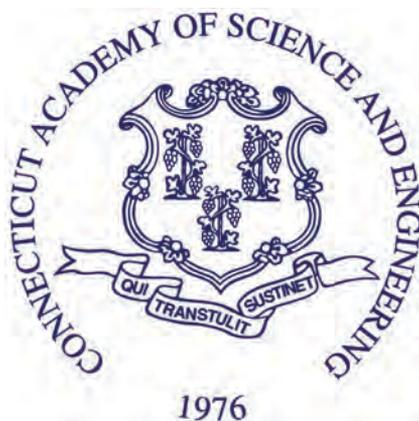


# CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



ANNUAL REPORT  
2016-2017

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## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING

*The Connecticut Academy is a non-profit institution patterned after the National Academy of Sciences to identify and study issues and technological advancements that are or should be of concern to the state of Connecticut. It was founded in 1976 by a Special Act of the Connecticut General Assembly.*

### VISION

*The Connecticut Academy will foster an environment in Connecticut where scientific and technological creativity can thrive and contribute to Connecticut becoming a leading place in the country to live, work and produce for all its citizens, who will continue to enjoy economic well being and a high quality of life.*

### MISSION STATEMENT

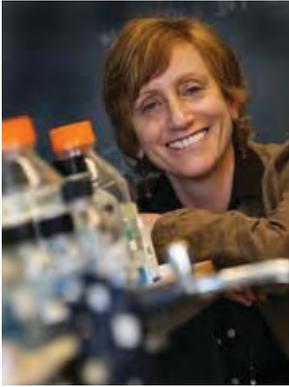
*The Connecticut Academy will provide expert guidance on science and technology to the people and to the state of Connecticut, and promote the application of science and technology to human welfare and economic well being.*

### GOALS

- *To provide information and advice on science and technology to the government, industry and people of Connecticut.*
- *To initiate activities that foster science and engineering education of the highest quality, and promote interest in science and engineering on the part of the public, especially young people.*
- *To provide opportunities for both specialized and inter-disciplinary discourse among its own members, members of the broader technical community, and the community at large.*

**CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING**  
**805 Brook Street, Building 4-CERC, Rocky Hill, CT 06067**  
**Telephone: 860-571-7143**  
**e-mail: [acad@ctcase.org](mailto:acad@ctcase.org) • web: [www.ctcase.org](http://www.ctcase.org)**

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This was a productive but challenging year, highlighted by projects conducted on behalf of the Connecticut Department of Transportation. Financially, the Academy has been impacted by the state's financial condition and it is anticipated that the state's budget challenges will continue to require the use of academy reserves to support its operations. Recognizing the financial challenges facing the academy, the Governing Council took action by creating the Future of CASE committee to explore strategies and options for achieving financial stability and sustainability.

In 2017, 24 new members were elected with a total membership of 402 of Connecticut's leading scientists, physicians, and engineers at year end. Taking into consideration the election of new members and membership attrition in fiscal years 2015, 2016, and 2017, the Academy's membership grew at limited anticipated growth rates of 2.7%, 1.8%, and 2.3% respectively for the past three years.

The Academy's efforts in advising the state on issues of science and technology included the following three projects conducted for the Connecticut Department of Transportation: project deliverability, innovative technologies for commercial vehicle enforcement, and strategies to minimize the carbon footprint of Connecticut bus operations. Additionally, a grant to develop a science and technology fellowship program to provide the General Assembly qualified advice and analyses on current science and technology-related policy issues in a nonpartisan manner was received from the California Council on Science and Technology. The Public Policy Inquiries section of the annual report highlights the studies and projects conducted by the Academy this past year.

Lieutenant Governor Nancy Wyman, presented the 2017 Connecticut Medal of Science to CASE Member Robert Schoelkopf, Yale University, whose research focuses on the development of superconducting devices for quantum information processing, which will lead to revolutionary advances in computing.

The Academy's quarterly *Bulletin* continues to provide timely information of interest at both the state and national levels. This year the *Bulletin* feature articles covered a range of topics, including: Cybersecurity: Implications and Prevention - What Can We Learn from the NIST Framework?; Making the PITCH: The Program in Therapeutics for Connecticut's Health; Posing

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'Grand Challenges': IBM Watson Health is Transforming Global Healthcare; and Unlocking the Mysteries of Dyslexia; Finding the Keys to Successful Intervention.

Additionally, the Academy continued its efforts to support science and technology initiatives in the state by assisting the *Hartford Courant* in its News in Education – Science Matters series – a program targeted to middle and high school students that publishes articles about interesting science and technology topics throughout the school year. The Academy also continued support for the Connecticut Science & Engineering Fair's Urban School Challenge (USC), which the Academy helped establish in 2012 through its Endowment Fund. The USC recognizes one high school student and one middle school student from an urban school district, providing the high school winner the opportunity to compete nationally and the middle school winner with a chance to attend Project Oceanology's Ocean Camp.

The Academy is pleased to have had an opportunity to participate in developing innovative ideas and solutions to various issues for consideration by the state's leadership and looks forward to meeting new challenges in the years ahead.

On behalf of the Academy's membership and its Governing Council, I would like to thank the individuals and organizations that have assisted us in the past year – our members, patrons, clients and colleagues. Thanks to our treasurer Ed Murphy for leading the Future of CASE committee, and to Executive Director Richard Strauss for his commitment to the Academy. Also, special recognition goes to CASE member Phil Gardner who served the Academy for over five years as its Treasurer and over six years as the *CASE Bulletin* Executive Editor for Engineering.



Laura Grabel  
President  
July 1, 2017

The property, affairs and activities of the Academy are managed by a Council of 11 Members, which serves also as the Board of Directors of the Corporation. In addition, the chairs of the ten Technical Boards serve as ex officio, non-voting members of the Council. The Council meets quarterly. There are three Standing Committees of the Academy: Executive, Membership and Nominating. The members of the Council and chairs of the Standing Committees for the 2017 fiscal year are:

### **Council of the Academy**

#### **Officers:**

President: Laura Grabel, Wesleyan University  
 Vice-President/President Elect: Baki Cetegen, UConn  
 Treasurer: Phillip Gardner, Coherent Inc. (ret.);  
                   Edmond Murphy, Lumentum (ret.)  
 Secretary: Regis A. Matzie, Westinghouse Electric Company (ret.)  
 Past President: Sandra K. Weller, UConn Health

#### **Councilors:**

Christine Broadbridge, Southern Connecticut State University  
 Joann Sweasy, Yale School of Medicine  
 Robert Hobbs, United Technologies Research Center (ret.)  
 Ralph Lewis, UConn  
 Ripi Singh, Inspiring NEXT  
 George Wisner, Barker Mohandas & Connecticut Science and Engineering Fair

**Chairmen of the Technical Boards:** *(See pages 4-5 for a listing of the chairs.)*

#### **Chairmen of the Standing Committees**

*Executive Committee:* Laura Grabel, Wesleyan University  
*Membership Committee:* Baki Cetegen, UConn  
*Nominating:* Sandra K. Weller, UConn Health

#### **Council Advisors:**

John P. Cagnetta, Northeast Utilities (ret.)  
 Anthony J. DeMaria, Coherent\*DEOS LLC (ret.)  
 Alan C. Eckbreth, Consultant & United Technologies Research Center (ret.)  
 Myron Genel, Yale School of Medicine  
 Gale Hoffnagle, TRC Environmental Corporation, Inc.  
 Lou Manzione, University of Hartford  
 Michael J. Werle, TEaMS, Inc

#### **Academy Staff:**

*Executive Director:* Richard H. Strauss  
*Associate Director:* Terri Clark  
*Assistant Director for Programs:* Ann G. Bertini

The Members of the Academy are divided into ten Technical Boards (TBs) that represent both their technical and public policy interests.

The TBs' responsibilities in their designated policy areas include: serving as a forum for examining science-based issues; providing the resources for assembling and overseeing ad hoc committees to respond to inquiries placed with the Academy; and generating guidance in instances where science and technology are expected to offer new opportunities or challenges for the development of sound state policy. In each of the above, the TBs may encourage the participation of expert non-members.

The Chairs and mission statements of the TBs for the 2017 fiscal year were:

### **AGRICULTURE, FOOD AND NUTRITION**

Theodore G. Andreadis, The Connecticut Agricultural Experiment Station  
The production, distribution, safety, and nutrition of food, including development of biotechnology to improve the quality of food and the environment.

### **BIOMEDICAL RESEARCH AND HEALTH CARE**

Andrew Arnold, UConn Health  
The delivery, quality and cost of medical care and related problems, including preventative health care and the development of biotechnology for improving human health.

### **COMMUNICATION AND INFORMATION SYSTEMS**

Niloy Dutta, UConn  
All means of communicating: voice, data, and other combinations of business and personal information, including the development of new hardware and software technologies, with special attention to complementarity and interchangeability with transportation systems.

### **ECONOMIC DEVELOPMENT**

Karl M. Prewo, Innovatech, LLC  
Economic opportunities afforded by Connecticut's technological base and its human and natural resources, with a special role in assessing the potential economic impact of new technologies.

