NJIT: Collaborating in the Converging Fields of Engineering, Technology, and Life Sciences

Volume 2: Supporting Evidence of Activities

A report submitted to:

The University of Medicine and Dentistry Advisory Committee

October 19, 2011
# NJIT Activities in Convergent Life Sciences

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Medical, Life Sciences, and Health Related Educational Activities at NJIT

1.1 College of Science and Liberal Arts

1.1.1 Department of Biological Sciences (Federated with Rutgers-N)

1. BS in Biology: The Bachelor of Science Degree Program in Biological Sciences emphasizes a quantitative approach to biology. The BS program will help students develop computer and mathematical skills needed for biological sciences in the 21st century. Students opting for BS must take advanced mathematics and computer science courses, including one upper division mathematical biology course. This curriculum is ideal for students who wish to work in industry, in government, or as a researcher or teacher. To obtain a Bachelor of Science (BS) Degree in Biological Sciences, students must satisfy the Major Requirements in Biology, the General University Requirements (GUR), and complete a minimum of 128 credits. The requirements for a BS in Biology consist of 38 credits in Biological Sciences plus cognate courses in Chemistry, Physics, Mathematics, and Computer Science.

2. BA in Biology: The Bachelor of Arts in Biology curriculum does not include the additional mathematics and computer science courses require for the BS program. This program is ideal for a student planning on a health career or going on to graduate studies in areas such as business or law. To obtain a BA in Biology you must satisfy the Biology Major Requirements, the General University Requirements (GUR), and complete a minimum of 124 credits. The requirements for a BA in Biology consist of 38 credits in Biological Sciences plus cognate courses in General Chemistry, Organic Chemistry and Physics.

3. Biology Double Majors

a. Biology-Math: As Biology becomes a more quantitative science, the demand for mathematical biologists will continue to grow. Students with exceptional mathematics and science skills have the option of the Biology-Mathematics double major. Unlike many double majors that take at least five years to complete, the Bio-Math double major has been designed to be completed in four years. This double major allows the students to ask such questions as: How does the brain form memories? How do neurons coordinate activities? How do elephants decide where to travel next? Can we predict where a bird will nest? How do plants spread through a landscape? How will climate change affect plants?

b. Biology-Chemistry: The double major program in Biology-Chemistry combines two allied disciplines while preparing students for graduate work in either Biology or Chemistry, as well as careers pursuant to such fields as genetics, biotechnology, and molecular biology that embody both Biology and Chemistry. This program focuses on Biological Sciences (35 Biology credits) and Chemistry (47 credits) with required courses in Biochemistry, Organic, Analytical and Physical Chemistry.

c. Biology-STS: Science Technology and Society (STS), offered by the Department of Humanities, integrates science and technology with the humanities and social sciences. The multidisciplinary
Appendix 1.1 College of Science & Liberal Arts Educational Activities in Convergent Life Sciences

approach of STS offers biology majors a unique opportunity to enhance their biology educational and expand their career options. The double major in Biology-STS can be achieved with either the BA or BS curriculum in biology.

4. Graduate Programs

1. MS in Biology: The MS in Biology provides students with advanced knowledge of both plant and animal biology and microbiology. The program requires successful completion of a minimum of 30 credits of graduate-level courses. Students are expected to maintain a grade point average of 3.0 and are required to complete a minimum of one 3-credit course in four of the following five core areas: Cell Biology/Biochemistry; Molecular Biology; Computational Biology; Ecology/Evolution; and Plant Biology.

2. PhD in Biology: The PhD in Biology provides students with advanced knowledge of research in the areas of Cell and Molecular Biology, Ecology and Evolution, Computational Biology. The Graduate Standard Committee mentors, monitors and advises all graduate students during completion of track-specific core courses. The Committee meets with students each semester to evaluate coursework, research progress, and provide advisement on course selections, first-semester mentoring, laboratory rotations, and potential thesis advisors. The Committee ultimately assists and guides graduate students toward successful completion of the Qualifying Exam and Thesis Prospectus stages of the program.

The doctoral curriculum in biology is divided into three areas of study. Each has a set of required courses that provide a formal foundation in research fields covered in that area. Students must earn at least a grade of 3.0 in order to receive credit for core courses. The remainder of the course work is chosen in consultation between the student and the advisor and the Standards Committee with permission of the graduate program director. Detailed program information can be found at the links below in each area of study: Cell and Molecular Biology, Computational Neuroscience, and Ecology and Evolution.

1.1.2 Department of Mathematical Sciences

1. BS in Mathematical Sciences with an option in Mathematical Biology: This option prepares students for modeling, computational, and analytical work in industry or government, for graduate study in mathematics or a related field, or for various professional schools. NJIT’s Department of Mathematical Sciences is one of the few departments in North America with such a strong program in Mathematical Biology. There are ten active researchers in Mathematical Biology, including seven in Computational Neuroscience.

2. MS in Computational Biology: The Master of Science in Computational Biology seeks to train students at the interface of biology, computational science, and mathematical science. The program will train students to put biological problems in mathematical form using the techniques of mathematical modeling. It will teach students how to use computational, numerical, and analytical tools to analyze and solve mathematical models, and how to interpret
the results in biological terms. The program will be of interest to students who want to pursue a truly inter-disciplinary learning experience.

3. MS in Biostatistics: The MS in Biostatistics focuses on developing new statistical methods, as well as applying existing techniques, to interpret data about the medical and life sciences. The proposed MS in Biostatistics program will fuse student interest in biology with interest in statistics and computing; teach how to help pharmaceutical companies test and develop new drugs, and help develop public health programs or policies that help people live better.

4. PhD in Mathematical Sciences includes an Applied Mathematics Track. This doctoral degree emphasizes the applications of mathematical methods to physical and biological sciences and engineering, including biology and medicine.

1.1.3 Department of Chemistry and Environmental Science

1. BS in Biochemistry: The Bachelor of Sciences in Biochemistry is an interdisciplinary program that includes chemistry, biology, biomedical engineering, physics, and computer sciences. The program focuses on: Chemical and three dimensional structures of biological molecules, biological molecular interactions, cellular synthesis and degradation of biological molecules, cellular energy conservation and use, mechanisms to control and organize biological molecules for cellular activities, and mechanisms of storage, transmission, and expression of genetic information. Students in the Biochemistry program will learn theoretical fundamentals and laboratory skills necessary to understand the life processes. Students will be exposed to current biotechnology and biologic topics: genetic engineering, molecular biology, enzymology, and microbiology. The program will prepare students for their professional fields such as medicine, medical technology, patent law, biopharmaceuticals, chemical industries, advanced school teaching, and health research.

2. BS in Environmental Science: The major in environmental science is an interdisciplinary program among the NJIT Department of Chemistry and Environmental Science, the Department of Earth and Environmental Sciences at Rutgers-Newark, and the NJIT and Rutgers Federated Biological Sciences Department. The program provides students with a strong background in science and fundamentals as they relate to the environment. The program is designed to prepare graduates for technical positions in the environmental industry and/or to continue their education at the graduate level. The program also prepares students to pursue positions related to the environment in the fields of law, business, sociology, health, and political science.

1.1.4 Department of Physics

1. BS in Biophysics: The major in Biophysics is an interdisciplinary degree that derives knowledge from several disciplines that include chemistry, biology, engineering, physics, and computer science. The objective of this program is to present the theoretical fundamentals and laboratory skills necessary to understand the physics of life processes. Biophysics focuses primarily on a number of topics: (1) the energetic and three-dimensional structures of biological molecules, (2) biological molecule interactions with each other, (3) cellular synthesis and
Appendix 1.1 College of Science & Liberal Arts Educational Activities in Convergent Life Sciences

degradation of biological molecules, (4) cellular energy conservation and use, (5) mechanisms for controlling and organizing biological molecules for cellular activities, (6) mechanism for storage, transmission and expression of genetic information, and the physics of devices with medical applications.

1.1.5 Department of History (Federated with Rutgers-N)

1. BA in Law, Technology and Culture: This is a pre-law major at NJIT and prepares students at a technological university for careers in law and law-related areas including the role of law in science, medicine, and business.

1.1.6 Department of Humanities

1. BS in Science, Technology, and Society: Students enroll in the Bachelor of Science in Science, Technology and Society (STS) program because they are interested in discovering how and why the work and communication strategies of scientists, technologists and other professionals affect the social systems in which we all partake. STS majors begin their studies by exploring the theoretical and historical foundations of science and technology as they concern politics, economics, environment, medicine, and culture. During the second and third years, core courses present case studies and practical assignments that build on the fundamentals learned in the first year. Students also select an area of specialization, or create one of their own, and identify a topic for their senior projects. STS majors are continuously developing their abilities to analyze complex information, solve critical problems, and demonstrate their ethical awareness and sense of public responsibility. STS alumni attend medical, law or business graduate programs. Albert Dorman Honors College (ADHC) students may participate in accelerated and other pre-professional programs allied with Seton Hall University's law school or UMDNJ's Medicine, Physical Therapy (DPT) or Physician's Assistant programs.

1.1.7 Pre-professional Health-related Programs

1. Accelerated (3 year) and normal (4-year) programs are available to prepare students for careers in medicine, dentistry, optometry, and physical therapy. Medical and dental accelerated programs require four years beyond the three years at NJIT. The Bachelor's/M.D. program with St. George's University involves three years at NJIT, two years of study in Grenada (Caribbean Islands), then two years at St. Michael's Medical Center adjoining NJIT in Newark. The Doctor of Physical Therapy (DPT) program requires 3 years beyond NJIT.

2. Physician Assistant: This BS/MS degree joint program with the University of Medicine and Dentistry of New Jersey culminates in a Master of Science in Physician Assistant. The program is open to all students with a GPA of 3.0 or better who can complete the expedited undergraduate curriculum in three years; which is similar to other accelerated curricula.

3. Advising for Pre-professional programs: This is a university-wide service that currently resides in the Department of Biological Sciences. DBS University Lecturer, Dr. Darshan Desai is the university Pre-Health adviser. He advises individually all pre-health applicants throughout the
Appendix 1.1 College of Science & Liberal Arts Educational Activities in Convergent Life Sciences

year, articulates the students’ letters of recommendations, and organizes information sessions and activities (e.g. invited speakers) for pre-Health students. He also integrates the Department and the University’s pre-Health committees. Pre-Health advising is performed in consultation with all health professional admissions committees (i.e. UMDNJ, NYU, Drexel, Temple, and Albert Einstein School of Medicine).

1.1.8 Other Activities: Undergraduate Research Experience

1. Undergraduate Biology and Mathematics Training Program (UBM)

The UBM Program provides a year-long interdisciplinary research opportunity for NJIT sophomore and junior students majoring in Mathematics and Biology. Each year, six students are recruited into the program, and paired into three groups that conduct research combining biology and mathematics in one of the participating laboratories at either NJIT or Rutgers-N. Before engaging in full-time research work over a 10-week period in the summer, students take a course in Mathematical Biology, and take part in a year-long seminar where they learn programming and mathematical modeling techniques. The goal of the program is to better prepare undergraduate biology or mathematics students to pursue graduate study and careers in fields that integrate mathematics and biology.

The program is offered in collaboration with the Department of Biological Sciences.

Source of funding: NSF
1.2 Newark College of Engineering

1.2.1 Department of Biomedical Engineering

1. BS in Biomedical Engineering: Biomedical engineering combines the study of fundamental biological and physiological processes and the study of engineering methods. The program offers three areas of specialization: Bioinstrumentation, Biomechanics, and Biomaterials and Tissue Engineering. Students are encouraged to explore the breadth of the field through many opportunities -- design new instrumentation, study advanced computer applications in medicine and pharmacology, research new biomaterials, apply laser technology to treat disease, build micro and nano machines, and work on new prosthetic devices. Instead of lectures, students in the studio-based program work in teams to perform angioplasty on pasta, amniocentesis on jelly donuts and surgery on hot dogs. Developed with funding from the NSF and the Whittaker Foundation, the studio classes are taught in specially designed classrooms equipped with sophisticated equipment. The studios are wired for the Internet and multimedia equipment and are furnished with ten PC-based lab stations that serve groups of students. The studios also have customized biomedical equipment such as amplifiers, oscilloscopes, power supplies, function generators and multi-meters.

2. MS in Biomedical Engineering: The graduate program in Biomedical Engineering at NJIT currently has one of the top five enrollments among biomedical engineering masters programs in the nation. This allows the department to offer a comprehensive set of courses specifically in biomedical engineering, which are augmented by related engineering courses taught in other departments. NJIT's location, in the middle of the nation's largest concentration of biomedical industries, provides access to expert instructors who offer specialized courses, which add to the richness of the academic environment. The MS in the Biomedical Engineering program stresses the application of the principles and practices of engineering, science and mathematics in solving clinical problems in medicine and surgery.

3. PhD in Biomedical Engineering: The BME PhD is a joint program that builds upon the synergies between NJIT and UMDNJ. The Program enrolled its first students in the fall of 2001 and has risen to the top 1/3rd of biomedical engineering doctoral programs in the nation. The physical proximity of the two institutions facilitates access to courses, laboratories, libraries, and seminars, as well as blending scientific and clinical opportunities in education and research. In addition, the location of NJIT and UMDNJ in Newark promotes interaction with New Jersey's pharmaceutical and medical device industries and medical facilities. As the preparation for the Ph.D. involves an extensive research apprenticeship in the form of a dissertation, the program is closely linked to the areas of biomedical engineering research at NJIT and UMDNJ. This research is clustered in the following areas: Biomaterials and Biocompatibility, Tissue Engineering and Regenerative Medicine, Cellular and Orthopedic Biomechanics, Biomedical Signal Processing, Imaging and Instrumentation, and Neural and Neuromuscular Engineering.
1.2.2 Department of Chemical, Biological and Pharmaceutical Engineering

1. MS in Pharmaceutical Engineering: The Pharmaceutical Engineering Program, including related MS degree programs (Pharmaceutical Engineering, Pharmaceutical Bioprocessing, Pharmaceutical Material Processing) and Graduate Certificate programs (Pharmaceutical Technology, Pharmaceutical Manufacturing, Pharmaceutical Management). Pharmaceutical engineering is the branch of engineering devoted to the application of engineering concepts, scientific principles, and codes of practice to develop processes and scale-up criteria for drug manufacturing and pharmaceutical operations, including the operation of industrial facilities for pharmaceutical production. In December 2001 the New Jersey Institute of Technology (NJIT) established the first official Master’s Degree Program in Pharmaceutical Engineering (PhEn) in the State of New Jersey. The PhEn program has grown rapidly, as shown in the student enrollment and graduation figures presented below. Because of the success of the PhEn program, additional pharmaceutical related programs have been recently developed at NJIT outside the CBPE department, in which the Director of the PhEn program was also involved. These programs include Pharmaceutical Chemistry (hosted in the Chemistry and Environmental Science Department) and Pharmaceutical Systems Management (hosted in the Industrial and Manufacturing Engineering department), both incorporating in their curriculum some of the existing PhEn courses.

The PhEn and related programs have been designed so that applicants with different backgrounds, such as engineering, chemistry, pharmacy, biology and others can be admitted to the program. Nevertheless, the program is strongly oriented toward the engineering component of “Pharmaceutical Engineering”. In addition, since the pharmaceutical industry is a chemistry-based industry a chemical engineering background is the most appropriate to enter the program. Many of these students now work at companies in New Jersey, the US, as well as other countries where the pharmaceutical industry is rapidly developing. During the period 2002-2011, the Schering-Plough Foundation has provided funds to initiate and develop the Pharmaceutical Engineering educational programs ($500,000). PhEn courses have routinely been offered at company sites, i.e., Wyeth (then acquired by Pfizer) and Schering-Plough (then acquired by Merck).

