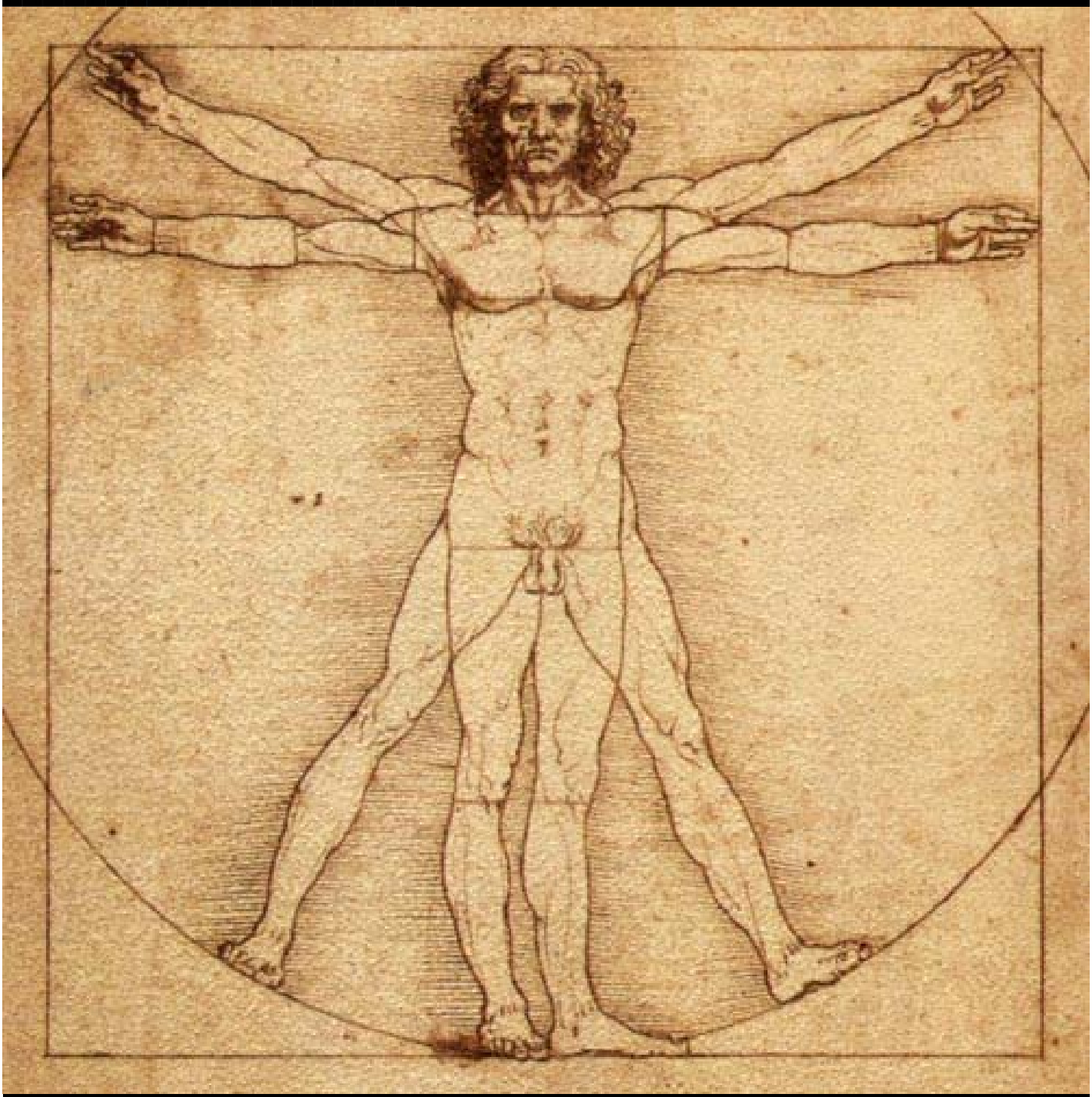
The BMES Pulse

The Official Newsletter of the Biomedical Engineering Society at Vanderbilt



Design/Layout: Mike Scherer and Christine Zhang

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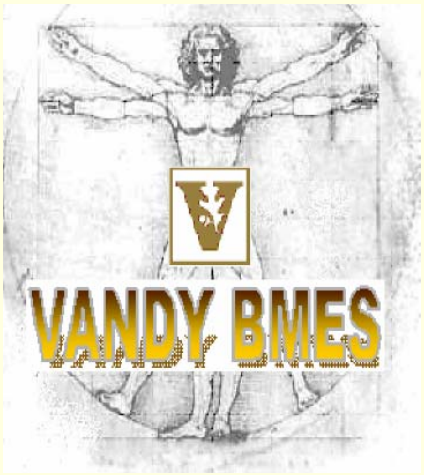
FALL 2008 VOLUME 1, ISSUE 1

First-Ever Vanderbilt BMES Newsletter Published!