### **EDUCATION AND HUMAN RESOURCES**

Kathleen F. Maurer, Connecticut Department of Correction  
The effective utilization of people in ways that will contribute to human development and economic growth, including applications of technology to improve both basic and advanced skills to make people more employable, and with attention to the impact of urban growth and development.

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## **ENERGY PRODUCTION, USE AND CONSERVATION**

Lee S. Langston, UConn

The production, use, conservation and distribution of energy with special attention to meeting future demand and environmental quality standards.

## **ENVIRONMENT**

Ralph Lewis, UConn

The physics, chemistry, geology, biology, ecology and engineering of the environment as these relate to issues of economic development, energy use, transportation, public health and the quality and utilization of Connecticut's atmosphere, land, water and sea natural resources.

## **PUBLIC HEALTH**

Theodore Holford, Yale School of Public Health

The impacts on the public health of communicable diseases and of materials and energy of man-made and natural origin in the environment.

## **TECHNOLOGY**

Francis R. Preli, Pratt & Whitney

The development and utilization of knowledge for the purpose of providing material goods and services, including the utilization of research results to design and manufacture materials and products, with particular attention to developing effective means for transferring technology from the academic to the industrial community and within the industrial community, and for the improvement of manufacturing technology.

## **TRANSPORTATION SYSTEMS**

John Ivan, UConn

The movement of people and material within and across Connecticut, including vehicles and infrastructure, with special attention to complementarity and interchangeability with communication systems.

The Bylaws of the Academy provide that members must live or work in Connecticut and are to be elected by the current members on the basis of their accomplishments in science, engineering and/or technology. In particular, scientists and engineers may be considered for membership on the basis of fulfillment of either or both of the following criteria:

- Scientific distinction achieved through significant original contribution in theory or application;
- Unusual accomplishments in the pioneering of new and developing fields of applied science and technology.

In addition, members of the national academies are automatically considered for membership by resolution of Council.

The Bylaw Amendment adopted at the end of fiscal year 2015 allows that the number of candidates considered for election be no more than 6% of the Academy's membership as of July 1 (the start of the fiscal year). At the close of the 2017 fiscal year the Academy had a total of 402 members, including this year's 24 newly elected members, as follows:

**Kenneth B. Bowes**

Vice President of Engineering, Eversource Energy

**Claudio Bruno**

Research Professor, Mechanical Engineering, UConn

**David B. Carter**

Senior Vice President, Engineering, Pratt & Whitney

**Frederick M. Cohan**

Professor of Biology and Environmental Studies, Biology Department, Wesleyan University

**Robert M. Darling**

Principal Research Scientist, United Technologies Research Center

**Alan M. Finn**

Research Fellow, Systems Department, United Technologies Research Center

**Alison P. Galvani**

Burnett and Stender Families Professor of Epidemiology and Professor of Ecology and Evolutionary Biology; Director of the Center for Infectious Disease Modeling and Analysis, Yale School of Public Health

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**Puxian Gao**

Professor, Materials Science and Engineering, UConn

**Jonathon Howard**

Eugene Higgins Professor, Molecular Biophysics & Biochemistry, Yale University

**Mark R. Jaworowski**

Fellow, Physical Sciences Department, United Technologies Research Center

**Ann E. Kurth**

Dean & Linda Koch Lorimer Professor, Yale School of Nursing

**Andre Levchenko**

John C. Malone Professor & Director, Yale Systems Biology Institute, Yale University

**Baikun Li**

Professor, Civil and Environmental Engineering, UConn

**Alexander J. Majewski**

Fellow, UTC Aerospace Systems

**Michael J. Maloney**

Manager, Structural Alloys, Hot Section Materials and Coatings, Pratt & Whitney

**Jordan Peccia**

Professor, Chemical and Environmental Engineering, Yale University

**Peter A. Raymond**

Professor of Ecosystem Ecology, Yale School of Forestry & Environmental Studies

**Philip E. Rubin**

Senior Advisor to the President and Chief Executive Officer Emeritus, Haskins Laboratories, and Professor Adjunct/Research Affiliate, Yale University

**Alexander C. Russell**

Professor and Director of Graduate Studies, Computer Science and Engineering, UConn

**Zhong Shao**

Professor, Computer Science, Yale University

**Frederick J. Sigworth**

Professor, Cellular and Molecular Physiology with joint appointments in Biomedical Engineering and Molecular Biophysics and Biochemistry, Yale University



*Newly elected CASE members at the 42<sup>nd</sup> Annual Meeting, May 22, 2017. (Photo: Frank LaBanca)*

**David C. Steffens**

Professor & Chair, Psychiatry, UConn School of Medicine

**Hugh S. Taylor**

Anita O’Keeffe Young Professor of Women’s Health & Chair,  
Department of Obstetrics, Gynecology and Reproductive Sciences, Yale  
School of Medicine & Yale-New Haven Hospital

**Sandra L. Wolin**

Professor of Cell Biology and Molecular Biophysics and Biochemistry;  
Director, Yale Center for RNA Science and Medicine, Yale School of  
Medicine

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## HONORARY MEMBERSHIP

*The Academy created the category of Honorary Membership in 2009 to recognize individuals not otherwise eligible for membership. Honorary members are nominated and designated after a 2/3 vote of the Academy's Council. Selection of Honorary Members is limited to no more than two individuals per year. Honorary Members shall be entitled to all privileges of membership, except voting and holding elective office.*

**Joel Gordes, Director,** Center for Energy Security Solutions, was elected to Honorary Membership for leadership and contributions throughout his career that support the Academy's vision to "foster an environment in Connecticut where scientific and technological creativity can thrive and contribute to Connecticut becoming a leading place in the country to live, work and produce for all its citizens ..."



*Honorary CASE Member Joel Gordes speaks at the 42<sup>nd</sup> Annual Meeting of the Academy. (Photo: Frank LaBanca)*

Throughout his career, Gordes has been instrumental in promoting energy policy change in the public sector with a focus on emerging electric grid vulnerabilities and developing strategies for greater energy safety, resilience and security. He has been Principal of Environmental Energy Solutions since 1995, an energy consultancy involved in multidisciplinary aspects of energy, environment, energy security and economic development. More recently, he has served as Director of the Center for Energy Security Solutions. In those positions, he has served on numerous state boards and commissions including his appointment to the former Connecticut Energy Advisory Board (CEAB) in 2007, 2011 and 2013. He has also served for over 10 years as Technical Coordinator for the Energy Conservation Management Board, created by the state's electric deregulation legislation. Gordes served as the CEAB designee to CASE for the academy's Energy Assurance Planning Project. He has been a valued contributor to other CASE projects, serving as a study committee member for The Feasibility of Using Waste Heat from Central Power Stations, and Advances in Nuclear Power Technologies, as a study advisor for the Shared Clean Energy Facilities and a committee member for the current study on Strategies to Minimize the Carbon Footprint of Connecticut Bus Operations.

A former state representative for the 62nd district (1987-91), Gordes served as Vice Chair for the Energy & Public Utilities Committee. During his time in

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office, he authored or co-authored many energy-related public acts including bonus rates of return for utility energy efficiency programs and energy sections of Public Act 90-219, Connecticut's first global warming act. During the 1990 budget deficit, he authored a bill that was unanimously passed to re-lamp state buildings with energy efficient lighting that saved the state \$130 million over a ten-year period.

A graduate of the U.S. Air Force Academy, Gordes flew 130 combat missions in Vietnam. He was drawn to the field of renewable energy and energy security after observing the effects of oil embargoes during the 1970s. Gordes studied solar energy at the Hartford Graduate Center of Rensselaer Polytechnic Institute and worked as a sales engineer for a renewable energy firm before moving to public service.

Gordes is the author of several papers on energy security, renewables and distributed resources. He lives in West Hartford with his wife Lin.

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## DISTINGUISHED SERVICE AWARD

*The Distinguished Service Award was created by the Academy's Governing Council in 2009 to honor members that have provided outstanding service to the Academy. The Council nominates, and selects by vote, recipients of this award.*

### **Myron Genel**

was elected by the Academy's Governing Council to receive the Distinguished Service Award in recognition of outstanding contributions as a Member of Council, Officer, and Executive Editor of the *Bulletin*.

Elected to CASE in 1992, Dr. Genel has served on several study committees for the Academy, including the Connecticut Disparity Study (2013-16), Independent Monitor

Report: Implementation of UCHC Study Recommendations (2009) and A Needs-Based Analysis of the UConn Health Center Facilities Plan (2008). Additionally, he served for a total of 12 years as an Elected Council Member (2000-06), and Vice President/President/Past President (2006-12). Beginning in Spring 2016, Dr. Genel is serving as the 1st CASE Bulletin Executive Editor for Medicine, providing expert advice and editing support for each issue and assisting in the selection feature articles. In this role, he also participates in quarterly Council Meetings.

A graduate of the University of Pennsylvania Medical School, Dr. Genel joined the Yale School of Medicine in 1971, and was Associate Dean, Government and Community Affairs from 1985 to 2004. Previously he was chief of the pediatric endocrinology section and program director of the Children's Clinical Research Center.

