



# Alpha Eta Mu Beta

June 2012  
Vol. 10 No.2

NATIONAL BIOMEDICAL ENGINEERING HONOR SOCIETY

## National News Letter

### 2010-2012 National Officers

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www.alphaetamubeta.org

### MESSAGE FROM THE E BOARD

The time is quickly approaching for another exciting summer. The National Executive Board has been hard at work these past few months and we are happy to report on our projects and progress. Some of these projects involve collaborations with AIMBE and other organizations, fund raising and the launching of our LinkedIn page. We have also adopted a new constitution, please check it out here <http://tinyurl.com/74vuddc>. For more details please feel free to checkout our meeting minutes which can be found on the website, located under the documents tab.

If your chapter has not submitted the annual chapter report, please download the template from the following link, <http://tinyurl.com/6nklqyd>. If you have any questions or concerns, please do not hesitate to contact the Executive Director.

This year, the annual grand meeting marks an important time for Alpha Eta Mu Beta, for there will be elections of National Officers. With this change in the constitution, we will be electing a (non-student) vice president as well as president this year. If you are interested in running for a national position, please contact Dr. Dominic Nathan, chairman of the 2012 elections committee for an information packet.

We have also included information on how to apply for the national awards, on page 8 of this newsletter. Please take a few moments to read the descriptions and requirements, and send in the appropriate documents to the national student secretary, Ms. Stefanie Gonzalez. All active members of AEMB are highly encouraged to consider participating in the award nominations. Awards and new charters will be presented at the Annual AEMB banquet held in conjunction with the BMES conference in Atlanta GA.

Lastly, if you have not already submitted your list of current and alumni members, please do so immediately. This will help us, the national staff to recognize AEMB members at the annual BMES conference by providing members with a special ID badge.

## ADVISOR FOCUS

**Name** : George D. Pins  
**Position** : Associate Professor  
Dept. Biomedical Engineering  
Worcester Polytechnic Institute  
**Education** : BS Applied Science,  
Rutgers University  
PhD Biomedical Engineering,  
Rutgers University  
**Post doc** Center for Engineering in Medicine,  
Massachusetts General Hospital, Harvard Medical  
School & Shriners Hospital for Children, Boston, MA



George D. Pins graduated with a BS in Applied Science, followed by a PhD in biomedical engineering from Rutgers University. As a dedicated faculty member, Dr. Pins holds appointments at the rank of assistant professor in the department of biomedical engineering, at Worcester Polytechnic Institute (WPI) and at the Center for Bioprocess and Tissue Engineering, at the Bioengineering Institute, at WPI. He is also serves as the director of the Pins lab which conducts cutting edge research in biomaterials and tissue regeneration, evidence of which is seen in his strong publication record and the many successful lab alumni.

In the classroom, Dr. Pins has successfully developed several undergraduate and graduate courses in areas relevant to his research interest, topics that he holds near to his heart. He has been very instrumental in forming the undergraduate curricular track for tissue engineering and revising the biomaterials and biomechanics tracks. In addition, Dr. Pins serves on several committees, of which he is the chair for the undergraduate program review committee and coordinator of the biomedical engineering department guest seminars and lectures committee.

His passion for teaching and dedication to his students is evident from his eagerness to actively engage students, both in and outside of the class room, and help them to understand the course material. Dr. Pins even takes time to listen to his students about their goals in life and provides gentle guidance on how to realize these goals and succeed. Dr. Pin's involvement with AEMB began in 2007 when he helped to established the chapter at WPI in 2008. Today the WPI chapter is a strong and vibrant organization on the WPI campus. Recognizing the importance of student development, Dr. Pins also serves as the BMES chapter advisor.

His zeal for research and enthusiasm for teaching and advising has led to Dr. Pins, and his advisees being recognized through several awards, both locally and internationally.

