

New Brunswick Strategic Planning Proposal

Proposal Title:

Formation of an Institute for Quantitative Biomedicine at Rutgers (iQB@R)

Proposal Initiator:

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Primary Strategic Priority/Foundational Element/Integrating Theme Addressed (Select one)

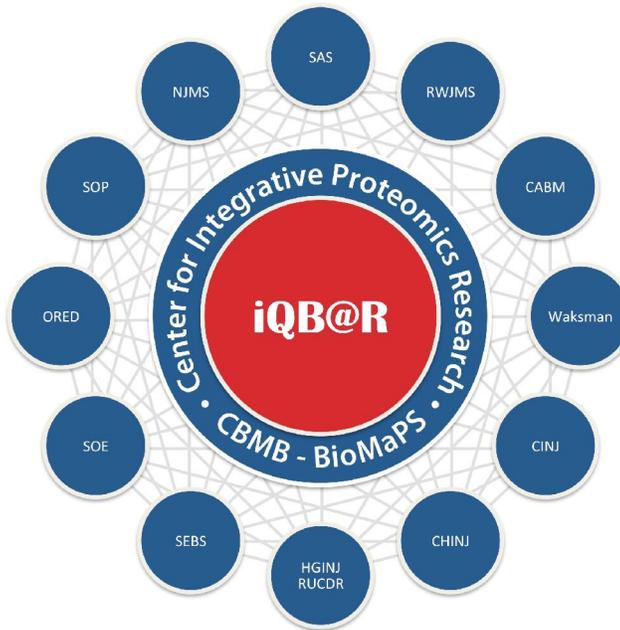
- Envision Tomorrow's University
- Build Faculty Excellence
- Transform the Student Experience
- Enhance Our Public Prominence
- Strong Core of Sciences and Humanities
- Inclusive, Diverse, and Cohesive Culture
- Effective and Efficient Infrastructure and Staff
- Financial Resources Sufficient to Fund Our Aspirations
- Robust Shared Governance, Academic Freedom, and Effective Communication
- Cultures, Diversity, and Inequality—Local and Global
- Improving the Health and Wellness of Individuals and Populations
- Creating a Sustainable World through Innovation, Engineering, and Technology
- Educating Involved Citizens and Effective Leaders for a Dynamic World
- Creative Expression and the Human Experience
- Measuring Progress and Defining Success

Proposal Abstract (247 words):

Following the historic merger of Rutgers, The State University of New Jersey, with the University of Medicine and Dentistry of New Jersey, the time is now to establish a broadly inclusive center-of-excellence dedicated to collaborative application of tools from the quantitative sciences to grand challenges in biology and medicine. The new Institute for Quantitative Biomedicine at Rutgers (hereafter the Institute, abbreviated iQB@R) will engage scientists from across the Greater Rutgers system and foster creation of the biomedical research university of the future by

- establishing and enabling interdisciplinary Research Working Groups;
- providing administrative and infrastructure support to enable effective competition for large-scale research grants/contracts and shared instrumentation awards from state, federal, and supranational sources;
- working closely with the Rutgers Foundation to attract funding from philanthropic sources to support interdisciplinary research, necessary infrastructure investments, and education/outreach; and
- helping to train next generation researchers expert in the quantitative sciences for careers working at the interface with biology and medicine.

The Institute will be headquartered within the Center for Integrative Proteomics Research, where it will build on the successes of the School of Arts and Sciences BioMaPS Institute for Quantitative Biology. The iQB@R will encompass the entire Rutgers system by nucleating a diverse community of biologists, chemists, clinicians, computer scientists, engineers, linguists, mathematicians, materials scientists, physicists, and statisticians committed to collaborative work on important biomedical research problems. Initially, the Institute will form Research Working Groups focusing on Cancer Genomics/Proteomics and Antibiotic Resistance, which represent areas of strength across Greater Rutgers.