Dr. Genel has served at the interface between biomedical research, clinical endocrinology and public policy in many capacities. He was a member of the National Children's Study Federal Advisory Committee (2005-08), the Health and Human Services Secretary's Advisory Committee on Human Research Protections (2006-09) and a charter member of the Institute of Medicine's Clinical Research Roundtable (2000-04). A founder of the Connecticut Stem Cell Coalition, Dr. Genel also served as a member of Connecticut's Stem Cell Research Advisory Committee. He has also been a consultant to the



*CASE Member Distinguished Service Award winner Mike Genel and CASE President Laura Grabel. (Photo: Frank LaBanca)*

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International Olympic Committee's Medical Commission on issues relating to gender identity in elite athletic competition.

For twenty-seven years, beginning in 1984, Dr. Genel directed the public affairs activities of three major pediatric academic and research societies: American Pediatric Society, Association of American Medical School Department Chairs and the Society for Pediatric Research. He has also served as chair of the American Medical Association's (AMA) Council on Scientific Affairs; the governing council of the AMA Section on Medical Schools and the Association of American Medical Colleges (AAMC) Council of Academic Societies. A Distinguished Service member of the AAMC, Dr. Genel has received a number of awards including, the Distinguished Service Award from the Society for Pediatric Research, the Joseph W. St. Geme, Jr. Leadership Award from the Federation of Pediatric Organizations and the President's Award for Distinguished Service from the American Academy of Pediatrics. He also currently serves on the board or directors of the Stepping Stones Museum for Children, Norwalk, and on the Connecticut Commission of Women Children and Elderly.

## PUBLIC POLICY INQUIRIES

One of the principal purposes of the Academy is to provide science and technology information and advice on public policy issues, upon request of a government agency or private organization. Information regarding inquiries received, continued, or completed during the fiscal year is listed below (*listed by project start date*):

*Strategies for Improving Transportation Project Delivery Performance:* This study was initiated at the request of the Connecticut Department of Transportation (CTDOT) to identify practices for improving transportation project delivery performance for the various contracting methods used by CTDOT and other transportation agencies that are applicable for CTDOT's use. CTDOT has made a commitment to continuous process improvement for project deliverability through initiatives such as piloting alternative contracting methods, and assessing environmental review and permitting processes internally and with environmental regulators through working groups. The study committee found that considerations for improving project delivery performance involve:

- An articulated vision from CTDOT leadership regarding project deliverability and a shared production culture/team orientation among departments.
- Using the project delivery method and contractor selection method that best fits a project's specific objectives and challenges.
- Establishing key project delivery performance measures to monitor processes.
- Engaging a consultant with expertise to help guide the development and implementation of ACM processes, as well as for training CTDOT staff.

Project Start Date: *August 2015*

Project Completion Date: *September 2016*

Source: Connecticut Department of Transportation

*Innovative Technology Deployment: Development of a Virtual Screening Facility Pilot Project for Connecticut's Commercial Vehicle Enforcement Program:* This study was conducted for CTDOT and the Connecticut Department of Motor Vehicles (CTDMV) for the purpose of creating an implementation document for development and deployment of a virtual electronic screening (e-screening) and weigh-in-motion (WIM) pilot project. CTDMV's and CTDOT's goal is to utilize state enforcement resources in the most efficient manner possible. The majority of motor carriers operate safely and legally. Many state and federal entities are interested in rewarding motor carriers by allowing those with good safety records to bypass commercial vehicle enforcement sites and inspections, while focusing enforcement resources only on those motor carriers that are not operating safely and/or legally. Study conclusions included:

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- Investment in the deployment of innovative technologies to screen commercial vehicles and drivers for weight and safety inspection has the potential to improve the effectiveness of Connecticut’s commercial vehicle enforcement program and achieve outcomes including improved safety, highway preservation, and increased mobility of commercial vehicles traveling in Connecticut. Virtual Screening Facilities (VSFs) and weigh stations with enhanced screening functionalities will enable enforcement officers to focus enforcement operations on those commercial vehicles most likely to be in violation of state and federal weight, size, and safety laws, while providing those in compliance with increased mobility by allowing them to bypass enforcement activities. Importantly, analysis of the 24/7 data collected from these sites provides the opportunity to strategically design enforcement strategies to maximize enforcement effectiveness.
  - Performance measures used for administrative purposes and required by state statute for assessing the effectiveness the commercial vehicle enforcement program should be based on and aligned with programmatic objectives and outcomes. Metrics used to assess success in achieving desired outcomes should include measures related to improving safety, highway preservation, and mobility.

Project Start Date: *October 2016*

Project Completion Date: *November 2017*

Source: Connecticut Department of Transportation, Connecticut Department of Motor Vehicles

*Sustainability Strategies to Minimize the Carbon Footprint for Connecticut Bus Operations:* This study was initiated at the request of CTDOT. CTDOT has experienced a demographic change in the makeup of public transportation customers in Connecticut – from principally commuters and transit-dependent people – to millennials and others using transit for all travel needs as indicated by growth in off-peak usage. The objective of this study is to identify a strategy to achieve a vision of a pathway to minimize the carbon footprint for CTDOT-contracted bus operations in Connecticut, including resulting benefits and challenges. The economic value of investments necessary to achieve strategy goals in terms of initial capital costs, ongoing operating costs including life-cycle costs, and overall benefits/savings were considered and presented in an easy-to-read and comprehensible format. The carbon footprint was calculated/estimated for all CTDOT-contracted bus operations. This analysis looked at the carbon footprint associated with day-to-day operations of equipment and facilities.

Project Start Date: *October 2016*

Anticipated Project Completion Date: *January 2018*

Source: Connecticut Department of Transportation

*Connecticut Science and Technology Policy Fellowship Program Planning:* CASE was awarded a planning grant from the California Council on Science and Technology (CCST), in partnership with the Gordon and Betty Moore

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Foundation, and the Simons Foundation, to develop and implement a Connecticut Science and Technology Policy Fellowship Program (CPFP) for the Connecticut General Assembly (CGA). CASE established a CPFP Advisory Committee to oversee the planning process. The CPFP will be modeled after other science and technology policy fellowship programs. Specifically, the American Association for the Advancement of Science – Congressional Science & Engineering Fellowship Program that provides fellows yearlong assignments in the federal government. These programs provide opportunities for PhD (or equivalent) scientists and engineers to learn about policy making, while contributing their knowledge and analytical skills through a yearlong congressional office assignment. As the host organization, CASE will conduct the planning process to develop the CPFP in cooperation with key staff from the CGA’s Office of Legislative Management and Office of Legislative Research. A decision to implement the CPFP will be made by the CGA following completion of the program’s development.

Project Start Date: *February 2017* Anticipated Project Completion Date: *February 2018*  
Source: California Council on Science and Technology

Most inquiries are referred to the Technical Boards for a response, or to the Academy Executive Director. One, or more, of the ten Technical Boards is selected to assemble appropriate experts to conduct a study and prepare the response to the inquirer. The Academy provides technical support, prepares reports, and otherwise conducts the pertinent business of the Academy in these efforts.

The Academy also receives requests from state agencies, private organizations, and private inquirers for sources of technical information and technical experts on a variety of topics. While not a referral service, the Academy will provide or suggest resource persons in this state or elsewhere as appropriate.

The Academy continues to be funded by a plan under which the State of Connecticut and the private sector share a substantial portion of the general support of the Academy.

The following major sources of funding were recognized in fiscal year 2017 for studies and technical assistance (*see also Public Policy Inquiries*):

- \$29,550 from CTDOT for a study on *Strategies for Improving Transportation Project Delivery Performance*
- \$155,025 from CTDOT for a study on *Innovative Technology Deployment: Development of a Virtual Screening Facility Pilot Project for Connecticut's Commercial Vehicle Enforcement Program*
- \$171,636 from the CTDOT for a study on *Sustainability Strategies to Minimize the Carbon Footprint for Connecticut Bus Operations*
- \$12,500 from the California Council on Science and Technology for a study on *Connecticut Science and Technology Policy Fellowship Program Planning*
- \$3,000 from the Connecticut Center for Advanced Technology to support the awarding of the H. Joseph Gerber Medal of Excellence to winners of Connecticut science and technology competitions.

## PUBLICATIONS

In response to the provision of the Academy charter to “... encourage both specialized and interdisciplinary discourse among its members and with other members of the technical community by means of ... publications ...” the Academy undertakes the following activities:

### *The Bulletin*

This quarterly publication of the Academy promotes the exchange of technical and research information among the various technical communities in Connecticut. The *Bulletin* generally includes a feature article, news from the National Academies, a short article highlighting a science museum or science-rich programs located in Connecticut and information regarding science and technology developments of interest in the state of Connecticut.

