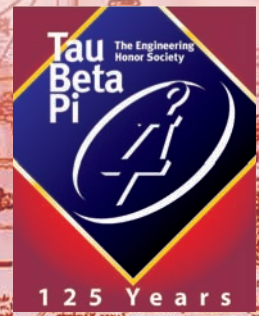


THE BENT

OF TAU BETA PI

The Engineering Honor Society

SUMMER 2010



Lasers at 50
Fellows and Scholars
Engineers and Scientists

Williams Memorial Dedication, October 11, 1930

Pennsylvania Alpha Welcomes

2010

TAU BETA PI CONVENTION

COME HOME, TAU BATES! VALLEY FORGE WILL be the site of the 105th annual Tau Beta Pi Convention on October 7-9, 2010. The Pennsylvania Alpha Chapter, celebrating its Quasiquintennial, is proud host to attendees arriving from as far away as Alaska. The chapter previously hosted major celebration Conventions in 1910, 1930, 1960, and 1985 as the Association returns to its roots every 25 years.

Those who arrive at the Philadelphia Airport will be greeted by representatives of the host chapter. Transportation will be provided for a 30-minute drive to the Radisson Valley Forge, where all conventioners will stay, and events, including business meetings, Engineering Futures and ICE sessions, installation of the 2010-14 Executive Council, and informative seminars, will be held.

Representatives from many graduate schools of engineering and companies will be available at a Recruiting Fair in the hotel from 9 a.m. to 3 p.m. on Thursday, October 7. Be sure to bring copies of your résumé and your chapter's résumé book! Visit just for the fair.

Special guest speakers and presentations are planned for this celebratory Convention. Dr. Lyle D. Feisel of 'Lyles Law' fame kicks things off at dinner on Thursday. Dr. Terry J. Hart will review the history and future of space flight at dinner the next evening, followed by Bill Landry's performance of his one-man show "Einstein, the Man." Dr. Alton D. Romig Jr., manager of Sandia National Laboratories, will speak at the closing banquet on Saturday.

On Saturday, Pennsylvania Alpha will showcase the Lehigh University campus in Bethlehem, an hour's drive from the hotel. The model initiation will be held in Packard Hall, after which students will lead tours through engineering departments. The Bent monument, dedicated in 1960

in front of Williams Hall—named for Founder Williams—will be moved to a highly visible location in front of Packard Hall and re-dedicated that afternoon.

Expenses of one student delegate per chapter and a few selected alternate delegates—and the on-site expenses of chapter advisors—will be paid by the Association. Other non-voting delegates and all alumni are welcome, encouraged, and invited to attend at their own expense.

Information is available at www.tbp.org, and you may register online at www.tbp.org/tbpconv. You may contact Headquarters by email at convention@tbp.org. Phone: 865/546-4578 or Fax: 865/546-4579.

Tau Beta Pi's 2010 Convention promises to be an opportunity to learn more about Tau Beta Pi and the wonderful people who make it great. Pennsylvania Alpha members feel a well-deserved honor in hosting the event, and will be ready and eager to make your stay memorable! We invite you to enjoy the campus, develop new friendships for life, and experience this historical environment.



Alumni Memorial Building, Lehigh University.

the BENT of



SUMMER 2010
Vol. CI / No. 3

*f*ounded at Lehigh University, South Bethlehem, Pennsylvania, June 15, 1885, by Edward H. Williams Jr., A.B., A.C., E.M., Sc.D., LL.D. (1849-1933). Key and name registered in U.S. Patent Office. Member, American Society for Engineering Education and (co-founder) Association of College Honor Societies. Affiliate, American Association for the Advancement of Science.

Features

Kentucky Gamma Installed.....	12
Idaho Gamma Installed.....	14
Lasers at 50.....	18
by Alan S. Brown	
Engineers and Scientists.....	22
by Dr. Henry Petroski, P.E.	
TBP Names 2010-11 Scholars.....	28
TBP Names 2010-11 Fellows.....	32

Reports

CII 2010 Convention Preview	
16 List of Chapters	
27 Executive Council Meeting	
27 Constitution Amendment Ratified	
42 Western Kentucky University	
44 Boise State University	
47 Alumnus Receptions	

ON THE COVER:
The relationship between engineers and scientists is examined by Henry Petroski. He analyzes the different ways we benefit from scientific theories and engineering realities. Alan S. Brown reviews the ways laser have changed our lives during the past 50 years.

Cover artist: Dali Polivka



Departments

2 Council's Corner	46 District Doings
4 Editorial	48 In the Colleges
6 Letters	50 Brain Ticklers
11 Who's Who	52 Lyle's Law
39 Chapter Eternal	54 Alumnus Notes
	56 Insignia



Editor: James D. Froula, P.E., TNA '67
Editorial Board: Robert F. Black; Dr. Lyle D. Feisel, P.E., IA A '61; Samuel C. Florman, P.E., NY A '44; and Dr. John W. Prados, P.E., TNA '54.
Editorial Assistant: David S. Roberts

THE BENT of Tau Beta Pi® (ISSN 0005-884X) is published quarterly for \$10 per year by The Tau Beta Pi Association, Inc., Room 508, Dougherty Hall, The University of Tennessee, Knoxville, Tennessee 37996-2215; www.tbp.org; FAX 865/546-4579; email: tbp@tbp.org. Life subscriptions are \$60. Printed in U.S.A. Periodicals postage paid at Knoxville, TN, and at additional mailing offices. SUBSCRIBERS and POSTMASTER: Send address changes and all other correspondence to tbp@tbp.org or to: THE BENT of Tau Beta Pi / P.O. Box 2697 / Knoxville, Tennessee 37901-2697. Telephone: 865/546-4578
Vol. 101 No. 3 Circulation: 87,000 Initiated Members: 515,885

Copyright © 2010 by The Tau Beta Pi Association, Incorporated, www.tbp.org. THE BENT is the official publication of The Tau Beta Pi Association, Inc., The Engineering Honor Society. Title reg. U.S. Patent and Trademark Office. All rights reserved. Ideas expressed in articles with by-lines in this magazine do not necessarily reflect the policy of the Association.

ADVERTISING REPRESENTATIVE:
UniDiversity
Telephone: 434/244-9776
Email: adv@tbp.org

Visit www.tbp.org



COUNCIL'S CORNER

The Tau Beta Pi Association was founded at Lehigh University in 1885 by Edward Higginson Williams Jr. to mark in a fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as students in engineering, or by their attainments as alumni in the field of engineering, and to foster a spirit of liberal culture in engineering colleges.
—Preamble to the Constitution

Connection and Reconnection

this fall during our national Convention, members of Tau Beta Pi will celebrate the 125th anniversary of the founding of our Association. During this event to be held in Valley Forge and at Lehigh University, student members and alumni alike will gather to celebrate the longevity of the idea started by Professor Edward Higginson Williams Jr. in 1885. As we look forward to this Convention, I encourage each of us to think back about the connections that we have made through TBPI and to think about reconnecting with the Society and those whom we have not seen in many years.

My reconnection with TBPI came about seven years after I graduated from the University of Tennessee. After completing my second degree in graduate school and starting my career, I lost my connection with TBPI. Then one night out of the blue, I received a phone call from former Tennessee Alpha Chapter President Martha Polston. Martha was then serving as national TBPI President and in that role was working on a new program called Engineering Futures (EF). She was seeking volunteers to train as facilitators who would then present material on interpersonal skills, team building, and creative thinking to engineering students at TBPI chapters around the country.

Intrigued by this idea and the possibility of reconnecting with TBPI, I joined the first group of volunteer facilitators to receive training in the Engineering Futures Program. At that time I had no idea the impact this decision would make on my life. Now some 20 years later, I remain a volunteer with TBPI as an Engineering Futures Facilitator. But, in addition I have served as chapter advisor, District Director, and am a member of the Executive Council.

As I have learned during the course of my life, you never know where a connection might lead. I never would have guessed that I would continue as a TBPI volunteer during the coming years, and I certainly could not anticipate that the Engineering Futures Program would grow to where it is today with Facilitators presenting 200 sessions to more than 2,400 students a year.

In my current role as an Executive Councillor, I am privileged to be able to visit with student members and alumni at some of the 16 District spring conferences that

are held each year. As a result of an effort started by President Larry Simonson, alumni have been invited to attend local District spring conferences for several years. When I meet alumni at these events, one remark that I hear numerous times is something along the lines of: "I was so glad to get your invitation to this conference because I haven't heard from Tau Beta Pi since I was initiated 30 or 40 years ago."

In the Spring 2010 issue of *THE BENT*, Mike Peterson, another Tau Bate who was in the first group of EF volunteer facilitators with me, wrote an article about the Engineering Futures Program. In that report, he encouraged those of you who felt you had benefited from the EF Program, either as a student or facilitator, to reconnect with TBPI by visiting our website www.tbp.org and writing a note about your experience. We hope to reconnect with some of those thousands of students and former facilitators with whom we've connected through the EF Program during the past two decades.



I will expand on Mike's request by asking that—whether or not you participated in the Engineering Futures Program—you personally act to reconnect with TBPI. There are numerous ways to do this. You can volunteer as a mentor to an engineering student through the AlumNet Program, become a chapter advisor, participate in the EF Program, join the growing MindSET Program, become active in (or start) an alumnus chapter, attend an initiation ceremony at a chapter near your home, or simply join one of the several social networking sites that thousands of Tau Bates populate like [TBPCONNECT](#), LinkedIn, or Facebook. Who knows where your reconnection might take you? My hope is that—as I meet our alumni in the future—I never hear again that they haven't heard from us in 30 or 40 years, but instead hear from reconnected members that they, like me, are still fostering new connections in TBPI.

—Norman Pih, Tennessee Alpha '82, Executive Councillor



Take on the PE.
Then take on the world.



Earn the credential that's recognized far and wide.

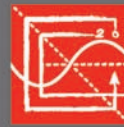
The FE/PE process prepares you to make an impact, increases your earning capacity and enhances your professional prestige.

In short, a PE is your key to more freedom and greater opportunities.

This is the time to stand out, and nothing says outstanding like Professional Engineer.

Where will your PE take you?

Find out what it takes.
www.ncees.org/licensure
800.250.3196



NCEES
advancing licensure for
engineers and surveyors



Vice President Solange Dao, front row, second left, with honorees at the California Alpha Gamma (San Francisco State University) new member celebration for Fall 2009 and Spring 2010. The chapter holds one large banquet a year to honor the initiates from both semesters.



EDITORIAL

Happy 125th Birthday, Tau Beta Pi!

On June 15, 1885, Founder Williams initiated Irving A. Heikes, *PA A 1885*, as the first member of TBPI. The Society has since developed into perhaps the finest association of interesting members of any organization on the planet. It is appropriate on this anniversary to remind ourselves of the origin and events leading to the present success. Our website (under *About TBPI*) includes the monumental *Beginnings of Tau Beta Pi* by Edwin S. Stackhouse, *PA A 1886*, and excerpts from this document—first published in the April 1941 issue of *THE BENT* and reprinted in 1952 for distribution to every new member—appear below.

[From a statement by Prof. E.H. Williams Jr., May 1923:]

“In 1885 as an attempt to secure a chapter of Phi Beta Kappa for Lehigh University was made by members of that fraternity living in the Bethlehems and elsewhere.... The petition was sent to the fraternity senate in that year, and it was to lie until the next triennial meeting.

The idea of a chapter for Lehigh was based upon an honorary reward for high scholarship, which should be open to every student in every department, and it was supposed that such would be the policy of Phi Beta Kappa. But ...[in] 1883, a chapter had been granted to Cornell University, and in the awarding of keys to students who had attained the necessary standing, there was made only a consideration of the statistics of those who had taken classical and pure scientific courses, and thus all technical students were debarred from membership.

This result was published in the daily press and excited considerable discussion, so that in the winter of 1884-85 it seemed to be definitely decided that if a chapter of this fraternity came to Lehigh it would be valueless to the great majority of the students, as at that time there were comparatively few in the university, and especially so in the courses which would lead to Phi Beta Kappa. ...

These facts so impressed the writer—who was the only one of the petitioners connected with the technical schools—that he determined to furnish the students in those schools with something of a similar nature; and as priority was a matter of importance in fraternity matters, it became necessary for an establishment and successful operation of this rival for Phi Beta Kappa, before the coming of the latter, if the petition for its establishment should be granted. This required an immediate foundation so that members of the class of 1885 could be put in charge of the work of selection of proper men from 1886. If this were done successfully it would follow, that when

Phi Beta Kappa came in the fall of 1886 and elections were made according to its laws either then or in the following summer, this new technical fraternity would have chosen men from its third class, and, thus, would have become firmly established.

It stands to reason that it is easier to secure agreement in a committee of one than in a larger number. The writer was the only member of the faculty interested in this matter, and haste was imperative, so without an idea of selfishly taking whatever honor that might accrue to the founding of such a society, he determined to go ahead alone, and at once began a consideration of the conditions and limitations necessary in granting membership. This



was imperative, as Phi Beta Kappa had been careless in the past, and all in the first third of a class could secure membership, and few cared to wear the key. Again, Phi Beta Kappa was purely a graduate society, and its elections were given only to graduating seniors. As the Lehigh petition had not been granted, there was nothing to show that the qualifications for membership had been

changed, and it was determined that the new society should be based on a different idea—an idea of life and associative work with those who were in charge of the college government.

Another idea became prominent and imperative—that there should be, if possible, a continuity in the work, so that the inevitable class antagonisms should not defeat that work because it had been carried on by a previous class, and, in its stead, a new start should be made which in its turn should be buried by the incoming class. This required that all of the eligible men in the senior class should be in full membership as soon as possible after the beginning of the senior year. And to secure continuity it required that those certainly eligible in the junior class should be admitted to membership as soon as possible after the beginning of the last term of the junior year. They thus would become acquainted with the ends in view and could make the necessary selections for the remainder of their class.

A third idea entered into the consideration, and one which has been a value in the parent chapter. Seniors are past the period when teachers are natural villains. They are also arrived at years where they can appreciate the good and bad points of college discipline and can discuss

them without bias, as those who win membership in such an organization are of necessity highly qualified to do their work well and to appreciate good work. And as time passed it would follow that members of the society would become members of the teaching force, and selective members of that force would become honorary members of the society. In these ways there would be found in the society a meeting ground where around the same table matters of interest could be discussed in a friendly and temperate manner, and constructive criticism offered by the undergraduate members of the society.

... These were the basic ideas upon which it was proposed to build the society.

The writer then drew up a Constitution and the skeleton of Bylaws, for an individual chapter and for an association of chapters, with direction for conventions and the granting of new chapters. A diploma ... was drawn up, and Edmund G. Klose of the Moravian Publication House bought for the society (then in embryo) a font of type, and the proper form was struck off.

The class records of the past were unearthed and the standing of each man calculated, and in this manner the eligibles in the alumni were found. A proper form of notification was drawn up, and the writer (as "Sec'y.") notified them of their election. All accepted, and diplomas were afterwards given to some. This was done to feel the pulse of the men and to see how they looked upon the scheme. At this time no undergraduates had been approached. But in May Mr. Heikes was asked to remain after class, and the matter was brought to a head by his acceptance of election."

[A letter from Irving A. Heikes, March 20, 1940, states:]

"In June 1885 ... at the close of a recitation with Prof. Williams, he asked me (alone) to remain for a conversation. He then proceeded to tell me how he, a member of Phi Beta Kappa, had endeavored to have that organization broaden its qualifications for membership so as to make students in Engineering and Science eligible. Although he had spent some years in this effort, he had not succeeded and felt that further effort would be futile.

He felt that the value and incentive to high attainment in scholarship and in material activity of an Honorary Fraternity for Engineering and Scientific students

(paralleling Phi Beta Kappa in the Classical field) were so considerable that he had decided to found such a society. He had conferred with some of the alumni of Lehigh (who would be eligible for membership) and had met with a favorable response. He had selected a name for the Fraternity (Tau Beta Pi) and had written a Constitution and Bylaws; he had prepared all the essentials for such an organization. Inasmuch as I was to be the valedictorian of the class ... (1885) he wanted to make me the first member. I desired a few days for reflection. At the expiration of a few days I told him that I accepted his proposal. He thereupon proceeded to the initiation ceremonies. No one else was present. He may have had (probably had) a vision of the future of the Society, but I certainly had not. Two other members of the class of 1885 (Price and Birney) ... were later initiated by Prof. Williams and me. I am not sure of the following. My impression is that since commencement week with its activities was upon us, the selection and initiation of the men from the class of 1886 was deferred until the next academic year. I went back to Lehigh for a fifth year for the degree of engineer of mines when, I think, the men of 1886 were taken in. Later in the academic year the men of the junior class 1887 were taken in."

[On March 19, 1940, Heikes wrote:]

"Professor Williams chose or selected or elected me as the "Adam" of the Association of which he was the Creator, and breathed into me the "breath of life" by giving me the grip and password."

After reflection, we realize how closely aligned the Association has remained to the original idea of Founder Williams for 125 years. The membership process with even higher standards today for seniors than the original "first quarter of the class" is followed carefully, along with a constant focus on the Eligibility Code. Continuity in governance is maintained. Every single chapter conducts an election and initiation every year. Amazing! Thanks to each of you for believing in and loyally supporting this remarkable Society, now 460,000 living members strong. Happy birthday TBPI!

J.D.F.

Send THE BENT to Me

(Detach and mail to: Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697. Allow four-to-six weeks for subscription to take effect.)

- I enclose \$60, for which I shall expect to receive THE BENT for life. I will keep you informed of any change of address.
- I enclose \$12.50 as the first payment for a BENT Life Subscription. Remind me to send \$12.50 each year for the next four years.
- I enclose \$10, which will keep me on the mailing list of THE BENT for one year. I should appreciate an expiration notice a year from now, so that I may renew without missing any issues. (Note that you may call 865/546-4578 to pay by credit card.)

Name _____ Chapter _____ Class _____

Address _____ Email _____

City _____ State _____ Zip _____



LETTERS

War and Engineering

• Dr. Delagrangé's article on "Engineering Aspects of War, Part II," in the Spring 2010 issue of THE BENT, was extremely interesting and informative. While I "sat through this movie before" as a WWII veteran, I found several items enlightening and educational. War is never a solution to the world's ills, and I guess we can find some solace in knowing that destructive devices and concepts can find their productive way into a civilized society. This perhaps may be an oxymoron of the highest order.

On page 32, under "Airplanes," Dr. Delagrangé discusses the bombing strategies of the Allies. Initially (1940-42) the British performed night raids only against the Nazis on the continent. In later years (1942-45) the U.S. bomber groups did the daytime bombing, and the British continued at night. Also, the U.S. air forces employed radar-jamming devices to offset the deadly effects of the "flak" inflicted on the planes. Long strips of aluminum material called "chaff" were thrown out of the planes. I don't know if chaff was an acronym for the material; however it was of minimal help actually but a great help psychologically for the air crews.

On page 33, under "War in the Pacific," I appreciated the full description of the acronym SCUBA as I didn't know of its origin.

I thoroughly enjoyed Dr. Delagrangé's treatise and his previous writings and look forward to Part III.

Jerome Greenstein, IL B '49
[Author's response: Good letter. The bombing strategy in WWII indeed underwent a large number of evolutions, enough to fill an article on its own. Chaff is apparently just a word meaning basically "junk." —Art Delagrangé]

• I found the article "Engineering Aspects of War" to be most interesting. When will the next part be available?

Dr. Edward C. Roche Jr., P.E., NJ A '54

• I enjoyed Dr. A.D. Delagrangé's article and give thanks that I was on active duty in the U.S. Army Artillery during 1955-59, when we were not in a shooting war. The first Iraq war in 1993 alerted me to the peril I luckily avoided, as air defense artillery is the first target of the enemy air force! As we had analog computers from the early 1950s to point our guns then later guide our missiles, I didn't realize until 1959 that a digital computer could be useful. I'm a peaceful guy, so when I need to establish rapport with a gun nut, I bring up the subject of obturation, which I had to teach as part of my ballistics training duties. Although its vague definition is in my unabridged dictionary, I've never met anyone who knew what it is.

Franklin S. Sax, MO Γ '55

Climate Model Discussion

• I thought you put together a very interesting group of letters. I was one of the scientists who got into TBPI a long time ago even though I wasn't an engineer. I enjoy reading THE BENT.

The letters published in the Spring 2010 issue appear to express some conflicting technical ideas. For example, T.G. Van Camp says that we are wasting time unless we focus research on the Little Ice Age, whereas F.D. Smith suggests that modeling should attempt to correlate major climatic changes with planetary positions over at least one axial precession interval, which apparently lasts 19,000 to 23,000 years. P.R. Latour talks about an analysis of data over the last 400,000 years, whereas C.F. Austin says that scientists should look at long-term temperatures for the last 3,000,000 years. However, J.O. Ogletree says that scientifically precise global temperatures have been recorded only in the last two centuries. Are global temperatures for the last 20,000, 400,000, or 3,000,000 years meaningful and relevant?

P.R. Latour says that carbon dioxide does not affect atmospheric temperature, but J.M. Kallis says that greenhouse gases increase earth's temperature.

Are all of these members of TBPI correct regarding the application of basic concepts to climate models? Interestingly, R.N. Thoney says "Earth does not have a meaningful temperature in science. The concept of a 'global temperature' has no meaning." If the concept of a global temperature is meaningless, are all of the other statements mentioned above invalid?

Charles E. Stephan, OH A '61

• It was with personal enjoyment that I read the letters by Pierre R. Latour and Roger N. Thoney in the Spring issue of THE BENT. Although I am anything but an expert in the area of global warming, as a TBPI member and a scientist I really enjoyed two experts explaining that global warming is a highly complex technical issue that has not even begun to be understood by true thermodynamicists, and much much less so by the politicians that claim it is or isn't a problem to be dealt with. With the United States and the world in the middle of the mess created by those creatures that claim they know what they're doing but most certainly either do not know or do not care about our planet, the use of language insulting to all intelligent people is such a waste of potentially useful energy. Stay with it, members of TBPI, and teach those who really do not know that science and not politics is the only hope left for our planet.

And one word to Editor Froula, you are so wrong that "successes... are achieved through group effort." TBPI, like our civilization, is comprised of individuals who accomplish what group effort never could. It is the individual who has made science the only successful entity in our civilization, and the groups that continually try to control those individuals are responsible for the resultant



Next Challenge? The PE. We've got your edge.

For over 40 years, our engineers have created the FE and PE exams.

These are the same people who produce NCEES study materials.

As a result, you can practice with actual questions from past exams. Get a real feel for exam day. And know just how ready you are.

We do the exams. You do the math.
Study with NCEES.

www.ncees.org/exams/study_materials
800.250.3196



NCEES
advancing licensure for
engineers and surveyors

failures. Please ponder the explosion in space that destroyed the lives of seven astronauts because the group made the wrong decision—just one of many examples of group failure.

Lawrence Fischer, P.E., NY 1 '55

- Alan Brown's article and these letters are much more grounded in reality than most of the debate on climate change. I'm very thankful that TBPI has entered the fray, and done it in a fair and objective way. This debate will go on for a long, long time. The letters regarding the article on climate models are very well done, and I would like to email them to several colleagues, along with his article. Thanks for sending them.

Howard W. Wahl, P.E., WA A '56

- I want to congratulate Mr. Brown on the well-written article on climate, beliefs, and the issues with modeling. Although I belong to the camp that believes we are causing some if not all of the change, I am suspicious that we can really affect any changes through the political process, and I am not convinced that the change is going to be as cata-

strophic as portrayed by the press. Good article.

David C. Ramsower, P.E., AZ A '69

- Thank you (A. Brown) for the article on "Climate Models and Their Critics." I value your thinking and writing skills. I received the Spring issue of THE BENT and read the letters in response. While some were thoughtful and rational, many were surprisingly misinformed. I am amazed at the incomplete and faulty thinking expressed in those letters. I had expected the response of Tau Beta Pi members to be overwhelmingly informed and supportive. I am stunned that so many TBPI writers displayed a lack of understanding of climate science and modeling.

I am a retired aerospace engineer who has become interested in earth sciences and the climate in particular. I have tried to educate myself on the climate through the collection and reading of mainstream books, review of technical papers, and contacts with the national labs. I am not an expert, but believe I am grounded in the basic concepts underlying climate change.

I am troubled by the amount of misinformation that is propagated through the internet and conservative media. I find the FOX media especially troubling as it seems to have placed capturing an audience at the cost of lost integrity and harm to future generations. But what troubles me even more is the gullibility of the average citizen to buy into the misinformation.

I have prepared and delivered talks on global warming inspired by the book, *The Discovery of Global Warming*, by Dr. Spencer R. Weart. I find the degree of skepticism, even by very well-educated people, alarming. It is almost as if there is a wave of anti-science developing in the U.S.

I hope your article spreads around the country. I hope it is read by all TBPI members and by students in all the engineering schools. I hope that the media will pick up on the article and bring it to the public's attention.

Edward R. Coleman, MI E '57

- Alan Brown concludes his article on Climate Models in the Winter 2010 issue by stating that "it is a shame the discussion cannot be more civil."

LETTERS

The real shame is that the climate debate has been co-opted by politicians for political purposes unrelated to climate change—starting with a former Vice President.

While favoring the data promulgated by the United Nations Intergovernmental Panel of Climate Change (basically a political group) over the opinions of the “deniers,” Mr. Brown presents enough information for rational scientists and engineers to conclude that the science of global climate change, and man’s impact on it, is hardly settled. This is contrary to what the politicians would have you believe because to do so would open debate to the whole range of scientific research that is ongoing.

Further examination would reveal that many of the surface-temperature monitors are located in urban heat islands that are known to be warmer than conditions in rural areas. Such examinations would also have to take into account that the warming trend, as measured by atmospheric observations, has stalled over the past few years as well as other studies of effect of ocean currents and sun-spots on earth’s climate. The role of CO₂ also needs to be investigated as there is evidence that an increasing level of this gas is not a precursor of warming of the earth’s atmosphere. The scientific community would also have to debate whether the warming trend, if there is one, will become asymptotic or will reverse as it has throughout earth’s history. If climate change follows the patterns of the past, then the fears generated by the politicians will be far less onerous than they portray and will show their proposals to be mere propaganda rather than a serious effort to counter a trend of either warming or cooling.

In summary, the proposals embodied in the “cap-and-trade” legislation and other proposals to curtail growth in the U.S. being debated in Congress are not based on “settled science” but on a grab for political power that has the potential to reduce the standard of living for all Americans!

Stephen G. Petersen, NY Γ ’53

• First, the article mentions the “hockey-stick” graph. [*Global Annual Mean Surface Air Temperature Change: data.giss.nasa.gov/gistemp/graphs/—Ed.*] Some are concerned that it does not include the medieval “warm period” and the “mini-ice age,” both of which may have significant deviations, at least based upon limited observational evidence (e.g., “Greenland was green”). It would be helpful for all readers to see an updated graph that shows the “hockey-stick” graph, the medieval warm period, and the mini-ice age.

Second, it is not clear if the climate models include all effects, such as the different ocean and solar cycles, orbital dynamics, and volcanoes. Again, more information would be beneficial.

Third, when one deals with observations and measurements (whether from climate or experiments), there are three fundamental questions about the phenomena involved:

1. Is there a change? In this case, is there a change in the climate given the many phenomena and cycles involved?

2. What is causing the change? Are we (mankind/civilization) causing it? In this case, are greenhouse-gas emissions and other anthropogenic activities causing it?

3. What can be done about it (e.g., to replicate it if beneficial, or to ameliorate it if it is detrimental)? In this case, what can be done to reduce greenhouse-gas emissions and climate change (assuming they are detrimental)?

Many members of the scientific community and the public consider these questions and become unconvinced that global warming is occurring, or that mankind is causing it, or that anything can be done about it, or that anything can be done about it without destroying our way of life. In addition, the article cites examples of data manipulation that further confuse the issues, and the December meetings in Copenhagen did little to support the global-warming case. Other instances of “climategate” keep being discussed in the media. Indeed, there are some supporters of global warming that use it to propose

massive government programs with draconian approaches that could destroy our democratic institutions and deny us our liberties, regardless of the data and models and without an open and sincere discussion.

Instead of arguing the first two questions—for which answers are difficult to find, I propose focusing on a variant of the third question—namely, what can we reasonably do now to reduce emissions while maintaining our lifestyles and democratic society?

We can start by looking at history. The current U.S. situation is similar to the mid-to-late 1970s, when energy, the environment, the economy, and national security all came together. We are looking at wind and solar again and are spending trillions. However, per the U.S. Energy Information Administration, little will change over the next 20 years from this investment; emissions will not decrease, significant petroleum imports will remain, and trillions will be lost in the balance of trade. In contrast, France learned from the 1970s and, on a unit GDP basis, emits half as much carbon dioxide as we do. Why? Because France now generates about 80% of its electricity from nuclear power (using technology originally developed in America).

We need to learn from history and stop repeating errors. The country should pursue three approaches, all using existing technologies that can provide immediate results.

Improve domestic energy supply—drill in the U.S., use natural gas more, use nuclear more, and use coal to liquids (perhaps integrated with other methods to reduce emissions). One of the great ironies is that fossil-fuel prices need to be kept low and stable for implementation of alternative energy sources, because of the latter’s capital-energy intensive nature.

Reduce demand and/or demand growth—efficiency is the gift that keeps on giving and any increase in efficiency reduces emissions—and use supercritical coal plants, combined cycles, plug-in electric hybrid vehicles, and extended-range electric vehicles. We already have battery

technologies that can give us a 50-100 mile range, which covers 90% of all daily driving.

Transition—move to lower emission technologies, such as hydroelectric and nuclear power. Use solar and wind power only where there are clear niche applications (i.e., because of their low capacity factors, an over-capacity of 200-300% is usually needed).

I would be happy to submit an article with more information on the energy and environment situation.

Alexander P. Murray, PA F '78

- Alan S. Brown has not considered a few aspects of the climate. We need to be cautious about accepting everything that the global warming proponents claim. Examine ALL the data, and interpret the finding truthfully.

The data presented is NOT conclusive. Some data has been withheld or manipulated. Other data is presented without adequate support. There is sufficient reason to question the data and the interpretation. Look at one bit of information supplied by IPCC. The news sources have revealed a gross error by IPCC—the statement that the glaciers in the Himalayas would melt by 2035. This information was questioned. Now IPCC admits that this statement is wrong. IPCC claims a typographical error. Unfortunately, it has no means to correct this error. The next report is due in six years. Someone needs to verify all the figures and data. I hope that those chosen for this task will not be influenced or intimidated by the provider of the data.

Just because there is a statistical correlation between temperature and carbon-dioxide concentration does not mean that CO₂ is driving the temperature upward. In fact, a close examination of temperature versus CO₂ concentration reveals that temperature is driving the CO₂ concentration, not the other way around. Changes in temperature have led CO₂-concentration by approximately 800 years according to “Temperature-to-CO₂ Proved” by John L. Daly (posted on John-Daly.com April 19, 2001). The normal sense says CO₂ concentration is NOT the major contributor or cause of global warming.

Furthermore, CO₂ makes up only 0.04 percent of the greenhouse gases. Water vapor is the earth's largest greenhouse gas. Alan Brown quoted Ronald Stouffer regarding the importance of water vapor in clouds and that we do a poor job modeling them. In addition, Stouffer reminds us that clouds (water vapor) are important enough to change global warming's magnitude. Should we regulate water-vapor emissions to control this gas since it is such a large component contributing to our climate?

Do you remember the cloud-seeding project about 50 years ago? What lesson did we learn about this attempt to manipulate the climate? We cannot control climate. We are not God. Let us not be so foolish to think we are better than those of yesteryear. It could be a costly mistake. Let us learn from the past rather than repeat the same mistake.

