

THE BENT

OF TAU BETA PI

The Engineering Honor Society

Fall 2017



**Hydrail Fever!
Honorees and
Scholars**

CHAPTERS

ALUMNI CHAPTERS (74)

District 1 • denotes active chapter

- *Central Connecticut, Hartford*
- *Greater Boston Area, MA*
- District 2**
- *Buffalo, NY*
- *Central Jersey, NJ*
- *Long Island Suburban, NY*
- *Newark, NJ*
- *New York City, NY*
- *New York Capital District, NY*
- *Rochester, NY*
- *Southern Tier, Binghamton, NY*
- District 3**
- *Lehigh Valley, Bethlehem, PA*
- *Philadelphia, PA*
- *Pittsburgh, PA*
- *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**
- *Atlanta, GA*
- *Central Florida, Orlando*
- *Daytona Beach, FL*
- *Gainesville, FL*
- *Miami, FL*
- *Midlands, Columbia, SC*
- *Palm Beach/Broward, FL*
- *Piedmont, Clemson, SC*
- *Puerto Rico*
- *Tampa Bay, FL*
- District 6**
- *Bluegrass, Lexington-Frankfort, KY*
- *Central Alabama, Birmingham*
- *Great Smoky Mountains, Knoxville-Oak Ridge, TN*
- *Greater Gulf Coast, Mobile, AL*
- *Louisville, KY*
- *Mid-South, Memphis, TN*
- *Rocket City, Huntsville, AL*

- District 7**
- *Ann Arbor Area, MI*
- *Central Michigan, Lansing*
- *Cincinnati, OH*
- *Columbus, OH*
- *Dayton, OH*
- *Flint, MI*
- *Ohio's North Coast, Cleveland*
- *Southeastern Michigan, Detroit*
- *West Michigan, Grand Rapids*

- District 8**
- *Chicago Area, IL*
- *Central Illinois, Urbana-Champaign*
- *Indianapolis, IN*
- *Milwaukee Area, WI*

- District 9**
- *Rolla, MO*
- *St. Louis, MO*
- District 10**
- *Central Texas (Austin/San Antonio)*
- *North Texas (Dallas-Fort Worth)*
- *Greater New Orleans, LA*
- *Texas Gulf Coast, Houston*

- District 11**
- *Ames, IA*
- *Minnesota, Twin Cities, MN*

- District 12**
- *Pikes Peak, CO*
- *Front Range, CO/WY*
- *Salt Lake City, UT*
- *Treasure Valley, Boise, ID*

- District 13**
- *El Paso, TX*
- *Phoenix, AZ*
- *Sun City, AZ*
- *Tucson, AZ*

- District 14**
- *Columbia River Basin, Richland, WA*
- *Portland, OR*
- *Puget Sound, Seattle, WA*

- District 15**
- *Sacramento Valley, CA*
- *San Francisco Bay Area, CA*
- *San Francisco Peninsula, Palo Alto, CA*

- District 16**
- *Los Angeles, CA*
- *Greater San Diego, CA*
- *Southern California*

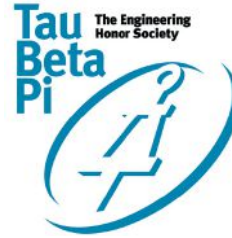
COLLEGIATE CHAPTERS (253)

Chap. Dist.	Institution
AL A 6	Auburn Univ.
AL B 6	Univ. of Alabama
AL G 6	Univ. of Ala. at Birmingham
AL D 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 G 13	Northern Arizona Univ.
AZ D 13	Embry-Riddle Aero. Univ., Prescott
AR A 9	Univ. of Arkansas
CA A 15	Univ. of California, Berkeley
CA B 16	California Inst. of Technology
CA G 15	Stanford Univ.
CA D 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 O 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 P 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 F 15	Univ. of the Pacific
CA X 16	California State Univ., Fullerton
CA Y 16	Univ. of California, San Diego
CA Z 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 AD 15	Univ. of California, Santa Cruz
CA AE 16	Univ. of San Diego
CO A 12	Colorado School of Mines
CO B 12	Univ. of Colorado at Boulder
CO G 12	Univ. of Denver (inactive)
CO D 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 G 1	Univ. of Hartford
DE A 3	Univ. of Delaware
DC A 4	Howard Univ.
DC B 4	Catholic Univ. of America
DC G 4	George Washington Univ.
FL A 5	Univ. of Florida
FL B 5	Univ. of Miami
FL G 5	Univ. of South Florida
FL D 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 O 5	Florida International Univ.
FL I 5	Embry-Riddle Aeronautical Univ.
GA A 5	Georgia Inst. of Technology
GA B 5	Mercer Univ.
IA A 14	Univ. of Idaho
ID B 12	Idaho State Univ.
ID G 12	Boise State Univ.
ID D 12	Brigham Young University-Idaho
IL A 8	Univ. of Illinois at Urbana-Champaign
IL B 8	Illinois Inst. of Technology
IL G 8	Northwestern Univ.
IL D 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 G 8	Univ. of Notre Dame
IN D 8	Valparaiso Univ.
IN E 8	Trine Univ.
IN Z 8	Indiana Univ.-Purdue Univ. Indianapolis
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 G 9	Kansas State Univ.
KY A 6	Univ. of Kentucky
KY B 6	Univ. of Louisville
KY G 6	Western Kentucky Univ.
LA A 10	Louisiana State Univ.
LA B 10	Tulane Univ.
LA G 10	Louisiana Tech Univ.
LA D 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 G 4	United States Naval Academy
MD D 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 G 1	Harvard Univ. (inactive)
MA D 1	Tufts Univ.
MA E 1	Northeastern Univ.
MA Z 1	Univ. of Massachusetts at Amherst
MA H 1	Boston Univ.
MA O 1	Univ. of Massachusetts Lowell
MA I 1	Western New England Univ.
MI A 7	Michigan State Univ.
MI B 11	Michigan Tech. Univ.
MI G 7	Univ. of Michigan
MI D 7	Univ. of Detroit Mercy
MI E 7	Wayne State Univ.
MI Z 7	Kettering Univ.
MI H 7	Lawrence Technological Univ.
MI O 7	Oakland Univ.
MI I 7	Univ. of Michigan-Dearborn
MI K 7	Western Michigan Univ.
MI 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	Univ. of Missouri-Columbia
MO B 9	Missouri Univ. of Science & Technology
MO G 9	Washington Univ.
MO D 9	Univ. of Missouri-Kansas City
MO E 9	Saint Louis University
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 G 2	New Jersey Inst. of Technology
NJ A 2	Princeton Univ.
NJ E 2	Rowan Univ.
NJ Z 2	The College of New Jersey
NM A 13	New Mexico State Univ.
NM B 13	Univ. of New Mexico
NM G 13	New Mexico Inst. of Mining & Tech.
NY A 2	Columbia Univ.
NY B 2	Syracuse Univ.
NY G 2	Rensselaer Polytechnic Inst.
NY D 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 O 2	Clarkson Univ.
NY I 2	Cooper Union School of Engineering
NY K 2	Univ. of Rochester
NY L 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 Q 2	Polytechnic Institute of New York Univ.
NY R 2	Alfred Univ.
NY T 2	Binghamton University
NY Y 2	United States Military Academy
NC A 4	North Carolina State Univ.
NC B 4	Univ. of N.C. at Chapel Hill (inactive)
NC G 4	Duke Univ.
NC D 4	Univ. of North Carolina at Charlotte
NC E 4	North Carolina A&T State Univ.
NC Z 4	East Carolina University
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 G 7	Ohio State Univ.
OH D 7	Ohio Univ.
OH E 7	Cleveland State Univ.
OH Z 7	Univ. of Toledo
OH H 7	Air Force Inst. of Technology
OH O 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 G 9	Oklahoma State Univ.
OR A 14	Oregon State Univ.
OR B 14	Portland State Univ.
OR G 14	Univ. of Portland
PA A 3	Lehigh Univ.
PA B 3	Pennsylvania State Univ.
PA G 3	Carnegie Mellon Univ.
PA D 3	Univ. of Pennsylvania
PA E 3	Lafayette College
PA Z 3	Drexel Univ.
PA H 3	Bucknell Univ.
PA O 3	Villanova Univ.
PA I 3	Widener Univ.
PA K 3	Swarthmore College
PA A 3	Univ. of Pittsburgh
PA M 3	Penn State Erie, The Behrend College
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 B 5	Univ. of South Carolina
SC G 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 G 6	Tennessee Tech. Univ.
TN E 6	Christian Brothers Univ.
TN Z 6	Univ. of Memphis
TN A 6	Univ. of Tennessee at Chattanooga
TX A 10	Univ. of Texas at Austin
TX B 13	Texas Tech Univ.
TX G 10	Rice Univ.
TX D 10	Texas A & M Univ.
TX E 10	Univ. of Houston
TX Z 10	Lamar Univ.
TX H 10	Univ. of Texas at Arlington
TX O 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
TX N 10	Univ. of Texas Rio Grande Valley
UT A 12	Univ. of Utah
UT B 12	Brigham Young Univ.
UT G 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 G 4	Old Dominion Univ.
VA D 4	Virginia Military Inst.
VA E 4	Virginia Commonwealth Univ.
WA A 14	Univ. of Washington
WA B 14	Washington State Univ.
WA G 14	Seattle Univ.
WA D 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 G 8	Univ. of Wisconsin-Milwaukee
WI D 8	Milwaukee School of Engineering
WI E 8	Univ. of Wisconsin-Platteville
WY A 12	Univ. of Wyoming

the Bent^{of}



Fall 2017
Vol. CVIII / No. 4

*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 and Trademark Office. Member, American Society for Engineering Education and (co-founder) Association of College Honor Societies. Affiliate, American Association for the Advancement of Science.

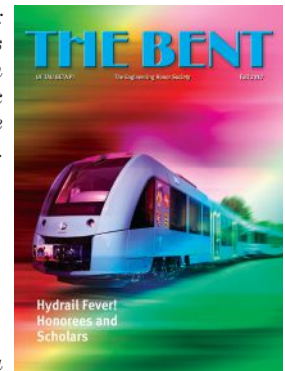
Features

2017 McDonald Mentor	10
2017 Outstanding Advisor	11
2017 Distinguished Alumni	12
2017 Laureates	14
Hydrogen Fever!	16
by Arielle Emmett	
Leadership: Robert Langer.....	24
by Alan S. Brown	
TBPI Names 271 Scholars	28

Reports

Chapter Endowment Update.....	33
Contributors to 2017 Alumni Giving Program.....	34
Executive Director's Report.....	38
Engineering Futures Update.....	47

ON THE COVER:
Arielle Emmett reports on developments in hydrogen-powered electric trains abroad versus the United States.



Cover artist: Dali Polivka

Tau Beta Pi:
THE BENT



Departments

Council's Corner	2	Chapter Eternal.....	44
ED Exposition	4	Association Briefs.....	48
Letters	6	Brain Ticklers	50
Who's Who.....	7	Caption Contest.....	53
Viewpoint.....	8	Alumni Notes	54
In the Colleges.....	22	Insignia	56

Editor: David S. Roberts Managing Editor: Patricia B. McDaniel
Editorial Board: Lyle D. Feisel, Ph.D., P.E., IA A '61; James D. Froula, P.E. (ret.), TN A '67; and John W. Prados, Ph.D., P.E., TN A '54

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 Engg., The University of Tennessee, Knoxville, Tennessee 37996-2215; www.tbp.org; FAX: 865/546-4579; email: tbp@tbp.org. Life subscriptions are \$95. Printed in U.S.A. Periodicals postage paid at Knoxville, TN, and at additional mailing offices. SUBSCRIBERS and POSTMASTER: Send address change, request for online subs., & other correspondence to tbp@tbp.org or to: The Bent of Tau Beta Pi / P.O. Box 2697 / Knoxville, TN 37901-2697. Telephone: 865/546-4578

Copyright © 2017 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 and in paid advertisements do not necessarily reflect the policy or opinions of the Association.