## GRADUATE STUDENT FOCUS

**Name** : Manuel Salinas  
**School** : Florida International University  
**Research** : Cardiovascular Biomechanics  
**Education** : BS Biomedical Engineering  
MS Biomedical Engineering  
PhD Candidate in  
Biomedical Engineering



Manuel Salinas successfully completed his masters research on fluid flow simulations in bioreactors for heart valve tissue engineering at the Tissue Engineered Mechanics, Imaging and Mechanics Laboratory, under the guidance of Dr. Sharan Ramaswamy. His passion for the field led him to further pursue a doctorate in biomedical engineering. Manuel is the successful recipient of the Minority Biomedical Research Support-Research Initiative for Scientific Enhancement (MBRS-RISE) award from the NIH to support his graduate work. His doctoral research is in an area that he holds dear and that is cardiovascular, bioreactors, and computational fluid dynamics (CFD) simulations. The flame for his passion was ignited during his undergraduate studies where he served as research assistant in the biomaterials and cardiovascular mechanics labs. It is Manuel's hope and vision to use his research toward the development of more effective diagnostic and treatment modalities for cardiovascular related diseases, an area in which the World Health Organization has identified as a major source of death and disability.

In his own words, Manuel regards his induction into AEMB "not only as a great honor but also as a motivation and obligation to excel". A strong man of his word, the fruits of his hard labor are evident from his multiple oral and poster presentations at local and international conferences. As an undergraduate and graduate student, Manuel has also received several merit based scholarships and awards; the most notables of these being the Outstanding Master's Degree Graduate award from the FIU College of Engineering and Computing and the Best Graduating Master's Student from BME.

In addition to research, Manuel plays a prominent role on campus, being a mentor and role model to many undergraduate students. He is actively involved with the planning and coordination of department and college activities. He is an active member of 5 professional engineering societies and even with all his hard work and achievements, Manuel always maintains a humble and down to earth demeanor, a trait that is well respected by his peer and mentors. In his free time, Manuel enjoys outdoor activities and frequently practices tennis and soccer.

## UNDERGRAD STUDENT FOCUS

**Name** : Melissa Mae White  
**Education** : BS Biomedical Engineering  
**School** : University of Miami



*M*elissa M. White is an undergraduate BME student in the department of Biomedical Engineering at the University of Miami, FL. Melissa successfully balances her academics, work, and curricular activities and is able to give each one her utmost best. Evidence of this is seen in her strong academic performance, having successfully completed her undergraduate education in 3 years while consistently achieving high grades and even being inducted to the Provost List (upper 6%). Melissa has actively been involved with a wide range of service and community events on campus such as serving as the co-chair on the student engineering advisory board. She has been actively involved within the community through the America Reads Tutor program in which she served in teaching and administrative roles at West Lab Elementary. Melissa has served as a peer counselor for incoming freshman and helped to develop an award-winning, experiential learning program specifically for incoming students who were on a UMIAMI academic scholarship.

As the president of the University of Miami's AEMB chapter, Melissa focused on increasing the recognition and presence of the UMIAMI chapter both on campus and on the national level. Together with her executive board she worked hard to establish tradition and AEMB chapter honors within the department. These factors were to serve as the pillars to anchor the current class of members and enable future growth and stability of the chapter. Some of their efforts were such as creating an annual award to recognize outstanding achievements for an undergraduate member member of the UMIAMI AEMB chapter. This year's recipient was Lauren Marussich. In addition, Melissa, together with her officers successfully planned the induction ceremony for new initiates and a banquet at a local car museum, for the first time ever. This banquet was also the platform from which the UMIAMI chapter celebrated the achievements by all of their graduating seniors who were anxious yet excited and ready to face their new challenges in graduate school, medical school, law school, or in industry. In addition, as chapter president, Melissa established an active collaboration with the UMIAMI BMES chapter and together planned and hosted several events.

Having recently completed her undergraduate studies, Melissa has been accepted to the Masters of Science in Engineering, Science and Technology Entrepreneurship (ESTEEM) program at the University of Notre Dame.