Frank J. Barton, P.E., FL F '76

Removing Debris in Space

In reference to the article “Removing Debris in Space” in the Spring 2010 issue, it's been a long time since I've designed a spacecraft but it seems that the author did not adequately consider the attitude-control requirements. His vehicle consists of a spacecraft at each end of a 10-kilometer tape tether. Both spacecraft must orient themselves along the axis of the tether, and, to maneuver

the entire vehicle, both spacecraft must fire coordinated thrusts in parallel in the correct spatial orientation. Mr. Pearson estimates that the lateral thrusters will exert half-newton forces. He envisions that the lateral thrusts are generated electrically by passing current through the tether in the earth's magnetic field for an indefinite period of time using a solar array as the source of electricity. However, the attitude-control thrusters are more likely to be in the 10-pound range, requiring chemical fuels that will limit the spacecraft's life, especially in support of long-duration electrodynamic burns.

In order to aim the lateral thrusts, an earth sensor and star tracker are likely to be needed. Mr. Pearson should do a quantitative study of the attitude controls, including their effect on the size of the two spacecraft.

Dr. Myron Kayton, P.E., NY F '55

PPI Has You Covered

Before, During, and After Your Engineering Exam



The Power to Pass™
www.ppi2pass.com

Save 30% on all PPI print products.
Visit www.ppi2pass.com/TauBetaPi
for more information.

LETTERS

[Author's response: Thank you for a key question on attitude control of the EDDE spacecraft. Omnidirectional star trackers and earth sensors will be needed; however, no chemical attitude-control thrusters are required. EDDE is not two independent spacecraft connected by a loose tether, but an integrated system of a rotating tether and end masses whose attitude, rotation rate, and plane are controlled solely by electrodynamic forces. Rotation maintains tether tension due to centrifugal force, and the end bodies "hang" from the ends of the tether.

The only attitude control required is rotation about the conductor axis to orient the solar arrays, which is done by reaction wheels or magnetic torquers operating against the inertia of the end bodies. The only rocket thrust is provided by ion rockets for debris capture. A thorough discussion of the EDDE attitude dynamics is given in the reference by Levin, Volume 126 of the AAS Advances in the Astronautical Sciences, pp. 183-233.—Jerome Pearson, OH H '61.]

Potpourri

• I recently read "Designing Against Disease" in the Winter 2010 issue. It was quite interesting. Being a Lehigh alumnus I particularly appreciated the reference to Thomas M. Drown, who was Lehigh's fourth president from 1895 to 1904. However, the notation that his membership is Pennsylvania Alpha 1859 is puzzling. Lehigh is Pennsylvania Alpha of TBPI, but did not exist until 1865, so how could one be a member six years prior? This slight glitch did not detract from your excellent article. I expect that few readers noticed the discrepancy.

Donald L. Talhelm, PA A '59
[Thomas M. Drown's catalog card confirms that he received his M.D. from the University of Pennsylvania in 1859 and was initiated into Tau Beta Pi during his presidency at Lehigh University. When a member is initiated for scholastic attainment, the class refers to the year when the engineering-related degree is granted.—Ed.]

• Once again, you've [Trudy Bell] written a superb piece, this time on typhoid for THE BENT. I am always astonished to find how you select interesting topics and write detailed articles that go beyond mere superficial reporting. I lived in Lowell and worked in Lawrence, long after the typhoid epidemics, but I heard vague stories about them.

I attend numerous lectures and conferences in West Los Angeles on a wide variety of interesting topics I know nothing about. Hence, I am eager to read your own latest works. Keep up the good work. Look forward to your next piece about an interesting subject.

Dr. Myron Kayton, P.E., NY I '55

• This week I had a friend ask me whether something was patentable. From what he had told me I thought not, but I remembered an article I had read in THE BENT on the subject and wanted to reread it. I googled "Tau Beta Pi patents," and the BENT article was first up. I was surprised to see that it was from Fall 2002—seven-plus years ago already. While your work with students obviously has lasting value, know that even your BENT articles have lasting value.

I appreciate what you do, and this little thing was just another reminder. "Thanks," and keep up the good work. Special kudos to Trudy Bell, who always comes up with fascinating stuff.

Dale R. Krueger, IL A '78

• Very much enjoyed your Spring 2010 publication. Thanks for relevant and interesting quarterly magazines!

Martin G. Rollinger, MI I '82

• I'm about to switch to GEICO car insurance to take advantage of that awesome deal through TBPI. They quoted me \$168 for six-month liability. You guys rock!

Justin P. Elchert, OH A '09

• Congratulations on our 125th anniversary. I was a college student representative at the 1985 Convention for the 100th anniversary.

Suzanne T. Heninger, UT A '86

Rocket Engineering

• I decided to write based on two items in the Winter 2010 issue of THE BENT. The first was the Norman Augustine item in Who's Who. The second was the article by Alan Brown. The "climate-change" article presented a good view of the controversy surrounding earth temperature measurements.

There is another controversy that needs discussion. It is not as important as climate change, but it is important to the public whose money is being used. The controversy is about the U.S. space policy and advanced-performance rocket engines (APRE).

Mr. Augustine's committee assessed the NASA human-space-flight projects, but ignored alternatives to existing programs. I believe my name may have been submitted as a candidate for membership on the committee, but Mr. Augustine said he didn't want any *zealots* on the committee. He did not schedule any public meetings near my community where my advocacy of advanced performance rocket engines (APRE) could be heard. I appear to have been systematically excluded from the debate. I think the committee represented the aerospace industry's interest, but not the public interest. The reason is as follows.

The complaint has been that the Space Shuttle is too expensive to be operated. The development of the Ares vehicles, using existing rocket technology, will result in another system that is too expensive to operate. That is why the mandate to return to the moon was premature and irresponsible. Advanced performance rocket engines will put a greater payload in orbit at less expense. That is a valid reason for the expenditure of public money. It will also maintain U.S. leadership in space. I think the case for development of APRE should be heard before we continue spending money on a premature and irresponsible program. I would be glad to write an article on this subject for THE BENT.

Dale L. Jensen, P.E., WA A '56
1. F. Moring, No Zealots, *Aviation Week & Space Technology*, 1 June 2009



WHO'S WHO

AAES National Awards

The following were among those honored by the American Association of Engineering Societies in April 2010: **Dr. Charles M. Vest**, WV A '63: national engineering award; **Dr. Karen A. Panetta**, MA A '85: Norm Augustine award; and **Daniel D. Clinton Jr.**, P.E., TX A '52: Kenneth Andrew Roe award.

American Academy Elects Fellows

Seven Tau Bates were among the 2010 fellows elected in April by the American Academy of Arts and Sciences:

- **Dr. Sunney I. Chan**, CA A '57;
- **Dr. William A. Goddard III**, CA E '60;
- **Arthur L. Goldstein**, NY F '57;
- **Dr. James M. Moran Jr.**, IN F '63;
- **Dr. David N. Seidman**, NY E '60;
- **John W. Wilkins**, IL F '59; and
- **Dr. Jeannette M. Wing**, MA B '79.

IEEE Honors

Recipients of 2009 annual awards from the IEEE include: **Dr. Andrew J. Viterbi**, MA B '57, 2010 medal of honor; **Dr. Paul E. Gray**, MA B '54, founders medal in recognition of his "leadership in education, research, and public policy;" and **Dr. Roger W. Brockett**, OH A '60, Leon K. Kirchmayer graduate teaching award.

National Academy of Science Elects

The following are among new members elected to the National Academy of Sciences in April:

- **Dr. Alexis T. Bell**, MA B '64, professor of chemical engineering at the University of California, Berkeley;
- **Dr. Richard F. Eisenberg**, NY K '44, professor of chemistry at the University of Rochester;
- **Dr. Steven E. Koonin**, CA B '72, U.S. Department of Energy undersecretary for science; and
- **Dr. Jack K. Wolf**, PA A '56, professor at the center for magnetic recording, University of California, San Diego.

NAE Officers

Academy members have elected officers. **Dr. Irwin M. Jacobs**, NY A '56, was re-elected to a two-year term as chair. **Dr. Linda M. Abriola**, PA Z '76, **Paul Citron**, PA Z '69, and **Dr. Ruth A. David**, KS B '75, were re-elected as councillors.

Chinese Engineering Academy

The Chinese Academy of Engineering has elected a class of six new foreign members, including three Tau Bates: **Dr. Surendra P. Shah**, NY A '65; **Dr. Henry T. Yang**, IN A '62; and **Dr. Charles M. Vest**, WV A '63.

Dr. Donald E. Knuth, Ohio Alpha '60, professor emeritus of the art of computer programming at Stanford University, has received the Katanagi prize for research excellence, presented annually by Carnegie Mellon University in cooperation with Tokyo University of Technology. Dr. Knuth is widely known for his work on programming algorithms and as the designer of TeX.



Edgar S. Woolard Jr., North Carolina Alpha '56, former chairman and CEO of DuPont and current chairman of the New York Stock Exchange's compensation committee, has received the Josiah Marvel cup award, the highest honor presented by the Delaware State Chamber of Commerce. He is a prominent advocate for corporate ethics.

Joseph M. Colucci, Michigan Alpha '58, president of Automotive Fuels Consulting Inc. and retired executive director, materials research, General Motors Research and Development, is the recipient of the 2010 SAE international medal of honor.

Dr. Siegfried S. Hecker, Ohio Alpha '65, is joint winner of the Enrico Fermi award, administered by the Department of Energy. He is co-director, center for international security and cooperation, and professor at Stanford University's department of management science and engineering.

Dr. Werner J.A. Dahm, Alabama Delta '78, is chief scientist of the U.S. Air Force.



He serves as chief scientific adviser to both the chief of staff and secretary of the Air Force and provides assessments on scientific and technical issues affecting the military mission. Dr. Dahm is on a leave of absence as professor of aerospace engineering at the University of Michigan.

Tau Bate astronauts helped to crew two recent 2010 Space Shuttle missions. **CPT Alan G. Poindexter**, USN, GA A '86, was commander of STS-131, which delivered a multi-purpose logistics module to the International Space Station. One of the mission specialists was **Richard A. Mastracchio**, CT B '82. STS-132 carried a Russian mini-research module to the ISS, with **CPT Stephen G. Bowen**, USN, MD F '86, and **Dr. Garrett E. Reisman**, PA A '91, as mission specialists.

ABET Leadership

Dr. Larry A. Kaye, P.E., NY E '68, has been elected 2010-11 president of ABET. **Dr. Bassem F. Armaly**, IA B '63, serves as treasurer.

2010 Harry S. Truman Scholars

Two Tau Bates were among the 2010 class of Harry Truman scholars: **Jared A. Crawford**, WV A '11, and **Varun Sivaram**, CA F '11.

Kentucky Gamma Installed



PHOTOS: Bryan Lemmon/WKU

Charter Presentation

Solange C. Dao, PE., President Sean M. Hamlet, Dr. Shane M. Palmquist, PE., and Dr. Julie R. Ellis, Advisors (left to right).

THE KENTUCKY GAMMA CHAPTER of Tau Beta Pi was installed at Western Kentucky University in Bowling Green, KY, on February 27, 2010. Vice President Solange C. Dao, P.E., was official installing deputy of the Society's 242nd collegiate chapter, assisted by Executive Director James D. Froula, P.E., and District 6 Director Christy M. Gearheart.

The 2009 Convention granted a chapter to the Western Kentucky University Engineering Honor Society, represented in East Brunswick, NJ, by Sean M. Hamlet, president, and Dr. Shane M. Palmquist, *NH A '95*, advisor.

Room 2136 of the Engineering and Biological Science Building on the campus was the site of the formal ceremonies of initiation and chapter installation, witnessed by Laura A. Allen, *SC B '10*, Taylor D. Baggett, *KY B '11*, Dr. C. Warren Campbell, *AL B '71*, Jason A. Gearheart, *KY B '04*, Alia F. Abdul Ghaffar, *TN B '10*, J. Benjamin Gotow, *TN B '10*, W. Jason Hines, *KY B '11*, Amelia R. Shaw, *TN B '10*, and Dr. Robert E. Stammer Jr., *TN B '72*. The initiation team included: Dr. Palmquist; Dr. Mark E. Cambron, *KY A '90*; Dr. Julie R. Ellis, *GA A '80*; Kassy M. Lum, *KY A '10*; Dr. Kevin S. Schmaltz, *VA B '84*; Dr. Larry D. Tyler, *KY B '63*; Dr. Bruce L. Walcott, *IN A '81*; John C. Wright, *KY A '10*; and the three national officials listed above. Thirteen undergraduate students and 13 alumni (identified on the facing page) comprise Kentucky Gamma's charter members.

Immediately after the formal initiation, the new members were constituted a new chapter in the ceremony of installation conducted by Ms. Dao. The ceremony in-

cluded the formal election and installation of the chapter's charter officers and advisors (identified in a photograph caption on the facing page).

A social hour and tour of the National Corvette Museum preceded the banquet, sponsored by the Ogden college of science and engineering. Dr. Ellis, engineering department head, served as mistress of ceremonies, welcomed initiates, visitors, faculty, and friends, and stated the great honor to her college and university in having the new chapter on campus.

Mr. Froula reviewed the history of the WKU petitioning process and challenged the initiates to pursue excellence in all of their activities, to support the engineering profession, maintain impeccable ethics, and serve their *alma mater* and fellow students.

Ms. Dao welcomed Kentucky Gamma into the Association, encouraged the students to participate in TBPI activities, build a great chapter, bring great credit to their university, and become effective leaders.

Ms. Gearheart offered her assistance to the new chapter, welcomed Kentucky Gamma into District 6, and reviewed its traditions and distinguished members.

President Hamlet, Dr. Ellis, and Dr. Palmquist presented charter membership certificates to the initiates.

Dr. Ellis stated that TBPI is all about character and things that matter and noted how engineers could not be where they are without strong support from their families and friends. She congratulated the initiates and welcomed the 15 visitors.

Finally, Dr. Palmquist recognized his fellow chapter advisors and both former and current chapter officers.



Student Initiates

Front row (L-R): Joshua T. Grace, Amanda M. Huff, and Jason M. Whitehouse. Back row: Justin L. Haag, Kurt W. Woods, Nathan A. Roberts, and Nathan T. Dick.



Student Initiates

Front row (L-R): Sean M. Hamlet, Sarah E. Bertke, and Andrew P. Ayre. Back row: Matthew T. Lodmell, Nicholas P. Harlow, and Daniel S. Childress.



Alumni

Front row (L-R): Adam L. Ayer, Catherine S. Gay, and Andrew J. Davis. Back row: Kevin D. Dick, Aaron D. Dobbins, Ryan J. Farris, and Russell A. Clayton.



Alumni

Front row (L-R): Scott A. Smith, Aleks E. Paaso, and Jacob A. Riggs. Back row: John P. Saalwaechter, David W. Morse, and Andrew M. Lindsey.



First Officers and Advisors

Front row (L-R): President Sean M. Hamlet, Vice President Nathan A. Roberts, Corresponding Secretary Sarah E. Bertke, Recording Secretary Nicholas P. Harlow. Back row: Drs. Julie R. Ellis, Shane M. Palmquist, P.E., Kevin S. Schmalz, and Mark E. Cambron, Advisors.



Initiation Team

Front row (L-R): Solange C. Dao, P.E., Dr. Christy M. Gearheart, Kassy M. Lum, and Dr. Julie R. Ellis. Back row: James D. Froula, P.E., Dr. Mark E. Cambron, Dr. Shane M. Palmquist, P.E., Dr. Larry D. Tyler, Dr. Bruce L. Walcott, and John C. Wright.

Idaho Gamma Installed



INITIATION PHOTOS: Carrie Quinney, BSU Photographic Services

Charter Presentation

Councillor Norman Pih, President Shatakshi Goyal, Dr. Janet M. Callahan—Chief Advisor, and Dean Cheryl B. Schrader (left to right).

THE IDAHO GAMMA CHAPTER of Tau Beta Pi was installed at Boise State University on March 13, 2010. Executive Councillor Norman Pih was the official installing deputy of the Society's 243rd collegiate chapter, assisted by Executive Director James D. Froula, P.E., and District 12 Director Tricia E. Schwaller.

The 2009 Convention granted a chapter to the Boise State University Engineering Honor Society (EHS), represented in East Brunswick, NJ, by Shatakshi Goyal, president, and Dr. Janet M. Callahan, *CT A '83*, advisor.

The Simplot Ballroom A in the Student Union Building on the campus was the site of the formal ceremonies of initiation and chapter installation, witnessed by Linda R. Stuffle, P.E., *MI B '71*, Dr. R. Eugene Stuffle, *ID B '66*, and Dr. John M. Youngsman, *WA B '09*, BSU faculty.

The initiation team comprised: Dr. Callahan, Dr. James R. Ferguson, *CA Z '77*, Dr. George A. Murgel, *MT A '76*, Dr. Cheryl B. Schrader, *IN A '84*, Dr. and Ms. Stuffle, and the three national officials listed above. Sixteen alumni and 47 students (identified in photographs) comprise Idaho Gamma's charter members.

After the formal initiation, the initiates were constituted a new chapter in the ceremony of installation conducted by Councillor Pih. The ceremony included the formal election and installation of the charter officers and advisors (identified in a photograph caption).

A well-stocked formal reception in the Simplot Ballroom foyer preceded the installation banquet of Idaho Gamma, enjoyed by parents, spouses, and friends.

Dr. Callahan served as mistress of ceremonies and wel-

comed all initiates, the five visitors whom she introduced, and faculty to the event. She reviewed the history and community-service projects of the former EHS, stated her pride in having this new chapter on campus, and recognized the excellent leadership of former society officers.

Dr. Michael R. Laliberte, BSU vice president for student affairs, spoke of the accomplishments of the former EHS, the importance of honor societies on a campus helping to make the world a better place, and the history of societies, suggesting that TBP became a true honor society before ΦBK converted from a social literary club.

Mr. Froula reviewed the history of the petitioning process and challenged the members to pursue excellence in all of their activities, to support the engineering profession, maintain impeccable ethics, and serve their alma mater, fellow students, and the nation.

Mr. Pih congratulated the initiates, spoke of the importance of families and friends, and encouraged members to volunteer whenever someone requests their help. Ms. Schwaller welcomed Idaho Gamma and encouraged the new members to participate in District 12 activities.

Dr. Schrader, dean of engineering, thanked Drs. Callahan, Murgel, Sin Ming Loo, *AL A '97*, and Lynn D. Russell, *MS A '60*—founding dean of engineering. She reviewed the history of her college—for which TBP represents a great moment and tremendous opportunity—and encouraged the initiates to accept the responsibility to support both their communities and succeeding students.

Dr. Callahan and Dr. Schrader presented charter membership certificates to the initiates. Finally, Dr. Callahan challenged the initiates to maintain the TBP momentum.



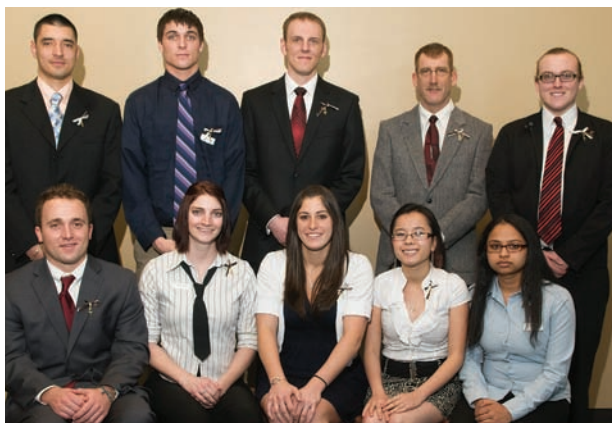
Student Initiates

Front row (L-R): Davis G. Daniel, Amber Cox, Stephanie L. Barnes, Nihan Darnall, and Michael R. Banks. Back row: Alex S. Calvert, Travis A. Dean, Patrick J. Conro, Eugene V. Castro, and Ross M. Butler.



Student Initiates

Front row (L-R): Ken R. Fukumoto, Shatakshi Goyal, Jacquelyn R. Forhan, Cary H. Haws, and Mark E. Johnson. Back row: Jonathan T. Henderson, Jason H. Griswold, McKenzie H. Fox, Daniel S. Feeser, and A. Rey DeLeon.



Student Initiates

Front row (L-R): Benjamin J. Losser, Jozey L. Mitcham, Kathryn A. Lewis, Mo Thi Nguyen, and Anita Poudel. Back row: Adrian Rangel, Brian J. Pierre, Bryan P. Murphy, Gavin M. Moody, and David A. McLenna III.



Student Initiates

Front row (L-R): Adrian Rothenbuhler, Daniel J. Routson, Sonya M. Shawver, R. Tyler Rowe, and Michael R. Rippee. Back row: Jonathan Rocha, Jon A. Stanley, Thomas R. Simenc, Derek J. Reis, and Kris M. Ravenscroft.



First Officers and Advisors

Front row (L-R): Vice President Ross M. Butler, President Shatakshi Goyal, Cataloger Amber Cox, Recording and Corresponding Secretary McKenzie H. Fox. Back row: Treasurer Jon A. Stanley, and Advisors: Dr. George A. Murgel, Dr. Janet M. Callahan, Dean Cheryl B. Schrader—representing Thaddeus B. Welch III, and Dr. James R. Ferguson.



Student Initiates

Front row (L-R): Logan J. Ward, Pamela Ward, and J. Scott Winston. Back row: Grant H. Stephens, Gregory J. Taddicken, Jared H. Truxal, and Andrew J. Vissotski.

(Continued on page 17.)

CHAPTERS

ALUMNUS CHAPTERS

District 1 • denotes active chapter
Central Connecticut, Hartford

District 2
Buffalo, NY
Long Island Suburban, NY
Newark, NJ
New York, NY

- Rochester, NY
- Schenectady, NY
- Southern Tier, Binghamton, NY

District 3
Lehigh Valley, Bethlehem, PA
• Philadelphia, PA—New, established June 2010.
Wilmington, DE

District 4
• Baltimore, MD
Hampton Roads, Newport News, VA
Kanawha Valley, Charleston, WV
Research Triangle, Durham-Chapel Hill-Raleigh, NC
Richmond, VA

• Washington, DC

District 5
• Central Florida, Orlando

Daytona Beach, FL
Gainesville, FL
Miami, FL
Midlands, Columbia, SC
Piedmont, Clemson, SC
Puerto Rico
Tampa Bay, FL
West Palm Beach, FL

District 6
Bluegrass, Lexington-Frankfort, KY
• Central Alabama, Birmingham
• Great Smoky Mountains, Knoxville-Oak Ridge, TN
• Louisville, KY
Greater Gulf Coast, Mobile, AL
Mid-South, Memphis, TN

District 7
Central Michigan, Lansing
Cincinnati, OH
Dayton, OH

- Southeastern Michigan, Detroit
- Flint, MI
- Grand Rapids, MI

- Ohio's North Coast, Cleveland
- Columbus, OH

District 8
Chicago Area, IL
• Central Illinois, Urbana-Champaign
Milwaukee, WI

District 9
Rolla, MO
St. Louis, MO

District 10
Houston, TX

District 11
Ames, IA
• Minnesota, Twin Cities, MN

District 12
• Front Range, CO/WY
Salt Lake City, UT

District 13
El Paso, TX
Phoenix, AZ
Sun City, AZ

District 14
Columbia River Basin, Richland, WA
Portland, OR

- Puget Sound, Seattle, WA

District 15
• Sacramento, CA
• San Francisco Bay Area, CA
San Francisco Peninsula, Palo Alto, CA

District 16
Southern California, Los Angeles

COLLEGIATE CHAPTERS (243)

Chap. Dist. Institution

AL A 6 Auburn Univ.
AL B 6 Univ. of Alabama
AL F 6 Univ. of Ala. at Birmingham
AL A 6 Univ. of Ala. in Huntsville
AL E 6 Univ. of South Alabama
AK A 14 Univ. of Alaska Fairbanks
AZ A 13 Univ. of Arizona
AZ B 13 Arizona State Univ.
AZ F 13 Northern Arizona Univ.
AR A 9 Univ. of Arkansas, Fayetteville
CA A 15 Univ. of California, Berkeley
CA B 16 California Inst. of Technology
CA F 15 Stanford Univ.
CA A 16 Univ. of Southern California
CA E 16 Univ. of California, Los Angeles
CA Z 15 Santa Clara Univ.
CA H 15 San Jose State Univ.
CA Ø 16 California State Univ., Long Beach
CA I 16 California State Univ., Los Angeles
CA K 16 California State Univ., Northridge
CA A 15 Univ. of California, Davis
CA M 15 Calif. Poly. St. Univ., San Luis Obispo
CA N 16 California State Poly. Univ., Pomona
CA E 16 San Diego State Univ.
CA O 16 Loyola Marymount Univ.
CA II 16 Northrop Univ. (inactive)
CA P 15 California State Univ., Fresno

CA S 16 Univ. of California, Santa Barbara
CA T 16 Univ. of California, Irvine
CA Y 15 California State Univ., Sacramento
CA Ø 15 Univ. of the Pacific
CA X 16 California State Univ., Fullerton
CA Ø 16 Univ. of California, San Diego
CA Ø 16 Harvey Mudd College
CA AA 15 California State Univ., Chico
CA AB 16 Univ. of California, Riverside
CA AF 15 San Francisco State Univ.
CA AA 15 Univ. of California, Santa Cruz
CO A 12 Colorado School of Mines
CO B 12 Univ. of Colorado at Boulder
CO G 12 Univ. of Denver (inactive)
CO A 12 Colorado State Univ.
CO E 12 Univ. of Colorado at Denver
CO Z 12 United States Air Force Academy
CT A 1 Yale Univ.
CT B 1 Univ. of Connecticut
CT F 1 Univ. of Hartford
DE A 3 Univ. of Delaware
DC A 4 Howard Univ.
DC B 4 Catholic Univ. of America
DC F 4 George Washington Univ.
FL A 5 Univ. of Florida
FL B 5 Univ. of Miami
FL F 5 Univ. of South Florida
FL A 5 Univ. of Central Florida
FL E 5 Florida Atlantic Univ.
FL Z 5 Florida Inst. of Technology
FL H 5 Florida A&M Univ.-Florida State Univ.
FL Ø 5 Florida International Univ.
GA A 5 Georgia Inst. of Technology
GA B 5 Mercer Univ.
ID A 14 Univ. of Idaho
ID B 12 Idaho State Univ.
ID F 12 Boise State Univ.
IL A 8 Univ. of Illinois at Urbana-Champaign
IL B 8 Illinois Inst. of Technology
IL F 8 Northwestern Univ.
IL A 8 Bradley Univ.
IL E 8 Southern Illinois Univ. at Carbondale
IL Z 8 Univ. of Illinois at Chicago
IN A 8 Purdue Univ.
IN B 8 Rose-Hulman Inst. of Technology
IN F 8 Univ. of Notre Dame
IN A 8 Valparaiso Univ.
IN E 8 Trine Univ. (formerly Tri-State Univ.)
IA A 11 Iowa State Univ.
IA B 11 Univ. of Iowa
KS A 9 Univ. of Kansas
KS B 9 Wichita State Univ.
KS F 9 Kansas State Univ.
KY A 6 Univ. of Kentucky
KY B 6 Univ. of Louisville
KY F 6 Western Kentucky Univ.
LA A 10 Louisiana State Univ.
LA B 10 Tulane Univ. of Louisiana
LA F 10 Louisiana Tech Univ.
LA A 10 Univ. of Louisiana at Lafayette
LA E 10 Univ. of New Orleans
ME A 1 Univ. of Maine
MD A 4 Johns Hopkins Univ.
MD B 4 Univ. of Maryland
MD F 4 United States Naval Academy
MD A 4 Univ. of Maryland Baltimore County
MD E 4 Morgan State Univ.
MA A 1 Worcester Polytechnic Inst.
MA B 1 Massachusetts Inst. of Technology
MA F 1 Harvard Univ. (inactive)
MA A 1 Tufts Univ.
MA E 1 Northeastern Univ.
MA Z 1 Univ. of Massachusetts at Amherst
MA H 1 Boston Univ.
MA Ø 1 Univ. of Massachusetts Lowell
MA I 1 Western New England College
MI A 7 Michigan State Univ.
MI B 11 Michigan Tech. Univ.
MI F 7 Univ. of Michigan
MI A 7 Univ. of Detroit Mercy
MI E 7 Wayne State Univ.
MI Z 7 Kettering Univ.
MI H 7 Lawrence Technological Univ.
MI Ø 7 Oakland Univ.
MI F 7 Univ. of Michigan-Dearborn
MI K 7 Western Michigan Univ.
MN A 7 Grand Valley State Univ.
MN A 11 Univ. of Minnesota-Twin Cities
MN B 11 Univ. of Minnesota, Duluth
MS A 6 Mississippi State Univ.
MS B 6 Univ. of Mississippi
MO A 9 Missouri Univ. of Science & Technology
MO F 9 Missouri State Univ.
MO A 9 University of Missouri-Kansas City
MT A 12 Montana State Univ.
MT B 12 Montana Tech of the Univ. of Montana
NE A 9 Univ. of Nebraska-Lincoln
NV A 15 Univ. of Nevada, Reno
NV B 16 Univ. of Nevada, Las Vegas
NH A 1 Univ. of New Hampshire
NH B 1 Dartmouth College
NJ A 2 Stevens Inst. of Technology
NJ B 2 Rutgers Univ.
NJ F 2 New Jersey Inst. of Technology
NJ A 2 Princeton Univ.
NJ E 2 Rowan Univ.
NM A 13 New Mexico State Univ.

