Endowed Chairs Installation

Carissa Krane, Schuellein Endowed Chair in Biology

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"Scientific Inquiry: A Team Sport"

On behalf of Dr. Swavey and myself, I would like to express our deep gratitude and appreciation to all of you who are here, celebrating this event in recognition of the legacies of Bro. Leonard Mann and Dr. Robert Schuellein and their lasting contributions to the Natural Sciences and the Biological Sciences at the University of Dayton. It is with great honor that I deliver these brief remarks, entitled "Scientific Inquiry: A Team Sport".

As a marianist brother, Robert Schuellein graduated from UD in 1944 with an undergraduate degree in Biology. After earning Masters and Doctorate degrees at the University of Pittsburgh, he returned to Dayton in the late 1950's to join the faculty in biology, where he helped to establish the graduate program in biology. In fact, the very first and second MS degrees conferred in the Biological Sciences were to his graduate students. He left the University and the Marianist order in 1964 to join the National Institutes of Health in the National Heart, Lung and Blood Institute and the National Institute of Dental Research, where he oversaw research grant administration and research training programs until he retired in 1983. He died in 2011 at the age of 91.

In a letter written to the University, Dr. Schuellein stated that his motivation for establishing an endowed chair in the biological sciences at UD stemmed from a number of considerations. He said that he learned from his experiences at the NIH, that maintaining a strong research faculty is essential for continued academic excellence. He noted that the NIH funded training programs that had strong research components recruited the better trainees. He also said that it was evident that research mentors with solid research accomplishments "magnetically" attracted the better student.

As a grants administrator at the NIH, Dr. Schuellein would have had the opportunity to award grant funding to scientists to support scientific inquiry. He was given the opportunity to support, in a different way, his passion for faculty-mentored student research training through training grants and stipend awards. His function as a grants administrator would have been to guide the peer-review process through the rigorous review of a diversity of proposals, whose objectives ranged from basic science and discovery-based projects, to hypothesis driven, clinical experimentation.

During his time at the NIH in the 1960s, 70s and 80s, it was quite common that a scientist was the sole Principal Investigator on a grant proposal. A single PI would assemble a group of graduate students and postdocs to pursue scientific questions, employing the use of specialized, disciplinary and even sub-disciplinary methods and approaches. While great advances were made under this model, it became apparent that large scale ambitious projects, like sequencing the human genome would require a new approach; one that was more collaborative, interdisciplinary, technology driven, and informatics intensive.

As noted in a 2011 report published by the American Association for the Advancement of Science, "many of the breakthrough discoveries during the second half of the 20th century cross disciplinary boundaries, changing the nature of questions asked while emerging technologies have allowed new approaches to the ways scientists investigate questions. However, the advances in technology have come at a time when the world is faced with large and urgent challenges that require the tools of science to help resolve."

The societal challenges we face in the 21st century will deal with basic human needs: Health, availability of food and clean water, sustainable energy and the environment.

These societal challenges are global and complex, mired in a conflagration of political, cultural, economic, philosophic, and religious considerations. It is imperative that scientists take an active role in providing the solutions to these problems. Yet it is quite clear that no single scientific discipline will have the power to address even one of these issues. Thus, the question we must ask ourselves is this: Are we as scientists, mentors, teachers and students, adequately prepared with the disciplinary tools, skills, knowledge and expertise, and informed with a fluency of multidisciplinary perspectives and sensibilities, to solve the major societal challenges that we will face in the 21st century?

To explore this question, scientists and engineers from professional societies including the American Association of Medical Colleges (AAMC), the National Academies of Science and Engineering, the American Association for the Advancement of Science (AAAS), and funding agencies including the National Institutes of Health (NIH), the National Science Foundation (NSF), and the Howard Hughes Medical Institute (HHMI) independently convened working groups in the first decade of the 21st century to examine the state of the field as it were, and its readiness to address these challenges. Several reports were published outlining strategies to address these issues, all of which converged on a similar recommendation: Integration. The need to train and support scientists with deep knowledge in one discipline and basic fluency in several.

