

SCIENCE AND TECHNOLOGY STRATEGIC PLAN FOR RHODE ISLAND: **ACCELERATING INNOVATION THROUGH COLLABORATION IN THE OCEAN STATE**

RHODE ISLAND
**SCIENCE &
TECHNOLOGY**
ADVISORY COUNCIL



COVER PHOTO BY SAMY MEER



Lincoln D. Chafee, Governor

www.stac.ri.gov

Dear Friends,

We are pleased to share with you a *Science and Technology Strategic Plan for Rhode Island: Accelerating Innovation Through Collaboration in the Ocean State*. The following pages contain an executive summary of the plan. The full document can be found at www.stac.ri.gov.

The plan identifies three science and technology core sectors that are strong in Rhode Island and for which we have the potential to build world-class R&D stature and establish economic vitality. They are **marine sciences, life sciences and energy and the environment**. The plan also identifies a combination of complementary assets in Rhode Island that enhance and boost these sectors. Finally, it sets forth a set of specific actions that lays the foundation for economic growth by encouraging cooperation and building partnerships at our universities and colleges, hospitals and governmental agencies and in the private sector.

It is vital that we work together, building on our strengths and leveraging our distinct resources so that Rhode Island is positioned to take full advantage of the next wave of technology-powered growth and job creation. Solutions to the many complex problems facing our world will increasingly be found at the convergence of multiple disciplines, making collaboration the key to tackling diverse challenges from climate change to clean energy to personalized medicine. Supporting collaborative research and development in our areas of core expertise must be embraced as an economic development priority. Timely, targeted and transformative investments which build on our strengths, efficiently utilize state and federal R&D funds and accelerate the transfer of discovery into the marketplace are key to long-term economic security and job growth. By working together, we can expand opportunities for growth among our key partners.

This plan is a living document, to be updated as new expertise and resources develop. We thank everyone who participated in helping to inform and shape this plan, and look forward to continuing to work together to position Rhode Island as a leader in collaborative research and innovation.

Sincerely,

Clyde Briant, Eng.Sc.D.

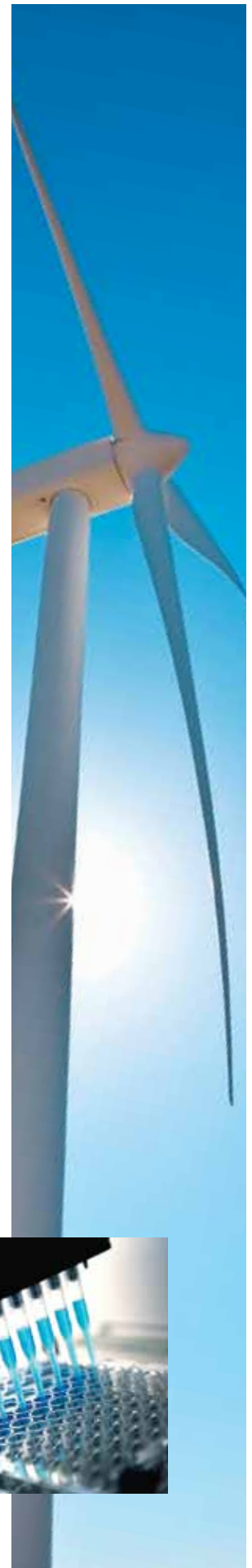
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L-R: PHOTO #1 BY BEAU JONES, PHOTO #3 BY LIFESPAN



INTRODUCTION

LOCATED IN THE GLOBALLY PRE-EMINENT NORTHEAST CORRIDOR MEGA-REGION, Rhode Island has distinct core strengths and assets upon which to build a knowledge economy. In order to secure its economic future, Rhode Island must build on its expertise in the marine sciences, life sciences, and energy and the environment and take specific actions to leverage these strengths against its many supporting resources and assets—including a strong IT sector, legacy of manufacturing and design, established collaborative platforms and historically ocean-based economy. The plan identifies four goals that spell out how the state can build on these core competencies to bring S&T professionals together, improve the S&T infrastructure, streamline the conversion of S&T ideas into marketable products and services, and communicate the state’s S&T accomplishments to the wider public.