1.2.3 Department of Electrical and Computer Engineering

1. MS in Bioelectronics: Bioelectronics brings together the best of two worlds: the strengths of biology and biochemical interactions are combined with electronic signal detection, processing and analysis. This leads to new applications in medicine, diagnostics and therapeutics that would never be imaginable within the limitations of each separated domain. The MS in Bioelectronic is offered in response to experts’ assertion that the healthcare industry and the economy will be transformed by enterprises involved in designing and manufacturing of biomedical sensors and bioelectronic devices and systems, involving micro- and nano-electronic materials, for biomedical imaging (at cellular, molecular and organ levels), diagnostic, therapeutic, and other clinical applications.
1.2.4 Department of Engineering Technology

1. BS in Medical Informatics Technology: Medical Informatics is an interdisciplinary program which combines courses from Information Systems, Biology and Management. It is the study of how health data is collected, stored and communicated, how data is used for administration and clinical decision making and how computers and telecommunications can be applied to support those processes. The areas of study in Medical Informatics are; Medical Records, Telemonitoring, Expert Systems, Security, CT-MRI & PET scan data analysis and storage and Medical Sensors. Articulation agreements for students in AAS programs in Bergen Community College and Rockland Community College. There are 3-4 other community colleges that are working on developing a two-year program that will articulate to us. In addition, we work with the Barnabas Heath (particularly Newark Beth Israel Medical Center) for internships in this program.

1.2.5 Department of Mechanical and Industrial Engineering

1. MS in Healthcare Systems Management: The MSHSM trains and educates graduates in the application of systems analysis and quantitative methods in managing the various components of the healthcare delivery system. The program provides graduates with contemporary knowledge and the needed technical expertise for the efficient design, management and operation of healthcare facilities, including hospitals, nursing facilities, clinics, and pharmacies. Students are also associated in research projects related to healthcare information technology, operations designs, and simulation modeling. Graduates would find jobs in hospitals and healthcare organizations, serving in progressively more responsible positions in the quality improvement, decision support, information technology, patient accounting, facilities planning, or operations management departments.

Students have interned at St. Joseph’s Healthcare System, Virtua Health, and Meadowlands Hospital. Graduates are employed at several NJ Healthcare organizations including Somerset Medical Center, eClinical Works, and Raritan Bay Medical. Also, In 2008 program received the Special Achievement Award from the Healthcare Planning and Marketing Society of New Jersey (HPMSNJ).

2. MS in Occupational Safety and Health Engineering: The program: (1) Trains engineering/science graduates in Occupational Safety and Health Engineering at the masters level, (2) Collaborates in research and training within the occupational health & safety related programs in occupational medicine, industrial hygiene, ergonomics and, biomechanics programs under the Region-II NIOSH (National Institute of Occupational Health & Safety) ERC (Education and Research Center), and (3) Conducts research in ergonomics, biomechanics, and safety. The research focus is prevention and reduction of occupation related health problems and injuries of workers. The average program enrolment is 15, and the graduation rate is 4-5 MS students per year.
Region II NIOSH ERC (www.nynjerc.org) is composed of academic institutions that provide interdisciplinary graduate training, research and continuing education in the core occupational safety and health areas of occupational medicine residency (OMR), occupational safety (OS), industrial hygiene (IH), occupational health nursing (OHN), and other closely related occupational safety and health fields. Under the Region II NIOSH ERC, NJIT’s MS OSHE collaborates with four other academic institutions (i) Mount Sinai School of Medicine – Department of Community and Preventive Medicine, (ii) Hunter College – School of Health Sciences, (iii) University of Medicine and Dentistry of NJ - Robert Wood Johnson Medical School, School of Public Health, and (iv) New York University – Occupational and Industrial Orthopedic Center, Ergonomics and Biomechanics.

1.2.6 Other Activities: Course and Curriculum Development

1. Educational Materials to Enhance Chemical Engineering Curricula with Applications in Biological Engineering

This NSF-funded project aims to prepare faculty to effectively incorporate biological applications into their curricula. I am the editor in chief of the Dynamics and Control track.

The Program is offered in collaboration with the University of Virginia, University of Maryland Baltimore County, Bucknell University, and San José State University.

Source of funding: National Science Foundation
1.3. College of Computing Sciences

1.3.1 Department of Computer Science

1. BA/BS in Bioinformatics: Bioinformatics is concerned with the development and implementation of tools that enable efficient access to, and use and management of, various types of information. Bioinformatics creates tools that are deployed in the diagnosis and prevention of cancer and other diseases, and in the discovery and/or design of new drugs. Bioinformatics is also concerned with the development of new algorithms (mathematical formulas) and statistics with which to assess relationships among members of large data sets, such as methods to locate a gene within a sequence, predict protein structure and/or function, cluster protein sequences into families of related sequences, and derive intermolecular interactions and biological pathways. The undergraduate degrees in bioinformatics provide the student with an understanding of bioinformatics, computer science and biology fundamentals, along with the sciences, mathematics, and supporting interdisciplinary studies. The BS in Bioinformatics has graduated multiple students who have gone on to careers in medicine and biotechnology and currently enrolls multiple premed students.

2. MS in Bioinformatics: The program addresses the growing need for professionals with an educational background that blends biology with computer science and mathematics. This combination of skills is needed both in the pharmaceutical and biotechnology industries, as well as in biomedical research. Bioinformatics faculty at NJIT specialize in technological, computational, and mathematical aspects of biology, including the application and development of DNA microarray techniques, modeling of molecules, genetic data mining and warehousing, biophysical models of neurons and networks of neurons, among other areas. Cross training in biology, computer science, and mathematics is an essential component of bioinformatics competency. This master's program is designed to provide bioinformatics skills for those with a background in either biology or computer science/physical science. Based on the selection of electives, students can specialize in the life sciences (for those with a biology background) or computing (for those with a computer or physical science background). The MS in Bioinformatics program graduates tens of students every year into careers in biotechnology and related fields.
1.4 College of Architecture and Design

1.4.1 School of Architecture

1. PhD in Urban Systems (joint program with UMDNJ/Rutgers-N/NJIT): All students take a set of required, core courses taught at the three institutions. They specialize in one of three tracks: Urban Educational Policy (at Rutgers), Urban Health (at UMDNJ) and Urban Environment (at NJIT). Students are admitted and are registered at their home institutions. All decisions about admissions, curricular and other academic requirements are made jointly by faculty from the three partners, and faculty jointly serve on dissertation committees. The diploma lists all three universities.
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Appendix 2.1  Cellular Engineering Research

Name

Shahriar Afkhami

Name of NJIT program or activity

Collaborative Research: Cavitation in insects: physical mechanisms for switching on the embryonic tracheal system

Brief synopsis

We propose to resolve the physical mechanisms driving both parts of the process (cavitation and subsequent air expansion). We hypothesize that cavitation is driven by some combination of negative pressure in the egg liquids, surface chemistry of tracheal tubes, and surface tension of intra-tracheal liquids. Further, we hypothesize that subsequent expansion of the initial bubbles into the rest of the tracheal system depends on interactions between surface forces in the tracheal system and liquid transport by either tracheolar cells or across the walls of the tracheal system, or by evaporation and recondensation.

External partners or collaborating institutions

H. Arthur Woods, University of Montana, Division of Biological Sciences

Source(s) of funding

Submitted to NSF
Appendix 2.1  Cellular Engineering Research

Name
Treena Arinzeh

Name of NJIT program or activity
Research

Brief synopsis
This research project involves the development of new bone grafting biomaterials for the repair of large bone defects.

External partners or collaborating institutions
UMDNJ - Newark, NJ - Department of Orthopaedics, Dr. Sheldon Lin

Source(s) of funding
PI - Arinzeh, Coulter Foundation. $200K for 2 years, 09-01-10 through 08-31-12.
We are also receiving supplemental funds in year 2, as of 11-01-11, to pursue large animal studies. Additional funding expected to be approximately $300K.
Appendix 2.1 Cellular Engineering Research

Name

Treena Arinzech

Name of NJIT program or activity

Research

Brief synopsis

This project involves the development of piezoelectric biomaterials/smart materials for use in regenerative medicine.

External partners or collaborating institutions

Collaborations are at NJIT and Sports Medicine and Orthopaedic Center, Livingston, NJ, Dr. Louis Rizio - Orthopaedic Surgeon

Source(s) of funding

National Science Foundation - $400,000, 08-01-2010 to 07-30-13
Appendix 2.1  Cellular Engineering Research

Name

Treena Arinzech

Name of NJIT program or activity

Research

Brief synopsis

This work is in collaboration with a medical device company in NJ to evaluate the bone bioactivity of biomaterials for use in orthopedic applications.

External partners or collaborating institutions

Integra Life Sciences, Plainsboro, NJ

Source(s) of funding

Integra Life Sciences, Plainsboro, NJ, $35K, 01-01-11 to 12-31-11
Appendix 2.1  Cellular Engineering Research

Name

Treena Arinzeh

Name of NJIT program or activity

Research

Brief synopsis

We are developing a novel bioinspired biomaterial for articular cartilage repair.

External partners or collaborating institutions

Sports Medicine and Orthopaedic Center of NJ, Livingston, NJ, Dr. Louis Rizio, Orthopaedic Surgeon

Source(s) of funding

PI - Arinzeh, Grant proposal submitted on 07/11 to the Musculoskeletal Transplant Foundation, $300,000 for 3 years
Appendix 2.1  Cellular Engineering Research

Name

Treena Arinzeh

Name of NJIT program or activity

Research

Brief synopsis

We are developing a smart material for the repair of osteochondral defect due to battlefield injuries

External partners or collaborating institutions

University of Pennsylvania and VA Center of Philadelphia, Dr. Jonathan Garino, Orthopaedic Surgeon

Source(s) of funding

PI - Arinzeh, Invited proposal to be submitted on 12/11 to Department of Defense, $1,000,000 for 3 years.
Appendix 2.1  Cellular Engineering Research

Name

Treena Arinzeh

Name of NJIT program or activity

Research

Brief synopsis

We are developing a tissue engineering model to evaluate breast cancer cells in a bone marrow microenvironment in order to understand the mechanism for their dormancy and resurgence in this environment.

External partners or collaborating institutions

UMDNJ - Newark, NJ, Dr. Pranela Rameshwar - hematologist/oncologist

Source(s) of funding

Proposals submitted to the Department of Defense on 09/11 for $600K for 3 years, and National Institutes of Health, R21, $400K for 2 years, PI - Arinzeh
Name

Cheul Cho

Name of NJIT program or activity

Extracorporeal bio-artificial liver assist device with human stem cell-derived hepatocytes

Brief synopsis

This project aims to differentiate human embryonic stem (ES) cells into functional hepatocytes and to evaluate their therapeutic efficacy in a bio-artificial liver (BAL) for the treatment of acute liver failure. Current potential cell-based therapies and extracorporeal BAL devices for the treatment of liver failure are severely limited by the low availability of functional human liver cells, called hepatocytes. The research focuses on designing a clinically-scaled bio-artificial liver. Approximately 10 percent of the liver mass is necessary to support a patient with acute liver failure, which is a critical limitation for many cell-based therapies for liver failure.

Embryonic stem cells are considered a potential source of cells for hepatic therapies due to their limitless capacity for self-renewal and proliferation, and their ability to differentiate into all major cell lineages. This novel method differentiates embryonic stem cells into hepatocytes with high purity. Incorporating these cell-derived hepatocytes into a device to treat fulminant hepatic failure has improved animal survival, thereby underscoring the cells’ therapeutic potential.

External partners or collaborating institutions

Collaborators on research and grant proposals:

  - Dr. Steven Levison, Ph.D., Professor of Neuroscience
  - Dr. Chirag Gandhi, M.D., Assistant Professor of Neurosurgery
  - Dr. Junichi Sadoshima, MD, PhD, Professor of Cell Biology (Consultant)
  - Dr. Andrew de la Torre, MD, Associate Professor of Surgery

Source(s) of funding

Coulter Foundation
Appendix 2.1 Cellular Engineering Research

Name

Edgardo Farinas

Name of NJIT program or activity

Engineering proteins using directed evolution and rational approaches

Brief synopsis

The central aim of his research is to develop methodologies and “rules” for enzyme design, and apply these methods to efficiently create novel and practical biocatalysts. His current research interest is in engineering proteins using directed evolution and rational approaches. His research goals include developing high-throughput screening technologies to assay mutant enzyme libraries to discovery novel biocatalyst; combining rational and directed evolution approaches to create de novo enzymes; metabolic pathway engineering in bacteria; novel protein display technologies; and incorporation of nonnatural amino acids in proteins.

Source(s) of funding

In 2008, Farinas received a National Science Foundation (NSF) CAREER award for his project "New Tools for High-Throughput Screening of Protein Libraries: Engineering Metalloproteins Displayed on Bacillus Subtilis Spores." The prestigious career award recognizes teacher-scholars most likely to become the academic leaders of the 21st century.
Appendix 2.1 Cellular Engineering Research

Name

Haidong Huang

Name of NJIT program or activity

Bioorganic chemistry, nucleotides

Brief synopsis

Using artificial receptors to detect damaged DNA bases.
Using synthetic analogues to study mutagenic effect of DNA alkylation.
Artificial ribonucleases.
Appendix 2.1 Cellular Engineering Research

Name

G. Miller ("Mill") Jonakait, Distinguished Professor, Department of Biological Sciences

Name of NJIT program or activity

“Astrocytes inhibit the microglial dendritic cell phenotype”

Brief Synopsis

One project involving two graduate students, is designed to investigate the interaction between two glial types in the mammalian brain. These two cell types are microglia (immune regulators) and astrocytes. We have found that astrocytes have potent inhibitory actions on microglia. These studies have ramifications for autoimmune disorders of the brain (like multiple sclerosis) as well as brain cancers (like glioblastomas).

Source(s) of funding

The glial work has been supported for many years by grants from the National Science Foundation.
Appendix 2.1  Cellular Engineering Research

Name

G. Miller (“Mill”) Jonakait, Distinguished Professor, Department of Biological Sciences

Name of NJIT program or activity

“Mediators of maternal inflammation”

Brief synopsis

Our other project (involving one graduate student) is designed to investigate what happens to embryonic brain development (with a focus on a small area in the forebrain) when mothers become inflamed. Using mice, we introduce a viral mimic to pregnant dams and, using stereology, enzyme assays, and RT-PCR, examine alterations in brain chemistry. This has important implications for schizophrenia and autism, two developmental disorders that have been linked to prenatal inflammation. In association with this project we are investigating the influence of particular chemokines (chemoattractants of the immune system) in regulation proliferation and/or differentiation of neural stem cells derived from the embryonic brain.

Source(s) of funding

The autism work is currently funded by the NJ Governor’s Council for Medical Research and Treatment of Autism.
Appendix 2.1  Cellular Engineering Research

Name
Eun Jung (Alice) Lee

Name of NJIT program or activity
In vitro regeneration of lung tissue

Brief synopsis

The fundamental components employed in the field of tissue engineering are scaffold, bioreactor and cells. In this research, the decellularization method is used to produce suitable scaffolds for regenerating lung tissue in vitro. In addition, a bioreactor system was developed to facilitate physiologic and long-term culture of engineered tissue. Furthermore, embryonic stem cells offer unique opportunities as an ideal cell source for cardiovascular research, and strategies to use engineered tissues as a provider of cardiogenic niche in vitro to facilitate advanced maturation of stem cell-derived cardiomyocytes to resemble adult cardiomyocyte phenotype are examined.
Appendix 2.1  Cellular Engineering Research

Name

Cyrill Muratov

Name of NJIT program or activity

Collaborative Research: Dynamics of Morphogen Gradients

Brief synopsis

The project describes a series of theoretical and experimental studies of morphogen gradients, defined as the concentration fields of chemical substances that control spatial patterns of cell differentiation in developing tissues. Current studies of morphogen gradients move in an increasingly quantitative direction and demand the development of a rigorous theoretical framework that can be used to interpret experimental results and guide systems-level analyses of pattern formation mechanisms. This project develops such a framework, combining rigorous mathematical and computational analysis of a general class of reaction-diffusion models of morphogen gradient formation with applications of these models to a specific pattern formation event in Drosophila embryo.

