Letter from the AMEP coordinator

Dear AMEP Alumni, Students and Friends,

I am pleased to give you the first edition of the AMEP newsletter. Despite AMEP being a small and established degree program, it is a program that is still unique at American universities and that, I think, has given its graduates an invaluable set of skills. A great program attracts great students, and I simply love advising the students in this program. They are smart, self-motivated and interesting. I am sure that the impact of AMEP is not commensurate with its size.

The idea for this newsletter came a few years ago when I met Dan Koellen (AMEP ‘79 – see the story on him inside) who came to Madison, and told us that he wanted to “give back to AMEP”. After a few discussions, the greatest needs on AMEP were identified as 1. Building cohesion amongst the students who are scattered across campus and often did not know each other, and 2. Attempting to create a funded position of AMEP director that could steer and develop the program. (Currently, the AMEP coordinator runs the program simply as an additional departmental duty.) To seed these ideas, Dan endowed the “AMEP Leadership Prize” (see story inside) and began a “flexible fund” for which we gratefully accept additional donations. With these funds we have started many initiatives, the main ones are
a once-a-semester “AMEP get-together” (usually tacos are served – and this is clearly the highlight for students!), an AMEP student advisor at the summer SOAR program for incoming freshmen, and the leadership Prize. Now, with this newsletter, we would like to include the alumni back into the AMEP community.

In this newsletter you will find a brief history of the program and then a profile of some AMEP advisors, current students and alumni. My hope is that you will enjoy finding out what is going on in Madison and with your classmates these days! I would also like to solicit any information that you would like to bring to future issues of the newsletter – perhaps you have an AMEP reminiscence you would like to share or would like to hire one of our superb graduates! You can send me email at milewski@math.wisc.edu. If you would like to know what I do when I am not taking care of AMEP business, see my web site: www.math.wisc.edu/~milewski

I would like to thank Dan Koellen for all his support to the program and Li Jiang who wrote most of this newsletter and put it together. Lastly, to compete with Cary Forest I have to tell you my favorite equation(s): the Euler equations of fluid mechanics!

Paul Milewski,
AMEP coordinator and Professor of Mathematics

History of AMEP

When asked about his view of the AMEP major, Professor Wayne Dickey, the prior AMEP coordinator said, “It’s a very rare program. It’s a good program, very hard.” Such is the general consensus of everyone who has been involved with this small but robust program.

The AMEP major has a total of only thirty to forty undergraduate students, and that’s including everyone from freshmen to seniors. That number was at a historical maximum of about seventy during the Space Race of the early 1960s. However, just because the program is one of the smallest on campus doesn’t mean that it’s a young one. Professor Dickey and Professor Howard Connor were able to shed some light on the history of AMEP program.

Professor Connor was the coordinator of the program from 1963 to 1966 and then from 1968 to the early 90’s. He had actually graduated from Madison with a degree in what was then called ‘Applied Mathematics and Mechanics’ (AM&M) in 1956 before going on to M.I.T. Similar to
the current AMEP major, AM&M run by the Math Department. The name changed in the late ‘50s to ‘Applied Mathematics and Physics’ (AMP). Professor Connor explains that “The requirement of engineering courses was instituted in the 1960s and we started to work on changing the name to Applied Mathematics, Engineering and Physics (AMEP). Professor Dickey came to the University of Wisconsin – Madison in 1967. He was the AMEP coordinator in the mid-90s. While other universities may have an Applied Mathematics major, it is hard to find one with such a broad focus.

Professor Dickey explains that AMEP is a “general science program” made for those who are “not so anxious to specialize.” He says that it was never intended to be a large program, but something for those few students who do not want to focus on a specific subject or may not know what they want to concentrate on. It gives students a superb foundation in the Physical Sciences. Professor Dickey admits that this major does have its drawbacks. The scarcity of the students, combined with the vast branching of the major itself, make it so that the students often do not know each other. Professor Paul Milewski, the current coordinator of the program, has helped remedy this problem by holding his delicious “taco parties” where AMEP students are able to meet each other and, perhaps more importantly, get free food.

The program offers an enormous amount of versatility and reach. Not surprisingly, most graduates of the major have gone on into fields of mathematics, physics, and engineering. Along with these, though, there have been students who have gone into teaching, scientific administration, and patent law. While the major is an ideal preparation for graduate school, there have been a good number students throughout the years who have gone straight into industry after receiving their bachelor’s. Professor Dickey states “the beauty of this program is breadth.” As anyone can see from the numerous alumni who have become successful in all varieties of disciplines, AMEP is indeed a program that strongly prepares its students for a diverse range of subjects.

