



The Honorable Daniel J. McKee
Governor of the State of Rhode Island

January 23, 2023

The Honorable K. Joseph Shekarchi
Speaker of the House of Representatives

The Honorable Dominick J. Ruggiero
President of the Senate

RE: Report on the Science and Technology Advisory Council for Calendar Year 2022

Dear Governor McKee, Speaker Shekarchi, and President Ruggiero,

We are pleased to submit this report pursuant to RI Gen L § 42-143-4.

Science and technology are life blood for Rhode Island—they represent crucial economic drivers for the state through industries like marine trades and the blue economy, life sciences and public health, energy, advanced materials, and food innovation. This is true now more than ever. Since its inception in 2005, the Science and Technology Advisory Council (STAC) has been charged to facilitate collaboration and synergies between research and its impact on local economic development, and to work to ensure that the science research and technology development taking place in the state's institutions are being leveraged to support commercial development and innovation in Rhode Island. This linkage is critical: If partnered properly with state efforts, university research can catalyze economic development. And STAC is uniquely positioned to forge this linkage.

In 2022, the Council has begun to revitalize the role of STAC—connecting it more deeply to essential efforts and investments in the blue economy and life sciences, providing stronger communications and support for R&D efforts driven by our businesses, and more closely connecting the STAC Council and its expertise to the efforts and priorities of the Governor and of RI Commerce.

In the coming year, STAC will focus on expanding the expertise we have on the Council, updating the state's Science and Technology Plan in alignment with RI2030 and the Comprehensive Economic Development Strategy, and advocating for targeted investments in biomedical and blue economy research and economic development, including the development of infrastructure and commercial lab space, to ensure the state stays ahead of the scientific advances needed to be truly competitive.

We welcome further engagement with the General Assembly on these important topics.

Sincerely,

Handwritten signature of Pete Snyder in black ink.

Handwritten signature of Jill Pipher in black ink.

Pete Snyder and Jill Pipher
Co-Chairs of the Science and Technology Advisory Council

Science and Technology Advisory Council | 2022 Annual Report

The **Science and Technology Advisory Council (STAC)** was launched by executive order in 2005 and sustained by statute in 2006 to make science and technology innovation central to the state's leadership agenda.

STAC seeks to assist state leadership in developing programs and policies that:

- (1) **Increase research & development** leading to new products, more-efficient production methods, and new business growth in Rhode Island—which hopefully highlights the connection between new ideas and the supports needed to sustain them.
- (2) **Encourage Entrepreneurship** through the transfer of new technologies and discoveries into the marketplace; and
- (3) **Enable Innovation** through supporting an environment rich in talent, capital, and ideas that can create new products for world markets.

Executive Summary

2022 was a year of regrowth for STAC, as innovation, technology, and science forge an even stronger role in Rhode Island's economic efforts. This year, STAC has awarded 41 grants within its programming.

In 2023, the STAC Council's planned focus areas are:

- ✦ Expanding the expertise currently on the STAC Council;
- ✦ Updating the state's Science and Technology Plan in alignment with RI2030 and the State's upcoming Comprehensive Economic Development Strategy;
- ✦ Advocating for targeted investments in biomedical and blue economy research and economic development—as well as the infrastructure necessary to support them—and connecting more deeply with these essential efforts to ensure the state stays ahead of the scientific advances needed to be truly competitive;
- ✦ Continuing the Council's existing programming through fiscal year appropriations to serve small businesses and science and technology innovation in Rhode Island;
- ✦ Providing stronger communications and support for R&D efforts driven by our businesses; and
- ✦ More closely connecting STAC and its expertise to the efforts and priorities of the Governor, General Assembly, and of RI Commerce.

Overview & Background

STAC seeks to assist state leadership in developing programs and policies that: (1) Increase research and development by increasing Rhode Island's R&D capacity; (2) Encourage Entrepreneurship through the transfer of new technologies and discoveries into the marketplace; and (3) Enable Innovation, which depends on an environment rich in talent, capital, and ideas that can create new products for world markets.