External partners or collaborating institutions

Princeton University

Source(s) of funding

NSF
Appendix 2.1 Cellular Engineering Research

Name

Leiping Wei, Assistant Professor, Chemistry & Environmental Science NJIT

Name of NJIT program or activity

Environmental Bioinorganic Chemistry

Brief synopsis

A study of the behavior and function of inorganic and organometallic compounds in biological systems. Currently studies the production and exudation of thiol containing small peptides by marine phytoplankton in response to the exposure to environmentally relevant levels of heavy metals, the abiotic and biological degradation of these thiol compounds in natural seawater, and the enzymatic and genetic control of the production of these compounds.
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Appendix 2.2  Neuroscience & Engineering Research

Name

Sergei Adamovich

Name of NJIT program or activity

Biomedical Engineering

Brief synopsis

The goal of this study is to optimize hand rehabilitation post-stroke using interactive virtual environments, robotics and non-invasive brain stimulation. The potential benefit will be to provide more targeted therapeutic interventions so as to maximize recovery of function in the hemiplegic hand of patients who have had a stroke.

External partners or collaborating institutions

Partners:

Dr. Alma Merians, PT, PhD, Chairperson and Professor, Dept of Rehabilitation and Movement Sciences, UMDNJ

Dr. Eugene Tunik, PT, PhD, Assistant Professor, Dept of Rehabilitation and Movement Sciences, UMDNJ

Source(s) of funding

NIH R01 grant, 2009-2013, total cost $1,143,553, PI: Adamovich, PI on the subcontract to UMDNJ: Merians
Name
Tara Alvarez

Name of NJIT program or activity
BME dept, Vision and Neural Engineering Lab

Brief synopsis
Functional and structural advanced imaging of controls and patients with traumatic brain injury in collaboration with Bharat Biswal, Associate Professor of Radiology. This has led to 5 peer reviewed publications, many conference papers and 2 student paper awards.

External partners or collaborating institutions:
UMDNJ and Kessler

Source(s) of funding:
NSF CAREER to T. Alvarez, NIH to B. Biswal
Appendix 2.2  Neuroscience & Engineering Research

Name

Amitabha Bose

Name of NJIT activity or program

Mathematical models of neuronal activity

Brief synopsis

The primary goal of the research of Amitabha Bose is to derive and analyze mathematical models of neuronal activity. Primary applications include studies of the crustacean stomatogastric ganglion (STG). In particular, Bose and collaborators have developed models which explain how neurons in the pyloric network of the STG maintain phase relationships with one another as the frequency of network oscillations change (Manor, Bose, Booth and Nadim, 2003; Bose, Manor, Nadim, 2004). Other models explain how the frequency of the gastric mill rhythm is controlled by modulatory inputs to the STG (Ambrosio, Nadim, Bose; 2005). Bose is also interested in understanding the various roles that short-term synaptic plasticity can play in neuronal networks. He has shown how plasticity can give rise to bi-stability in oscillator-follower networks (Bose, Manor, Nadim; 2001) and how it can be used to explain the phenomena of episodic bursting in the context of frog ventilatory rhythmogenesis (Bose, Lewis, Wilson; 2005).

Source(s) of funding

NSF
Appendix 2.2 Neuroscience & Engineering Research

Name

Amitabha Bose

Name of NJIT activity or program

Mathematical models of REM Sleep State

Brief synopsis

Collaborative research on the mechanisms that underlie sleep rhythms including what controls the onset of REM sleep.

External partners or collaborating institutions

Rupesh Kumar and Birendranath Mallick, Jawaharlal Nehru University, New Delhi

Source(s) of funding

NSF
Name

Richard Foulds, Ph.D.
Associate Professor Biomedical Engineering

Name of NJIT program or activity

Rehabilitation Engineering Research Center on Children with Orthopedic Disabilities

Brief synopsis program

This grant began in November 2005 and will be completed on October 31, 2011. It supported three research and three development projects addressing:

- Robot assisted therapy for children with Cerebral Palsy
- Methods of improving bone mineral density in non-ambulatory children
- Researching new models of motor control that are applied to children with spasticity
- Developing telemanipulation interfaces for effective use of a wheelchair-mounted robot
- Development of an adaptive video game platform for use with severely disabled children
- The development of novel interfaces for use by children with multiple disabilities

External partners or collaborating institutions

The primary partners were the Children’s Specialized Hospital (affiliated with UMDNJ’s Robert Wood Johnson Medical School), the Elks Passaic County Cerebral Palsy Center, and First Children’s Center.

Source(s) of funding

$4,725,000 from the National Institute on Disability and Rehabilitation Research
Name

Jorge Golowasch

Name of NJIT program or activity

Role of neuromodulators and activity in the regulation of ionic currents and neuronal network activity

Brief synopsis

Neuronal network activity is shaped by its intrinsic properties, synaptic interactions and by extrinsic neuromodulation, which result in a diverse repertoire of network outputs. Because of the vital nature of rhythmic behaviors (respiration, locomotion, heartbeat, etc.) it is likely that evolutionary pressures would have selected mechanisms to make these rhythms stable and able to recover from disruptive perturbations to maximize survival. Using primarily the pyloric network as a model system and a combined experimental and modeling approach this project examines the biophysical mechanisms that generate stability of function.

Source(s) of funding

NIH
Name

Jorge Golowasch, Farzan Nadim

Name of NJIT program or activity

Linear conductance-based mechanisms underlying oscillations in neuronal networks.

Brief synopsis

The goal of this project is to provide a new understanding of the neuronal properties that are critical for producing stable slow bursting oscillations and to explore the consequences of their activation when neurons expressing them are embedded in a network. In this proposal, a novel approach is used whereby a nonlinear inward current is replaced with a linear current of negative conductance. This approach exposes the multiple roles played by regenerative inward currents and simplifies the investigation of the contribution of other ionic currents to oscillatory activity.

External partners or collaborating institutions

This project is pursued as a collaboration with two other co-PIs (Drs. Farzan Nadim and Amithaba Bose) from Mathematics.

Source(s) of funding

NSF
Name

Victor Matveev

Name of NJIT program or activity

Research Project "Calcium Dynamics in Exocytosis and Synaptic Facilitation"

Brief synopsis

In this project a combination of analytic, computational and experimental techniques are used to gain deeper understanding of calcium dynamics involved in chemical synaptic transmission. The main goal of the project is to elucidate the precise sequence of steps linking calcium ion entry into the cell through calcium channel to the release of neurotransmitter into synaptic cleft, a process termed exocytosis. The project also focuses on the impact of intrinsic and externally applied calcium binding substances termed calcium buffers on exocytosis and its time-dependent changes, using mathematical modeling of buffered calcium diffusion inside the cell.

Source(s) of funding

NSF
Name

Robert Miura, Distinguished Professor Mathematical Sciences

Name of NJIT program or activity

Mathematical physiology

Brief synopsis program

The research of Robert M. Miura covers several areas in mathematical physiology, especially in neuroscience. The techniques used are mathematical modelling, mathematical analysis, approximation methods, and numerical simulations. His research on excitable biological cells, including neurons, cardiac cells, and pancreatic beta-cells, is aimed at understanding electrical effects on cell function and signalling. These studies involve detailed investigations of membrane electrical properties, subthreshold resonance, stochastic resonance, signal propagation on dendrites, and mechanisms leading to bursting electrical activity. His studies on spreading cortical depression, and more generally intercellular communication via ion flows, include analysis and simulations of partial differential equation models. Diffusion of ions in the brain is studied using the lattice Boltzmann method.

External partners or collaborating institutions

UMDNJ
Rutgers Newark
Appendix 2.2  Neuroscience & Engineering Research

Name

Farzan Nadim

Name of NJIT program or activity

Regulation of Neuronal Oscillations by Synaptic Dynamics

Brief synopsis

This project focuses on developing experimental measurements in the context of a novel mathematical framework to understand how synaptic and neuronal dynamics contribute to circuit function in oscillatory networks in the highly accessible crustacean pyloric network. The methods and characterizations developed in this proposal can be generalized to more complex networks of the human brain to describe the emergence of biological oscillations and their disorders as observed in injury or pathological conditions resulting from demyelinating diseases, disorders of the striatum such as Parkinson’s disease, schizophrenia and autism spectrum disorders.

Source(s) of funding

NIH
Appendix 2.2  Neuroscience & Engineering Research

Name

Farzan Nadim

Name of NJIT program or activity

Temporal Fidelity of Axonal Conduction and its Neuromodulation

Brief synopsis

The propagation of electrical signals in nerves and axon tracts is fundamental for nerve cell communication and information processing in the nervous system, and is altered in a range of diseases that change the electrical properties of nerve cell membranes. This is a collaborative project with Dr. Dirk Bucher (Univ. Florida) to study how the variety of ion channels and pumps expressed in axons of neurons affect the action potential velocity in a history-dependent manner.
Name

Bryan Pfister, PhD

Name of NJIT program or activity

Multi-investigator Research Grant: Investigation of physiological dysfunction from repetitive mild head injury

Brief synopsis

The three investigators in this proposal bring a complement of expertise in TBI modeling, anatomical evaluation, neural engineering, neurophysiology and behavior. Our joint efforts will test our hypothesis that mild and repetitive TBI causes physiological changes in neurons and neural circuits without clear loss of brain cells. These physiological changes will be linked to behavioral impairments, in particular learning, memory and motor function. The studies of this proposal will provide a comprehensive analysis of the effect of mild and repetitive TBI from individual neurons to the complex behavioral level.

External partners or collaborating institutions

Kevin Pang, Ph.D.
Professor, Department of Neuroscience
Director of the Graduate Program in Biomedical Engineering
University of Medicine and Dentistry of New Jersey
&
Research Physiologist
Medical Research Service
VA - New Jersey Health Care System, East Orange, NJ

Viji Santhakumar, PhD.
Assistant Professor, Department of Neuroscience
University of Medicine and Dentistry of New Jersey

Source(s) of funding

NJ Commission on Brain Injury Research
Appendix 2.2  Neuroscience & Engineering Research

Name

Bryan Pfister

Name of NJIT program or activity

Research Grant: The effects of diffuse axon injury on myelin and myelinated axons

Brief synopsis

Dr. Kim's laboratory will establish myelinated axons on multi-well injury plates assembled and provided by our laboratory. We will provide and operate the axon stretch injury device and help with the scientific interpretation of the results. Dr. Kim will analyze the injury responses of myelinated axons and myelin/oligodendrocytes.

External partners or collaborating institutions

Haesun A. Kim
Associate Professor,
Federated Dept of Biological Sciences, Rutgers

Source(s) of funding

NJ Commission on Brain Injury Research
Appendix 2.2  Neuroscience & Engineering Research

Name

Camelia Prodan

Name of NJIT program or activity

Neuroscience – Brain Injury

Brief synopsis

We are measuring the complex conductivity of extracellular fluids which result from neurological injuries. The conductivity and dielectric susceptibility are indicative of the concentrations of key constituents that provide important information about the injuries and their treatment.

Source(s) of funding

NSF
Appendix 2.2  Neuroscience & Engineering Research

Name

Mesut Sahin

Name of NJIT program or activity

Neural prostheses; brain-computer interfaces; optical neural stimulation; cerebellar and spinal cord neural circuits; neural recording with multi-electrode arrays; electrode materials.

Brief synopsis

Current project is to develop and test a technology known as FLAMES -- floating light activated micro-electrical stimulators --for wireless activation of the central nervous system. Energized by an infrared light beam through an optical fiber located just outside the dura mater, the tough, fibrous membrane forming the outermost of the three coverings of the brain and spinal cord, these micro-stimulators allow victims of spinal cord injuries to regain self-mobility, environmental control and computer access. Electrical activation of central and peripheral nervous system has been investigated for treatment of neural disorders for many decades and a number of devices have already successfully moved into the clinical phase, such as cochlear implants and pain management via spinal cord stimulation, and others are on the way such as microstimulation of the spinal cord to restore locomotion; microstimulation of the cochlear nucleus, midbrain, or auditory cortex to better restore hearing; and stimulation of the visual cortex in the blind subject. But the current implantable microelectrode arrays use wired interconnects for applying the electric stimulations, and these fine wires are a major source of device failure since they are the first to break in chronic implants. The floating microstimulators will be free from any interconnects and tethering forces that would erode over time.

External partners or collaborating institutions

Cancer Institute of UMDNJ, headed by David Lagunoff.
UMDNJ  Neuroscience department.
UMDNJ faculty are serving as PhD committee members

Source(s) of funding

National Institute of Neurological Disorders and Stroke
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Appendix 2.3  Pharmaceutical Processes Research

Name

Piero M. Armenante

Name of NJIT program or activity

Dissolution Testing Research Projects

Brief synopsis

In the pharmaceutical industry, drug dissolution testing is routinely conducted to provide \textit{in vitro} drug release information for both quality control purposes, i.e., to assess batch-to-batch consistency of solid oral dosage forms such as tablets, and drug development, i.e., to predict \textit{in vivo} drug release profiles. The most common dissolution testing system for solid dosage forms is the USP Dissolution Testing Apparatus 2.

The activities carried out in different project in Prof. Armenante’s Multiphase Mixing Laboratory have shown that his apparatus is very sensitive to a number of variables, including the initial location of the tablet (see figure below). These studies conducted in this lab using tools such as Particle Image Velocimetry (PIV), Laser-Doppler Velocimetry (LDV), and Computational Fluid Dynamics (CFD) have not only elucidated the basic mechanisms responsible for the performance of this test, but have also resulted in a novel design (including a pending patent) and operating guidelines.

External partners or collaborating institutions

Schering-Plough Company and Merck Company

Source(s) of funding

Schering-Plough Company ($100,000), and Merck Company ($100,000).

.
Appendix 2.3 Pharmaceutical Processes Research

Name

Ecevit Biligi, Asst. Professor Chemical, Biological, Pharmaceutical Engineering

Name of NJIT program or activity

Pharmaceutical solids manufacturing technology

Brief synopsis

Enhancing bioavailability of poorly soluble APIs via nano-particle coated pellets: preparation of colloidal API dispersions in wet stirred media mills and their fluidized bed coating onto beads

Enhancing bioavailability of poorly soluble APIs using the fluidized bed (FB) technology and developing a fundamental understanding of mechanisms that lead to improved bioavailability

Population balance modeling of breakage, agglomeration, and growth mechanisms in particulate unit operations toward developing a better mechanistic understanding of various pharmaceutical unit operations such as fluidized bed granulation, milling, and crystallization.

Developing mathematical models to assess the impact of material non-homogeneity, anisotropy, as well as of thermal and mechanical field interactions within the context of hyperelasticity and finite thermoelasticity of rubber-elastic materials

External partners or collaborating institutions

Merck

Source(s) of funding

NSF
Appendix 2.3  Pharmaceutical Processes Research

Name

Rajesh Dave, Distinguished Professor Chemical, Biological, Pharmaceutical Engineering

Name of NJIT program or activity

Engineering Research Center for Structure Organic Particulate System

Brief synopsis

The Center’s vision is to be the national focal point for science-based development of structured organic composite products and their manufacturing processes in the pharmaceutical, nutraceutical, and agrochemical industries. The research program will (1) Develop a scientific foundation for the optimal design of structured organic composites; (2) Develop science and engineering methods for designing, scaling, optimizing and controlling relevant manufacturing processes; (3) Establish effective educational and technology transfer vehicles; and (4) Establish effective mechanisms for the inclusion and participation of minorities and women at all levels.

Outcomes that determine C-SOPS success are: faster, more reliable, less expensive drug product development; less expensive manufacturing; lower risk to patients through improved quality; new multidisciplinary educational programs, enhanced manpower supply; and new technologies benefiting all industries that focus on delivery of bioactive substances.