A New Biology for the 21st Century

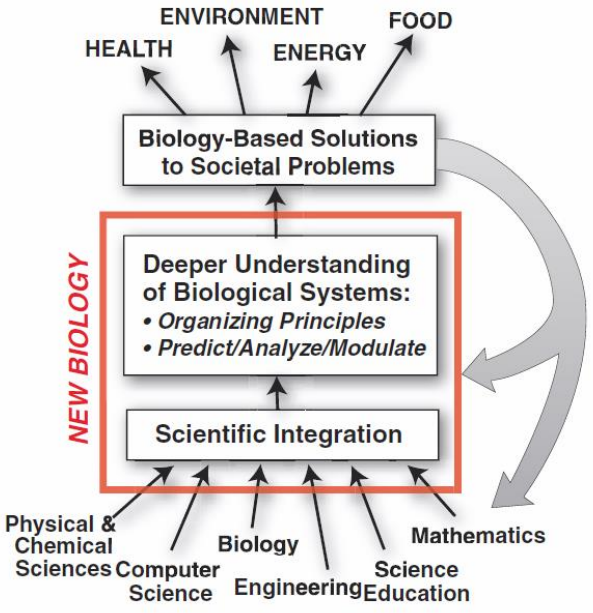

FIGURE 2.1 What is the New Biology?
SOURCE: Committee on a New Biology for the 21st Century.

Reproduced for the purpose of public presentation from the National Research Council of the National Academies (2009). A New Biology for the 21st Century. National Academies Press, Washington DC.

As quoted from in the National Academy of Science report, *A New Biology for the 21st Century*, "As students are taught to approach science as an exercise that solves a problem, they will recognize how mathematics, physics, chemistry, computational science and engineering contribute to the problem-solving process and therefore, see the relevance of and be more motivated to master these other disciplines….Purposefully organized around problem solving, this approach marshals the basic research to advance fundamental understanding, brings together researcher with different expertise, develops the technologies required for the task and coordinates efforts to ensure that gaps are filled, problems solved, and resources brought to bear at the right time…. The New Biologist is not intended to replace the research that is going on now; that research, much of it fundamental and curiosity-driven by individual scientists, is the foundation on which the New Biology rests and on which it will continue to rely."

A similar conclusion was derived in the *Vision and Change* report generated by the AAAS and NSF. While disciplinary competencies are required for scientific literacy and expertise, "As important, undergraduates need to understand the process of science, the interdisciplinary nature of the new biology, and how science is closely integrated within society. Students also should be competent in communication and collaboration, as well as have a certain level of quantitative competency, and a basic ability to understand and interpret data."

The committee also concludes that "Faculty have a unique opportunity to inspire a new generation of undergraduates to address these pressing society challenges, but they also face a unique challenge to ensure that ALL undergraduates develop a level of biological (scientific) literacy needed to make informed decision about the complex problems facing the world today."

When reading these reports and recommendations, it becomes quite clear that the Natural Science departments at the University of Dayton are well-poised to join the revolution to transform the pursuit of science now and into the future.

- Founded in the central mission of the University as defined by the catholic intellectual tradition and informed by catholic social teaching, UD has created the platform and landscape for developing our students with the capacity to address the challenges of the future. We accomplished this by designing a curriculum that seeks to educate the whole person through intentional integration, inquiry, and reflection.

  Mission of the University of Dayton:

  Our mission is simple, yet profound.

  The University of Dayton is a top-tier Catholic research university with academic offerings from the undergraduate to the doctoral levels. We are a diverse community committed, in the Marianist tradition, to educating the whole person and linking learning and scholarship with leadership and service.

- The institution has committed to the goals, strategic initiatives and tactics outlined in our transitional strategic plan, many of which relate directly to the sciences.

As stated in the *UD Transitional Strategic Plan 2015-2017*

Goal 1: Educate for transformation and prepare a new generation of servant leaders

Strategic Initiative 1.2: Promote learning through active engagement with the community

Tactic 1.2B: Advance high impact experiential learning, mentored by faculty and staff, as a signature element of a UD education, and strengthen the infrastructure to coordinate, assess, and sustain high-quality experiential learning

Goal 2: Cultivate Outstanding Scholarship, Research and Artistic Expression

Strategic Initiative 2.1: Invest in targeted areas of multidisciplinary research in which the University shows the greatest promise for national and international preeminence

Tactic 2.1A: Continue to invest in and promote collaboration among existing and emerging areas of research strength, especially in engineering and the sciences

Goal 4: Advance Global and Intercultural Citizenship and Engagement

Strategic Initiative 4.3: Support as a valued educational and institutional resource the engagement of a racially, ethnically, culturally, religiously and socioeconomically inclusive University of Dayton community.

