, each handling their processes differently. Grant proposals, conflict of interest disclosures and other requirements often overlap, leading to duplicated efforts. Efficiencies in the regulatory system would ease this burden for research institutions. At the same time, Faulkner stressed that research institutions must demand the highest standards of behavior, which can only be achieved if universities foster a culture of integrity among faculty, students, staff and administrators.

RESEARCH BRIEF
Detecting Fraud Informatics: Research to Combat Misinformation on Science, Health Topics

ORAU and Penn State University collaborated on timely research in 2017 to detect fraud informatics with the goal of creating curriculum to combat contradicting news on science and health topics. The team used machine-learning methods and theoretical analyses to review a large database of articles and characterize what distinguishes stories that are likely to contain misinformation. They developed a culturally sensitive curriculum and evaluation of university students’ understanding of fraud informatics across news delivery platforms such as social media. Training materials for English and non-English language news outlets are being developed using online predictive modeling tools and ORAU’s network of geographically, ethnically and culturally diverse member universities. The curriculum focuses on how fraudulent stories are created, psychological aspects of falling for fraudulent informatics, and methods of effecting change via social media by using tools that predict fraudulent informatics or verify legitimacy. The team will make the models, tools and training materials publicly available for use in research, in classes and online.

LEADING THE WAY
Arlene A. Garrison, Ph.D.
ORAU Vice President, University Partnerships
Ph.D., University of Tennessee
Expertise: Online process analysis, vibrational spectroscopy methods, technology transfer, STEM diversity and inclusion
Fellow, American Chemical Society
Board member, National Academy of Inventors, 2014–2017
Board member, American Chemical Society Insurance Trust, 2009–2017
Chair-elect, Business Management and Development Division of the American Chemical Society, 2017
Presenter, American Chemical Society Southeast Regional Meeting, November 2017

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STEM Education and Community Initiatives

Through sharing their personal passion for helping others and participating in company-sponsored community initiatives, ORAU employees made 2017 a year of giving. ORAU and its employees also invested in advancing science, technology, engineering and math (STEM) education. From free workshops for teachers, technology makeovers for classrooms, summer science academies, hands-on camps, and skills competitions for students, ORAU definitely made a “STEMpact” in 2017. Capping things off was a unique opportunity to experience the total solar eclipse that occurred in August 2017. ORAU employees celebrated with an eclipse-watching event and supported a myriad of educational events for K-12 and university-age students across our region.

A Chance to Share Their Passion

Helping a local family construct their home
More than 55 ORAU employees and their families volunteered time to Habitat for Humanity of Anderson County, Tennessee, partnering with Bechtel Corp., to help build a home for the Benson family from Oak Ridge, which is expected to be completed in 2018.

Giving time and toys to kids
Employees took turns playing the role of elves at the Holiday Bureau’s Toy Distribution during the holidays as they helped parents in need find the perfect presents for their children.

Donating 416,000 books to preschoolers
Since 2001, ORAU has partnered with Dolly Parton’s Imagination Library to donate a total of 416,000 books to area preschoolers in Anderson County, Tennessee, with nearly 10,450 graduates of the program.

Supporting International Friendship Bell Peace Pavilion project
ORAU President and CEO Andy Page, pictured center, participated in the groundbreaking for the new International Friendship Bell Peace Pavilion after ORAU announced their donation of $100,000 to project efforts.

A Year of Giving

Raising $175,000 for animals in need
Amy Starkey, an administrative associate at ORAU, is co-founder of the Helping Paws Animal Network, a Section 501(c)(3) nonprofit that supports 30 animal rescue groups in the East Tennessee area. Started in 2011, the Helping Paws Animal Network now consists of 87 ORAU members and has donated a total of $175,000 to animals in need of food, vet services and homes.