The program itself has evolved gradually over the last forty years. It is somewhat surprising that despite the fast advances in science, the solid and broad foundation provided by AMEP is still relevant, competitive and even innovative! The most recent addition to the program is the integration of a computational and numerical analysis requirement, providing skills that are fundamental for today’s scientists.
Faculty Profile

Professor Cary Forest is the current Physics advisor of the AMEP program. He received an AMEP degree from Madison and went on to Princeton University for his Ph.D. Professor Forest came to the University of Wisconsin – Madison in 1997 as an assistant professor and also became an AMEP advisor that year. His undergraduate Engineering focus was in Engineering Physics, with an emphasis in plasma. Before beginning his undergraduate studies, Professor Forest was already set on going to graduate school. Therefore, he chose a major that was well suited for such a task. To him, the AMEP program looked challenging and “gnarly.” He very much liked the flexibility that the major offered. Unlike many other majors, where classes for all four years have been prepared for the student, AMEP lets the student choose what Engineering classes they would like to take and some of the higher math courses as well. Professor Forest stated that he was not distracted by any of the Humanities requirements, and he could really focus on the classes that highly interested him.

He became an advisor to the AMEP program because he believes that it’s a terrific program. Other than great flexibility, Professor Forest says that it offers “the world’s best Physics degree, and the world’s best Math degree.” Along with great exposure to the Engineering field, AMEP becomes the “ultimate preparation for graduate school.” If this wasn’t reason enough to get involved, Professor Forest also likes the connection that AMEP offers between the Physics and Math departments. By being an AMEP advisor, Professor Forest has gotten to know some of the faculty there.

During Professor Forest’s stay at the university, the biggest change that he has seen in the Physics part of AMEP is the incorporation of a 247-248-249 sequence. This sequence of introductory classes offers “a smaller class size and a more intimate relationship” between the students and teachers. Though the series is not mandatory, Professor Forest believes that it offers a “much smoother
road” for those in AMEP. Unfortunately, many prospective AMEP students have so far not been given this information at orientation and miss out on the opportunity.

Professor Forest’s research involves the Dynamo Problem, which is the understanding of how planets and stars generate their own magnetic fields and how plasmas act in a manner that leads to self-generation of magnetic fields. A more detailed description is available on Professor Forest’s website: http://home.physics.wisc.edu/~cbforest/

Professor Forest explains that he wishes he could do more for students in AMEP. However, from his experience, the majority of the AMEP students already possesses a degree of independence, and don’t usually require his advice. One major advice that he would give everyone pursuing the degree is to take advantage of the research opportunities offered on campus. He states that research experience should contribute “a third or more of your overall education.” As a student who went on to the Princeton Program in Plasma Physics, which is regarded as one of the top plasma programs in the United States, Professor Forest is confident that the AMEP program “prepares you for operating at the highest level.”

On a side note, for those of our readers who have always wanted to know what equation a professor would want tattooed on his body, this is your lucky day. For Professor Forest, it comes down to the “always cool” Einstein’s equations of general relativity or something closer to his field of study: the Fokker-Planck equation.

Current Student Profiles

Doug Lipinski is a senior in the AMEP program and the recipient of the annual AMEP Leadership Prize in 2006, which is awarded to “outstanding student(s) pursuing a degree in AMEP with demonstrated leadership and a solid academic record.”

Doug started out as an Engineering Mechanics major, but he found that the classes were not as theoretical as he would have liked. Since he did not enjoy the applied aspect of the program, Doug began taking Physics classes and found those to be more interesting. Then, in the fall semester of his sophomore year, Doug switched to an AMEP major with an engineering focus still in Engineering Mechanics.

Doug has been involved with several research experiences and internships. During the summer of his freshmen year, Doug had an engineering internship with IBCC Industries, Inc. in
Milwaukee. His job was to assemble and disassemble “some big piece of machinery” for a training video. Since a lot of the machinery is imported, a training video explains the anatomy of the machinery very clearly. After doing the internship, Doug realized that he did not want to continue work in this field, and that was a big part of why he switched majors the next year. Since the summer of his sophomore year, Doug has done research with Professor Paul Milewski modeling biological nano-particles that attach to receptors on a surface, such as the surface of a cell. In his sophomore and junior years, Doug was also a part of a team that competed at NASA’s Reduced Gravity Student Flight Opportunities Program. The program allows undergraduates to propose an experiment to be flown on NASA’s zero-G airplane, better known to some as “the vomit comet.” For his sophomore experiment, Doug studied the Richtmeyer-Meshkov instability on board the aircraft (this is the instability of a rapidly accelerated fluid interface). Doug led his team in his junior year, studying capillary action in microgravity.

After graduating this spring, Doug will most likely continue his studies at the University of Colorado at Boulder. His current plan is to get his Ph.D. and remain in research thereafter. Before all that, though, Doug will be helping out at orientation this summer to get the word out to students about AMEP and to get prospective AMEP students to choose the appropriate classes.