Proposal for Formation of the Institute for Quantitative Biomedicine at Rutgers (iQB@R)

Vision

Rutgers system-wide center-of-excellence for interdisciplinary quantitative biomedical research

Mission

- 1) To foster a vibrant, cohesive community of Rutgers basic, applied, and clinical scientists committed to collaborative application of tools from biology, chemistry, computer science, engineering, linguistics, materials science, mathematics, physics, and statistics to grand challenges in biomedical research
- 2) To develop next generation researchers expert in the quantitative sciences for careers working at the interface with biology and medicine

Rationale/Executive Summary

The historic merger of Rutgers, The State University of New Jersey, with the University of Medicine and Dentistry of New Jersey (UMDNJ) on July 1st 2013 occurred in the midst of an unprecedented period of growth in access to patient genome sequences and complementary data coming from high-throughput measurements of biological systems. This “perfect storm” of institutional change and the Big Data revolution demands that we seize the initiative and establish a broadly inclusive center-of-excellence dedicated to collaborative application of tools from the quantitative sciences to grand challenges in biology and medicine. Together, we can redefine how the quantitative sciences of a traditionally structured research university interoperate with the basic science and clinical departments of two major medical schools. The following proposal calls for launch of a new Institute for Quantitative Biomedicine at Rutgers (hereafter the Institute, abbreviated iQB@R) that will engage scientists from across the entire Rutgers system and foster creation of the biomedical research university of the future.

The Institute will be headquartered within the Center for Integrative Proteomics Research (Proteomics), where it will build on the successes of the School of Arts and Sciences BioMaPS Institute for Quantitative Biology. The iQB@R will encompass the entire Rutgers system by nucleating a diverse community of biologists, chemists, clinicians, computer scientists, engineers, linguists, mathematicians, materials scientists, physicists, and statisticians committed to collaborative work on important biomedical research problems.

iQB@R Members will be drawn from the Schools of Arts and Sciences (SAS), Engineering (SOE), Environmental and Biological Sciences (SEBS), and Pharmacy (SOP), the Cancer Institute of New Jersey (CINJ), the Center for Advanced Biotechnology and Medicine (CABM), the Child Health Institute of New Jersey (CHINJ), the Environmental and Occupational and Health Sciences Institute (EOHSI), the Human Genetics Institute of New Jersey (HGINJ/RUCDR Infinite Biologics), the New Jersey Institute for Food, Nutrition, and Health (NJIFNH), the New Jersey Medical School (NJMS), the Robert Wood Johnson Medical School (RWJMS), the Waksman Institute of Microbiology, and the Office of Research and Economic Development (ORED). iQB@R membership will be contingent on Interdisciplinary Quantitative Biology Boot Camp teaching and participation in one of the Institute’s collaborative Research Working Groups.

Realizing the Vision

To enable collaborative research, maximize funding opportunities, and support graduate and post-doctoral training the iQB@R will

1. Establish and foster the activities of high-performing interdisciplinary Research Working Groups composed of Rutgers scientists plus select external collaborators and focused on grand challenges in biomedical research
2. Develop/Enhance/Manage/Host Infrastructure Initiatives and Core Facilities for
 - Biophysical and Biochemical Studies of Biomolecules in Solution
 - Cryo-Electron Microscopy and Tomography
 - High-Performance Computing Infrastructure for Biology
 - Mass Spectrometry of Biomolecules
 - Macromolecular Nuclear Magnetic Resonance Spectroscopy
 - Protein Crystallography
 - Screening of Compound Libraries
 - Single Molecule Measurements of Biological Systems
3. Launch a Quantitative Biology M.Sc. Degree under the aegis of the BioMaPS Graduate Program in Computational Biology and Molecular Biophysics that will complement extant Rutgers Ph.D. training programs in the quantitative sciences by helping our doctoral students and post-doctoral researchers bridge their quantitative science subject matter expertise with biology and medicine more effectively
4. Establish a transparent governance system that meets the needs of Institute stake holders, and provides for periodic internal and external peer review of progress *versus* goals and scientific/organizational impact
5. Develop a sustainable Business Model to fund ongoing Institute operations
6. Establish an influential, high-profile International Quantitative Biomedicine Conference hosted on a triennial basis at Rutgers

iQB@R Launch Priorities

Initial priorities for launching the Institute are focused on achieving important foundational results during Year One operations by