Welcome to the inaugural issue of the **Vanderbilt BMES Newsletter!** Our goal is to promote Biomedical Engineering-related events and important news items, as well as to increase the Biomedical Engineering Department's overall exposure in the Vanderbilt community. We hope that you will find the contents of this first newsletter interesting, and if you would like to contribute to future newsletters, please contact Christine at christine.y.zhang@vanderbilt.edu! This is a student-run newsletter so it is a great way to get involved in your profession while supporting Vandy BME. We hope you like it! For general questions about the newsletter, email:

BMESpulse@vanderbilt.edu

Recent Events

Notable news items in the Department of Biomedical Engineering:

-Drs. **Paul H. King**, **Richard G. Shiavi**, and **Thomas R. Harris** are named Professors Emeriti effective Fall 2008. Congratulations on your prolific careers, professors!

-**Dr. Todd D. Giorgio**, Professor of Biomedical Engineering, has been named Chair of the Department of Biomedical Engineering, taking over for **Dr. Thomas R. Harris**, Orrin Henry Ingram Distinguished Professor of Engineering. Read Dr. Giorgio's comments regarding the change on pp. 4-5.

-The Senior Design team made up of Austin Dirks, Katie Gallup, Andrew Dawson, Frank Lamons, and Nick Burjek won the Thomas Arnold Design Prize, for their **Smart Anti-Tip System for Manual Wheelchairs**. Congratulations, team! As an added benefit, each team member received a cash bonus for their hard work!

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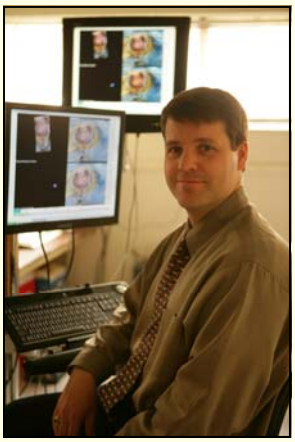
Special Thanks to Dr. Giorgio and Dr. Miga for their insight and support.

Also, special thanks to The Bio-Engineering Quarterly at the University of California San Diego for their invaluable advice.

INSIDE THIS ISSUE:

Interview with Dr. Michael Miga: The Man Behind BMES -The Intrigue and Mystery Unraveled

By: Rosie Korman



Q: What first sparked your interest in BME?

A: I actually have my bachelor's and master's degrees in Mechanical Engineering. In my senior year, a little after Christmas of 1990, I was activated for the Persian Gulf War. When I returned, I worked at a naval base developing countermeasure launchers for submarines while I finished my bachelor's and master's degree. After these two experiences, I decided that I wanted to do something different than working with weapons (shooting or designing). So, I went to Dartmouth College and got my Ph. D. in Biomedical Engineering.

Q: What is your main area of research?

A: Applied mathematical methods to medically oriented problems. This includes soft tissue modeling, image-guided surgery, and characterization of biological systems.

Q: Could you give us a brief explanation of the Biomedical Engineering Society, its purpose, and its goals?

A: I'd like it to primarily be a service organization for all the BME undergraduates here at Vanderbilt. The organization will have social, career, and informational aspects. Hopefully, it will serve as a gateway to introduce and expose undergraduates to the field of BME and to build camaraderie among the undergraduate classes.

For example, we are working toward a mentorship program within the BMES society and I mean that in the broadest sense of the word. We hope to foster relationships between students, alumni, physicians, industry, and other biomedical engineering undergraduate programs. Eventually the program will cultivate a broad range of community and science related service projects, such as sponsoring design competitions, engaging speakers for cutting-edge seminars and discussions, promoting shadowing experiences with BME-minded physicians, philanthropic work, facilitating internships and research experiences, becoming a conduit for recruiting, and facilitating attendance of students to the national BMES conference – perhaps even sponsor our own conference in the future.

In short, the BMES society is really striving to promote biomedical engineering at Vanderbilt in the most positive sense possible.

Q: Why should BME majors join the BMES?

A: It's a central place where an undergraduate can learn about BME and expand upon what s/he learned from a textbook or in class. It'll offer exposure to all parts of the department, BME mentors for medical and graduate school, contact with alumni, and a social context to communicate with fellow undergraduates. It is also a place where you can get involved and take an active role in shaping BME at Vanderbilt. For example, the newsletter that this interview will make it into is completely student-run - what an exciting and neat addition to one's training in BME at Vanderbilt!

Q: Well, I'm sold. How do I join the BMES?