## ALUMNI FOCUS

**Name** : Heather Hayenga  
**Education** : BS Biomedical Engineering (Honors)  
University of California, Davis  
PhD Biomedical Engineering  
Texas A&M  
**Current Position** : Post Doctoral Research Fellow,  
Cell Biophysics Lab,  
University of Maryland



*H*eather Hayenga completed her BS with honors in Biomedical Engineering at the University of California, Davis. Her passion for the field saw her pursuing a doctoral at Texas A&M University, under the mentorship of Professor Jay D. Humphrey at the Continuum Biomechanics Laboratory. Her research focus, in an area that is near to her heart consisted of characterizing the mechanics of atherosclerosis, hypertension induced growth, and arterial remodeling. This is both a very challenging and significant area of research for cardiovascular disease is the primary cause of death and disability in the US. In atherosclerotic plaques, cells sense the substrate rigidity and mechanical forces acting upon them to respond in ways that are essential for many aspects of tissue structure and function. Heather used atomic force microscopy to determine the regional stiffness of advanced atherosclerotic plaques, and histology to determine the corresponding wall compositions. She also used multiscale modeling to demonstrate the effects of mechanical stimuli with the spatially and temporally varying cellular responses. She then validated these models with literature and immunohistochemical results from a porcine hypertensive model created by her colleagues. Heather successfully completed her doctoral degree and her dissertation research which was focused on characterizing the mechanical properties and developing predictive models for atherosclerosis and hypertension.

Heather feels biomedical engineering is about understanding the needs of the community and working together to combat these needs one step at a time. During her time at Texas A&M, Heather played an instrumental role in making AEMB a strong and vibrant organization on campus. She served as the chapter president and as the induction and engineering chair, where she had the opportunity to invite and welcome new members, organize a career discussion panel, host professors visits and seminar talks, present her research at a chapter meeting, represent AEMB to the student engineering council, and serve as an ambassador/PR with BMES. Her most notable contribution to the chapter and department was to be a role model and actively encourage others to get involved in ways that will develop their specific aptitudes, and improve the current understanding and technology used in the biomedical field today.

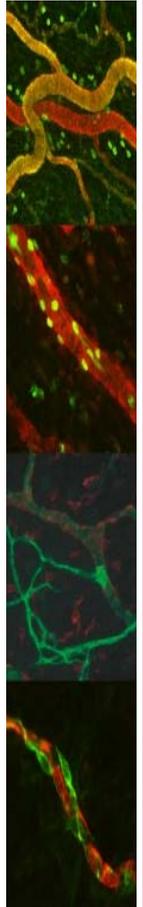
Currently, Heather is a post doctoral research fellow at the Cell Biophysics Lab the University of Maryland. In her free time, Heather enjoys keeping active through activities such as running, snowboarding, waterskiing and traveling. In the future, Heather hopes to pursue a career as an independent scientist studying research and development of cardiovascular devices.

## Understanding How Blood Vessels Grow in the Adult: A New Perspective for Future Therapeutic Design and Tissue Engineering

A key to tissue function is an adequate blood supply. Thus, not surprisingly, the microcirculation is a common denominator for multiple pathological conditions including diabetic retinopathy, myocardial ischemia, and cancer metastasis. Microvascular remodeling is a complex continuum of molecular and cellular events and is a term used to describe any type of structural adaptation associated with a vascular network. This general phenomenon in adult tissues is commonly studied as one of two specific sub-processes: angiogenesis and arteriogenesis. Angiogenesis refers to the growth of new vessels from existing ones, while arteriogenesis can be defined as the maturation of these new vessels. Work over the past twenty years has focused on understanding the major genetic and molecular factors involved in these two sub-processes (Carmeliet, 2004; Jain, 2003; Skalak, 2005). Though valuable in vivo and in vitro models have identified critical mechanistic interactions, translating this knowledge to functional tissue engineering or therapeutic design will require recognizing the relationships between these processes and the growth of other network systems, including nerves and lymphatics.