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



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

Leadership and Tau Beta Pi

Stephen Covey once said, “Leadership is a choice, not a position,” and throughout your life no matter what position or title you hold, your leadership should always be about the choices you make and more importantly holding yourself accountable to those choices.

As a lifetime member of TBPI, you quickly realize that this organization is the ideal training ground for student leadership and future growth. In addition, the importance of accountability is emphasized repeatedly.

Leadership & Accountability means followers can be leaders.

As an initiate of New Jersey Gamma in 1999, I came to understand this leadership concept quickly when I realized my vote on new members, ballot ratifications, and chapter business does actually count! Not only did it count, but it could and would impact the future of chapter officers, my chapter, and the entire Association.

As a participant in several Engineering Futures sessions, I realized the value of these sessions, gave them my full attention, and actively participated. In the 15 plus years since attending these sessions, I have been able to utilize skills I’ve learned, pass on my experience to others, and advocate for students to leverage this incredible educational leadership opportunity.

As the newly elected president of my chapter in 2000, it was my responsibility to attend the local District Conference. Here I learned from our District Directors the proper way to organize and operate the chapter including the important role our advisors filled in maintaining continuity.

As the voting delegate for the 2000 and 2001 Conventions in San Francisco, CA, and Columbus, OH, respectively, it was clear I was entrusted, along with the other student delegates, with major decisions that would shape our organization. The alumni volunteers worked to ensure my decision was not influenced by personal gain or bias but what was best for the members and the Association!

Leadership & Accountability means acknowledging your mistakes.

In 2009, I returned to active involvement in Tau Beta Pi as a District 2 Director. The acceptance of computer science programs from certain schools was being discussed on the Convention floor and I stood up and expressed

my views on the topic. At the time, I was approached by fellow directors and Association Officials who coached me regarding the impact my voice would have on the students—but I didn’t grasp their advice.

Some six years later, I watched a new District Director do the same thing I had done and it finally hit me



George Youssef

what my colleagues were trying to tell me. At that point I went and acknowledged to the alumni, still serving as volunteers, that I was wrong. I own my mistake of not recognizing the power of a single voice!

Leadership & Accountability means taking on a role that you believe in.

As a member of the Executive Council, I believe in the mission and purpose of this outstanding organization and the opportunities offered to our student members. Serving as an Executive Councilor means trying to balance

between the needs of the Association while helping to educate our future leaders to allow them to make the best decisions for our future.

As you move through this academic year and your professional career, think about your membership in TBPI and what leadership lessons it has taught you. Make sure to utilize all these tools, but also take the time to pass them on to others ensuring the long-term success of our Association and our profession.

“Managers do things right but Leaders do the right thing!!!”

Thank you for the opportunity to serve and I look forward to seeing some of you at the Convention in Dearborn, MI, in October.

George Youssef, New Jersey Gamma, '01
Executive Councilor



3.14.18



www.tbp.org/PiDay



MIT LINCOLN LABORATORY

Imagine it. Build it. Be the first.

Since 1951, MIT Lincoln Laboratory has been applying advanced technology to solve problems critical to national security. Since its inception, our people have envisioned incredible technology, and projects that start out as vital to national security often become vital to the everyday technology of the future. More than 700 patents have been granted for technologies developed by the Laboratory's staff. In the past six years, Lincoln Laboratory has been awarded 26 R&D 100 Awards that recognize the year's 100 most technologically significant innovations.

If you'd like to contribute to U.S. national security in an environment of extraordinary innovation – then begin your career at MIT Lincoln Laboratory.

- Aerospace or Mechanical Engineering
- Algorithm Development
- Applied Math
- Circuit Design and Laser Development
- Computer Engineering
- Computer Science and SW Engineering
- Cyber Security
- Digital Signal Processing
- Electrical Engineering
- Machine Learning and Computer Vision
- Modeling and Systems Architecture
- Physics

All positions are located in Lexington, MA.

For information on our current opportunities, please visit www.ll.mit.edu/employment

MIT Lincoln Laboratory is an Equal Employment Opportunity (EEO) employer. All qualified applicants will receive consideration for employment and will not be discriminated against on the basis of race, color, religion, sex, sexual orientation, gender identity, national origin, age, veteran status, disability status, or genetic information. Due to the unique nature of our work, we require U.S. citizenship.



ED EXPOSITION

Time to VineUp!

In 2000, Tau Beta Pi worked with **Amy L. Forbes**, Ph.D., P.E., *PA B '97*, to establish AlumNet, a program to match members interested in being mentored with members interested in serving as mentors. Hundreds of members signed up for the program which successfully paired many members together in productive mentoring relationships. Unfortunately, AlumNet was labor-intensive to administer and with the explosion of social media and the establishment of TBP-CONNECT, TBP and Dr. Forbes agreed to discontinue the program in 2011.

In the Summer 2008 issue of *The Bent*, Vice President **Solange C. Dao**, P.E., *FL A '95*, announced the creation of an online networking community called TBP-CONNECT. While it saw great initial success, its features never quite met the expectations of our members, and with the rapid growth of Facebook and LinkedIn, our members slowly stopped using it. In the fall of 2012, we discontinued TBP-CONNECT and instead advocated that members use other social media platforms to stay connected to Tau Beta Pi.

While we turned to other social media platforms for networking, we continued to note that our members were very interested in mentoring. Students and young alumni continue to show an interest in being mentored, and many seasoned alumni were interested in sharing their experiences with the next generation. While existing social media platforms facilitate member interaction and networking, they do not provide good tools for connecting members for mentoring. With over 28,000 people in our LinkedIn group, members are certainly connected but seeking out a mentor requires much more work!

Enter VineUp

About four years ago, Luke Deering, co-founder and CEO of VineUp, reached out to Tau Beta Pi about a partnership with their new social media platform. While it had many valuable capabilities, we felt it didn't provide any new features over our previous forays into social media. This past February, Luke presented the current version of VineUp at a meeting of the Association of College Honor Societies (ACHS). To put it mildly, we were blown away! Luke and his team had made major enhancements to the platform which caught my attention and the attention of many other honor society leaders.

After several months of presentations and discussions among the Association leaders, we agreed to a three-year partnership with VineUp to provide a social media platform to our members.

I expect many readers are asking, "What changed to make this so compelling?" or "Why should I register for VineUp?" Here are just a few reasons...

1. One of the greatest benefits of TBP membership is networking with individuals committed to Integrity and

Excellence in Engineering! Groups have been created for collegiate and alumni chapters to stay connected in addition to groups for discussions among different majors and career interests that are available. If an important group has yet to be created, any member can create it!

2. VineUp has built-in features to connect members in a mentoring relationship. When signing up, members can indicate whether they are interested in mentoring someone, receiving mentoring, or both. It also lets users specify areas of interest to establish a mentoring relationship.

3. VineUp is integrated with Facebook and LinkedIn which means no additional user name or password to remember! Members can also import LinkedIn profile data to streamline the profile creation process.

4. We live in a world of apps and our VineUp platform is available on both Apple and Android devices. If apps aren't your cup of tea, VineUp is accessible through any web browser.

We need **YOUR** help for this to be successful! VineUp will officially launch to our student members at this year's Convention in October. Prior to its official launch, we need our alumni to sign up and develop our pool of mentors. Visit www.tbp.org/?vineup to begin the sign up process and check out page 9 for more information about VineUp. For those app savvy members out there, the VineUp app can be downloaded from the Apple Store or Google Play by searching for **TauBetaPi4Life**. Membership in Tau Beta Pi is for life, so we decided "Tau Beta Pi for Life" would be an excellent name for our inaugural app. I hope to see you there!

Until Later,



Updating your *Bent* Subscription

Are you a life subscriber?

YES

Do you want to receive the digital *Bent*?

YES

Complete the conversion process on our website, www.tbp.org/EBent, using the label on the cover.

#BXNGFJT *****AUTO**SCH 5-DIGIT 81035
#123456H30
343 BENTR SUM13 0004 #100 #17950
WILE E. COYOTE
CLEVER R. ROADRUNNER

NO

NO



Enjoy your print edition of *The Bent*!



Enjoy your digital edition of *The Bent*!

Visit www.tbp.org/store/Bentsubs.cfm to pay by credit card, or detach and mail to: Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697.

- I enclose \$95 to receive *The Bent* for life.
- I enclose \$25 as the first payment for a *Bent* Life Subscription. Remind me to send \$25 each year for the next three years (\$5 processing fee deducted from first payment).
- I enclose \$45 to receive *The Bent* electronically for life.

Name: _____ Chapter: _____ Class: _____

Address: _____

City: _____ State: _____ Zip: _____

Permanent Email: _____



LETTERS

AI “More Mainstream”

- I was reading Alan S. Brown’s piece in *The Bent* Summer issue on AI and how it is becoming more mainstream in many areas of society.

I thoroughly enjoyed the article and the breadth and depth Brown put into it, covering many areas that AI has been implemented and how it has improved or at least been integrated into our everyday life. I did note one claim that you made during the article—though inaccurate about Tom Richardson’s work with AI and that he had the first-ever aircraft that could land like a bird.

Work by **Rick E. Cory, Ph.D., CA A’04**, and Joseph L. Moore, Ph.D., out of MIT’s Robot Locomotion group has had gliders execute landing maneuvers like birds for many years now. They use a combination of the glider’s dynamics, fluid dynamics from turbulent flows, and robust control techniques to correct for errors and successfully land aircraft in the post-stall regime like many birds do.

It appears Tom Richardson’s techniques that you talk about are the first to use artificial intelligence to land an aircraft like a bird. I thought this distinction important in the claim, as it represents a trend that we’re seeing a lot in AI: traditional techniques based on first principles are being replaced with increasing reliability by AI and machine learning alternatives.

Again, I thoroughly enjoyed the article and the time and effort you spent into crafting such an informative piece that was readable for all no matter how much background they may have had with AI. I just wanted to bring this to your attention as I know firsthand how much work Joe and Rick spent over many years to get aircraft to perform like birds with successful landing maneuvers.

Timothy R. Jenks, MA B ’13

Dollars for Dams

- Ms. Bell, thank you for your interesting and informative article on dams in *The Bent*. I’m an electronics, and never thought much about dams until Oroville made the news last year

It’s sad that dams didn’t make President Trump’s infrastructure list. Dams could at least have been ahead of airports. I also noted that the price tag for getting dams well, or at least better, is identical to the President’s plus-up for defense.

Another interesting number is the annual safety budgets for six states amounting to \$22-\$93 per dam. I’m told that every U.S. taxpayer pays \$16 toward California’s high-speed rail. If I had the choice, based on your article, I’d rather put my \$16 toward the dams—including California’s.

George F. Steeg, P.E., NY G ’54

- I read the lead article in the spring issue of *The Bent* regarding our deteriorating dams.

I find the “staggering” estimate to address deferred dam maintenance, nationwide, \$54 billion, to be an interesting number. It is the same amount the Trump Administration wants to add to the existing \$600 million the nation spends each year on our military. That is one year’s increase.

We could bring all of the nation’s dams up to reasonable condition just by deferring this proposed military increase for one year.

Stephen G. Cohn, CA A ’69

Leadership Inspires

- As an aspiring musician and guitar player in high school and college, who gave up music upon graduating and naval service, about the time Tom Scholz began his band at MIT, I am blown away after studying Tom’s life and career (Leadership, *The Bent*, Spring 2016).

So I went to my original store and bought a new guitar, bass, and amplifier and started playing again

almost 50 years later.

Thanks Tom for your inspiration! And you have given my life membership in Tau Beta Pi new meaning and pride.

James M. Diehl, DC G ’67

Correction

- I finally had a few minutes to browse through the Summer 2017 *Bent*. First, I would like to thank you for including the Alumnus Note I sent in earlier; it makes me look much better than I do in person.