The *Bulletin's* editorial staff includes Martha Sherman, Managing Editor, and Executive Editors, Academy Members:

- Executive Editor – Engineering: Phillip J. Gardner, Coherent Inc. (ret.); and Leon Pintsov, Pitney Bowes, Inc. *Dr. Gardner retired as Executive Editor – Engineering after the Winter 2016 issue, at which time Dr. Pintsov was appointed to fill this position.*
- Executive Editor – Science: Amy R. Howell, Professor, Department of Chemistry, UConn
- Executive Editor – Medicine: Mike Genel, Professor Emeritus of Pediatrics, Yale School of Medicine

Copies of the *Bulletin* are sent to Academy members, other academic and industrial scientists, state legislators, Connecticut's congressional delegation, the office of the Governor and Lieutenant Governor, commissioners of the state's executive departments, patrons of the Academy, as well as a variety of interested people.

### *Academy Web Site*

The Academy's web site is [www.ctcase.org](http://www.ctcase.org). Information includes:

- Home Page
- About CASE
- The Bulletin
- Press Releases
- Publications
- Technical Boards
- Student Science and Technology Competitions and Special Events
- Connecticut Medals of Science and Technology
- H. Joseph Gerber Medal of Excellence
- Honorary Membership
- CASE Member Distinguished Service Award
- Public Membership Directory\*
- CASE Member Portal & Directory
- CASE Endowment Fund: Donate
- Annual Report
- Contact Us
- NIE - News in Education

\* *The Academy's online membership directory provides a searchable database of Academy membership including current and past members.*

## CONNECTICUT MEDALS OF SCIENCE AND TECHNOLOGY

The Connecticut Medals of Science and Technology are awarded in alternate years by the State of Connecticut through the Office of Higher Education. The Connecticut Medals are modeled after the National Medals of Science and Technology, which are awarded annually by the president of the United States.

The Connecticut Medal of Science is awarded in recognition of extraordinary achievements in scientific fields crucial to Connecticut's economic competitiveness. The Connecticut Medal of Technology is awarded in recognition of extraordinary achievements by an individual in fields of technology that are demonstrated to have made a difference in Connecticut's industrial competitiveness.

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### 2017 Connecticut Medal of Science

**Robert Schoelkopf, PhD**  
*Sterling Professor of Applied  
Physics and Physics  
Director, Yale Quantum  
Institute  
Yale University*

Robert Schoelkopf remembers always wanting to be a scientist. When he was six years old, he was given a rock hammer and with this tool, decided he wanted to be a geologist. A few years later, he watched *The Undersea World of Jacques Cousteau* and thought he would like to be a marine biologist.

When he was sixteen, his parents brought him to Yale University for a Saturday morning Applied Physics program, and he discovered his true passion – to study physics.

Together with his faculty collaborators at Yale, Michel Devoret and Steven Girvin, Schoelkopf pioneered the approach of integrating superconducting qubits with microwave cavities, known as Circuit Quantum Electrodynamics. This Yale architecture, in which quantum information can be distributed by microwave signals on wires, is widely believed to be the most scalable path to useful quantum computers in the near future, and has been adopted by a majority of other groups. Some of Schoelkopf's other inventions include the



*Connecticut Medal of Science Winner Robert Schoelkopf with CASE President Laura Grabel, left, and Connecticut Lieutenant Governor Nancy Wyman, right. (Photo: Frank LaBanca)*

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Radio Frequency Single-Electron Transistor and the Shot Noise Thermometer. Schoelkopf grew up in Chappaqua, New York, and attended Horace Greeley High School, meeting his first mentor, Rosslyn Zook, a chemistry teacher with whom he completed an independent study. When he studied physics later in high school, he discovered a natural affinity for this aspect of science that “was so broad and fundamental, but with an experimental aspect.” Physics seemed intuitive to him with its “simplicity and purity.” After graduating from Princeton, Schoelkopf was moved by the Challenger disaster and the risks scientists took to explore new frontiers. As a result, he worked for two years at NASA Goddard Space Flight Center, where astrophysicist Harvey Moseley mentored him and he discovered that he “liked best what the physicists on the team were doing.” He realized he wanted to continue to study physics, and in particular, the use of low temperature physics to build sensitive instruments for astrophysics. Professor Schoelkopf recognizes the interconnective nature of science where, for example, techniques he learned from radio astronomy could unexpectedly be applied to quantum computing. After earning his PhD from the California Institute of Technology, Schoelkopf came to Yale in 1995 as a postdoctoral fellow where he pursued research in low temperature physics.

Professor Schoelkopf believes we are in the midst of a “second quantum revolution” with physicists, electrical engineers, mathematicians, and computer scientists applying the transformative ideas of quantum mechanics to the field of information science. His research focuses on quantum bits, or qubits, that exist in two states — 0 and 1 simultaneously — enabling a type of “quantum parallelism” in which “massive amounts of information can be stored and otherwise impossible tasks can be accomplished.” Schoelkopf’s simplest and best qubit design — the transmon qubit — holds the record for coherence time and has been adopted by groups worldwide. Professor Schoelkopf’s other inventions include the Radio Frequency Single-Electron Transistor and the Shot Noise Thermometer.

Professor Schoelkopf would like young people “to trust science but understand that it is always changing.” While noting that some ideas are well established, Schoelkopf believes by testing, experimenting and building upon already proven theories, we can always improve our understanding of how the world works. “Science is an imperfect process, but is self-correcting. What you know is important, but what you think you know and what you do not know are even more important.” He notes that “all physicists like to think that our work is useful, but might only be applicable in another generation or two. But in our field, we are seeing significant changes in the world resulting from quantum computing, all within our working lifetimes.”

Professor Schoelkopf’s papers in journals such as Physical Review Letters, Science, and Nature are cited more than 2,000 times each year. He is on the Thomson-Reuters List of highly influential scientists, and his 2004 paper founding the field of circuit QED has garnered over 1,800 references so far. In 2015, Professor Schoelkopf co-founded Quantum Circuits, Inc. (QCI), a private

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venture to develop, manufacture, and sell quantum computers based on the technologies for superconducting circuits developed at Yale. Above all else, Professor Schoelkopf would like to be known as a good father and husband, and a good collaborator and mentor, adding, “it’s likely that our team at Yale will be known as the inventors and founders of a whole new kind of technology and a new industry. That is really exciting and gratifying.”

*This summary was adapted from Professor Schoelkopf’s narrative for the Connecticut Science Center Medal Project, written by Wendy Swift, and other materials.*

*Previous recipients of the Connecticut Medal of Science include Frederick M. Richards, Sterling Professor Emeritus of Molecular Biophysics and Biochemistry, Yale University, 1995; Ronald R. Coifman, Professor of Mathematics, Yale University, 1996; William C. Stwalley, Board of Trustees Distinguished Professor and Head, Physics Department, UConn, 2005; Michael P. Snyder, Lewis B. Cullman Professor of Molecular, Cellular and Developmental Biology, Professor of Molecular Biophysics and Biochemistry and Director of the Yale Center for Genomics and Proteomics, Yale University, 2007; Robert R. Birge, Harold S. Schwenk, Sr., Distinguished Chair in Chemistry, UConn, 2009; Steven L. Suib, Board of Trustees Distinguished Professor and Head, Chemistry Department, UConn, 2011; Thomas A. Steitz, Sterling Professor of Molecular Biophysics & Biochemistry and Professor of Chemistry and Howard Hughes Medical Institute Investigator, Yale University, 2013; and Joan A. Steitz, Sterling Professor of Molecular Biophysics and Biochemistry, Yale University, and Howard Hughes Medical Institute Investigator, 2015.*

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*Previous recipients of the Connecticut Medal of Technology include H. Joseph Gerber, founder of Gerber Scientific, Inc., 1995; Charles H. Kaman, founder and CEO of Kaman Corporation, 1996; Anthony J. DeMaria, Chief Scientist, Coherent-DEOS, LLC, 2004; Gene Banucci, Founder and Chairman, ATMI, Inc., 2006; Tso-Ping Ma, Raymond John Wean Professor of Electrical Engineering, Yale University, 2008; Jonathan M. Rothberg, Chairman, CEO and Founder, Ion Torrent™, 2010; Yaakov Bar-Shalom, University of Connecticut Board of Trustees Distinguished Professor of Electrical and Computer Engineering and the Marianne E. Klewin Endowed Professor in Engineering University of Connecticut, 2012; Frederick Leonberger, Principal, EOvation Advisors LLC, 2014; and Cato T. Laurencin, MD, PhD, University Professor, University of Connecticut and CEO, Connecticut Institute for Clinical and Translational Science, 2016.*

## SPECIAL ACTIVITIES

The Academy sponsors, supports, or participates in a number of special activities in response to the mandate of its Charter to: “... *promote interest in science and engineering on the part of the public, especially young people.*” This year the Academy recognized students of the Connecticut Science & Engineering Fair, Connecticut Junior Science and Humanities Symposium, and the Connecticut Invention Convention at the Academy’s Annual Meeting and Awards Dinner on May 22, 2017. Funding for student and school awards is provided from contributions to the Academy’s Student Awards Fund by the Members of the Academy and by the Connecticut Center for Advanced Technology, for its sponsorship of the H. Joseph Gerber Medal of Excellence. Additionally, the Urban School Challenge of the Connecticut Science and Engineering Fair (CSEF) is supported by funding from the Academy’s Endowment Fund, Aetna Foundation, and IBM.