A new area of microvascular research is focused on the link between angiogenesis and neurogenesis (Eichmann et al., 2005; Weinstein, 2005). Common growth inhibitors in the nervous system appear to play regulatory roles in the vascular system. An unanswered question, however, is whether the presence of one system influences the growth of the other (Stapor and Murfee, 2012). All together a coordinated link between angiogenesis and neurogenesis is just beginning to be characterized and offers an exciting new perspective on the study of adult microvascular remodeling. The importance of applying information across systems is also exemplified when we consider the lymphatic system. Over the past decade the lymphatic system has re-emerged as a critical player in cancer metastasis. The identification of molecular players involved in lymphangiogenesis has benefited from the application of what we know about how blood vessels grow (Witte et al., 2011).

Since microvascular remodeling is characterized by multiple cell types along blood vessels and across network systems, future research paradigms will undoubtedly be influenced by the willingness to consider how all these players interact in the same tissue space.



*This is an original article contributed by Dr. Walter Lee Murfee, Assistant Professor at the Department of Biomedical Engineering and Adjunct Assistant Professor in the department of Physiology at Tulane University. Dr. Murfee is also the principal investigator of the Microvascular Dynamics Lab at Tulane University. For more information on his lab and research activities please visit the official webpage at <http://www.tulane.edu/murfeelab/> (picture on the right of this article is courtesy of the Microvascular Dynamics Lab, used with permission)*

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# Resource Use and Ethics in Biomedical Engineering

## – Animal use in research

Given the ways in which we use animals for clothing, agriculture, recreation, and especially for food, it is sometimes remarkable the amount of firepower that gets devoted to the uses of animals in biomedical research. Clearly people have a visceral reaction to the idea of animals confined in the laboratory, and being poked and prodded, cut, dosed, tested, infected, injected, and ultimately sacrificed in the name of human knowledge and comfort. While people have been arguing for a long time that humans don't have the right to treat animals this way (see e.g. Jean-Jacques Rousseau and Jeremy Bentham), the issue of anti-vivisectionism was brought vividly to the attention of the public with the revelation of photographs of monkeys from Taub's behavioral research lab in Silver Spring Maryland. This event in 1981 launched PETA, and kick started an enormous and powerful movement in the United States questioning the use of animals in biomedical research.

This was just publicity though. The debate by then had advocates on both sides. Congress, aware that an important issue was stirring, had created the Animal Welfare Act to regulate among other things, the treatment of animals being used in research. In 1961, the "Animal Care Panel" at the NIH to go work on establishing hard guidelines for animals in research, culminating in 1963 with the publication of the *NIH Guide for the Care and Use of Laboratory Animals*. In 1971 NIH established rules for compliance, which included institutional committees overseeing the use of animals in research. In 1986, this was codified with the creation of *Institutional Animal Care and Use Committees* in each institution receiving federal funds to oversee the use of animals in research.



All this effort at oversight, however, hasn't dampened the zeal of groups who wish to abolish animal research, nor this lingering discomfort amongst the public with animal research. Research institutions have taken various approaches to dealing with the issue, from hiding their animal researchers in difficult-to-locate basements, to inviting the public in to see their programs. It is not our purpose here to argue one side or the other of this debate, nor to reach any strong conclusions. Rather, our goal is to bring up some issues that researchers deal with routinely to stimulate serious thought about how animals are used in research, what we gain from it, and how we might evaluate the relationship between the cost and the payback.

### **Reduction, Refinement, Replacement**

The "Three Rs of Biomedical Research" were articulated in 1959 by Russell and Burch, and have become the cornerstone of discussion about the use of animals in biomedical research. IACUCs now generally demand a direct expression of how researchers are contributing to the 3Rs in their approach to research. Here we will start by examining those three Rs.