I was, however, surprised to see that I graduated from the University of Alabama. While it is a great university, I am actually a member of the Arizona Beta Chapter—graduating from Arizona State University with my undergraduate degree in 1970.

I always thoroughly enjoy the articles, the faculty, and alumni notes and, of course, reading about all the young engineers who are almost certainly going to make us very proud in the future.

R. Wayne Headrick, Ph.D., P.E., AZ B ’70

Thank You!

- I wanted to thank you for providing the funding to the Alaska Alpha Chapter for student scholarships.

I was very fortunate to receive one of these awards and am thankful for the support you have provided to make this possible.

Your generous contribution to my academic endeavors shall be put to good use in both short and long terms. I am very excited to continue to pursue a dual major in petroleum engineering and geosciences at the University of Alaska Fairbanks.

Ultimately, I look forward to a career in which I can help develop our nation’s bountiful natural resources and contribute to greater energy independence.

Thank you again for helping to make these goals easier to achieve.

*Cody D. Keith
Chapter President, AK A ’20*



WHO'S WHO

Sylvia E. Acevedo, *New Mexico Alpha '79*, has been named CEO of the



Girl Scouts of the USA. The lifelong Girl Scout and longtime business leader had been interim GSUSA CEO since June 2016. A former NASA engineer

and STEM advocate, she has championed minority girls' and women's causes. Acevedo is a consultant on using technology to capitalize on demographic trends, and was formerly president and CEO of Communicard LLC, that used innovative technology to harness market patterns.

Mary T. Barra, *Michigan Zeta '85*, has announced that General Motors is giving \$850,000



to the nonprofits Code.org, Black Girls Code, Institute of Play, and Digital Promise for STEM programs and training. Barra, GM's CEO, said: "It's my hope those

students become graduates who are equipped to join us in the technical fields required to lead in the future of mobility." She added that a modern car has many millions of miles of code, and they must address this.

Perry L. McCarty, Sc.D., *Michigan Epsilon '53*, has been inducted as a "Stanford Engineering Hero."



The Stanford University Professor Emeritus has defined the field of environmental biotechnology that is the basis for

small-scale and large-scale pollution control, and safe drinking water sys-

tems. McCarty joined the Stanford faculty in 1962 when he came to help develop the environmental engineering and science program. He was elected to membership in the National Academy of Engineering in 1977 and the American Academy of Arts and Sciences in 1996.

Arun N. Netravali, Ph.D., *Texas Gamma '69*, is the 2017 Marconi Prize winner.



He is the former president of Bell Labs (now Nokia Bell Labs) and leader of pioneering work on video compression standards that were

the key technology for MPEG 1, 2 and 4. These enabled a wide range of video services including digital TV, HDTV, and streaming video, ushering in a digital video revolution. The technology is now used in most TVs and all mobile phones.

George R. Oliver, *Massachusetts Alpha '82*, is chairman and CEO of



Johnson Controls International, the company formed last year by the merger of Johnson Controls and fire-security systems provider Tyco International.

Oliver was previously CEO at Tyco, which he joined in 2006 after holding leadership positions at GE.

Thomas C. Roberts, P.E., *Kansas Gamma '70*, has become president of the National Society of Professional Engineers. He has more than 40 years' experience in planning, organizational development, and leadership training programs. Roberts began his career as a U.S. Army chemical officer, helping to develop



laser guided weapons in the 1970s. In 1993, he became assistant dean and associate professor for the college of engineering at Kansas State University. Roberts was responsible for recruitment and leadership development there for 21 years.

Dara Khosrowshahi, *Rhode Island Alpha '91*, has been named as the



new chief executive officer of ride hailing company Uber. He had been CEO of online travel firm Expedia since August 2015. An engineer who trained at

Brown University, Khosrowshahi helped to expand IAC/InterActiveCorp's travel brands which were combined into Expedia. Prior to that, he was at the investment bank Allen & Company. Khosrowshahi also serves on the boards of Fanatics Inc. and The New York Times Co.

Dawn M. Tilbury, Ph.D., *Minnesota Alpha '89*, has been chosen



by The National Science Foundation to head its directorate for engineering. The University of Michigan mechanical engineering professor is

charged with supporting research and education critical to the nation's future and fostering innovations to benefit society. Tilbury will retain her U-M appointment and intends to return there after her time at the NSF.



VIEWPOINT

This is the first in an occasional series of articles from members giving individual viewpoints on topics of engineering, ethical or professional interest. It should be noted that these are personal views and do not represent the opinions or policies of Tau Beta Pi.

Don't Fly in 10 Years!

MY COLLEGE TEAMMATE leaned over and whispered: "Don't fly in 20 years."

It was April 2010; I was on my final leg of undergrad education. That spring semester, we were watching half of our aeronautical engineering peers give final presentations for capstone design, which ranged from excellent, through awful, to alarming.

To be fair, the school produced an impressive amount of excellent engineers. But those are not the people who stick out in memory. Perhaps that's one of my personal flaws. Regardless, that off-hand remark is proving to be prophetic.

While everyone is handwringing about the events in Washington, DC, a real, insidious, and largely unknown threat is lurking in the bones of every aircraft.

Time-based failure, specifically crack growth in metals (fatigue), appears to be an afterthought in many analyses I've reviewed. This failure mechanism was responsible for the Comet crashes in the 1950s, F-111 in 1969, Aloha Airlines in 1988, Chalks Airlines in 2005, F-15 in 2008, Southwest Airlines in 2011, and a firefighting C-130 in 2012. In the Chalks and C-130 cases, the failures were directly a result of poor repair design.

Find Cracks

These are just the cases which have gained some publicity. We actually find cracks on aircraft all the time. With proper fleet management, we're able to deal with these before they become catastrophic. However, recent interactions make me wonder if everyone is as concerned as they should be about this issue.

Companies keep asking the question, "What do Millennials want?" Apple was able to figure this out with the iPod. Most people didn't know they wanted an iPod until they acquired one.

I submit to you that what Millennials want is not coffee shops, nap rooms, and hammocks. They want safe spaces...to fly! They want aircraft to stay airborne. They want (whether they know it or not) engineering rigor



Lawrence C. "Charlie" Stoker III, New York Gamma '10, is an aircraft structural integrity program (ASIP) engineer for the U.S. Air Force. His specialties involve taking finite element analysis, comparing and matching it to test data, and using that fusion to inform fleet management decisions. He has presented at the 2015 ASIP Conference in San Antonio, TX, and contributed to a paper published and presented at the 2013 AIAA Conference. Stoker's awards include: Civilian Jr. Engineer of the Year for A10 Division (USAF, 2016), DoD Value Engineering Achievement Award (Team, 2015), and Civilian of the Year Cat II for A10 Division (USAF, 2014).

behind every piece of aircraft structure.

Fellow engineers, we are the champions of airworthiness, and we need to take our task seriously!

Recent experiences have raised red flags. I am concerned with the analyses I see coming out of other offices and other companies. I have a common thought: "I really hope they don't deal with commercial aircraft this way." For some reason in military aviation, the thought that "The pilot has a parachute" is enough to let some engineers get cavalier.

A parachute may save the pilot, but it won't save my house as the abandoned plane barrels into the ground!

In all seriousness, the "lazy way out" has become a common denominator. If we don't address this problem now, we will either be praying for luck or become statistics.

Ignore Problems

People don't like to be corrected. But you can't ignore problems like poor analyses, lack of understanding the problem, and incorrect free-body diagrams.

Yet when you address these, the engineer or the lead gets defensive! Rather than listen to the substance of the concern, pride becomes the foundation of the inquiry. Fellow engineers: be the mentor and provide correction to your subordinates!

I too was once a cocky, inexperienced engineer who thought he knew everything. Thankfully, I had a mentor who wasn't concerned with friendship. He was able to be painfully blunt and correct my attitude before I became dangerous. Leads, supervisors, and senior engineers: you must do this with your new engineers.

Without this mentorship or training, you end up with flat-out-wrong finite element analyses (FEA), misapplication of newer technologies, and investigating the wrong components! I just reviewed a document where an engineer "refined" the mesh of a finite element model, and the stress went DOWN 40%. Where did all that load go? That's not the way it works. Perhaps the model was wrong to start. The engineer's lead or supervisor should

have reviewed and pointed this out before providing the so-called analysis.

Fellow engineers: trust in new technologies is not your deliverance. Proper testing and characterization is required. FEA and 3D printing will not fix analytical holes in your assumptions!

All this begs the question: why is there such little focus on aerostructures? It appears as if all you have to do is say the word “laser” (or synergy, for that matter), and you have all levels of management and customers saying “take my money!” Maybe we should coin the term Laser-Focus-Analysis-Aerostructures.

Could it be that the next aircraft crisis is right around the bend?

I look at our local universities. One is dropping many classes in fatigue crack growth. Another focuses heavily on aerodynamics and very little on structure. I wish my own schooling had included more aerostructures concerns.

Our next wave of engineers is going to be intimately familiar with composites, 3D printing, the various computer-aided design tools, and the latest-and-greatest technologies. Like anything else, all these need some form of validation, testing, and understanding.

Space Tourism

I recently read an article about Elon Musk’s plan for space tourism. That’s fantastic! Does his engineering team have a group of engineers intimately familiar with fatigue?

It took us over 30 years to finally get metals right. The composites field is getting to that point after nearly 30 years. We still learn something new every day. The task is far from complete.

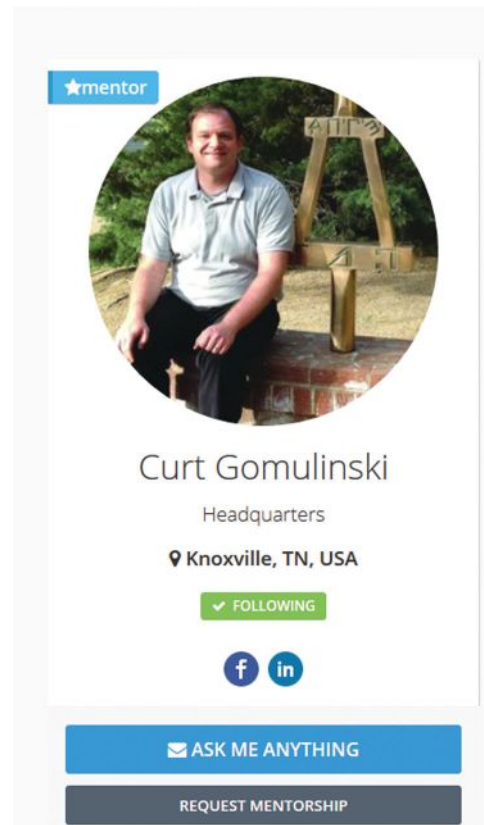
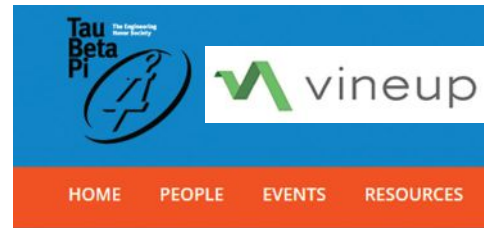
Some will accuse me of “standing in the way of progress.” If progress is gaining speed as you fall out of the sky due to fatigue, I proudly stake my claim as that barrier.

As the “graybeards” retire, the knowledge tends to go with them. I fear that in 10 years, we will have a group of un-mentored, and more dangerously, unaware engineers who are too proud to accept errors spotted in their analysis.

I hope we can pull our heads out of the clouds and start addressing these deficiencies before they address us.

How to Join TauBetaPi4Life Community:

- **Be sure your email address is on file with TBP Headquarters and follow instructions in invitation email.**
- **Visit tbp.vineup.com to sign up on desktop.**
- **Search and download “TauBetaPi” in app store and join this way.**



As of September 2017, Tau Beta Pi has a new online community aimed at engaging members (alumni and students) and bringing them together by interests, skills, and location.