*The H. Joseph Gerber Medal of Excellence  
– An Award of the Connecticut Academy  
of Science and Engineering in Partnership  
with the Connecticut Center for Advanced  
Technology*

This award is in recognition of H. Joseph Gerber’s (1924-1996) technical leadership in inventing, developing and commercializing manufacturing automation systems for a wide variety of industries worldwide. An elected member of the National Academy of Engineering and the Connecticut Academy of Science and Engineering, Mr. Gerber received the National Medal of Technology in 1994 followed by the Connecticut Medal of Technology in 1995.

Joe Gerber’s contributions to the technological capabilities of manufacturing were the result of a life grounded in genius, and shaped by vision and determination. As an inventor and as founder, Chief Executive Officer, Chairman of the Board and President of Gerber Scientific, Inc., Mr. Gerber was a leader for nearly half a century in inventing and producing factory automation equipment designed to solve global manufacturing problems. Mr. Gerber shaped his companies and the industries they served with a vision – of increasing human potential through technology; of eliminating tedious, time-consuming manual tasks through automation that increases productivity; and of creating technology that directly and immediately revolutionized manufacturing for companies both large and small. Today, Joe Gerber’s genius continues to dominate in the manufacture of apparel and flexible materials, signs and commercial graphics, and lenses for eyeglasses.

Mr. Gerber made the following comments upon his receipt of the National Medal of Technology in 1994: “This award is more than a symbol of personal

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achievement as it is the highlight of a long and productive career for me. It is an affirmation that manufacturing automation has enhanced every aspect of human life and profoundly impacted the standard of living of every person and nation in the world. I am only one of the many who have contributed to our nation's rich technological heritage and one of the fortunate few to be recognized for his achievements."

The 2017 H. Joseph Gerber Medal of Excellence was awarded to the winners of CSEF Life Sciences and Physical Sciences Senior Divisions, and the High School Winner of the Fair's Urban School Challenge. Each of the winners received a solid silver medal, a \$1,000 honorarium, certificates of recognition, and a biography entitled *The Inventor's Dilemma: The Remarkable Life of H. Joseph Gerber* and written and autographed by his son, David Gerber. Each high school was also recognized with a Commendation Plaque and a \$500 donation to its science department to further science and mathematics education from the Academy. Students also received certificates of recognition from their US congressional representatives in recognition of their outstanding achievements. The Gerber Medal winners are:

**Shobhita Sundaram, Greenwich High School, Greenwich, CT**

2017 Connecticut Science & Engineering Fair - 1<sup>st</sup> Place, Life Sciences-Senior Division  
Project: *Detection of Premalignant Pancreatic Cancer via Computational Analysis of Serum Proteomic Profiles*



**Ethan Novek, Greenwich High School, Greenwich, CT**

2017 Connecticut Science & Engineering Fair - 1<sup>st</sup> Place, Physical Sciences-Senior Division  
Project: *Novel Low-Temperature Carbon Capture Using Aqueous Ammonia and Organic Solvents*



**Maya Geradi, Wilbur Cross High School, New Haven, CT**

2017 Connecticut Science & Engineering Fair - Urban School Challenge High School Winner  
Project: *A Study of Circadian Genetics and Abiotic Stress Towards Sustainable Agriculture*

Top (from left): CASE Honorary Member and CCAT President & CEO Elliot Ginsberg, Gerber Medal Winner Maya Geradi, and CASE President Laura Grabel.

Bottom: Gerber Medal Winner Ethan Novek.  
(Photos: Frank LaBanca)

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## Connecticut Science & Engineering Fair

The 2017 CSEF was held in March at Quinnipiac University in Hamden. To promote interest in science and engineering, and to recognize those high school students whose science projects are judged to be the best of the senior division the following major categories, Life Sciences and Physical Sciences, and the Urban School Challenge, the Academy provides special awards each year to these top CSEF winners. *(Please see the H. Joseph Gerber Medal of Excellence for a listing of the winners of this award.)*

In addition, the Academy recognizes the middle school winner of the Urban School Challenge with a \$250 honorarium. The school's science department is recognized with a Commendation Plaque and a \$500 donation for the purpose of furthering science and mathematics education. The Middle School winner is:

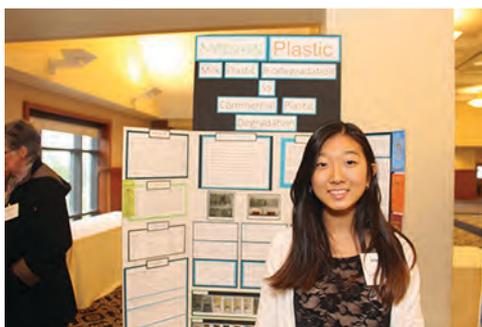
### **Madison Lee, Sport and Medical Sciences Academy, Hartford, CT**

Project: *Natural Plastic: Milk Plastic Biodegradation Versus Commercial Plastic Degradation*

### **Connecticut Junior Science and Humanities Symposium**

The Connecticut Junior Science and Humanities Symposium is sponsored by the University of Connecticut/UConn Health and is part of the national US Army, Navy, and Air Force sponsored Junior Science and Humanities Symposium. The Academy joined with other corporations and institutions in support of this event.

The 2017 symposium was held in March at UConn Health. The symposium has been effective in enhancing student motivation, stimulating original research and promoting the setting for exciting scientific meetings. It is intended to recognize students who have demonstrated intellectual achievement and promise. This event provides a forum for selected high school students to present a variety of technical papers and posters, meet in small discussion groups with leading scientists from Connecticut industries, and utilize special facilities at the university to explore technical and ethical challenges of current science. The Academy recognizes the top five oral presenters and their respective schools. The winners are as follows:



*Madison Lee, Connecticut Science and Engineering Fair, Urban School Challenge Middle School Winner. (Photo: Frank LaBanca)*

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**1<sup>st</sup> Place: Shobhita Sundaram, Greenwich High School, Greenwich, CT**

Project: *Detection of Premalignant Pancreatic Cancer via Computational Analysis of Serum Proteomic Profiles*

**2<sup>nd</sup> Place: William Yin, Greenwich High School, Greenwich, CT**

Project: *Portable, Low-Cost Tattoo-Based Biosensor for the Non-Invasive Self-Diagnosis and Quantification of Atherosclerosis*

**3<sup>rd</sup> Place: Haya Jarad, Amity Regional High School, Woodbridge, CT**

Project: *Identifying Quasi Periodic Patterns in fMRI Versus CBF Data*

**4<sup>th</sup> Place: Gabrielle Stonoha, Manchester High School, Manchester, CT**

Project: *Growth and Sustainability of Metarhizium on Low-nutrient Substrates*

**5<sup>th</sup> Place: Lauren Low,  
Engineering & Science  
University Magnet  
School, West Haven, CT**

Project: *A Novel Rapid Diagnostic Test for Zika Virus NS1 Protein Using Nanoribbon Microfluidics*

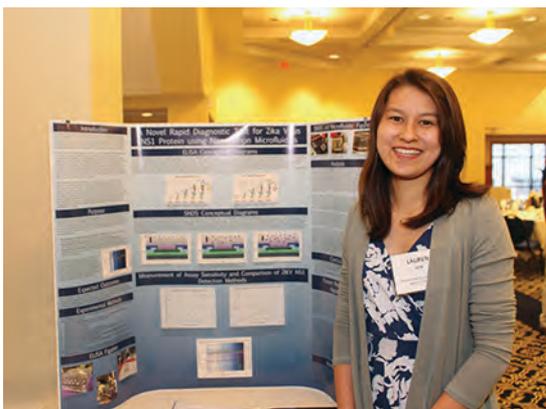
These students and their schools were recognized at the 2017 Annual Meeting and Dinner of the Academy.

The students received Certificates of Recognition and a \$250 honorarium.

Each high school was also recognized with a Commendation Plaque and a \$500 donation to its science department to further science and mathematics education from the Academy. Students also received certificates of recognition from their US congressional representatives.

### **Connecticut Invention Convention**

The Connecticut Invention Convention is a program that seeks to provide students in grades K-8 with a meaningful opportunity to develop and encourage creative thinking and invention. The Invention Convention program is designed to integrate all aspects of a student's educational experience in an effort to solve real-life problems by understanding and using creative skills. The convention provides an opportunity for student inventors to participate in a friendly competition and to share their ideas with each other as well as adult inventors, engineers, patent attorneys and other professionals.



*Lauren Low, Connecticut Junior Science and Humanities Symposium awardee. (Photo: Frank LaBanca)*



*Winners of the 2017 Gerber Medals, Connecticut Science & Engineering Fair, Connecticut Junior Science & Humanities Symposium and the Connecticut Invention Convention. (Photo: Frank LaBanca)*

For 2017, the Academy recognized the 15 middle and elementary school student winners of the Invention Convention with Certificates of Recognition and a \$50 certificate for the purchase of scientific equipment, books, or other science, technology, engineering and/or mathematics-related materials. Winners also received certificates of recognition from their US congressional representatives.