Center research activities are organized along a thrust structure, composed of four cohesive and interconnected thrusts, and following the logical conceptual flow of product engineering activities: (A) Materials Formation and Characterization, (B) Design, Scale Up, and Optimization of the Manufacturing Process, (C) Structural Characterization and Performance Modeling of Product, and (D) Integrated Systems Science.

External partners or collaborating institutions

Rutgers, Purdue, U. Puerto Rico Mayaguez

Source(s) of funding

NSF
Lilly, Pfizer, Glaxo-Smith Kline, Proctor & Gamble, Abbot Laboratories, Bristol Myers Squibb, Johnson & Johnson, Merck, National Starch, Kraft, E.I. DuPont, ICI

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Appendix 2.3 Pharmaceutical Processes Research

Name

Prof. Costas G. Gogos in collaboration with Prof. Marino Xanthos, Dr. Huiju Liu, ACE Polymer Research Engineer, and polymer colleagues at the Polymer Processing Institute

Name of NJIT program or activity

Pharmaceutical Hot Melt Extrusion (HME) program

Brief synopsis

Hot Melt Extrusion (HME) refers to a novel process for manufacturing oral dosage pharmaceutical products for very poorly-soluble Active Pharmaceutical Ingredients (APIs). Such APIs are mixed with water soluble polymer excipients and extruded at temperatures above the glass transition or melting point of the excipient but below that of the API, to avoid degradation. The solubility of the API in the molten excipient is increased greatly enabling it to form solutions at concentrations in the range of 20-50%. Thus, when the extrudate is quenched to room temperature, where the polymer excipient is solid, the API remains in solution. When ingested, since the excipient is water soluble, the API becomes readily bioavailable. For this reason there is currently a strong interest from both academia and the pharmaceutical industry to study and use HME, especially in view of the fact that currently 70% of new synthesized drugs are very poorly water soluble. In the last four years our Pharma HME program has actively focused on research topics such as the relationship between molecular interactions and drug solubility, as well as physical shelf life stability, enhanced laminar mixing mechanisms of APIs in polymeric excipients during extrusion, and increasing dissolution rates by creating foamed Excipient/API extrudates.

External partners or collaborating institutions

Schering Plough (now Merck) and Wyeth (now Pfizer) Merck Corporation, ColorCon Incorporation, FMC Corporation, BASF Corporation, Evonic, and University of Rhode Island

Source(s) of funding

NSF GOALI Grant: CMMI-0927142 (2009 -2012)
ACE Contracts [Dual Technology Application] DAAE 30-03-D-1015 (2008- 2012)
Contracts: Merck, ColorCon, and FMC contracts – total of approximately $150,000
Name

Boris Khusid, Professor, CBPE

Name of NJIT program or activity:

Development of novel lab-on-a-chip (LOC) technologies for bio-medical applications

Brief Synopsis:

Development of digital droplet-based LOC devices for processing of collected specimens of a bodily fluid (saliva, urine, etc.)

Production of potable water from saline water, water for injection and pharmaceutical applications.

Novel membrane techniques for protein purification, virus removal, pharmaceutical and biopharmaceutical separations/purifications.

External partners or collaborating institutions:

NASA Glenn Research Center, Cleveland, OH

Sandia National Laboratories, Albuquerque, NM

University of Colorado, Boulder, CO is another site for the multi-site MAST NSF I/UCRC---NJIT is the lead site and industrial members of the MAST NSF I/UCRC---NJIT center.

Sources of Funding:


Magnetic Field Effect on Ionic Solutions, #11-3 MAST NSF I/UCRC, Boulder, CO, Contract $100,500 (1/1/11 – 12/31/13).

Micromechanical Model of Polymeric Membrane Pleating, #11-4 MAST NSF I/UCRC, Boulder, CO, Contract $100,500 (1/1/11 – 12/31/11);
Appendix 2.3  Pharmaceutical Processes Research

Name

Boris Khusid, Professor, CBPE

Name of NJIT program or activity:

Development of novel technologies for manufacturing personalized medicines

Brief Synopsis:

Under a personalized medicine scheme, drug prescribing and dosing should be carefully tailored to a patient's genetic background. We develop novel small-scale pharmaceutical technologies for manufacturing of tailored therapeutics since the existing technologies have evolved around processes for mass production. My group works on two projects (printing of pharmaceutical formulations and fabrication of pharmaceutical films) supported by the NSF ERC on Structured Organic Particulate Systems.

External partners or collaborating institutions:

Institutions and industrial members of the NSF ERC on Structured Organic Particulate Systems.

Sources of Funding:

NSF ERC on Structured Organic Particulate Systems
Appendix 2.3 Pharmaceutical Processes Research

Name

Norman Loney, Professor Chemical, Biological and Pharmaceutical Engineering

Name of NJIT program or activity

Mathematical Modeling of Drug Release from Lidocaine Loaded Biodegradable Nanospheres without Film Resistance

Brief synopsis

This work has developed a comprehensive mathematical model that theoretically demonstrates the pertinent mechanisms controlling oral dosage drug delivery and would now like to explore the confirming experimental studies. Mathematical modeling can help to advance the understanding of the mass transport mechanisms which are involved in the control of drug release. Quite frequently, polymers are added to modify the release step of a drug. The chemical nature of the polymers commonly used for pharmaceutical purposes can differ significantly. Because it is not anticipated that there will be an overall mathematical model covering all the possible physicochemical processes that can occur in a given system, it becomes important to identify an adequate theory for a specific drug delivery system.

It is well known that kidney transplant is a very successful and current medical operation. However, what may not be as well known is that hemodialyzers are very prevalent because there are just not enough kidneys available for transplants. This leads to the issue of well-designed dialyzers that might even be reusable in certain circumstances depending on a patient’s ability to purchase a new dialyzer. We have developed a mathematical model of a multi-fibule counter current dialyzer with the capability to predict the pertinent mass transfer parameters that are critical to the design of a multi-fibule potentially reusable hemodyalizer. This work has been published and presented in Scotland and China with great revues but we are still lacking benchmarking (experimental) data.
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2.4 Medical Device Research
2.4 Medical Device Research

Name

Treena Arinzeh

Name of NJIT program or activity

Research

Brief synopsis

This research project involves the drug release from metallic implants used for total hip replacements.

External partners or collaborating institutions

Pipeline Orthopaedics, Inc.

Source(s) of funding

Pipeline Orthopaedics, Inc., $10K, 08-01-11 to 02-01-12
2.4 Medical Device Research

Name

Linda Cummings

Name of NJIT program or activity

Multi-level Model of Reperfusion Injury

Brief synopsis

The proposed project (with Raquel Perez-Castillejos, BME) aims to elucidate the key mechanisms leading to reperfusion injury to the endothelium that can follow an ischemic event, and to investigate and optimize the particular therapy of postconditioning. Project will build in vitro (microfluidic) and mathematical models to describe ischemia followed by reperfusion within a blood vessel, and use its models to study systematically the two key components of the reperfusion process (i) reintroduction of flow (shear stress) and (ii) re-oxygenation.

Source(s) of funding

Submitted to NSF
2.4 Medical Device Research

Name
Atam Dhawan

Name of NJIT program or activity
Multi-spectral Medical Imaging

Brief synopsis
Atam P. Dhawan, Ph.D. was a Canadian Commonwealth Fellow at the University of Manitoba where he completed his Ph.D. in Electrical Engineering with specialization in Medical Imaging in 1985. In 1984, he won the first prize and the Martin Epstein Award in the Symposium of Computer Application in Medical Care Paper Competition at the Eighth SCAMC Annual Congress in Washington, D.C., for his work on developing a three-dimensional (3D) imaging technique to detect early skin-cancer called melanoma.

In recent years, optical imaging has been of significant interest as a non-invasive medical imaging modality for biomedical and clinical applications. Visible and near-infrared light wavelengths have been used for tissue and organ imaging using surface reflectance, transillumination and transmission based methods. Fluorescence optical imaging has shown great potential in molecular imaging with a spectrum of applications including drug discovery.

Source(s) of funding
National Institutes of Health
NASA
The Gustavus A. Ohle Jr Trust Foundation
William G. & Helen C Hoffman Foundation
2.4 Medical Device Research

Name

Reginald C. Farrow

Name of NJIT program or activity

Nanoscale Cell Electrophysiology

Brief synopsis

Cell electrophysiology is the core cell biology discipline, which relates cellular electrical activity to cell function. The main goal of this research is to develop and test a carbon nanotube probe array that is integrated with on-chip addressing and signal processing that would be capable of resolving the cell membrane potential distribution along and through the cell membrane and investigate cellular signaling mechanisms with molecular sensitivity and provide a pathway to spatial resolution on the order of nanometers. We have demonstrated that a device with two nanoprobes spaced 6 µm apart can detect the presence of motile cells in suspension using impedance spectroscopy and are currently fabricating a device that has a 14 element array of nanoprobes with 2 µm spacing. The logical extension of these experiments is to reduce the spacing between SWNT nanoprobes with the capability to individually address each one. Then thousands of measurements at different locations in and around a cell could be performed rapidly. Also, interactions between cells could be recorded in real time. One example of where this may be important is neuroplasticity, which is important for understanding how the brain repairs itself after injury.

External partners or collaborating institutions

UMDNJ, Rutgers Newark

Source(s) of funding

DARPA
2.4 Medical Device Research

Name
Haim Grebel

Name of NJIT program or activity
The Detection of Human and Avian Flu Viruses using Graphene-Coated Infrared Platforms

Brief synopsis
2011 NJIT Excellence in Research Prize & Medal Winner, Prof. Haim Grebel is the director of the Electronic Imaging Center. His research focuses on artificial structures at the micron and nano-scales, and in particular, the linear and nonlinear electromagnetic properties of sub-wavelength structures, meta-structures. His techniques have led to a unique and affordable micro sensor for “The Detection of Human and Avian Flu Viruses using Graphene-Coated Infrared Platforms.”

Source(s) of funding
US Department of Defense (Army & Navy)
2.4 Medical Device Research

Name

Zafar Iqbal

Name of NJIT program or activity

Nanoscale Enzymatic Biofuel Cell

Brief synopsis

Nanoscale biofuel cells may provide a continuously renewable, tailored power source for a wide range of applications, including: targeted drug delivery, physiological monitoring and control, synthetic organs, prostheses, and other advanced medical devices, which include pacemakers, insulin pumps, glucose and pressure sensors, and bionic devices for stimulating the brain and spinal cord. A novel vertical carbon nanotube deposition technology with other advances by this research team has enabled the design and fabrication of an enzymatic micro-biofuel cell that is scalable to the limits of current process technology used in traditional ICs. The simplicity of biofuel cell architecture is also ideally suited to enable power for implantable medical devices that could derive power from glucose in the blood. This could be very beneficial in situations where a battery failure is life threatening.

Source(s) of funding

US Army, DARPA
2.4 Medical Device Research

Name

Michael Jaffe (BMDCL)

Name of NJIT program or activity

Collagen Biomaterials Development

Brief synopsis

Michael Jaffe, research professor of biomedical engineering and chemistry directs collagen research at the Medical Device Concept Laboratory (MDCL). MDCL projects focus on reconstituted collagen fiber formation, collagen characterization -- both as a "material" and as tissue engineering substrate, collagen mechanical properties and transport of small molecules through skin. One project of special interest is a collaboration among Treena Arinzech and Sam Hessami (OB/GYN) and Fred Silver (pathology) of UMDNJ, aimed at understanding the collagenous failure that leads to uterine prolapse, a major problem in women's health.

External partners or collaborating institutions

Rutgers Center for Biomaterials

Source(s) of funding

NJ Commission on Science & Technology
Name

Som Mitra

Name of NJIT program or activity

Chemical Characterization Methodologies and Proteomics to Assess Exposure to Water Dispersible Carbon Nanotube

Brief synopsis

The objective of this project is to develop reliable and reproducible exposure assessment methodologies and protein expression-based methods aimed at the development of biological/toxicological response endpoints that can serve potential biomarkers for well-characterized engineered nanomaterials (ENMs). While raw, unrefined, and hydrophobic carbon nanotubes tend to settle out of aqueous media/environs, highly water dispersible, functionalized carbon nanotubes (f-CNTs) will contaminate water resources. Large quantities of these derivatized forms of CNTs will be manufactured as they find diverse applications ranging from polymer composites to drug delivery. Accordingly, one of the major potential routes of human exposure is alimentary, occurring via consumption of water or products from plants and animals that have taken up the CNTs through food-chain dynamics. Therefore, the focus of this project will be intestinal and liver cells

External partners or collaborating institutions

Indiana University Medical Center

Source(s) of funding

NIH
Name

Raquel Perez-Castillejos

Name of NJIT program or activity:

Designing a microfluidic device to test retinal neuron targeting

Brief synopsis

In retinal degenerative diseases the death of photoreceptors causes irreparable vision loss. Current techniques to replace the photoreceptor layer have found limited success mainly due to the lack of synaptic connectivity between the transplanted photoreceptors and the host tissue. To test if the reason for this lack of success is the absence in the host of appropriate guidance cues for transplanted photoreceptors, we have devised a microfluidic device that controls the environment to which each photoreceptor is exposed.

External partners or collaborating institutions:

UMDNJ
2.4 Medical Device Research

Name

Bryan Pfister

Name of NJIT program or activity

Capstone Design project with Children’s Specialized Hospital; Flow Transducer to sense flow from a Pediatric tracheostomy tube

Brief synopsis

Developing a device to sense flow and will monitor the patient while they are exhaling. If flow diminishes the clinician/caregiver will be alarmed through an audible alarm that alerts the clinician/caregiver that flow is not present through the transducer. This will indicate that the patient has an obstruction or plug in the tracheostomy. This device will have a direct impact in the number of deaths in Pediatric tracheotomy patients and improving patient safety.

External partners or collaborating institutions

Drew Finer, BS, RRT
Director of Clinical Technology
Children's Specialized Hospital
200 Somerset St.
New Brunswick, NJ 08901

Source(s) of funding

Capstone grant from the NCIIM
2.4 Medical Device Research

Name

Camelia Prodan

Name of NJIT program or activity

Biogeophysics – Quantify microbe-mineral transformations in sulfur reducing bacteria using dielectric spectroscopy

Brief synopsis

The present work aims at quantifying the thickness of biomineral formation on Desulfovibrio vulgaris bacteria using dielectric spectroscopy. These bacteria use sulfur for respiration and in the process convert soluble heavy meal ions in water to insoluble metal sulfide precipitates and coat themselves with these precipitates. We have carried out biophysics research to quantify the mineral formation on these bacteria.

External partners or collaborating institutions

Rutgers (Newark)

Lawrence Berkeley National Laboratory

Source(s) of funding

Subsurface Biogeochemical Research Program (SBR), U.S. Dept. of Energy

US Department of Energy, Office of Biological and Environmental Research as part of the LBNL Sustainable Systems SFA
2.4 Medical Device Research

Name

Camelia Prodan

Name of NJIT program or activity

Biophysics – High throughput screening of drugs

Brief synopsis

The present research involves use of dielectric spectroscopy to provide a technique for high throughput screening of drugs.
2.4 Medical Device Research

Name

Camelia Prodan

Name of NJIT program or activity

Cell occlusion in cerebro-spinal fluid constricted passages

Brief synopsis

We have carried out applied biophysics research to develop and test the rate and mechanisms of occlusion of artificial passages in implanted devices by agglomerations of cells. These studies are important to devices like the Smart Shunt and we are part of that effort.

External partners or collaborating institutions

UMDNJ

Harvard Medical School

Infoscitex Corporation

Source(s) of funding

NIH
2.4 Medical Device Research

Name

Kamalesh K. Sirkar, Distinguished Professor, CBPE

Name of NJIT program or activity:

Membrane Separations/Center for Membrane Technologies

MAST NSF I/UCRC---Membrane Science, Engineering and Technology Center--- NSF Industry/University Cooperative Research Center

Brief Synopsis:

Development of membrane-assisted controlled release of drugs and drug delivery via iontophoresis, aqueous-organic partitioning, thermally sensitive membranes, liposomes etc.; Membrane-assisted development of nanoparticle coating for drug delivery; Ultrapure water production for potable water from saline water, water for injection and pharmaceutical applications; Novel membrane techniques for protein purification, virus removal, pharmaceutical and biopharmaceutical separations/purifications, anesthesia gas treatment.