1. Forming two interdisciplinary **Research Working Groups** in **Cancer Genomics/Proteomics** (Co-Chairs: Ganesan and Burley) and **Antibiotic Resistance** (Co-Chairs: Perlin and Burley). Initial focus on these two research areas will allow us to build on considerable strengths resulting from the Rutgers/UMDNJ merger. Both teams will develop short and medium term research plans, informed by deep subject matter expertise and the outcomes of SWOT (Strengths, Weaknesses, Opportunities, and Threats) analyses. During the latter part of Year One, iQB@R members will be tasked with identifying additional Research Working Groups that will be formed during Years Two and Three.
2. Creating the **New Jersey Core Facility for Cryo-Electron Microscopy and Tomography** that will be housed in a custom design/build microscopy suite located on the Ground Floor of Proteomics (Busch Campus). Recruitment of a tenure-track Assistant Professor cryo-electron microscopist jointly by Proteomics and the Department of Cell Biology and Neuroscience is expected to result in the appointment of Dr. Yuan He (currently at UC Berkeley) and acquisition of an FEI 200keV Scanning Transmission Electron Microscope equipped with state-of-the-art direct electron detection. This instrument will be the first of its kind in New Jersey, enabling high-resolution structural studies of large macromolecular complexes of importance in human health and disease. The facility will be operated by an expert technical staff and will be made available on a tiered fee-for-service basis to scientists from Rutgers, neighboring academic institutions, and industrial partners.
3. Organizing the **2nd Annual Interdisciplinary Quantitative Biology Boot Camp**, which will be held January 5-16 2015 and offered as a for credit winter break course. The 2014 Boot Camp attracted more than 100 participants from virtually all of Rutgers' scientific programs (undergraduate, graduate, and, M.D./Ph.D. students, post-doctoral researchers, faculty, and staff).

4. Establishing a transparent **Governance System**. The Institute will be led initially by the proposer, Stephen K. Burley, who is an experienced physician-scientist biomedical researcher with an educational background ranging from mathematical physics to clinical medicine and considerable leadership/managerial experience in both academe and industry. A broadly representative Executive Committee will be elected to work with Burley to guide the launch of iQB@R and begin making longer-term plans.
5. Developing a fiscally responsible, sustainable **Business Model** to fund ongoing Institute operations. Seed funding of \$120,000/year for the first three years is requested elsewhere in this proposal. Rutgers New Brunswick Strategic Planning seed funding will be matched by a commitment of \$30,000/year for the first three years from Proteomics operating funds. (See iQB@R Year One Budget below for a detailed breakdown.) Within three years, the Institute plans to fund day-to-day operations from an appropriate share of the indirect cost returns derived from joint grants submitted by and administered through iQB@R. Additional requests for funding from the University and its Decanal Units will take the form of rigorously justified requests for infrastructure needs, such as institutional commitments required for shared instrumentation grants.

Alignment of iQB@R with the University Strategic Plan

Formation of the iQB@R is entirely congruent with our **Aspiration “to be broadly recognized as among the nation’s leading public universities: preeminent in research, excellent in teaching and committed to community.”** The merger of Rutgers with UMDNJ provides us with a unique opportunity to redefine how the quantitative sciences of a traditionally structured research university interoperate with the basic science and clinical departments of two major medical schools. Launch of the Institute will contribute to creation of an unprecedented, broad based biomedical research enterprise at Rutgers free of bureaucratic impediments to success, by fostering collaborative research programs involving quantitative scientists, biologists, and clinicians. Among the **Integrating Themes**, the Institute best resonates with **“Improving the Health and Wellness of Individuals and Populations.”** In terms of **Strategic Priority components**, the iQB@R can make contributions across the board to **“Envision Tomorrow’s University”** by helping to break down some of the many silos extant within Greater Rutgers, **“Build Faculty Excellence”** by enabling recruitment and retention of the best and brightest, **“Transform the Student Experience”** by training students expert in the quantitative sciences to work at the interface with biology and medicine, and **“Enhance Our Public Prominence”** by contributing to human health and disease and highlighting the unique benefits provided to New Jersey taxpayers through the newly merged Rutgers system. In parallel, the iQB@R can make contributions to three of the **Foundational Elements** of the Strategic Plan, including **“Strong Core of Sciences and Humanities”**, **“Inclusive, Diverse, and Cohesive Culture”**, and **“Effective and Efficient Infrastructure and Staff”**.

Who will Launch iQB@R?