*CASE Connecticut Invention Convention Winner Shiven Patel. (Photo: Frank LaBanca)*

The 42<sup>nd</sup> Annual Meeting and Dinner of the Academy was held May 22, 2017, at the University of Connecticut. The event included a business meeting for members that provided a review of the activities and affairs of the Academy.

Approximately 250 Academy members and guests had an opportunity to meet with student science competition

award winners, who displayed their projects during the event's reception. Lt. Governor Nancy Wyman presented the 2017 Connecticut Medal of Science to Robert J. Schoelkopf, Sterling Professor of Applied Physics and Physics and Director of the Yale Quantum Institute at Yale University.



*CASE Member Kathleen McGroddy-Goetz, Vice President-Partnerships and Solutions, IBM Watson Health, delivers the keynote speech for the 42nd Annual Meeting of the Academy. (Photo: Frank LaBanca)*

During dinner, 24 newly elected members of the Academy were recognized. Additionally, 23 high school and middle school students of science and technology competitions were presented with awards during the Academy's celebratory Student Science Competition Awards Ceremony. The students and schools recognized by the Academy are listed under the "Special Activities" section of this report. Approximately \$10,000 was awarded to this year's winning students and their schools

The event included a keynote speech by CASE Member Kathleen McGroddy-Goetz, Vice President of Partnerships and Solutions at IBM Watson Health. McGroddy-Goetz discussed advances in cognitive computing. The evening also included a student presentation by two-time H. Joseph Gerber Medalist Ethan Novek, a senior at Greenwich High School, and founder of a company, Innovator Energy.

The Academy recognizes and thanks the following companies and organizations for their generous donations in support of the Annual Meeting: Bristol-Myers Squibb; Connecticut Center for Advanced Technology; Connecticut Economic Resource Center; Connecticut

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Technology Council; Eversource Energy; The Jackson Laboratory; Pratt & Whitney; TRC Environmental Corporation, Inc.; UConn Health; UConn School of Engineering; United Technologies Aerospace Systems; United Technologies Research Center; Wesleyan University; and Yale University.

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**CONNECTICUT ACADEMY OF SCIENCE  
AND ENGINEERING, INCORPORATED**

**Financial Statements  
and Independent Auditor's Report**

**YEAR ENDED JUNE 30, 2017  
(with comparative totals for 2016)**

CONNECTICUT ACADEMY OF SCIENCE  
AND ENGINEERING, INCORPORATED

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Statement of Cash Flows	5
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# INDEPENDENT AUDITOR'S REPORT

JOHN C. BURNS, CPA, LLC  
CERTIFIED PUBLIC ACCOUNTANT AND CONSULTANT

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## INDEPENDENT AUDITOR'S REPORT

To the Council of the Academy  
Connecticut Academy of Science & Engineering, Incorporated

I have audited the accompanying financial statements of the Connecticut Academy of Science & Engineering, Incorporated (a nonprofit organization), which comprise the statement of financial position as of June 30, 2017, and the related statements of activities, functional expenses and cash flows for the year then ended, and the related notes to the financial statements.

### **Management's Responsibility for the Financial Statements**

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

### **Auditor's Responsibility**

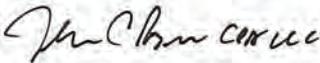
My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that I plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, I express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for my audit opinion.

### **Opinion**

In my opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Connecticut Academy of Science & Engineering, Incorporated as of June 30, 2017, and the changes in its net assets and its cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.



Farmington, Connecticut  
December 15, 2017

6 FOREST PARK DRIVE • FARMINGTON, CONNECTICUT 06032  
PHONE (860) 404-2930 • FAX (860) 255-7349  
john@johnburnscpa.com

# STATEMENT OF FINANCIAL POSITION

## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING INCORPORATED

### STATEMENT OF FINANCIAL POSITION JUNE 30, 2017

(with comparative totals for 2016)

	2017	2016
<b>ASSETS:</b>		
<b>Current Assets:</b>		
Cash and cash equivalents (Notes 2 and 3)	393,930	\$466,888
Investments (Notes 2 and 4)	26,201	26,224
Accounts receivable contracts (Note 2)	0	36,000
Unbilled amounts earned under contracts (Note 2)	31,005	0
Other assets	5,914	8,306
	<u>457,050</u>	<u>537,418</u>
<b>Fixed Assets:</b>		
Furniture and equipment	18,001	18,001
Less accumulated depreciation	(15,528)	(12,230)
	<u>2,473</u>	<u>5,771</u>
<b>Other Assets:</b>		
Investments, board designated endowment (Note 10)	208,515	188,776
	<u>\$668,038</u>	<u>\$731,965</u>
<b>TOTAL ASSETS</b>		
<b>LIABILITIES AND NET ASSETS:</b>		
<b>Current Liabilities:</b>		
Accounts payable and accrued expenses	\$85,975	\$48,185
Contract revenue received in advance (Notes 2 and 5)	23,239	9,850
	<u>109,214</u>	<u>58,035</u>
<b>Net Assets (Notes 2 and 6):</b>		
<b>Unrestricted:</b>		
Board designated endowment	210,321	190,582
Undesignated	334,779	454,036
	<u>545,100</u>	<u>644,618</u>
Temporarily restricted	13,724	29,312
	<u>558,824</u>	<u>673,930</u>
	<u>\$668,038</u>	<u>\$731,965</u>
<b>TOTAL LIABILITIES AND NET ASSETS</b>		

See notes to financial statements

# STATEMENT OF ACTIVITIES

## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING INCORPORATED

### STATEMENT OF ACTIVITIES YEAR ENDED JUNE 30, 2017 (with comparative totals for 2016)

	2017			2016
	Unrestricted	Temporarily Restricted	Total	Total
<b>REVENUES</b>				
Contracts (Note 5)	\$372,211		\$372,211	\$768,494
Contributions (Note 2)	38,380	-	38,380	37,750
Membership dues	47,100		47,100	46,950
Interest income	4,671		4,671	4,603
Investment gains(loss)	(3,096)		(3,096)	6,195
Report fees and miscellaneous income	0		0	438
Contributed services (Note 2)	0		0	26,983
<b>TOTAL REVENUES BEFORE NET ASSETS FROM RESTRICTIONS</b>	<b>459,266</b>	<b>-</b>	<b>459,266</b>	<b>891,413</b>
Net assets released from restrictions (Note 6):	15,588	(15,588)	0	0
<b>TOTAL REVENUES</b>	<b>474,854</b>	<b>(15,588)</b>	<b>459,266</b>	<b>891,413</b>
<b>EXPENSES (Note 2):</b>				
Program services:				
Publications	33,342	0	33,342	31,952
Technical guidance and information	294,164	0	294,164	581,054
Awards	16,558	0	16,558	12,883
Total program services	344,064	0	344,064	625,889
Support Services:				
Management and general	230,110	0	230,110	214,954
Fund raising	198	0	198	199
Total support services	230,308	0	230,308	215,153
<b>TOTAL EXPENSES</b>	<b>574,372</b>	<b>0</b>	<b>574,372</b>	<b>841,042</b>
<b>CHANGE IN NET ASSETS</b>	<b>(99,518)</b>	<b>(15,588)</b>	<b>(115,106)</b>	<b>50,371</b>
<b>NET ASSETS, BEGINNING OF YEAR</b>	<b>644,618</b>	<b>29,312</b>	<b>673,930</b>	<b>623,559</b>
<b>NET ASSETS, END OF YEAR</b>	<b>\$545,100</b>	<b>\$13,724</b>	<b>\$558,824</b>	<b>\$673,930</b>

See notes to financial statements.