The new platform, by VineUp, will be available for use on desktop and mobile devices (Apple and Android app). Features include registration integration with Facebook & LinkedIn, robust mentoring capabilities, and all-inclusive Association social feeds in one location.

Student members will be provided a link to join after completing catalog cards. Alumni will receive a link with a verified code in the URL.

Contact tbp4life@tbp.org with questions or issues related to joining the community.



2017 TBPi-MCDONALD MENTOR

Established in 2006, the Tau Beta Pi-McDonald Mentor Award celebrates excellence in mentoring and advising among educators and engineers who have consistently supported the personal and professional development of their students and colleagues. It recognizes those who have shown true concern for individuals, supported an environment for developing talents, and earned respect and recognition for their contributions to their field and the greater community.

Daniel F. Dolan, Ph.D.

fOR HIS OUTSTANDING success in mentoring engineering students, **Daniel F. Dolan, Ph.D., Minnesota Alpha '70**, is the 2017 TBPi-McDonald Mentor. He is CAMP director at the South Dakota

School of Mines & Technology.

Dolan will be honored on October 13, 2017, at the 112th annual Convention in Michigan. Tau Beta Pi President Norman Pih will present him with \$1,000 and an engraved medallion and pin. Another \$1,000 grant will be presented to the South Dakota Alpha Chapter for nominating him.

Established in 2006 by Marion and Capers W. McDonald, *North Carolina Gamma '74*, and the Association, the McDonald Mentor Award recognizes engineering educators or professionals who have shown true concern for the individual, supporting an environment for developing talents, and who have earned respect and recognition for contributions to their field and to the greater community.

Dolan is dedicated to mentoring on campus and beyond through engaging prospective engineering students, SD Mines students in all disciplines, and faculty. He is an example of a well-balanced engineer who promotes technical abilities and soft skills equally.

All of his degrees, B.S., M.S., and Ph.D., are in mechanical engineering and were earned from the University of Minnesota. Dolan joined the faculty at SD Mines in 1981 after a post-doctoral appointment at the University of Duisburg in Germany.

He is a former professor of mechanical engineering and the Director of the Center of Excellence for Advanced Manufacturing and Production (CAMP) at SD Mines. CAMP is a competitive, nationally recognized program that brings together students, faculty, and industry leaders to partner on real-world projects. According to the nominating chapter, CAMP is one of the best recruit-



ing tools for prospective students.

As CAMP director, Dolan advises and coaches the Society of Automotive (SAE) Aero Design, Baja SAE, Formula SAE, Unmanned Aerial Vehicle, and SAE Clean Snowmobile Challenge teams. He also received a higher education assessment certificate in graduate psychology from James Madison University. This degree complements his passion for research in the psychology of learning. His efforts in this area involve students from all departments on campus that participate in the CAMP programs and progression through their education.

Dolan was cited for fostering creativity, design thinking, and a love for engineering in his students. He was also commended for outreach activities in the local community through CAMP, including GEAR-UP, recruiting and

retention of women in STEM fields, and high school visits.

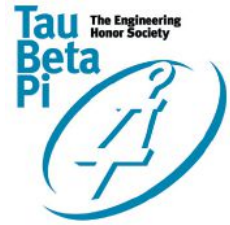
He has been recognized with many prestigious awards, including: the Presidential Award for Outstanding Professor, an Outstanding SD Mines Student Activities Advisor, and the SAE Faculty Advisor Award. He is the co-inventor on six patents and is well-published in areas from composite materials to engineering teaming.

Although Dolan retired from the faculty in May, he plans to continue his work with the CAMP program, which celebrates its 20th anniversary this year.

Attributing the success of the CAMP program directly to Dolan's leadership, a former academic peer said, "He helps (teams) develop their own mentoring skills."

For his continued commitment to the education and development of engineering students and for positively impacting thousands of lives through encouragement, guidance, and with passion, Daniel F. Dolan, Ph.D., is the 2017 Tau Beta Pi-McDonald Mentor

The Tau Beta Pi Outstanding Advisor has been recognized every year since 1994. Selection is made by a committee of deans at engineering colleges and past award winners.



2017 OUTSTANDING ADVISOR

LeVern W. Faidley, Ph.D.

IN RECOGNITION OF SERVICE TO his chapter and the Association, **LeVern W. Faidley, Ph.D.**, *Iowa Alpha '67*, is named the 2017 Tau Beta Pi Outstanding Advisor. He is Chief Advisor to the Iowa Alpha Chapter and a retired program planning and resource management consultant.

He will be honored on October 13, 2017, at the 112th annual Convention in Michigan. President Norman Pih will present \$1,000 and a commemorative plaque to Faidley. Another \$1,000 grant will be presented to the Iowa State University (ISU) College of Engineering's discretionary fund.

Faidley exemplifies going above the call of duty and is always an enthusiastic supporter of students and TBPi alumni. His nomination summary and references concur that the submitted documents could not do justice to the extensive involvement and continued roles he undertakes as Chief Advisor to his collegiate chapter. The energy and interest he brings to this position are integral to the vitality and continued success of the Association.

Faidley received his bachelor's degree in agricultural engineering from Iowa State University. His master's and Ph.D. degrees are both in agricultural engineering from Michigan State University. He spent much of his career working for the United Nations Food and Agriculture Organization in Rome, Italy, before retiring in 2004. Returning to Ames, IA, he became a non-faculty advisor to Iowa Alpha in 2005. Faidley began serving as Chief Advisor in 2011 and also serves as a member of the TBPi Advisor Recruitment and Development Committee.

Both of LeVern's children are Tau Bates and were active ISU undergraduates. LeAnn graduated ISU with degrees in engineering science and physics. She earned her Ph.D. in mechanical engineering and is now an associate professor of engineering science at Wartburg College in Iowa. Galen earned his bachelor's and master's degrees



in computer engineering from ISU and is a senior engineering project team lead at Caterpillar Inc.

Faidley's success as an advisor begins with his commitment to "being there." He participates in all chapter activities, attends all meetings, guides chapter leaders, and works tirelessly to make the chapter more effective. Other traits that make him an outstanding advisor include: improving the chapter's algorithm for identifying eligible candidates, ensuring that all ISU engineering department chairs are TBPi members or become so.

His nomination states that every semester since Faidley became an advisor, Iowa Alpha has initiated at least one eminent engineer and ISU alumni. The chapter also has the Alpha Scholars Program for first year engineering students. He initiated and helps support the program that now awards 24 scholarships each year. These scholars often become chapter leaders.

In 2013, the annual Convention took place in Ames and Faidley was instrumental in the successful planning and implementation. This contributed to the exceptional reputation the chapter maintains on campus.

He was also cited for his vital contributions towards chapter outreach events including "Building the Future" and the "Roller Coaster Competition." These two K-12 events focus on promoting STEM disciplines.

Faidley is involved in an initiative to assist historically black colleges and universities in installing collegiate chapters of Tau Beta Pi. He has personally contributed to help fund faculty from these to attend Conventions.

In recognition of his contributions as a leader and role model, for his commitment to improving the Association and strengthening its membership, and his limitless dedication to his alma mater and ISU collegiate chapter, Tau Beta Pi hereby recognizes LeVern W. Faidley, Ph.D., as the 2017 Tau Beta Pi Outstanding Advisor.

Lilia A. Abron, Ph.D., P.E.

IN RECOGNITION of outstanding lifetime achievements, **Lilia A. Abron, Ph.D., P.E.**, *District of Columbia Alpha '68*, is recognized as a 2017 TBPI Distinguished Alumna. She is the CEO and founder of PEER Consultants and former assistant professor at Howard University.

Abron became the first African American woman to receive a Ph.D. in chemical engineering in 1972 from the University of Iowa. Her bachelor's degree was earned in chemistry from Le Moyne College and her master's in sanitary engineering from Washington University in St. Louis.

She then served as an assistant professor of civil engineering at Tennessee State University with a joint appointment as an assistant professor of environmental engineering at Vanderbilt University.

Before founding PEER Consultants in 1978, Abron joined the faculty at Howard University. She is the first African American to start an engineering consulting firm that focused on environmental issues. In 1995, she co-



founded PEER Africa to establish innovative best practice solutions for environmentally sound and sustainable projects that contribute to the eradication of poverty and promote economic development in the communities of South Africa. PEER Africa won the American Academy of Environmental Engineers and Scientists 2012 Superior Achievement Award.

Through her firm, Abron worked on the Boston Harbor cleanup, with the Department of Defense and the Department of Energy through its hazardous waste remedial program.

She has been active in the community, as president of the Washington, DC, chapter of Jack and Jill of America, Inc., and as a board member at the Baptist Home for Children.

As an educator, engineering consultant, and trailblazer, Abron has nurtured and encouraged liberal culture. Her work and influence make a difference and promote integrity and excellence in engineering.

Terry D. Olberding

IN RECOGNITION of outstanding lifetime achievements, **Terry D. Olberding, Tennessee Alpha '78**, is recognized as a 2017 TBPI Distinguished Alumna. She is a management consulting contractor with Eagle Research Group and past nuclear safety specialist for the Department of Energy's National Security Administration.

Olberding received an Administrator's Gold Medal in 2010, for her 32 years of government service. Many of those years were spent as a manager at the National Nuclear Security Administration working for the Department of Energy in Oak Ridge, TN.

She received her bachelor's degree in engineering sciences and mechanics from the University of Tennessee (UT) and is an active member of the Great Smoky Mountains Alumni Chapter. Olberding is a sought after consultant, but makes time for community activities.



Most notable is her involvement in breast cancer awareness. She is a survivor but lost her twin sister, Sherry, to the disease. Olberding is leader of the Knoxville Jazzercise Race for the Cure Team, raising community awareness and money for research.

She is an annual judge at UT's Engineers Day and at the Science Bowl in Oak Ridge. She also participates in "Introduce a Girl to Engineering" events, volunteering with TBPI, the Society of Women Engineers, and in DOE-sponsored events.

Olberding is an avid quilter, donating her work to charity. She is active in her local church and supports East Tennessee Children's Hospital.

For her prolific efforts as a volunteer, leadership roles, and commitment to the nuclear facilities at Y-12, and her strength in the fight against breast cancer, Terry Olberding is an inspiration to others and has greatly contributed to their future in engineering and beyond.

Distinguished Alumni are recognized for their demonstration of outstanding adherence to the ideals of Tau Beta Pi (integrity, breadth of interest, adaptability, and unselfish activity) and for fostering a spirit of liberal culture in society. Recipients exemplify excellence in both leadership and character to members of collegiate chapters. This year's TBP Distinguished Alumni will be honored on October 14, 2017, at the 112th annual Convention in Michigan. Tau Beta Pi President Norman Pih will present a commemorative plaque, and a \$2,000 scholarship will be given in the name of each alumnus to a deserving student member of Tau Beta Pi.

Tom Scholz

IN RECOGNITION of outstanding lifetime achievements, **Tom Scholz**, *Massachusetts Beta '69*, is recognized as a 2017 TBP Distinguished Alumnus. He is co-founder of the band Boston and previously worked as a senior product design engineer at Polaroid Corporation.

Scholz is more than a musician. He is an engineer with bachelor and master's degrees in mechanical engineering from Massachusetts Institute of Technology (MIT), an inventor with nearly three dozen patents, and a philanthropist establishing a foundation called Third Stage.

While working as an engineer at Polaroid, he invested in a basement recording studio. Scholz played all of the instruments, gradually teaching himself audio engineering and music production.

He began recording demos of songs he wrote with Brad Delp. The two signed a contract with CBS/Epic Records in 1976. It did not take long for Boston to become



a hit and their first album has sold more than 17 million copies.