OPPORTUNITY FOR RHODE ISLAND: CORE COMPETENCIES

Through active discussions with a broad range of leaders of Rhode Island-based research institutions including research universities, teaching universities, hospitals, public agencies, industry associations and government agencies, the Rhode Island Research Alliance, a program of the RI Science and Technology Advisory Council (STAC), performed an extensive assessment of potential areas for research collaboration. In these meetings, interviewees shared information on current work as well as their vision for future research collaborations. Meetings with individual researchers and community leaders further defined the snapshot that was developing of Rhode Island’s core science and technology strengths. From this assessment, three niches emerged:

- ▶ **MARINE SCIENCES AND TECHNOLOGY:** Rhode Island has a strong reputation in marine science research, education and industry and is home to the country’s first and most active University Sea Grant program. Our marine economy encompasses multiple disciplines, such as marine genomics, ocean engineering, aquaculture, and fisheries management and employs over 12,000 highly skilled workers in more than 800 companies, including leading-edge technology companies.
- ▶ **LIFE SCIENCES AND TECHNOLOGY:** This diverse sector of life science institutions, including drug manufacturing, basic research, biomedical devices, cell line development, bio-nanotechnology and biomedical textiles, employs more than 35,000 people across more than 1,400 businesses; the sector is growing so quickly here that the Milken Institute predicts it will triple by 2014. The bioscience employee rate in Rhode Island grew 259% from 2001–2006 while the national average rose only 4%.
- ▶ **ENERGY AND ENVIRONMENT:** The State has taken critical steps in implementing energy efficiency and conservation policies, developing the country’s first offshore wind farm, conducting basic and applied research in next-generation batteries and biofuels, hosting public/private partnerships to address smart grid develop-



Helen Huang, Assistant Professor, Department of Electrical, Computer, & Biomedical Engineering at the University of Rhode Island is developing smarter prosthetics that will bring greater mobility and improved quality of life for users of the devices.

ment, and examining policy questions such as the toxicity of nano-materials and the effects of various environmental exposures. With such cross-sector participation and growing momentum towards alternative energy and environmental protection, Rhode Island is poised to become a leader in the emerging alternative energy and green technology industries.

In addition to identifying these three individual areas of strength, the assessment revealed the significant opportunities that emerge where these three areas overlap. For example, environmental research into how global warming will affect the oceans and weather patterns will help life sciences researchers understand the potential impacts on human health. Understanding the impacts of climate change is also becoming increasingly important to industry, especially to those businesses that rely on understanding regional weather-related risk, such as fisheries, recreation, real estate and insurance. Thus, these three areas, major research and development areas in their own right, are also interrelated at a higher level; growth in one of these areas will stimulate growth in others.

LEVERAGING ASSETS AND RESOURCES

Discovery is one part of the innovation pipeline and must be combined with other assets and resources in order to convert ideas into new products and processes. A strong technology and innovation infrastructure provides the base for this conversion. Rhode Island's potential to maximize the economic benefits of science and technology research and development will depend on the state's ability to seize these opportunities and align them with our unique complementary resources and infrastructure.

Business, government and educational leaders across the state have agreed that Rhode Island must become a strong participant in the knowledge economy. In many ways, the Ocean State is primed to pursue this role; it has a strong history of innovation and has already committed resources and workers to knowledge-based industries. The latest available data indicate that high-wage industry sectors — key pieces of the knowledge-based economy — account for almost 40% of the state's private sector employment. Knowledge-based industry sectors feature prominently in the Rhode Island Department of Labor and Training's prediction of the sectors with the most potential for expansion by the year 2016, including the information technology sector; finance and insurance; professional, scientific and technical services; management of companies and enterprises; educational services; and health care and social services.

The following describes some of the state's most significant assets and resources, all of which play an important role in developing the foundation needed to transfer scientific research into the marketplace.