Tactic 4.3A: Improve recruitment, academic and scholarship support, persistence to graduation, and an inclusive environment for domestic minority and international undergraduate and graduate students, with particular attention to diverse underrepresented minority and international student populations

Tactic 4.3B; Improve recruitment, advancement and leadership opportunities for faculty and staff from groups underrepresented in the University community

Goal 5: Practice Responsible Stewardship

Strategic Initiative 5.2: Support curriculum, faculty, researchers and staff with facilities, equipment, and information technology and resources that will enable them to fulfill their potential and contribute most effectively to the University and the wider community

- We have faculty who have leveraged their own research excellence and expertise to champion multidisciplinary research centers of excellence designed to facilitate interdisciplinary research projects that include faculty, graduate and undergraduate students and outside collaborators.
    - The mission of the University of Dayton SupraMolecular Applied Research and Technology Center (UDSMART Center), founded by Dr. Shawn Swavey, and co-directed by Dr. Jayne Robinson, "is to develop a sustained collaboration of experts from the Sciences and Engineering (centered around supramolecular science) to develop ideas and transfer these ideas from the benchtop to application with the goal of bettering the lives of people around the world. In the process, this center will help to educate future scientists and engineers and serve the community of Dayton."
    - Center for Tissue Regeneration and Engineering at Dayton (TREND), established by Dr. Panagiotis Tsonis, was recognized in 2010 by the State of Ohio as an Ohio Center of Excellence. The mission of the TREND Center is to "promote and support research collaborations between university faculty and research scientists and engineers in the area of tissue regeneration and bioengineering. The interests of the center are in eye, bone, and ear regeneration and engineering. The Center welcomes new academic and research training in this field leading to MS and PhD degrees and provides opportunities for undergraduate research with the Center faculty."

- As an institution, UD is a leader in its commitment to sustainability and the environment. The mission of the Hanley Sustainability Institute and the River Stewards are largely synergistically aligned with Pope Francis' recent encyclical on the environment.9

So, what's next? How can we capitalize on our assets, foundation, and mission to continue to improve our collective capacity to solve the societal challenges we face?

Our Challenges, Our Solutions

- ❖ Develop a Strategic Plan for the Natural Sciences
- ❖ More closely align the science majors curriculum and non-majors curricular offerings with the emergent realities of the societal challenges through the development of additional interdisciplinary coursework
- ❖ Invest in the growth and development of current and new disciplinary and interdisciplinary graduate programs in the Natural Sciences and Bioengineering
- ❖ Meaningfully recognize the value and contributions of faculty in supporting faculty-mentored undergraduate research experiences
- ❖ Collaboratively design a science facility with infrastructure that will support basic, applied, integrative and interdisciplinary research
- ❖ Increase the number of tenure-track faculty lines to meet the increasing demand in STEM; Address limitations to current hiring policies
- ❖ Continue to enroll high quality students in STEM, but supply the resources to guarantee "value added" experience
- ❖ Increase support (start-up funds, 100% rule, facilities, resources, equipment funds, core facilities, indirect returns, research council awards, course buy-out, space, ability for NTT faculty to write for grants) for faculty research
- ❖ Make an institutional commitment to improve the practical logistics of pursuing interdisciplinary research and teaching and better the administrative support for experiential learning
- ❖ Our default answer to good ideas should be "yes let's make it happen", not "no" because we can't imagine how
- ❖ Improve the tools used to assess and document our progress; if the tools (Banner, DegreeWorks, Digital Measures) are not accurately reflecting the work we do, change the tools, not the activity

We are positioned at a moment in time, when the University will be saying goodbye to one president, while welcoming our next. As a nation, we will be electing a new president.

As scientists we have the opportunity to create, imagine, design, test, inquire, and rigorously pursue knowledge as we attempt to understand the natural world around us. The research we do is both important and fulfilling, and societally relevant.

It is also our responsibility, as stewards of the scientific disciplines that we represent, to invite, welcome, invigorate, inspire and support our students who will be the next generation of scientists, and to remind ourselves that in the end, we are scientists because doing science is fun. It is a way to engage people of all ages in the joy of exploration, discovery and understanding.

To close, I would like to read the introduction to the A New Biology for the 21st Century:

A vision of the future.

Imagine a world:

Where there is abundant, healthful food for everyone

Where the environment is resilient and flourishing

Where there is sustainable, clean energy

Where good health is the norm.

How will we, as a community of scientists, contribute to this vision?

How will we use our time and talents collaboratively, to pursue integrative answers to questions driven by our curiosity and desire to understand the natural world around us?

Scientific Inquiry IS a team sport. Welcome to the team.

Source material:

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