But this training can be enhanced. Weill Cornell Medical College (WCMC) has the potential to educate undergraduates on the foremost advances in biomedical research and the world of medicine from the clinical perspective. With the Cornell-Ithaca campus so far away from WCMC, however, many undergraduates miss out on educational opportunities that access to the medical college could provide.

Inspired by these issues, Chris B. Schaffer, Biomedical Engineering, and Michael G. Kaplitt, Neurological Surgery, WCMC, are trying to bridge this gap with the initiation of their innovative course, BME 411—Science and Technology Approaches to Problems in Human Health. The course exposes Cornell students on the Ithaca campus to applied medicine. Students learn how real biomedical research problems are identified, how medical research is conducted, and what it means to be a doctor—all of which show the connection between basic and applied biomedical research and healthcare. By hearing from clinicians and scientists in the field and participating in their own team projects, students can gain essential knowledge and experience for considering a future in medicine and biomedical research.

BME 411, offered for the first time in fall 2007, is designed to give students in-depth “snapshots” on current problems in human health. In the two weekly class periods, students hear lectures on health problems related to infectious, neurological, musculoskeletal, and cardiac diseases and cancer. Faculty from WCMC and Cornell-Ithaca come to the class to discuss their current research on understanding the disease process, developing new treatment strategies, and ultimately improving patient outcomes. Schaffer describes the lectures as a means to “give exposure and information to Cornell undergraduates from the insider’s point of view.”

The course is much more interactive and collaborative than the typical lecture series. Students can sign up for informal lunches with the guest lecturers and attend after-class question-and-answer sessions. Background reading and weekly quizzes provide students with the basis for a deeper understanding of the lecture topics. A major component of the course and half of the students’ grade is a team project conducted throughout the semester.

An essential objective is to help students gain knowledge and concepts for developing original questions of their own. Students follow their interests in exploring specific scientific and medical issues in greater detail in their team projects. These projects give the students experience in the development of identifiable research questions, the innovation of strategies for treatment, the mechanisms for creating a proposal for original biomedical research, the exploration of the tools that exist to conduct research or the possibilities for tool development, and the connection of research to a larger problem in human health. With the opportunities to communicate informally with guest lecturers and individual office hours with Schaffer and Kaplitt, the faculty provide students with excellent support and feedback for their team projects.

Schaffer is excited about how the course can give students the chance to develop their skills and experience in innovation, which is required for advanced level research and important for those seeking future careers in medicine and biomedical research. With the lectures, team projects, and additional course requirements, BME 411 offers practical exposure to the applied research and clinical medicine at WCMC. This course is a powerful stepping-stone in the overall goal of enhancing the undergraduate experience at the Cornell-Ithaca campus.
The Lectures

Tuberculosis:
Elizabeth R. Rhoades,
Microbiology and Immunology

Leishmania:
Susana Mendez,
Baker Institute for Animal Health

Virology:
[a] Michael G. Kaplitt,
Neurological Surgery, WCM

Targeted Drug Delivery in Brain Cancer:
Mark M. Souweidane,
Neurological Surgery, WCM

Heart Valve Disease and Treatment:
Jonathan T. Butcher,
Biomedical Engineering

Stem Cell Therapy in Heart Disease:
Michael I. Kotlikoff,
Biomedical Sciences

Orthopedic Surgery:
Steven R. Goldring,
Chief Scientific Officer,
Hospital for Special Surgery

Surgical Treatments for Epilepsy:
[c] Theodore H. Schwartz,
Neurological Surgery, WCM

Ethanol Biosensors and Pharmacokinetics:
Peter C. Doerschuk,
Biomedical Engineering

Orthodontic Surgery:
Lawrence J. Bonassar,
Biomedical Engineering

Parkinson’s Disease and Gene Therapy:
Michael G. Kaplitt,
Neurological Surgery, WCM

Stroke:
[e] Philip E. Steig,
Neurological Surgery, WCM

Brain Cancer:
[f] Susan C. Pannullo,
Neurological Surgery, WCM

Hypertension:
Robin L. Davison,
Biomedical Sciences/Cell and Developmental Biology, WCM

Tissue Engineered Tumor Models:
[g] Claudia Fischbach-Teschl,
Biomedical Engineering

Orthopedic Surgery:
Steven R. Goldring,
Chief Scientific Officer,
Hospital for Special Surgery

Stem Cells and Cancer:
Michael G. Kaplitt,
Neurological Surgery, WCM

Protein Engineering for Therapeutics:
Moonsoo Jin,
Biomedical Engineering

Clinical Cardiac Imaging:
David J. Skorton,
Neurological Surgery, WCM

Intravascular Treatment of Brain Vascular Disorders:
Y. Pierre Gobin,
Neurological Surgery, WCM

Stents for Coronary Vascular Disease:
David R. Fischell,
Angel Medical Systems, Inc.