- ▶ **DESIGN, CRAFT AND MANUFACTURING:** Rhode Island has a long legacy as a lead innovator in manufacturing and design, and Rhode Islanders have a time-honored reputation for turning ideas and knowledge into products. Rhode Island School of Design is one of the premier art and design schools in the world. Other resources in the design sector include media and gaming expertise.
- ▶ **INFORMATION TECHNOLOGY:** Information technology is one of the major drivers of the knowledge economy, and the sector is expected to grow 16.2% in Rhode Island by 2014. As a tool, IT is in high demand across industry sectors and areas of research, and managing the exponentially increasing amount of data is critical to the success and efficiency of researchers and most business operations.
- ▶ **TECHNOLOGY TRANSFER AND TRANSLATIONAL RESEARCH:** Rhode Island is uniquely positioned to leverage its compact geography and densely connected research networks to create optimal alignment among its institutions and organizations, share core resources and expensive investments, and facilitate face-to-face communication across the state. In other words, Rhode Island is designed for the type of collaborative activity required for successful transfer and translation.
- ▶ **ACADEMIC RESEARCH INSTITUTIONS:** Set amid the largest concentration of higher-education facilities in the United States, Rhode Island offers access to a rich talent pool. Both Brown and the University of Rhode Island have areas of significant research strength. Brown currently brings in approximately \$180 million in research grants and awards annually; URI brings \$105 million. These two universities are committed to expanding their research capacities and connecting research with commercial application through innovation.
- ▶ **HIGHER EDUCATION:** Rhode Island's eleven colleges and universities have 80,000 students — which equates to about one person in twelve in the state.
- ▶ **DEFENSE SECTOR:** The Rhode Island defense industry is comprised of more than 100 companies, employs more than 16,000 people and generated \$1.75 billion in revenue in 2008. The Ocean State is home to highly skilled manufacturing companies such as Electric Boat, Raytheon Integrated Defense Systems and numerous software engineering firms. Only here can you find such a diverse portfolio of defense-related expertise concentrated in such a small geographic footprint. Our defense sector supports multiple Department of Defense and Homeland Security needs with a highly connected network of companies, ranging from multinational corporations to start-ups moving into the marketplace.
- ▶ **HOSPITALS:** Rhode Island's teaching hospitals are linked with medical science research, and many are networked into two outstanding medical systems, Lifespan and Care New England. Rhode Island hospitals as a whole have an estimated economic impact of \$5.9 billion and they employ 20,370 health care professionals, representing a payroll of \$1.6 billion. In 2010, Rhode Island's statewide academic medical system received 451 awards from the NIH totaling \$148.9 million.
- ▶ **INDUSTRY INVESTMENT IN R&D:** From biopharmaceuticals to gaming to textiles to boat building, Rhode Island companies have established capacities for innovation. Business R&D expenditures in proportion to payroll are the second highest in the nation.

ESTABLISHED COLLABORATION CAPACITY

Over the past decade, Rhode Island has fostered a collaborative platform that utilizes the state's small size to leverage already well-developed relationships between government, academia and industry. These collaborations among the state's research universities, research hospitals, corporations and government agencies support and enhance current research activities and increase our competitiveness for additional funding. The following groups are examples of established platforms for multi-institutional collaboration:

- ▶ **STAC:** The Science and Technology Advisory Council (STAC) brings together leaders from research universities, hospitals, business, and economic development sectors to provide guidance for Rhode Island's science and technology efforts. STAC established the Rhode Island Research Alliance in 2008 to facilitate greater connectivity among collaborative research efforts in the state. In addition to providing its own Collaborative Grants Program, the Research Alliance works with research institutions in the state to attract support from federal funding programs such as the National Science Foundation's EPSCoR program and the National Institutes of Health's IDeA program.
- ▶ **NSF-EPSCoR:** The Rhode Island Experimental Program to Stimulate Competitive Research (RI EPSCoR) builds partnerships between state government, institutions of higher education and industry to effect lasting improvements in Rhode Island's research infrastructure and national R&D competitiveness.
- ▶ **NIH-IDEA NETWORK:** The Institutional Development Program of the National Institutes of Health fosters biomedical and behavioral research and enhances the competitiveness of investigators at six core facilities throughout the state by supporting faculty development and biomedical research infrastructure enhancement.
- ▶ **OSHEAN:** OSHEAN is a consortium of 26 non-profit entities (institutions of higher education, hospital systems, public libraries, and government agencies) working towards the collaborative provision of economical, ultra broadband, Internet-based, communications infrastructure.



Rhode Island School of Design graduate Jake Zien's idea for PivotPower (a flexible power strip) started as a class project and is now selling more than 60,000 units through product development company, Quirky.