Council membership consists of leaders in academic, business, and public sectors who work collaboratively to advance these important issues. Council members meet on a regular basis to review progress and develop new recommendations for enhancing research and development, supporting entrepreneurial activity, and increasing innovation in Rhode Island.

Innovate RI Small Business Fund (IRISBF)

The federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs represent the largest source of early-stage, high-risk technology financing in the United States. Federal agencies participating in this program provide seed capital for early-stage research and development projects leading to commercialization of resulting products or services. The programs are designed to benefit entrepreneurs and small businesses—while increasing the competitiveness of the U.S. economy—by funding the development of innovative products and services. Agencies award grants to explore the technical merit of an idea or technology in response to a specific agency topical need.

In 2013, the Rhode Island General Assembly created the Innovate Rhode Island Small Business Fund (IRISBF) to make available to Rhode Island businesses with 50 or fewer employees to defray the cost of applying for SBIR/STTR awards, match SBIR/STTR Phase I and Phase II awards, and hire interns. The goals of the program are to:

- Leverage state funds to encourage and support Rhode Island entrepreneurial participation in the federal SBIR/STTR programs;
- Increase the amount of federal research dollars received by Rhode Island firms;
- Sustain companies through the early stages of product development;
- Encourage the establishment of high potential, high quality, high growth ventures in Rhode Island; and
- Enhance the talent pipeline in the biosciences and engineering fields.

Collaborative Research Grants

In 2006, STAC launched the RI Research Alliance to create a statewide platform to promote collaboration across the state's research organizations. The Alliance manages the Collaborative Research Grant Program, which provides funding to projects that focus on building research capacity across institutions and advancing the competitiveness of RI researchers to secure additional funding. Grants are also awarded to projects that contribute to current or future economic development of the state through technology development and commercialization or that demonstrate strong translational components. Since its inception, the Alliance has awarded over \$11 million in state funds through the Collaborative Research Grant Program, with the goal of stimulating cutting-edge cross-institutional research projects.

By the Numbers | Program Efficacy to Date

The IRISBF has four granting programs

1. Grants of up to \$3,000 to assist small businesses offset the costs associated with preparing a competitive Phase I SBIR/STTR application.
2. Matching grants of up to \$45,000 to encourage recipients of SBIR/STTR Phase I awards to pursue the more substantial Phase II awards.
3. Matching grants of up to \$100,000 to assist recipients of SBIR/STTR Phase II awards with commercialization efforts.
4. Grants of up to \$3,000 to assist companies in the life sciences and engineering sectors defray the cost of providing internships and mentoring to eligible Rhode Island residents attending a Rhode Island college or university.

IRISBF efficacy since inception

Since launch of the IRISBF in August of 2013, ninety-five unique companies have received 408 grants totaling \$6.9 million. The Fund has received \$8 million to date in state funding.

95 state matching grants totaling \$6,030,155. This has, in turn, leveraged over \$50 million in federal funding, over an eight time return on our state's investment.

Companies participating in the Fund have added staff, expanded facilities, and attracted additional investment.

Additionally, the program provides grants to support internship placements—a critical component of the Fund—as it connects businesses to new talent and Rhode Island talent to our growing businesses. To date, 187 internship grants have been awarded.

IRISBF Year in Review

In 2022, the IRISBF awarded:

- 9 grants under the proposal incentive grant (Phase 0) totaling \$23,539
- 12 grants under the SBIR/STTR Phase 1 Matching grant totaling \$461,999
- 2 grants under the SBIR/STTR Phase 2 Matching grant totaling \$175,000
- 18 internship grants totaling \$48,000

IRISBF Case Studies

Flux Marine Ltd. Bristol, RI

- Flux Marine was awarded an SBIR Proposal Incentive grant in February 2020 as well as another in March 2021. In May 2021, a SBIR Phase 1 matching grant was awarded based on their successful SBIR Phase 1 award from the National Science Foundation. After this, the Flux Marine team raised \$15.5 million in an oversubscribed Series A funding round led by Ocean Zero LLC (March 2022) and were, at the same time, approved for award under the RI Commerce

Qualified Jobs Incentive Tax Credit Program. Note: Flux Marine was also awarded an Innovation Voucher from RI Commerce, in collaboration with the University of RI in 2021.