A: Just send an email stating your desire to join BMES to: Dr. Miga, Dr. Judy Lewis, Morgan Folus (BMES President): morgan.b.folus@Vanderbilt.Edu , or any other BMES officer. You should also register with the professional organization (http://www.bmes.org/membership.asp). This is the professional society and there are all kinds of benefits to being a member in the national society.

Fun Facts:

-The BME program was created at Vanderbilt in 1968.

- In 1980 it offered its first MS and PhD programs, and in 1988 became its own department.

-Currently BME has the largest undergraduate enrollment in the School of Engineering.

-The Department is staffed by 17 faculty members, and has been ABET accredited since 1993.

Interview with Dr. Todd Giorgio

By: Michael Scherer

Most BME students will know him as their Nanotechnology or Transport Phenomena professor, but behind the scenes, Dr. Todd Giorgio has been acting as interim chair of the Biomedical Engineering Department for most of the past year. Recently, he was officially named to succeed Dr. Thomas Harris as chair of the department. Dr. Harris retired this past May.

Aside from his appointment as professor of Biomedical Engineering, Dr. Giorgio also serves as professor of Chemical Engineering and professor of Interdisciplinary Materials Science. He is on the executive committee of the Vanderbilt Institute for Nanoscale Science and Engineering (VINSE) and currently conducts research at the Vanderbilt-Ingram Cancer Center. Among other notable achievements, Dr. Giorgio is a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) and has won an outstanding teaching award from the School of Engineering and four awards for the best research paper from the Vanderbilt Engineering Research Council.

I had the chance to ask Dr. Giorgio a few questions regarding his personal experiences and what his plans are as chair of the department.

Q: When did you come to Vanderbilt?

A: I arrived as an Assistant Professor in January 1987 – 21 years ago!

Q: When you first arrived at Vanderbilt, did you expect yourself to become Chair of the Department of Biomedical Engineering?

A: Our Department was established in 1988 from a biomedical engineering program, so, when I arrived, there was no Department of Biomedical Engineering. But I certainly wasn't thinking that I might be the Chair of any department at that time.

Q: What about your background will make you an effective leader of the BME department?

A: I am convinced that biomedical engineering – as an interdisciplinary field – will continue to transform human health worldwide. I'm enthusiastically committed to developing biomedical engineering at Vanderbilt to its full (and considerable) potential. My experience in teaching and research provides a platform to understand the challenges of academia and offer a vision of our shared future in the Department and with our partners.

Q: How closely have you been working with Dr. Harris in order to ensure a smooth transition at the top of the BME department?

A: I became the Interim Chair in July 2007, and Dr. Harris and I have been working together since that time to minimize the potential problems associated with the transition. Our offices are practically adjoining (in the BME Department office, SC 5824) and we talk and exchange emails regularly. His experience has been extremely valuable and has contributed significantly to the Department this year.

Q: What new changes do you plan to instill in the department?

A: As a discipline, biomedical engineering is evolving. Our undergraduate curriculum must evolve to enable our graduates to meet the needs of industry and be qualified for entry into graduate and medical schools. I'm confident that we will refine the curriculum soon. I also expect that we will hire a full-time laboratory technician to support and expand our undergraduate laboratory experiences.

Cont. on page 5

…Interview with Dr. Todd Giorgio cont…

Q: A number of BME faculty will be retiring in the next year or two. How do you see that impacting the strength of the program and the number of undergraduate/graduate students admitted?

A: We will experience significant faculty change over the next few years, starting with the appointment of Drs. Harris, King and Shiavi as Professors Emeriti at Commencement 2008.

We are approved to seek a number of new faculty and will start this process during the summer of 2008. The expertise that these new BME faculty members bring to our Department will be critical to our continued success in teaching and research. I do not see these changes influencing the number of undergraduate students selecting a BME major at Vanderbilt. The research activities of our new faculty, however, will likely lead to an increase in the number of predoctoral students in our Department.

Q: What attributes of the BME department at Vanderbilt do you think set it apart from other programs around the nation? What strengths to you plan to build on, and what weaknesses will you attempt to bolster?

A: Our Department has earned a strong, visible national ranking through our substantial strengths in teaching and research. We have many distinguishing characteristics and count our outstanding students, faculty and staff among our strengths. Vanderbilt offers a unique educational environment for engineers with a considerable focus on interpersonal professional skills and leadership. There are some clear opportunities for us in areas of current strength including biophotonics, cell and molecular bioengineering and imaging. Few academic departments have sufficient resources to develop strength in each of the many areas appropriate for biomedical engineering activities and we are no exception. We will look to current and new partners in the School of Medicine to strengthen and develop interactions at specific interfaces, focusing on the most important problems in medicine and biology.