External partners or collaborating institutions:

University of Colorado, Boulder, CO is another site for the multi-site MAST NSF I/UCRC---NJIT is the lead site.

Ben-Gurion University, Zuckerberg Institute for Water Research, Beer Sheva, Israel.

Sources of Funding:

Continuous Coating of Ultrafine Drug Particles by Heterogeneous Polymer Nucleation in a Hollow Fiber Membrane Module”, US NSF CMMI-1100622, $349,942, 05/01/11 – 04/30/14.

“Collaborative Research: Membrane Science, Engineering and Technology Center”, NSF-IIP-1034710, $400,000, 07/15/10 – 06/30/15.

“Perfluorinated Membranes for Pharmaceutical Processing”, #09-4 MAST NSF I/UCRC, Boulder, CO, Contract $80,000 (9/1/09 – 12/31/11).

Membrane Development for DCMD Treatment of Produced Fluids”, #09-1 MAST NSF I/UCRC, Boulder, CO, Contract $120,000 (1/1/09 – 12/31/11); Conoco-Phillips - $30,000.

MAST Membership Fee: $150,000 for NJIT site for 2010-2011 year.
Name

Prof Raj Sodhi, MIE Department

Name of NJIT program or activity:

Doctoral Research on Kinematics of Human Motion

Brief synopsis

This research involves the study of human knee kinematics and mechanics to improve the implant design and surgical strategy. The objective is to design new replacements devices for polycentric motion of the knee joint.

External partners or collaborating institutions:

Stryker Orthopedics

Source(s) of funding:

Stryker Orthopedics has provided software and background data on this research.
2.4 Medical Device Research

Name

Gordon Thomas

Name of NJIT program or activity

Smart Shunt: to help in the treatment of hydrocephalous and brain injury

Brief synopsis

We have carried out applied biophysics research to develop and test an implantable monitor of flow and pressure in a shunt that relieves brain pressure. The sensor uses a pressure sensitive capacitor that is part of a resonant circuit. It is sensitive enough to measure the small flow rate of the fluid that flows through the brain, yet the sensor requires no internal power so can function for decades after implantation.

External partners or collaborating institutions

UMDNJ, Harvard Medical School, Infoscitex Corporation

Source(s) of funding

Several; currently $3M multiyear grant from NIH

Other comments

Technology patented by NJIT
Name

Gordon Thomas

Name of NJIT program or activity

Non-invasive, glucose monitor to help control diabetes

Brief synopsis

We have carried out applied biophysics research to develop and test an optical measurement of the glucose concentration in the anterior chamber of the eye. We used Raman scattering to allow a quick and painless measurement, safe from infection. We are carefully studying the specificity and accuracy of the method.

External partners or collaborating institutions

UMDNJ

Source(s) of funding

Diabetes Foundation; National Medical Testbed
2.4 Medical Device Research

Name

Gordon Thomas

Name of NJIT program or activity

Personal tonometer to help prevent blindness

Brief synopsis

We have carried out applied biophysics research to develop and test a sensor system that measures the pressure in the fluid of the anterior chamber of the eye to help treat glaucoma. The device touches the eyelid gently, measures the compressibility of the combination of tissues and extracts the eye pressure using an algorithm based on the biophysics. The device is comfortable, safe from infection and allows a patient to measure the pressure at home and as often as the medical situation requires.

External partners or collaborating institutions

UMDNJ, Incubation Factory LLC

Source(s) of funding

Several; Glaucoma foundation; Hoffman Foundation

Other comments

Technology patented by NJIT and licensed by the Incubation Factory LLC
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2.5 Bio-Medical Informatics Research
2.5 Bio-Medical Informatics Research

Name
Tamara Gund, Professor, Chemistry & Environmental Science NJIT

Name of NJIT program or activity
Bio-molecular modeling

Brief synopsis
Modeling of receptors and their ligands, especially the acetylcholine (muscarinic and nicotinic), the sigma and PCP receptors and the pleasure receptor (cocaine and other abusive drugs); Modeling of the interaction between antimalarial agents such as artemisinin (qinghaosu) with hemin; Calculation of preferred structures of biologically and theoretically important molecules.

Source(s) of funding
National Institutes of Health
2.5 Bio-Medical Informatics Research

Name

Yehoshua Perl (CS)

Name of NJIT program or activity

Medical Informatics Research Group

Brief synopsis

Yehoshua Perl and James Geller, in particular, have achieved national reputations through a large number of publications in top journals and conferences on various aspects of medical ontologies and terminologies and received ongoing NIH funding for this work. They have supported and graduated multiple PhD students who have continued to academic and research careers. Perl was just selected as a Fellow of the American College of Medical Informatics Other NJIT collaborators, grantees and co-publishers of the group have included

James Geller (CS)
Michael Halper (IS)
Barry Cohen (CCS)

External partners or collaborating institutions

Dr. Gai Elhanan, Halfpenny Technologies
Dr. Huanying Gu, NYIT
Dr. Yan Chen, BMCC, CUNY
Dr. George Hripcsak, Columbia Univ.
Dr. Ling Chen, BMCC, CUNY

Source(s) of funding

"Partitioning to Support Auditing and Extending the UMLS." Grant #1-R01-LM008445-01A2, National Library of Medicine (NIH), 2006-10.

Name

Michael Recce

Name of NJIT program or activity:

Comparison of affymetrix and compugen human genome microarrays

Brief synopsis

The human genome microarrays from Compugen® and Affymetrix® were compared in the context of the emerging field of computational biology. The two premier database servers for genomic sequence data, the National Center for Biotechnology Information and the European Bioinformatics Institute, were described in detail. The various databases and data mining tools available through these data servers were also discussed. Microarrays were examined from a historical perspective and their main current applications-expression analysis, mutation analysis, and comparative genomic hybridization-were discussed. The two main types of microarrays, cDNA spotted microarrays and high-density spotted microarrays were analyzed by exploring the human genome microarray from Compugen® and the HGU133 Set from Affymetrix® respectively. Array design issues, sequence collection and analysis, and probe selection processes for the two representative types of arrays were described. The respective chip design of the two types of microarrays was also analyzed. It was found that the human genome microarray from Compugen 0 contains probes that interrogate 1,119,840 bases corresponding to 18,664 genes, while the HG-U133 Set from Affymetrix® contains probes that interrogate only 825,000 bases corresponding to 33,000 genes. Based on this, the efficiency of the 25-mer probes of the HG-U133 Set from Affymetrix® compared to the 60-mer probes of the microarray from Compugen® was questioned.

Source(s) of funding:

National Institutes of Health
Name

Usman Roshan (CS)

Name of NJIT program or activity:

Genetic phylogeny reconstruction and disease risk prediction

Brief synopsis

Dr. Roshan has published multiple papers in the fields of genetic phylogeny reconstruction and disease risk prediction, has graduated multiple PhD students who have gone on to research careers in the field.

Collaborators

Dennis Livesay, UNC Charlotte
Hakon Hakonarson, UPenn
Shahriar Afkhami, NJIT

Source(s) of funding

2.5 Bio-Medical Informatics Research

Name

Donald Sebastian

Name of NJIT program or activity

Electronic Healthcare Record Systems

Brief synopsis

The New Jersey Health Information Technology Extension Center (NJ-HITEC) was established by NJIT, through a $25 million federal grant to assist the state’s primary care providers serving the at-risk population to achieve “Meaningful Use” of electronic health record systems. Nearly 4,000 physicians have already been engaged by the program in its first 18 months. Senior Vice President for Research and Development, Dr. Donald Sebastian, is the principal investigator of the grant. When integrated with a Health Information Exchange, the EHR becomes a pipeline to the physician for pharmaceutical companies to supply information on new drugs and therapies, to recruit and manage populations for clinical trials and to conduct longitudinal studies on drug interactions.

External partners or collaborating institutions

NJ Hospital Association (107 members), Medical Society of NJ, NJ Academy of Physicians

NJ Department of Health & Senior Services

Source(s) of funding

US Dept of Health, Office of the National Coordinator ($25M / 4yr)

NJ Department of Health & Senior Services

NJ Medicaid
2.5 Bio-Medical Informatics Research

Name

Donald Sebastian

Name of NJIT program or activity

Healthcare Information Exchange Networks

Brief synopsis

New Jersey Health Information Exchange, the NJHIN, a system that will change the way health care is delivered - and paid for - in the State of New Jersey. IBM and NJIT have collaborated on this response, and along with our consortium partners, Citibank (Citi), IGI Health, Optum Insight and NJ-HITEC, New Jersey’s Regional Extension Center, describe a first-of-a-kind, state of the art solution to enable the establishment of the NJHIN and put in place the self-sustaining model to provide ongoing support to both the State and Regional HIE initiatives. Combining innovative technology with proven elements upon which the State is already standardized, with firms whose world-class capabilities are well-known in their respective fields (many of which are already in evidence in New Jersey), and are based in, or have significant New Jersey presence, our response describes an integrated, comprehensive solution which has the powerful proposition that it meets all the State’s requirements, and won’t cost the State a dime.

External partners or collaborating institutions

Health-e-cITi-NJ (see partners below)

IBM, CITI Bank, Optum, IGI Health

Source(s) of funding

US Dept of Health, Office of the National Coordinator ($5M / 4yr)

NJ Department of Health & Senior Services
Name

Carol Venanzi, Professor, Chemistry & Environmental Science NJIT

Name of NJIT program or activity:

Computer-aided drug design

Brief synopsis

Research interests are in the application of quantum chemistry and molecular modeling to elucidation of DNA/ligand binding and to development of a treatment for cocaine abuse. Recent work funded by the National Institutes of Health focuses on the study of dopamine reuptake inhibitors as potential treatment for cocaine abuse, as well as the development of novel opioid pain medications based on salvinorin A.

Source(s) of funding

National Institutes of Health
Name

Jason Wang (CS)

Name of NJIT program or activity:

Bio databases and data mining

Brief synopsis

Dr. Wang is a nationally known figure who has published extensively in top journals, especially in bio databases and data mining, is the author of several books, sits on the board of multiple journals, has graduated multiple PhD students who have gone on to academic and research careers in bioinformatics.

External partners or collaborating institutions

Prof. Tamar Schlick, New York University
Dr. Bruce Shapiro, National Cancer Institute, NIH

Source(s) of funding

III-CXT: Structure Comparison and Mining for RNA Genomics (NSF 2007-2010)
2.5 Bio-Medical Informatics Research

Name

Zhi Wei (CS)

Name of NJIT program or activity:

Bio-informatics Research

Brief synopsis

Zhi Wei has published multiple papers and done grant supported research in bioinformatics.

External partners or collaborating institutions

Dr. M. Herlyn, the Wistart Institute
Dr. H. Hakonarson, the Children's Hospital of Philadelphia
Dr. W Sun, Southern California University
Dr. H. Li, Univ of Penn.
Dr. Z. Zhao, Temple Univ.

Source(s) of funding

"Identification and prediction of polyadenylation sites using deep sequencing reads", NIH
Subcontractor for Bin Tian, UMDNJ
"Cell-Cell Communication During Melanoma Development", NIH, the Wistart Institute
2.5 Bio-Medical Informatics Research
2.6 Miscellaneous Research in Convergent Life Sciences

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2.6 Miscellaneous Research in Convergent Life Sciences
Name

Daniel Bunker

Name of NJIT program or activity

Predicting effects of large herbivores on forest regeneration

Brief synopsis

Large herbivores such as white-tailed deer are increasing in abundance worldwide and have major impacts on forest regeneration. However much of our current knowledge of these impacts are observational and not predictive. By combining experimental exposures of tree species to herbivory and measurements of key plant traits, we will be able to predict impacts of deer on plant species solely from the traits of species, allowing predictions in ecosystems not yet impacted by high deer densities. Our approach includes multiple experimental sites throughout eastern North America, allowing us to generalize broadly to eastern deciduous forests.

External partners or collaborating institutions

Bill McShea and Norm Bourg, Smithsonian Institution

Don Waller, U. Wisconsin, Madison

Alex Royo, US Forest Service

Steeve Cote and Line Laporte, U. Laval
2.6 Miscellaneous Research in Convergent Life Sciences

Name

Hans Chaudhry, Research Professor, Biomedical Engineering NJIT.

Name of NJIT program or activity


Brief synopsis

Three dimension mathematical model of deformation of human fascia under manual therapy treatment was published in JAOA and was awarded 2009 George W. Northup, DO, Medical Writing Award, in addition to other published papers in peer reviewed journals.

External partners or collaborating institutions

Dr. Thomas Findley MD. Ph.D. VA Medical Center, East Ornage, New Jersey.

Source(s) of funding

Mayhill Medical Group, Saddlebrook, New Jersey.
2.6 Miscellaneous Research in Convergent Life Sciences

Name

Aridaman K. Jain

Name of NJIT program or activity

Statistical Consulting with the New Jersey Meadowlands Commission (NJMC)

Brief synopsis

NJMC is responsible for preserving the delicate balance of nature and the environment of the Meadowlands and measuring the quality of air, water, and soil in the Meadowlands District. Recently, we have conducted data analysis and statistical modeling of: (i) the effects of elevation, depth, and location on the organic composites and metals in the New Jersey Coast and (ii) the effects of meteorological factors such as temperature, humidity, wind direction, wind speed, and solar radiation on the five air pollutants (CO2, NO, NO2, NOx, and O3).

Source(s) of funding

New Jersey Meadowlands Commission
2.6 Miscellaneous Research in Convergent Life Sciences

Name

Stephen Pemberton

Name of NJIT program or activity


Brief synopsis

This research aims to produce a book in the history of biomedicine genre that explores how genetics was understood, appropriated, and advanced by twentieth-century physicians engaged in preclinical and clinical research involving blood and diseases of the blood (i.e., hematology). Blood and Heredity will therefore examine the diverse array of concepts, tools, and practices that medical researchers deployed in their hematological work in the past century (inclusive of biochemistry, molecular biology, and animals models), and it analyze this work in the context of ongoing developments in American medicine, culture, society, and politics. This work builds on my prior books (published in 2006 and 2011), but is most directly an outgrowth of my article: “Canine Technologies, Model Patients: The Historical Production of Hemophiliac Dogs in American Biomedicine,” which appeared in Industrializing Organisms: Introducing Evolutionary History (New York: Routledge, 2004).
Name

Bryan Pfister

Name of NJIT program or activity

Capstone Design: Woods Service, Inc.; Story Telling Robot

Brief synopsis

Literacy is a major goal of Woods Services’ and would like students to independently choose to have books read out loud to them. To increase enthusiasm for this activity, Woods has asked for an engineering team to adapt a robot to be the story teller with animation. The robot will be programmed to play the prerecorded book narrative with the mouth light blinking in coordination with the voice. The team will also program an animation routine for each story that the robot will do in coordination with the currently used PowerPoint (moving arms, pointing and dancing). A second goal of the Capstone team will be to create an interface where the clients with disabilities can independently play a book from a menu by choosing a button. Perhaps the robot could be programmed to say “press the red button if you want to hear ...; press the blue button in you want...; press the music symbol if you want to hear a song.”