# STATEMENT OF FUNCTIONAL EXPENSES

## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING INCORPORATED

### STATEMENT OF FUNCTIONAL EXPENSES YEAR ENDED JUNE 30, 2017 (with comparative totals for 2016)

	2017				2016				
	PROGRAM SERVICES		SUPPORT SERVICES		PROGRAM SERVICES		SUPPORT SERVICES		
	Publications	Technical Guidance & Information	Awards	Total Program Services	Management & General	Fund Raising	Total Support Services	2017 Total Program & Support	2016 Total
Professional services	\$26,832	\$269,283	\$846	\$296,961	\$158,904	\$0	\$158,904	\$455,865	\$606,032
Professional services in-kind (Note 2)	0	0	0	0	0	0	0	0	26,983
Employee benefits	581	14,220	124	14,925	26,264	0	26,264	41,189	35,455
Rent	312	624	0	936	2,886	78	2,964	3,900	3,900
Office expenses	487	1,534	0	2,021	17,839	0	17,839	19,860	22,428
Insurance	217	434	0	651	2,010	54	2,064	2,715	2,674
Travel and subsistence	0	6,644	0	6,644	577	0	577	7,221	6,021
Council activities	0	0	0	0	4,763	0	4,763	4,763	4,722
Membership activities	0	0	0	0	12,183	0	12,183	12,183	24,495
Awards and prizes	0	0	15,388	15,388	0	0	0	15,388	12,667
Printing	4,649	897	0	5,546	495	0	495	6,041	13,697
Sponsorships	0	0	0	0	1,750	0	1,750	1,750	2,020
Depreciation (Note 2)	264	528	0	792	2,439	66	2,505	3,297	3,388
<b>TOTAL EXPENSES</b>	<b>\$33,342</b>	<b>\$294,164</b>	<b>\$16,558</b>	<b>\$344,064</b>	<b>\$230,110</b>	<b>\$108</b>	<b>\$230,308</b>	<b>\$574,372</b>	<b>\$764,502</b>

# STATEMENT OF CASH FLOWS

CONNECTICUT ACADEMY OF SCIENCE  
AND ENGINEERING INCORPORATED

STATEMENT OF CASH FLOWS  
YEAR ENDED JUNE 30, 2017  
(with comparative totals for 2016)

	<u>2017</u>	<u>2016</u>
CASH FLOWS FROM OPERATING ACTIVITIES		
Change in net assets	\$ (115,106)	\$ 50,371
Adjustments to reconcile change in net assets to net cash provided by operating activities:		
Net unrealized (gains) losses on investments	3,096	(6,195)
Depreciation	3,297	3,388
Change in operating assets and liabilities:		
Accounts receivable contracts	36,000	(36,000)
Unbilled amounts earned under contracts	(31,005)	57,107
Other assets	2,392	(2,856)
Accounts payable and accrued expenses	37,790	2,386
Contract revenue received in advance	13,389	6,850
Total adjustments	<u>64,959</u>	<u>24,680</u>
Net cash provided by operating activities	<u>(50,147)</u>	<u>75,051</u>
CASH FLOWS FROM INVESTING ACTIVITIES		
Purchase of investments	(22,811)	(23,653)
Purchase of furniture and equipment	<u>0</u>	<u>(990)</u>
Net cash used in investing activities	<u>(22,811)</u>	<u>(24,643)</u>
INCREASE IN CASH AND CASH EQUIVALENTS	(72,958)	50,408
CASH AND CASH EQUIVALENTS, BEGINNING OF YEAR	<u>466,888</u>	<u>416,480</u>
CASH AND CASH EQUIVALENTS, END OF YEAR	<u>\$ 393,930</u>	<u>\$ 466,888</u>

See notes to financial statement

# NOTES TO FINANCIAL STATEMENTS

## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING, INCORPORATED

### NOTES TO FINANCIAL STATEMENTS JUNE 30, 2017

(with comparative totals for 2016)

#### NOTE 1 – NATURE OF OPERATIONS

The Connecticut Academy of Science and Engineering, Incorporated (Academy) was established to foster science and engineering, to promote the application of science and engineering to human health and welfare, and to study and report upon any subject within its competence when appropriate.

The Academy is a not-for-profit organization established under Special Act No. 76-53 of the State of Connecticut and incorporated under the Non-stock Corporation Act of the State of Connecticut.

#### NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

##### Net Asset Classes

The net asset classes of the Academy consist of the following:

##### Unrestricted Net Assets

Unrestricted net assets are net assets that are not subject to donor-imposed restrictions and may be used for any operating purpose of the Academy.

##### Temporarily Restricted Net Assets

Temporarily restricted net assets are net assets that are subject to donor-imposed stipulations that require the passage of time and/or the occurrence of a specific event, for them to be used.

##### Cash and Cash Equivalents

Cash and cash equivalents represent cash in checking accounts, money market funds or short-term investments with original maturities of three months or less, other than those held in the board designated investment endowment account.

##### Investments

The Academy records investments in marketable securities with readily determinable fair values at their fair values in the statements of financial position. Realized and unrealized gains and losses are reported in the statement of activities.

##### Accounts Receivable Contracts, Unbilled Amounts Earned Under Contracts and Contract Revenue Received in Advance

Accounts receivable - contracts consist of fees earned on contracts in progress, but not yet received. In the opinion of management, all accounts receivable at June 30, 2017 and 2016 are deemed collectible.

Unbilled amounts earned under contracts consist of fees earned on contracts in progress, but not yet billed. Contract amounts considered earned are recognized as revenue when the work is performed.

Contract revenue received in advance consists of contract fees received, but not yet earned.

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CONNECTICUT ACADEMY OF SCIENCE  
AND ENGINEERING, INCORPORATED

NOTES TO FINANCIAL STATEMENTS  
JUNE 30, 2017  
(with comparative totals for 2016)

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Furniture and Equipment

All acquisitions or donations of furniture and equipment are reflected at cost or their fair value at the date of gift. Depreciation is provided for over the estimated useful lives of the assets, which range from five to seven years, on a straight-line basis.

Contributions

Contributions received are recorded as unrestricted, temporarily restricted or permanently restricted support depending on the existence or nature of any donor restrictions.

Contributed Services

Contributed services have been provided by a number of unpaid volunteers who have contributed their time. The members of the Academy and their peers have donated significant amounts of time to the Academy's program services. Contributed services are recognized if the services received create or enhance nonfinancial assets or require specialized skills, are provided by individuals possessing those skills, and would typically need to be purchased if not provided by donation. Contributed services that do not meet the above criteria are not recognized.

Contributed services and related expenses meeting the criteria for recognition provided for the Technical Guidance and Information Program was \$0 and \$26,983 for the years ended June 30, 2017 and 2016, respectively.

Functional Expenses

The costs of providing the various programs and other activities have been summarized on a functional basis on the accompanying Statement of Activities. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

The Academy's Program Services are as follows: "Publications" represents the production and distribution of quarterly bulletins; "Technical Guidance and Information" represents the providing of information and advice on science and technology to government, industry and citizens of Connecticut; and "Awards" represents a student awards program to recognize achievements related to science and technology.

The Academy's Support Services are as follows: "Management and General" represents expenses incurred in support of the general operation and management of the Academy; and "Fund Raising" represents expenses related to fund raising activities in support of the Science and Technology activities and the operation and general affairs of the Academy.

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CONNECTICUT ACADEMY OF SCIENCE  
AND ENGINEERING, INCORPORATED

NOTES TO FINANCIAL STATEMENTS  
JUNE 30, 2017  
(with comparative totals for 2016)

NOTE 2 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (continued)

Income Taxes

The Academy is a not-for-profit organization and is exempt from federal taxes as a public charity under section 501(C)(3) of the Internal Revenue Code. Accordingly, no provision for income taxes has been made in the accompanying financial statements. The Academy's informational returns for the years ended June 30, 2014 through 2017 are open for examination by the Internal Revenue Service.

Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Reclassifications

Certain amounts in the 2017 financial statements have been reclassified to conform to the 2016 financial statement presentation.

Subsequent Events

Management has evaluated subsequent events through December 15, 2017, the date the financial statements were available to be issued. Through that date, there were no material events that would require recognition or additional disclosure in the financial statements.

NOTE 3 - CONCENTRATIONS OF CREDIT AND MARKET RISK

Financial instruments, which could potentially subject the Academy to concentration of credit risk, consist principally of cash and cash equivalents, investments and support from governmental agencies.

At times, cash and cash equivalents exceed the amount insured by the Federal Deposit Insurance Corporation, however the Academy has not suffered, nor expects to suffer, any losses from such concentrations.

The Academy receives approximately 81% of its total revenue and support from various governmental agencies. A significant reduction in the level of this support, if this were to occur, could have a significant impact on the Academy's programs and activities. At June 30, 2017, approximately \$31,005 of accounts receivable and unbilled amounts earned under contracts are due from governmental agencies.

**CONNECTICUT ACADEMY OF SCIENCE  
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**NOTES TO FINANCIAL STATEMENTS  
JUNE 30, 2017**

(with comparative totals for 2016)

**NOTE 4 - INVESTMENTS**

Investments valued based upon quoted market prices are composed of the following as of June 30:

	<u>2017</u>		<u>2016</u>	
	<u>Cost</u>	<u>Fair Value</u>	<u>Cost</u>	<u>Fair Value</u>
Money market funds	\$104,091	\$104,091	\$ 82,568	\$ 82,568
Corporate bonds	<u>122,864</u>	<u>130,625</u>	<u>122,864</u>	<u>132,432</u>
	<u>\$226,955</u>	<u>\$234,716</u>	<u>\$205,432</u>	<u>\$ 215,000</u>

**NOTE 5 - CONTRACT ARRANGEMENTS**

During the years ended June 30, 2017 and 2016 the Academy applied to the Connecticut General Assembly, other State Agencies and public companies for funding in the form of Personal Service Agreements. The Academy has obtained various contracts aggregating \$471,700 and \$452,500 during the years ended June 30, 2017 and 2016, respectively. Certain services are provided by the members of the Academy on a volunteer basis, but do not meet the criteria to be recognized in the accompanying financial statements (Note 2).