This allowed him to create Third Stage, which has had major impacts. This ranges from marketing efforts for Earth Island Institute, leading to an agreement by major companies to stop selling tuna caught in dolphin ensnaring nets, to funding an awareness campaign against inhumane treatment of veal calves.

He has been recognized for his charitable work with the Mahatma Gandhi Award by Action for Life and the PETA Humanitarian Award. In addition, Scholz started his own company to produce the specialized audio equipment he invented.

With dedication and hard work, he has touched the lives of many people through his music. Scholz also paved

the way in freeing artists from unreasonable demands from record companies. His many accomplishments and inventions have shaped the music industry and made him an exemplary engineer and entertainer.

Charles E. Sukup, P.E.

IN RECOGNITION of outstanding lifetime achievements, **Charles E. Sukup, P.E.**, *Iowa Alpha '76*, is recognized as a 2017 TBP Distinguished Alumnus. He is president of grain drying and storage equipment makers Sukup Manufacturing Company. Sukup was the family-owned business' first degreed engineer, earning B.S. and M.S. degrees in agricultural engineering from Iowa State University (ISU).

After becoming president in 1995, Sukup added portable grain dryers, grain bins for farm and commercial storage, and pre-engineered steel buildings to Sukup's products. This has grown the company to eight times its previous size.

Sukup has also made substantial philanthropic contributions at local and international levels. He has an interest in the world's food supply and has made several trips to Africa, most recently for the

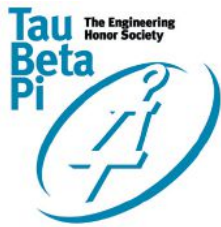


American Society of Agricultural and Biological Engineers (ASABE) conference on Global Food Security. His nomination said, "Sukup Safe T Homes® in Haiti have become globally known for providing safe shelter during natural disasters."

He has received numerous awards, notably the 2016 Cyrus Hall McCormick Jerome Increase Case Gold Medal from ASABE.

Sukup is also a supporter of music at ISU. He contributed to the music department for the Charles and Mary Sukup Endowed Artist in Organ position. He also made a leadership gift towards construction of Sukup Hall in the agricultural and biosystems engineering department.

A well-respected engineer and business leader, Sukup has demonstrated his commitment to creating a better world through making products that increase the world's food supply and giving back through civic activities.



2017 LAUREATES

Three Laureates have been selected in the 36th year of Tau Beta Pi's annual program to recognize gifted engineering students who have excelled in non-technical areas. Award categories include arts, athletics, diverse achievements, and service. The Laureates join 102 other outstanding Tau Bates who have been cited since the program began in 1932. The Laureates will be honored on October 14 at the 112th annual Convention in Michigan. Tau Beta Pi President Norman Pih will present each with a \$2,500 cash award and a commemorative plaque.

The Laureate Program was inaugurated to further Tau Beta Pi's second basic purpose as stated in the preamble to the Constitution: "to foster a spirit of liberal culture in engineering colleges." A committee of District Directors considered ten nominees from ten chapters.

Kasey M. Cooper

KASEY M. COOPER, *Alabama Alpha '18*, has been named a 2017 Tau Beta Pi Laureate for her achievements in athletics. She will be honored with other 2017 Association award winners on October 14 at the 112th annual Convention in Michigan.

Kasey is majoring in mechanical engineering at Auburn University and will graduate during the spring of 2018.

She has been a four-year starter as third baseman for the Auburn softball team. She is a two-time SEC Scholar-Athlete of the Year, the SEC's all-time runs batted in (RBI) leader, and her .386 career batting average is exceeded only by her grade point average—3.98.

Kasey was selected and has competed for two summers with the USA Women's National Softball team, winning a silver medal at the World Cup of Softball (2016). In addition, She is a three-time All-American, three-time Academic All-American, and Auburn's all-time home runs leader (67).

She has been a devoted member of Alabama Alpha.



Her service has included giving tours of the Auburn mechanical engineering department, during which she recruited females, reassuring them that they could thrive in a male-dominated major.

With her extraordinary time management skills, she makes time to volunteer through service activities with her chapter and with the softball team. Kasey is a determined leader who helps others succeed through mentoring and as a camp counselor. She exemplifies what it means to be a student-athlete and has battled through adversity to meet her goals on and off the field.

She fosters academic achievement in her teammates with quiet steady leadership, and instills in them that a strong work ethic is always in the formula for success. Kasey also volunteers up to 20 hours a week for guest speaking at local sports banquets and by encouraging young athletes at their practices and events.

Kasey plans to go to medical school to become a surgeon and help extend life.

Kevin Fraser

KEVIN FRASER, *North Carolina Gamma '17*, has been named a 2017 Tau Beta Pi Laureate for his diverse achievements. He will be honored with other 2017 Association award winners on October 14 at the 112th annual Convention in Michigan.

He is an electrical and computer engineering graduate of Duke University, and will work as a full-time analyst with BlackRock.

His sponsors said Kevin's numerous achievements in service and athletics embody the spirit of liberal culture, and embrace the values of Tau Beta Pi.

Kevin has contributed as a member of the varsity swimming and diving team, and has worked to help bring an end to anti-LGBTQ+ discrimination in athletics. He is a two-time All-ACC Academic Team selection and was a member of the 2013-14 ACC Championship team.

Through his role as a mentor, Kevin has helped to build a



community among the first-year athletic class of student-athletes, establishing peer connections and instilling traits to enable future success. He also coordinated the representation of more than 50+ members of Duke Athletics in North Carolina's annual Pride Parade.

Kevin participates as a council member of Team IMPACT, which seeks to improve the lives of children facing life-threatening illness. Over the past four years, he has developed a close relationship with a young boy fighting leukemia. He was able to allow the young child to attend Duke swim practices.

Through his actions, Kevin has displayed great character and devotion to broadening his own perspective and those of his peers in the classroom, the community, and the swimming pool. For these efforts, and from diverse experiences as a well-rounded student-athlete, he is prepared to make lasting contributions as an engineer.

Simone M.M. Stanley

SIMONE M.M. STANLEY, *District of Columbia Alpha '17*, has been named a 2017 Tau Beta Pi Laureate for her achievements in the arts. She will be honored with other 2017 Association award winners on October 14 at the 112th annual Convention in Michigan.

She is a graduate of Howard University with a degree in chemical engineering. She plans to work in a post-baccalaureate program at the National Institutes of Health before attending graduate school focused in healthcare technology.

Simone began studying dance at the age of 4 and by age 12 she had choreographed her first performance. In middle school, she began playing the clarinet and competing in science fairs. She has been a member of the Howard Dance Company since her freshman year.

As a sophomore, she was elected as president of the local chapter of the National Society of Black Engineers and as the Director of the Dance Company. Each summer, Simone has done research, worked an internship, or studied



in South Africa through the Global Education and Awareness Research Undergraduate Program.

As a member of the DC Alpha Chapter, Simone has been active with the K-12 MindSET program sharing her love of STEM. She also participated in her chapter's Pi Talk Event 2015 giving a presentation "Dancers in the Lecture Hall," which discussed the use of arts in traditional learning environments as a teaching supplement.

She has been a student ambassador and served in other capacities for Howard's college of engineering and architecture, giving many young students a role model who excels in engineering and encourages them to do the same.

Simone has excelled in the arts (music, dance, & choreography) while fostering interest in STEM. Her participation in volunteer outreach and as a leader in the engineering community has demonstrated her personal integrity and commitment to promoting lifelong learning.

Hydrogen Fever!

From H₂-powered trams and railways to supersonic transport, the global carbon economy may soon get a lighter, cleaner competitor

By Arielle Emmett

SPEED—WILDLY SUPERSONIC, hydrogen-powered speed—might soon be available for passengers traveling across the American continent in giant tubes resembling PVC water pipes.

The tubes will contain multi-articulated vehicles—crosses between a plane and a train. Inside the tubes, the vehicles will breathe fuel, store oxidant, and increase in weight during operation.

This is Arnold Miller's vision. Miller, a Ph.D. chemist and inventor in 2002 of the first American hydrogen fuel cell-powered mining locomotive, dreamed up his prototype supersonic vehicle and published the first of seven journal articles detailing an aerodynamic analysis of it beginning in 2008.¹ If hydrogen atmosphere were contained within the tubes, he said, passenger vehicles could race along on a hydrogen aerostatic fluid film at Mach 3 relative to the air outside.

"You have a lower Mach number in hydrogen since it has a much higher speed of sound than air, so inside the tube you'd be experiencing the ride as subsonic—no shock waves," said Miller, a former professor at the Colorado School of Mines and now president of Vehicle Projects Inc. and the non-profit Supersonic Institute, a Colorado group advancing new concepts in high-performance transportation.

"Major Challenge"

"Taking hydrogen fuel from the tube solves the problem of vehicle hydrogen storage, a major challenge of contemporary hydrogen-powered vehicles," he explains (2008, p. 1995). Based on comparisons with the aerodynamic properties of a mid-size turboprop plane (the Bombardier Dash 8 Q400™), Miller estimated that his hydrogen-oxygen fuel cell powered vehicles would require 2330 liters of liquefied oxygen onboard which, combined with hydrogen, would generate 2.0 MW of power. This would run the vehicle at 1500 km/hour (932mph). That's supersonic speed with respect to air, propelling passengers from New



Arnold Miller

York to Los Angeles in 2.64 hours, about half the time of a conventional jet.

Miller's startling proposal may be decades ahead of realization. However, lower-speed hydrogen-oxygen fuel cell powered vehicles including light rail, city trams, switching and mining locomotives, along with hydrogen-powered cars, trucks, even single-engine airplanes, are already in action, part of a fast-growing global hydrogen economy.

That economy is based on two factors: one is the impact of climate change and the exhaustion of natural resources, including dirty carbon fuels, creating new opportunities to link mass transportation with renewable sources. In addition, the hydrogen economy is based on a concept of hydrogen gas as an *energy vector*—a medium for conveniently transporting, storing, and converting energy into electricity to fuel sustainable growth.

Abundant hydrogen can generate power with little or no carbon emissions provided the source of energy to produce hydrogen is clean—for example, renewable wind power, hydroelectric, or solar. Hydrogen can either be burned to generate heat, or can combine with air in a fuel cell (usually in the presence of a platinum catalyst) to produce electricity to power a train, car, or even an apartment building, its only byproduct water.

However, since hydrogen gas (H₂) is too chemically active to be available in nature, it must be generated by applying energy to a source—most often natural gas (a process known as steam methane reforming, which also produces CO₂ emissions), along with biomass, alcohols, or electrolysis of water. Electrolysis splits water molecules into hydrogen gas and oxygen, and can be utterly non-polluting if the electrolysis is driven by renewable energy.

Feuds over Efficiency

Hydrogen gas in turn can be compressed, liquefied, and stored. On board a train, for example, it can be run through a fuel cell where it recombines with O₂ from the ambient air, producing free electrons that generate the current necessary to move the train or charge batteries that power the train. Fuel cells work best at constant output so on rail vehicles they are generally used in combination with batteries which absorb stopping energy and use it again for re-acceleration.

In the past, though, the process of producing, compressing, and transporting hydrogen to a user for conversion into electrical energy was believed to be inefficient; some engineers claimed only 20 to 25% of the total



Alstom's Coradia iLint, a hydrail running up to 140km/hr (87mph), is tested and ready to roll in Germany by late 2017.

processing energy could be recovered for fuel cell use. In 2006, for example, Ulf Bossel, an energy consultant with the European Fuel Cell Forum, called the hydrogen economy a “wasteful economy,” arguing that electricity obtained from hydrogen fuel cells appeared to be four times as expensive as electricity drawn from the conventional transmission grid.

“Because of the high energy losses within a hydrogen economy the synthetic energy carrier cannot compete with electricity,” Bossel claimed.² But hydrogen proponents today say the economics have transformed.