External partners or collaborating institutions

Joseph E. Campbell MEd, OTR/L, ATP
Senior Occupational Therapist
and
Mark Bresler, MS
Assistive Technology Engineer
Woods Services
Langhorne, PA 19047

Source(s) of funding

Capstone grant from the NCIIA
Name

Gautham Rao

Name of NJIT program or activity

Administering Entitlement: The Founders, Public Health Care, and the Early American State

Brief synopsis

This article draws on archival research from private libraries and government repositories to explore the federal marine hospitals of the early republic, the first public health care system in United States history. Beginning in 1798, the federal government collected twenty cents per month from mariners’ wages and used this revenue to subsidize medical care for sick and disabled merchant mariners. By studying governance from the bottom-up, this article argues that jurists, physicians, and officials’ regulation of sailors’ entitlement to public healthcare facilitated and reflected a transformation of national authority. Between 1798 and 1816, sailors’ entitlement was a local matter, based on the traditional paternalist understandings of maritime laborers as social dependents. By 1836 though, the federal Treasury redefined entitlement around a newly calculus of productivity: only the productive were entitled to care at the marine hospitals. This story about health care, governance, federal law and political economy in the early United States suggests that the early American state was a more vibrant participant in the market and society than has been previously understood.

Source(s) of funding

Library Company of Philadelphia ($20,000 in 2009)
2.6 Miscellaneous Research in Convergent Life Sciences

**Name**

Kimberly N. Russell

**Name of NJIT program or activity**

Use of transmission line easements for the benefit of native bees

**Brief synopsis**

Concern for the maintenance of wild bee populations has increased in recent years, with evidence from Europe and the U.S. suggesting a general decline in abundance and diversity. This project seeks to evaluate the role of transmission line rights-of-way in providing much needed habitat and resources to native bee species. We are evaluating various vegetation management techniques in terms of their ability to support bee populations and provide source populations of pollinators to the surrounding landscape. In addition, we are evaluating the possible impact of EMF (electro magnetic fields created by transmission lines) on the behavior and development of bees.

**External partners or collaborating institutions**

Enertech, American Transmission Company, Army Corps of Engineers, USGS

**Source(s) of funding**

Electric Power Research Institute (EPRI)
2.6 Miscellaneous Research in Convergent Life Sciences
## NJIT Commercialization Activities in Convergent Life Sciences

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# NJIT Enterprise Development Center

## Incubator Tenant Companies in Convergent Life Sciences

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Acquisci, Inc. is a privately held company that has recently acquired a device-based proprietary multi-therapeutic platform; doseable-Oxidative Stressed Autologuous Blood (d-OSAB), a systemic anti-inflammatory treatment of cardiovascular diseases wherein inflammation is an underlying etiology. The Company’s initial clinical inflammatory-based targets are Ischemic Brain Stroke and Chronic Heart Failure, two diseases with few viable treatment options. d-OSAB represents a novel re-engineered formulation based on unregulated traditional therapies, which have been in use for more than 20 years and generated a safety profile of non-toxicity in more than five million treatments delivered to more than 35,000 patients. However, previous therapies utilized imprecise technologies not suitable for FDA or European regulatory clearance for commercial marketing. d-OSAB includes a regulatory-approvable patent pending therapeutic contract device, among other proprietary advantages, allowing for precise dose measurement and control. Additional applications of the d-OSAB platform include a purification process for the production of pathogen-free biologics, most notably inactivating infectious prions, the rogue protein attributed to Mad Cow and Creutfeldt-Jakob diseases.

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Advantage Insurance Group LLC specializes in Consumer Directed Health Insurance Plans. Health Insurance for individuals and corporations is established to include tax free, HSA, FSA monie accounts to be spent on healthcare. We offer the "Advantage Wellness Program" providing data storage of "Personnel Medical Records" at VitaVantage.com. VitaVantage.com is a "Health Maintainer Service" offering online "Doctor Consults" providing prescriptions targeted toward Health and Wellness. The E-commerce site of VitaVantage.com offers health products and services with receipt of expenditures to Personnel Medical Record.

Contact: Margherita D’Onofrio  
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American Oriental Bioengineering, Inc (AOBO) is a high-tech enterprise incorporating the Chinese and Western cultures. It has the advantage of competing in the international economic market. The management team is made up of people of various nationalities and cultures, with a new interactive economic operating model of deriving capital through the enterprise and driving the enterprise with capital. After 30 years of development efforts, particularly in the combination of Eastern and Western cultures, AOBO has established a unique set of values and corporate culture. The core values and essence of this corporate culture are: Discover needs, Realize value, and Mutual development. Corporate Mission: Dedicated to your health improvement. Corporate Spirit: Be pragmatic, innovative, perseverant, and transcendent. Corporate Vision: To be the perpetual global leader in modern plant-based pharmaceutical products.

Contact: Willy Lee  E-mail: will@email.bioaobo.com
Phone: (646) 367-1718 ext 106  Website: www.bioaobo.com

Assistive Innovation Corporation is a company based in The Netherlands providing assistive devices to those with upper body extremity in North America. Our major product is this iARM, a robotic arm that assists our clientele with severe upper limb restrictions. A significant number of activities in daily life, which these people normally are unable to achieve, can be achieved using the iARM. Because of its broad functionality, it is completely compensating the lost arm or hand function of our users.

Contact: Diego Ramirez  E-mail: info@assistive-innovations.com/
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Applechem Laboratory researches, develops, manufactures, and markets proprietary Value-added specialty intermediates and ingredients to consumer product companies in the cosmetic and toiletry industries. At present, it has developed Ggel™ and Gblock™ product families, based on patent-pending nanotechnology. Ggel™ family provides great sensory and product stability to the oil-based consumer products. Gblock™ family products are dispersions of highly concentrated nano inorganic UV filters; they provide consumers continuous broad-spectrum UV protection without skin irritation potential, and provide customers quick formulation development and product roll-out.

Contact: Samuel Lin  E-mail: samuel.lin@applechem.biz
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ATNT is the first biotech company which develops novel cross-disciplinary engineering methods, to find the most effective molecular targets for treatment of complex human disorders. ATNT is the leading provider of a universal target discovery service, which significantly minimizes the research and development cost of finding the most effective therapeutic targets. ATNT founders are well-recognized university professors whose areas of expertise encompass molecular biology, cell biology, biochemistry, molecular genetics, human genetics, animal models, systems biology and engineering disciplines. Our staff members are high profile experts in engineering and biology. ATNT has successfully developed novel tools and techniques to identify the most important therapeutic targets in complex cellular networks. Using patented technologies, ATNT provides a unique service to pharmaceutical and biotech companies. Our service will provide a set of therapeutic targets that have the minimal chance of failure minimizing the time and cost of finding novel therapeutics. Located at the heart of three leading biomedical and engineering academic institutions in Newark, ATNT bring together a unique team of scientists and engineers. ATNT uses advanced technologies and state of the art facilities to target the most promising molecules for treatment of complex human diseases.

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BanDeMar Networks, LLC, is a minority owned small company specializing in advanced video solutions for e-learning markets. Our products and services include just-in-time multimedia training over cell phones, real-time global imagery, multi-player collaborative live webcasting, and real-time health and biometric monitoring. By complying with international open standards, our products and services interoperate smoothly with our clients’ information technology assets and instructional designs. Our clients include private and government agencies in the US and Europe. For the most challenging of applications, BanDeMar Networks has the resources to fund, develop, and deploy new technologies and content. Our academia, medical, and science outreach partners include subject matter experts that ensure the accuracy of content, and our experienced company members (Ph.D. in systems engineering, J.D. in intellectual property law, and practicing M.D.) ensure overall project success. BanDeMar Networks is uniquely experienced in consolidating intellectual property, early enterprise adopters, and federal entrepreneurial funding. The IP holders, early adopters, and funding sources all effectively become clients of BanDeMar Networks, and the synergy required between all parties requires their careful selection and management by BanDeMar. This business model interfaces with those of research organizations, enterprise users and investors.

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BioNeutral Group is a specialty chemical company dedicated to the innovation, development and rapid commercialization of high value products focused on the neutralization of infectious agents, biological weapons and dangerous and noxious chemicals. BioNeutral has developed two families of products for environmental remediation and protection. The Ogiene™ product family is designed to neutralize and eliminate a wide variety of toxic and noxious chemicals and objectionable odor associated with these chemicals often found in household and industrial settings. Examples of these chemicals include carbon dioxide, sulfur dioxide, organic amines, organic acids, components of smoke and formaldehyde. Particularly noteworthy is the Ogiene™ Formaldehyde Eliminator which has been demonstrated to be exceptionally effective at eliminating formaldehyde present in the FEMA trailers occupied by the victims of hurricane Katrina in the Gulf Coast area. In addition the Ygiene™ family of products effectively and rapidly eradicates a broad spectrum of harmful microorganisms including bacteria in both the vegetative and more difficult to control spore form. Ygiene™ also eliminates viruses, yeast, mold, resistant microorganisms and certain bioweapons of mass destruction. The Ygiene™ products can be used in applications ranging from household hard surface disinfectants to extremely rapid acting sterilants. The Ogiene™ and Ygiene™ product families provide solutions to remediate and protect the environment and save lives.

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CarboMet, LLC is a nanotechnology-based early stage company spun out of New Jersey Institute of Technology (NJIT). Its primary focus is on developing a patent-pending carbon nanotube-enabled enzymatic bio fuel cell for implantable use as a renewable power source in cardiac pacemaker, prosthetic device, defibrillators and drug delivery micro-pumps. CarboMet’s goal is to become a leading supplier and manufacturer of biofuel cells or bio batteries for biomedical devices.

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Website: www.carbomet.com
Centro de Genética Clínica (CGC) has been specializing into different medical areas, as a consequence of laboratories interdisciplinary, installed capability for new exams and the active and crucial clinical department. CGC is a reference today in many national and international research fields such as prenatal diagnosis, oncogenetics and rare diseases. Nowadays, medical genetics is one of the most blooming scientific fields due to the human genome decoding in 2003. Each day we learn more about the genetic components of most diseases and the human clinical conditions. From the disease gene to the susceptibility markers, genetics is becoming, with no doubt, an essential tool in the practice of Medicine in the 21st century. The large panel of analysis offered, bound to technological developments in our labs, allows CGC to complement the work of several specialists from distinct areas in the implementation of common projects and development of new tests.

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Criterion Chemical LLC is a start-up specialty chemicals business, offering consulting & research, method development, process optimization and kilogram-scale synthesis services. The range of the business is very general, allowing for opportunities from any industrial sector. Criterion Chemical's facilities are available to large chemical companies for supplementary or auxiliary efforts; they are available as well to small businesses or individual entrepreneurs who have no facilities of their own. Criterion Chemical also conducts its own research and production efforts, with a view to patenting, licensing and selling new products and technology in the marketplace.

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**Phone:** (973) 643-4086  
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CyberExtruder is a software development company whose patented core technology enables the automatic conversion of a single two dimensional (“2D”) facial image (e.g. passport photo) to an accurate three dimensional (“3D”) model of the subject's face or head. This technology has significant applications in two industry segments: (1) as an enabling technology in the biometric technology segment of the security industry, and (2) as a personalization technology in the very hot sector of New Media. One example is putting your face on avatars in Second Life, a 3-D virtual world entirely built and owned by its residents. Since opening to the public in 2003, Second Life has grown explosively and today is inhabited by a total of 4,177,015 people from around the globe. Second Lifers can do anything and go anywhere, movies, museums and...
Appendix 3.1 NJIT Incubator Companies in Convergent Life Sciences

concerts; it’s like "The Matrix" meets MySpace. It fosters real relationships with online alter egos called avatars, a computer-generated graphic. The words, thoughts and feelings that are expressed by that avatar are a real person's and now users can easily put their stylized face on the character in seconds using CyberExtruder’s software.

Contact: Larry Gardner  
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Cyrano Nasal Sciences will commercialize botulinum toxin for the treatment of nasal disorders including allergic rhinitis (hayfever). A single application of botulinum toxin has been shown to treat the symptoms of sneezing, itching, runny nose (rhinorrhea) and congestion for up to five months. Cyrano is actively commercializing this revolutionary treatment.

Contact: Ira Sanders  
Phone: (917) 847-8082  
Fax: (973) 643-4502

DANLIZ Therapeutics, LLC (a subsidiary of Theophy, LLC) is focused on the delivery of the personalized medicine through targeted therapeutics. Theophy is in the business of: 1) acquisition, 2) development and (3) commercialization of the innovative technology ‘with integrity”, i.e., proprietary, novel intellectual that will generate evidence-based, medically-effective and socially-assessable products. Theophy’s global mission is to improve health care and outcomes dramatically for all patients especially those with life-threatening diseases and unmet medical needs.

Contact: Lawrence Akinsanmi, M.D., Ph.D  
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Edge Therapeutics, Inc. is a drug development company with 3 orphan drugs based on drug delivery platform technology that provides for site-specific, sustained release delivery of FDA-approved, off-patent drugs. Edge’s initial focus is to prevent or reduce secondary brain injury after either a spontaneous or traumatic brain injury which results in bleeding into the brain.

Contact: Brian A. Leuthner  
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Endomedix, Inc. core focus is in hydrogel technology in the growing medical device market. In particular, Endomedix is focused on the tissue sealant, hemostat and biomedical adhesive market. At the core of their technology is a biocompatible, biodegradable, environmentally-responsive hydrogel with a number of biomedical applications. Endomedix Hydrogel Technology is one of the first and only all-natural, non-synthetic, non-blood derived technologies that cover applications in: General Surgery, Vascular Surgery, Neurosurgery, Spine Surgery, Ophthalmologic Surgery, and Wound Care. This medical device will be used to control bleeding in surgical procedures (other than ophthalmic) as an adjunct to hemostasis when control of bleeding by conventional means is ineffective or impractical.

Control: Richard Russo  
Phone: (848) 248-1883  
Fax: (941) 948-0351

The Hammond Group, Inc is a multi-service company in healthcare, community corrections, and behavioral and mental health treatment services. THG is a private corporation dedicated to providing high quality community based therapeutic services for at risk children and families. The Hammond Group, Inc takes pride in the diversity of our staff. At THG, we feel that our staff is a true reflection of America. There are many bilingual clinicians, behavioral assistants, mentors, and staff range from Spanish, Mandarin, Taiwanese, Urdu, Bengali, French, Twi, and several Africa dialects. THG provides services throughout the states of New Jersey, Maryland, Pennsylvania and parts of North Carolina and Virginia. The Hammond Group, Inc is divided into several divisions all related to providing excellence in community based therapeutic services.

Contact: Greg Hammond  
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Fax: (866) 634-2131

Healthy Functions, LLC is a New Jersey company that develops state-of-the-art pressure support surfaces for patients. The patented mechanism of action is entirely novel, yet simple and effective. Our line includes a standalone powered flotation therapy bed and a mechanized support mattress for conversion of institutional or home beds. We have FDA authorization to manufacture and market our technology as a class 2 device, and three more U.S. patents pending.

Contact: Robert G. Jarmon, M.D.  
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Fax: (973) 643-4502
Health-ISP facilitates private and secure transfers of patient health information between a patient and their doctors, hospitals, testing labs, or imaging services, using new US-sponsored standard for health internet services—the U.S. National Health Information Network. Today, communication of patient medical records among doctors, hospitals, and labs is most often achieved by sending paper via fax or courier. Health-ISP offers a private, secure and safe alternative to send and receive sensitive health information, making it faster, far less expensive, and enabling healthier patients. Health-ISP also allows patients to have easy access to their medical records.

**Contact:** John B. Williams  
**E-mail:** jwilliams@health-isp.com  
**Phone:** (973) 819-6121  
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JMS Healthcare Partners LLC is a unique health care consulting firm providing the perfect blend of interoperability, technology implementation and business intelligence expertise. Our team is comprised of highly experienced healthcare consultants from various parts of the North America; working together to give you the best the market has to offer. JMS offers comprehensive strategic, financial, operational and technology-related consulting services to hospitals and healthcare providers empowering healthcare interoperability. We operationalize strategies that facilitate the transfer and transmission of healthcare information to create tangible and meaningful results to our customers.