Committing on a personal level to cancer research
When ORAU Senior Communications & Marketing Specialist Michael Holtz isn’t promoting ORAU capabilities and STEM education, he campaigns for the much more personal cause of cancer advocacy. Holtz was diagnosed with stage 3 colon cancer 6 years ago, and in 2017 he celebrated five years in remission. Through his cancer advocacy, Holtz serves as state lead ambassador for the American Cancer Society Cancer Action Network. “Working at ORAU and having a flexible schedule allows me to meet with lawmakers and advocate for public policies that improve quality of life, increase funding for cancer research and so much more.”

Other organizations ORAU proudly supports:

Images: ORAU employees volunteering at the local Habitat for Humanity, playing elves for the Holiday Bureau’s Toy Distribution, donating books to preschoolers, participating in the groundbreaking for the International Friendship Bell Peace Pavilion, raising money for animals in need with Helping Paws Animal Network, and advocating for cancer research.
Making a STEMpact

In celebration of National STEM Day, ORAU reached out to employees, teachers and students in the community as well as ORISE research participants to find out how they impact STEM, or make an impact with STEM, in their work every day. During this fun campaign, 9,244 people were reached on Facebook, with multiple photos being posted to Facebook from educators, research program participants and employees showing ORAU their #STEMpact.

Championing science through competition

ORAU contributed $104,564 toward management and sponsorship of the Tennessee Science Bowl competition. In 2017, Oak Ridge High School took first place in the Tennessee Science Bowl and went on to compete at the national level. Photo credit: DOE/Lynn Freeny

Providing $336,000 in Extreme Classroom Makeovers in nine years

ORAU awarded $25,000 for technology and classroom upgrades to Rutledge Middle School teacher Kyle Roach in the 2017 Extreme Classroom Makeover Contest. Now in its ninth year, the contest has provided $336,000 for technology improvements in area schools.

Putting lesson plans to the test for new technology

First grade teacher Renee Kohagen of Berean Christian School accepts her prize for winning the ORISE Summer 2017 STEM Lesson Plan Competition with her lesson plan “Is Oobleck a solid or a liquid?” For the first time, ORISE asked teachers to put their own original STEM lesson plans to the test for the chance to win new technology for their classroom. Kohagen and two more teachers were awarded iPads for their excellent STEM lessons.

Inspiring students with STEM on the big screen

In helping students at Vine Middle School discover a love for STEM, ORAU hosted a special educational screening of “Hidden Figures,” the Oscar-nominated movie illustrating the important role female African-American mathematicians played in the early NASA space program. Following the movie, students were visited by minority scientists and researchers from ORAU, ORNL and the National Oceanic and Atmospheric Administration (NOAA) who spoke about their personal backgrounds, STEM careers and inspirations.

Granting $487,000 in 15 years of ORAU Education Grants

$36,000 in ORAU Education Grants was donated to 38 teachers from 14 East Tennessee schools to fund educational projects that complement its mission of enriching STEM programs. Since the program’s beginning in 2002, ORAU has provided $487,000 to area schools.

Welcoming future scientists to lab internships

ORISE spent the day at ORNL welcoming incoming participants and guiding them through orientation to their research participation programs. To make the day more memorable, ORISE also hosted the #ORNLStory photo contest with photo frames and gift card prizes for winners.
Teaching teachers colorful and sweet chemistry

As a part of 20 free K-12 teacher professional development workshops offered by ORAU and attended by more than 380 teachers from across East Tennessee, University of Tennessee chemistry professor emeritus Al Hazari, Ph.D., hosted the “Colorful and Sweet Chemistry” class, showing teachers fun experiments for students, involving the color spectrum and the sense of taste.

Gaining hands-on experience with summer institute for teachers and students

Thirty-two high school students and 16 teachers spent two weeks this summer at the Appalachian Regional Commission (ARC) Math-Science-Technology Institute, hosted by ORAU, working with scientists at ORNL and ORAU on STEM projects related to bioenergy, robotics, engineering and atmospherics. Twenty-six middle school participants spent one week working on atmospheric and bioenergy projects of their own, such as building and designing wind turbines. This program is funded by ARC and managed by ORAU.