**Reduction.** Through careful experimental design, it seems evident that a prudent scientist could reduce the number of animals required to carry out a particular experiment. This of course comes with a trade-off: in any experiment, smaller numbers means increased uncertainty. When does that uncertainty become too large to render the experiment useless? If there is a clear boundary, then operating with numbers below that boundary would mean that the animals used in the experiment were subjected to an experimental paradigm with no chance of producing usable results? Making this determination means that investigators are increasingly called upon to carry out *a priori* power analyses of their work. These are difficult analyses in which researchers make assumptions about the outcomes of their research, and then do statistical calculations based on those assumptions. In other words, researchers are asked to extrapolate based on very limited information.

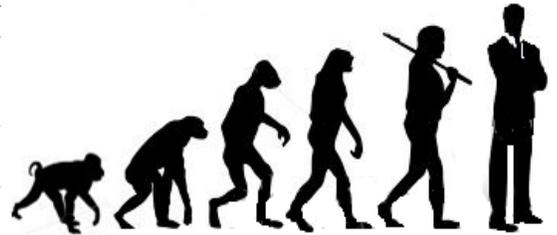
**Refinement.** Many of the procedures we use as animal researchers can be improved to produce more high quality data per suffering caused to animals. A favorite example on both sides of the debate is the **Draize** test. This test, devised in the 40s, involved dripping a substance into the eye of a rabbit, leaving it there for some period, and then looking for changes in the eye resulting from the exposure. This was a preferred photo-op for antivivisectionists: rabbits evidently suffering with ulcerated or cloudy eyes. This is also a poster-child amongst researchers, because more reliable batteries of tests have been devised in the meantime, by scientists (naturally), and the **Draize** test is no longer used routinely to test substances. This is a good instinct in any case, to improve experimental measures to get the most out of an experiment. In addition to acquiring more effective data, we also focus on improving our

experiments in ways that primarily reduce the distress and pain inflicted upon our research subjects.

**Replacement.** To the extent possible, we are urged to replace experiments on animals with experiments that take other forms, such as tissue culture or computer simulation. The handling of this imperative however, raises serious questions with how we make decisions regarding the use of animals. Researchers now are routinely required to participate in training programs to ensure that they are familiar with the requirements of compliance. Here is a statement on *Replacement* from one such program, the Laboratory Animal Training Association module on the use of animals:

*“Replacement of live vertebrate animals with those lower on the evolutionary scale or the employment of non-animal techniques is encouraged. Those who oppose animal research in any form are convinced that the use of animals is not essential and that tissue culture, computer simulation and various other methods can replace animals entirely. Although complete replacement of live animals will not be possible for many research disciplines, alternative methods have already replaced animals in many laboratories. Tissue culture, for example, has replaced animals in the isolation and propagation of many viruses. Computer simulation using previously obtained data from animal studies is now used in highly sophisticated cardiac function modeling investigations.”*

This statement is dubious, at best. Let us begin with the very first sentence: “those lower on the evolutionary scale.” This phrase reveals a serious lack of sophistication in biology. It implies that some animals (e.g. humans, chimps) are far more evolved than others (e.g. monkeys, cockroaches, slime molds). This of course is not true. Life appears to have started on Earth somewhere on the order of 3.5 billion years ago. Every extant species can be said to have been evolving under various pressures for that entire duration. Cockroaches are every bit as evolved as monkeys or humans.



There is an intuition here about what matters, which is a large nervous system and consciousness. Jeremy Bentham famously wrote “The question is not, Can they reason? nor, Can they talk? but, Can they suffer?” This nicely captures the intuition many share about how we treat animals, except that people often assume that if an animal has a nervous system like ours, it must suffer in the same way we do. This is an assumption that recent evidence is increasingly suggesting can be addressed empirically (see <http://darwinianconservatism.blogspot.com/2011/06/bud-craig-on-interoception-and.html>). From this perspective our question should be indeed to ask the ways in which we can measure an animal’s suffering.