American Ecotech L.C. Warren, RI

- American Ecotech was awarded an SBIR Proposal Incentive grant in March 2021 and then received an SBIR Phase 1 award from US Air Force in April 2021—as well as an SBIR/STTR Phase 1 matching grant attached to that award. The company has since received six more SBIR/STTR awards and correlated matching funds and reported eight new positions added.

Circadian Processing Systems, Inc. Newport, RI

- After first receiving an innovation voucher from RI Commerce, Circadian took advantage of STAC's SBIR/STTR Proposal Incentive Grant and were then awarded an SBIR Phase 1 award from the National Science Foundation in November 2020—for which STAC provided match. Within two years, Circadian has been granted patents and have additional pending and NASA has begun to test, and publish on, their technology. In 2022, the company was also admitted into and completed the Creative Destruction Labs (CDL) program, which is designed for seed-stage science- and technology-based companies with potential to scale massively.

Note: All IRISBF awards are further detailed in quarterly reports submitted by the RI Commerce Corporation and available at <https://commerceri.com/about-us/open-government-transparency/>.

RI Research Alliance

The Collaborative Research Grant program provides funding to projects that focus on building research capacity across institutions and advancing the competitiveness of RI researchers to secure additional funding. Grants are also awarded to projects that contribute to current or future economic development of the state through technology development and commercialization or demonstrate strong translational components.

2022 STAC Collaborative Research Grants

Five interdisciplinary research teams were selected to receive funding, totaling \$399,239, from the Science & Technology Advisory Council (STAC) this year. Research projects directly address the RI National Science Foundation EPSCoR proposed program themes of:

- (1) Assessing Resilience: What are the key data, methods, and/or techniques needed to assess the current health of Narragansett Bay and its resilience to anthropogenic stressors in real time?
- (2) Understanding complexity: How can our understanding and data collections of the physical, biogeochemical and ecological processes that contribute to coastal ecosystem complexity be used to improve and evaluate Narragansett Bay ecosystem models?
- (3) New Innovations: What new innovations in sensors are needed to improve the collection of data on the physical, biogeochemical, and ecological processes as well as anthropogenic stressors (e.g., pollution) that are impacting Narragansett Bay?
- (4) Increasing Engagement: How can novel approaches to the visualization of complex information, coastal species and environmental change, fostered through the collaboration of artists, designers,

engineers and scientists, promote broader engagement in and understanding of scientific research, data, and findings?

- (5) Improving Sustainability: How does the coastal environment affect humans and how can human behavior and responses be modified to improve coastal ecological and economic sustainability
- (6) Big Data: What new tools or techniques are needed to capture, analyze, and disseminate large data sets that engage and inform academic, industry, government and community stakeholders?

2022 Collaborative Research Grant Awardees

Metagenomics and Metatranscriptomics to Profile Microbial Activity as a Determinant of Methane Production in Narragansett Bay Sediment (\$80,000)

- Dr. Peter Belenky, Assist. Professor of Molecular Microbiology and Immunology – Brown University PI
- Dr. Roxanne Beinart, Assist. Professor URI Graduate School of Oceanography – University of Rhode Island

Streamlining marine sensors development by improving testing infrastructure (\$79,296)

- Dr. Vinka Craver, Professor, Civil and Environmental Engineering – University of Rhode Island PI
- Dr. Lindsay Green-Gavrielidis, Assist. Professor, Biology and Biomedical Sciences – Salve Regina University
- Dr. Carol Thornber, Professor, Natural Resources Science and Director, University Research Operations – University of Rhode Island
- Dr. Lucie Maranda, Assoc. Marine Research Scientist, Emerita – University of Rhode Island

Multi-scale modeling of bacterial plankton-mediated nutrient cycling in the Narragansett Bay (\$79,995)

- Dr. Kei Inomura, Assist. Professor – University of Rhode Island, GSO PI
- Dr. Ying Zhang, Assoc. Professor – University of Rhode Island, CMB/CELS
- Dr. Katia Zolotovskiy, Assist. Professor – Rhode Island School of Design