Contracts, accounts receivable – contracts and contract revenue as of and for the year ended June 30, 2017 consisted of the following:

<u>Agency</u>	<u>Accounts Receivable- Contracts</u>	<u>Unbilled Amounts Earned Under Contracts</u>	<u>Contract Rev. Year End June 30, 2017</u>
Connecticut Center for Advanced Technology	\$ 0	\$ 0	\$ 3,000
Connecticut Department of Transportation	0	31,005	356,211
Connecticut Science Center	0	0	500
California Council on Science & Technology	<u>0</u>	<u>0</u>	<u>12,500</u>
Totals	<u>\$ 0</u>	<u>\$ 31,005</u>	<u>\$372,211</u>

**NOTE 6 - NET ASSETS**

Net assets released from donor-restriction by incurring expenses satisfying the purposes of contributions restricted to various Academy programs, amounted to \$15,588 and \$9,667 for the years ended June 30, 2017 and 2016, respectively.

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NOTE 6 - NET ASSETS (continued)

Temporarily restricted net assets at June 30, 2017 consist of \$13,724 for Student Awards. Net assets temporarily restricted at June 30, 2016 consist of \$29,312 for Student Awards.

Unrestricted board designated net assets at June 30, 2017 and 2016 consist of amounts set aside for the Academy Endowment.

NOTE 7 - DEFINED CONTRIBUTION PLAN

The Academy maintains a simple defined contribution plan for its employees. The Academy matches 100% of the first 3% of each employee's contributions. The amount contributed by the Academy was \$6,563 and \$6,503 for the years ended June 30, 2017 and 2016, respectively.

NOTE 8 - OPERATING LEASE

The Academy has a lease for office equipment which expires in September 2019. The monthly lease payment is \$164. As of June 30, 2017, future minimum lease payments under the operating lease in each of the years subsequent to June 30, 2017 are as follows:

<u>Year Ending</u> <u>June 30,</u>	
2018	\$ 1,972
2019	1,972
2021	<u>411</u>
	<u>\$ 4,355</u>

The rental expense for the operating lease for the years ended June 30, 2017 and 2016 was \$1,972 and \$1,972, respectively

NOTE 9 - FAIR VALUE MEASUREMENTS

The fair value hierarchy in FASB ASC Topic 820 prioritizes fair value measurements into three levels based on the nature of the inputs. The three levels of the fair value hierarchy under FASB ASC Topic 820 are as follows:

Level 1 - Investments in this category are valued based on quoted prices in active markets for identical assets that are accessible at the measurement date. An active market is a market in which transactions for the asset occur with sufficient frequency and volume to provide pricing information on an ongoing basis.

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NOTE 9 – FAIR VALUE MEASUREMENTS (continued)

Level 2 – Investments in this category are valued based on inputs, in the absence of actively quoted market prices, which are observable for the asset, either directly or indirectly. Level 2 inputs include: (a) quoted prices for similar assets in active markets, (b) quoted prices for identical or similar assets in markets that are not active, (c) inputs other than quoted prices that are observable for the asset such as interest rates and yield curves observable at commonly quoted intervals, and (d) inputs that are derived principally from or corroborated by observable market data by correlation or other means.

Level 3 – Investments in this category are valued based on unobservable inputs for assets. Unobservable inputs are used to the extent observable inputs are not available, thereby allowing for situations in which there is little, if any, market activity for the asset at the measurement date.

The asset's or liability's fair value measurement level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement.

The following is a summary of the Academy's investments by level, within the fair value hierarchy as of June 30, 2017

	Fair value measurement using input considered as:			
	Level 1	Level 2	Level 3	Total
Money market funds	\$104,091	\$ 0	\$ 0	\$104,091
Corporate bonds	0	130,625	0	130,625
	<u>\$104,091</u>	<u>\$130,625</u>	<u>\$ 0</u>	<u>\$234,716</u>

The following is a summary of the Academy's investments by level, within the fair value hierarchy as of June 30, 2016

	Fair value measurement using input considered as:			
	Level 1	Level 2	Level 3	Total
Money market funds	\$ 82,568	\$ 0	\$ 0	\$ 82,568
Corporate bonds	0	132,432	0	132,432
	<u>\$ 82,568</u>	<u>\$132,432</u>	<u>\$ 0</u>	<u>\$215,000</u>

NOTE 10 – BOARD DESIGNATED ENDOWMENT

The Academy's endowment consists of a fund designated by the Board to function as an endowment with the purpose of enhancing the Academy's mission, especially relative to informing the public and engaging youth in science and technology. As required by accounting principles generally accepted in the United States of America, net assets associated with endowment funds, including funds designated by the Board to function as endowments, are classified and reported based on the existence or absence of donor-imposed restrictions. The endowment consists of unrestricted monies designated by the board for investment to fund future Academy activities.

Investment Return Objectives and Risk Parameters

The objectives of the investment portfolio of the Academy include the preservation of capital, generation of income and capital appreciation such that the value of invested assets keeps up with the rate of inflation. Endowment assets will be held in cash and cash equivalents and bonds.

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**NOTE 10 – BOARD DESIGNATED ENDOWMENT (continued)**

**Spending Policy and How the Investment Objectives Relate to Spending Policy**

The Academy Endowment Fund spending rules provide for a maximum annual draw from the fund of 3% of the fund balance, plus \$2,000 per year.

The changes in the Academy's endowment fund are as follows:

	<u>Board-Designated Unrestricted</u>	<u>Total</u>
Endowment assets, June 30, 2015	\$ 162,186	\$162,186
Investment return:		
Investment income	3,332	3,332
Unrealized gains	4,814	4,814
Total investment return	<u>8,146</u>	<u>8,146</u>
Additions to endowment funds	25,250	25,250
Amounts appropriated for expenditure	<u>(5,000)</u>	<u>(5,000)</u>
	<u>20,250</u>	<u>20,250</u>
Endowment assets, June 30, 2016	<u>190,582</u>	<u>190,582</u>
Investment return:		
Investment income	3,335	3,335
Unrealized loss	<u>(2,676)</u>	<u>(2,676)</u>
Total investment return	<u>659</u>	<u>659</u>
Additions to endowment funds	24,080	24,080
Amounts appropriated for expenditure	<u>(5,000)</u>	<u>(5,000)</u>
	<u>19,080</u>	<u>19,080</u>
Endowment assets, June 30, 2017	<u>\$ 210,321</u>	<u>\$ 210,321</u>
Endowment assets are comprised of the following at June 30,:		
	<u>2017</u>	<u>2016</u>
Money market fund	\$105,897	\$ 84,374
Corporate bonds	<u>104,424</u>	<u>106,208</u>
Total endowment	<u>\$ 210,321</u>	<u>\$190,582</u>



# MAJOR STUDIES OF THE ACADEMY

## 2017

- Innovative Technology Deployment: Development of a Virtual Screening Facility Pilot Project for Connecticut's Commercial Vehicle Enforcement Program

## 2016

- Strategies for Improving Transportation Project Delivery Performance
- Early Childhood Regression Discontinuity Study
- Connecticut Disparity Study: Phase 3

## 2015

- Winter Highway Maintenance Operations: Connecticut
- Addressing Family Violence in Connecticut: Strategies, Tactics and Policies
- Shared Clean Energy Facilities

## 2014

- Methods to Measure Phosphorus and Make Future Predictions
- Energy Efficiency and Reliability Solutions for Rail Operations and Facilities
- Connecticut Biomedical Research Program: Analysis of Key Accomplishments
- Connecticut Disparity Study: Phase 2
- Peer Review of a CL&P/UConn Report Concerning Emergency Preparedness and Response at Selective Critical Facilities

## 2013

- Analyzing the Economic Impacts of Transportation Projects
- Health Impact Assessments Study
- Connecticut Disparity Study: Phase I
- Connecticut Stem Cell Research Program Accomplishments

## 2012

- Strategies for Evaluating the Effectiveness of Programs and Resources for Assuring Connecticut's Skilled Workforce Meets the Needs of Business and Industry Today and in the Future

- Benchmarking Connecticut's Transportation Infrastructure Capital Program with Other States
- Alternative Methods for Safety Analysis and Intervention for Contracting Commercial Vehicles and Drivers in Connecticut

## 2011

- Guidelines for the Development of a Strategic Plan for Accessibility to and Adoption of Broadband Services in Connecticut
- Advances in Nuclear Power Technology

## 2010

- Environmental Mitigation Alternatives for Transportation Projects in Connecticut
- The Design-Build Contracting Methodology for Transportation Projects: A Review of Practice and Evaluation for Connecticut Applications
- Peer Review of an Evaluation of the Health and Environmental Impacts Associated with Synthetic Turf Playing Fields

## 2009

- A Study of the Feasibility of Utilizing Waste Heat from Central Electric Power Generating Stations and Potential Applications
- Independent Monitor Report: Implementation of the UCHC Study Recommendations

## 2008

- Preparing for Connecticut's Energy Future
- Applying Transportation Asset Management in Connecticut

## CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING

805 Brook Street, Building 4-CERC

Rocky Hill, CT 06067

Phone: 860-571-7143

e-mail: [acad@ctcase.org](mailto:acad@ctcase.org) • web: [www.ctcase.org](http://www.ctcase.org)