NM B 13 Univ. of New Mexico
NM F 13 New Mexico Inst. of Mining & Tech.
NY A 2 Columbia Univ.
NY B 2 Syracuse Univ.
NY F 2 Rensselaer Polytechnic Inst.
NY A 2 Cornell Univ.
NY E 2 New York Univ. (inactive)
NY Z 2 Polytechnic Inst. of Brooklyn (inactive)
NY H 2 City College of CUNY
NY Ø 2 Clarkson Univ.
NY I 2 Cooper Union School of Engineering
NY K 2 Univ. of Rochester
NY A 2 Pratt Inst. (inactive)
NY M 2 Union College
NY N 2 SUNY at Buffalo
NY E 2 Manhattan College
NY O 2 SUNY at Stony Brook
NY P 2 Rochester Inst. of Technology
NY S 2 Polytechnic Institute of New York Univ.
NY T 2 Alfred Univ.
NY Y 2 Binghamton University
NY Z 2 United States Military Academy
NC A 4 North Carolina State Univ. at Raleigh
NC B 4 Univ. of N.C. at Chapel Hill (inactive)
NC F 4 Duke Univ.
NC A 4 Univ. of North Carolina at Charlotte
NC E 4 North Carolina A&T State Univ.
ND A 11 North Dakota State Univ.
ND B 11 Univ. of North Dakota
OH A 7 Case Western Reserve Univ.
OH B 7 Univ. of Cincinnati
OH F 7 Ohio State Univ.
OH A 7 Ohio Univ.
OH E 7 Cleveland State Univ.
OH Z 7 Univ. of Toledo
OH H 7 Air Force Inst. of Technology
OH Ø 7 Univ. of Dayton
OH I 7 Ohio Northern Univ.
OH K 7 Univ. of Akron
OH A 7 Youngstown State Univ.
OH M 7 Wright State Univ.
OH N 7 Cedarville Univ.
OH E 7 Miami Univ.
OK A 9 Univ. of Oklahoma
OK B 9 Univ. of Tulsa
OK F 9 Oklahoma State Univ.
OR A 14 Oregon State Univ.
OR B 14 Portland State Univ.
OR F 14 Univ. of Portland
PA A 3 Lehigh Univ.
PA B 3 Pennsylvania State Univ.
PA F 3 Carnegie Mellon Univ.
PA A 3 Univ. of Pennsylvania
PA E 3 Lafayette College
PA Z 3 Drexel Univ.
PA H 3 Bucknell Univ.
PA Ø 3 Villanova Univ.
PA I 3 Widener Univ.
PA K 3 Swarthmore College
PA A 3 Univ. of Pittsburgh
PR A 5 Univ. of Puerto Rico
RI A 1 Brown Univ.
RI B 1 Univ. of Rhode Island
SC A 5 Clemson Univ.
SC F 5 Univ. of South Carolina
SC F 5 The Citadel
SD A 12 South Dakota School of Mines & Tech.
SD B 11 South Dakota State Univ.
TN A 6 Univ. of Tennessee
TN B 6 Vanderbilt Univ.
TN F 6 Tennessee Tech. Univ.
TN A 6 Christian Brothers Univ.
TN E 6 Univ. of Memphis
TN Z 6 Univ. of Tennessee at Chattanooga
TX A 10 Univ. of Texas at Austin
TX B 13 Texas Tech Univ.
TX F 10 Rice Univ.
TX A 10 Texas A & M Univ.
TX A 10 Univ. of Houston
TX Z 10 Lamar Univ.
TX H 10 Univ. of Texas at Arlington
TX Ø 13 Univ. of Texas at El Paso
TX I 10 Southern Methodist Univ.
TX K 10 Prairie View A & M Univ.
TX A 10 Texas A & M Univ.-Kingsville
TX M 10 Univ. of Texas at San Antonio
UT A 12 Univ. of Utah
UT B 12 Brigham Young Univ.
UT F 12 Utah State Univ.
VT A 1 Univ. of Vermont
VT B 1 Norwich Univ.
VA A 4 Univ. of Virginia
VA B 4 Virginia Polytechnic Inst. & State Univ.
VA F 4 Old Dominion Univ.
VA A 4 Virginia Military Inst.
VA E 4 Virginia Commonwealth Univ.
WA A 14 Univ. of Washington
WA B 14 Washington State Univ.
WA F 14 Seattle Univ.
WA A 14 Gonzaga Univ.
WV A 4 West Virginia Univ.
WV B 4 West Virginia Univ. Inst. of Technology
WI A 8 Univ. of Wisconsin-Madison
WI B 8 Marquette Univ.
WI F 8 Univ. of Wisconsin-Milwaukee
WI A 8 Milwaukee School of Engineering
WI E 8 Univ. of Wisconsin-Platteville
WY A 12 Univ. of Wyoming

Idaho Gamma Installed

(Continued from page 15.)



Idaho Gamma Alumni

Front row (L-R): Lincoln Bollschweiler, Rebecca E. Ahern, Eamonn T. Harter, and Alex J. Hammond. Back row: Philip J. Fouts, Ryan L. Flamm, David Estrada, and Christopher V. Buu.



Idaho Gamma Alumni

Front row (L-R): Stillman A. Norton, Jean M. Margulieux, Sarah L. Klevmoen, and Benjamin O. Murphy. Back row: Richard G. Southwick III, Tommy K. Smith, Stephen J. Klick, and Brian J. Jaques.



Idaho Gamma Initiation Team

Front row (L-R): Dean Cheryl B. Schrader, Tricia E. Schwaller, Linda R. Stuffle, P.E., and Dr. Janet M. Callahan. Back row: James D. Froula, P.E., Norman Pih, Dr. James R. Ferguson, Dr. George A. Murgel, and Dr. R. Eugene Stuffle.



Discover the satisfaction of
innovation and service to the nation

MIT Lincoln Laboratory applies advanced technology to problems critical to national security in the areas of communications, space surveillance, advanced electronics, air and missile defense, cyber security, integrated sensing and decision support, and homeland protection. For over 58 years as a Department of Defense research and development laboratory, we have maintained an impressive record of technical innovation. The Laboratory has produced nearly 500 patents and more than 80 high-tech companies have spun-off from the Laboratory's technology development.

Cyber Systems and Technology Group Opportunities

The MIT Lincoln Laboratory Cyber Systems and Technology Group's R&D efforts focus on techniques for protecting from, and detecting and reacting to, intrusions into networked information systems, and for preventing software faults and understanding malicious code that exploits those faults. The group is involved in testing and evaluating the security of U.S. Government systems and networks and in identifying and demonstrating vulnerabilities in such systems. In each of the group's R&D areas, emphasis is placed on realistic data and experimental evaluation of techniques in test beds. Opportunities include:

- **Computer Security Architects (1172, 1623 and 1936)**
- **Computer Testing and Evaluation Engineer (1737)**
- **Malicious Code Analysis Engineer (1997)**
- **Malicious Code Analysis Researcher (1559)**

Selected applicants will be subject to a government security investigation and must meet eligibility requirements for access to classified information.

All positions are located in Lexington, MA.

Please visit our website at www.ll.mit.edu for more information on these and our many other opportunities.



Technology in Support of National Security

As an Equal Opportunity Employer, we are committed to realizing our vision of diversity and inclusion in every aspect of our enterprise. Due to the unique nature of our work, we require U.S. citizenship.

LASERS at 50—From Death Rays to DVDs

by Alan S. Brown

In the 50 years since their invention, lasers are everywhere. They play DVDs and CDs, scan bar codes at supermarkets, deliver phone and internet service over optical fibers, perform delicate surgeries, manipulate molecules in the lab, and lock smart bombs on their targets.

Yet, the first thing most people ever heard about lasers could be summed up in two words: “death ray.”

The death-ray story began, as these things often do, at a press conference. On July 7, 1960, reporters from the world’s major papers jammed a room at New York City’s Delmonico Hotel to witness the latest triumph of American science. The researcher giving the presentation, Dr. Theodore H. Maiman, was relatively unknown even among those who had vigorously pursued lasers and masers for the past decade.

Maiman was a slight 33-year-old with a receding hairline. Like many of the top laser researchers, he had a Ph.D. in physics, completed in 1955. Unlike them, he also had an M.S. in electrical engineering and a B.S. in engineering physics.

Maiman had first tested his laser two months earlier. It was an elegant design that consisted of a ruby photon source, a three-coil xenon flash lamp to energize the ruby, and a machined metal tube to contain the parts. The ruby was silvered on both ends to create mirrors, though one of the mirrors was only 95 percent reflective. When the lamp flashed, it produced photons that would bounce between the two mirrors, releasing more photons each time they collided with an energized electron in the ruby. About five percent of those rubies would pass through the partially silvered mirror, creating the first laser beam.

Maiman was a practical engineer who had repaired electrical appliances to pay for his undergraduate education. The laser reflected his pragmatic nature. “One of the things I did, and it did prove successful, was to try to use things that were around. If I had to develop a new lamp, it would have been a whole other research project,” he recalled in an interview many years later.

Maiman combed through strobe and flash catalogs for a light source that would meet his needs. He chose the ruby



Graphic shows the experimental Boeing YAL-1 airborne laser testbed, weapons system, a megawatt-class chemical oxygen-iodine laser mounted inside a modified Boeing 747-400F. It is primarily designed as a missile-defense system to destroy tactical ballistic missiles while in boost phase.

because high-purity chromium-doped aluminum oxide crystals were readily available. He machined many of the other parts.

Maiman had tested the new laser on May 16, and it worked the first time. He immediately submitted a short note describing the invention to *Physical Review Letters*. It was rejected. According to editor Simon Pasternack, the note looked like an extension of a Maiman paper published in June that described how rubies behaved when energized by intense light. Dr. Charles H. Townes, a giant in the field, later wrote, “Pasternack’s reaction perhaps reflects the limited understanding at the time of the nature of lasers and their significance.”

Maiman then submitted the paper to *Nature*, a more prestigious magazine, which would publish it in August. Still, Maiman’s employer, Hughes Research Laboratories, knew others were working on lasers. It organized the July press conference to ensure Maiman (and Hughes) received credit for the breakthrough.

Death Rays

After Maiman finished explaining how the laser worked, a reporter asked if it could be used to make a death ray. Maiman said he couldn’t rule that out. The next morning, the papers were filled with headlines like, “LA Man Builds Death Ray.”

The inventor himself felt the term misrepresented his work. Yet Maiman and other researchers—many of whom replicated Maiman’s simple design after looking



at newspaper photos—cheerfully classified laser power as “one-Gillette” on up, depending on how many razor blades the beam could cut through. By 1964, a laser was slicing a metal table and threatening James Bond’s most vital organs in the smash-hit film *Goldfinger*.

Yet the reporter’s question about death rays was well grounded. Although it took a convoluted path, the birth of lasers could be traced back to the British military’s interest in death rays.

In the mid-1930s, rumors began circulating that Nazi Germany was developing a radio-frequency death ray that could incinerate cities and people. In January 1935, the British Air Ministry asked Sir Robert A. Watson-Watt, an engineer, if he could build an electromagnetic death ray to use against aircraft. Watson-Watt calculated that the weapon would be impractical, but noted that radio waves could detect enemy aircraft long before they reached their targets. One month later, he demonstrated the first modern radar system.

Britain later shared radar with the United States. The allies achieved massive advances in radio-frequency and microwave technology, signal detection, and electronics, said Arthur Siegelman, a Stanford University electrical engineer and microwave and laser optics pioneer. He noted that the United States recruited many top academic physicists to work on these problems at labs at MIT, Harvard, Columbia, Bell, and other locations.

By the end of World War II, it was clear that engineers and scientists had not only saved Great Britain from the blitz with radar, but had ended the war with the atomic bomb. Policymakers continued to fund many research laboratories, hoping for the next breakthrough.

Columbia University, for example, had worked on radar magnetrons during the war. After 1945, the newly created Office of Naval Research left the lab’s microwave equipment in place and provided funds to continue its research. In 1948, Townes joined the lab. He had spent WWII developing a 1.25-centimeter-wavelength microwave radar bombing system. At Columbia, he hoped to use governmental surplus microwave equipment to probe the structure of molecules and atoms.

The Navy was pushing for higher frequencies in the millimeter range so it could reduce the size of its radar systems to make them easier to mount on ships. This was a high priority project, because aircraft had become a decisive factor in projecting sea power during World War II. Unfortunately, the electronic techniques used to generate the relatively long microwaves used in radar could not oscillate higher-frequency microwaves. The Navy pushed researchers to find an answer.

“Enough Meetings”

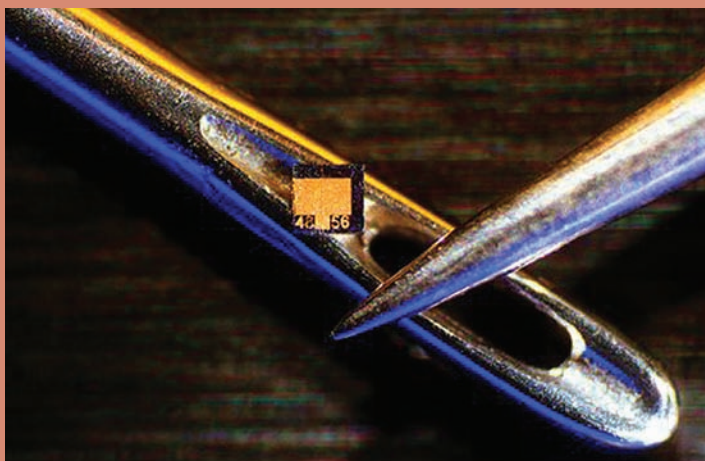
The Columbia Radiation Laboratory, where Townes was now director, was a major recipient of this largess. Yet by 1951, Townes was ready to give up. “We’d had enough meetings, that we had really surveyed everything that was going on, surveyed our own ideas. And so I was beginning to feel that, well, we may be coming to an end as to what we could usefully do immediately,” he recalled in an interview years later.

Dejected, Townes went to Washington, DC, for a final meeting of the Office of Naval Research’s microwave panel. He was an early

riser. While sitting on a park bench waiting for a restaurant to open for breakfast, he found the way forward. Instead of trying to make electronic devices small enough to generate short wavelengths, Townes realized he could generate high-frequency radiation by pumping energy into atoms and molecules and then stimulating them to emit energy.

It’s All a Matter of Scale

Lasers range in size from microscopic diode lasers, top, with numerous applications, to football-field-sized neodymium glass lasers, bottom, used for inertial confinement fusion, nuclear-weapons research and other high-energy-density physics experiments.





Townes whipped out—what else?—an envelope and calculated that ammonia molecules could emit short-wavelength microwaves. Moreover, the output would be coherent—that is, it would produce only a single frequency of radiation.

It took another three years for Townes and two graduate students to develop their device. He called it a maser, for *microwave amplification by stimulated emission of radiation*. The science behind the maser would eventually lead to what Townes called the optical maser, or laser.

The maser essentially trapped energized ammonia gas in a resonant cavity, then hit it with microwaves. This stimulated the emission of microwave radiation, which the cavity prevented from escaping until it built up sufficient intensity. Researchers eventually learned to generate photons from other materials, including rubies.

Masers did not solve the Navy's radar problem, but they did find some interesting applications. Used in amplifiers, they helped to capture satellite data and to discover the background temperature of the universe. They formed the heart of the first atomic clocks. Meanwhile, researchers kept looking for ways to work with shorter wavelengths.

Lighting the Way

Townes kept gnawing at the problem. At first, he focused on infrared rays, the next shortest wavelengths in the spectrum, but they proved intractable. In 1957, he realized that he could bypass across the infrared entirely and work with much higher frequency visible light.

That same year, Townes and his colleague and brother-in-law, Arthur L. Schawlow of Bell Labs, wrote a landmark paper that described (at least in theory) the components needed to make an optical maser. It involved many elements used in the maser, such as pumping a suitable material to a higher energy level and containing the stimulated photons in a resonant cavity prior to release.

That set the race for the laser in motion. In addition to Columbia, the major contenders included Bell Labs, IBM, Westinghouse, and defense contractor TRG.

Gordon Gould, a doctoral student at Columbia, had discussed some of his ideas about optical pumping—using light to energize a photon source—with Townes in 1956. This proved the key to energizing photon sources. In November 1957, Gould bought a dime-store notebook and in one weekend filled it with details of how to energize a lasing material with light and build a resonator using mirrors to amplify the photons. He called his optically pumped resonating device a laser, the first use of the word.

Gould took his notebook to a nearby candy store and had it notarized. It took 30 years, but on the basis of those early jottings, Gould overturned Townes and Schawlow's patent on the laser. Yet Gould was not the first to build a working

laser. Although he had left Columbia to work on the project at TRG, he was barred from the top-secret program because he had participated in a Marxist study group while at college.

Instead, the honors fell to Maiman, the darkest of dark horses. Most top U.S. researchers clustered around New York City. Maiman worked at Hughes Research Laboratories in Malibu, CA, overlooking the Pacific Ocean. He was certainly not a star on the

meeting circuit, though he had published papers. Maiman's advantage lay in the strength of his convictions and the clever ways he found to navigate around barriers.

His choice of ruby showed his willingness to go against the crowd. In 1959, Schawlow had delivered a conference paper that showed that ruby would not make a good photon source for lasers. Maiman was not convinced. He had worked with ruby-based masers at Hughes and understood the material and its properties better than most. Well enough, in fact, to spot flaws in Schawlow's calculations.

Maiman also knew how to slip past problems. While others worked to develop a continuous-light source powerful enough to pump their photon source, Maiman opted for pulsed power. He found what he was looking for in an off-the-shelf coiled xenon flash lamp. While he would not be able to operate his laser continuously, he could produce a beam of coherent light. This allowed him to move past others, such as Westinghouse's Irwin Wieder, who worked with rubies but

Why Lasers Work

Albert Einstein is ordinarily associated with the type of chain reaction that releases energy in an atomic bomb. Less well known, he also developed the theory of stimulated emission that is the basis of the chain reaction that releases photons in a laser.

The laser story began in 1916, when Einstein turned his attention to how light (which is really a form of energy) interacted with matter. When an atom absorbed a photon, the added energy would push one of its outermost electrons up to the next highest energy level. The electron would then spontaneously emit a photon and would return to a lower energy level. This is what creates ordinary light when, say, passing an electrical current through a light bulb's filament.

But what happens when a photon strikes an already excited electron that cannot move to a higher energy state? According to Einstein, if the photon had the right amount of energy, it would pop a photon loose from the electron. Equally important, the two photons would have the same energy and momentum. In other words, they would be coherent.

Those two photons could then interact with other excited electrons, releasing additional photons. This constant doubling of photons is the chain reaction that generates massive amounts of coherent light in lasers.

As the 1950s ended, many research groups using light sources to pump the electrons in their photon sources—often rubies, semiconductors, or gases—to higher energy levels. Many had found a way to contain the chain reaction in a mirrored resonator, so light could reflect back and forth as the chain reaction built. Finally, in May 1960, Theodore Maiman of Hughes Research Laboratories built the first laser to reduce Einstein's insights to practice.



could not pump enough energy using tungsten lamps.

While Hughes moved its laboratories from its air hangers in Culver City to a new research facility in Malibu, Maiman worked at home on the design. He was very secretive. "He writes a paper to show management he's doing something, while not telling anyone of the design," noted science writer Jeff Hecht, who wrote *Beam: The Race to Make the Laser*.

Back in the lab, Maiman built his laser. "It worked the first time, though the beam quality was modest," said Hecht. "TRG replicated it within two or three weeks. Bell Labs followed a few weeks later. They were all working from a press release using a picture different from the actual laser, since the photographer had thought it looked prettier with five coils and a thinner rod."

Others adapted Maiman's design to their own devices.

At IBM, Peter P. Sorokin added mirrored ends to the calcium fluoride crystals and created a laser that needed less input power. At Bell Labs, Schawlow created a laser from a different type of ruby crystal. Another group at Bell used a combination of helium and neon to produce the first gas laser. Neodymium-glass and gallium-arsenide diode lasers followed within a couple of years.

Bell researchers were the first with a paper on lasers in the United States, and their publicity machine implied that they had invented the laser.

Maiman later called the laser "a solution looking for a problem." It did not take long to find. Lasers took the research world by storm. Many investigators were attracted by one unexpected property of Maiman's laser: high power. Unlike masers, lasers put out tremendous energy. This opened the door to entirely new applications.

Roughly 18 months after Maiman's press conference, surgeons at Columbia-Presbyterian Hospital in New York City used a laser to destroy a retinal tumor. Today, lasers act as scalpels for all kinds of surgery and to burn off tumors and treat cosmetic blemishes.

The early "eight-Gillette" lasers morphed into laser cutting, etching, and welding tools. Many retail stores have laser barcode readers. Lasers create holographs, imprint circuitry on semiconductor wafers, align precision machinery, and weld together metals or plastics to make three-dimensional parts from CAD drawings.

At home, they read music and movies from CDs and DVDs, and transmit telephone, television, and internet service over optical fibers. No boardroom presentation is complete without a laser pointer.

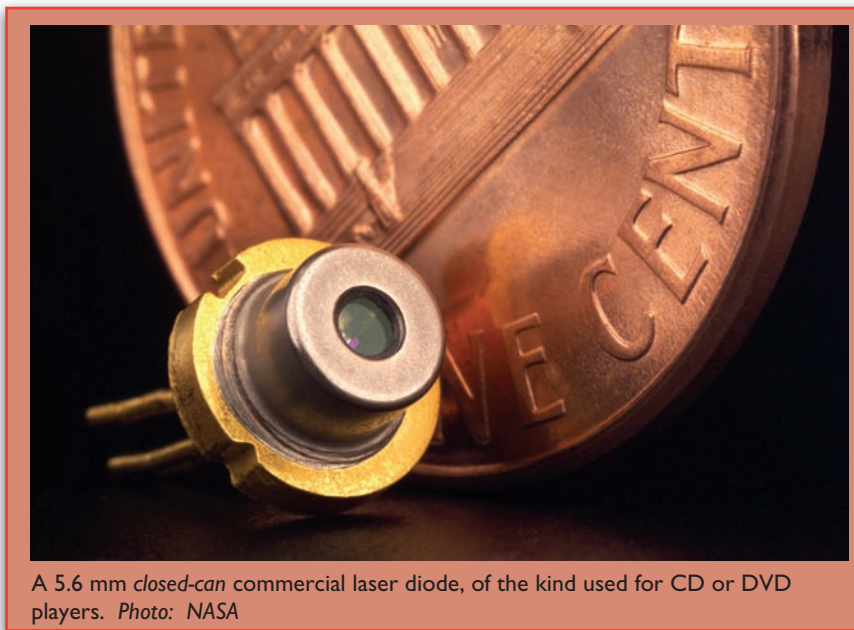
Many laser researchers earned renown for their discoveries. In 1964, Dr. Townes and two Russian scientists, Aleksandr M. Prokhorov and Dr. Nicolay G. Basov, won the Nobel prize in physics for fundamental work in quantum electronics and laser theory. Schawlow and Dr. Nicolaas Bloembergen (who built the first ruby maser) shared the prize in 1981 for contributions to laser spectroscopy and nonlinear optics.

Gould won his first major patent victory in 1987, and laser manufacturers began to settle their cases against him. He was elected to the National Inventors Hall of Fame in 1991.

Maiman was nominated twice for a Nobel prize but never won. He did win other prestigious awards, including the Japan prize, Wolf prize in physics, and Oliver E. Buckley condensed matter prize. He was inducted into the National Inventors Hall of Fame in 1984.

In March 1962, General Curtis E. LeMay, *Ohio Gamma '32*, Air Force chief of staff, told a crowd

at Assumption College in Worcester, MA, that the Air Force wanted to develop light-beam weapons that could divert satellites in orbit and perhaps even knock down incoming missiles. It was not exactly a death ray, but in the public mind, it was close enough. The military continues to investigate beam weapons.



A 5.6 mm closed-can commercial laser diode, of the kind used for CD or DVD players. Photo: NASA

Alan S. Brown has been an editor and freelance writer for more than 25 years and lives in Dayton, NJ (insight01@verizon.net). A member of the National Association of Science Writers and former co-chair of the Science Writers in New York, he graduated *magna cum laude* from New College at Hofstra University in 1974. He is an associate editor of *Mechanical Engineering* and contributes to a wide range of engineering and scientific publications.

Engineers and Scientists: Similarities and Differences

by Dr. Henry Petroski, P.E., New York Xi '63

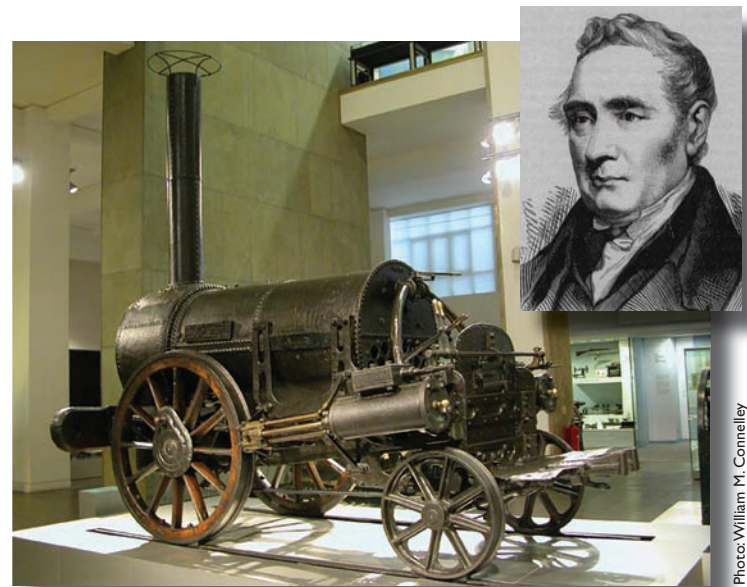
It is an irony that engineering gets less-frequent and less-explicit public recognition than science, for it is engineering and not science that has a direct influence on our daily lives, on our comfort, and on our standard of living. There is little immediate impact of the scientific discovery of a new physical phenomenon or a new chemical element. Such events are newsworthy in themselves, of course, but they may or may not ultimately influence our lives. The real but often unstated significance of a discovery is its potential engineering promise in the form of new electronic devices or new materials. Little of the “benefit on mankind” that chemical engineer Alfred Nobel wished to honor derives from a disembodied physical phenomenon or the addition of the name of a new element to the periodic table. These are certainly intellectual and scientific achievements of the first order, but in themselves they do not necessarily benefit that most abundant segment of mankind that is seeking to raise itself toward the status of the developed countries, where achievement is measured not in scientific theories but in engineering realities.

Engineering was not always the neglected sibling. In nineteenth-century Britain, engineers were heroes. It was engineers who had given the developed world, at least, its canals, railroads, steamships, the telegraph, sanitation, electric light, and inventions and gadgets galore. The Victorian engineer was held up as a model not only of industry and invention but also of honesty and goodwill. Samuel Smiles's hagiographies of the likes of George and Robert Stephenson, who brought intercity railroads to Britain and so changed the way people traveled, were collectively known as *Lives of the Engineers*. Smiles's *Lives* went through numerous editions, some appearing even as late as the early twentieth century, providing clear evidence that his stories of achievement and virtue were read and read widely.

Heyday of Engineering

Today, British engineers look back forlornly at their nineteenth-century counterparts and what they see as the heyday of engineering in the context of society. In his president's address before a meeting of the Institution of Structural Engineers, David I. Blockley, among his many accomplishments a most thoughtful theorist of engineering, described a common lament among contemporary British engineers, namely, that “even very able engineers sometimes feel it necessary to apologize for themselves and say, when faced with anything remotely outside their field, ‘I'm only an engineer.’”¹

Science as we know it today was in fact threatened by engineering in the late-nineteenth and early-twentieth centuries—not a little because of the celebration of the Victorian engineers specifically and of engineering and



The pioneering rocket locomotive built in 1929, and inspired by George Stephenson, inset, is shown preserved at the Science Museum in London.

technology generally in the pages of the likes of *Scientific American*. Given the overwhelming benefits that came from inventions like the telegraph, telephone, electric light and power, and radio, science seemed at best to be the handmaiden of engineering. After all, it was the Industrial (and not the Scientific) Revolution that so raised the standard of living in the Western world. The scientific coup of capturing the prizes endowed by the engineer Nobel was emblematic of how science strove for recognition at the time. The development of the atomic bomb crowned a decades-long struggle of scientists to win victory over the engineers. They did it by having more egocentric personalities, more gentlemanly influence in Washington and the academy and in society generally, and by scaring the world.

Being the entrenched dominant and more visible class that they are, it is no wonder that scientists—mad, egghead, or otherwise—fare better in newspapers and in the polls than engineers. One can speculate on the reasons. Scientists and advocates of science engage in their own kind of public relations. The efforts of the National Science Foundation to explain “how basic research reaps unexpected rewards” can be viewed as falling into this category. By providing examples of how basic research—unmotivated other than by being science for science's sake—can ultimately produce advances in health care, public safety, and other incontrovertibly important areas, the audience might be said to be conditioned to have a high tolerance for scientific research, no matter how abstract or metaphorical. By repeating

the conventional wisdom that “scientific discovery makes invention possible,”² a director of the NSF reinforced the seeming primacy of science over engineering and all other technological endeavors.

It is an old joke among engineers that when newspapers report some positive technological achievement—like a successful rocket launching or the safe landing of an interplanetary probe—it is attributed to scientists. When something negative happens—like a rocket exploding on the launch pad or a probe going astray or otherwise malfunctioning—it is the engineers who are blamed. In a story about a promising new fusion method, scientists were credited with achieving thermonuclear fusion with a blast of X-rays. The method was described as potentially simpler than that of using magnetic fields to compress hydrogen, but admittedly the new method presented “an engineering challenge that scientists have only begun to think about.” After describing alternative approaches to solving the engineering problem, the conclusion was that to choose among them, “We definitely need more physics.” Though elaborating on the engineering problem, whose solution holds great promise for producing electrical power, the story on the new fusion method had not one mention of engineers.³ Like all generalizations, this view of how the press treats scientists and engineers differently is not invariably true, but it occurs often enough for it to have a subtle and cumulative effect on public opinion.

Slide Rule Set

There have been some indications that things may be changing, in engineering and elsewhere in society. A newspaper feature, which appeared remarkably in the house-and-home section of the *New York Times*, ran under the headline, “Slide-Rule Set, Nameless No More,” with the sub-heading declaring that “The elegant poetics of engineering creates a new model for home building.” One New York engineer, Guy Nordenson, who has collaborated with architects, is described as a “Renaissance nerd,” giving the normally pejorative term a new twist. By way of explanation, the author described engineers who, in their younger years at least, played flamenco guitar, raced bicycles, and who still quote Rainer Maria Rilke and Ezra Pound. While some of the Renaissance nerds eschew the mantle of celebrity engineer, others embrace it, “determined to recast the image of the engineer in the more exciting role of inventor.”⁴

Not surprisingly, among the engineers described in the *New York Times* piece is the engineer-architect-artist Santiago Calatrava, who, evoking Le Corbusier’s remark that a building is a machine to live in, was quoted as saying, “A building is a sculpture you walk into.” Calatrava’s structures graced Europe long before they reached America. But his first project in the U.S.—the Milwaukee Art Museum addition—with its dynamic *brise soleil* that unfolds like a bird’s wings to shade the structure from the sun—was a resounding success. Described as a “poet-engineer and architect,” Calatrava is the kind of individual who can single-handedly change the public image and the self-image of the engineer.

But in fact the world has long been familiar with engineers like Calatrava, who is in the tradition of the Swiss

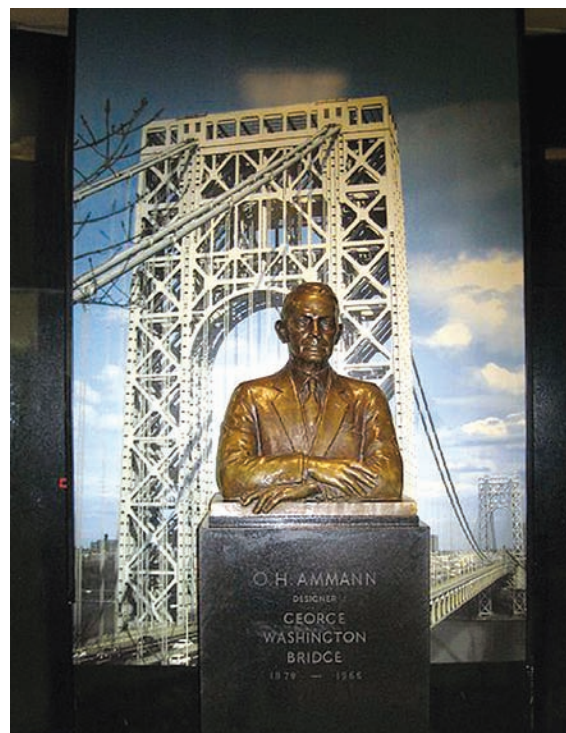


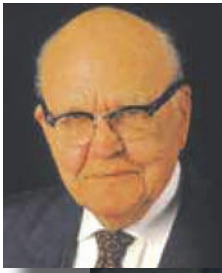
Photo: Jim Henderson

A bust of bridge builder and Tau Bate Othmar H. Ammann at the George Washington Bridge bus station in New York.