Schools of Arts and Sciences (SAS):

Baum, Berman, Bhanot, Burley, Case, Chen, Kalodimos, Khare, Mischaikow, Morozov, Olson, Sengupta, Schliep, Sontag, York

School of Engineering (SOE):

ECE: Parashar
BME: Shinbrot, Shreiber, Yarmush

School of Environmental and Biological Sciences (SEBS):

Goodman, Bromberg, Tumer
NJIFNH: Gillies

School of Pharmacy (SOP):

Kimball, LaVoie

Cancer Institute of New Jersey (CINJ):

DiPaola, Chan, Foran, Levine, Ganesan, Zheng

Center for Advanced Biotechnology and Medicine (CABM):

Stock, Arnold, Marcotrigiano

Child Health Institute of New Jersey (CHINJ):

Rabson, Comoletti

Environmental and Occupational Health Sciences Institute (EOHSI):

Reuhl, Kipen

Human Genetics Institute of New Jersey (HGINJ/RUCDR Infinite Biologics):

Tischfield

New Jersey Medical School (NJMS):

Perlin, Tian

Robert Wood Johnson Medical School (RWJMS):

Inouye, Lobel, Nanda, Taylor

Waksman Institute of Microbiology:

Ebright

Office of Research and Economic Development (ORED):

Molloy

N.B. This roster will grow as Rutgers scientists are recruited to the Research Working Groups in Cancer Genomics/Proteomics and Antibiotic Resistance.

Desired Outcomes from iQB@R

Formation of the Institute for Quantitative Biomedicine at Rutgers is expected to yield the following benefits:

1. Creation of a new community of scholars drawn from across Greater Rutgers within the first two years of operations.
2. Creation of vibrant research networks fostered by Institute Research Working Groups within the first two years of operations.
3. Successful applications for both research funding and shared instrument grants within the first three years of operations.
4. Successful private philanthropic fundraising for education and outreach activities within the first three years of operations.
5. Self-sustaining operational funding of day-to-day activities within the first three years of operations.
6. Successful external peer-review evaluation during the fifth year of Institute operations.

Anticipated Resources for Launching iQB@R

Seed funding of \$120,000/year for the first three years is requested. These Rutgers New Brunswick Strategic Plan Fund seed monies will be matched by a commitment of \$30,000/year for the first three years coming from Proteomics operating funds.

At the end of Year Three, the iQB@R intends to fund ongoing operations from an appropriate share of the indirect cost returns derived from joint grants submitted by and administered through the Institute.

Additional requests for iQB@R funding from the University and its Decanal Units will take the form of rigorously justified requests for infrastructure needs, such as institutional commitments required for shared instrumentation grants.

iQB@R Year One Budget Breakdown

Funds Requested from Rutgers New Brunswick Strategic Plan Fund

Associate Director of iQB@R-2 months Summer Salary+Fringe (Dr. Gail Ferstandig Arnold, Research Professor)	\$16,432
Administrative Assistant/Meeting Planner Salary+Fringe (To be appointed)	\$75,168
Internal Student Run iQB Seminars (8/year)	\$1,784
Invited iQB Seminars (8/year)	\$15,446
Annual Offsite iQB@R Retreat	\$8,110
Quarterly Onsite iQB@R Research Working Group Meetings (8/year)	\$3,060
<u>Total Requested from Rutgers New Brunswick Strategic Plan Fund</u>	<u>\$120,000</u>

Matching Funds Committed by Proteomics

Accounting/Grants Preparation Assistant (50% Salary+Fringe)	\$30,000
<u>Total Committed by Proteomics</u>	<u>\$30,000</u>

Total iQB@R Year One Budget \$150,000

Proposed Measures to Mark Progress or Determine Success

The success of the Institute for Quantitative Biomedicine at Rutgers will be measured using the following metrics:

1. Evidence of creation of a new community of scholars drawn from across Greater Rutgers, as judged by growth and diversity of the Institute membership roster (diversity considerations include faculty rank, gender, race, ethnic origin, primary scientific expertise, Department, School) and participation levels in Institute-sponsored seminars, teaching, and conferences.
2. Evidence of creation of vibrant research networks fostered by Institute Research Working Groups, as judged by statistical analyses of the growth of joint publications and evaluation of impact factors and citation rates for Institute Member publications.
3. Evidence of successful Institute Member applications for research, shared instrumentation, and training grants.
4. Evidence of successful private philanthropic fund raising for education and outreach activities.
5. Evidence of self-sustaining operational funding after the initial three-year period during which University seed funding is requested.
6. Evidence of both impact and long-term viability as judged by an expert peer-review evaluation to occur during the fifth year of Institute operations.

Please save your proposal as a Word document and submit it as an email attachment to NBStratPlanProposals@rutgers.edu by April 15, 2014.