“Conversion efficiencies have improved and going all the way to liquefying hydrogen isn’t seen as necessary (and adds inefficiency),” observed Alistair Miller, an energy consultant and research emeritus at Canadian Nuclear Laboratories (CNL) in Chalk River, Ontario. “What Bossel didn’t acknowledge—and perhaps in 2006 couldn’t see—was the extreme swings in the value of electricity on grids from substantially negative to very expensive, in large part caused by the deployment of wind and solar renewables,” Miller explained.

The New Bitcoin

Today, in fact, renewables and fuel cell advances have turned the economic “bitcoin” of hydrogen into a winner, especially in rail applications. With high-efficiency wind turbines and solar cells that now produce excess power in countries like Canada and Germany, it’s now possible to use peak production excess to split water electrochemically and produce hydrogen gas without emissions, and at comparatively low cost.

Further, claims Stan Thompson, a former BellSouth environmental and transportation futurist and inventor of the term “hydrail” (a term designating hydrogen fuel

cell railway technology in 2003), “there is very roughly a 65% efficiency in the two-way, electricity to hydrogen to electricity transition,” he says, citing technical discussions of efficiency among fuel cell experts whose opinions vary depending on application.

“In return for the 35% loss, hydrail avoids the need for [multiple millions] per kilometer of overhead track electrification infrastructure. Overall, the cost of the hydrogen is trivial in proportion to the avoided cost of external power. And, as renewables supplant extracted fossil carbon, prices will only get cheaper.”

The past decade has shown significant momentum for zero-emission mass transportation vehicles in Europe, China, Japan, and Canada. In Japan, for example, the first ever hybrid fuel cell-battery railcar was tested in 2006; Japan began building hydrogen-powered vehicle and residential fuel cell prototypes as early as 2000, according to Thompson. With North Carolina transpor-



Stan Thompson



Andreas Hoffrichter

In China, hydrogen-powered light rail and tram applications will soon become widespread throughout the country's crowded urban centers. Research leaders include Southwest Jiaotong University, Tangshan Railway Vehicle Company (China's oldest railway, based in Tangshan, Hebei), and CRRC Sifang Co. Ltd. (Qingdao), a subsidiary of China South Rail Corporation. Development of the first fuel cell architecture for passenger trams began in 2009 in the laboratory of Southwest Jiaotong University's Weirong Chen, an engineer who develops power systems for hydrail with a big staff of scientists and students (China also has hydrogen research projects at leading universities in Beijing, Shanghai, and Wuhan).

Fully Operational

A demonstration fuel cell-powered locomotive known as "Blue Sky" bowed in 2013, which was equipped with Ballard 150 KW HD-6 fuel cell stacks. Separately, in 2015, China's Sifang Co., Ltd. debuted a fully operational hydrogen-powered tram accommodating 380 passengers in Qingdao.

With government permission, the first regular hydrail tram service could begin in Foshan, a relatively small city 28 kilometers east of Guangzhou and north of Hong Kong, according to Southwest Jiaotong sources. Foshan is part of the giant megalopolis that Southern Chinese cities are rapidly becoming.

The United Kingdom's first hydrogen-powered passenger train completed a pilot trip in 2012, but research activities and experiments go on all the time at University of Birmingham Center for Railway Research and Education. Engineer and teaching/research fellow Stephen Kent and Andreas Hoffrichter, Ph.D. (who is now the Burkhardt Professor of Railway Management at Michigan State University) undertook some risky railway experiments back in 2009.

"Andreas' Ph.D. was on hydrogen as an energy carrier for rail applications," Kent said. "While he was doing that with us, we took part in the Institution of Mechanical Engineers Railway Challenge in 2012, which was to design and build a narrow gauge train" using high performance characteristics for acceleration, regenerative braking and ride quality. With Hoffrichter's input, the Birmingham team built a hydrogen fuel-cell prototype

tation specialists Bill Thunberg and Jason Hoyle, he started the International Hydrail Conferences, beginning in 2005, an annual event drawing hydrogen railway experts worldwide.

at 1/5th scale; fuel cell power was 1.1 kW supplemented by batteries resulting in a total of 4.4 kW, sufficient for the vehicle to compete. Though the prototype didn't win the competition in that year (the vehicle that won was a more "traditional combustion engine with a petrol generator," Kent said), "the next year we went whole hog with a hydrogen powered fuel cell with a battery pack hybridized. It had a solid state hydrogen storage (metal hydride) instead of storing hydrogen as a gas, and we used a high-end industrial computer and controlled the train with a touch screen tablet computer."

This past year, the group produced another hydrogen-powered locomotive that came in second in the annual challenge. Although he knows of no definite plans for hydrail deployment right now, "people are talking about it," Kent said. "The UK government is introducing clean air zone cities by 2020, and since we're increasingly using renewable energy, hydrogen could potentially help with energy storage and transportation." Britain's regional rail may want to modernize its diesel fleet with hydrail since the cost of overhead wires had gone through the roof—as much as \$20 million per kilometer (0.62 miles).

The cost of conventional rail electrification is also forcing Canada to look at hydrail alternatives. In June 2017, Ontario announced a feasibility study to evaluate hydrogen-powered passenger trains as part of its \$13.5 billion GO Transit network electrification program. Ontario Transportation Minister Steven Del Duca told the *Toronto Star* that the feasibility study will evaluate whether hydrogen trains might be a better option than traditional electrical vehicles requiring catenary (wires). The economics are complex—much of the presumed advantage of hydrogen power depends on how hydrogen gas is generated in the first place (whether from renewable electricity like hydro or wind, or traditional sources such as steam methane reforming). Therefore, Del Duca says, "It could be traditional electrification, it could be electrification by hydrogen fuel cell. It could be a combination of both."³

Germany's First Hydrail Passenger Train

No doubt the most exciting news this year comes from Germany. In 2014, the French multinational company Alstom issued an RFP to five major fuel cell companies for a planned single level, self-propelled, emissionless passenger train known as the Alstom Coradia iLint. Alstom enlisted the interest of four German States—Lower Saxony, North Rhine-Westphalia, Baden-Württemberg, and Hesse—to test and deploy the hydrogen-powered train. By 2015, a Canadian company, Hydrogenics, of Mississauga, Ontario, won the \$50 million Alstom fuel cell contract to support development of as many as 100 hydrogen-oxygen fuel cell stacks for train cars. "We had a hard time getting a hearing [for several years]," said Hydrogenics CEO Daryl Wilson. "We had tried eight different railway companies and couldn't find one that would use our fuel cells. But Alstom was the exception."

Still, it took the French company five years of study

Alstom's iLint 200kW fuel cell will power hydrogen rail in Germany. Hydrogenics, of Mississauga, Ontario, developed the cell.

before it decided to take the plunge. By September 2016, Alstom's 80 km/hour, emission-free hydrogen fuel cell passenger train was tested successfully in Saxony, followed by a test of the train at 140 km/hour (87 mph) in Velim, Czech Republic. Emitting nothing but steam and water, the Coradia iLint operates silently, and will begin regular commercial service in Saxony by the end of this year. Schleswig-Holstein, Germany's northernmost state, will come afterward; it operates a 1,100-kilometer (684-mile) rail network, most of whose trains are now diesel fueled.

No More Nuclear Power

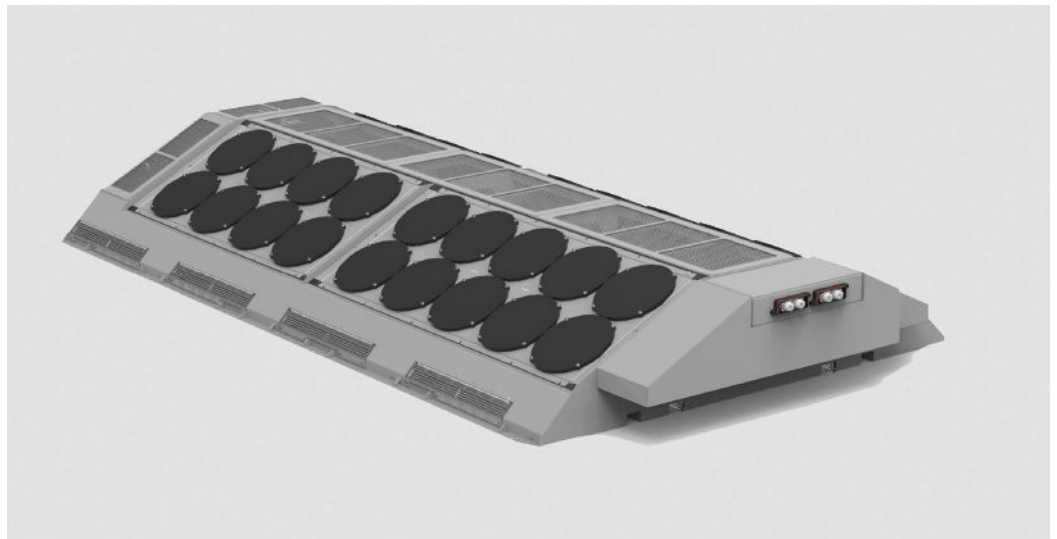
"In Germany we now have no more nuclear power and so much wind energy that is not immediately needed, [so] hydrail is becoming popular," said Holger Busche, Ph.D., the scientific advisor for economy, energy, traffic, and innovation for the Green Party of Schleswig-Holstein State Parliament. As a political organization, the Green Party helped jumpstart the call for hydrail. Busche collaborated with now retired Detlef Matthiessen, Speaker for Energy Policy and Technology Innovation for the Schleswig-Holstein Landtag (Parliament), leading the commitment to convert 100% of the northern state's diesel-powered trains into hydrail by 2025.

"This is an economic thing," Busche explained. "Back in 1998 I was thinking about the whole system of electricity production and [calculating] times and locations where we would have too much renewable energy," he said. "You have to do something with the excess, and I asked myself how many wind turbines do I need to operate the trains in Northern Germany....that's how it started."

Today, "a hydrogen-powered train can easily travel 600-700 miles per day, and the costs are much better in terms of fuel per mile than [individual motor] cars," Busche explained. "For the [Coradia iLint] train, you need only two or three hydrogen gas filling stations because the trains always operate on the same lines as opposed to thousands of filling stations for cars. So the train is incredibly more economical than cars."

Busche, Arnold Miller, and perhaps a dozen others in Europe, the U.S., and Japan were working independently on hydrogen fuel cell projects and concepts more than twenty years ago, but the economics and, perhaps more important, the ideology of the energy and transportation industries militated against widespread support.

In the U.S., for example, Stan Thompson, the retired futurist at Bell South (later AT&T), co-founded the Mooresville Hydrail Initiative, a North Carolina organization intent on showcasing the first emissions-free hydrogen fuel cell commuter train running along a 28 mile north corridor from Charlotte to Mooresville —Thom-



son's suburban home on the shores of gigantic Lake Norman. The lake was created in 1960 by the damming of the Catawba River; it features hydroelectric, coal and nuclear power plants, ideal for supplying electricity for hydrogen generation. But even though Thompson believed fervently in a non-polluting transportation system—he championed hydrail to dozens of local, regional, and international business, government, and university research groups—his Mooresville transportation dream has never come about.

"At Bell South I had been studying the hydrogen economy and recognized it as a profound technology on the horizon—a game changer," Thompson said. "But propulsion innovations became moot when the local Iredell County Commission in North Carolina opposed funding the train connection altogether." That's when Thompson and Bill Thunberg, a former mayor of Mooresville and executive director of the Lake Norman Transportation Commission, decided to seek federal innovation funding and launched the international conferences to show that hydrail was more than just a local idea.

Was Hydrail Suppressed?

Thompson claims that both media and government also suppressed information about the hydrogen story for quite some time. "The Obama Administration declared hydrogen to be 'Bush science,'" Thompson said. Federal hydrogen project support was withdrawn in favor of funding other renewable technology. Even a promising joint project—a full size hydrogen fuel cell switching locomotive developed by Arnold Miller and funded by the U.S. Army Corps of Engineers jointly with Burlington Northern Sante Fe (BNSF)—eventually ground to a halt despite successful demonstrations.