Testing the ontogenetic migration hypothesis in the emerging Rhode Island Jonah crab fishery with novel molecular isotope geochemistry and acoustic tagging. (\$79,948)

- Dr. Kelton McMahon, Assist. Professor – University of Rhode Island, GSO PI
- Dr. Melissa Omand, Assoc. Professor – University of Rhode Island, GSO
- Dr. Skylar Bayer, Assist. Professor – Roger Williams University
- Ms. Corinne Truesdale, Supervising Biologist Rhode Island Department of Environmental Management, Division of Marine Fisheries

Parameterizing nutrient recycling from plankton interactions for ecosystem modeling (\$80,000)

- Dr. Susanne Menden-Deuer, Ph.D. – Professor - University of Rhode Island PI
- Dr. Sarah Knowlton, Professor – Rhode Island College
- Dr. Heather McNair, Postdoctoral Fellow – University of Rhode Island, GSO

Priorities & Recommendations for 2023

In 2009 and again in 2014, the RI Science and Technology Advisory Council (STAC) identified three priority Science and Technology (S&T) domains: marine sciences, life sciences and energy and environment. These domains were recognized economic drivers in the State over the past six years and have persisted through the pandemic. In 2021, an update to the state's science and technology plan includes two additional complementary domains (advanced materials and food innovation and technology), as well as updated focus areas within each domain.

All five S&T domains meet the following criteria:

- 1) Tackle complex global societal challenges;
- 2) Demonstrate RI's leadership and expertise;
- 3) Leverage RI's geography, population and assets;
- 4) Provide local to global scalable solutions; and
- 5) Offer clear opportunities for intersection and collaboration across domains.

2021 updated priority science and technology domains (1) Marine Sciences, (2) Life Sciences and Public Health, (3) Energy, (4) Advanced Materials, (5) Food Innovation & Technology,

2023 Core Priority 1: Aligning STAC efforts and expertise directly to State economic development priorities

The State is undergoing two connected, required, and important economic development planning efforts in 2023: the statutorily required Long-Term Economic Development Vision and Policy as well as the Comprehensive Economic Development Strategy (CEDS), an update to which is required by the Economic Development Agency (EDA) in order to continue to unlock federal EDA funding. Similarly, STAC will be required to update the State's Science and Technology Plan in alignment with a new EPSCoR award period. This is a great moment of opportunity to align strategies, best leverage resources, find efficiencies and economies of scale, and set Rhode Island up for a successful path to further science and technology innovation, and economic development, for the next five years.

2023 Core Priority 2: Engage deeply in the Blue Economy and Life Sciences efforts in state to ensure federal research funding, higher education research, and commercial research are aligned in support of these efforts

Over 120 entities in the state have engaged in two years of strategic conversation and planning to arrive at a bold, workable, and important vision for Blue Economy growth and Life Sciences growth in Rhode Island. We are at an inflex moment for both Blue Economy and Life Sciences in Rhode Island. There is momentum with the announcement of the construction for the new RIDOH State Health Lab, planning for the Brown University Life Sciences Building in the Jewelry District, the additional wet lab space being built out at 225 Dyer Street, and a \$50M investment in life sciences in the Governor's proposed FY24 budget. Recent announcements of an oyster hatchery as part of the state's Innovation Campus initiative and a newly awarded seafood wastewater treatment facility feasibility study with the town of Narragansett are further energizing the Blue Economy work in the Ocean State. 2023 will bring new efforts, in collaboration with federal agencies, to support seafood wastewater are further energizing the Blue Economy work in the Ocean State.

If we seize this moment, we can truly set Rhode Island apart in the life sciences field. If we don't, it will be a missed opportunity.

2023 Core Priority 3: Redouble STAC's communications efforts and redefine STAC as a central thought leader on science and technology in Rhode Island

Since its inception in 2005, STAC has not engaged a targeted communications plan for awareness, education, or business development throughout Rhode Island. STAC will work with marketing and communications staff at Rhode Island Commerce Corporation to increase awareness of STAC and its efforts. STAC will accomplish this goal through targeted social media campaigns, structured posts on LinkedIn, and press releases with success stories of the STAC efforts.