Q: How will your new responsibilities as department chair affect your research/teaching roles? Will we still be seeing you as a professor?

A: My aim is to maintain significant research activity in the applied nanotechnology and cell biology areas. I'm teaching a new course this semester (Nanobiotechnology) and enjoying the opportunity to expand our undergraduate curriculum in this direction. I expect to maintain some teaching activity as Chair and continue my participation in all aspects of our intellectual community.

Vanderbilt BME is on the Move!!!

BME FACULTY SEARCH

The Department of Biomedical Engineering at Vanderbilt University (VUBME) is pleased to invite applications for multiple tenured/tenure-track faculty positions at all levels. This initiative is part of exciting new opportunities at VUBME, which includes a major expansion of its faculty as well as state-of-the-art space. Interviews for the initial 3 positions will begin by November 1, 2008. Applications will be accepted until all positions are filled.

We seek to recruit outstanding faculty from all areas of Biomedical Engineering. VUBME research has core strengths in the areas of biophotonics, nanobiotechnology, and image-based technologies. Other areas of potential interest include neural engineering, -omics engineering, and biomaterials. VUBME growth will build on strong collaborative research with VU medical, engineering and science faculty who are all within immediate walking distance of each other.

For more information go to:

HTTP://WWW.BME.VANDERBILT.EDU/BMEFACULTYSEARCH

Interview with Professor Christopher Rowe: ES 130…Wait Don't You Mean ES 140?

By: Christine Zhang

ES 130 used to be the freshman introduction to engineering until a man of genius decided that the professors were as bored teaching the class as the students were sleeping in it.

ES 130 was a skills-based course that taught a variety of computing topics, such as HTML, VRML, Excel and a little bit of Matlab. The format was a point and click methodology versus a problem solving methodology. The class was just not living up to the standards professors had for first year students, though. Now, it has transformed from a lecture/lab format to an all-lab format thanks to the inception of the laptop program.

The planning process was overhauled for this new course. A lot of questions were asked during the design process, including what should students be able to do at the end of their first semester of engineering, which entails having very specific problem-solving skills? More than 40% of students entering the School of Engineering are unsure of the major they choose or what their intended major even involves. A completely new course involving a rigorous problem solving component while maintaining the computing component was needed as well as a component providing freshman with a better understanding of what each discipline involves so they can make an educated decision about the major that best suits their needs and passions.

The engineering administration and quite a few faculty members were not receptive to having first semester, discipline-specific curriculum because the strength of the first-year program. That is: students who don't know what their major is won't be behind those who do. This common first year contributes to the academic identity of our engineering program at Vanderbilt. It is also a great marketing tool for prospective students by taking a lot of pressure off students who haven't quite decided at 17 what they want to do with their professional lives. The Dean's Office formed a multidisciplinary committee chaired by Dr. Rowe and Dean Overholser to create a course that provides discipline-focused modules with common education for all students, no matter their major.

The first module of ES 140 is essentially a condensed half semester of ES 130 revamped into a multi-disciplinary format centered on the engineering problem-solving process. The new course teaches freshmen how to think like an engineer, using various engineering settings earlier than before. The modules are ideally designed to reduce the perception that one is drastically different from another as far as workload and grading standards while maintaining clear differences between the disciplines. The committee employed the expertise of the VaNTH Engineering Research Center that specifically focuses on how to better teach bioengineering material using modern education methods. The methods compiled by VaNTH's research were applied to multiple disciplines outside of bioengineering helping them accomplish one of the course goals: to develop a better curriculum.

Engineering is such a complex topic that a four-week introduction into an entire discipline gives only two options. As Dr. Rowe says, "It has to be a mile wide and 1 inch deep or half a mile wide and 2 inches deep… The cool thing about ES 140 is that, if the module is designed correctly, you'll see what you've learned in the course at multiple points before you graduate." It was collectively decided that a deeper understanding of one topic closer mimics a more rigorous engineering course in a specific discipline albeit in a more diluted version.

There are still a lot of changes to look forward to for incoming freshmen. The entire first module will be redesigned to be more interesting and effective, although the course as a whole will still maintain the same level of rigor. A constant measurement, assessment and implementation process has been used since the original development of the course to create an even better version of ES 140 each year. Now you know why we've been surveyed to death this year!

BME 272/273 Senior Design: What Should I Expect?

By: Michael Scherer

BME 272 – Design of Biomedical Engineering Devices and Systems, but better known as simply "Senior Design," is a year-long course intended for graduating senior BME's. The stated objective of the course is the "development of design skills through lectures and exercises involving the design process and through the completion of a senior level design project." Directed by Dr. Paul H. King, the course begins as a lecture-based sequence where design theory and other potential design issues such as regulatory requirements, ethics compliance, etc. are discussed.