PHOTO BY RI STAC



PHOTO BY URI COASTAL RESEARCH CENTER

top: Wolfgang Peti, Associate Professor of Medical Science at Brown University, advances research in structural proteins for the development of more targeted and efficient pharmaceuticals. *bottom:* Much of the data for the nation's first Ocean Special Area Management Plan (SAMP) was gathered by researchers from URI's Graduate School of Oceanography working from the 185-foot Research Vessel *Endeavor*.

- ▶ **PRE-K TO 16 COUNCIL:** The Council, which is chaired by the Governor, includes the leadership of higher education, elementary and secondary education, labor and training, and economic development. The Council's chief purpose is to "produce a more competitive workforce and promote economic development through quality education, research and workforce development."
- ▶ **RI-CIE:** The Rhode Island Center for Innovation and Entrepreneurship (RI-CIE) was launched in April 2009 to boost business growth in Rhode Island. RI-CIE is meant to dovetail with city and state efforts already underway to strengthen entrepreneurial connectivity and enhance services and offerings in order to spur innovation and new venture creation in Rhode Island.
- ▶ **OSCAR:** The Ocean State Consortium for Advanced Resources (OSCAR) is a consortium of key academic and health organizations, industry and government stakeholders committed to making core resources available. The goal is to enable and grow an interconnected research enterprise that provides access and interoperability of infrastructure through a seamless and shared interface 1) to facilitate collaborations across the state, 2) to leverage strengths of individual organizations, and 3) to provide cost efficiencies and capacity-building opportunities. The fundamental charge of the consortium is to provide statewide resources that will address grand societal challenges that cannot be addressed by one entity or institution alone.

OUTCOMES

INNOVATION ECOSYSTEM

- ▶ Highly trained knowledge workers
 - ▶ World-class researchers
- ▶ Culture of creativity and entrepreneurship
- ▶ Economy driven by knowledge and innovation

CAPACITY

CONVERSION OF IDEAS TO APPLICATION

- ▶ Pilot Testing at Scale
- ▶ Technology Transfer
- ▶ Clinical Translational Research

FOCUS

LIFE
SCIENCE

ENERGY/
ENVIRONMENT

MARINE
SCIENCE

TOOLS

INFORMATION
TECHNOLOGY

DESIGN THINKING/
SCENARIO PLANNING

BASIC
SCIENCE

IMPLEMENTATION PLAN

Supporting collaborative research and development in our areas of core strength must be embraced as an economic development priority. Timely, targeted and transformative investments, which play to our strengths and support discovery and innovation and its transfer into the marketplace, are key to long-term economic security and job growth. In the next five years, Rhode Island's goals and specific actions for the development of science and technology should accomplish the following:

- ▶ Bring together researchers across the state to encourage collaboration in marine science, life science, and energy and environmental science.
 1. Identify areas ripe for collaboration through continued assessment of emerging opportunities.
 2. Increase volume of collaborations by establishing statewide networking forums for Rhode Island researchers for each of the three focus areas and a networking website to facilitate grant proposal development, recruitment, publication and communication of research activities.
 3. Support the development of the Ocean State Consortium for Advanced Resources (OSCAR) in building a shared vision and agenda including infrastructure platforms, talent, and innovative tools and data to enable collaboration and innovation on grand-challenge laboratories that inspire cross-sector collaborations and ideas.

- ▶ Improve existing infrastructure for collaborative research, including Rhode Island's capacity for technology transfer within and across S&T sectors.
- ▶ Facilitate business innovation by streamlining the pipeline between research ideas and new venture creation.
 1. Identify the gaps in the pipeline between research ideas and new venture creation.
 2. Increase the number of new ventures created using research developed in RI by working with public and private institutions in the state to engage the appropriate actors such as RI-CIE, the Slater Technology Fund, Tech Collective, Bio-Group, Providence Geeks, the Greater Providence Chamber of Commerce, RI Manufacturing Extension Partnership (RIMES) and university technology transfer offices.
 3. Organize an annual exposition to showcase new research discoveries to interested entrepreneurs, and showcase industry needs to experts in research institutions.
- ▶ Communicate research findings and initiatives to public officers and the wider community.
 1. Educate public officials, businesses and community opinion leaders concerning this Science and Technology Strategic Plan and the latest research and development projects happening across Rhode Island.
 2. Develop a statewide publication to chronicle research and development in Rhode Island.