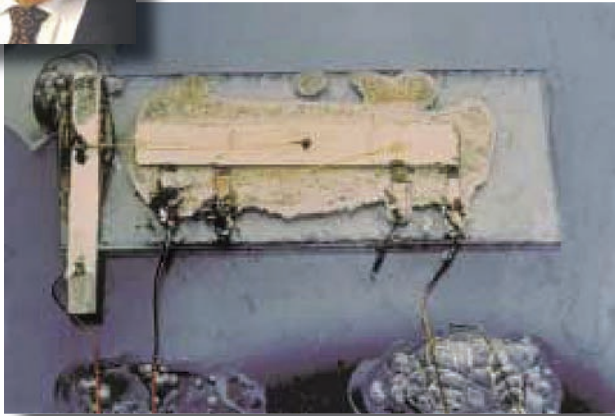
bridge builders Robert Maillart and Christian Menn, whose work has been the subject of an exhibition curated by David P. Billington for the Princeton Art Museum. Billington’s classic book, *The Tower and the Bridge: The New Art of Structural Engineering*,⁵ is an excellent introduction to the values of engineering, as is his brilliantly innovative, *The Innovators: The Engineering Pioneers who Made America Modern*,⁶ which presents engineering in the social context in which it always must work, showing that the equations used by nerds, enlightened or not, necessarily have embedded in them the values of society.

The value-laden achievements of engineers like Eiffel and Maillart, and Menn and Calatrava, whose careers and whose works collectively span more than a century, belie the fear that there is a crisis in engineering. In fact, there always have been and we can expect that there always will be engineers who rise above the rest and excel. America has had its John Roebling and James Buchanan Eads and Othmar H. Ammann, *New York Epsilon '02*, and a host of other giants of design and construction. Acknowledging them raises the issue of the great-man theory of history, which has fallen out of fashion, but the reality is that the process of conceiving and carrying out a great engineering project takes a leader, a visionary, an entrepreneur, an innovator, a great man or woman—now that women are no longer discouraged from joining the profession.

It is no accident that it is bridge builders who come most immediately to mind when thinking and speaking about engineering and art and values—and visibility. Bridges are pure engineering structures. Their form and their function are one. They need no great façade or other architectural embellishment, though chief engineers sometimes do hire architects as consultants. That is not to say that architec-



PHOTOS COURTESY OF TEXAS INSTRUMENTS



FIRST INTEGRATED CIRCUIT: Jack S. Kilby, *IL A '47*, inset, invented the integrated circuit at Texas Instruments in 1958. Comprised of only a transistor and other components on a slice of germanium, Kilby's invention, 7/16-by-1/16-inches in size, revolutionized the electronics industry.

tural details, embellishments, and accidents do not make a difference in bridge building. The Golden Gate Bridge would not likely be the iconic success that it is were it not for its art deco architectural theme and the wisely chosen color of its paint. In an analogous way, the overall appearance of New York's Bronx-Whitestone Bridge benefits greatly from the sleek architectural treatment of its massive anchorages. Though architects did contribute to the appearance of such bridges, it was always the chief engineer who chose the architect—as he did the assistant engineers—and made the final decision as to what architectural and engineering advice to accept or reject and at what time to curtail calculations and begin building.⁷

There are many masterpieces of structural art among the bridges of America, and not all of them are the work of widely known engineers. Numerous bridges on the Oregon coast highway, for example, are the work of state bridge engineer Conde B. McCullough, *Iowa Alpha 1910*. Constructed mostly during the 1930s, they are without peer in the genre of the reinforced concrete arch. The Sunshine Skyway Bridge across Tampa Bay, perhaps until recently the most well-known and widely-recognized cable-stayed bridge in America, was the work of the late Eugene C. Figg, *South Carolina Gamma '58*, who also designed the spectacular soaring concrete arch carrying the Natchez Trace Parkway across a quiet Tennessee highway. Among the newest high-profile cable-stayed bridges in America is the awkwardly named but beautifully lighted Leonard P. Zakim Bunker Hill Bridge across the Charles River. This engineering achievement seems to serve as the signature backdrop for virtually every television interview that takes place in Boston, a subtle reminder of an upstaged profession.

The differences in self-image and expectations between scientists and engineers are perhaps nowhere so striking as in how they view the world and their place in it. Scientists, especially those who deal directly with the mysteries of the universe, must certainly have big egos and feel a strong sense of self-worth. How else could they presume that they can discover fundamental laws of nature and unlock secrets

that have been kept since the beginnings of time? Even the most ambitious and self-confident of engineers, those who direct great projects that result in the longest bridge or the tallest skyscraper in the world or who produce the smallest machines or the strongest materials, seldom claim to understand everything that they do. Whenever they work on the frontiers of technology, engineers invoke the art of engineering and engineering judgment to carry their work across the gaps in scientific knowledge about whatever it is they might be doing. Humble engineers ultimately invoke and apply a factor of safety to their designs, effectively coating them with a buffer of protection from the unknown or unknowable.

Jack S. Kilby, *Illinois Alpha '47*, is one of the few engineers to be awarded a Nobel prize—in physics in 2000 for his 1958 invention of the integrated circuit—which occurred shortly after he joined the staff of Texas Instruments to do research in miniaturization. Following his early success, he, like many others in the fledgling semiconductor industry, was looking for applications for the chips of silicon that have been called stone circuits. In 1965, in the more managerial role that successful engineers tend to rise to, Kilby summoned some engineers into his office and told them that he and the president of Texas Instruments had been talking, and what they wanted the company's engineers to come up with was “some kind of personal computer.” This was when digital computers were still room-sized and mechanical desk calculators were the size of typewriters and had the look of cash registers. What Kilby described to his engineers was unheard of—a computer no bigger than the book on his desk, something that could fit in his pocket and operate on batteries. It had to have some buttons or other means of inputting a problem it was to solve, and it had to have some lights or some other display to announce a solution. Kilby called the thing a “slide-rule computer.”⁸

Back to the Drawing Board

The product Kilby described was without precedent. According to one of the engineers who was at the meeting, after Kilby laid out what was wanted, “There was probably not more than 10 seconds of silence, because engineers don't laugh at absurdities. When you tell 'em you want to do something, they just give it their best shot.”⁹ The project became known by the code name *Cal Tech*, and two years later Kilby's engineers presented him with “a black aluminum box studded with numbered keys the size of sugar cubes, the whole assembly closer in bulk to a hardcover than a paperback.”¹⁰ The result, “the world's first cordless, portable calculator,” disappointed the president of Texas Instruments because it was not what he envisioned as being capable of launching integrated circuits into the mass marketplace. The engineers were sent back to their drawing boards and, after three years, during which time microchips shrank in size and advanced in computing power, the company released its first electronic scientific calculator—at a price (\$350) that may have been extraordinarily high for everyday consumers but not for scientists and engineers who immediately saw its advantages.

Neither scientists nor engineers can just will into existence a solution to a problem, but engineers always have the advantage in finding one. Scientists and engineers are bound by the same laws of nature, the same building blocks of the universe, and the same methods of inquiry. But, in addition, engineers have the advantage of seeking something to make rather than just explaining what is already made. If there is no chemical element between potassium and calcium (atomic numbers 19 and 20, respectively), chemists cannot make one in the laboratory. However, if there is no bridge between New York and New Jersey, engineers can (and did) design and construct one. According to Willy Ley, writing in the visionary *Engineers' Dreams*, "the word fantastic, when applied to engineering, merely means 'it has not yet been done.'"¹¹

Engineers frequently invoke aerodynamicist Dr. Theodor von Kármán's, *California Beta '02*, oft-quoted distinction between scientists and engineers: "The scientist seeks to understand what is; the engineer seeks to create what never was." The only camp from which I have heard objections to this distinction is the chemists, especially synthetic chemists. Granted, a chemist synthesizing something that was theretofore unknown in nature is creating what never was. Yet most chemists no more want to be described as engineers than real engineers want to be described as scientists, our engineering educational system notwithstanding.

We can extricate ourselves from the apparent dilemma presented by von Kármán's dichotomy in a simple way. The "pure" scientist may indeed seek to understand the given universe and its various components, and the "real" engineer may seek to create things that are not found in nature. However, the apparent scientist/engineer duality is in fact a continuum, with von Kármán's distinction being only a caricature. The overwhelming majority of scientists and engineers move freely back and forth along the continuum of seeking truth in nature and seeking beauty in things.

Laws of Nature

Everything made, whether by scientists or engineers, may be considered natural in the sense that it ultimately consists of the fundamental chemical elements and is wholly compatible with the laws of nature. We laugh at perpetual-motion machines precisely because they purport to violate the basic laws of thermodynamics, and we recognize how absurd it is to think that anyone can seriously believe those laws can be violated by some clever manipulation of components, materials, and processes. The term artificial and synthetic are often used in a pejorative sense in opposition to natural. In fact, everything is natural in the sense that it is made up of ingredients and formed of processes that come from and comply with the laws of nature. We really are using the term natural as shorthand for naturally occurring. But even here, we misrepresent the reality. Cotton may be said to be a natural fabric, but cotton shirts do not occur in nature. They are the product of harvesting, ginning, dying, spinning, weaving, sewing, and, perhaps the most unnatural of all processes, marketing. If cotton feels better to wear than polyester, then so be it, but it is not necessarily because cotton is more natural than polyester.

Another form in which von Kármán's distinction is often presented is as follows: "Science studies what is; engineering creates what never was." This anthropomorphizing of the activities of science and engineering is usually considered to make the same point as the distinction between scientists and engineers. In fact, that is not at all the case, and therein lies a further confusion between scientists and engineers. Scientists can indeed have as their motivating goal the understanding of nature, of what is, but that is not to say that they always pursue that goal exclusively. Sometimes, in order to gain further insight into some naturally occurring substance or process, they have to design an experiment or a piece of apparatus or an instrument that enables them to carry their investigation forward. Similarly, engineers may indeed wish to create things that do not occur in nature, but that is not to say that they are always engaged directly in that pursuit. Sometimes, in order to make an advance toward their goal of a new machine or process, they have to go off on a tangent in order to gain a more complete understanding of some impediment that stands in the way of their objective. This is what the Wright brothers had to do when they could find no scientific theory on which to base the shape of a wing or propeller. Mechanical engineer Dr.



It's all rocket engineering! The April 12, 1981, launch at Pad 39A of STS-1, just seconds past 7 a.m., carried astronauts John W. Young, *Georgia Alpha '52*, and Robert L. Crippen, *Texas Alpha '60*, into an earth orbital mission scheduled to last for 54 hours, ending with an unpowered landing at Edwards Air Force Base, CA. Photo: NASA

Simon Ostrach, *Ohio Alpha '44*, whom NASA has recognized as one of a dozen "superstars of modern aeronautics," has argued for an R&D process—which he designates R4D—in which a design is the ultimate goal and scientific research is conducted in service to that goal.¹²

When scientists and engineers do deviate from the ideal distinctions made by von Kármán, they in effect move away from the ends and toward the middle of the continuum on

which they operate. When scientists depart from pure science, they engage in a sort of engineering; when engineers deviate from pure engineering, they engage in a sort of science—that known as engineering science. In other words, scientists can and do engage in engineering, and engineers can and do engage in science. The two lines of thinking about von Kármán’s distinction—defined by the scientist/engineer and the science/engineering endpoints—are not really parallel but orthogonal. The continuum between scientist and engineer and the one between science and engineering are two dimensional, and the activities of scientists and engineers engaged in a project can be plotted as points on the plane defined by the scientist-engineer and science-engineering axes.

If we can overcome our habit of thinking of the left side of the line of abscissas as negative and the lower portion of the line of ordinates as negative, we can plot points describing scientists and engineers engaged in scientific and engineering activities without prejudging either to be positive or negative, good or bad, better or worse, depending on the quadrant in which they fall. A plot of points representing all sorts of activities of scientists and engineers is likely to look more like data coming from a random-number generator than lying on a deterministic graph.

The fact of the matter is that virtually all scientists do engineering and all engineers do science to varying degrees at various times in their careers. During World War II, scientists working on the Manhattan Project engaged in considerable engineering, represented by points located in the second quadrant. Engineers working on the same project no doubt collaborated with scientists to engage in activities deep in the fourth quadrant. Indeed, the plot of all points representing the scientific and engineering activities of all scientists and engineers would likely occupy those quadrants with a much greater frequency than they did the first and third, where scientists performing science and engineers doing engineering would be located.

Same Basic Problem

In some instances, the same basic problem attracts scientists and engineers equally. The engineering science of fluid dynamics, which is applicable to a wide range of phenomena, “from the turbulent flow of cosmic jets to the sound raindrops make when they strike the surface of a lake,” was recently the focus of a newspaper article. “The apparent simplicity of fluid dynamics is an illusion. Scientists and engineers,” the reporter went on, giving both camps equal billing, “have been struggling to understand the behavior of flowing fluids—which can be liquids or gases, but also piles of sand or heaps of mixed nuts—for centuries, but mysteries in the field still remain.” Such mysteries can account for the spontaneous failure of grain hoppers or the disintegration of a space shuttle returning to the earth’s atmosphere. It takes scientists and engineers, engaged in pursuits called science and engineering, working together to solve those mysteries and thus make water flow more smoothly from a pitcher or air move more silently and effectively to ventilate a room.¹³

If significant progress is to be made in solving more earth-shaking problems that of late have been the focus of attention everywhere from the mass media to peer-reviewed journals of science and engineering, then it behooves scientists and engineers to understand each other as well as themselves and their respective and cooperative roles in the larger scheme of things. The solution of global problems relating to climate, energy, security, the environment, and the world economy requires global thinking. Engineers and scientists are perfectly capable of such thinking, but it must be done in the context of a synergistic approach to the complimentary scientific and engineering goals of understanding the world as it is and seeking to change it for the better.

Endnotes:

- ¹ D.I. Blockley, “Thinking Outside of the Box, with Phil’s Eight New Maxims,” *The Structural Engineer* 79: 22-29 (16 October 2001), pp. 23-24.
- ² National Science Foundation, *How Basic Research Reaps Unexpected Rewards* (Washington, DC: National Science Foundation, 1980), pp. i-ii.
- ³ Kenneth Chang, “New Fusion Method Offers Hope of New Energy Source,” *New York Times*, April 8, 2003, p. F2.
- ⁴ Julie V. Iovine, “Slide-Rule Set, Nameless No More,” *New York Times*, January 30, 2003, pp. D1, D7.
- ⁵ David P. Billington, *The Tower and the Bridge: The New Art of Structural Engineering* (New York: Basic Books, 1983).
- ⁶ David P. Billington, *The Innovators: The Engineering Pioneers who Made America Modern* (New York: Wiley, 1996).
- ⁷ For another view, see John van der Zee, *The Gate: The True Story of the Design and Construction of the Golden Gate Bridge*. (New York: Simon & Schuster, 1986).
- ⁸ Jerry D. Merryman, as quoted in Jeffrey Zygmunt, *Microchip: An Idea, Its Genesis, and the Revolution It Created*. (Cambridge, MA: Perseus, 2003), p. 86.
- ⁹ *Ibid.*
- ¹⁰ *Ibid.*, p. 92.
- ¹¹ Willy Ley, *Engineers’ Dreams*. Revised edition (New York: Viking Press, 1954), p. 16.
- ¹² Simon Ostrach, “Microgravity and the Human Exploration of Space Technology Challenges,” *Technology in Society*, Vol. 30, issues 3-4 (August-November 2008): pp. 411-414.
- ¹³ Bruce Schechter, “From Flowing Fluids, Beautiful Images and Unlocked Secrets,” *New York Times*, June 24, 2003, p. F3.

Dr. Henry Petroski, P.E., New York Xi '63, is the Aleksandar S. Vesic professor of civil engineering and a professor of history at Duke University. His most recent book is *The Essential Engineer: Why Science Alone Will Not Solve Our Global Problems*. A member of the National Academy of Engineering, a distinguished member of the ASCE, and a fellow of the ASME, American Academy of Arts and Sciences, and Institution of Engineers of Ireland, he has received the Washington award from the Western Society of Engineers.



EXECUTIVE COUNCIL MEETING

The Executive Council met by web and teleconference on Jan. 15 and 26, Feb. 16, and March 9, 2010.

The Council voted a TBPI Distinguished Service Award to retiring District 2 Director Andrea J. Pinkus, *NY A '97*. Major Jammie L.H. Jamieson, *CO Z '00*, was re-appointed to the Fellowship Board for a term ending July 31, 2013. Matthew T. Pittard, *UT B '01*, was appointed as District 13 Director to a term ending June 2012.

Councillor Jason A. Huggins reported on the meeting of the District Program Planning Committee in Atlanta on January 16. The 2009 Convention held in October in East Brunswick, NJ, and Rutgers University was reviewed and judged to have been successful, and the Council reviewed recommendations presented during the annual meeting and revised plans for the 2010 Convention. In compliance with a recommendation from the 2009 Convention, the invitation of the Kentucky Alpha Chapter to host the 2012 meeting in Lexington was accepted. The Council modified a policy to limit either on-site or full reimbursement of advisors to one per chapter in 2010.

Vice President Solange C. Dao was appointed Installing Deputy for the Kentucky Gamma installation on Feb. 27 and Councillor Norman Pih as Installing Deputy for the Idaho Gamma installation on March 13.

Dr. Philip M. Gerhart, P.E., *IN B '68*, was appointed Chair of and Drs. Robert J. Marley, *MT A '83*, and Cheryl B. Schrader, *IN A '84*, were appointed to the National Outstanding Advisor Selection Committee. District Directors B.A. Kramer, J.A. Hester, and C.D. Gomulinski were appointed to the Laureate Selection Committee.

A schedule of Spring District Conferences was reviewed, and assignments were made for national-official representation at all 16 Districts. The Council established a policy to pay for the conference expenses of representatives whose institutions had been granted charters by the previous Convention.

Executive Director J.D. Froula reported on the status of the 2009 Alumnus Giving Program, on expense cost savings realized during 2009-10, on the status of the multi-state charitable-organization registration project, and on the various information-technology improvements; his first-quarter and second-quarter financial reports of the fiscal year had been sent to the Council and were accepted; GEICO contributed \$14,000 in December for seven TBPI-GEICO Scholarships; and a \$460,000 bequest from the estate of Charles O. Forge, *CA I '56*, was received. His draft of the TBPI Trust Investment Policy was received. A contract had been signed with Professional Publications Inc. to provide discounts on professional licensing exam review materials to all members for three years. The Council accepted the auditor's management letter and directed Mr. Froula to determine if TBPI internal controls and financial practices are similar to those of similarly sized honor societies.

President L.A. Simonson reported on his visits with alumni in Virginia and plans for future visits on behalf of the Financial Development Committee.

Councillor J.F.K. Earle reported on recent progress in the TBPI K-12 MindSET Program. A grant of \$50,000 was received in December 2009 for MindSET from the Stephen Bechtel Fund. David E. Dale, *NY II '06*, was appointed to the MindSET National Management Committee and Ashish Myles, *FL A '02*, to the Region 2 Management Committee for terms ending June 2012.

Project grants with cash awards were given under the MindSET Program to the Florida Delta and New Hampshire Alpha Chapters and under the GIG Program to the Ohio Iota Chapter, and the local projects will be reported in later issues of *THE BENT*.

Constitutional Amendment Ratified

The 2009 Convention approved one amendment to the Constitution and Bylaws of Tau Beta Pi and sent it to the chapters for ratification. In accord with the Association's amending procedure, with 234 chapters eligible to vote, 176 or more affirmative chapter votes are required to ratify an amendment, and 59 or more negative votes would defeat it.

The voting deadline was April 1, 2010. Headquarters received 188 valid ballots (plus 9 invalid for lack of a chapter quorum). The proposed amendment was therefore ratified.

Amendment

1. Require an Executive Council to take office within 11-14 months after its election. (Const. Art. III, Sec. 3(h))

Outcome

1. Ratified by chapter vote; 186 affirmative, 2 negative.

THE BEST PEOPLE ENGINEERING JOB BOARD

Tau Beta Pi has renamed its career center and job board, to alert members about the improved opportunities available through the partnership with JobTarget.

During challenging economic times, it is essential that TBPI members have a resource where they can seek employment, support, and information—www.tbpi.org.



Tau Beta Pi Names 102 Scholars for 2010-11

THE FELLOWSHIP BOARD announced the selection of 102 TBPi Scholars from 389 applicants for senior-year study in the 2010-11 academic year. Scholarships of \$2,000 are awarded to members on the competitive bases of scholarship, campus leadership and service, and promise of contributions to the engineering profession, with consideration given to economic need and academic commitment. This 12th group brings the total to 960 Scholars. Additional bios are posted on www.tbp.org.

The Nagel Scholarships are given in honor of former Secretary-Treasurer Emeritus R.H. Nagel, P.E., *NY A '39*.

The Record Scholarships are sponsored by Leroy E. Record, *KS A '29*, whose generous bequest in 2001 funded the Record Scholarship Fund to provide earnings for awards in perpetuity.

The Stabile Scholarships are named for Vincent A. Stabile, *NY A '40*, whose gift in 1999 endowed the award.

The Dodson Scholarships are sponsored by Charles R. Dodson, *MD B '30*, who made a generous gift to TBPi in 1998.

Ruth M. and Cleveland L. Campbell, P.E., IA A '47, made recent gifts to sponsor the Campbell Scholarships.

The Soderberg Scholarships are sponsored by Elsa and Peter H. Soderberg, *CT A '68*.

GEICO sponsors the seven GEICO Scholarships.

The Scribner Scholarships are named for A. Clayton Scribner, *NY G '29*, whose 2003 bequest endows the award.

The Fluor Foundation made a gift in 2010 to sponsor the tenth Fluor Scholarship.

The Mentor Scholarship is given in admiration of the 1926-46 automobile industry by James P. Tarwater, *MO B '51*.

The Alford Scholarship is named for Henry M. Alford, *MS A '27*, who left a bequest to the Association in 2005.

The Althouse Scholarship is named for Ernest E. Althouse, *PA A '26*, who left a bequest to the Society in 2006.

The Anonymous Scholarship is given by a generous donor who contributed 10 awards in 2006.

The Bose Foundation funds the fourth Bose Scholarship. **The Curtis Scholarship** is named for Richard A. Curtis, *OH A '64*, who left a bequest to the Society in 2007.

The Kolff van Oosterwijk Scholarship is named for H.L.J. Kolff van Oosterwijk, *CA A '50*, who left a bequest in 2008.

The Stechmeyer Scholarship is named for John P. Stechmeyer, *OH E '48*, who left a bequest to TBPi in 2008.

The Michael R. Lindeburg, P.E., Scholarships are named for the president of Professional Publications, Inc.

George P. Mitchell, TX A '40, made a special gift to sponsor the Mitchell Scholarship.

The Stanley Scholarship is named for 2009 Distinguished Alumnus—Richard H. Stanley, P.E., *IA A '55*.

Melissa L. McCoy, *Nagel Scholar No. 34*

MELISSA IS STUDYING CHEMICAL ENGINEERING at Georgia Institute of Technology. She expects to pursue a graduate degree and then move into industrial research, where she thinks the pace will suit her personality. Internships have included design and operating experience with a mining and chemical company in Chile, and she's spending this summer with BP working on oil exploration at a glacier in Alaska.



Chonpatin Phaiboonpalayoi, *Nagel Scholar No. 35*

CHON IS MAJORING IN PETROLEUM ENGINEERING AND ECONOMICS at the University of Texas at Austin, where he has already completed graduate-level research. He plans to return to work in his native Thailand, although salaries are about 10 times higher in the U.S., to start work on his ambition to improve education in Thailand. He may also apply for U.S. graduate school study in petroleum engineering.



SCHOLARSHIP	RECIPIENT	CHAPTER	FIELD OF STUDY
Nagel No. 34	Melissa L. McCoy	GA A '12	Chemical Engineering
Nagel No. 35	Chonpatin Phaiboonpalayoi	TX A '11	Petroleum Engineering
Dodson No. 36	Helen E. Durand	CA E '11	Chemical Engineering
Dodson No. 37	Kristina M. Hammarstrom	CA Φ '11	Chemical Engineering
Dodson No. 38	Pamela Jreij	CA AB '11	Engineering Management
Campbell No. 23	Justin T. Schultes	IA A '10	Bioengineering
Soderberg No. 14	Evan M. Herndon	IA A '10	Mechanical Engineering
Soderberg No. 15	Evan M. Herndon	IN A '11	Mechanical Engineering
Soderberg No. 16	Paul J. Morrison	OH B '11	Mechanical Engineering
GEICO No. 15	Mark T. Pomerence	IN Γ '11	Electrical Engineering
GEICO No. 16	John J. Bird	KS B '11	Aerospace Engineering
GEICO No. 17	Noah H. Cantor	FL B '11	Computer Engineering
GEICO No. 18	Casey M. Clark	MT B '11	Environmental Engineering
GEICO No. 19	Ryan M. Davis	NY Θ '11	Engineering & Management
GEICO No. 20	Eric S. Harper	OH Θ '11	Chemical Engineering
GEICO No. 21	Kevin M. Koryto	MI A '11	Biosystems Engineering
Scribner No. 13	Katherine F. Maass	TX A '11	Chemical Engineering
Scribner No. 14	Matthew D. Belley	NY Γ '11	Mechanical & Nuclear Engineering
	Kyle E. Watters	NY Γ '11	Chemical Engineering

SCHOLARSHIP	RECIPIENT	CHAPTER	FIELD OF STUDY
Fluor No. 10	Laura A. Divel	IN Γ '11	Civil Engineering
Mentor No. 7	Benjamin R. Forry	NY B '11	Mechanical Engineering
Alford No. 5	Michael W. Barton	MS A '12	Aerospace Engineering
Althouse No. 4	Avantika Agrawal	PA Δ '11	Computer Science Engineering
Anonymous No. 4	Lonna Gordon	NY P '11	Chemical Engineering
Bose No. 4	Steven J. Levine	MA B '11	Electrical Engineering & C.S.
Curtis No. 3	Michelle K. Sing	OH A '11	Polymer Science & Engineering
Kolff van Oosterwijk No. 2	Yacub E. Bholat	CA O '11	Civil Engineering
Stechmeyer No. 2	Kevin J. Vick	OH A '11	Engineering Physics
Lindeburg No. 1	Emily A. Henderson	UT Γ '11	Civil Engineering
Lindeburg No. 2	Jennifer A. Johnson	SC A '11	Civil Engineering
Mitchell No. 1	Michael W. Hackemack	TX Δ '11	Nuclear Engineering
Stanley No. 1	Alexander P. VanFosson	IA B '11	Chemical Engineering
Record No. 545	Tyler K. Andrews	SC A '11	Civil Engineering
Record No. 546	Brock B. Argyle	UT B '11	Chemical Engineering
Record No. 547	Olga A. Beltsar	IN Γ '11	Civil Engineering
Record No. 548	Cynthia E. Chen	TX A '11	Chemical Engineering
Record No. 549	David L. Freese	NE A '11	Electrical Engineering
Record No. 550	Shawn D. Furrow	VA B '12	Electrical & Computer Engineering
Record No. 551	Alisha M. Gillis	UT B '11	Electrical Engineering
Record No. 552	Anna K. Hailey	MS B '11	Chemical Engineering
Record No. 553	John G. Hoppe IV	SC A '11	Civil Engineering
Record No. 554	David Fan-Chung Hsu	IL A '11	Electrical Engineering
Record No. 555	Sean T. Hunt	DE A '11	Chemical Engineering
Record No. 556	Jonathan D. Jones	MS B '11	Chemical Engineering
Record No. 557	Kevin A. Lepre Jr.	AL E '11	Chemical Engineering
Record No. 558	Michael I. Levine	MA Θ '11	Computer Engineering
Record No. 559	Kevin E. Lindsay	GA B '11	Biomedical Engineering
Record No. 560	Michael P. Litchfield	NH A '11	Electrical Engineering
Record No. 561	Qingyi Liu	OH B '11	Electrical Engineering
Record No. 562	Daniel S. Livermore	WI A '11	Chemical Engineering
Record No. 563	Tai T. Luu	NJ Γ '11	Civil Engineering
Record No. 564	Chandra A. Macauley	MT A '11	Chemical Engineering
Record No. 565	Derrick C. Nelson	AL E '11	Electrical Engineering
Record No. 566	Joseph C. Nelson	AL B '11	Chemical Engineering
Record No. 567	Ehimwenma Nosakhare	DC A '11	Electrical Engineering
Record No. 568	Angela N. Oguna	KS A '11	Electrical Engineering
Record No. 569	Mark T. Olson	SD A '11	Electrical Engineering
Record No. 570	Robert J. Ontko	OH A '11	Chemical Engineering
Record No. 571	Aminy E. Ostfeld	RI A '11	Chemical Engineering
Record No. 572	Stephen P. Palecek	AL B '11	Electrical & Computer Engineering
Record No. 573	Matthew C. Peters	LA B '11	Engineering Physics
Record No. 574	Mark A. Pfingsten	OH A '11	Electrical Engineering
Record No. 575	Louis G. Reis	LA Γ '11	Biomedical & Chemical Engineering
Record No. 576	Michael A. Renkoski	MO B '11	Metallurgical Engineering
Record No. 577	Beatris R. Rusu	AZ B '11	Computer Systems Engineering
Record No. 578	Steven J. Rzepka	NH A '11	Civil Engineering
Record No. 579	Andrew D. Smith	SD A '11	Electrical Engineering
Record No. 580	Haley A. Smith	MI H '12	Electrical Engineering
Record No. 581	Samuel P. Thompson	UT B '11	Civil Engineering
Record No. 582	Will M. Thompson	NY Θ '11	Electrical Engineering
Record No. 583	Marissa E. Tousley	NY Σ '11	Materials Science & Engineering
Record No. 584	Bridget T. Wimer	ID A '12	Electrical Engineering
Record No. 585	Jingwei Zhang	NY H '11	Biomedical Engineering
Record No. 586	Ryan D. Ziegler	SD A '11	Chemical Engineering
Stabile No. 101	Patrick L. Adams	LA Δ '11	Mechanical Engineering
Stabile No. 102	Gregory E. Chatlos	OH B '11	Mechanical Engineering
Stabile No. 103	Elizabeth M. Cook	MI Z '11	Industrial Engineering
Stabile No. 104	Samuel R. Ellison	OR A '12	Mechanical Engineering
Stabile No. 105	Benjamin L. English	MD Γ '11	Mechanical Engineering
Stabile No. 106	Mark H. Fermelius	UT B '11	Mechanical Engineering
Stabile No. 107	James D. Follum	WY A '10	Electrical Engineering
Stabile No. 108	Daniel R. Gerber	AL B '11	Mechanical Engineering
Stabile No. 109	Dustin D. Gerrard	UT B '11	Mechanical Engineering
Stabile No. 110	Joshua J. Gidlow	LA Γ '11	Mechanical Engineering
Stabile No. 111	Kurt E. Harris	UT Γ '12	Mechanical Engineering
Stabile No. 112	Colin A. Hosli	LA Γ '11	Electrical Engineering
Stabile No. 113	Dennis Indrawan	MI Z '11	Industrial Engineering

SCHOLARSHIP

RECIPIENT

CHAPTER

FIELD OF STUDY

Stabile No. 114	Jessica L. Katz	MA I '11	Industrial Engineering
Stabile No. 115	Andrew J. Komendat	NY II '12	Mechanical Engineering
Stabile No. 116	Kelsey J. Kotur	MO A '11	Industrial Engineering
Stabile No. 117	Yinuo P. Lin	IN A '11	Industrial Engineering
Stabile No. 118	Christina M. Locklear	AL A '11	Mechanical Engineering
Stabile No. 119	Erin A. McNamara	OH A '11	Biomedical Engineering
Stabile No. 120	Joseph D. Owen	NC Δ '11	Mechanical Engineering & Physics
Stabile No. 121	Katrin Passlack	AZ B '11	Mechanical Engineering
Stabile No. 122	Carolina F. Penteado	FL Z '11	Mechanical Engineering
Stabile No. 123	Chris J. Searcy Jr.	AL B '10	Mechanical Engineering
Stabile No. 124	Melissa J. Street	WA B '11	Mechanical Engineering
Stabile No. 125	Michael C. Stromberg	NM B '11	Mechanical Engineering
Stabile No. 126	Jessica L. Turner	MI I '10	Electrical & Computer Engineering
Stabile No. 127	Justin M. West	WV A '11	Mechanical & Aerospace Engineering
Stabile No. 128	Joseph F. Wilson	NH A '11	Mechanical Engineering
Stabile No. 129	Xuyang Zhang	OH B '11	Mechanical Engineering

Helen E. Durand, *Dodson Scholar No. 36*

Helen is a chemical engineering major at the University of California, Los Angeles. She is taking an environmental option, and hopes to work ultimately in water sanitation. She would like to tackle unsanitary conditions that lead to disease in many countries and to remove chemicals from drinking water.