In mid-October, students form their own teams and projects are chosen from a list provided by BME professors, pertinent local businesses, and MDs from Vanderbilt University Hospital. Potential projects range from the creation of novel microfluidic devices to wheelchair modifications and improvements. Students also have the option to seek out their own projects and can form interdisciplinary teams if varying skill sets are required to complete the project. For example, one group this year is designing a tissue stimulator and is made up of two BME's, a Mechanical Engineering major, and a Computer Science major.

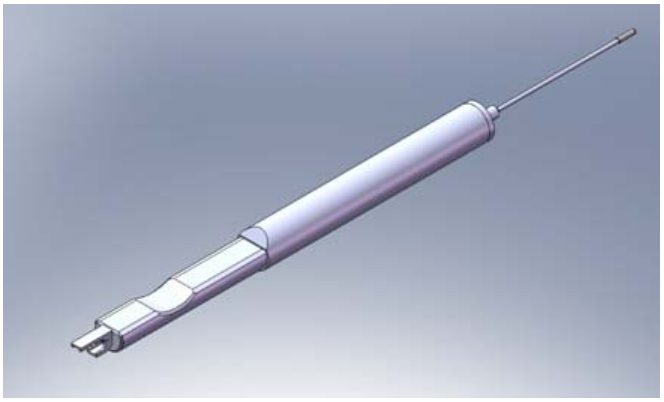
I spoke with three fellow seniors – Brian Cost, Tyler Kibbee, and Justin Johnson – to gain their perspective on this unique course.

Q: How did you guys pick your project and form your team?

A: We are doing our Senior Design project in conjunction with a small biotech company named, OrthoHelix Surgical Designs, Inc. The company is located in Akron, Ohio, and Brian worked as a co-op engineer there this previous summer. The company specializes in a niche market of orthopedic implantable devices specifically designed for hand and foot surgeons. The devices include plates and screws for trauma injuries as well as all the instruments needed to implant the plates and screws. In the fall, Brian contacted Derek Lewis, Director of Engineering at OrthoHelix, and asked if there were any potential projects the company was interested in allowing us to pursue. Derek suggested developing a depth gage instrument used to measure the depth of a drilled screw hole in human bones. The need for such a design arose from the inadequacies of the existing depth gage used in the field. The existing depth gage had difficulty accurately measuring screw hole depth size. From there, Brian contacted Tyler Kibbee and Justin Johnson to form the complete team for the project.

Q: Give us a brief description of your project.

A: We designed an improved depth gage that will accurately and repeatedly measure screw hole depth size. Our design incorporates an expandable medical-grade silicon tip that plugs a bone hole on the far cortex of the bone. The existing gage uses a small metal hook that is designed to "hook" onto the far cortex of the bone for measurement. Difficulties arise sometimes because surgeons do not know for sure if the small hook is actually going through the entirety of the hole. Our design overcomes this because the expandable silicon tip assures the surgeon they are measuring from the right spot.



Depth gage developed by senior BME's Brian Cost, Tyler Kibbee, and Justin Johnson in conjunction with OrthoHelix Surgical Designs, Inc. based in Cleveland, OH.

Q: What do you like most about the course?

A: The course has allowed us to use our own ingenuity and create a solution to a real-world problem. This has also been the longest duration of any project and it has forced us to perfect our time management skills. I think the Senior Design project enables students to gain a taste of the real world working environment before we are actually there. This experience is invaluable to the transition from college to the business world.

Q: How has your project developed?

A: Since the beginning, we have changed our design a couple of times. We finally settled on a fundamental design and have been making gradual improvements as the project has progressed.

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...Senior Design Interview cont...

Q: What have you learned from the course?

A: The course has encouraged us to expand beyond the normal scope of a college assignment and seek outside information from professionals. Moreover, it has taught us not to be afraid of trying something that may not work because; in the process of failing you sometimes learn something new to help you solve the problem. We were fortunate because we had so much freedom in the direction of our project design

Q: What has been the hardest part of completing your project?

A: The hardest part about completing our project is the communication with a company. In our case, the project is not an immediate priority for OrthoHelix; therefore, sometimes we do not have the best response time with questions and concerns. However, from this we have developed an improved sense of persistence. It is up to us to complete our project and we cannot rely on everything to flow smoothly. It became our responsibility to continually follow through and check in on the company to receive input and guidance.

Q: Do you think you will be able to apply any of the skills you have learned in the course after graduation? How?