"We got a big influx of money in fiscal year 2002 from the Department of Defense," Miller recalled. "The army was interested in this concept of moving munitions and supplies from points on the base to a main line railway where they could be transported for long distance," he said. "We also looked at the project as having high potential for emissions-free transit in urban rail. And the army thought of these fuel cell powered locomotives as mobile power sources, so if the base micro-grid was knocked out, you could use the locomotive to provide power to critical infrastructure like hospitals."

Miller and his team finalized two locomotives—each

a 130-ton switching locomotive delivering maximum power of at least 1.5 MW from a fuel cell “prime mover” and an auxiliary traction battery. At the time, 2010, the first locomotive was the heaviest and most powerful fuel cell land vehicle invented, with an observed thermodynamic efficiency of 51%. The second locomotive had double the continuous fuel cell power (0.5 MW) and a high power-density auxiliary lithium battery enabling increased hydrogen storage (the locomotive was designed to be upgradeable to 175 kg of hydrogen). This vehicle was completely built, but its fuel cell failed during the final stage of testing.

As Miller explained it, each locomotive contained compressed hydrogen fuel stored in carbon-fiber composite tanks located on the roofline, and the price of the hydrogen fuel (in large quantities) was no more than diesel. Miller’s first locomotive successfully completed a rigorous yard-switching demonstration at the BNSF rail yard in Los Angeles, producing enough power for an 11-hour operational shift. “It worked very well and did everything it was supposed to do. The train operators preferred the fuel cell because there is almost no vibration and the locomotive had more acceleration than a diesel,” he said.

In another demonstration, Miller pulled the first hydrogen-powered locomotive up to a large maintenance shop at Hill Air Force Base, Utah, which was filled with big vehicles, lathes, and welding machines. “It worked like a charm, ran everything at 65 kW,” he said.

But even though “the vehicle was a big leap forward,” after 12 years of work, BNSF and the army shuttered the project. “BNSF decided not to pay for the repair of the fuel cell in the second-gen locomotive which had failed,” Miller explained. “Instead the railway decided to pursue an alternative line of R&D, which they had already been pursuing. To my knowledge, hydrogen storage had nothing to do with the decision.” BNSF had demonstrated “extraordinary support” for the dozen years (through 2014) that the project went on, he said.

Culture Derails Solutions

Nonetheless, Miller acknowledges how American culture has derailed many of the most inventive and green public transit solutions. “We don’t have high-speed rail in this country even though the Japanese were doing it in the 1960s, and now the Europeans, Koreans, and Chinese are doing it big time,” Miller observed. “Americans value rugged individualism; mass transit is for sissies in this view. We just don’t put much value on it. We’d rather drive an SUV than hop a fast train.”

Another factor is the sudden collapse of oil prices and other products related to petroleum, Miller explained. In the U.S., that itself has made fossil fuels continually attractive from an economic perspective. “It’s very hard to compete against [the falling prices] of petroleum...for example, it would be expensive to buy a fuel-cell vehicle—I know based on our own results over the years, the price would be about twice.”

There is evidence, however, that successful hydro-

gen projects worldwide, along with the falling prices of renewables, is producing the economics necessary to promote disruptive change. This will even happen in North America. In parts of Canada, for example, the abundance of both nuclear power and hydro has given the country new options to adopt clean fuel distribution and hydrogen-powered modes of transit.

“Hydrogen is the ultimate clean fuel as long as you don’t use natural gas to produce it,” said Alistair Miller, Ph.D., the research emeritus at Canadian Nuclear Laboratories (CNL). He looks to Toronto and the GO trains as a possible early demonstration of hydrogen power. Moreover, with the increasing abundance of wind and solar power “hydrogen is an obvious storage medium,” he said. “In Canada you’ve got this network of commuter rail. But when [Ontario] went to electrify the Toronto to Barrie train line 100 km north, they discovered that installation of the overhead catenary and the cost of electrifying these lines would be horrendous. You can’t justify it anywhere.”

Quest for Zero Emissions

Trains, boats, spacecraft, localized hydrogen fuel cell production and energy distribution, even the actions of California legislators are all on the hydrogen radar these days. Some experts predict that fuel cells will disrupt the carbon economy in profound ways.

“Fuel cell [energy production] may soon have the same role as the microprocessor had for the computer,” predicts Stefano Cordiner, a professor of energy conversion at the University of Rome Tor Vergata. “When the microcomputer came out, that was the breakthrough technology that [caused] the huge spread in personal computing,” he said. “In a way the fuel cell represents a [similar] core technology component. Once you produce hydrogen as an energy vector, you can use it in many different devices and ways...even producing electric energy by yourself.”

The whole idea of creating *distributed* generation of hydrogen may change the entire energy network worldwide. “If taken to the limit, it means that each user may be able to produce the energy required locally. In effect, the energy is located exactly at the point where it’s needed, so that allows for the deployment of renewable energy anywhere,” Cordiner said.

In California, as in Germany, energy production is transforming rapidly. The California legislature has passed new laws that support zero emission levels, and that will apply to trains in the ports of Los Angeles.

“There’s a study that shows main line diesel trains originating in the ports of Los Angeles produce nitrous oxide (NOx) emissions equal to all the major industrial emissions from Southern California,”⁴ said Herbert Wancura, the owner and principal of Synergis, an Austrian engineering and energy consultancy. He says, railroads have evaded the toughest pollution standards because they can argue efficiency; that is, “their emissions per ton per passenger per mile or kilometer is very low, so they get away with technology that’s not state of the art.”

A technician works on the internal structure of the 200 kW fuel cell subsystem, designed to be roof-mounted on the Alstom Coradia iLint train. The fuel cell stack module building blocks can be seen, as well as the process (fluid and gas) manifolds which mechanically interconnect the modules.

But now, as in Austria, Germany, and soon other parts of Europe, California will be following the cleanest experimental standard known as Tier 5. “People will want to close the debate on emissions” Wancura predicts. He argues that the Alstom example of emission-less hydrail could also present the cheapest alternative for passenger rail in the U.S. (heavier freight rail is another matter; freight lines will take longer to adopt alternative emissions technologies like hydrail).

“Light rail systems with catenary are expensive and not well liked,” Wancura continued.

But with hydrogen-powered trains, especially trams, “the infrastructure is cheaper, about 1/5th of the cost of ordinary catenary type infrastructure. That type of commuter rail could work in the States.”

Still, nothing will happen that quickly. Jason Hoyle, the research analyst at the Energy Center of Appalachian State University in Boone, NC, has been looking carefully at the economics of the fuel cell industry since 2004. He says that the fundamental orientation of governments in Europe and Japan versus the U.S. has spelled the difference between hydrail adoption and refusal to get on the bandwagon.

Willing to Invest

“European governments are willing to invest in things that have broader social benefits like transportation initiatives, and Germany is out front in this,” he said. “In Japan, whose culture is technologically advanced, having no embedded interest in oil and gas, people are willing to sacrifice what in America we might see as personal liberties” which include transport by cars and trucks. In China, he adds, hydrail will become part of emerging “everything” transportation and energy culture, since virtually all green technologies there are brand new. But in the U.S., the political will to make disruptive change will come with hesitation, even arm twisting. For example, in cities that require mass transit, the choice either to foot the bill for overhead catenary or maintain scummy diesel may be so distasteful and impractical that hydrogen will finally emerge. Most likely, that will happen only when officials acknowledge that there is no other technology, especially for trams and light rail, as cheap, clean, or as good.

In January 2017, 13 major transport, mining, and energy companies signed an agreement at the Davos World Economic Forum to create The Hydrogen Council, a consortium planning to invest 10 billion Euros (US\$10.7 billion) in products and technologies over the next five years. This is probably the biggest indicator that the hydrogen economy—and hydrail—are on their way.



In June, at the 12th Annual Hydrail Conference held in Graz, Austria, transportation specialist Bill Thunberg noticed a big change. “At the very beginning of these conferences, it was a bunch of academics getting together and discussing the barriers to hydrail and how to move forward,” he said. “But at this meeting, instead of 95% academics, it was 95% commercial attendees. It was clear to me that these commercial interests will have to resolve competitive issues to move hydrogen forward,” he continued. “Whether it’s boats, trains, trams, switchers, or different kinds of vehicles required in intermodal ports, there’s going to be a huge push to clean up diesel emissions without interrupting the business cycle.”

“Hydrogen as an energy vector will be important,” Thunberg predicts. “It’s not going to be one size fits all. These days, when you have an intermodal yard, you’ll have to find a way to do what you do to grow your business on a zero-emission basis. The idea of hydrogen as an energy vector will make a whole lot of sense in these zones. With no more diesel after a certain date, especially in Europe but also in the U.S., you’re going to see a dramatic change in zero emissions technology. Whether it’s hydrail or batteries or a combination of both, that’s the big takeaway.”

1. Miller, A.R. (2008). Hydrogen tube vehicle for supersonic transport: Analysis of the concept. *International Journal of Hydrogen Energy* 33, 1995-2006, doi:10.1016/j.ijhydene.2008.01.030
2. Bossel, Ulf (October, 2006), Does the hydrogen economy make sense? *Proceedings of the IEEE*. Vol. 94, No. 10.
3. Spurr, B. (June 15, 2017). Ontario looks at hydro-powered trains for GO transit. Retrieved from <https://www.thestar.com/news/queenspark/2017/06/15/ontario-looks-at-hydrogen-powered-trains-for-go-transit.html>
4. Smith, R.F. et al (May 2008). Electrification of the freight train network from the Port of Los Angeles and Long Beach to the Inland Empire: Final Report on Prime Award No. 65A0244, Subaward no GT 70770. California Dept. of Transportation, California State Polytechnic University, Pomona.

Arielle Emmett, Ph.D., writes about aerospace, aviation, energy and biotechnology for *Smithsonian.com*, *Smithsonian Air & Space*, *Business North Carolina*, and many others magazines and journals. She was a Fulbright Specialist in Indonesia in 2015 and has taught in China and Hong Kong. She lives in Mooresville, NC.



IN THE COLLEGES

SPOTLIGHT

Data Science Jobs Growth

By the year 2020 the number of data science and analytics job listings is projected to grow by nearly 364,000 to approximately 2,720,000. This was one of the conclusions in a report by a research partnership formed by IBM with Burning Glass Technologies and Business-Higher Education Forum.

Other findings included:

- Jobs requiring machine learning skills are paying an average of \$114,000. Advertised data scientist jobs pay an average of \$105,000 and advertised data engineering jobs pay an average of \$117,000.
- 59% of all data science and analytics (DSA) job demand is in finance and insurance, professional services, and IT.
- Annual demand for the fast-growing new roles of data scientist, data developers, and data engineers will reach nearly 700,000 openings by 2020.
- Data science and analytics jobs remain open an average of 45 days, five days longer than the market average.

Apprenticeships for Skills Gap

Companies operating in the U.S. are looking to Germany's apprenticeship approach to vocational training in order to fill America's skills gap, reports the *Wall Street Journal*.

Americans view a four-year college degree a more viable path to high-paying jobs than a two-year degree adds the *WSJ*. So the apprenticeship program is a seemingly better alternative that allows participants on-the-job training, a recognized qualification, and a chance to stay on with the company.

Two million U.S. manufacturing jobs are expected to remain vacant over the next decade due to a shortage of trained workers.

PEOPLE

Frederick F. Burgess, P.E., Indiana Gamma '87, has become vice president for infrastructure, properties and planning at Cornell University. Burgess has served, since 2015, as the commanding officer of naval facilities engineering command in Washington, DC.



A Cornell press release said he has nearly 25 years experience in "managing complex facilities, contracts, and public works, most recently as the senior executive in charge of planning, building, and maintaining the facilities for eight naval bases in the DC area."