This raises another very real question: *“what are we protecting with our rules and laws?”* Are we truly addressing the needs of the animals which serve as our research subjects, or are we providing a salve by which we can argue that we are working to protect the animals so that the concerned public leaves us be? Most of us depend on public financing for our research, and should be answerable to the public for the work that we do. Perhaps it’s best to paint our work with a broad brush, utter some platitudes about how we are helping humanity, and then urge the public to trust us and let us get on about our business.

Perhaps we could do better to be honest about what we are doing and our motivations. Many of us want to help humanity with real medical advances and biotechnology. Some others of us want to make products and hit it big. Others just want to advance our understanding of biology. Is one motivation somehow better or more acceptable than others? How do we weigh our motivations against public opinion and the cost to our animal subjects? Are there weightings we can put on each of these items, or are some so intangible that it’s almost fruitless to try?

And most importantly, who makes these decisions? Traditionally it has been scientists and engineers in concert with funders. Should the public have a larger say? Which public? Do we let anti-vivisectionists participate in this conversation? If not, why not? Most of this has advanced in a nearly Darwinian mode. Humans gain so much from science and engineering that we scientists and engineers are given wide latitude in our experiments. Surely if some of us went to the pet store, bought an animal, took it home, and did some of the things we do in the lab, we’d be in trouble. Why are we free to experiment upon vertebrates?

We are experimenters. Clearly we feel this is justified, but we ought not pretend that we are serving the best interests of the animals (“our animals live longer in the lab than they would in the wild!”), or that the world will come to an end if our experiments are not allowed to proceed (“my experiment is **NECESSARY** to humanity”). Let us instead be serious and nuanced in how we think about the animals which we use in the laboratory.

*This article is the second in a series of articles on the topic of resource use and ethics in the field of biomedical engineering. The authors will also post discussion topics in on the AEMB blog. They look forward to feedback from their thoughtful audience. The article was created by Stephanie Naufel, a graduate student at Northwestern University and current National Student Vice President of AEMB, Jerry Collins, professor at Alabama A&M, AEMB advisory board member and director of the BMES Ethics committee and Steve Helms Tillery, a professor in the department of biological and health systems engineering at Arizona State University.*

# AWARDS

Do you know of an Alpha Eta Mu Beta event that caught your attention or made an impact on your campus? Is there a committee member who has truly impressed you by their involvement in your chapter? It is time to complete the Alpha Eta Mu Beta awards. The following are the award and their details :

## MOST IMPROVED CHAPTER

This award is given to the chapter that has shown the most improvement in terms of membership, activities, funds and involvement on campus. An official report of the past and present is needed from the officers regarding the above mentioned activities, current status of the chapter and future plans. This report must also be signed by the chapter advisor.

## MOST ACTIVE CHAPTER

This award is given to the chapter that has shown remarkable involvement in the department, on campus and within the community. An official report of all activities to be considered for this award is required from the officers and this report must also be signed by the chapter advisor.

## OUTSTANDING CHAPTER OFFICER

This award recognizes a chapter officer who has given his/her utmost dedication and support toward advancing the goals and status of the chapter while maintaining strong leadership, academics and character. A formal letter for nomination shall be written by the chapter advisor highlighting the above mentioned traits and contributions of the respective chapter officer.

## OUTSTANDING CHAPTER ADVISOR

This award recognizes a chapter advisor who has strived to be a strong mentor, given his/her utmost dedication and support while advancing the goals and status of the chapter and being instrumental growing and developing the chapter and its members. A formal letter for nomination should be written by the chapter president highlighting the above mentioned requirements and subsequently signed by all the chapter officers.

## OUTSTANDING CHAPTER MEMBER

This award recognizes an AEMB chapter member who has had good involvement in chapter activities and events, and has served as a positive role model within the chapter and the department. A formal letter for nomination shall be written by the chapter president that highlights the above mentioned traits and the letter is subsequently signed by the chapter advisor.