**Contact:** John T. Donnelly  
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**Fax:** (609) 818-1031

Hilin Life Products has invented the original fertility management product. Flagship device is 1st FDA-approved mini ovulation microscope, clinically proven 98 % accurate. The original MaybeMom sold 60K units without marketing. With newly patented KNOWHEN™, plan is to achieve $ 416 MM in sales over 5 years. The timing in this consumer climate combined with our unique talents makes us confident that we can deliver these impressive results while improving result women’s health.

**Contact:** Helen Denise  
**Email:** hdenise@maybemom.com  
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**Lenterra, LLC** is developing innovative sensor and analyzer technologies for applications in analytical instrumentation, industrial processing, aerospace, environmental metrology, and biomedicine. Lenterra’s current focus is on two proprietary sensor technologies: microplasma-based technology for gas identification and fiber-optical sensor technology for industrial and environmental metrologies. These pre-commercialization R&D projects are supported by NASA and the National Science Foundation.

**Contact:** Valery Sheverev  
**Phone:** (973) 623-0755  
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**Medsonics** is a medical device company developing a convenient and cost effective way to quantitatively identify, monitor and track bone fractures from inception to full healing. Currently there is no quantitative method to track healing, since x-rays are qualitative and MRIs and CTs are expensive and impractical. The Medsonics US, Inc. device is hand-held and uses an interactive menu driven display making it easy to use. It provides quantitative measurements and assessment of the extent and healing rate of bone fractures, and has the sensitivity to identify hairline fractures and potential to characterize osteoporosis and identify pathological abnormalities such as bone cancer and osteoporosis.

**Contact:** Sandford Roth  
**Phone:** (646) 373-1674  
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**Medtech SAS** established in 2002, is the fruit of over a decade of experience of its founder in robotics applied to different surgical fields (Neurosurgery, Orthopedic surgery, Urology, Cardiovascular surgery, Digestive surgery, etc.). **Medtech** began its activity by developing its first surgical robot, BRIGIT™, for orthopedic surgery whose patent portfolio was acquired in 2006 by Zimmer Inc., the world leader in orthopedic surgery. Today, **Medtech** offers a new generation of Robotized Surgical Assistant dedicated to Neurological procedure with ROSA™. This innovative system offers a safer and more effective solution to today's Neurosurgeons by allowing more rapid, precise and less invasive neurological procedures.

**Contact:** Bertin Nahum  
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Menssana Research, Inc. has developed a portable breath collection apparatus (BCA) which can collect breath samples virtually anywhere, for highly sensitive laboratory analysis. The BCA is being used in clinical research studies in hospitals in the USA and Europe, and has even collected breath samples in a USAF air force transport jet at high altitude. Mensanna is now performing clinical studies with the BCA, mostly funded by the National Institute of Health, to evaluate breath testing in various diseases, including lung cancer, breast cancer, heart transplant, rejection ischemic heart disease, kidney disease and diabetic mellitus. The FDA has approved breath test for heart transplant rejection for clinical use.

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Next Generation Technology Research goal is to explore the potential of medicinally useful plants and prospects of modern medicines and health care products derived from plant origin and develop actives whose effectiveness can be demonstrated independently as well as in formulations. Currently, NGTECH SCRD is putting its effort to build an herbal research and development division to develop benign inexpensive raw materials of plant origin for Cosmmeceuticals, Nutraceuticals, Pharmaceuticals, Biomaterials applications to meet the world healthcare market need. The plant-based products will not only be beneficial to the consumers, but also it will be helpful in preventing the environment from synthetic chemical pollution. Our work in Natural products is not only our vision but it is our passion.

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Contact: Lalit Deo  
Phone: (847) 757-3595

Optimal Analysis (Sobrex) is a new composition of matter, which in small doses completely blocks alcohol inebriation. At higher dosages, the time required for clinical withdrawal is radically reduced and traumata are rapidly eliminated. Drug toxicity has been demonstrated to be very low at dosages ten times greater than those needed for detoxification. Also, because the drug blocks inebriation it automatically prevents re-addiction (recidivism), and appears safe to take for extended periods of time. The drug also completely eliminates nicotine withdrawal traumata at very low dosages in about 36 hours.

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Pipeline Biomedical Holdings, LLC is a company that develops and brings into initial market release medical products and technologies. Our entrepreneurial management team is comprised of highly-experienced individuals with a proven track record of successfully commercializing unique medical products. In addition to pursuing our own concepts, Pipeline Biomedical is capable of evaluating, capitalizing, creating and/or managing start-up to late stage businesses that possess intellectual property and novel products. Pipeline Biomedical is engaged in market segments that include medical devices, operating room equipment, surgical instruments and diagnostics. Technologies, products and ideas are developed in-house and through partnering with external sources such as universities, venture capital firms, medical institutions, companies, surgeons, inventors and individuals.

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Pure H20 Technology has developed and is currently marketing a series of specialized water treatment systems that will supply ultra-pure make-up water to the pharmaceutical, electronics, and food industries. The equipment will be marketed under the trade name “iPure”.

Contact: Mathew Rela  
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Phone: (973) 622-0440 ext.103  
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Prospect Biosystems is an innovative developer and provider of products uniquely serving the Sample Preparation needs of the Proteomics market. Our products provide up-stream sample processing and are complementary to existing analytical instrumentation. The Edge™ 200, our first product, currently in beta test, provides sample preparation for the simplification, enrichment and characterization of complex proteomic mixtures. This bench-top unit separates complex samples rapidly and reproducibly into well-defined, characteristic fractions. Pre-packaged GradiSpec™ reagents, under development, will further enhance the ease and reproducibility of each fractionation. These and future products are designed to meet our customers’ needs in the areas of cellular or sub-cellular fractionation, enrichment of low-abundance proteins from crude extracts or identification of biomarkers.

Contact: Marc Horn  
E-mail: mhorn@prospectbiosys.com  
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Fax: (973) 215-2558
**Urovalve, Inc** mission is to design, develop and commercialize superior medical devices that address serious problems with urinary flow and control. During the last year, the company has successfully completed the initial human feasibility study and is developing plans for what is expected to be the pivotal clinical trial of the refined design. Upon successful completion of this trial, Urovalve will meet with the FDA to request a 510k premarket notification to enable commercialization. Urovalve plans to manufacture through contract or partnerships, and will seek opportunities for collaboration for broader commercialization. This revolutionary disposal intraurethral valve-catheter is intended to enable men who experience urinary retention to control bladder emptying and to significantly reduce health risks associated with current available catheters. Urovalve’s revenues are projected to grow to $100 million by 2011. Urovalve has received funding from private investors as well as through the New Jersey Economic Development Authority Technium program and the New Jersey Commission on Science and Technology. The company also has received a Phase I Small Business Innovative Research (SBIR) Grant from NIH, and is looking forward to a positive decision on a Phase II SBIR application that is pending with NIH.

**Contact:** Harvey Homan  
**Phone:** (973) 596-1350  
**Fax:** (973) 643-4502  
**Website:** www.urovalve.com

**x-dicator** Condition Change Indicator is a safe, non-toxic, environmentally benign temperature-monitoring device that uses the natural laws of physics and chemistry to detect and alert the user of a freeze; a freeze-thaw cycle traversing 0ºC. (32º F); or alert one to exposure temperatures greater than 30º C (86º F). The Condition Change Indicator is a small, unobtrusive, inexpensive, non-crushable indicator device that provides and irreversible visual signal. The primary market applications of the Condition Change Indicator on the cold side are anticipated to be the monitoring of vaccines and of frozen food items throughout the “cold chain”, from the point of manufacture, throughout shipping to and from various intermediaries; to replacement of a vaccine in a doctor’s refrigerator or of a frozen food in a grocer’s freezer, and finally from a doctor to a patient or from a frozen food retailer to the consumer’s home.

**Contact:** I.N. Cooperman  
**Phone:** (732) 431-3096  
**Fax:** (732) 462-9307  
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NJIT Life Science Related Intellectual Property

**Signal Processing and Communication Algorithms for Protein (Mis)Folding**
Inventor(s): Abdi, Ali (Electrical & Computer Engineering)

**Systems and Methods for Identification of Critical Molecules via Channel Capacity**
Inventor(s): Abdi, Ali / Emamian, Effat (Electrical & Computer Engineering)

**Fault Diagnosis in Cellular Signaling Pathways**
Inventor(s): Abdi, Ali / Tahoori, Mehdi B. (Electrical & Computer Engineering)

**System and Method for Ipsilesional Brain Stimulation and Bilateral Plasticity-based Hand and/or Arm Training and Neurorehabilitation to Effectuate a Change in Neural Function**
Inventor(s): Adamovich, Sergei / August, Katherine G. / Merians, Alma S. / Tunik, Eugene (Biomedical Engineering / UMDNJ)

**Method of Obstacle Breaching and the Device for the Same**
Inventor(s): Adamovich, Sergei / August, Katherine G. / Tunik, Eugene (Biomedical Engineering / UMDNJ)

**Robotically Facilitated Simulations in Virtual Environments**
Inventor(s): Adamovich, Sergei / Merians, Alma S. / Qui, QinYin (Biomedical Engineering / UMDNJ)

**Computer-Aided Cytogenetic Method of Cancer Diagnosis**
Inventor(s): Andrushkiw, Roman I. / Boroday, Natalya / Klyushin, Dmitriy A. / Petunin, Yuriy I. (Mathematical Sciences / Kyiv National Shevchenko University)

**Computer-Aided Cytogenetic Method of Cancer Diagnosis - "New RGB-image method (1st Algorithm)**
Inventor(s): Andrushkiw, Roman I. / Boroday, Natalya / Klyushin, Dmitriy A. / Petunin, Yuriy I. (Mathematical Sciences / Kyiv National Shevchenko University)

**Computer-Aided Cytogenetic Method of Cancer Diagnosis - "New RGB-image method (2nd Algorithm**
Inventor(s): Andrushkiw, Roman I. / Boroday, Natalya / Klyushin, Dmitriy A. / Petunin, Yuriy I. (Mathematical Sciences / Kyiv National Shevchenko University)

**Computer-Aided Cytogenetic Method of Cancer Diagnosis - refinement of method using RGB-image analysis of the nuclei**
Inventor(s): Andrushkiw, Roman I. / Boroday, Natalya / Klyushin, Dmitriy A. / Petunin, Yuriy I. (Mathematical Sciences / Kyiv National Shevchenko University)

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Appendix 3.2 NJIT Intellectual Property in Convergent Life Sciences

A glycosaminoglycan mimic for cartilage applications and as an additive in cell culture media to enhance growth factor activity
Inventor(s): Arinzeh, Treena L. (Biomedical Engineering)

A Piezoelectric Scaffold for Nerve Growth and Repair
Inventor(s): Arinzeh, Treena L. / Collins, George / Lee, Yee-Shuan (Biomedical Engineering)

A Novel Hydrogel and Hydrogel Composite for Cartilage Repair Applications
Inventor(s): Arinzeh, Treena L. / Collins, George / Mantilla, Bruno A. (Biomedical Engineering)

Nano and microfiber meshes for directing stem cell morphology and for tissue engineering
Inventor(s): Arinzeh, Treena L. / Jaffe, Michael / Shanmugasundaram, Shobana (Biomedical Engineering)

Electrospun Electroactive Polymer for Regenerative Medicine Applications
Inventor(s): Arinzeh, Treena L. / Jaffe, Michael / Weber, Norbert (Biomedical Engineering)

Portable Electrospinning Device
Inventor(s): Arinzeh, Treena L. / Mahecha, Luz E. / Mantilla, Juan J. / Shanmugasundaram, Shobana (Biomedical Engineering)

Electrospun Ceramic-Polymer Composite as a Potential Scaffold for Tissue Repair
Inventor(s): Arinzeh, Treena L. / Shanmugasundaram, Shobana / Suzuki, Satomi (Biomedical Engineering)

A novel mixing device for fast homogenization and reaction in stirred vessels and tank reactors
Inventor(s): Armenante, Piero M. / Caramellino, Micaela (Chemical Engineering)

Novel Dissolution Testing Apparatus with Off-Center Impeller for Solid Dosage Forms
Inventor(s): Armenante, Piero M. / Wang, Yimin (Chemical Engineering)

Electro-Hydrodynamic Microfluidic Mixer Using Transverse Electric Field
Inventor(s): Aubry, Nadine N. / Batton, John L. / El Moctar, Ahmed O. (Mechanical Engineering)

Improved Microfluidic Mixing
Inventor(s): Aubry, Nadine N. / Glasgow, Ian (Mechanical Engineering)

Improved Dielectrophoresis Electrode
Inventor(s): Aubry, Nadine N. / Ruan, Hai Sheng (Mechanical Engineering)
Appendix 3.2  NJIT Intellectual Property in Convergent Life Sciences

System & Method for Subject Specific Multivariate Region of Interest Motion Detection to Improve Medical Imaging Diagnostic, Gating, and Registration Applications
Inventor(s): Austin, Katherine / Boric-Lubecke, Olga / Lubecke, Victor (Biomedical Engineering)

A FPGA/DSP Design for Real-Time Fracture Detection Using Low Transient Pulse
Inventor(s): Chang, Timothy N. (Electrical & Computer Engineering)

Bone Fracture Detection Using Randomized Low Transient Pulses
Inventor(s): Chang, Timothy N. (Electrical & Computer Engineering)

Quantitative Ultrasound for Tumor Detection
Inventor(s): Chang, Timothy N. (Electrical & Computer Engineering)

Enhancing Sonic Imaging with Low Transient Pulse Shaping
Inventor(s): Chang, Timothy N. / Cheng, Biao (Electrical & Computer Engineering)

Liquid delivery / Spot formation monitoring system for the SmartPin
Inventor(s): Chang, Timothy N. / Shen, Qiong (Electrical & Computer Engineering)

Delivery of Metered Amounts of Liquid Material
Inventor(s): Chang, Timothy N. / Tolias, Peter (Electrical & Computer Engineering / UMDNJ)

Methods for differentiating human stem cells into functional hepatocytes and developing 3D liver tissue models.
Inventor(s): Cho, Cheul Hyung (Biomedical Engineering)

Device for the Continuous Production of Oriented Nanofiber Scaffolds
Inventor(s): Collins, George / Arinzeh, Treena L. / Lee, Yee-Shuan (Biomedical Engineering)

Magnetically Controlled Powder Discharge (MCPD)
Inventor(s): Dave, Rajesh N. (Mechanical Engineering)

Magnetically Enhanced Powder Flow (MEPF)
Inventor(s): Dave, Rajesh N. (Mechanical Engineering)

Continuous, scalable device for dry coating of cohesive powders with nano-particles using the Comil for improved properties such as flow, fluidization and bulk density
Inventor(s): Dave, Rajesh N. / Beach, Lauren E. / Mullarney, Matthew P. (Chemical Engineering)

Apparatus and Method for Precise Testing of Packing Density and Flowability of Cohesive Powders using Vibrations
Inventor(s): Dave, Rajesh N. / Beach, Lauren E. / Sanchez-Quintanilla, Miguel-Angel (Chemical Engineering)
Make High Drug-Loaded (Carrier-Free) Inhalation Drugs by Using Fluid Energy Mill
Inventor(s): Dave, Rajesh N. / Chen, Yu Hua / Han, Xi (Chemical, Biological & Pharmaceutical Engineering / Chemical Engineering)

Method for enhanced fluidization of highly cohesive particles and its beneficial effect for coating, granulation and other particle processing in conventional and non-conventional fluidization devices.
Inventor(s): Dave, Rajesh N. / Chen, Yu Hua / Pfeffer, Robert / Yang, Jun (Chemical Engineering / Mechanical Engineering)

A concentric ultrasonic nozzle for producing nano and micro-structures in supercritical fluid assisted processes
Inventor(s): Dave, Rajesh N. / Luo, Jian Jun / Pfeffer, Robert (Chemical Engineering / Mechanical Engineering)

Nanoparticle Coating or Encapsulation Using a Supercritical Antisolvent Process
Inventor(s): Dave, Rajesh N. / Pfeffer, Robert / Wang, Yu Lu (Chemical Engineering / Mechanical Engineering)