E.M. Herndon, *Elsa & Peter Soderberg No. 14*

Evan is an M.E. major at Purdue University and has undertaken five semesters of work experience at Toyota. He is looking forward to mechanics and automotive engineering courses that will complement this. After graduation, he plans to establish himself in an engineering career and work part-time towards a master's.



Noah H. Cantor, *GEICO Scholar No. 16*

Noah is majoring in computer engineering and computer science at the University of Miami. His interest in network programming has led him into network security, with a focus on steganography, the covert transport of information by techniques like concealment in computer files. He plans to work for the government.



Kristina M. Hammarstrom, *Dodson No. 37*

Kristina is an engineering management major at the University of the Pacific, where she has been President of both TBII and SWE. She is applying for the university's blended program to make an early start on her master's. This would have an emphasis on mechanical engineering, and be followed by an M.B.A.



P.J. Morrison, *Elsa & Peter Soderberg No. 15*

Paul is a mechanical engineering major at the University of Cincinnati, where he's been TBII Recording Secretary. He is also active in the flying club, qualifying as a certified private pilot. He has been a co-op at General Electric Aviation, and will apply to go to graduate school on a leadership development program there.



Casey M. Clark, *GEICO Scholar No. 17*

Casey is working on her bachelor's in environmental engineering at Montana Tech of the University of Montana. She is also pursuing a B.S. in mathematical sciences. This will help her to compete in industry and share her knowledge. She is interning with the world's largest private-sector coal company.



Pamela Jreij, *Dodson Scholar No. 38*

Pamela is a bioengineering major at the University of California, Riverside. She plans graduate studies leading to a Ph.D. in bioengineering, with an emphasis on biomechanics. She envisions herself as an engineering researcher developing biomedical devices to improve and enhance human health.



M.T. Pomeranke, *Elsa & Peter Soderberg No. 16*

Mark is an E.E. major at the University of Notre Dame, where he serves as TBII President. He came to appreciate the importance of electricity when his hometown of Springfield, MO, lost power for about two weeks in 2007 after an ice storm. He plans to concentrate on alternative energy to make a contribution in the future.



Ryan M. Davis, *GEICO Scholar No. 18*

Ryan is majoring in engineering and management at Clarkson University. He has developed a passion for implementing *Lean* and *Six-Sigma* concepts into business practice. He has interned at General Electric and would like to join its operations management leadership program, while studying part-time for a master's.



Justin T. Schultes, *Campbell Scholar No. 23*

Justin is majoring in mechanical engineering at Iowa State University. His ambition is to design and test new products for an agricultural equipment company, hoping to implement new technologies that would contribute to a cleaner environment. He plans to work for an M.B.A. part-time upon starting work.



John J. Bird, *GEICO Scholar No. 15*

John is majoring in aerospace engineering at Wichita State University. He wants to continue developing as an engineer in graduate school and has participated in a NASA co-op program. His long-standing passion of flying sailplanes has synergized with his interest in "green aviation."



Eric S. Harper, *GEICO Scholar No. 19*

Eric is working on his B.S.Ch.E. at the University of Dayton, where he continues to serve as TBII President. He has been a co-op student working on solar-cell research at Wright-Patterson Air Force Base. This has raised his interest in polymers, and he's looking into this field for doctoral studies in graduate school.



Kevin M. Koryto, GEICO Scholar No. 20
Kevin is working on a bachelor's in biosystems engineering at Michigan State University. So far, he's developed a particular interest in water resources and sustainable design. He is keeping his options open for the future, planning to learn more about himself and to seek a career that will allow him to make a difference.



Michael W. Barton, Alford Scholar No. 5
Michael is working on a bachelor's in aerospace engineering at Mississippi State University, where he was TBII fundraising chair. His next step will be a master's. He would like to join NASA's Mars program. Then he wants to work in Washington, DC, as an interface between space engineers and lawmakers.



Kevin J. Vick, Stechmeyer Scholar No. 2
Kevin is an engineering physics major at Case Western Reserve University. He has been on an eight-month co-op job with General Electric and plans to seek employment with a company that has a graduate development program. Continuing education is important to him, and he plans to earn both a masters and a Ph.D.



Katherine F. Maass, GEICO Sch. No. 21
Katie is majoring in chemical engineering at the University of Texas at Austin. Graduate studies will be aimed at earning a Ph.D. through performing research in drug delivery or biomaterials. She knows she can make a big difference some day to the lives of people with disorders and diseases. She has also been active in SWE.



Avantika Agrawal, Althouse Scholar No. 4
Avantika is working on her bachelors' in computer science engineering major and also on economics at the University of Pennsylvania. She hopes to work for Microsoft, where she's already interned, before continuing for a master's in computer science engineering. Her dream is to lead a technology start-up.



E.A. Henderson, Lindeburg Scholar No. 1
Emily is majoring in civil engineering at Utah State University, where she has served as TBII Vice-President and now serves as President. She plans to seek a master's in transportation or structural engineering and expects to decide after interning. She has also been active in ASCE, SWE, and Engineers Without Borders.



Matthew D. Belley, Scribner Sch. No. 13
Matthew is majoring in mechanical and nuclear engineering at Rensselaer Polytechnic Institute, where he has been TBII Treasurer. Research projects included thermoelectric devices, and he plans to pursue graduate studies. He hopes to intern again this summer at BAE Systems to obtain industrial experience.



Lonna Gordon, Anonymous Scholar No. 4
Lonna is majoring in chemical engineering at the Polytechnic Institute of NYU. She already has a degree in English and psychology. She is interested in developing medicines, and her graduate school plans are focused on biotechnology research. She believes that this will help her bridge the worlds of business and science.



Jennifer A. Johnson, Lindeburg Sch.No.2
Jennifer is a civil engineering major at Clemson University, where she has been TBII Vice-President and now serves as President. She is focusing on transportation systems, hoping to tackle problematic issues like gas consumption, congested highways, and deteriorating infrastructure. She plans to pursue her master's.



Kyle E. Watters, Scribner Scholar No. 14
Kyle is majoring in Ch.E. at Rensselaer Polytechnic Institute, where he has been TBII Corresponding Secretary and President. He is focusing on his minor of biology and is interning this summer at a biotech company. He is still deciding on whether to continue for a Ph.D. in engineering or biology or to enter medical school.



Steven J. Levine, Bose Scholar No. 4
Steve is an electrical engineering and computer science undergraduate at the Massachusetts Institute of Technology, where he is TBII President. He plans to remain at MIT to begin graduate studies, very likely related to robotics. Then, he will start work in industry or perhaps continue doing research.



Michael W. Hackemack, Mitchell Sch. No. 1
Michael is majoring in nuclear engineering at Texas A&M University, where he has served as TBII Recording Secretary. He plans to include graduate classes in his final year and continue research to prepare for an early start on a master's. He then plans to begin work on a career in the nuclear industry.



Laura A. Divel, Fluor Scholar No. 10
Laura is majoring in civil engineering at the University of Notre Dame, and plans to remain for an M.B.A. She has a special interest in bridges, believing they connect people in many different ways. She hopes to work as a field engineer or manager of large infrastructure projects and plans to earn her P.E. license.



Michelle K. Sing Curtis Sch. No. 3
Michelle is a polymer science and engineering major at Case Western Reserve University. Her ultimate ambition is to be a professor as she enjoys teaching others. TBII President, she is spending this summer in Switzerland on an undergraduate research program. She plans to enter graduate school on her way to a doctorate.



A.P. VanFosson, Stanley Scholar No. 1
Alex is a chemical engineering major at the University of Iowa. He hopes to continue to graduate school to qualify for research and development. He has been working on the redesign of a chlorine generator to disinfect water and hopes to manage this through field trials in Ghana during the next three years.



Benjamin R. Forry, Mentor Scholar No. 7
Ben is an M.E. major at Syracuse University, where he was TBII Secretary and President. He is interested in finding ways to improve energy efficiency, conserve and use waste energy, and improve distribution. He plans to attend graduate school and then pursue a career in engineering research or design while earning a P.E.



Yacub E. Bholat, Kolff van Oosterwijk No. 2
Yacub is majoring in civil engineering at Loyola Marymount University. Graduate school plans include an accelerated program to obtain a master's in one year. He plans to pass the Fundamentals of Engineering examination on his way to becoming a professional engineer.



Tyler K. Andrews, Record Scholar No. 545
Tyler is majoring in civil engineering at Clemson University, where he plans to remain for a master's in structural engineering. He has been studying structural health monitoring and may pursue it as a career. Interested in the monitoring and preservation of historical structures, he may also continue for a doctorate.



See additional bios at www.tbp.org.

Tau Beta Pi Fellows for 2010-11

THE FELLOWSHIP BOARD SELECTED 28 Tau Beta Pi Fellows for 2010-11, 17 of whom will receive \$10,000 cash stipends for one year of graduate study and 11 who have other extensive financial aid for their year of advanced work. Implemented by President A.D. Moore in 1929, the Fellowship Program has provided a total exceeding \$5,140,000 to 928 stipend recipients.

Now in its 77th year, the Fellowship Program remains a principal philanthropic activity of the Association and continues to receive strong support from alumni. The program was initiated with funds from the operating budget of the Society, including the eventual transfer of money from BENT life-subscription fees. It was first enlarged in 1938 by a gift from the Southern California Alumnus Chapter, and in 1948 the first Alumnus Fellowship was awarded. Since that time, gifts from alumni, industry, and friends and the earnings of the invested Fellowship Fund have all contributed to these awards.

Matching gifts to the Association from 219 companies on behalf of their Tau Beta Pi employees are allocated to fellowships and scholarships, and the Society is most appreciative of this generous support.

In addition to its own awards, Tau Beta Pi selects recipients for named fellowships, which are administered just as other Society fellowships.

The Tau Beta Pi-Stark Fellowship is named for Donald A. Stark, who contributed much to progress in the fluid-power industry. This award, given for the 33rd time, is presented to a fellow who plans graduate study in engineering with emphasis in the field of fluid power or fluid mechanics. Stipends are provided by the earnings from a \$150,000 gift to Tau Beta Pi in 1986 from the Donald A. and Jane C. Stark Charitable Trust.

Fifteen fellowships are named for members. The TBPI-Williams Fellowship, established in 1980 to honor the Association's Founder, Dr. Edward H. Williams Jr., is awarded to a candidate who plans to work toward a doctoral degree and enter the engineering teaching profession.

Two fellowships honor former Tau Beta Pi Presidents. The one named for Charles H. Spencer, President during 1936-47, is awarded for the 55th time. It is presented to the winner who has made significant contributions to his or her collegiate chapter. The Harold M. King Fellowship honors the 1954-58 President, whose special interest was in the student branches of the national technical societies.

Given for the 49th time, the King Fellowship is awarded for outstanding participation in volunteer technical-society work.

Eight named awards are sponsored this year by the late William Fife, *CA A '21*, who bequeathed the earnings of an irrevocable trust for TBPI fellowships. They are named in honor of his father, James Fife.

The Matthews Fellowship is awarded for the 13th time and honors Secretary-Treasurer Emeritus R.C. "Red" Matthews, *IL A '02*, who served as Secretary during 1905-12 and as Secretary-Treasurer in 1912-47. Red died in 1978 at the age of 99. The 13th Nagel Fellowship is awarded in honor of Secretary-Treasurer Emeritus Robert H. Nagel, P.E., *NY A '39*, who served as Secretary-Treasurer in 1947-82 and Editor of *THE BENT* during 1942-82. Bob died in 1997.

The sixth Hanley Fellowship is named for Mary A. and Edward P. Hanley, *IL B '42*, who left a bequest in 2007. The third Arm Fellowship is named for Rena M. and David L. Arm, *PA E '30*, who left a bequest in 2007.

The Centennial Fellowship, given to that fellow who the board determines is most outstanding, commemorates the 100th anniversary of the Association.

The Tau Beta Pi-Sigma Tau award commemorates Clarel B. Mapes, Sigma Tau's former national president and secretary-treasurer, and perpetuates the memory of Sigma Tau, former national engineering honor society founded at the University of Nebraska in 1904. When it merged with Tau Beta Pi in 1974, the assets of its foundation were transferred to the Fellowship Fund.

The Tau Beta Pi-Best Fellowship commemorates Ina C. and Raymond A. Best, *NY I '33*, and is to be used by a member for the purpose of acquiring an M.B.A. at Rensselaer Polytechnic Institute. There was no applicant.

Tau Beta Pi received 258 fellowship applications. Board members Susan L.R. Holl, Lawrence J. Hollander, Jammie L.H. Jamieson, and Director of Fellowships D. Stephen Pierre Jr. made the selections on March 27. Fellows are introduced on the following pages.

FELLOWSHIP	RECIPIENT	CHAPTER	FIELD OF ADVANCED STUDY
Centennial 25	Zachary S. Lamb	AL A '10	Robotics
Fife No. 131	William P. Cleveland	MS A '10	Cognitive Engineering
Fife No. 132	Mihai Duduta	MA B '10	Materials Science & Engineering
Fife No. 133	Renee S. Hale	OK Γ '10	Chemical Engineering
Fife No. 134	Farshad Madhi	NY Θ '09	Fluid Mechanics
Fife No. 135	Salman H. Naqvi	NJ Γ '10	Electrical Engineering
Fife No. 136	Katherine E. Niehaus	CA Γ '10	Bioengineering
Fife No. 137	Jacklyn M. Wilkinson	SC A '10	Materials Science & Engineering
Fife No. 138	Hao Zou	CA Γ '08	Electrical Engineering & Bus. Admin.
Spencer No. 55	Sleiman S. Sleiman	OH Z '09	Chemical & Environmental Engineering
King No. 49	Keane L. Steele, E.I.	SC Γ '09	Structural Engineering
Sigma Tau No. 37	Nathan D. Nicholes	OK A '10	Biochemical Engineering
Stark No. 33	Matthew A. Hitt	AL Δ '10	Mechanical Engineering
Williams No. 31	Aditya M. Kunjapur	TX A '10	Chemical Engineering
Matthews No. 13	Lauren B. Priddy	MS A '08	Bioengineering
Nagel No. 13	Julian J.T. Reyes, E.I.	WA B '10	Environmental Engineering
Hanley No. 6	Alexandra B. Chakeres	MO Γ '10	Mechanical Engineering
Arm No. 3	Courtney E. Shell	TX Δ '10	Mechanical Engineering
TBP No. 772	Sharice Q. Handa	CA Σ '10	Mechanical Engineering
TBP No. 773	Abhishek Jaiswal	ID B '10	Nucl. Plasma & Radiological Engineering
TBP No. 774	Marsela Jakub-Wood	LA Δ '10	Electrical Engineering
TBP No. 775	Toby A. Klein	NY I '10	Mechanical Engineering
TBP No. 776	Jaclyn R. Kondratko	IN Δ '10	Biomedical Engineering
TBP No. 777	Diana K. Ladkany	NY K '10	Medicine
TBP No. 778	Karthish Manthiram	CA Γ '10	Chemical Engineering
TBP No. 779	Jonathan L. McKinney	MO B '10	Chemical Engineering
TBP No. 780	Li Tan	OH B '10	Chemical Engineering
TBP No. 781	Brian J. Thomas	IN A '10	Computer Science

Centennial Fellow No. 25

Zachary S. Lamb



Zach graduated first in his class in mechanical and materials engineering, with a 4.0 G.P.A., at Auburn University. He served as 2009-10 TBI Chapter President. He has also been active in IEEE and ASME. Gradu-

ate school plans at Carnegie Mellon University will focus on robotics. His current research interests include field and mobile robotics, where he intends to work on path planning and navigation techniques. These allow robots to make intelligent decisions by identifying obstacles and landmarks and to choose the best plan of action. Zach believes robotic systems are the key to making life easier, especially in areas like reducing labor costs, saving lives with smarter vehicles, or improving prosthetics to restore human functions to amputees. Tributes from his professors include praise for carrying a perfect G.P.A. in arguably the most difficult curriculum there, with his double major. He also honed his leadership skills while serving as a head referee for both Alabama and the South in the BEST high-school robotics competition.

Fife Fellow No. 132

Mihai Duduta



Mishu has graduated from MIT, where he served as Massachusetts Beta President, with a B.S. in materials science and engineering. Postgraduate studies at the University of California, Berkeley, are aimed

at a Ph.D. so he can follow his passion: research for sustainability. He has been working on high-energy-density redox cells. These have become a research topic because of potential for grid and electrical vehicle applications. He sees making a fully electric car as one of the greatest engineering challenges. Mishu has also developed a passive solar desalinator, inspired by the Namib desert beetle that uses a patterned surface on its back to harvest water from airborne vapor. He believes this can also be used to purify water from biological or chemical contaminants. Previous honors included the Romanian presidential insignia for excellence and a silver medal at the International Chemistry Olympiad in Kiel, Germany. An MIT teacher described him as the "very best" undergraduate he had encountered there.

Fife Fellow No. 134

Farshad Madhi



Farshad has received a dual B.S. in mechanical engineering and physics from Clarkson University. Next on his agenda is graduate study at the University of California, Berkeley, to begin work toward a

Ph.D. in mechanical engineering. Undergraduate studies included work on more efficient designs for ocean-wave energy extraction with the lowest environmental impact. Farshad wants to stay with this for his Ph.D., developing analytical and computational tools to guide optimal design for wave energy. Design would include gauging environmental impact of the moving devices on oceanic wildlife and the maintenance of mechanical devices in the sea, as well as the practicality of design. Farshad is a Baha'i from Iran, where he says he was denied access to advanced education. He had to risk imprisonment and death to emigrate to the U.S. Now he wants to open more closed doors by demonstrating that when individuals can reach their full potential, all humankind is benefited.

Fife Fellow No. 131

William P. Cleveland



William is a computer and aerospace engineering graduate of Mississippi State University, where he was TBI Chapter President. Internships included a study-abroad fellowship at the von Karman Institute

for Fluid Dynamics in Belgium, where he researched local warming surrounding a power plant. Summer projects also included researching at NASA Langley, working on an unmanned aerial systems refueling testbed, and at the Air Force Institute of Technology. Graduate study plans include work in cognitive engineering at Georgia Tech and continuing to earn a Ph.D. He believes autonomous systems will impact the future, making decisions based on large amounts of data magnitudes faster than a human. This has many applications that interest William, ranging from unmanned aerial vehicles to intelligent road transportation. The challenges to make these systems work are great, but the benefits to society are even greater. He is fascinated by the role humans play in relating to these autonomous systems.

Fife Fellow No. 133

Renee S. Hale



Renee is a chemical engineering graduate of Oklahoma State University, where she ranked second in her college with a 4.0 G.P.A. and received a Barry M. Goldwater scholarship. She's off to

England to attend the University of Cambridge advanced chemical engineering master's program and the university's center for sustainable development. Her main interest lies in recycling waste streams into useable energy resources as part of global sustainability. Renee started with wastewater treatment during a summer as an environmental engineer at IBM, then turned to biomass waste after seeing sustainable technology dramatically reduce costs and add non-financial benefits to the process. She believes the most promising innovations will soon need to be installed on a large scale. Many chemical engineers are trained to deal with traditional petrochemical fluids and do not fully understand biomass and other biomaterials. She wants to design processes to generate renewable energy from them as soon as possible.

Fife Fellow No. 135

Salman H. Naqvi



Salman graduated first in his class with a 4.0 G.P.A. gaining a B.S. in electrical engineering from New Jersey Institute of Technology. He was TBI Chapter Vice President, a TBI Record Scholar, and a Barry

M. Goldwater scholar. An electrical engineering M.S. at Stanford University is his next step toward a Ph.D. His passion is fusing environmental research and electrical engineering, and he has been working on using ground remote sensing to study the impacts of urban areas on global atmospheric circulation. He spent three years working on a system observing the New York-Newark urban hub. Salman is looking to focus on signal processing and electromagnetic research after undergraduate experience at NJIT, NOAA, and Lockheed Martin, which has allowed him to see connections between disciplines. His ultimate goal is to serve renowned space weather institutes like NASA and NOAA to help to fill the nation's need for better environmental understanding and safeguards.

Fife Fellow No. 136

Katherine E. Niehaus



Kate has completed her bachelor's in biomechanical engineering at Stanford University, where she had a 4.0 G.P.A. She's staying at her *alma mater*, where she has been accepted for the bioengineering master's program.

She was an Academic All-American athlete in 2008 and 2009 for her cross-country and track prowess and was elected captain for the past season. She also received an NCAA Elite 88 award for the student athlete with the highest G.P.A. in the nation in his or her sport. Kate's intended major was in human biology. She soon realized she wanted to help make the body work better and changed her field. She interned at a medical-device start-up and worked on migraine-focused technology. A migraine-sufferer friend's reaction to this showed her the importance of having a tangible impact on people's lives. She is also looking forward to learning about areas like bioinformatics and neuroengineering. Research into prosthetic design and control is another possibility.

Fife Fellow No. 138

Hao Zou



Hao is a second year Ph.D./M.B.A. dual-degree candidate at Stanford University's electrical engineering department and graduate business school. He has been chapter President and also been active in IEEE.

Soon after graduating, he plans to start a company to commercialize his research on next-generation communication systems and grow it into a multinational enterprise. Hao's interest in the field began when DSL technology in his home country China arrived as he was starting high school. He saw high-speed internet as a means to fight censorship, poverty, and corruption. His research on next-generation systems earned him worldwide recognition with a Marconi young scholar award from Britain's Royal Society. He has been working with senior executives from leading companies to standardize communications technologies for the North American, European, and Asian markets. He would like to return to China and use his experience to improve the lives of people across the world.

King Fellow No. 49

Keane L. Steele, E.I.



Keane graduated with a B.S. in civil and environmental engineering from the Citadel, where he was TBPI Chapter President. He will continue his studies this fall by starting on a structural engineering master's

at Virginia Tech. While interning at a nuclear-power station, he found himself researching the design basics of a structure's resistance to tornadic missiles. After many classes, internships, and discussions with professors, he decided to continue his education in structural engineering. For both structure and sustainability, one area Keane would like to address is the retrofitting and upgrading of bridges. Ultimately, he would seek employment with a large international firm. His goal is to work on landmark projects all over the world, and he hopes eventually to own a structural engineering and consulting firm. He has passed his fundamentals of engineering exam and looks forward to attaining professional licensure. He has also been active in ASCE and commanded a company of the Citadel's corps of cadets.

Fife Fellow No. 137

Jacklyn M. Wilkinson



Jackie has graduated with a B.S. in ceramic and materials engineering at Clemson University, where she was first in her class with a 4.0 G.P.A. She served as TBPI Treasurer, Vice President, and finally

President, as well as her SWE chapter industry chair. She is starting graduate studies at her *alma mater*, and will spend her second year at France's University of Bordeaux, to earn two master's degrees, in chemistry and in materials science and engineering. Jackie will be focusing next fall on multi-component glass systems for novel infra-red fibers, working toward their use in Raman Gain applications. Because these glasses are transparent in the mid-infrared region, they can be used in systems to protect aircraft from heat-seeking missiles. She plans to get a head start on this research by interning at her graduate school laboratory. Other campus activities have included intramural flag football and taking part in a program to tutor student athletes in math and chemistry.

Spencer Fellow No. 55

Sleiman S. Sleiman



Sleiman received his B.S. in chemical engineering from the University of Toledo, where he was TBPI President, and treasurer of the Arab Student Union. From Lebanon, he will study toward a graduate

degree in C.E. at American University of Beirut to be involved in the process of preparing engineers in a part of the world where chemical and petroleum industries are the backbones of national economies. Sleiman learned the value of co-op programs, and work in the Middle East and America will provide excellent experience. However, he is convinced he belongs in the academic world and wants to serve as a professor. Teaching engineering principles has always brought him pleasure. He believes that the chance to make a difference in a learner's understanding of a topic is more valuable to him than any product design or process optimization he has done. The result is far more tangible, and the impact definitely longer lasting. Thus, he will pursue a graduate degree and the satisfaction of conducting research.

Sigma Tau Fellow No. 37

Nathan D. Nicholes



Nathan has received his bachelor's degree in chemical engineering from the University of Oklahoma, where he served as TBPI Secretary and later as President. First in his class with a 4.0 G.P.A., he has

an educational ambition to obtain a Ph.D. in biochemical engineering and pursue a career in bioprocess design, with the possibility of serving as a university professor in the future. The research that intrigued him the most has been pharmaceutical development. Nathan will begin graduate work at the Johns Hopkins University and will examine pharmaceutical protein production. He expects to pursue industrial internships to help him better understand how to apply the theories he studies to current processes. Upon completion of his doctorate, he plans to work for 10-15 years in the biochemical engineering industry. After gaining sufficient experience there, he hopes to be able to use his combined academic and industrial knowledge to train the next generation of bioengineers.

Stark Fellow No. 33

Matthew A. Hitt



Matthew is a mechanical engineering graduate of the University of Alabama in Huntsville, where he had a 4.0 G.P.A. He is continuing there for a master's and will be a graduate research assistant

at the propulsion research center there. His research project will be to design and build a liquid-oxygen system to evaluate turbomachinery, providing practical experience in thermodynamics and heat transfer. At the same time, he will take the F.E. exam to become prepared for different career contingencies. On completing his master's, Matthew plans to pursue a doctorate at another university to provide academic diversity and learn about different engineering methods. He is preparing for a career in research and teaching, either as a professor or as a contractor teaching part-time. The experience of educating various people in different aspects of engineering has given him a desire to teach at a state school or at a Christian college that is building an engineering program.

Matthews Fellow No. 13

Lauren B. Priddy



Lauren received a master's in biomedical engineering and was first in her engineering class with a 4.0 G.P.A. at Mississippi State University. She will be starting on a bioengineering Ph.D. at the Wallace H. Coulter

department of biomedical engineering at Georgia Tech and at Emory University. Her goal is to become a professor, teaching and researching biomedical engineering. Lauren has already been involved in synthetic biology laboratory work and has studied soft-tissue biomechanics. Another research focus has been traumatic tissue injury. Her specific objective involves combining advanced imaging techniques and computer modeling of cardiovascular tissue to simulate damage progression from injury or disease. This would advance cardiovascular tissue repair and regeneration. Active in the Society of Women Engineers and the Institute of Biological Engineering, she was co-captain of the MSU cheerleading squad and was on the national competition squad.

Hanley Fellow No. 6

Alexandra B. Chakeres



Alexandra has gained a B.S. in chemical engineering from Washington University in St. Louis, where she was first in her engineering class with a 4.0 G.P.A. She will attend the University of Colorado at

Boulder for graduate studies in mechanical engineering. She wants to research renewable-energy technology and focus on biomass gasification, which appeals to her as a promising field. Research skills were honed during a summer at the National Renewable Energy Laboratory (NREL). Alexandra wants to do more work there on partial oxidation of gasification tars. These are produced during biomass gasification and present a problem in downstream processes like liquid-fuel synthesis and turbine use. Partial oxidation cracks the tars into components that systems can handle. At NREL, she distinguished herself by showing confidence in her experimental abilities, generating plans, diving into experiments, and producing quality data.

Williams Fellow No. 31

Aditya M. Kunjapur



Aditya has received his B.S. in chemical engineering from the University of Texas at Austin, where he ranked first in his class with a 4.0 G.P.A. He was the first undergraduate in his department to become

a teaching assistant. Bound for MIT, he hopes graduate studies will lead one day to a professorship. His passion is finding a sustainable solution to energy needs, and studies will focus on second-generation microbial feedstock. With his existing knowledge of oil-and-gas production, Aditya hopes to have a unique advantage in developing a competitive alternative to petroleum. He also aspires to be involved in the emerging advanced biofuel industry as a consultant. Four summers working in the petroleum industry have shown him the problems to be overcome by any transformative fuel, ranging from the environment to national security. Teachers pay credit to his academic credentials and extracurricular interests, in both on-campus activities and student-chapter professional societies .

Nagel Fellow No. 13

Julian J.T. Reyes, E.I.



Julian has received his B.S. in civil engineering from Washington State University. He plans to remain in Pullman to obtain a master's in environmental engineering and then work for an international firm on water

projects in areas where that resource is scarce. He has developed a keen interest in environmental fluid mechanics and water resources. He seeks to investigate changes in rivers, involving increased deposits and higher flow rates. These help to determine what will happen downstream at the coast, where major industrial, commercial, and residential activities usually congregate. Julian believes that these factors should be considered, along with the environment, economic factors, and social equity for sustainable development of water resources. He has interned with Ph.D. students at German universities and worked on radio-frequency-identification technology in recycling systems, as well as his German language skills. He believes that understanding a foreign language and culture is an asset in a global economy.

Arm Fellow No. 3

Courtney E. Shell



Courtney has graduated with a B.S. in biomedical engineering at Texas A&M University, where she was first in her department with a 4.0 G.P.A. Her postgraduate studies at the University of Texas

at Austin will focus on a doctorate in mechanical engineering, with a speciality in neuroengineering, prosthetics, medical robotics, and/or biomechanics. She spent two semesters as a co-op student with an orthopedic-device manufacturer. Courtney plans to return to industry to work in product development at a prosthetic-device firm or transition to academia as an entrepreneurial professor, developing devices for technology transfer via start-up companies or licensure. She is especially interested in designing a prosthetic limb directly controlled by the patient's brain or peripheral nervous system. Other interests included a study-abroad program in Germany, leading an honors invitational program, volunteering with Habitat for Humanity, intramural soccer, and a church choir and orchestra.

Tau Beta Pi Fellow No. 772

Sharice Q. Handa



Sharice has graduated with a B.S. in mechanical engineering from the University of California, Santa Barbara, where she was TBPi Secretary, then President. Remaining at her *alma mater*, she will pursue her graduate

studies in mechanical engineering. She is interested in gecko-inspired adhesives and spent part of a summer studying them at Germany's University of Saarland. Sharice sees applications like surgical stitches or wall-climbing gloves and would like to continue working in a closely related field in nanotechnology or materials. She has a passion for learning and teaching, spending summers as a teaching assistant for a middle-school-level CSI class. Working with children to solve a "crime" with chemistry and forensics, she was inspiring the next generation of engineers and scientists. She sees her future in industry or academia—working independently or collaborating and enjoying being at the cutting edge of technology—while at the same time teaching at a university, sharing knowledge, and inspiring others.

Tau Beta Pi Fellow No. 773

Abhishek Jaiswal



Abhishek has graduated from Idaho State University, with a dual B.S. in mechanical and nuclear engineering. He was TBPi Recording Secretary at ISU, ASME chair, and vice president of the Nepalese student association. Undergraduate projects included work on a robotic design for a prosthetic hand and research at the center for space nuclear research of the Idaho National Laboratory. There he worked on power-cycle concepts for space applications. He has also undertaken a project on using a light water reactor in an underground setting. This has intensified his interest in the thermal sciences and demonstrated to him that this field has a lot of research potential. Graduate study plans at the University of Illinois at Urbana-Champaign include research into heat transfer, thermodynamics, and energy systems in the field of nuclear plasma and radiological engineering. Abhishek would like to gain practical industrial experience and then join an academic institution as an educator and a researcher.

