

## Students at NJIT

### Biren Bhatt

Biren Bhatt was accepted into NJIT's Accelerated BS/MD Program in 2001. He was excited about the prospect of becoming involved in research during his freshman semester. He was therefore put in touch with Dr. Charles Spillert of the Department of Surgery at the New Jersey Medical School (UMDNJ), just a short walk from NJIT.



Biren has done such a great job that he has sufficient data to present two papers, "A Functional Clotting Assay to Monitor Low Molecular Weight Heparin Dosage" and "Hypochlorite Demonstrates Anticoagulative Properties", both of which are co-authored by Dr. Spillert and Prof. David Kristol, at the Northeast Bioengineering Conference in April. Biren would like to specialize in cardiology when he completes medical school.

### Kiran Patel

Kiran Patel, a student in NJIT's Accelerated BS/MD Program since 1999, was accepted into the Johns Hopkins 2000 summer program in "Research Experience for Undergraduates:



Computer-Integrated Surgical Systems and Technology". She has taken what she learned and helped NJIT develop its studio-style teaching approach in undergraduate biomedical engineering. Kiran will be honored at a banquet on April 5 for being the "Outstanding Senior in Biomedical Engineering." She will present a paper, "Integrating Biomedical Engineering Design into the Freshman Curriculum," coauthored by Robert DeMarco and Prof. Richard Foulds at the Northeast Bioengineering Conference. Kiran will attend New Jersey Medical School in September.

## Examples of Current Faculty Research

### "Optometric Vision Therapy for Convergence Insufficiency in the Oculomotor System"

Tara Alvarez

Vergence eye movements are used to track objects moving in depth. We are studying the effects of optometric vision therapy for Convergence Insufficiency (CI) to 1) increase our understanding of how CI alters the normal eye muscle physiology, 2) provide how vision therapy improves neuro-control parameters, and 3) study the long-term effects of the Convergence system through modeling and digital signal processing.

CI is present in 7% of the general population [20 million people, mainly young people] and severely affects the amount of work that a person can perform, thereby limiting his/her productivity and quality of life.

Although Vision Therapy has had some success, it remains unknown precisely how the therapy works. That is, how does this Therapy affect oculomotor control? Dynamic responses comparing normal people to CI populations will provide insights into the neural strategy that the brain utilizes to process binocular disparity and to blur visual information. This insight will lead to more effective therapeutic regimens, so that additional patients can receive more effective and efficient treatments resulting in health care cost reduction.

The therapy includes 1) recording dynamic vergence eye movements of the normal and CI populations, 2) quantifying and comparing the responses through mathematical modeling and digital signal processing, 3) performing vision therapy on the CI population, and 4) quantifying the results after several months to determine how the vergence neural mechanism and control have changed.

**The New Jersey Institute of Technology is a public research university located in Newark, NJ.**

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### "Stem Cells for Bone Repair in Osteoporosis; Tissue Engineering"

Treena Livingston

Age-related bone loss or Osteoporosis is a major public health problem that affects over 28 million people in the United States. With the average age of the population increasing each year, this number will also increase with time. Osteoporosis is estimated to be responsible for 1.5 million fractures per year, typically occurring in the hip and spine. Fractures in these sites have a debilitating effect on a person's quality of life due to the lack of mobility, long-term rehabilitation and its associated costs. This research focuses on improving the outcome of osteopathic patients who suffer from large fractures, by investigating the applicability of tissue engineering therapy.

Tissue Engineering is a technology that has been successful in preclinical models studying bone regeneration. Tissue engineering for bone repair encompasses the combination of cells and/or growth factors with an appropriate scaffolding material to stimulate bone regeneration.

Stem cells isolated from adult bone marrow are capable of differentiating into osteoblasts, chondrocytes, adipocytes and other connective tissue lineages. When stem cells are combined with a bioactive ceramic scaffold composed of hydroxyapatite/calcium phosphate, they have been shown to induce bone formation in large, long bone defects in rats and dogs.

It is believed that the scaffold acts as a template for the implanted stem cells to attach, differentiate and secrete factors that induce the host stem cells to differentiate and form bone. Recent studies have shown that stem cells in aged and osteoporotic patients are lower in number and have impaired function, respectively. The goal of this study is to evaluate stem cell-loaded bioactive ceramics utilizing stem cells derived from aged and osteoporotic animals as a clinically relevant model for investigating tissue-engineered bone materials.

## WHY DO WE NEED BIOMEDICAL ENGINEERS?

The average age of the population of the United States keeps increasing each year. We are anticipating that by the end of this decade twenty-five percent of the people in this country will be 65 years old or more. With this increasing life expectancy society must find ways of preventing, diagnosing and treating debilitating illnesses in order to minimize the health deficits of the people and to enable them to live a high quality of life. It is the biomedical engineers who develop the new methods of diagnosing and treating medical and surgical problems. Biomedical engineers have developed the prosthetic heart valves, the artificial kidney [hemodialysis], arm and leg prostheses, and the technology to analyze lung function, brain function, and heart function

## IS BIOMEDICAL ENGINEERING A GOOD DEGREE FOR PRE-MED STUDENTS?

At NJIT all biomedical engineering students take the following courses as the first three in their undergraduate curriculum:

FED 101 – students working in groups of three, using a Lego Kit, build a remote surgical tool which they then use to 1) reattach the tip of a frankfurter tip, and 2) cleanly remove the pit of a fruit. This is a fun learning course.

BME 301 – students in a studio environment [no more than 25 students] learn the electrical engineering aspects of medicine/biomedical engineering; EKG, nerve conduction, elementary signal analysis.

BME 302 – students in a studio environment [no more than 25 students] learn the mechanical aspects of medicine/biomedical engineering; muscle action; motion of arms, legs; forces on the body

## Biomedical Engineering Staff

David Kristol, Acting Chairman  
(973) 596-3584; [Kristol@njit.edu](mailto:Kristol@njit.edu)

Clare Naporano, Assistant to the Chair  
(973) 596-5476; [naporano@njit.edu](mailto:naporano@njit.edu)

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## Faculty Mentioned in this Newsletter

Tara Alvarez  
Vision Engineering; Neural Engineering;  
Telemedicine;  
[alvarez@njit.edu](mailto:alvarez@njit.edu)

Richard Foulds  
Neuromuscular Engineering;  
Biomechanics  
[foulds@njit.edu](mailto:foulds@njit.edu)

Treena Livingston  
Biomaterials; Tissue Engineering  
[livingston@njit.edu](mailto:livingston@njit.edu)

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## Teaching Staff

Michael Bergen

Michael Bergen received his M.S. degree in Biomedical Engineering from NJIT in 1999. He has fifteen years of experience working in biosignal processing at the Veterans Administration Medical Center in East Orange, where he has been studying chronic fatigue syndrome, stress, and heart disease using signal acquisition, computer automation and biomedical instrumentation.

# Biomedical Engineering at



The New Jersey Institute of Technology

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## Meet the Biomedical Engineering Faculty

For information, contact the NJIT Admissions Office  
**(973) 596-3300**

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