

## **The Importance of University Collaborations with Industry**

### ***A Message to the SEA Fellows Summer Science Symposium, Darling Marine Center, August 11, 2016***

Speaking to you as a former student at the Darling Marine Center a long time ago, I want to congratulate the participants of the SeaFellows Program for accepting the opportunity to work here this summer, not only for the experience of doing important research but also for choosing one of the best life experiences possible, spending a glorious season by and on the ocean in Maine. Some 43 years ago this month I arrived here after college following a stint in the Peace Corps. I knew that I loved science and was seeking ways to connect science with service to benefit and improve people's lives. I surveyed the options of a specialty and decided to pursue shellfish aquaculture as a suitable scientific and commercial challenge. Seafarming incorporates marine science as a tool to raise food and provide livelihoods for people while preserving Maine's working waterfront heritage. It was my pleasure to be involved in the transformative years of Maine's aquaculture industry because it turns out that aquaculture is a continuum of centuries of fishing and boatbuilding in our coastal towns and villages.

So why should the University, its faculty, students, administrators, and facilities dedicate resources to work on matters important to commerce and to industry? There is a saying that goes, *"Knowledge is scattered treasure while education organizes it into art, commerce and science."* According to this homily, education has three distinct yet interrelated outcomes: art, commerce and science. Together they enrich us as individuals and collectively as a society.

During the nation's civil war, in addition to a preoccupation with an ineffectual federal response to the Southern states' secession, Congress passed a seminal law named the Morrill Act which changed the way education is perceived. The act set up so called land grant institutions by transferring federally controlled land to the states to raise capital that established and endowed colleges in the practical pursuit of agriculture, science, and engineering. This mission contrasted to the historic practice of higher education focusing principally on an abstract curriculum. So the organized collaboration between universities and industry in the United States started more than a hundred and fifty years ago and was made possible through an enlightened federal policy. Eventually, the national Sea Grant Program was established to bring similar support to marine industry and conservation. Over time institutions of higher education have become incubators for the application of technology in commerce, and our society has benefitted immensely from that relationship.

What's the importance of the marine industry to Maine's economy? If we are just concerned with seafood landings, so called ex-vessel prices, it's over a billion dollars per year. Add in transportation, boatbuilding, water based tourism, shipyards, and miscellaneous activities, the figure swells to more like \$5 billion annually. The economic activity resonates throughout Maine and turning full circle, underpins the state's tax base and returns monies to the University's budget. By connecting science with commerce, the university not only thrives, but performs the function originally conceived by the Morrill Act, to seek beneficial, practical outcomes for society.

Let's focus for a minute on some of the promising ventures between the University and industry. The Darling Marine Center and the Center for Cooperative Aquaculture Research provide dedicated incubator space for

businesses, while the Down East Institute contributes efforts to the development of practical R&D in support of Maine's eastern counties. Past contributions from these facilities have led to much improved fish and shellfish hatcheries, selective breeding of farmed fish and shellfish, and the knowledge of causation and mitigation of disease of these animals. Business incubators have supported the cultivation of new species in Maine, originally, oysters, mussels, more recently baitworms, urchins, halibut, ornamentals, eels, yellowtail, arctic surf clams, and sea vegetables.

At Orono the Aquaculture Research Institute and the Maine Aquaculture Innovation Center form a partnership to support applied research and oversee the incubators in Walpole and Franklin. The Aquaculture Research Center lab provides flowing fresh and artificial seawater to support faculty and graduate students' work. The Aquatic Animal Health team with the Hitchner Isolation Facility delivers diagnostic services and product development to combat aquatic animal diseases. And the Department of Industrial Cooperation works to assist entrepreneurs adopt and protect technologies in partnership with the University.

By proposing an Alliance for Maine's Marine Economy between branches of the University and a host of selected businesses and non-profits, a group of insightful faculty and administrators recently received first-rate reviews for a \$7 million proposal in a competition for state bond monies to create marine jobs and transform R&D infrastructure in collaboration with marine businesses. After two years of a five year effort, the SeaNet Program promises significant contributions to Maine's aquaculture industry. And Sea Grant Marine Extension has done and continues to do important work as part of the collaboration with commerce. Success in my own choice of profession, shellfish farming, depended on the work of various dedicated extension professionals since the 1970's.

There are three critical requirements for successful collaborations:

- Critical mass- the mix (skills) and weight (experience and resources) of the group
- Leadership- the committed champions who push the agenda and get things done
- Capital (\$) to fuel work plans leading to innovation from R&D and to applied commercialization

Sometimes these collaborations require taking calculated risks, some of which by the law of averages are destined to fail. "Fail quickly and cheaply" is a mantra that ultimately supports innovation because it recognizes the iterative and sometimes uneven process of making significant advancements. University collaborations with commerce should incorporate the process of risk-taking.

In my opinion there should also be a balance of what we term triple bottom line objectives applied to collaborations. We, the University/industry team should incorporate and monitor measurable impacts for the economy, for social equity, and for environmental conservation as outputs of the work. Can we mitigate ocean acidification, can our fishing communities benefit from aquaculture, can we diversify our economy to be more than tourism and service jobs, and how are these outcomes documented?

Two of the seven social sins enumerated in a London sermon by Frederick Lewis Donaldson in 1925 unintentionally created expectations for science and commerce to work together. According to his message,

*science requires humanity, and commerce requires morality.* These tenets create the mix of desired principles, morality and humanity, to yield joint outcomes for the common good.

Here are a few guidelines when charting future University/industry collaborations:

- Institutions of higher education and industry share interdependence for accessing human and financial resources. The storied successes of Silicon Valley demonstrated the value of an unimpeded flow of people, ideas, and money between educational institutions and businesses.
- Growth in the sectors of Maine's marine economy is dependent on innovation. Working together, science and commerce impart a slightly discomfiting tension that leads to the adoption of new paradigms for change.
- Bridging the "Valley of Death" commercialization gap is critical to taking R&D results to fully developed business applications. Many fruitful scientific accomplishments languish and dissipate without a plan and money to apply them to business. My employer, CEI, invests in the best pre-commercial ideas allowing entrepreneurs to take them to commercialization. Nevertheless Maine is short of the resources to take good R&D to the next level. University/industry collaboration should not be satisfied solely with R&D but must advance along the path to commercialization.

Let me close with some messages to both the students and to the University.

To the students, I urge:

- Choose life themes including scientific interests that positively impact our society.
- Accept wise mentorship and when it's your turn, offer it to others.
- Be willing to make connections to leaders outside your chosen field of science, e.g. with successful business people.
- Connect commerce and science in your learning objectives, understand the jargon of business in addition to the nomenclature of science, e.g. take a business course as an elective, or read some basic articles on business planning, management, finance, and marketing.

To University faculty and administrators I offer:

- Realize that business and industry are powerful allies for political purposes, and for creating prosperity in society.
- Recognize that industry can be as generous as government in providing funds for R&D innovation. As long as the motives are driven by triple bottom line objectives, there is no downside to these collaborations.
- Emulate the nimbleness of decision-making and action that is taken for granted in the business world. By adopting behaviors second nature to your partners, you'll find their willingness for stronger collaborations enhanced.

Finally, welcome to you all. I'm confident that you'll enjoy the presentations given by the students about their work at today's event. My appreciation is offered to the University of Maine, the SeaFellows and SeaNet Programs for the opportunity to speak to you. Thank you.

*Richard Clime, 8/11/2016*