Doug’s advice for incoming students is not to be shy about taking interesting classes. He believes that if one is considering a class, then he should go ahead and take it because it’s the best way to get a feel of the subject. He says that students who are open to several paths will enjoy the AMEP program because of its range of options and flexibility. However, he also warns that because a lot of the work is left for the students themselves, they have to be able to manage themselves or they will fall behind.

**Brianna Cash** is a senior, one of the few female AMEP students on campus, and a world class Ironman athlete. She came to Madison as a student majoring in Mathematics with an interest in
Pre-med. Other than Pre-med, it was quite apparent that Brianna is interested in many other subjects. She saw AMEP as a way to explore a lot of different fields and switched to AMEP during the second semester of her freshmen year. Her engineering focus is Civil Engineering, but she has become more interested in other areas: in hindsight, if she were to start over, Brianna would pursue industrial or biomedical engineering.

Brianna’s research experience includes an internship with SCHARP, the Statistical Center for HIV/AIDS Research and Prevention in Seattle. There, she conducted some mathematical modeling of the spread of HIV. The work she did there was an “eye-opening experience” for her, and she has decided to pursue mathematical modeling in the public health field. During the summer of 2006, Brianna also did consulting work for the Albanian health ministry.

Along with research experiences, Brianna has also studied abroad in Turkey’s Middle East Technical University in spring of 2006. At the university, she took classes on Thermal Physics and Engineering. Taking classes there allowed her to experience a different method of teaching. Brianna explained that in Turkey the classes were very intense and the professors are not prone to give out high scores. In her Physics class, no one received an A.

After graduating, Brianna will be working at the National Institute of Health, doing mathematical statistics. She also plans on going on to graduate school at the University of Maryland to work on her Ph.D. in mathematics and M.S. in public health.

Her advice to current AMEP students is to play around with different engineering classes. Looking back, Brianna wishes that she knew more about all the subcategories of each primary engineering focus so she could have concentrated more on her interests.

Lastly, when asked who she thought was hotter between Einstein and Newton, Brianna whole-heartedly chose Einstein. What does Einstein have that Newton doesn’t? Brianna says, “I dig the crazy hair.” And it was all natural, too. You can’t beat that.
The AMEP Leadership Prize

“The leadership prize is an annual cash award given to an AMEP student for supporting and promoting AMEP as a major and for academic excellence. This award is for a student who has helped support AMEP through mentoring underclassmen, recruiting prospective students, enhancing the synergy of the three areas of study that make up AMEP, or augmenting the program in other ways. This award is for the student who focuses on more than GPA or their ability to secure a graduate position but also how they can give back to the program that provided their education. This type of leadership will contribute to their future success.” (Dan Koellen AMEP ‘79)

Awardees

2003 – Kyle Mandli (AMEP ’04)

2004 – Lyuba Chumakova (AMEP ’04), Jeremy Hanson (AMEP ’04) and Andrew Huening (AMEP ‘05)

2005 – Jeffrey Noel (AMEP ’05) and Christopher Yu (AMEP ’06)

2006 – Doug Lipinski

2007 – Li Jiang and Zac Labby
Kyle Mandli graduated from the University of Wisconsin – Madison in 2004 and was the recipient of the first AMEP Leadership prize in 2003. He grew up in the Madison area and started out pursuing Engineering Mechanics at the university. However, he soon realized that AMEP suited him better, and changed to the major while maintaining his Engineering focus in Engineering Mechanics. During his undergraduate studies, Kyle was also involved with the AMANDA/Ice Cube project on campus (a project responsible for building neutrino detectors in Antarctica). Currently, Kyle is pursuing his Ph.D. in Applied Mathematics at the University of Washington, studying numerical methods for hyperbolic conservation laws. He is also working with volcanologists from the Cascade Volcano Observatory “to create a better computational model to predict pyroclastic flows and surges from volcanoes around the world using Mt. St. Helens as a testing ground.”

At the beginning of his undergraduate education, Kyle felt “too confined” by the Engineering curriculum. AMEP seemed perfect for him because he wanted to find “a program that would allow [him] to construct [his] own course work to what [he] wanted to do and emphasized the Mathematics and Physics courses.” Kyle believes that the level of education that he received has placed him “well ahead of [his] peers” because he had already been exposed to some of the material. The work that he is currently involved in requires a strong background in both physics and engineering, and his previous contact with that material has been “indispensable.”
Concerning his switch to the AMEP program, Kyle says:

“Looking back on that decision I would say that choice was probably the best because of my interest in fluid dynamics and material mechanics. Applied Mathematics has a long history in theoretical mechanics so it naturally supplements the subject…In terms of pursuing applied mathematics, I feel that the best avenue for Engineering specialty is Engineering Mechanics.”

Kyle still keeps in touch with his friends and professors in the Mathematics and Physics departments at the University.