Undergraduate projects included work on a robotic design for a prosthetic hand and research at the center for space nuclear research of the Idaho National Laboratory. There he worked on power-cycle concepts for space applications. He has also undertaken a project on using a light water reactor in an underground setting. This has intensified his interest in the thermal sciences and demonstrated to him that this field has a lot of research potential. Graduate study plans at the University of Illinois at Urbana-Champaign include research into heat transfer, thermodynamics, and energy systems in the field of nuclear plasma and radiological engineering. Abhishek would like to gain practical industrial experience and then join an academic institution as an educator and a researcher.

Tau Beta Pi Fellow No. 774

Marsela Jakub-Wood



Marsela graduated with a B.S. in electrical engineering at the University of Louisiana at Lafayette, where she ranked first in her class with a 4.0 G.P.A. Graduate school plans are aimed at a higher

degree in electrical engineering, focusing on power systems and renewable energy. She joined the BeauSoleil solar home project last year and was assigned to the electrical engineering senior-design team. This involved designing the photovoltaics, wiring the electrical system, and calculating the load to ensure the house produces more than it consumes. Marsela realized a major shortcoming with the PV system with the speed at which the panels began to degrade, as well as problems with the instability of the solar power grid. She plans to address these issues in her graduate studies at Washington State University and conduct a deeper study of advanced power systems. Her goal is to find a more efficient method of using and promoting solar energy. She plans to continue her studies to earn a doctorate.

Tau Beta Pi Fellow No. 775

Toby A. Klein



Toby is a mechanical engineering graduate of the Cooper Union, where she ranked first in her class with a 4.0 G.P.A. In graduate work at MIT, she plans to focus on efficient, economical ways to produce and

store energy. She is enthusiastic about addressing the challenges of moving from fossil fuels to alternatives based on bio-fuels and hydrogen and is interested in cost-effective and environmentally sound energy-generation processes. She started work in this field at SUNY at Stony Brook, where she researched hydrogen storage. Toby aspires to an industrial position with a company that emphasizes innovation, collaboration, and lifetime learning. She plans to maintain contact with her professors and fellow students throughout her career to remain at the cutting edge of alternative energy research. On campus and in internships, she delved into projects in implementation of high-speed train systems and control of a prosthetic hand using muscle signals. She served as IITΣ recording secretary.

Institute for Defense Analyses

For over half a century, the Institute for Defense Analyses has been successfully pursuing its mission to bring analytic objectivity and understanding to complex issues of national security. IDA is a not-for-profit corporation that provides scientific, technical and analytical studies to the Office of the Secretary of Defense, the Joint Chiefs of Staff, the Unified Commands and Defense Agencies as well as to the President's Office of Science and Technology Policy.

To the right individual, IDA offers the opportunity to have a major impact on key national programs while working on fascinating technical issues.

broaden your perspective



your career • your future • your nation

IDA is seeking highly qualified individuals with PhD or MS degrees

Sciences & Math

- Astronomy
- Atmospheric
- Biology
- Chemistry
- Environmental
- Physics
- Pure & Applied Mathematics

Engineering Other

- Aeronautical
- Astronautical
- Biomedical
- Chemical
- Electrical
- Materials
- Mechanical
- Systems
- Bioinformatics
- Computational Science
- Computer Science
- Economics
- Information Technology
- Operations Research
- Statistics
- Technology Policy

Along with competitive salaries, IDA provides excellent benefits including comprehensive health insurance, paid holidays, 3 week vacations and more – all in a professional and technically vibrant environment.

Applicants will be subject to a security investigation and must meet eligibility requirements for access to classified information. U.S. citizenship is required. IDA is proud to be an equal opportunity employer.

Please visit our website www.ida.org for more information on our opportunities.

Please submit applications to: <http://www.ida.org/careers.php>

4850 Mark Center Drive Alexandria, VA 22311

Tau Beta Pi Fellow No. 776

Jaclyn R. Kondratko



Jackie has graduated from Valparaiso University, where she was TBPI Vice President, with a B.S. in mechanical engineering. Her next step is a master's in biomedical engineering at the University of Wisconsin–Madison on her way to a career in industry developing devices to help people with physical handicaps. She values her own active lifestyle and her soccer career as a member of her school's NCAA Division 1 team and 2009 captain. Jackie would like to focus graduate research on an area of biomechanics developing orthopedics or devices for sports injury victims. She has known many fellow players to suffer knee ligament injuries and sees this as an area for research. She has also studied the use of point-vibration therapeutic devices to help reduce self-stimulating behavior in autistic children. This can also help them integrate into classroom settings. Last summer, she worked in Switzerland on an NSF-funded project to electrolyze zinc and oxygen from zinc oxide, using solar energy and a small amount of electricity.

investigate if the performance of thermoelectric materials—converting heat into electricity—can be significantly improved by using nanostructured topological insulators, which are a new state of quantum matter. This research could lead to more direct solar-power generation, as well as recovering energy from automobile engine exhaust to curb greenhouse gas emissions. Karthish hopes to work as a teaching assistant, as he prepares to become a professor, and create a TBPI program such as AlumNet in which graduate students will mentor undergraduate engineering majors who need advice about classes, research opportunities, or internships. A Stanford teacher described him as his “most amazing” undergraduate “in terms of past track record, intellectual depth, leadership, and great personality.”

Tau Beta Pi Fellow No. 778

Karthish Manthiram



Karthish has received his B.S. in chemical engineering from Stanford University, where he had a 4.1 G.P.A. Graduate studies at the University of California, Berkeley, are his next move. He wants to

investigate if the performance of thermoelectric materials—converting heat into electricity—can be significantly improved by using nanostructured topological insulators, which are a new state of quantum matter. This research could lead to more direct solar-power generation, as well as recovering energy from automobile engine exhaust to curb greenhouse gas emissions. Karthish hopes to work as a teaching assistant, as he prepares to become a professor, and create a TBPI program such as AlumNet in which graduate students will mentor undergraduate engineering majors who need advice about classes, research opportunities, or internships. A Stanford teacher described him as his “most amazing” undergraduate “in terms of past track record, intellectual depth, leadership, and great personality.”

Tau Beta Pi Fellow No. 780

Li Tan



Li is completing a combined B.S./M.S. in chemical engineering at the University of Cincinnati, where he ranked first in his class with a 4.0 G.P.A. He has been TBPI Chapter Vice President and tutor-

ing chair and active in AIChE. His next objective is a Ph.D. in chemical engineering at MIT. His career goal is to serve on a university faculty, doing research in areas like biomedical applications and pharmaceutical production. Li's master's thesis is about synthesizing electrodes on proton-exchange-membrane fuel cells from nanoparticles. He will also analyze the performance of the fuel cells based on spectroscopy and give suggestions for improving performance. This formal thesis research is preparation for his future graduate-study. A second-year research co-op job at Pfizer taught him about the formal research process. Another project, doing literature research then developing and analyzing the pharmaceutical process, culminated in a peer-reviewed journal article and a conference poster.

Tau Beta Pi Fellow No. 777

Diana K. Ladkany



Diana majored in biomedical engineering at the University of Rochester, also her new medical school, and was TBPI President in 2009-10. Graduating first in her class, she has been part of the Rochester early

medical scholars program and plans to become a doctor. However, she loves her engineering background and is determined to use it. Diana has worked with laboratory equipment from the mechanical engineering standpoint, before progressing to applying ultrasound to tissue engineering. She wants to continue with ultrasound and other non-invasive therapeutic methods of healing. Such fields intrigue her because they will allow her to continue with projects that may bridge the engineering and medical fields. She has been active in the medical emergency response team and spends time in an emergency room that keeps her involvement fresh with the medical field and its personnel. A member of SWE, Diana served as president of the Student Association for the Development of Arab Cultural Awareness.

Tau Beta Pi Fellow No. 779

Jonathan L. McKinney



Jonathan majored in environmental engineering at Missouri University of Science and Technology, where he is remaining to begin graduate school. Academic and career goals include obtaining a Ph.D.

and helping society move towards sustainability through research and education in environmental engineering. Jonathan believes the health challenges facing society are due to poor environmental quality, caused by society itself. This is beginning to improve, however, and will continue to do so for generations, as people start to consider sustainability in everyday life. He is planning to study for a master of science in chemical engineering, as he sees mass and heat transport, thermodynamics, and reactor design as the fundamentals behind most engineered solutions to environmental problems. Chemical engineering principles will help him contribute quality work to society. It will also make him more effective in teaching the fundamentals of environmental engineering to the next generation.

Tau Beta Pi Fellow No. 781

Brian J. Thomas



Brian graduated at the top of his class with a B.S. in computer engineering and a 4.0 G.P.A. from Purdue University. He was TBPI Corresponding Secretary and then President of Indiana Alpha. He wants to

continue studying artificial intelligence at Brown University, particularly computer vision. He has been working on a project to create a robot that can learn and play arbitrary board games. Brian is fascinated by human ease in performing complex sensory tasks and wishes to develop algorithms that mimic our natural abilities. He has also been studying signals and systems, probability, while completing a mathematics minor. His desire to teach and help others to overcome intellectual roadblocks further convinced him to pursue graduate studies. Brian plans to go on for a doctorate and become a professor. He co-taught a weekly hour-long course introducing freshman engineers to college-relevant subjects like time management. Brian has been praised for initiative, leadership skills, and resolve as a Tau Bate.



CHAPTER ETERNAL

The condensed style of these notices of death is made necessary by Tau Beta Pi's large membership and space limitations in THE BENT. You may write the Editor for further facts concerning the following deceased members. The assistance of all is earnestly sought in reporting to TBPi the deaths of Association members, with appropriate details.

- AL A '51 **McRae, Daniel D.**; December 2009.
 AL B '49 **Williamson, Hugh I.**; January 24, 2010.
 '53 **Morris, Jim W.**; October 9, 2009.
 '57 **Jones, Curtis A.**; June 17, 2008.
 AL Γ '59 **Tolar, Carroll T.**; December 5, 2004.
 AZ A '52 **Loveless, William D.**; July 21, 2007.
 AR A '39 **Weis, Robert E.**; December 13, 2008.
 CA A '51 **McNinch Jr., Edwin K.**; July 11, 2009.
 CA B '36 **Bush, Kenyon T.**; December 23, 2002.
 '36 **Caldwell, Wyche D.**; July 22, 2007.
 '36 **Cortelyou, Curtis G.**; December 18, 2009.
 '36 **Davis Jr., Leverett**; June 15, 2003.
 '36 **Goodheart, Clarence F.**; June 4, 2006.
 '36 **Heitz, Robert G.**; January 28, 1995.
 '36 **Kossiakoff, Alexander I.**; August 6, 2005.
 '36 **Nestler, Wasson W.**; no details.
 '36 **Sklar, Maurice**; no details.
 '36 **Watts, Euclid V.**; no details.
 '37 **Carrick, Harry H.**; no details.
 '37 **Griffis, LeVan**; December 22, 1993.
 '37 **Grobecker, Alan J.**; July 1, 1998.
 '37 **Horkey, Edward J.**; July 26, 1996.
 '37 **Legge, John A.**; no details.
 '37 **Morgan, Bruce F.**; October 3, 1995.
 '37 **Nellis, Donald C.**; January 15, 2006.
 '37 **Walley, Bernard**; August 6, 2004.
 '38 **Beavon, David K.**; May 12, 1993.
 '38 **Clarke, Charles W.**; January 7, 2005.
 '38 **Ellis, Herbert B.**; April 1, 1990.
 '38 **Graybeal, Oran A.**; February 25, 2005.
 '38 **Harris, Clyde W.**; July 21, 1998.
 '38 **Lavender Jr., Harrison M.**; no details.
 '38 **Moore, Frederic H.**; September 17, 1996.
 '38 **Rosencranz Jr., Richard**; January 27, 1989.
 '38 **Sherwood, David M.**; October 13, 1996.
 '38 **Wimpress, Richard N.**; July 23, 2009.
 '38 **Wood, Homer J.**; April 5, 2007.
 '39 **Carstarphen, Charles F.**; August 14, 2004.
 '39 **Devirian Jr., Philip S.**; June 5, 2002.
 '39 **Frampton Jr., William R.**; July 22, 2008.
 '39 **Goodell, Jack H.**; June 30, 2009.
 '39 **Green, Albert P.**; June 12, 1994.
 '39 **Ritchey, James C.**; February 28, 2005.
 '39 **Tangren, R. Fulton**; January 3, 2003.
 '40 **Brewer, Leo**; February 22, 2005.
 '40 **Brumfield, Robert C.**; December 29, 2002.
 '40 **Brunner, Frederick C.**; September 17, 2003.
 '40 **Goodmanson, Lloyd T.**; August 8, 1993.
 '40 **Jongeneel, James W.**; March 1, 1991.
 '40 **Loeffler, Donald E.**; July 2, 1993.
 '40 **Newby, Clinton T.**; no details.
 '40 **Todd, George J.**; July 21, 2003.
 '40 **Walter, Don L.**; April 22, 1998.
 '40 **Weir, Gordon B.**; no details.
 '41 **Abraham, Wayne G.**; July 27, 2009.
 '41 **Acker, Roy M.**; August 19, 2005.
 '41 **Snodgrass, Reuben**; September 8, 2000.
 '41 **Wahrhaftig, Clyde A.**; April 7, 1994.
 '41 **Wood, David S.**; March 12, 1998.
 '42 **Alford, Jack L.**; February 11, 2006.
 '42 **Baird, Hugh A.**; July 6, 2009.
 '42 **Rogers, William L.**; December 22, 2003.
 '42 **Schauer, Eric H.**; October 21, 1999.
 '42 **Seibel, Charles M.**; July 9, 1994.
 '42 **Webster, Paul W.**; October 9, 1993.
 '43 **Alpert, Leonard S.**; December 2, 2006.
 '43 **Blayney, James A.**; no details.
 '43 **Hodder, Wayne K.**; no details.
 '43 **Richardson, Audre H.**; no details.
 '43 **Schamberg, Richard**; January 20, 2005.
 '43 **Thiene Jr., Paul G.**; July 19, 2004.
 '44 **Field, Almeron J.**; January 25, 2009.
 '44 **Lauterbach, Robert E.**; May 10, 1996.
 '44 **Nelson, John B.**; July 10, 1999.
 '44 **Norsworthy, Thomas W.**; September 1995.
 '44 **Osgood, George M.**; November 28, 2007.
 '44 **Soike, Richard J.**; March 20, 2009.
 '44 **Wilcox, Doyle E.**; July 31, 2008.
 '45 **Fraday, William E.**; January 7, 2001.
 '45 **Lowe, Edward K.**; April 15, 1997.
 '45 **Morison, Bradley G.**; February 17, 2008.
 '45 **Scarborough, Alfred D.**; November 8, 2008.
 '45 **Stiles, Stanford G.**; September 16, 2003.
 '45 **Woodard, Clarence J.**; January 3, 2001.
 '46 **Downs Jr., Bert W.**; May 18, 1994.
 CA Γ '36 **Leps, Thomas M.**; April 23, 2010.
 '41 **Coope Jr., George F.**; November 7, 2009.
 '47 **Willard, Robert N.**; October 10, 2009.
 '60 **Munson Jr., H. Carl**; no details.
 '73 **Bourn, Douglas R.**; February 17, 2010.
 CA Δ '47 **Yen, Teh Fu**; January 12, 2010.
 '48 **Lichnecker, Harold A.**; September 14, 1997.
 '59 **Lang, Charlotte K.**; June 26, 2009.
 CA E '48 **Dining, John R.**; April 21, 2010.
 '58 **Michaelis, George H.**; March 10, 1996.
 CA Z '68 **Selna, Terence C.**; November 14, 2006.
 CA I '69 **Taylor, Joseph M.**; March 9, 2009.
 CA M '37 **Steuck, Fred H.**; February 27, 2010.
 CA E '94 **Griffith, Scott A.**; no details.
 CA P '50 **Jarrett, McRae**; October 17, 2009.
 CO A '30 **Purdum, John F.**; no details.
 CO B '39 **Remke, Marvin A.**; July 26, 2003.
 '44 **Krupotich, Edward**; December 17, 2006.
 '62 **Barta, Kay F.**; February 26, 2010.
 CO Δ '74 **Denhalter, Kip W.**; no details.
 CT A '46 **Kuesel, Thomas R.**; February 17, 2010.
 '49 **Teaze, David A.**; December 1, 2008.
 '52 **Preston, John L.**; February 21, 2010.
 DE A '66 **Brostrand, Arthur C.**; no details.
 DC B '63 **Vlissides, Matthew J.**; January 19, 2010.
 FL A '50 **Tilden, John R.**; January 20, 2010.
 '62 **Senterfitt, Donald R.**; February 15, 2010.
 FL Γ '73 **Barton, James S.**; no details.
 GA A '40 **Cauble, Gordon B.**; December 3, 2009.
 '41 **McRae, Grady M.**; no details.
 '43 **Hill Jr., Maryan E.**; September 3, 2005.
 '43 **Pigford, Thomas H.**; February 27, 2010.
 '43 **Sadow, Ray M.**; February 20, 2006.
 '44 **Linden, Henry R.**; September 13, 2009.
 '47 **Walker, Robert L.**; no details.
 '48 **Moseley Jr., Carl M.**; April 27, 2002.
 '49 **McGinnis, Charles E.**; April 28, 2005.

CHAPTER ETERNAL

- '77 **Jackson, Jeffrey L.**; November 25, 2009.
- IL A '39 **Carr, Maurice K.**; no details.
- '43 **Carroll, J. Raymond**; December 2008.
- '49 **Brigham Sr., William H.**; 2005.
- '85 **Ulmer, Donald G.**; July 20, 2009.
- IL B '54 **Pittelko, Harvey P.**; November 21, 2008.
- IN A '36 **Hunsicker, Harold Y.**; no details.
- '37 **Webb, Richard C.**; December 12, 2009.
- '39 **Harvey, Douglass C.**; September 2009.
- '48 **Nickoloff, Nick E.**; no details.
- '49 **Miller, Jerome A.W.**; March 9, 2010.
- '49 **Nachand Jr., Charles D.**; January 26, 2010.
- '50 **Field, Thomas O.**; March 1, 2010.
- '59 **Swank, Lewis R.**; August 18, 2009.
- IA A '45 **Thomsen, Frederick T.**; September 2009.
- '49 **Gibson, James W.**; no details.
- '49 **Toren, Ralph L.**; January 12, 2010.
- '61 **Beeson, Robert E.**; no details.
- '70 **Schaeffer, Dennis R.**; October 25, 2009.
- IA B '41 **Snell, Jacob K.**; May 5, 2010.
- '54 **Stapleton, Richard J.**; January 19, 2010.
- KS A '41 **Adams, Ralph G.**; no details.
- '50 **Walker, Charles H.**; no details.
- '56 **Bennett, Richard P.**; February 27, 2010.
- KY A '50 **Weatherspoon, Glenn**; no details.
- KY B '42 **Stevens, James I.**; no details.
- LA A '37 **Lewis, Stanley J.**; no details.
- '51 **Rozas, Eugene A.**; October 26, 2009.
- '57 **Tudor Jr., Robert B.**; March 14, 2010.
- LA B '40 **Blessey, Walter E.**; February 17, 2010.
- ME A '55 **McKechnie Jr., Karl H.**; October 19, 2009.
- MD B '47 **Nachtigall, Alfred J.**; no details.
- MA A '36 **Edmunds, Donald L.**; May 31, 1999.
- '46 **Johnston, E. Russell**; January 24, 2010.
- '56 **Heath, Robert R.**; December 2005.
- MA B '38 **Steuer, H. Guyford**; April 9, 2010.
- '42 **Root III, Albert B.**; November 2007.
- '51 **Roberts, James E.**; no details.
- '53 **Dausman, George E.**; no details.
- MA E '52 **Heney, Joseph E.**; January 17, 2009.
- '71 **Foulis Jr., John F.**; April 7, 2006.
- MI A '38 **Caldwell, R. William**; 2004.
- MI B '49 **Freeborn, William A.**; no details.
- '53 **Blatz, William E.**; no details.
- MI Γ '38 **Elliott, Clifton M.**; 2008.
- '42 **Sliepevich, Cedomir M.**; October 22, 2009.
- '47 **Frey, Donald N.**; March 5, 2010.
- '48 **Sheehan Jr., Raymond J.**; September 7, 2006.
- '48 **Weeks, Richard M.**; April 14, 2009.
- '50 **Cleveland, Donald S.**; November 3, 2009.
- '50 **King, Ray H.**; 2000.
- '52 **Hollis, Jack L.**; March 12, 2009.
- '54 **Treichler, Leonard J.**; February 27, 2002.
- '55 **Everett, Willis L.**; June 2004.
- '56 **Weber, William B.**; January 7, 2010.
- '59 **Maguire, David E.**; August 2, 2007.
- '82 **Plude, John R.**; April 27, 2009.
- MI Δ '58 **Welder, Gerald E.**; November 11, 2009.
- '64 **Sting, Donald W.**; March 29, 2010.
- MI E '57 **Schneider, Austin E.**; October 19, 2009.
- MI Z '47 **Cornet, John P.**; December 16, 2009.
- '47 **Gress, Albert V.**; November 3, 2008.
- MI H '44 **Hossack, Alexander**; October 9, 2004.
- '59 **Johnston, Laird E.**; November 21, 2008.
- MN A '38 **Brierley Jr., W. Gordon**; no details.
- '44 **Batzli, Robert O.**; September 30, 2009.
- '45 **Anderson, James G.**; no details.
- MS A '47 **Spain, Frank K.**; April 25, 2006.
- MO A '42 **Fisher, Charles H.**; March 15, 2010.
- '62 **Cochran, John R.**; December 14, 2009.
- MO B '35 **Fine, Morris M.**; April 16, 2009.
- '40 **Dowling, Paul T.**; March 4, 2010.
- '41 **Fick, Armin F.**; March 17, 2009.
- '49 **Withrow, Harold J.**; no details.
- '50 **Greenberg, Aaron J.**; October 2009.
- '50 **Spanier, Lawrence A.**; April 28, 2007.
- '51 **Parrish, David D.**; October 6, 2008.
- '51 **Spindle, Harvey E.**; January 2007.
- '51 **Venarde, Jack H.**; November 10, 2006.
- '52 **Bauer, Richard H.**; February 14, 2010.
- '66 **Kasten, Richard J.**; January 27, 2010.
- '75 **Jackson, Robert T.**; 2003.
- MO Γ '27 **Millstone, Isadore E.**; June 2, 2009. [*Centenarian No. 65*]
- '38 **Schwartz, Robert T.**; July 2, 2009.
- '48 **Dreifke, Gerald E.**; January 10, 2010.
- '63 **Pierce, Leo E.**; no details.
- '94 **Lamoree, David P.**; June 2009.
- MT A '44 **Schmit, Joseph W.**; January 28, 2008.
- '56 **Poor, Clifford E.**; July 1, 2009.
- MT B '42 **Hilpert, Conrad R.**; August 12, 2009.
- NV A '37 **Keeler, Charles F.**; February 12, 2010.
- NJ A '42 **Cuming, William R.**; no details.
- NJ B '35 **Stringfield, H.C.**; September 28, 2009.
- '50 **Howland, Frank L.**; February 13, 2010.
- NJ Γ '35 **Degennaro, P. Frank**; February 27, 1997.
- '44 **Hutchings Jr., Joseph L.**; December 2008.
- '00 **Rubin, Leonard**; 2006.
- NM A '52 **Gunaji, Narendra N.**; April 5, 2010.
- '73 **McCarthy, William C.**; July 28, 2009.
- NM B '76 **Gaddis, Mark W.**; no details.
- NY B '50 **Bliss, Malcolm M.**; February 24, 2009.
- '60 **Malafi, Hilary T.**; August 12, 2003.
- NY Γ '43 **Saunders Jr., Louis N.**; August 14, 2003.
- '48 **Marschall, Albert R.**; November 18, 2008.
- '50 **Ragati, Albert L.**; July 1, 2009.
- '51 **Hunter, Robert A.**; July 7, 2008.
- '58 **Goldstein, Kenneth S.**; October 20, 2007.
- '76 **Ellis, David G.**; May 31, 2009.
- NY Δ '39 **Gordon, William E.**; February 16, 2010.
- '41 **Shaw, Walter B.**; July 20, 1992.
- '60 **Rempe, David M.**; February 8, 2010.
- '76 **Dentes, George M.**; 2006.
- '76 **Rhoads, Donald P.**; no details.
- NY Z '41 **Schaffner, Charles E.**; July 12, 2002.
- NY H '42 **Forman, Herbert L.**; no details.
- '57 **Padovano, Vincent**; no details.
- NY I '42 **Lucken, Ernest G.**; February 16, 2010.
- NY Λ '50 **Feingold, Sherwin K.**; April 11, 2009.
- '52 **Rice, John T.**; July 29, 2009.
- NY N '52 **Johns, Frederick C.**; no details.
- NY Σ '52 **Spriggs, Richard M.**; July 21, 2007.
- NC A '44 **Zachary, Robert A.**; January 8, 2005.
- '51 **Jenkins Jr., Alvin W.**; April 28, 2010.
- '58 **Townsend, Clarence W.**; October 26, 2009.
- NC Γ '42 **MacLachlan Jr., William M.**; no details.
- '47 **De Mott Jr., Robert W.**; October 21, 2009.
- '49 **Brown, Lloyd L.**; no details.
- NC Δ '91 **Beam, Kimberly D.**; November 24, 2005.
- ND A '48 **McLean, Keith W.**; August 4, 2009.
- OH A '41 **Beckwith, Robert W.**; October 25, 2009.
- OH B '39 **Seuberling, H.P.**; no details.
- OH Γ '53 **Fletcher Jr., Leonard W.**; June 19, 2008.
- OH Δ '55 **Lee, Thomas G.**; February 21, 2010.
- OH Θ '60 **Limbirt, Frank J.**; December 24, 2004.
- OH I '44 **Spencer, William E.**; June 11, 2009.
- OK A '50 **Martin, Richard W.**; no details.
- OR A '52 **Jenkin, W.R.**; April 5, 1998.
- '98 **Hurley, Montgomery B.**; no details.

PA A '36 **Healy, Dudley L.**; no details.
 '51 **Hohmann, Gerald D.**; April 14, 2010. [Twins]
 '51 **Hohmann, Lawrence A.**; March 5, 2010. [Twins]
 PA B '41 **Whitehurst, Theodore R.**; no details.
 '52 **Reed, Joseph R.**; February 27, 2010.
 '56 **Waltmeyer, Robert V.**; April 12, 2002.
 '60 **McCarron, Russell L.**; February 10, 2010.
 '67 **Baran, Daniel E.**; June 7, 2008.
 PA I '34 **Ord, John A.**; April 6, 2010.
 '38 **Copp, Joseph H.**; October 28, 2005.
 '49 **Forsythe, Alan K.**; September 19, 2009.
 PA Δ '51 **Reitz, Theodore C.**; no details.
 PA E '57 **Haring, Donald R.**; March 19, 2009.
 PA Z '49 **Bash, Ignatius F.**; March 11, 2010.
 PA H '48 **Douglas, William H.**; December 17, 2009.
 '48 **Hildebrand Jr., Arthur R.**; April 25, 2010.
 '80 **Love, Timothy E.**; August 10, 2003.
 PA I '51 **Boles, Charles T.**; November 26, 2007.
 '79 **Harper Jr., James**; April 21, 2007.
 '82 **Fedele, Carlo J.**; June 5, 2008.
 RI A '60 **Hsia, T. Ming-Su**; February 2010.
 SC A '47 **Brackett, William D.**; February 16, 2004.
 '81 **Bolchoz, Charles B.**; December 19, 2007.
 SC Γ '45 **Wells Jr., William M.**; no details.
 TN A '43 **Niles Jr., Charles F.**; January 15, 2010.
 '43 **Rymer Jr., William W.**; June 2, 2009.
 '44 **Powell, Robert M.**; August 23, 2008.
 '48 **Parris, Leon L.**; March 21, 2010.
 '55 **Councill, Edwin D.**; February 4, 2010.
 TN B '51 **Grisard, Frank H.**; 2004.
 TN Γ '66 **Stonecipher, George R.**; March 7, 2007.
 TX A '36 **Levine, Joe S.**; no details.
 '39 **Redding, Edwin D.**; August 23, 2006.
 '49 **Focht, F. Tuck**; February 4, 2010.
 '50 **Shield, Bernard H.**; January 2009.
 '57 **Beall, Joseph E.**; no details.
 '59 **Brown, Kermit E.**; December 10, 2009.
 TX B '43 **Medlin, Homer L.**; no details.
 '48 **Hale, Robert L.**; no details.
 TX Γ '45 **Jewell, James G.**; February 27, 2003.
 TX Δ '49 **Robinson, Robert M.**; January 4, 2008.
 '50 **Ross, Hardy E.**; March 24, 2007.
 '52 **Adams, James E.**; July 1, 2008.
 '52 **Cohen, Aaron**; February 25, 2010.
 '57 **Holley, Cyrus H.**; June 27, 2008.
 '57 **LeFevre, E. Walter**; November 23, 2009.
 TX H '63 **Decker, Donald A.**; January 12, 2010.
 TX A '52 **Kedzie, Donald P.**; February 15, 2010.
 UT A '48 **Carter, Alan C.**; October 15, 2000.
 '48 **Hunn, Spencer S.**; June 27, 2008.
 '48 **Wade, Glen**; no details.
 VA A '39 **Webb, Donald R.**; March 2009.
 '42 **Kinnier, Henry L.**; no details.
 '50 **McCauley, Don O.**; no details.
 '53 **Darden III, Colgate W.**; no details.
 '55 **Dancy, Julian H.**; May 5, 2009.
 '59 **Deaner, Harold W.**; August 30, 2008.
 '67 **Crymes Jr., John M.**; no details.
 '68 **Arnold Jr., Eugene D.**; no details.
 VA B '42 **Broun, Richard G.**; November 22, 2009.
 '49 **Blake, Oscar J.**; May 17, 2004.
 '53 **Quible, Frank R.**; November 9, 2009.
 VA Γ '59 **Tiwari, Surendra N.**; no details.
 VA Δ '55 **Tuck, Winfree P.**; November 16, 2009.
 WA A '38 **Gannon, Philip E.**; April 17, 2005.
 '48 **Robinson, Robert B.**; no details.
 '67 **Hicks, Warren D.**; January 3, 2010.
 '98 **Jung, Roger L.**; 2005.
 WA B '37 **Grant, George A.**; August 23, 2009.

WV A '41 **Frisch, George M.**; January 20, 2010.
 '51 **Miller, Robert B.**; August 28, 2009.
 '54 **Blackwell, Lyle M.**; September 1, 2008.
 '80 **Public, Robert J.**; September 3, 2009.
 WI A '49 **Foss, Richard L.**; May 27, 2002.
 '98 **Ernst, Elizabeth A.**; no details.
 WI B '42 **Hammer, Charles H.**; 2006.
 '50 **Fitzsimmons, James J.**; October 2008.
 '51 **Marsh, Walter R.**; June 6, 2009.
 '51 **Obenberger, Wallace J.**; no details.
 '65 **Dallmann, Donald E.**; no details.