## OUTSTANDING CHAPTER ACTIVITY

This award recognizes an AEMB chapter that has presented a creative activity that maximizes the development and growth of its members. A formal letter for nomination shall be written by the chapter officers reporting on the activity, it's objectives, outcomes and participation and subsequently signed by the chapter advisor.

## BEST WEBSITE

This award recognizes an AEMB chapter that has the most informative and updated website that balances utility and appearance. A formal letter for nomination shall be written by the chapter president highlighting the above mentioned traits. The letter should be signed by all officers and the chapter advisor.

## BEST COMMUNITY SERVICE EVENT

This award recognizes an AEMB chapter that has been actively involved in their department, school or community through a significant event that brings about positive change and contribution to their community. A formal letter for nomination shall be written by the chapter president reporting on the activity, it's objectives, outcomes and participation. The letter is to be signed by all the officers and the chapter advisor.

## PLEASE DO NOT DELAY !

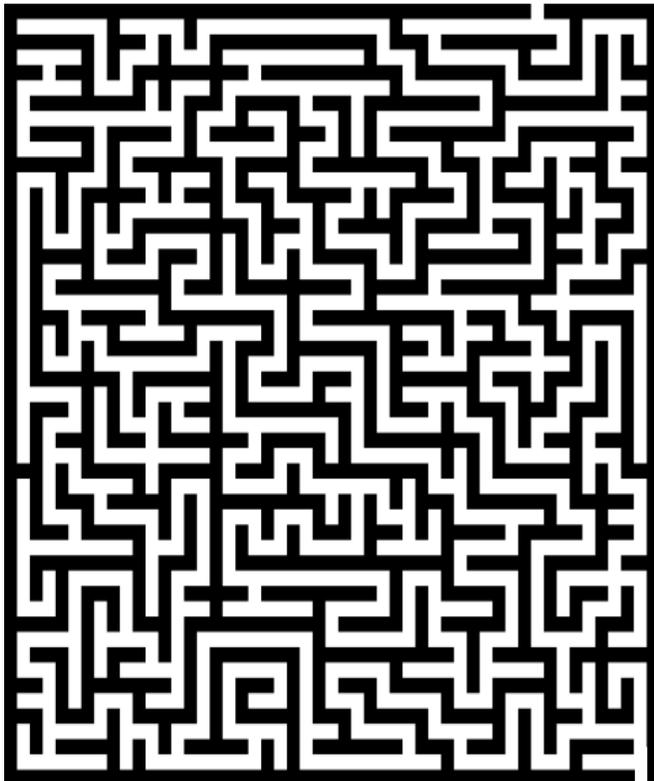
Please send in all documents no later than September the 25<sup>th</sup>, 2009 to the National Student Secretary, Ms. Stefanie Gonzalez via email at gonzalez.stefanie@gmail.com. If you have any questions or concerns, please do not hesitate to contact Ms. Stefanie Gonzalez. Awards and new charters will be presented at the National AEMB Banquet during the fall in conjunction with the BMES conference in Atlanta GA.

# Just for Fun

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Puzzle by websudoku.com

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START



*Would you like to contribute an article to any of our sections?*

Please feel free to contact the Editor-in-Chief  
Dr. Dominic E. Nathan via email

[dominic.nathan@mu.edu](mailto:dominic.nathan@mu.edu)

We are always looking for articles for each of the focus columns and also the main content.



**Do you have a question or concern about AEMB?**

Please feel free to contact the National Executive Director, Dr. Marcia A. Pool via email

[mpool@purdue.edu](mailto:mpool@purdue.edu)

Our response is a promise.

**REMEMBER  
TO  
CHECK THE  
WEBSITE !**

Please remember to check the national website

[www.alphaetamubeta.org](http://www.alphaetamubeta.org)

for important information relating to award applications, upcoming AEMB Events and other important topics.