Method, Process and Apparatus to De-agglomerate and Mix Agglomerated Nanoparticles
Inventor(s): Dave, Rajesh N. / Scicolone, James V. (Chemical Engineering)

Method and Apparatus for Multiexcitation Multispectral Imaging and Characterization of Skin-Leisons and Biological Tissue
Inventor(s): Dhawan, Atam P. (Electrical & Computer Engineering)

Method and Apparatus for Multispectral Transillumination Imaging and Analysis of Skin-Leisons and Cancer
Inventor(s): Dhawan, Atam P. (Electrical & Computer Engineering)

Ultrasonic Confined Impinging Jets for Crystallization, Precipitation, Fast Chemical Reaction, and Selectivity Improvement
Inventor(s): Di Benedetto, Giuseppe L. / Armenante, Piero M. / Barnes, George H. / Dave, Rajesh N (Chemical Engineering)

New Tools for High-Throughput Screening of Protein Libraries: Engineering Heterologous Proteins Displayed on Bacillus Subtilis Spores
Inventor(s): Farinas, Edgardo T. / Eichenberger, Patrick Y. / Gupta, Nirupama (Chemistry & Environmental Science)

Method for Fabricating a Carbon Nanotube Intracellular Electrical Probe
Inventor(s): Farrow, Reginald C. / Goyal, Amit / Iqbal, Zafar / Liu, Sheng (Physics)
Appendix 3.2  NJIT Intellectual Property in Convergent Life Sciences

**Carbon Nanotube Bio-fuel Cell on Single Plane**
Inventor(s): Farrow, Reginald C. / Iqbal, Zafar / Kanwal, Alokik (Physics / CSLA Chemistry & Environmental Science)

**Wireless Flow Sensor with dynamic pressure and temperature equalization**
Inventor(s): Farrow, Reginald C. / Liu, Sheng / Thomas, Gordon A. (Physics)

**Wireless Smart Shunt System**
Inventor(s): Farrow, Reginald C. / Liu, Sheng / Thomas, Gordon A. (Physics)

**Wireless Flow Sensor using a compact fluid drag path**
Inventor(s): Farrow, Reginald C. / Liu, Sheng / Thomas, Gordon A. / Vitale, KSS- (Physics)

**Apparatus & Method for Non-Invasive Measurement of Stretch**

**Method of the Delivery of Medication to the Surface of the Eye and the Apparatus for the same**
Inventor(s): Geskin, Ernest S. / Goldenberg, Boris (Mechanical Engineering)

**Procedure and Device for Cleaning Catheters and Device for Measuring Pressure and Flow Rate of Liquid in the Same**
Inventor(s): Geskin, Ernest S. / Goldenberg, Boris (Mechanical Engineering)

**Needleless Syringe and the Injection Procedure**
Inventor(s): Geskin, Ernest S. / Goldenberg, Boris / Greene, Richard J. (Biomedical Engineering / Mechanical Engineering)

**Method & Device for Corneal Shaping & Refractive Correction**
Inventor(s): Geskin, Ernest S. / Gordon, Eugene / L'Esperance, Francis (Mechanical Engineering)

**Targeted Monitoring of Interaction between Hemagglutinin (Ha1) from H1n1 and H5n1 Viruses and Sialosaccharides by Infrared Spectroscopy**
Inventor(s): Grebel, Haim / Banerjee, Amrita (Electrical & Computer Engineering)

**Electrospun Drug Loaded Biodegradable Polymers for Enhanced Therapeutic Affect in Neurosurgical Chemotherapy.**
Inventor(s): Griswold, Kimberly A. / Jaffe, Michael / Prestigiacomo, Charles J. (Biomedical Engineering / UMDNJ)
Direct Electron Transfer, Membrane-Free Enzymatic Biofuel Cell Using Carbon Nanotube/Porous Silicon Electrodes
Inventor(s): Iqbal, Zafar / Wang, Shiunchin C. (Chemistry & Environmental Science)

Integrated Biofuel Cell with Aligned Carbon Nanotube Electrodes
Inventor(s): Iqbal, Zafar / Wang, YuBing (Electrical & Computer Engineering)

MEMS Transducer for Ultrasonic Imagining
Inventor(s): Ivanov, Dentcho V. (R&D Microelectronics Research Center)

Portable Biochemical Sensors for Personal Protection
Inventor(s): Ivanov, Dentcho V. (R&D Microelectronics Research Center)

A Fast Response Time MEMs Device for Measuring with High Accuracy Small Changes in Viscoelastic Properties of Blood
Inventor(s): Ivanov, Dentcho V. / Hunter, William C. / Jarwal, Rajendra K. / Kristol, David (R&D Microelectronics Research Center / Biomedical Engineering)

An emergency Pressure Release System Built Into the Proximal Shunt Catheter
Inventor(s): Ivanov, Dentcho V. / Madsen, Joe (R&D Microelectronics Research Center)

Optical Sensor Array for Detecting Dynamic Parameters for Dental Occlusion
Inventor(s): Ivanov, Dentcho V. / Weiner, Saul (R&D Microelectronics Research Center / UMDNJ)

Fascia derived (not source specific) Type I collagen and method for purification in preparation for Medical Products and related application.
Inventor(s): Jaffe, Michael / Lauritzen, Nels J. / Wang, Sherri (Biomedical Engineering)

Improved Bone Composite Matrix
Inventor(s): Jaffe, Michael / Lauritzen, Nels J. / Wang, Sherri (Biomedical Engineering)

Novel External Ventricular Drain (EVD) Catheter
Inventor(s): Jaffe, Michael / McKinney, James S. (Biomedical Engineering / UMDNJ)

Gait Generation Devices For Leg Rehabilitation Therapy
Inventor(s): Ji, Zhiming (Mechanical Engineering)

Non-invasive Electromechanical Tonometer for Measuring Intraocular pressure
Inventor(s): John, Eugene J. / Alvarez, Tara L. / Thomas, Gordon A. (Physics / Biomedical Engineering)
Appendix 3.2  NJIT Intellectual Property in Convergent Life Sciences

A Front End Trigger Device for Biological Analyte Filtration Using Dielectrophoretic microdevice (gating)
Inventor(s): Khusid, Boris (Mechanical Engineering)

A Novel Engineering Approach for Assembling Microparticles into Large-Scale Structures.
Inventor(s): Khusid, Boris / Acrivos, Andreas / James, C.D. / Kumar, Anil (Mechanical Engineering)

A novel method for measuring simultaneously free-solution electroosmotic and electrophoretic mobilities under strong DC and low frequency AC fields
Inventor(s): Khusid, Boris / Acrivos, Andreas / Kumar, Anil / Qiu, Zhi Yong / Yeksel, Mike (Mechanical Engineering)

Method of Manufacturing Polymer or Drug Nanoparticles with Rapid Drying and Reduced Agglomerations
Inventor(s): Khusid, Boris / Dave, Rajesh N. / Gokhale, Abhijit A. / Pfeffer, Robert (Chemical Engineering / Mechanical Engineering)

AC Electric Field Method and Apparatus for Drop on Demand Printing of Drug Dosages onto a Film
Inventor(s): Khusid, Boris / Motamedvaziri, Shilan / Shen, Yueyang (Chemical Engineering / Mechanical Engineering)

Self Cleaning Proximal Shunt
Inventor(s): Kosinski, Sandra (Biomedical Engineering)

A Novel Method for Composition Analysis of Mixtures
Inventor(s): Krasnoperov, Lev N. / Mustaev, Arkady A. (Chemistry & Environmental Science)

The Boundary Method : A Mathematical Algorithm for Solving Human Motion Problems
Inventor(s): Lacker, H. M. / Narcessian, Robert P. (Biomedical Engineering)

Non-Linear Displacement Sensor Based on Optical Triangulation Principle
Inventor(s): Leu, Ming / Ji, Zhiming (Mechanical Engineering)

Minature Tissue Culture System
Inventor(s): Lieber, Samuel C. / Aubry, Nadine N. / Gaussin, Vinciane / Kruithof, Boudewijn / Vatner, Stephen (Mechanical Engineering / UMDNJ)

Advantages of Two Stage Precipitation for the Synthesis of Submicron Drug Particles and the Reduction in Solvent for the Casting of Drug Loaded Polymer Films
Inventor(s): Mitra, Somenath / Meng, Xiangxin (Chemistry & Environmental Science)
Performing Stereotactic Brain Surgery with Functional Magnetic Resonance Imaging
Inventor(s): Natarajan, Vikram M. / Biswal, Bharat B. / Schulder, Michael (Biomedical Engineering / UMDNJ)

A medical tool for optical imaging, Raman spectroscopy based analysis of tissues, temperature sensing in tissues and radio frequency (rf) power delivery combined in a single coaxial utility for simultaneous diagnosis and treatment of cancerous
Inventor(s): Niver, Edip / Lieberman, Kenneth (Electrical & Computer Engineering)

Method & Apparatus for Proving Engaging Activity For Patients
Inventor(s): Olsen, George W. (Information Systems)

Method & Apparatus for Providing Engaging Activity for Patients Suffering Alzheimer’s
Inventor(s): Olsen, Richard V. (Architecture & Building Sciences)

Three-dimensional Cell micropatterning in Microfluidic Channels: application to build in-vitro models of blood vessels
Inventor(s): Perez-Castillejos, Raquel (Electrical & Computer Engineering)

Schema Extraction for Medical Vocabulary Object Oriented Databases
Inventor(s): Perl, Yehoshua (Computer Science)

Semantic Visualization of Intersections of Categories or Types for a Two-Layered Knowledge Base System
Inventor(s): Perl, Yehoshua / Geller, James (Computer Science)

Benchtop Shock Tube for Modeling Blast Related Traumatic Brain Injury
Inventor(s): Pfister, Bryan J. (Biomedical Engineering)

Mechanical Axon Stretch Growth Device for Real Time Imaging
Inventor(s): Pfister, Bryan J. (Biomedical Engineering)

High Throughput Multiwell Axon Stretch Injury Device
Inventor(s): Pfister, Bryan J. / Meaney, David F. / Smith, Douglas (Biomedical Engineering)

Automated Collagen Wet Spinner
Inventor(s): Pfister, Bryan J. / Siriwardane, Mevan L. / DeRosa, Kathleen (Biomedical Engineering)

Dielectric Spectroscopy Assays for Screening of Ion Channel Ligands
Inventor(s): Prodan, Camelia (Physics)
Appendix 3.2 NJIT Intellectual Property in Convergent Life Sciences

**Disease risk prediction using SVMSNPs and support vector machines**
Inventor(s): Roshan, Usman W. (Computer Science)

**SNP selection using support vector machines**
Inventor(s): Roshan, Usman W. (Computer Science)

**A Non-Invasive Mechanical Device for Treatment of Obstructive Sleep Apnea**
Inventor(s): Sahin, Mesut (Biomedical Engineering)

**A Novel Method for Brain-Computer Interfacing**
Inventor(s): Sahin, Mesut (Biomedical Engineering)

**FLAMES - Haptic Interface for the Blind**
Inventor(s): Sahin, Mesut (Biomedical Engineering)

**FLAMES - Stimulation of Spinal Cord for Pain Management:**
Inventor(s): Sahin, Mesut (Biomedical Engineering)

**FLAMES - Visual Prosthesis**
Inventor(s): Sahin, Mesut (Biomedical Engineering)

**Voltage Sensitive Array for Neural Activity Recording**
Inventor(s): Sahin, Mesut (Biomedical Engineering)

**Electrostatic Forces on Particles Floating within the Interface between Two Immiscible Fluids**
Inventor(s): Singh, Pushpendra / Aubry, Nadine N. / Janjua, Muhammad M. / Nudurupati, Sai (Mechanical Engineering)

**Concentration, Separation and Removal of Particles at/from the Surface of Drops**
Inventor(s): Singh, Pushpendra / Aubry, Nadine N. / Nudurupati, Sai (Mechanical Engineering)

**A Conducting Polymeric Membrane: Polyaniline Applied to Iontophoretic Transdermal Drug Delivery System**
Inventor(s): Sirkar, Kamalesh K. / Fan, Qiuxi (Spon Chair: Memb. Separ. & Biotech.)

**A Thermo-Sensitive Release System Based on Polymeric Membrane for Transdermal Drug Delivery**
Inventor(s): Sirkar, Kamalesh K. / Fan, Qiuxi (Spon Chair: Memb. Separ. & Biotech.)

**Dental Restorative Materials**
Inventor(s): Snyder, William H. / Kristol, David (Biomedical Engineering)
Improved shunt with reduced probability of failure: applications to hydrocephalus and glaucoma. "No clog shunt"
Inventor(s): Thomas, Gordon A. (Physics)

Trans-Palpebral Tonometer for Glaucoma with Improved Positioning
Inventor(s): Thomas, Gordon A. (Physics)

Improved personal tonometer for glaucoma and other eye pressure abnormalities.
Inventor(s): Thomas, Gordon A. / Alvarez, Tara L. / Fechtner, Robert D. (Physics / Biomedical Engineering / UMDNJ)

Vibration-Powered Bio-Sensors
Inventor(s): Thomas, Gordon A. / Contreras, William C. / Farrow, Reginald C. (Physics)

An artificial pancreas using non-invasive, optical glucose monitoring
Inventor(s): Thomas, Gordon A. / Ergin, Aysegul / Greene, Richard J. (Physics / Biomedical Engineering)

Transpalpebral Tonometer for Glaucoma with Improved Positioning
Inventor(s): Thomas, Gordon A. / Fechtner, Robert D. / Milczarski, Stephanie (Physics / UMDNJ)

Novel Eye Instrumentation for the diagnosis of Alzheimer's disease
Inventor(s): Thomas, Gordon A. / Frederikse, Peter H. (Physics / UMDNJ)

Improved Artificial Pancreas Using Non-Invasive, Optical Glucose Monitoring
Inventor(s): Thomas, Gordon A. / Greene, Richard J. / zirkand, Naomi (Physics / Biomedical Engineering)

A Flow Meter for Hydrocephalus
Inventor(s): Thomas, Gordon A. / Liu, Sheng (Physics)

DiscoverR: A Tool for Finding Common Regions of RNA Secondary Structures
Inventor(s): Wang, Jason T. (Computer Science)

Lineage path integration for phylogenetic resources
Inventor(s): Wang, Jason T. (Computer Science)

PhyloGO: Building a Natural Ontology through Automated Gene Naming
Inventor(s): Wang, Jason T. (Computer Science)

RADAR: A Toolkit for RNA Data Analysis and Research
Inventor(s): Wang, Jason T. (Computer Science)
RmotifDB: Towards an Integrated RNA Motif Database  
Inventor(s): Wang, Jason T. (Computer Science)

StemcellWeb: Toward a Cyberinfrastructure for Collecting, Disseminating, Managing and Mining Stem Cell Research Findings on the Internet  
Inventor(s): Wang, Jason T. (Computer Science)

XML clustering and retrieval through principal component analysis  
Inventor(s): Wang, Jason T. (Computer Science)

One-step Efficient Production of Highly Hydrodeoxygenated Biofuel from Cellulose with Catalytic Nanoparticles in Ionic Liquids  
Inventor(s): Wang, Xianqin (Chemical Engineering)

Diagnostic and Prognostic Utility of GWAS Data in Type 1 Diabetes  
Inventor(s): Wei, Zhi / Hakonarson, Hakon / Wang, Kai (Computer Science)

Solvent Free Fabrication of Tissue Engineering Scaffolds  
Inventor(s): Wu, Jing / Fakirov, Stoyko H. (Chemical Engineering)

Sustained - Release Biogradable Microfibrils  
Inventor(s): Wu, Jing / Fakirov, Stoyko H. (Chemical Engineering)

Identifying important concepts from medical documents  
Inventor(s): Wu, Yi-Fang / Li, Quan Zhi (Information Systems / Computer Science)