Ethanol Dependence:
Sean O'Connor,
Indiana University, School for Medicine

Photonic Imaging of Cancer in Research and Medicine:
Warren R. Zipfel,
Biomedical Engineering

Evaluating Cancer Therapeutics:
Michael L. Shuler,
Biomedical Engineering

Clinical Cardiac Imaging:
David J. Skorton,
Neurological Surgery, WCM

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[304x100] Frank DiMeo; Lindsay France/CU; Undergraduate Research
Learning About Today’s Complex Medical Problems and Medical Research: Students of BME 411

Gillian Sarah Paul '08 Interviews Bashar Geer '08

Paul: How did you find out about the course?
Geer: I received an email about the course last semester detailing the new class. I was intrigued by the large scope of topics and their relevance to modern medicine. So, I signed up for it.

Describe your previous experience and awareness of the Weill Cornell Medical College?
Weill Cornell Medical College [WCMC] is really shrouded in mystery for many of the undergraduates at Cornell. I did an internship at WCMC last summer, so I am somewhat familiar with the medical college and aware of the vast amounts of the research that is performed there. Before my internship, I knew extremely little about it. I read about it in the Cornell Chronicle or the Cornell Daily Sun, but within my classes there was very little dialogue about what happens at the medical college.

What are your general impressions of the course so far?
The topics we have discussed are very diverse, ranging from HPV vaccination to spinal surgery. I am learning a lot about a variety of topics that are at the forefront of medicine in today’s era. The lecture that has interested me the most, so far, is FETCHO’s [Joseph R. Fetcho, Neurobiology and Behavior] lecture on neural regeneration in spinal injuries. He studies spinal regeneration in zebrafish and tries to extrapolate the data to humans so that we can ultimately help fix neuronal damage in the spine. The best assignment we have gotten so far is to come up with a research proposal for original research on any topic involving medicine. I really feel that this is a great assignment because it allows people to show their original thinking and helps students learn how to do research proposals, as I have never done it before this class. I feel that this is a great course to be offered as it is a window into modern medical research and shows students that doctors not only perform patient care, but are also able to expand their interests into other areas. It also helps students learn about a variety of topics to which they otherwise might never be exposed.

How does the course address the task of bridging the gap between the Ithaca and WCMC campuses?
The course addresses the task best by bringing doctors from WCMC to Ithaca, because otherwise we would never have any idea of what they do. Undergraduates get a taste of what types of research is being done and also that there is a lot of collaboration occurring between the two campuses.

What is your major?
Biological sciences concentrating in neurobiology.

What are your future interests?
To become a neurologist or a psychiatrist. I am pre-med and currently applying to medical school.

Has this class, so far, helped you in any way with your future interests?
Yes, this class has really helped me finalize my decision to proceed to medical school as I have realized that there is a possibility for research as well as just practicing medicine.

What is your favorite aspect of the course?
My favorite part of the course, so far, has been the assignment I mentioned before, where I have decided to investigate the Broca disease virus and its relationship to incidence of depression and schizophrenia. I want to investigate the mechanism behind how it affects neurons at a cellular and molecular level.

What is your least favorite aspect?
The weekly quizzes.

Later in the Course Gillian Sarah Paul '08 Talked with Jennifer Shum ’08 and Anna Gobin ’08

Jennifer Shum ’08
Biological and Environmental Engineering Major with Minors in Biomedical Engineering and Mechanical Engineering

I do research in biomedical engineering, and when I heard about this course, I was excited about learning more about the biomedical engineering research currently being done to solve the complex problems in medicine today. Most of my courses involve reading textbooks and learning about things that are already known. Though these important discoveries are interesting, what makes this course unique is learning about problems that have not been solved and about the research currently being done to change this. Most of the topics are not even published in textbooks yet, which is why most of our reading consists of journal articles. Because my future interests are in research, it is very beneficial to read journal articles and get used to the different format [as compared to textbook reading]. Our term project is a good experience. We have to write a research proposal that addresses a problem in medicine. It uses our intellectual creativity to find a solution to a problem of our choosing. Also, this is the only course where I have been taught how to write a proposal, so it was very useful.

Two of the most interesting lectures have been Professor Fetcho’s Lecture [Joseph R. Fetcho, Neurobiology and Behavior], on spinal cord injury and Dr. Schwartz’s lecture on surgical treatments for epilepsy. Professors from WCMC have especially interesting lectures because they often talk about patient cases in which they have been directly involved. The extra activities allow us to interact with professors in an informal setting (lunch and after-lecture sessions), so I feel more connected with the WCMC professors. I really enjoy the course very much. This is an important course to be offered.

Anna Gobin ’08
Chemical Engineering Major

The course material is interesting, and the format is very different from other courses I have taken. I have learned a lot from the lectures and the project and find the course very useful. I very much enjoy Dr. Kaplitt’s lectures [Michael G. Kaplitt, Neurological Surgery]. The lectures are my most favorite aspect of the course. Also, the articles we read are very interesting [reading the textbook is my least favorite], and I learn a lot from the quizzes.

This is an essential course to take if a student [engineer or pre-med] is planning to work in a medical field. What we see in this class is that doctors use the devices made by engineers, and it is very important for physicians and engineers to work closely together in order to develop useful tools. I want to work in the biomedical engineering industry.