Going toe-to-toe in robotics

More than two dozen students spent a week designing, building, programming and battling robots at the 2017 Oak Ridge Robotics Academy. ORAU provides the academy free to area students.

Learning math through movement

ORAU hosted the Math and Movement Mini-Academies this summer for students in kindergarten through fifth grade, which provided students the chance to exercise their minds and bodies with simple, fun exercises based on the concept that children retain more and gain valuable basic skills with more exercise. Younger students hopscotched, raced and used colorful floor mats to learn fundamental math concepts while older students began working on early algebra as they played games such as volleyball and baseball.

Taking to the water to enhance STEM-learning fun

One of 20 free professional development workshops for K-12 teachers, “SeaPerch” involved teachers building and operating underwater remotely controlled vehicles. The workshop offered educators the opportunity to engage in hands-on activities to enhance their STEM knowledge and curricula.

Expanding the STEM knowledge of students around the world

Sixty high school and 30 middle school students and 10 high school teachers from the U.S., Italy and South Korea attended the Joint Science and Technology Institute (JSTI), expanding their STEM knowledge with three-dimensional printing and design, environmental water quality and more. JSTI is sponsored by the Defense Threat Reduction Agency (DTRA) and managed by ORAU.

Photo credits: Luis A. Palacios, DTRA
ORAU and surrounding areas were blanketed by darkness on August 21 as the first total eclipse in almost 40 years passed over the United States. During the eclipse, ORAU’s Atmospheric Turbulence and Diffusion Division (ATDD) of NOAA’s Air Resources Laboratory led multiple research and outreach activities. The team constructed and deployed three mobile atmospheric monitoring units as well as a stationary unit. An unmanned aerial vehicle and a weather balloon were also released to gather data. More than 250 elementary students were involved in the weather balloon release. At ORAU, a full day of educational opportunities was provided for the Boys & Girls Clubs of the Tennessee Valley. Before viewing the totality, they created a giant chalk mural of the solar system, learned how eclipses occur and visited with a scientist from ORNL. ORAU employees, retirees and their families joined the Boys & Girls Clubs to watch the moment of totality with safety glasses at the Edge of Totality viewing party. ORAU also awarded a grant to Maryville College to support community outreach and to ensure students had the opportunity to be a part of this rare educational experience. Students and faculty from Maryville College used grant monies to provide presentations, laboratory experiments and special eyeglasses to local elementary and middle school students and teachers. Berea College students visited Maryville to view the eclipse in the path of totality.

SHARING EXPERTISE
Randy White
ORAU Research Group Manager, ATDD
M.S., University of Tennessee
Expertise: wind tunnel modeling, atmospheric and soil measurement in tornado research, wind energy studies, air pollutant measurement
Investigator, environmental and atmospheric experiments for DOE, National Weather Service, National Park Service, and National Oceanic and Atmospheric Administration
Presenter, environmental sciences programs for K-12 students
Project Manager, East Tennessee 2017 Total Solar Eclipse atmospheric testing and measurement
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Vickie L. Caughron, Chief Audit Officer
Jamey K. Kennedy, Vice President, Business Development
William J. (Jim) Vosburg, Ed.D., Senior Vice President and Director of ORISE
Andy Page, ORAU President and Chief Executive Officer

Back Row (L to R):
Monika J. Schiller, Senior Advisor
Eric W. Abelquist, Ph.D., ORAU Executive Vice President and Chief Research Officer
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Donna L. Cragle, Ph.D., Senior Vice President and Program Director, Health, Energy and Environment
J. Phil Andrews, Vice President and Chief Financial Officer
Thomas (Tom) D. Wantland, Director, Environment, Safety and Health

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Mae D. Mosley, Director, Employee Relations and Diversity