Mr. Dan Koellen has been essential in supporting the AMEP program, setting up both the AMEP Leadership prize and the AMEP Support Fund. Here is what Mr. Koellen has to say about the Support Fund:

“The AMEP Support Fund was established as a pass through fund for the program to use at its discretion. It can be used to subsidize a student’s research, sponsor speakers or advisors, recruit new students to AMEP, and generally to bolster the advancement of the program. Since the fund was set up so that it could accept donations from any alumni or other supporters we hope to increase its size. Eventually we would like to fund a part time director position to provide guidance and leadership for the program. This is an essential step for the program to grow in effectiveness and visibility, enhance the collaboration between the component programs, and continue the program’s growth.” This is particularly important since currently the AMEP “coordinator” is a pro-bono position.

Mr. Koellen graduated with a BS in AMEP in 1979 with an engineering emphasis in Electrical Engineering specializing in integrated circuit development. After graduation, he obtained a position in the semiconductor industry at the leading supplier of Dynamic Random Access Memory (DRAMs). During the same time, he studied at the Southern Methodist University, earning his MS in Applied Science and Engineering, majoring in electronic materials and Statistics. Following this, Mr. Koellen continued his career in the semiconductor industry at a start-up company in Sacramento that eventually grew into a 1000 person, $300 million revenue company. Later, he stepped away from industry and started working with “fledging start-up companies through mentoring and investment.” In addition, Mr. Koellen has become active in his region’s development and nurturing of emerging growth technology companies by chairing two non-profit groups involved in the effort. Furthermore, he is involved in a clean energy initiative for the Sacramento region.

Mr. Koellen states that deciding to become an AMEP major was very easy for him because it “combined [his] enthusiasm for Math and Physics and [his] hobby of building electronic and
ham radio equipment.” He found his passion in the seventh grade when he read a book about the new concept of integrated circuits and decided to build his career around this. Mr. Koellen reasoned that “a solid Math and Physics foundation would be essential for success in that industry.” Regarding his career, he says that “this unique combination enabled [him] to participate in an industry that was taking technology developed in a research and development environment directly into production; basically bridging the gap between scientific discovery to a well engineered technology that delivered commercially viable products.”

Mr. Koellen believes that the AMEP program has prepared him for industry better than any other major, as he often meets engineers who wish that they had a greater proficiency in Math and/or Physics. For Mr. Koellen, “much of the work [he] did was science based and had to be translated to guidance for the engineers who were designing products or sustaining the manufacturing process.” Mr. Koellen explains this further with an example:

“An example of this was work I did in surface analysis of electronic materials. The results of the analyses typically involved the basic chemistry or physics of materials. From these findings, I would have to determine how a process or an event affected the material and its likely influence on performance, yield, reliability, or suitability. Often one would have to transform these findings into design rules or changes to the manufacturing process. Without my background in Physics, Math and Engineering, I would not have been as successful. I often found myself in projects that were applying exciting new technologies or working on problems that others were not able to solve. I was asked to work on these very interesting and challenging projects because of my multi-faceted background and experience.”

From his experiences with the job market, Mr. Koellen believes that people must continue to educate the market about AMEP because industries can be very focused on specialized talent. However, he has also found that many companies realize that a well rounded base of Science, Math, and Engineering is extremely valuable. Though the graduates of the program possess a unique set of talents, Mr. Koellen advises that “ultimately the applicant needs to market their unique skill set to their future employer.

Mr. Koellen recognizes that the AMEP program, while providing students with a diverse background in physics, math, and engineering, doesn’t leave much room for other course work. In spite of this, he says that “it is beneficial to diversify beyond these offerings; especially with business, economic, or communication courses…these skills will help you compete for grants or business, track budgets for research projects or departments, and express your finding or thought effectively.”
Contact Information

For any information regarding the AMEP program, please contact the AMEP coordinator:

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The AMEP website is www.math.wisc.edu/~amep

Giving to the AMEP Program

If you would like to make a gift to support the AMEP program at the UW-Madison, please consider giving to Fund number 12553426, The Applied Math, Engineering and Physics (AMEP) Support Fund.

Gifts to this Fund support AMEP, a unique interdisciplinary program. The Fund will support activities designed to improve AMEP's ability to mentor students successfully, to foster a sense of community among students and faculty, and to enhance the visibility of AMEP on campus and to prospective students, corporate recruiters and graduate schools.

You may make your gift online at http://www.math.wisc.edu, clicking on “Giving to Mathematics”, and choosing the AMEP Support Fund. Or, you may send your gift to:

University of Wisconsin Foundation
US Bank Lockbox
PO Box 78807
Milwaukee, WI 53278-0807

Mark AMEP and the fund number 12553426 in the memo line of your check.

If you wish to speak with someone about your gift or other giving options, please feel free to contact our representative at the UW Foundation:

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