HEADQUARTERS VISITORS

Richard C. Kazmar, *Illinois Gamma '71, Knoxville, TN; September 14, 2009.*
William C. Easterday, *Ohio Epsilon '97, Jefferson City, TN; September 14, 2009.*
Eric J. King, *Tennessee Alpha '94, Austin, TX; September 14, 2009.*
Archie Mathews, *Massachusetts Zeta '53, Knoxville, TN; September 16, 2009.*
Billy J. Moore, *Tennessee Alpha '59, Monte Sereno, CA; October 1, 2009.*
Joseph D. Calhoun, *Tennessee Alpha '70, Macon, GA; October 9, 2009.*
Tricia E. Schwaller, *South Dakota Alpha '98, Centennial, CO; November 25, 2009.*
Curtis D. Gomulinski, *Michigan Epsilon '01, Ypsilanti, MI; November 25, 2009.*
Larry A. Simonson, *South Dakota Alpha '69, Rapid City, SD; January 26, 2010.*
Benjamin L. Langrill, *Michigan Epsilon '08, Laurel, MD; April 12, 2010.*
Kathleen L. Colbry, *Michigan Alpha '99, Okemos, MI; April 19, 2010.*
Dirk J. Colbry, *Michigan Alpha '06, Okemos, MI; April 19, 2010.*

TAU BETA PI PLANNED GIVING

Tau Beta Pi's updated 26-page guide to planned-giving opportunities shows how your support can benefit both TBPI and your financial situation.

Topics include:

- Gifts of cash, stock, real estate, and life insurance,
- Charitable remainder trusts, and
- Charitable lead trusts.

To request a copy, email:
GivingBooklet@tbp.org
 or write:

Tau Beta Pi
 P.O. Box 2697
 Knoxville, TN 37901-2697

*Gifts
+ Lasting
Value*

*Estate
Gifts*



Western Kentucky University



Looking north from the south side of the WKU campus at the "Hill."

"The Spirit Makes the Master"

Western Kentucky University's rich history dates back to its beginning as a normal school in Bowling Green, KY. On March 21, 1906, the state general assembly approved the Western Kentucky State Normal School as one of two new teacher training schools in the state. Dr. Henry H. Cherry, the private owner of the Southern Normal School, became the first president when the state absorbed his school into the new public institution. The hilltop, located just southwest of downtown Bowling Green, would be the permanent location of the institution and would blossom from a campus of three buildings in 1911 to 66 buildings in less than 100 years.

In 1922, the state renamed the school and authorized the Western Kentucky State Normal School and Teachers College to grant four-year degrees. In 1927, the institution merged with Ogden College, a private men's school on the east side of the hill. The name was shortened to Western Kentucky State Teacher's College in 1930, and, in 1931, the first master of arts degrees were offered.

The name changed again in 1948 to Western Kentucky State College. The third president, Kelly Thompson, massively reorganized and expanded the campus. During 1963-65, four more colleges were added, including: Bowling Green college of commerce, Potter college of liberal arts, the college of education, and the Ogden college of science and technology.

The college officially became Western Kentucky University on June 16, 1966. Today, there are six colleges: Bowling Green community college, college of education and behavioral sciences, Gordon Ford college of business, Ogden college of science and engineering, Potter college of arts, humanities, and social sciences, and the college of health and human services.

Approximately 21,000 students can choose from nearly 90 academic majors and 60 academic minors. In addition to certificate and associate programs, graduate students may pursue advanced degrees leading to a master of arts, master of science, M.B.A., or doctoral degree in educational leadership.

From the late 1960s through 2000, the department of engineering within Ogden college offered baccalaureate engineering technology programs in civil, electrical, mechanical, and electro-mechanical engineering technology. These were officially discontinued in 2000 to make way for new engineering programs. Since 2000, the department has offered three engineering baccalaureate programs in civil, electrical, and mechanical engineering, which were fully accredited by ABET/EAC in 2003.

In January 2005, the department moved into a new \$20-million, 72,000-sq.-ft. building, complete with new laboratory facilities, student rooms, faculty and staff offices, and a large high-bay area for testing. Today, the department is comprised of approximately 800 engineering students and is expected to grow in the future.

Each of the bachelor programs in engineering is focused on project-based engineering practice learning. Students are encouraged to join the discipline-focused student groups and participate in design competitions at the state and national levels. The engineering student organizations (ASCE, ASME, and IEEE) have been successful at competitions. Multidisciplinary projects create interdisciplinary opportunities for students among the three programs to collaborate and work together. Class sizes are small, and the 12 engineering faculty and four staff members are student-focused. The size of each program allows students to develop professional and trusting relationships with all of their professors and makes for an encouraging learning

Aerial view of the "Hill."

IMAGES COURTESY OF WKU



The complex for engineering and biological sciences on the WKU campus.

environment that produces confident, assured engineering practitioners upon graduation.

The official installation of the Tau Beta Pi Kentucky Gamma Chapter in February 2010 will further improve the reputation of an already prominent program at WKU. For more information on either the university or its engineering programs please visit these websites: www.wku.edu and www.wku.edu/engineering.

This article was prepared by Dr. Shane M. Palmquist, P.E., New Hampshire Alpha '95, assistant professor of civil engineering and Advisor of Kentucky Gamma. Photos are courtesy of Western University. The story of the Kentucky Gamma Chapter installation on February 27, 2010, appears on pages 12-13 in this issue.

Boise State University



The Engineering Honor Society at Boise State University (BSU) became an active student organization in 2004, hoping to eventually affiliate with Tau Beta Pi. By summer 2008 when the preliminary petition to affiliate with Tau Beta Pi was filed, the 13 inaugural members had grown to 28 actively participating students and many more alumni. The group grew to more than 100 student members and alumni whose ongoing goal was to continue to promote integrity and excellence in engineering.

From the beginning, the Engineering Honor Society (EHS) was active both on campus and in the community. Just a week after inception, EHS members met with 35 tenth-grade students from the Treasure Valley math and science center to explain to them how engineering impacts everyday life. The group promotes excellence on the fundamentals of engineering exam by sponsoring review sessions with free pizza. Members promoted graduate education by hosting seminar speakers focused on how to apply for and secure funding for graduate school. For four years, EHS members participated in many community-service activities including assisting the Idaho Foodbank, helping to clean up for those needing physical assistance through Rake Up Boise, and much more.

Since its inaugural year, the group consistently joined in outreach efforts in the college of engineering, helping to promote engineering to more than 11,000 K-12 students

and their families each year. EHS students developed a website, drafted and approved a set of bylaws, created their first advisory board, and continued actively to help engineering students understand the importance of professional licensure.

The Tau Beta Pi site visit was held in the fall of 2008, and former president Christopher V. Buu was invited to file a final petition in May 2009. Shatakshi Goyal, 2009-10 president, successfully presented the EHS petition in October at the 2009 Tau Beta Pi Convention. The installation occurred March 13, 2010.

The college of engineering was created by the state legislature in 1995 after intense lobbying from Idaho business and political leaders. The college began offering classes in 1996, graduated its first students in 1997, and was immediately accredited in the civil, mechanical, and electrical engineering disciplines. In 2004, materials science and engineering was added and also immediately accredited upon graduating the first students.

The college now offers 24 degree options ranging from bachelor's through master's and doctoral. The college is consistently ranked in the top 15 in the *U.S. News & World Report* list of top engineering programs among public, comprehensive universities. In addition, the school is ranked third nationally in the percentage of tenured/tenure-track women faculty, according to the American Society for Engineering Education.

IMAGES COURTESY OF BSU

The college has seen a 33 percent increase in undergraduate enrolment in the past three years and has tripled research expenditures during the past five years. In fact, college researchers average nearly one grant award per week. More than 82 percent of engineering undergraduate students experience hands-on research and internship opportunities prior to graduation.

The state board of education has also established three major research centers in the college of engineering. The center for environmental sensing was established to bring together the expertise of researchers across campus and across the nation to develop miniaturized, low-cost sensors to monitor environmental events. The center for orthopaedic and biomechanics research is a collaborative effort between the BSU departments of mechanical engineering and kinesiology, along with local clinicians with an interest in performing and supporting biomechanics research. The center for materials characterization supports research in materials science, electrical engineering, computer engineering, civil engineering, computer science, mechanical and biomedical engineering, physics, biology, chemistry, and geosciences.

The engineering college is a partner in a Federal Aviation Administration center of excellence. This partnership includes universities throughout the country, the FAA, other governmental organizations, and industrial affiliates. The team members coordinate research and development in areas of transportation technologies that are critical to the agency's mission and long-term vision.

The university is the "New U Rising" with its metropolitan character, traditional undergraduate teaching excellence, and advanced research and graduate studies. In fact, BSU was ranked among the nation's "top up-and-coming schools" in *U.S. News & World Report's* 2009 "America's Best Colleges" issue.

New buildings, record enrollment, expanded academic offerings, and cutting-edge research all are signs of the university's emergence as one of the best public institutions in the Northwest. It is the largest university in Idaho with nearly 19,000 students.

BSU is located in the state's governmental, commercial, and cultural heart, and yet the campus is just minutes from spectacular recreational opportunities amid the beauty of the Northern Rocky Mountains. It is home to 11 Idaho professor-of-the-year honorees since 1990. It is a progressive, learning-oriented, student-focused university dedicated to excellence in teaching, innovative research, leadership development, and community outreach.

Idaho's metropolitan university offers about 170 academic programs in seven colleges: arts and sciences, business and economics, education, engineering, graduate studies, health sciences, and social sciences and public affairs. Students can also study abroad through any accredited program at hundreds of sites around the world and participate in one of the largest internship programs in the Northwest.



BSU has the fastest growing research program in Idaho. Its engineers are engaged in world-class studies on campus and around the world. Campus undergraduates have a unique opportunity to stand shoulder-to-shoulder with researchers and graduate students making breakthroughs in novel materials, fabrication of new sensors, exploration of biomedicine, and environmental studies of the earth's shallow subsurface.

Campus life offers adventure and activity. More than 200 student organizations, new residence halls along the Boise River greenbelt, and a state-of-the-art student recreation center provide opportunities for both individual development and fun. More than one million visitors come to campus annually for Nobel and Pulitzer prize-winning speakers, Bronco football, Martin Luther King Jr. human rights celebration, and other events.

This article was prepared by Margaret Scott, director of communications and outreach in the BSU college of engineering. Photos are courtesy of BSU. The story of the Idaho Gamma Chapter installation on March 13, 2010, begins on page 14.



DISTRICT DOINGS

DISTRICT 2

The New York Eta Chapter at City College of New York hosted 85 student and alumnus members of Tau Beta Pi for the District 2 Conference on the weekend of February 20–21, 2010.

Activities included leadership training, a chapter operations workshop, and social and networking opportunities among students and alumni. Meetings were held in the Grove School of Engineering—named for Andrew S. Grove, NY H '60, former chairman and CEO of Intel.

A reception was hosted for eight local alumni, who shared their recollections of Tau Beta Pi, and met others in attendance. All learned about the K-12 MindSET Program, an Association update, and a discussion on personal development from Vice President Solange Dao.



Sunday morning, Andrea J. Pinkus and Felipe A. Leon presented Engineering Futures training to expand leadership effectiveness. Carl S. Selinger, NY I '67, Advisor to New York Iota and professor at the Cooper Union School of Engineering, gave his presentation, “*Stuff You Don't Learn In Engineering School.*”

The conference closed with a well deserved round of applause in recognition of New York Eta members for serving as excellent hosts. The District Directors urged attendees to use the information that they learned to reinvigorate their chapters and grow our membership. Everyone returned to respective homes under sunny skies on a warm winter afternoon.

—**Thomas Pinkham IV**
MA E '88
District 2 Director

DISTRICT 7

On March 27 at the University of Michigan-Dearborn, the 26th annual Wayne County Regional Tournament of the Science Olympiad was held.

For the fifth year in a row the tournament was sponsored by the Michigan Iota Chapter of Tau Beta Pi. This year the success of the competition was boosted by the strong support of the Michigan Epsilon, Michigan Delta, and Southeast Michigan Alumnus Chapters.

Of the 56 events, 22 were managed by Tau Bates. Michigan Delta members took responsibility for the overall scoring of the event. Winning middle- and high-school teams advanced to the state tournament in May at Michigan State University.



Photo by Rena Lavery

Wayne County Science Olympiad 2010 trajectory competition run by Michael J. Bustamante, Michigan Iota Cataloger.

Students from 39 area schools competed in science-and-engineering-based competitions in a variety of venues, ranging from testing events in astronomy and ornithology to construction-based events such as elevated-bridge and trajectory, where students arrive with pre-built devices that they test on-site.

The *Detroit Free Press* was on hand to cover the 2010 tournament and published Tau Beta Pi's successful involvement.

Events like this are a testament to the great things Tau Beta Pi chapters can achieve when working together, and all those involved deserve recognition for their hard work.

—**Andrew J. Flowerday,**
MI I '02, District 7 Director

TAU BETA PI 2010 ALUMNUS RECEPTIONS

President Larry A. Simonson socialized with alumni at spring receptions in Dayton, Detroit, Houston, and Naples, FL. Many thanks to our hosts: Michael J. Plank, Houston Coronado Club on March 30; Raymond E. Latham, Lakeside Country Club, Houston, March 31; and Martha and Richard G. Lee, Vineyards Country Club, Naples, April 8.



Houston guests at Lakeside Country Club included: **R. Wayne Young**, TX Δ '56; **Kevin G. Moormann**, SD A '04; **K.C. Jeang**, AZ A '74; **Bob J. Latham**, TX Δ '84; **Nicole L. Talbot**, MO B '77; **Lawrence E. Chapman**, TX Γ '48; **Randal W. Sitton**, TX E '85; **Frank C. Shelden**, TX Γ '48; **Raymond E. Latham**, TX Δ '56; and **Edwin J. Jennings**, TX Γ '48.



Houston guests at the Coronado Club included: **Randal W. Sitton**, TX E '85; **JoAnn M. Boss**, CA Δ '80; **Michael C. Romer**, TN A '04; **Anita E. Gale**, WA A '73; **Michael J. Plank**, TX Δ '83; **A. Katie Schroeder**, LA Γ '88; **Craig A. Fox**, TX Δ '77; **Stewart C. O'Dell**, TX Γ '78; and **Blake R. Samuels**, MT B '84.



Detroit guests at Birmingham Country Club (not all pictured) include: **Arleigh P. Helfer Jr.**, PA Γ '67; **Mumtaz A. Usmen**, MI E '70; **Curtis D. Gomulinski**, MI E '01; **Pritpaul S. Mahal**, MI Γ '07; **Michael A. Badalament**, MI Γ '91; **Andrew E. Toy**, MI I '95; **Colleen L. Hill**, MI E '00; Marilyn and **Amos O. Winsand**, CO B '52; and Angela and **Michael J. Vinarcik**, OH Γ '90.

Harry W. Lange, MI Z '75, manager of the Fidelity Magellan mutual fund, spoke to alumni on April 8 at the Vineyards Country Club reception in Naples, FL, about global investment conditions. (Pictures below)



James D. Froula, TN A '67; **Andrew C. Ask**, IA A '64; Martha and **Richard G. Lee**, MA Δ '51; **William J.**, NY Θ '64, and **Jaimie Flack**; and **Frederick H.**, IA B '49, and Jean **Biere**.



Hiroko and **Harry W. Lange**, MI Z '75; **Rodger F. Smith**, WI A '64; **Renee J. Jones**, FL Γ '00; Maria Terry; **Stephen S. Sattler**, MI Z '94; **Tom J. Woosnam**, IN A '65; **Andrew Edwards**, NJ Γ '47; and **Richard S. Traverse**, FL A '71 (Not pictured: **Edgar F. Minter**, PA A '57).



Veli V. Lapinoja, MI B '66; **Norman Pih**, TN A '82; Judy Lapinoja; **Sherry D. Jennings-King**, TN A '93; **James W.**, NC A '77, and Barbara Johnson; and Jane and **Quinn W. Martin**, IN A '69.

IN THE COLLEGES

SPOTLIGHT

Engineering Master's Increasing

Engineering master's degrees rose in 2009 to a new high of 41,608, reports the ASEE. Twenty-three percent of the degrees were awarded to women, which is also a high mark. Forty-four percent of the degrees were awarded to foreign nationals—the highest percentage since 2004. Based on the six percent increase in fall 2009 master's enrollment, ASEE anticipates more growth at this level in the near term.

	Women	Foreign Nationals	Total M.S.
2009	23%	44%	41,608
2008	23%	41.7%	38,986
2007	22.4%	38.7%	36,983
2006	22.5%	39.8%	39,015
2005	22.7%	42.6%	40,550
2004	21.9%	45.5%	39,837
2003	22.3%	46%	35,196

Global "Mindshare"

In a sign of the Defense Department's hunger for top research talent, the Defense Advance Research Projects Agency (DARPA) has ceased requiring participants in a young professors' fellowship to hold security clearances. Director Regina Dugan told a House armed services subcommittee that the requirement had limited participation to U.S. citizens, causing many universities to pull away. The change was made with "full awareness and protection of national security interests," Dugan said, to allow "the best minds in the country" to join in DARPA's fundamental research "whether or not they are U.S. citizens."

It reflects a recognition that "the talent pool, the mindshare, is global now." Chief of Naval Research Nevin P. Carr Jr. said that his agency, as well, is looking overseas. "We're not keeping up with demand," he said of this nation's current ability to produce its own science and engineering researchers. He noted that more American advanced degrees are now going to non-U.S. citizens than to Americans.

Engineering Bachelor's Constant

The numbers of engineering bachelor's degrees awarded annually per capita have remained essentially unchanged at about 250 per million population since the 1995 academic year (AY), says ASEE. There were significant fluctuations prior to this period (a maximum of 330 in 1984-85 and a minimum of 176 in 1975-76). Many individual engineering disciplines, however, have shown significant trend variations in recent years. Aerospace, biological/biomedical, civil, and mechanical engineering have been increasing substantially; but computer and electrical engineering have been declining. Among the smaller disciplines, nuclear and petroleum engineering have been increasing recently, while environmental engineering degrees continue to decline.

Doctor Who?

Some 58.3 percent of doctoral degrees in engineering in 2008 were awarded to foreign nationals says ASEE. This was a slight retreat from the high point of 61.6 percent that held for the 2006 and 2007 academic years. Yet it stands eight percentage points higher than the 2000 level. Nevertheless, the number of permanent residents receiving engineering doctorates increased from 3,005 in 2000 to 3,752 in '08. Overall, engineering doctoral degrees grew by 51 percent during this period to a total of 9,086.

Schools with Highest Percentage of Engineering Doctorates Awarded to Foreign Nationals*

1. Illinois Institute of Technology 88.9%
2. University of Cincinnati 86.1%
3. Florida International University 86.0%
4. SUNY, Buffalo 85.9%
5. University of Akron 84.6%
6. University of Texas, Dallas 84.4%
7. Texas A&M University 83.4%
8. Auburn University 81.6%
9. FAMU-FSU College of Eng'g. 80.8%
10. University of Kentucky 79.2%

* Minimum of 25 doctoral degrees awarded; 94 schools fit this criterion.

California Student Cuts Planned

California State University officials saw a record increase in applications for the new school year, although enrollment was being curbed, reports the AP. The system received more than 266,000 applications for fall 2010 by November 10, marking a 53 per-

cent increase from the same period the year before. At the same time, the system "is facing a \$564 million budget cut for the fiscal year" and is raising fees, furloughing employees, and decreasing enrollment "by 40,000 over the next two years."

New York P.E. Requirement Removed

The New York State Society of Professional Engineers is opposing actions by two local jurisdictions to eliminate the P.E. license as a requirement for certain governmental positions. NYS-SPE states that decisions in Colonie and Syracuse to reduce spending by replacing a P.E. with an unlicensed political appointee will jeopardize public safety, health, and welfare.

PEOPLE

Dr. John C. Bravman, California

Gamma '79, has been named the 17th



president of Bucknell University. For 11 years, Dr. Bravman has overseen Stanford's University's undergraduate program as vice provost for undergraduate education and served as dean of Stanford's freshman-sophomore residential college, which he founded in 1999.

Dr. Zvi Galil, New York Alpha '70, is to be dean of the college of computing at Georgia Tech. A member of the



National Academy of Engineering, he has research interests in algorithms, computational complexity, and cryptography. During 1995-2007, Dr. Galil served as professor and dean of the school of engineering and applied sciences at Columbia University. In 2007, he was named president of his *alma mater*, Tel Aviv University in Israel.

Dr. Robert H. Bishop, P.E., Texas Delta '79, professor of engineering, aerospace engineering, and engineering

mechanics at the University of Texas at Austin, has been named opus dean of Marquette University's college of engineering.

Dr. Sally E. Blount, *New Jersey Delta '83*, dean of the undergraduate college and vice dean of the Stern School of Business at New York University, has been named dean of Northwestern University's Kellogg School of Management. She is an expert in the fields of negotiation and behavioral decision making.



Dr. Frederick C. Berry, *Louisiana Gamma '83*, has been appointed vice president of academics at Milwaukee School of Engineering. Dr. Berry moves from Rose-Hulman Institute of Technology in Terre Haute, IN, where he served as head of the electrical and computer engineering department. He was co-director of Rose-Hulman's explore engineering program, designed to introduce middle- and high-school students to the world of engineering.



Dr. V.K. Sharma, *Indiana Epsilon '66*, has become dean of Trine University's school of engineering. He joined Trine as dean of the school of business in 2008 and has 35 years of technical and business experience in the commercial vehicle industry.

ASEE Election

Dr. Don P. Giddens, *GA A '63*, has become president-elect of ASEE. The following Tau Bates were also among those elected to ASEE office: **Dr. Ralph E. Flori Jr.**, *MO B '79*, vice president, member affairs; **Dr. Stephanie G. Adams**, *NE A '89*, chair, professional interest council I; **Dr. Bevelee A. Watford**, *VA B '81*, chair, professional interest council IV; and **Dr. Christi L. Patton Luks**, *TX Δ '81*, chair-elect, zone III.

Dr. Tod A. Laursen, *Oregon Alpha '86*, has been named as the new president of Khalifa University of Science, Research and Technology in Abu Dhabi. Dr. Laursen was chair of the department of mechanical engineering and materials science at Duke University and served as senior associate dean for education at its school of engineering during 2003-08.

FACILITIES

The University of Nevada-Reno has been awarded a \$1.2 million grant from the U.S. Department of Energy to develop and operate a national geothermal institute, reports the AP. This will be a consortium of geothermal schools, including the **Massachusetts Institute of Technology, Cornell University, Stanford University, University of Utah**, and the Oregon Institute of Technology.

The AP notes that all the schools in the consortium conduct geothermal research and education, but none is able to provide a geothermal degree program on its own. The institute will seek to "educate and train the next generation of scientists, engineers, plant operators, and policymakers." Classes could begin in early 2011, officials said. The geothermal program is expected to offer a series of eight one-week courses with additional field trips.

Wayne State University officials have approved the nation's first graduate program to train electric-car engineers, reports the *Detroit News*. The master's program in electric-vehicle-drive engineering received a \$5 million grant from the Department of Energy. Students, who can opt into an accelerated program, will learn how to design, power, develop, assemble, and promote electric and electric-hybrid engines.

In addition, WSU also will offer a graduate certification program in electric-vehicle engineering, a bachelor of science in electric transportation, and additional courses such as electrical engineering technology in electric-vehicle service.

The Lawrence Berkeley National Laboratory, at the **University of California-Berkeley**, has been awarded nearly \$18 million from the U.S. recovery and reinvestment act to build an advanced biofuels process development facility. Funded by the U.S. Department of Energy through its office of energy efficiency and renewable energy, this facility will help to expedite the commercialization of next-generation biofuels by providing industry-scale test beds for innovative technologies. Advanced biofuels, as defined by the energy independence and security act, are renewable fuels—other than ethanol derived from cornstarch—with at least 50 percent less life-cycle greenhouse-gas emissions than the fossil fuels they replace. Berkeley Lab's advanced biofuels unit will feature pre-treatment of biomass capabilities and bioreactors for the production of microbial or fungal enzymes that can break down biomass into fermentable sugars.

The U.S. Senate defense appropriations committee has approved \$4 million to develop the **University of Massachusetts Lowell's** nanomanufacturing research project. The university's projects include a structural damage detector for weapons, vehicles, and body armor and a sensor to detect biological and chemical agents, in addition to research into manufacturing solutions to mass produce the technology for the military. The laboratory will be part of the emerging technology and innovation center.

The University of Texas at El Paso is preparing to meet the current energy research demands for the 21st century with a Ph.D. track in energy science and engineering. Its mechanical engineering department will begin offering coursework for the new energy science and engineering track within the interdisciplinary doctoral program in environmental science and engineering. The program will include research topics such as fossil-fuel power-generation efficiency improvement, carbon capture and storage, high-capacity renewable power generation, and aerospace propulsion.

Brain Ticklers

RESULTS FROM WINTER 2009

Perfect

*Bachmann, David E.	MO B '72
*Beaudet, Paul R.	Father of member
Bush, James L.	TN Γ '01
*Campbell Jr., H. Grady	TN B '59
*Fenstermacher, T. Edward	MD B '80
*Fuemmeler, Jason A.	OH Θ '00
*Gaston, Charles A.	PA B '61
Jenneman, Jeffrey H.	OK A '08
*Kaliski Jr., Burton S.	MA B '84
Kaliski, Stephen	Son of member
*Kimsey, David B.	AL A '71
Kutcher Jr., John F.	MD A '86
*Mangis, J. Kevin	VA A '86
*Mayer, Michael A.	IL A '89
*McBride, John J.	WA A '57
*Norris, Thomas G.	OK A '56
Rasbold, J. Charles	OH A '83
Schleehauf, Martin W.	NY N '79
*Schmidt, V. Hugo	WA B '51
Silver, Robert E.	NY P '80
*Stribling, Jeffrey R.	CA A '92
*Strong, Michael D.	PA A '84
*Stubler, William G.	NY N '07
*Wendling, D. Greg	IL A '79

Other

Achterberg, Karl J.	WI A '84
*Alexander, Jay A.	IL Γ '86
Aron, Gert	IA B '58
*Berger, Toby	CT A '62
Bernacki, Stephen E.	MA A '70
Bertrand, Richard M.	WI B '73
Bukowski, Justin D.	OH A '90
*Couillard, J. Gregory	IL A '89
*De Vincentis, Joseph W.	TX Γ '93
deVitry, David M.	PA H '97
Harris, Kent	Non-member
*Harvey, Arthur J.	OH A '83
Jordan, R. Jeffrey	OK Γ '00
Klinger, Allen	NY I '57
*Midgley, James E.	MI Γ '56
Minnick, Michael V.	SC A '81
Palmer, William A.	ND A '65
Rentz, Peter E.	IN A '55
Robillard, David J.	MD Γ '88
Routh, Andre G.	FL B '89
Sigillito, Vincent G.	MD B '58
*Spong, Robert N.	UT A '58
Stepanian, Shant P.	NJ A '06
Summerfield, Steven L.	MO Γ '85
Sutor, David	Son of member
Svetlik, J. Frank	MI A '67
*Voellinger, Edward J.	Non-member
*White Jr., Warren N.	LA B '74
*York, Jeffrey A.	NC A '85
*Zelinka, Samuel L.	WI A '05

* Denotes correct bonus solution

In Memory

We sadly report the death on March 7, 2009, of **John W. Langhaar**, PA A '33. John served as a Brain Ticklers judge for 29 years, 1955-83. He was one of the finest recreational mathematicians we have known. Some of his problems

are still in our files. In fact, one of his original problems is new problem No. 5 in this column.

WINTER REVIEW

Problems 1 (bowling balls) and 2 (donuts) were the ones that presented the most difficulty of the regular problems. Many readers found the Computer Bonus easy.

SPRING SOLUTIONS

Readers' entries for the Spring problems will be acknowledged in the Fall BENT. Meanwhile, here are answers:

1 This 3x3 magic-square puzzle is easier to solve by starting at the end and working backwards. A 3x3 magic square is fully defined by three numbers (m, x, y) as shown by:

$$\begin{array}{ccc} m+x & m-(x+y) & m+y \\ m-(x-y) & m & m+(x-y) \\ m-y & m+(x+y) & m-x \end{array}$$

Since the number of letters in the spellings of the numbers one to seventy-two range from 3 to 11, the middle square must be 7, and the final magic square is the numbers 3 to 11 (which is unique except for rotations and reflections).

	<i>Final</i>	<i>Original</i>
	(# of letters)	(numbers)
	8 3 10	18 2 25
	9 7 5	22 15 8
	4 11 6	5 28 12

A list of the numbers 1 to 72, sorted by number of letters in their names, makes it easy to find the limited choices for each square. Seven letters only comes from 15, 16, and 70, while four letters comes from 4, 5, and 9. There are many choices for ten letters. The only combinations of 4-7-10 letters that works is 5-15-25. Three letters only comes from 1, 2, 6, and 10, while 11 letters has many choices. The only combinations of 3-7-11 letters that works is 2-15-28. Having five of the numbers in the original square allows the rest to be found from simple math from the sum of any row, column, or diagonal being 3m. That result is the original square shown above.

2 Zack lives at 55, Ann at 81, and Beth at 64. Let the house numbers be $N_A, N_B,$ and N_Z . Z must have answered both A's questions yes. That would mean that N_Z is 64 or 81, and the only way A could think she knows N_Z is if one of these numbers is hers, so the other is Z's. But only Z's second answer was truthful, so N_Z is a non-square > 50 . Again, for B to think she knows N_Z , Z must have answered both her questions yes, which would mean that N_Z is 27 or 64, and since one is her number, she thinks the other is Z's. But again only the second answer is correct. Now, since A and B live in different houses and their numbers are > 50 , N_A must be 81, and N_B must be 64. Since the sum of the house numbers is twice a square and $50 < N_Z < 64$, twice the square must be 200, and Z's number is 55.

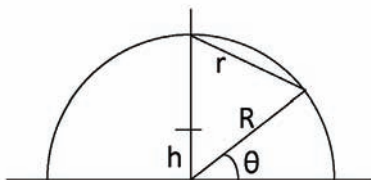
3 \$1.76 is the amount the player should wager. Since the 'adds' and 'takes' from the pot are symmetrical about \$10, they cancel each other, and all that matters is the odds of exactly \$10 in the pot. So, expected payout is: $\$10 \times \text{comb}(20, 10)/2^{20} = \$10 \times 184,756 / 1,048,576 = \1.76 . Since there are 10 throws of 2 coins, it is the 'same' as 20 throws of 1 coin with the requirement that 10 of the throws be heads. This can also be solved by calculating and adding the probabilities of the six possible outcomes with #HH = #TT and the number of draws even.

4 100,000! is 456,574 digits long. Stirling's approximation of $n! \approx (n/e)^n \sqrt{2\pi n}$ implies $\log_{10}(n!) = (n)\log_{10}(n/e) + (0.5)\log_{10}(2\pi n)$. So, for $\log_{10}(100,000!)$, we get 456,573.45; hence, there are 456,574 digits in 100,000! This can also be solved by adding $\log_{10}(j)$ for $j=1$ to 100,000.

5 $57/12 + 96/384 = 5$ is the solution to $AB/CD + EF/GHJ = A$. Since GHJ is a multiple of CD with all digits being different, there are a limited number of trials to do by hand or computer.