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David T. Duncan, Ph.D., Senior Vice President and Program Director, Scientific Assessment and Workforce Development
Arlene A. Garrison, Ph.D., Vice President, University Partnerships
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Lieutenant General, U.S. Marine Corps (Retired)

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Vice President for Research  
University of Georgia

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Vice Chancellor for Research and Economic Development  
North Carolina A&T State University

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AECOM

Bruce E. Gnade, Ph.D.  
Executive Director, Hart Center for Engineering Leadership  
Southern Methodist University

Maj. Gen. Dennis M. Kenneally  
U.S. Army (Retired)  
Southern Methodist University

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Southern Methodist University

Robert L. Burks, Ph.D.  
Association Vice President for Research  
Oak Ridge National Laboratory

Caroline M. Whitacre, Ph.D.  
Senior Vice President for Research  
The Ohio State University

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University of Mississippi

University of Nevada, Las Vegas  
University of Nevada, Reno

University of New Mexico  
University of New Orleans
Select ORAU Leadership Contributions

Vice chair, ISOE Working Group on Data Analysis, 2017, Derek Hagemeyer, ORISE Associate Director of Human Health & Environment

Secretary-elect, American Industrial Hygiene Association Nanotechnology Working Group, 2017, Martin Barrie, Ph.D., J.D., ORAU Senior Scientist, Epidemiologist and Principal, ORAU Commercial Sector Initiative

Director, Health Physics Society Board of Directors, 2017, Mike Mahathy, ORAU Health Physicist, Radiation Dose Reconstruction Program for NIOSH

Awardee, Alumni Spotlight, University of Tennessee, Educational Psychology and Counseling Department, June 2017, Erin M. Burr, Ph.D., ORAU Senior Evaluator and Assessment and Evaluation Section Manager

Presenter, Safety Fest TN, September 2017, “Ergonomics for Plant Design” and “Occupational Safety and Health Careers,” Jeffrey Miller, Ph.D., CHI, CSP, ORAU Senior Scientist and Head of ORAU’s Center for Safety Studies


Presenter and session chair, Con-Rad Global Conference on Radiation Topics, Munich, Germany, May 2017, “Role of Spatial Organization of Chromosome Domains in Ionizing Radiation Induced Chromosomal Aberrations” and “REAC/TS Approach to Rapid Dose Estimation and Decontamination of Plutonium Following a Puncture Wound,” Nick Dainiak, M.D., FACP, REAC/TS Medical and Technical Director

Presenters, International Conference on Radiation Biology, Chennai, India, and Bhalla Atomic Research Center, Mumbai, India, November 2017, Nick Dainiak, M.D., FACP, REAC/TS Medical and Technical Director, and Adayabalam Balajee, Ph.D., Technical Director, Cytogenetic Biodosimetry Laboratory

Instructor, All India Institute of Medical Sciences, New Delhi, India, and Tata Institute of Social Sciences, Mumbai, India, September 2017, Carol Iddins, M.D., REAC/TS Associate Director


Presenters, 2017 DOE Contractor’s Travel Manager’s Meeting, May 2017, Don Jenkins, ORAU Group Manager, and Lois Chrisman, ORAU Travel Manager

Presenter, 41st Annual Meeting of Professional and Organizational Development in Higher Education Network, November 2016, “It matters! The Transformative Power of New Faculty Development Initiatives” and “Music in STEM Education,” Beth White, Ph.D., ORAU Education Project Manager

Presenter, Tennessee Library Association Conference, April 2017, “Interview Tips and Tricks for Both Sides of the Desk,” Meredith Goins, Group Manager, ORAU Peer Review Programs

Presenter, Cyber and Information Security Consortium, “Cyber Security Challenges in Business,” October 2016, Chester Maze, ORAU Vice President and Chief Information Officer

Panel speaker, Women’s Leadership Workshop, ORNL, March 2017, Mae Mosley, ORAU Director, Employee Relations and Diversity
Select ORAU Published Works