A: We know with confidence that we have acquired new skills that will be useful after graduation. Among these, we have learned time management for long-term projects. We have also learned that patience is necessary in business and that you cannot be discouraged very easily. We have to be persistent in our projects because it continually improves the chances of success

Q: What advice would you give to students who have not yet taken Senior Design?

A: Carefully select your project to ensure that it is a reasonable task to undertake as an undergraduate with no real applicable experience. Do not overestimate what you are capable of because you may end up getting in over your head. However, be open-minded to many different ideas and have a few options to choose from. It would be better to have chosen your favorite project from a list rather than settle for a last minute project assignment. This will make the project easier on you mentally because you will enjoy doing it that much more.

Also, do not be afraid to talk to people you don't know. It turns out that they can be the most helpful people to the project. In our case, when we spoke to surgeons about our design, their feedback was critical. It is one thing to be an engineer and design something for a surgeon, but it is another thing to design something unusable. We can validate our design by seeing what surgeons have to say if they were using a device like ours in an operating room.

BENG 1: INTRODUCTION TO BIOENGINEERING

By our fellow engineers at UCSD: Reni Biswas and Sowyma Arja

Leonardo da Vinci: The Creator of Bioengineering

Over 500 years ago Leonardo da Vinci, while watching the wing motion of birds, thought to himself how can we allow humans to fly? He envisioned a machine-like device that would be powered by humans and allow them to achieve the same flight abilities as birds. From this innovation the airplane evolved. Believe it or not, da Vinci created the bioengineering field from this simple thought.

For Winter Quarter of 2008, Bioengineering students took a class called Introduction to Bioengineering, directed by Professors Shu Chien and Peter Chen. Every Wednesday a speaker attended the class to teach the students about the dimensions of Bioengineering, the entrepreneurship of selling new devices, improvements in medical technology, and the ethical issues involved in science. Of the many speakers who attend, Doctor Shankar Subramaniam and Y.C. Fung were two profound speakers who closed the introductory class with an overview of the value of engineering in the medical world.

Doctor Subramaniam centered his lecture on the importance of a "model." Like da Vinci who developed many model sketches of what he envisioned an airplane would look like, Doctor Subramaniam discussed the three types of models that are important : a biochemical model, a mathematical model that can express the equations, and a solved model of the mathematical equations. To illustrate the use of these models, he provided an example of drugs banned every month by the Federal Drug Administration (FDA) because new drugs are created. Doctor Subramaniam said, "In order to have [the new drugs] to do what we want, we need to remake a model that can show the relationships [between the drug and the body to illustrate], the cause and effects. We need engineering devices to do the computations [and each creation]."

From this Doctor Subramaniam demonstrated engineering is the language of expressing the innovations in medicine. He concluded his lecture with Leonardo da Vinci's idea of the airplane to illustrate that bioengineering is an innovative process in which ideas, like achieving flight, are brought to life through models of engineering.

da Vinci's first drawings of an airplane

Professor Y.C. Fung, who was first an aeronautical engineer and then founded the UC San Diego bioengineering program in 1966, further demonstrated innovations in bioengineering. He began with Newton's Second Law of Motion, a simple equation, Force = Mass x Acceleration (F=ma). From this, Professor Fung said engineers must "take this simple equation and look at it at different levels [and apply it to the physiology of the body in order to create networks [with our physiology and engineering fields]." He also provided an example of a gecko's foot. Surgeons are trying to replicate the skin on the tissue in a gecko's feet so that it can be used in the medical field to heal damaged tissues in human patients. Innovations continue to occur when scientists continuously search for ways to improve the human body. **~Reni Biswas**

Bioengineering Class

Bioengineering is not a field that can be defined by any easy means. Instead, it involves the integration of various disciplines, subjects, and components, making it a more complex field than one might expect. At first thought, one might simply associate bioengineering with just one of its many constituents, such as medical instrumentation, imaging, or tissue engineering to name a few. Such a perspective on the subject leads to a unjust simplification of all that it entails.

In order to truly understand and appreciate this fairly new branch of engineering, the subject itself must be properly defined. Thus, in broad terms, bioengineering can be defined as the integration of biology, medicine, and engineering. The biological hierarchy of bioengineering, from the macroscopic level of systems to the microscopic level of molecules and genes, helps to categorize certain aspects of the field. For example, nanotechnology and molecular mechanics deal with organisms at the cellular and molecular level, while cell matrices and cell-cell interactions deal with the tissue and cellular level of the hierarchy.

Work that exemplifies the cellular and molecular level of the hierarchy includes the three-dimensional nanomechanics of the red blood cell membrane network and microelectronic DNA chip technology. The cellular and tissue level of the hierarchy includes work involving the interaction between cells and the extracellular matrix, as well as stem cells and their various therapeutic applications.