Bonus. One is the ratio of the period of the oscillation of the half hoop to that of the whole hoop. The moment

of inertia I of the hula hoop [HH] about its center of gravity [c.g.] (the center of the HH) is MR^2 . I about the suspension point is I about its c.g. plus ML^2 , where L is the distance between the c.g. and the suspension point. For the HH, $L = R$, so $I = MR^2 + MR^2 = 2MR^2$. For a physical pendulum, the period $T = 2\pi\sqrt{I/(MgL)}$. Therefore, for the HH, $T = 2\pi\sqrt{(2MR^2)/(MgR)} = 2\pi\sqrt{2R/g}$. For the half HH, the c.g. is on the vertical center line at a distance h above the center (see figure). Now $\int_0^\pi (R\sin\theta - h)dM = 0$, but $dM = \rho R d\theta$, where $\rho = \text{mass/unit length}$. Therefore, $\rho R \int_0^\pi (\sin\theta - h/R)d\theta = \rho R^2[-\cos\theta - h\theta/R]_0^\pi = \rho R^2(1 - \pi h/R + 1) = \rho R^2(2 - \pi h/R) = 0$. Therefore, $h/R = 2/\pi$. I of the half HH about its suspension point is $\int r^2 dM$ (see figure). Now, $r^2 = (R\cos\theta)^2$



$+ (R - R\sin\theta)^2 = R^2(\cos^2\theta + \sin^2\theta) + R^2 - 2R^2\sin\theta = 2R^2(1 - \sin\theta)$ and $dM = \rho ds = \rho R d\theta$. Therefore, $I = \int_0^\pi 2R^2(1 - \sin\theta)\rho R d\theta = 2\rho R^3 \int_0^\pi (1 - \sin\theta)d\theta = 2\rho R^3[\theta + \cos\theta]_0^\pi = 2\rho R^3\pi(1 - 2/\pi)$. But, $M = \pi\rho R$. Therefore, $I = 2MR^2(1 - 2/\pi)$, and $T = 2\pi\sqrt{(2MR^2(1 - 2/\pi))/(MgR(1 - 2/\pi))} = 2\pi\sqrt{2R/g}$. Thus, the periods of the HH and half HH are the same.

Computer Bonus. The thousandth sequence of consecutive primes ending in 1, 3, 7, 9 starts with 11,740,031. One approach would be to start with 11 and increment by 10, test for a sequence of four primes (P_1, P_3, P_7, P_9), and continue this process, incrementing by 10 each time. However, a little analysis can reduce computing time. Consider a prime P_1 that is the first of a series, and use casting out 9s to reduce the sum of its digits to a single digit S_1 . S_1 cannot be 3, 6, or 9, because then P_1 would be divisible by 3. Also, S_1 cannot be 1, 4, or 7, since then P_3 would be divisible by 3. Therefore, S_1 must be 2, 5, or 8. But if we increment by 10, then S_1 will change to 3, 6, or 9, meaning P_1 will not be prime. Now try incrementing by 20.

S_1 will then become 4, 7, or 1, and S_3 will be 6, 9, or 3, so P_3 will not be prime. If we increment by 30, S_1 becomes 5, 8, or 2, the same values. Thus, in the computer search, it is only necessary to increment by 30.

NEW SUMMER PROBLEMS

1 Find all primes of the form $A^4 + 4B^4$, where A and B are positive integers.

—Puzzle Corner by Allan Gottlieb in *Technology Review*

2 Algernon, Bertie, and Clarence had so often expressed their opinion about Professor Popoff that when he was found murdered (stabbed with a dagger, but in a thoroughly gentlemanly way) it was natural that they should be suspected. In fact, for reasons into which we need not now go, it may be taken as certain that one of them is guilty. They made statements as follows:

Algernon:

1: I hadn't seen Popoff or had any contact with him for a week before his unfortunate demise.

2: Everything Bertie says is true.

3: Everything Clarence says is true.

Bertie:

1: I have never handled a dagger.

2: Everything Algernon says is false.

3: Everything Clarence says is false.

Clarence:

1: Algernon was talking to Popoff just before he was killed.

2: Bertie has handled a dagger.

3: I have for a long time thought more of Popoff than is generally realized.

Looking back on the tragic event now, it is interesting to see that Algernon and Bertie both made the same number of true statements. (This number can be anything from 0 to 3, inclusive).

Who killed Popoff?

—*Brain Puzzler's Delight* by E.R. Emmet

3 At its main base, the Patagonian navy had 16 Class I gunboats with 5 guns apiece, some Class II gunboats with 4 guns apiece, and some Class III gunboats with 3 guns apiece, when the admiral was ordered to crush a revolt that had broken out simultaneously on seven scattered islands. After some thought, he split his fleet into seven flotillas of 6

ships each, with each flotilla having at least one gunboat of each class but a different number of guns. How many Class II gunboats were there?

—Tantalizer by Martin Hollis in *New Scientist*

4 I dreamed that I lived in a large, vertical, rectangular painting, where everything was located by its x-z coordinates. My mail always landed right at my house, at coordinates (1,0), from an airplane flying at a constant speed of 1 m/sec along the path $z = x^2$. The falling mail was subjected to an acceleration due to "gravity" of 1 m/sec/sec downward, perpendicular to the x-axis. What was the x coordinate of the release point when the plane was flying in (1) the positive direction and (2) the negative direction? Ignore "air" resistance. Assume the initial velocity of the mail when it is dropped is the same as the airplane.

—Byron R. Adams, *TX A '58*

5 A vertical belt sander is being used to polish rolling pins. The rolling pin, with a diameter of 5 cm and a length of 100 cm, is rotated at 100 rpm about a horizontal fixed axis while being pressed against the belt with a force of 10 Newtons perpendicular to the belt, which is traveling at 2 m/s. If the coefficient of friction is 0.5, how many watts are being dissipated as friction when (1) the rotation of the rolling pin is opposite to the direction of the belt and (2) the rotation of the rolling pin is in the same direction as the belt.

—John W. Langhaar, *PA A '33*

Bonus. George is building a rectangular patio, which will be covered with one-foot-square concrete slabs of seven different colors. He has divided the patio into seven rectangular zones, each to be covered by slabs of a single color, with five different colors appearing around the perimeter of the patio and four different colors at the corners. The seven zones are all different sizes, but all have the same perimeter, which is less than 60 feet. What are the dimensions of the patio, and what are the dimensions of the seven zones?

—Enigma by Colin Singleton in *New Scientist* (Continued on page 53.)



LYLE'S LAWS

Lyle's Law of Discoverability

Some years ago, I was on the board of directors of an organization that was experiencing a bit of internal strife. Since there was some possibility that this kerfuffle could result in legal proceedings, our corporate counsel gave the board a briefing on how we should comport ourselves. Among the things I learned in that session was a new word—discoverable. In legal parlance, something is discoverable if it can be subpoenaed or otherwise brought to light of day and then used as evidence in a court proceeding. In particular, counsel warned us that anything we write—letters, emails, journals, or just plain personal notes—is discoverable. Well! The soft sounds of pens going into pockets filled the room.

There are various historical examples where damning letters or emails or tape recordings have brought the mighty low, but the potential liabilities of a personal written record had not really occurred to me before. After learning the legal meaning of discovery and reflecting a bit on the examples of recorded evidence that have resulted in considerable embarrassment—or worse—I am led to posit Lyle's Law of Discoverability: Don't record anything you don't want the whole world to see.

I know. I know. It was not so long ago that I presented Lyle's Law of Records—Write it down. At first blush, these laws seem to be in direct conflict. Not so. The difference is in the nature of the material recorded. The test is, would it embarrass you to have it widely circulated? Certainly you don't want proprietary laboratory notes to be seen by everyone, but it would not embarrass you if they were. But not every written—or photographed—thing will pass that test.

Which brings me to the phenomenon—I can't think what else to call it—that first brought this law to mind. Over the years, we have been treated to examples of love letters and compromising photographs surfacing at inconvenient times and in inconvenient circumstances, but their distribution has been somewhat limited in time and space. Today, technology has removed most such temporal and spatial limits. Social networking sites on the internet make it possible for people whose technical capabilities

exceed their social sophistication to post messages and photographs “just for their friends.” But, of course, it doesn't work out that way. The whole world is their stage, and they may find they have “friends” numbering in the millions.

Some people may differ (my grandchildren, perhaps?), but I don't consider myself a technological troglodyte.

I was using email back in the early days when you would call someone on the telephone to tell them you were sending them a message and then call them later to see if it had been received. And while I am not a fervid user of social networking sites, I am listed on one and have been able to use it to keep track of friends and colleagues. I have not, however, posted any nude pictures of myself (much to the relief of any potential viewers) or sent any compromising messages or even recorded my innermost thoughts. My reticence is not due to my technical limitations, although I do have more than a few. I simply believe that whatever is out

there is OUT THERE. Everywhere.

But the point of the Law of Discoverability is that everything is, or at least can be, everywhere once it is committed to writing or especially once it is recorded in ones and zeroes. It is discoverable either by intention or by happenstance. Columbus didn't set out to discover America.

Everyone occasionally becomes very irritated with someone else. When that happens, I have always advised the “irritatee” to write a long letter, memo, or email denouncing the irritator and telling them where they are wrong. Make it just as strong and nasty as you like—but don't send it. Let it lie on your desk or in your computer files for a couple of days and then discard it. Or at least revise it to soften and sweeten your words—since you may have to eat them—and then still delay a day or two before sending. That is no longer my advice. If you write the letter by hand and are careful to shred or burn it when you are finished, there is a reasonably good chance that it will not be discoverable. If it is committed to any kind of memory media, you should assume that it will never go away.

Don't record anything you don't want the whole world to see.
—L.D.F.

I am concerned that the Law of Discoverability could be interpreted as cynical advice to hide your peccadilloes. That is not the intent. The underlying message is that



privacy is not what it used to be and that you don't have to be involved in legal proceedings to have your writings and photographs become public. And there is more.

The most important principle embodied in the Law of Discoverability is this: if you would be publicly embarrassed by these writings or photographs or drawings, perhaps you should be privately embarrassed by them. Perhaps they should make

you uncomfortable even if you could guarantee that no one else would ever see them. If you don't want the whole world to see a picture or read an account of you doing something stupid, why take the picture or write the account? Or even more to the point, why do that stupid something in the first place? Perhaps this incessant display of our innermost thoughts and our outermost bodies (some more outermost than others) will turn out to be a blessing. The fear of getting caught—while effective—is not a very noble motivation for not doing wrong. But if it makes us ask why getting caught matters, it will have served a noble purpose.

—Lyle D. Feisel, Ph.D., P.E., Iowa Alpha '61

TBP Directory

Executive Council

President Larry A. Simonson, Ph.D., P.E., SD A '69, SDSM&T Foundation, 501 E. St. Joseph St., Rapid City, SD 57701.

(larry@tbp.org)

Vice President Solange C. Dao, P.E., FL A '95, 1110 E. Marks St., Orlando, FL 32803.

(solange@tbp.org)

Councillor Jonathan F.K. Earle, Ph.D., P.E., FL A '65, 8516 SW 20th Lane, Gainesville, FL 32607.

(jonathan@tbp.org)

Councillor Jason A. Huggins, P.E., FL A '96, 4701 Hickory Shores Blvd., Gulf Breeze, FL 32563.

(jason@tbp.org)

Councillor Norman Pih, TN A '82, # 10, 811 W. Cherry Ave., Flagstaff, AZ 86001.

(norman@tbp.org)

International Headquarters

Executive Director James D. Froula, P.E., TN A '67, P.O. Box 2697, Knoxville, TN 37901-2697. (tbp@tbp.org)

125TH ANNIVERSARY CLUB

2010 celebrates the 125th anniversary of the founding of Tau Beta Pi. To commemorate this historic occasion, a one-time recognition club has been established for donors



contributing \$125 or more in 2010. (Members of existing clubs will still be listed in those clubs.) Donors of \$125 or more will receive a striking memento acknowledging their special support during the Quasiquintennial celebration. This limited-edition item features the Association's

125th anniversary logo etched onto a polished 3" x 3" black marble paperweight. For more information, contact Patricia McDaniel—pat@tbp.org, 865/546-4578.



TBP CONNECT

Tau Beta Pi's InCircle Community

BRAIN TICKLERS (Continued from page 51.)

Double Bonus. Given the lengths of the N sides of an irregular polygon, how should the sides be arranged to maximize the enclosed area? Prove your answer.

—Puzzle Corner by Allan Gottlieb in *Technology Review*

Send your answers to any or all of the Summer Brain Ticklers to Jim Froula, Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697 or email to: BrainTicklers@tbp.org only as plain text. The cutoff date for entries to the Summer column is the appearance of the Fall BENT. The method of solution is not necessary. We welcome any interesting problems that might be suitable for the column. The Double Bonus is not graded. Jim will forward your entries to the judges who are **H. G. McIlvried III**, PA Γ '53; **J.L. Bradshaw**, PA A '82; **D.A. Dechman**, TX A '57. and the columnist for this issue,

F. J. Tydeman, CA Δ '73

\$\$ Benefit for Members

Members may be eligible for an additional discount off their automobile insurance.

GEICO

This special member discount is eight percent in most states and is available to qualified members in 45 states and the District of Columbia. In addition, GEICO offers many other money-saving discounts and a choice of convenient payment plans, 24-hour access for sales, service, and claims, and a nationwide network of claims adjusters.

Call 800/368-2734 to see what savings your membership could bring. If you currently have a GEICO policy, identify yourself as a Tau Beta Pi member to see if you are eligible for the member discount.

Or go to www.geico.com for a free rate quote.

• GEICO insurance available only to U.S. residents except for residents of Massachusetts.

ALUMNUS NOTES

California Gamma

Thomas R. Macdonald, '84, has joined the board of directors at CHiL Semiconductor Corporation, a leading developer of high-performance, mixed-signal power management integrated circuits. Macdonald was a vice president of



Intel's architecture group and general manager of the platform components group, responsible for server, workstation, and storage chipsets, firmware, and platform technologies.

California Eta

Sandeep S. Vij, '86, has been appointed president, CEO, and director of MIPS Technologies, Inc., a provider of industry-standard processor architecture and cores. He was vice president and general manager of the broadband and consumer division of Cavium Networks.

California Theta

Dr. Virginia W. Ross, '82, recently completed her Ph.D. in information technology from Capella University. She also earned a master of engineering in technical Japanese from the University of Wisconsin-Madison in 1999. She is an engineer with the Air Force Research Laboratory in Rome, NY, working on computer architecture research. Husband **David O. Ross, '83**, is also an engineer at the Air Force Research Laboratory.

California Omega

John M. Morris, '95, is the third Tau Bate in his family. He joins **Brooks T. Morris, CA Γ '34**, and **Samuel B. Morris, CA Γ '11**.

Colorado Alpha

Don K. Henderson, '61, is chairman and co-CEO of Sage Petroleum. He has 24 years experience as a petroleum and minerals-exploration geolo-

gist with Shell and Trend Exploration and as an executive with Trend, Fillon, HBB, and Provenance Petroleum. Henderson also spent five years as the Episcopal chaplain to Colorado University and eight years as rector of St. Aidan's Episcopal Church in Boulder.

Illinois Gamma

Dr. Peter K. Liaw, '77, has received received the L.R. Hesler award at the 2010 annual chancellor's honors program at the University of Tennessee. Dr. Liaw, joined the faculty there in 1993 and is professor of materials science and engineering.



Indiana Alpha

Duane M. Schmitz, '87, a former senior global executive with Eli Lilly and Company, has joined Harrison College as president of its online division. The college has identified online programs as a major resource. Schmitz served as senior director of business operations, global clinical development at Eli Lilly.



Indiana Gamma

Diane L. Peters, '93, Ph.D., P.E., has successfully defended her doctoral thesis in mechanical engineering at the University of Michigan.

Indiana Delta

Steven R. Wilkening, '84, P.E., is now an engineering manager for Tubelite Inc., in Walker, MI. He was previously a director of development for Weather Shield Manufacturing Inc. and a vice president of engineering at Caldwell Manufacturing Co.

Massachusetts Beta

Dr. Debasish Tripathy, '81, has become co-leader of the women's cancer program at the University of Southern California-Norris's comprehensive cancer center. He moved there from the University of Texas Southwestern Medical Center at Dallas, where he was director of the Southwestern breast cancer research program.



Massachusetts Zeta

Col. Edward T. Alexander Jr., '78, has been appointed by Northrop Grumman Corporation as corporate lead executive for the U.S. Air Force space and missile-systems center in Los Angeles, CA. He joined the company in 2003, after 24 years in the United States Air Force, where he served primarily in the acquisition of space and missile defense systems.



Michigan Gamma

Mark M. Rhoades, '83, is a lecturer in the systems engineering department at the Naval Postgraduate School in Monterey, CA.

Michigan Zeta

John J. Bellanti, '77, is executive vice president-worldwide operations for automotive supplier AAM. Bellanti has worked at four of its manufacturing facilities. He began his career at the Tonawanda forge plant when it was part of General Motors, progressing through a series of manufacturing management positions.

Michigan Iota

Andrew J. Flowerday, '02, has been promoted to a principal product en-

gineer at TRW Automotive. He is leading development on a variety of automotive switch products for Chrysler and Ford vehicles.

Mississippi Alpha

Carl Morris, '10, has joined grandfather **Robert L. Morris, PA Z '55**, in membership. Carl has been Vice President of his chapter. Robert served as chapter President.

Nevada Alpha

Aidan M. Graham, '98, P.E., is engineering manager for U.S. power systems engineering at Eaton Corporation in Warrendale, PA.

New Jersey Alpha

Humberto Makris, '94, is general director of International Maritime Services in Piraeus, Greece.

New Jersey Delta

David E. Karp, '10, has received one of 14 scholarships presented annually by the Winston Churchill Foundation. He is a mechanical and aerospace engineering major who has interned at NASA. The scholarship will allow Karp to study at Cambridge where he intends to obtain a M.Phil. focused on computational fluid dynamics. He will then pursue a Ph.D. in the U.S.



Ohio Delta

Dr. Natalie A. Kruse, '04, has become an assistant professor at the school of leadership and public affairs at Ohio University. She recently obtained her Ph.D. from Newcastle University in Northern England and has completed extensive research on underground mines, watershed management, and post-industrial pollution, as well as worked for companies around the globe.

Oklahoma Alpha

Yong Hong Koh, '92, has been promoted to director of engineering at ERNI Asia Holding Pte Ltd. Yong Hong was previously a marketing

and R&D manager. He will be focusing on product development and improvement. He will be responsible for all technical aspects of the newly built backplane and cable assembly factory in Beijing, China.

Oregon Alpha

Kenneth H. Lowman, '88, is broker-owner of Luxury Homes of Las Vegas. He became involved in real estate while working in Southern California as an engineer at a Frito Lay processing plant making Doritos.

Pennsylvania Alpha

Thomas W. Goettge, '65 is retiring from U.S. Steel, where he has been vice president—raw materials. He began his career with the firm in 1965 as a process analyst at Clairton Works.

Pennsylvania Lambda

Dr. Kim L. Needy, '84, has received the ASEE engineering management division's Bernard R. Sarchet award for lifetime achievement in engineering management education. She is head of the department of industrial engineering at the University of Arkansas. Dr. Needy's primary research interests are in engineering management, engineering economic analysis, sustainable engineering, and integrated resource management.



Kara L. Simpkins, '02, gave birth to a baby girl, Abigail Marie, on September 22, 2009.

Texas Alpha

Stephen J. Canny, '86, is industry analyst relations manager for enterprise social software at Cisco Systems, Inc.

Texas Eta

Larry F. Plaster, '71, has received an honorary fellow award from the American Helicopter Society for his leadership and innovation to improve vertical flight. He is manager of Apache modernization programs for Boeing in Mesa, AZ.

Texas Theta

Jeanne E. Yudin, '82, has left the corporate world after a career in engineering management (V.P. of quality, engineering, and research) for aerospace aluminum, to open a bed-and-breakfast, Chateau on the Mountain, outside Asheville, NC. She reports that many engineers, but not one metallurgist, have visited as guests.

West Virginia Alpha

Dr. Rakesh K. Gupta, '75, has been appointed professor and chair of chemical engineering at West Virginia University, where he has taught since 1991. He previously taught at the State University of New York at Buffalo for 11 years. Dr. Gupta's research is



focused on polymer rheology, polymer processing, and polymer composites. He took over as department chair from **Dr. Dady Dadyburjor, '72**, who held the post for more than 10 years.

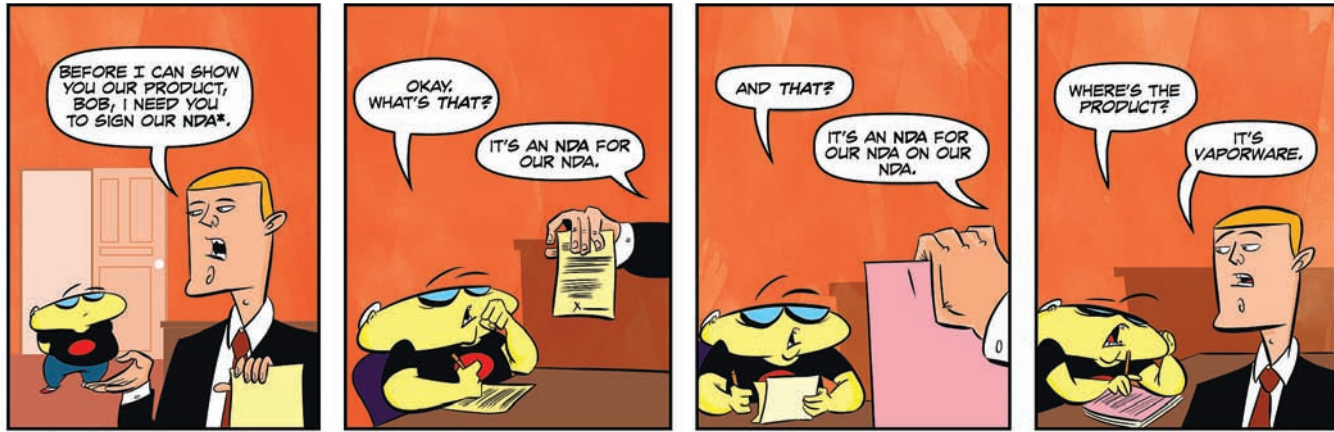
Wisconsin Alpha

Dr. Salmiah Kasolang, '92, is now attached to the faculty of mechanical engineering at *Universiti Teknologi MARA*, in Selangor, Malaysia.

WRITE YOUR OWN ALUMNUS NOTE!

Your fellow Tau Bates are interested in news about you. Send items about civic activities, honors won, weddings, births, promotions, changes in address, etc. to Tau Beta Pi, Box 2697, Knoxville, TN 37901-2697 or to alumnote@tbp.org. Material for publication must be received for the **Fall** issue by August 1, **Winter** issue by November 1, **Spring** issue by February 1, and **Summer** issue by May 1. Include name, address, chapter, class year, and email address or phone no. Thank you!

The PC Weenies



*NON-DISCLOSURE AGREEMENT

PRINTED WITH PERMISSION FROM KRISHNA M. SADASIVAM, TN A '95.

© 2010 KRISHNA M. SADASIVAM WWW.PCWEENIES.NET

Advertisers' Index

ADVERTISER	WWW.	PAGE NO.
Hess Corporation	hess.com/careers	Cover 4
Institute for Defense Analyses	ida.org	37
MIT Lincoln Laboratory	ll.mit.edu	17
NCEES	ncees.org/licensure	3
NCEES	ncees.org/exams/study_materials	7
PPI	ppi2pass.com/taubetapi	9

Member Benefits

SEE COMPLETE LIST at tbp.org/pages/ForMembers

- **AlumNet**—electronic mentoring service.
- **GEICO**—additional discounts on automobile insurance.
- **KODA**—an online community for young professionals. Find jobs, connect with employers, and launch your career.
- **LTCFP**—long-term care outreach and education program with access to favorable rates on long-term care insurance.
- **My Home Benefits**—moving discounts & real-estate services.
- **PPI**—discounts on professional licensing exam review materials (FE/EIT, PE, LEED, & more).
- **TBP Job Board**—post a résumé online and browse through hundreds of engineering jobs at top companies.

Tau Beta Pi Insignia

Integrity and Excellence in Engineering

ORDER BY CHECK FROM TAU BETA PI, P.O. BOX 2697, KNOXVILLE, TN 37901-2697.
PAYMENT MUST BE SENT WITH ORDER. PRICES INCLUDE U.S. DELIVERY.

ORDER BY CREDIT CARD (THROUGH PAYPAL) AT WWW.TBP.ORG/pages/GeneralStore OR CALL 865/546-4578.

QTY.	DESCRIPTION & QUALITY	PRICE	QTY.	DESCRIPTION & QUALITY	PRICE	ORDERING INFORMATION
—	A. OFFICIAL BENT (FULL SIZE) FOR MEMBERS ENGRAVED AT NO CHARGE WITH NAME, CHAPTER, AND CLASS:		—	H. WOMAN'S OVAL INCISED LETTER RING:		ADD \$9 TO PAYMENT FOR PRIORITY OR UPS DELIVERY ADD \$19 FOR REGISTERED MAIL OUTSIDE THE U.S.A.
—	•10K YELLOW GOLD.....	126.00	—	•10K YELLOW GOLD.....	235.00	
—	•10K WHITE GOLD.....	126.00		RING SIZE: <input type="text"/>		ALLOW 8 WEEKS FOR DELIVERY OF JEWELRY & CERTIFICATES & 12 WEEKS FOR DELIVERY OF CUSTOM-MADE RINGS. THANK YOU.
—	•GOLD FINISH, SATIN BACK.....	29.00				
—	B.1(p) OFFICIAL (FULL SIZE) BENT (PIN) FOR MEMBERS IS ENGRAVED WITH NAME, CHAPTER, & CLASS AT NO CHARGE, AND A PIVOTING PIN TO SECURE THE BENT TO A LAPEL IS SOLDERED ONLY ON NEW BENT:		—	I. TIE BAR, 50mm SOLID BAR WITH ALLIGATOR CLASP, GOLD FINISH (BENT NOT INCLUDED).....	49.00	Mail your order and check to: TAU BETA PI P.O. BOX 2697 KNOXVILLE, TN 37901-2697
—	•10K YELLOW GOLD.....	133.00	—	J. EXPANDABLE TIE BAR, WITH ALLIGATOR CLASP AND 140mm CURB CHAIN, GOLD FINISH.....	46.00	
—	•10K WHITE GOLD.....	133.00	—	K. WOMAN'S SINGLE-LINK BRACELET, GOLD FINISH (BENT NOT INCLUDED).....	44.00	
—	•GOLD FINISH, SATIN BACK.....	28.00	—	L. CROSS PEN WITH BENT, GOLD FINISH.....	65.00	
—	*B.2(p) SMALL BENT (PIN): •10K YELLOW GOLD.....	72.00	—	M. REPLACEMENT MEMBERSHIP CERTIFICATE.....	13.00	
—	•GOLD FINISH, SATIN BACK.....	27.00	—	N. MAN'S NECKTIE, 100% SILK, 95mm WIDE; NAVY & WINE STRIPES, WITH GOLD BENT.....	35.00	
—	*B.2(c) SMALL BENT (CHARM): •10K YELLOW GOLD.....	90.00	—	O. STOLE: WHITE SATIN GRADUATION COLLAR EMBROIDERED WITH BENT.....	20.00	
—	•GOLD FINISH, SATIN BACK.....	SALE PRICE ..14.00	—	P. CERAMIC MUG: 12-OZ., WHITE WITH 125th MOTIF.....	14.00	
—	*B.3(p) MINIATURE BENT (PIN): •10K YELLOW GOLD.....	70.00	—	R1. T-SHIRT: 100% PRESHRUNK COTTON, BLACK WITH RADIANT BENT, (XXL: 18.00) S-M-L-XL.....	16.00	
—	•GOLD FINISH, SATIN BACK.....	26.00	—	S. T-SHIRT: 100% PRESHRUNK COTTON, WHITE WITH BLUE LOGO ON BOTH SIDES, S-M-L-XL-XXL.....	13.00	
—	*B.3(c) MINIATURE BENT (CHARM): •10K YELLOW GOLD.....	69.00	—	T. GOLF SHIRT, 100% WHT. COT. PIQUE, BLACK TRIM COLLAR & CUFFS, S-M-L-XL-XXL.....	35.00	
—	•GOLD FINISH, SATIN BACK.....	25.00	—	U.1 UNSTRUCTURED, LOW-PROFILE, WHITE CAP WITH BLUE LOGO, TAU BETA PI ON SIDE.....	14.00	
—	C. MINIATURE BENT, TO BE WORN AS A TIE TACK; CLUTCH AND CHAIN ASSEMBLY INCLUDED:		—	U.2 UNSTRUCTURED, LOW-PROFILE, KHAKI CAP WITH BLACK LOGO, TAU BETA PI ON SIDE.....	14.00	
—	•10K YELLOW GOLD.....	89.00	—	V. TIE TACK, STERLING OVAL, w/ PIN & CLUTCH, NOT SHOWN (SEE WEB).....	45.00	
—	•GOLD FINISH, SATIN BACK.....	24.00	—	W. UNSTRUCTURED, LOW-PROFILE CAP, WHITE CROWN WITH BLUE LOGO, BLACK VISOR (SEE WEB) SALE PRICE	8.00	
—	D. MINIATURE BENT, GOLD FINISH, TO BE WORN AS A RECOGNITION BUTTON (CLUTCH INCLUDED).....	23.00	—	X. HONOR CORD: WHITE & ORANGE GRADUATION CORD, NOT SHOWN (SEE WEB).....	15.00	
—	E. WOMAN'S 3mm BALL-LEVER BACK EARRINGS, 14K YELLOW GOLD WITH 10K MINIATURE BENTS.....	119.00				
—	F. OFFICIAL RING (SEAL TYPE):					
—	•10K YELLOW GOLD.....	395.00				
—	•10K WHITE GOLD.....	395.00				
—	G. OFFICIAL SIGNET RING (WITH MINIATURE BENT):					
—	•10K YELLOW GOLD.....	475.00				

* FOR MEMBERS & RELATIVES

CHECK ITEM P—A NEW LIMITED-EDITION QUASQUICENTENNIAL COFFEE MUG

56 SUMMER 2010 THE BENT OF TAU BETA PI

TAU BATES...

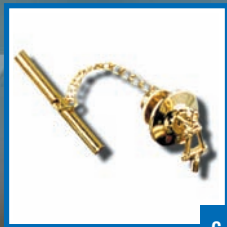
Show your Commitment to Excellence.



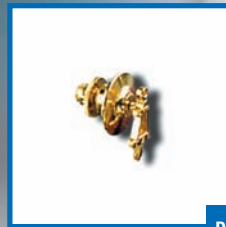
A.



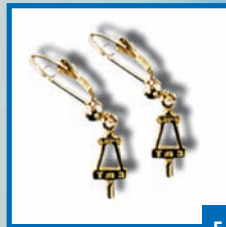
B.



C.



D.



E.



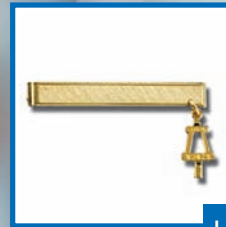
F.



G.



H.



I.



J.



K.



L.



M.



N.



O.



P.

NEW!



R1.



S.



T.




U.

Order Your TAU BETA PI
Official Insignia

ORDER OFFICIAL INSIGNIA FROM TAU BETA PI, P.O. BOX 2697, KNOXVILLE, TENNESSEE 37901-2697 OR AT WWW.TBP.ORG.

CHECK OR CREDIT CARD (865/546-4578). PLEASE STATE CHAPTER AND CLASS.



See things from a different angle?

**At our very core, we're a company
based on exploration.**

We're always seeking new ways to discover and produce oil and gas products, fresh approaches to refining and retail marketing, and innovative ideas for running our globally diverse business. That's why we highly value individual perspectives and independent spirit. We'll listen closely when you speak, invest in your development, and reward your accomplishments. At Hess, you'll discover you can make a difference—and be recognized for it! So why not explore an exciting future with us?

Exceptional opportunities are available in:

- Management
- Finance
- Engineering
- IT

Visit www.hess.com/careers to learn more.

HESS **HESS CORPORATION**
From Diversity Comes Innovation

EOE