Tissue and organ engineering define the next level of the hierarchy. This component of bioengineering includes tissue engineering involving various organs of the body, as well as blood substitutes, microcirculation, and implants to remedy degeneration of cartilage.

Finally, the highest level of hierarchy involves systems biology. This component includes systems biodynamics and integrative network biology. All of the above work to create a whole and define bioengineering. Ultimately, bioengineering is the application of all the above to improve medical technology in order to eventually improve the lives of patients. The integrative aspect of bioengineering encompasses this idea.

Not only is bioengineering the integration of engineering and biomedical sciences, but it is also the association and interaction between different levels of the biological hierarchy. In sum, the goal of bioengineering is to "improve health and quality of life by applying engineering principles to scientific discovery and technology innovation." **~Sowmya Arja**

Studying Across The Globe Is Right Next Door!

By: Martha Ingram

Fellow biomedical engineers, how often have you ventured to the Starbucks in the Student Life Center, passed the Global educational office, and for a moment wished your degree was in something else, so that you could travel abroad? For those who have shared in this experience, let me alleviate your disappointment. The preconceived notion that studying abroad is not for BME students is completely false; what's more, the span of possible options open to BME students stretches to places you've probably not even considered for a semester abroad.

Currently, there are five major universities overseas that have multiple BME course offerings, with four additional programs nearly in place for this coming semester. With two prominent universities in Australia, two in Cape Town, South Africa, sites in Europe, and others in progress in places like Singapore and China, Vanderbilt biomedical engineers have ample opportunity to experience engineering in a plethora of cultures and settings. Principal advising administrator Dean Stacy S. Klein has been working continuously to establish relations with universities, and exchange/abroad programs that will support the curriculum demands of Vanderbilt engineers. Most recently, Dean Klein has been working on programs in Dresden, Germany; Guadalajara, Mexico; France, China, and is even looking toward adding a program in Holland.

But, is studying abroad for a semester a smart decision for engineering students?

In this reporter's interview with Dean Klein, she answered, "It is completely possible, and that is the message we're wanting to get across,"…"Studying abroad has become much more flexible in recent years," and she supported this statement with a formidable booklet of courses equivalent in content to courses offered at Vanderbilt. At the University of New South Wales, for example, Klein pointed out approximately 10 courses that are required components of the BME curriculum. Klein offered herself as a resource for students who are considering studying abroad. She emphasized that students should "start planning now," particularly freshmen, so that determining the course load abroad is relatively painless, and will fit neatly into the required engineering curriculum.

According to Klein, students considering study abroad need not worry about the quality of these courses. "The approval process is very rigorous. Every potential class is approved by our faculty in that field…usually by going through that course's syllabus." Therefore, students can be confident that while attending classes at another campus overseas, they are still getting the quality education they need for their degree. The bonus is that students can gain exposure to major research environments, meet new people, become engaged in novel cultural activities, and develop international relationships that could prove resourceful in post-graduate careers.

In terms of credit, the abroad programs are organized in such a way that the student's semester abroad is nearly equivalent to a year at Vanderbilt, only at a campus perhaps on the other side of the world. For example, the new Dresden program is a semester-long program, optimally for spring semester sophomores or fall semester juniors, where the student would take 20 credit hours. Three courses would be engineering courses, and the others could be language courses or others, qualifying as part of the liberal arts requirement. Most of the approved courses have direct transfer to Vanderbilt, meaning that these courses are factored into the GPA, are counted as credit hours, and can be used to fulfill BME and liberal arts requirements for graduation. All of the classes are taught in English, unless the student decides to take a language course. There are ample opportunities within the abroad program for the student to increase his/her exposure to the language or culture of the host country, which can open the door for internships or research opportunities later in these countries.

Financially, studying abroad during the academic school year offers a major incentive: any financial package applicable to the student during the academic year on campus is applicable abroad. Klein added that Vanderbilt takes on the room and board fees of the student abroad, so the student only has to worry about tuition and a fee for the actual program. For these obligations, there are scholarships and grants readily available.

Most recently, a grant of approximately $80,000 has been established for the global education office to award small scholarships ranging from $500 to $2000 to help students pay for the traveling expenses and other small costs. This grant, in particular, has a stipulation of being available to "underrepresented students in the study abroad program," which means engineering students are encouraged to apply! There are also numerous scholarships available, some specifically for biomedical engineers, some for specific groups, and some organized by other classes. Students should refer to http://www.vanderbilt.edu/geo/scholarships.html, to get more information.

So engineers, you really can have it all!

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Interview with Dr. Klein cont...

No longer do you have to sigh and wish longingly that you could expand your horizons, applying your degree in places beyond Nashville. With a comfortable variety of potential sites, the accessibility to faculty like Dr. Klein and the engineering department heads, as well as the advisement of the directors in the Global Education Office, planning an incredible experience abroad is hardly difficult. The only thing you have to do is act quickly, seek out these resources, and determine which country to study in first!

Caution: Remove all Metal Before Entering

By: Chelsea Samson

The Vanderbilt Biomedical Engineering Society had the opportunity to tour Vanderbilt University's Institute of Imaging Science (VUIIS) earlier this year, a relatively recent $27 million addition to the Vanderbilt Medical Center.

The modern glass building that houses the VUIIS is an indicator of the novelty of the technology within. Consisting of three main centers focusing on small animal imaging, human studies, and image analysis, the VUIIS aims to integrate advances in the sciences in order to develop new and improved imaging techniques. The Institute employs MRIs, CTs, ultrasounds, lasers, and PET scanners for its research. The power of the machines was demonstrated when our tour guide held up a small metal chain near the bore of an MRI and it promptly levitated towards its innards. And that was "merely" a 3-tesla MRI. VUIIS recently obtained a $7 million 7-tesla magnet that offers the potential for microscopic spatial resolution in order to visualize previously undetected anatomy and disease. This new addition, along with a vertical-bore magnet, established Vanderbilt as a world leader in imaging science.

The Institute encourages collaboration between scientists, biomedical engineers, and physicians in order to address areas of needed improvement in imaging technology. Through the work VUIIS is doing, we will soon have a greater understanding of the inner workings of the brain, cancer, gene modification and expressions, metabolism, and physiology, ultimately leading to pharmaceutical development and advanced diagnosis tools.

For more information, visit www.vuiis.vanderbilt.edu or attend VUIIS weekly seminars every Friday at 1:15 p.m. during the school year. If you would like to volunteer to participate in a research study, complete an application at svn.vuiis.vanderbilt.edu/Volunteer

Photo courtesy of Lord, Aeck, and Sargent

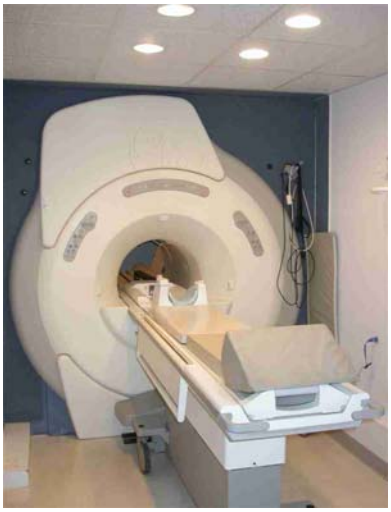


Photo courtesy of http://www.mritoday.net/MRI2

Upcoming Stories in the Next Issue ...

"VaNTH", I think you misspoke … No it's an educational initiative where Vanderbilt BME leads the way! *by Christine Zhang*

Learn about Medtronic's Therapy and Procedure Training Center … very cool! *by Chelsea Samson*

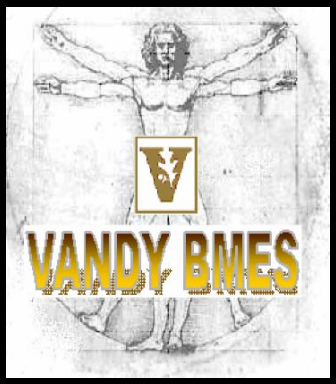
"E-week? What's that?" … you'll see! *by Abby Necessary*

"Plunderphonics and BME! How does that work?" … it takes a bit of *Girl Talk* to understand! *by Michael Scherer*

THE OFFICIAL NEWSLETTER OF THE BIOMEDICAL ENGINEERING SOCIETY AT VANDERBILT

Our Mission: *Vanderbilt's Biomedical Engineering Society (BMES) is an academic society whose goal is to provide pertinent information and resources about biomedical engineering to the biomedical engineering community at Vanderbilt. Our objective is to help our members network with as many professionals in the field of biomedical engineering as possible. Our ultimate goal is to help members land internships, research positions, and jobs in biomedical engineering.*

JOIN BMES AND BECOME A MEMBER TODAY!!



We're on the Web!

HTTP://BMES.VUSE.VANDERBILT.EDU

Supporting BME

The Biomedical Engineering Program at Vanderbilt is continually striving to be the very best biomedical engineering program in the country. Your support will help us achieve that objective. Please consider donating to the program– this will directly impact the resources for our undergraduates, the quality of the cutting-edge research taking place here in our laboratories, and ultimately the visibility of this very unique program.

- Todd D. Giorgio, Ph.D.

Chair of Biomedical Engineering

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