Robert T. Burns, Ph.D., P.E., Tennessee Alpha '95, has been promoted from assistant dean to dean of University of Tennessee Extension. This is the agricultural, community and economic development, and consumer



outreach unit of the UT Institute of Agriculture. He earned a B.S. in agricultural engineering, a master's in environmental engineering, and a Ph.D. in civil engineering all from UT-Knoxville.

Mung Chiang, Ph.D., California Gamma '00, is now dean of the engineering college at Purdue University. He was previously an electrical engineering professor at Princeton University, where he founded the EDGE Lab, which bridges the theory-practice gap in edge



networking research. Chiang has co-founded various mobile networking, Internet of Things, and big-data start-ups. He has also received the NSF Alan T. Waterman Award, and a Guggenheim Fellowship.

Jeffrey L. Duerk, Ph.D., Indiana Alpha '81, has become executive



vice president and provost at the University of Miami. He had been dean of the school of engineering at Case Western Reserve University since 2012. Duerk is a leading expert in biomedical imaging, with emphasis on magnetic resonance imaging. He holds more than 30 patents and was inducted as a fellow into the National Academy of Inventors in 2017.

Steven W. McLaughlin, Ph.D., Illinois Gamma '85, has been named the new college of engineering dean at Georgia Tech. Most recently, he served as chair and professor in the electrical and computer engineering department there.



McLaughlin has published more than 250 papers, holds 36 patents, and has research interests in communications and information theory.

Theresa A. Maldonado, Ph.D., P.E., Georgia Alpha '81, has been named as dean of the college of engineering and professor for The University of Texas at El Paso. She has been serving as the founding senior vice president for research, innovation and economic development at The University of Texas-



Rio Grande Valley. Maldonado is an expert on optics and received her Ph.D. in electrical engineering from Georgia Tech.

Carlo D. Montemagno, Ph.D., *Ohio Beta '80*, is the new chancellor of



Southern Illinois University at Carbondale. He was previously a professor of engineering and founder/leader of the interdisciplinary

Ingenuity Lab at the University of Alberta in Canada. According to a news release, Montemagno “is an internationally recognized expert in nanotechnology and biomedical engineering, focusing his work on linking multiple disciplines to solve problems in areas of health, energy, and the environment.” Previously, he was the founding dean of the college of engineering and applied science at the University of Cincinnati.

Justin Schwartz, Ph.D., *Illinois Alpha '85*, is the new dean of the college of engineering at Pennsylvania State University.



He was professor and department head of materials science and engineering at North Carolina State University. Schwartz received

his doctorate in nuclear engineering from MIT in 1990. His research interests focus on the scientific challenges in transitioning a new material into a technologically functional material.

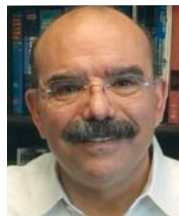
William E. Sitzabee, Ph.D., P.E.,



North Carolina Alpha '08, is the new associate vice president for facilities management and planning at Pennsylvania State University. He was interim vice president for infrastructure, properties,

and planning at Cornell. Sitzabee will oversee the university’s capital planning initiatives and day-to-day management of more than 32 million square feet of buildings, and 22,000 acres of land at 22 campuses across Pennsylvania. He previously spent more than two decades as a U.S. Air Force engineer, reaching the rank of colonel.

John L. Volakis, Ph.D., *Ohio Lambda '78*, has been appointed dean of Florida International University’s college of engineering and computing. Most recently, he was



chair and professor of electrical and computer engineering at The Ohio State University’s college of engineering. He has also served as the director of the ElectroScience laboratory overseeing nearly 170 people, including 30 faculty members and researchers. Volakis earned international recognition for introducing hybrid finite element methods widely used in electromagnetics CAD packages.

FACILITIES

University of California, Irvine, is building a state-of-the-art convergent science building to expand large-scale, collaborative, and cross-disciplinary research in engineering, computing, and physical sciences.

A \$30 million gift from the Samueli Foundation (Susan and **Henry Samueli, Ph.D., *California Epsilon '75***) has enabled UCI to raise a total of \$120 million. Construction of the up-to-100,000-square-foot facility could begin this fall and be completed in three years.

Henry Samueli, co-founder of semiconductor giant Broadcom Corp., said that he and his wife “are deeply committed to supporting STEM education at all levels along the learning pipeline, from kindergarten through higher education.”

•The Samueli Foundation is also giving \$20 million to the **University of California, Los Angeles**, to sup-

port a new program at the Henry Samueli School of Engineering and Applied Science that will give scholarships and internships for as many as 50 freshman students annually. The program is designed to increase undergraduate diversity and engineering and computing.

University of Colorado at Boulder is building a new 139,000-sq-ft



aerospace engineering building (artist’s impression above) with an indoor flight environment for testing unmanned aerial systems, and a roof design with the sightlines needed to track satellites.

The \$82.5-million project was approved by the board of regents and is slated for completion by July 2019. CU officials say the new building will group together aerospace engineering’s six main research clusters to facilitate greater collaboration among students and faculty.

The facility will have a 200-seat auditorium, distance-learning-equipped classrooms, faculty offices, and spaces for graduate students. It will also include space modeled after the integrated teaching and learning laboratory, a hands-on learning environment at the campus’ engineering center.

University of South Carolina is joining with Siemens Corp. to provide students access to an estimated \$628 million worth of the latest technology, reported *The AP*. The in-kind grant involves computers, robotics, and unlimited licensing on the latest software.

Roughly a quarter will go toward creating a digital factory innovation lab in the school’s center for aerospace innovation and research. This will give hands-on training with the same technology used by companies in the state, such as Boeing, BMW, Michelin and IBM.

Profiles in Leadership #1 |

Robert Langer: From an Ugly Duckling to Singular Swan

Robert S. Langer Jr., Sc.D., New York Delta '70

by Alan S. Brown

tHERE IS A REASON Massachusetts Institute of Technology's Robert Langer earned the nickname, "The Edison of medicine." He pioneered such innovative technologies as controlled release drugs, transdermal drug delivery, targeted cancer medications, and tissue engineering and regeneration. He is arguably the person most responsible for making engineering an integral part of biology and medicine.

Langer aims high and uses engineering to change the world. When he won the \$1.5 million Queen Elizabeth Prize for Engineering, considered the field's top honor, the award committee estimated that his discoveries saved or improved at least 2 billion lives.

In addition to earning almost every honor an engineer can receive, he has published 1,400 papers that have been cited 230,000 times. This is far more than any other engineer and all but a handful of scientists. His h-index,

What does it mean to be a leader? In this series "Profiles in Leadership," Tau Beta Pi is exploring that essential question through the lives of member engineers who attained leadership positions in their fields.

which measures a researcher's impact, is among the highest of any researcher ever.

Langer is no mere lab magician. His 1,260 issued and pending patents are licensed to 300 companies and 40 companies he co-founded. A recent *Harvard Business Review* profile put the value of his commercial technologies at \$23 billion.

Langer's history is the very definition of a black swan, a career so remarkable and unpredictable that it falls outside our expectations. Yet at the start of his career, he was an ugly duckling.

Langer struggled to find a post-doctoral fellowship and engineering jobs before landing in MIT's Department of Nutrition and Food Science. His first nine research grant applications were turned down.

"That story about the professor who sat smoking a cigar and blew smoke in my face and told me I ought to start looking for another job—that's a true story, and he was a very famous guy," Langer said.

Langer doesn't name names, but Michael Marletta, the former head of the Scripps Research Institute, saw it happen. "I thought I was in a Fellini movie," he said.

Top-ten Student

According to Langer, there was nothing special about his youth. He was born in Albany, NY, in 1948. His father had a master's in English from Harvard University and owned a liquor store where Langer sometimes helped.

"I was a pretty normal little kid," he recalled. "I played baseball, football, and basketball, and had lots of friends. I was always shy, but not unsocial."

In high school, Langer was a top-ten student in math and science and "not much good at anything else." He did have an ability to visualize solutions to math problems, a chessboard several moves out, or how a hand of bridge might evolve. He was also hooked on the A.C. Gilbert erector, chemistry, and microscope sets his parents gave him.

Upon graduation, his father and guidance counselor suggested Langer study engineering at Cornell. He plowed through classes, but was unsure about his future.



President Barack Obama awarded Langer the National Medal of Technology and Innovation in 2011. Langer is only one of five people to win the award and the National Medal of Science.

“I really didn’t know what I wanted to do,” he said. “I got a few offers to run chemical plants, which is what many of my classmates were doing. I was not very excited about that. So, I applied to graduate school to learn things that might be more exciting.”

He entered MIT in 1970 and picked an unusual problem for a chemical engineer: the regeneration of adenosine triphosphate, or ATP, the molecule cells use to transfer energy for biochemical processes. Langer thought he might be able to use it for chemical synthesis.

The process he developed was not very practical. His graduate work taught him the importance of precision and reproducibility and how to push deeper and deeper into a problem.

Langer also discovered his love of teaching when he helped start an alternative school for at-risk students. “I loved that, and I was gratified at how well the students did, and how the curricula made a tremendous difference,” he said.

Yet in 1974, as Langer was finishing his doctorate, he was still unsure about his future. Like his classmates, he applied for oil company jobs. Every firm made him an offer, but Langer wanted to make a difference in people’s lives. He applied for medical research positions, figuring his experience with ATP would help. No one responded. He applied for a faculty position in chemistry education. No reply.

Then someone at the lab mentioned Judah Folkman.

Culture Shock

Folkman was a medical researcher at Harvard University and a surgeon at Boston Children’s Hospital. While Langer pursued his Ph.D., Folkman was investigating how to stop blood vessels forming in tumors. If he could block their growth, called angiogenesis, the tumors would starve and die.

Most researchers ignored or belittled Folkman’s approach. By 1974, however, his team had identified the first growth factors. This led to an infusion of corporate money and an agreement, the first of its kind, that Folkman could protect his research with a patent. This would become a template for Langer’s future success.

“Judah was known for hiring unusual people, and one of the lab’s post-docs suggested I write him,” Langer said. “Judah wanted this problem solved. A lot of people with excellent medical and biological backgrounds had made little progress, so it made sense to try someone who had a very different kind of background.”

Langer’s first job was to isolate potential inhibitors for testing. Folkman asked him to look in bone marrow, where blood vessels do not grow. Langer located a slaughterhouse to get bones containing cartilage. Purification yielded hundreds of potential angiogenesis inhibitors. The medical researchers planned to test them on tumors in rabbit eyes, where the blood vessels were clearly visible. However, they had no way to deliver the large inhibitor protein molecules to the tumors. Langer’s solution was simple: embed the medicine in a polymer with interconnected pores and attach it to the tumor. Over time, the molecules would percolate through the pores to reach the tumor.

While timed release drugs existed for smaller molecules, no one thought it would work for large molecules. It was like asking a person to walk through a wall.

“I didn’t know you couldn’t do it because I hadn’t read



This Leader In Brief

Full professional name: Robert S. Langer.

Most recent positions: David H. Koch Institute Professor, Massachusetts Institute of Technology.

Birthplace: Albany, NY, 1948.

Highest degree: Sc.D., chemical engineering, Massachusetts Institute of Technology, 1974.

Major career highlights: Assistant professor, nutritional biochemistry, MIT, 1977-81; associate professor and professor, biochemical engineering, MIT, 1981-88; professor, chemical engineering, MIT, 1988-2005; institute professor, 2005-present, MIT.

Board memberships: Co-founded 40 companies and remains a director and/or scientific advisor for many of them. He chaired the U.S. Food & Drug Administration’s Science Board, its highest advisory board, from 1999-2002.

Honors: Has received more than 220 major awards. He is only one of five people elected to the National Academies of Medicine, Engineering, and Sciences. Honors include Lemelson-MIT Prize, 1998; Charles Stark Draper Prize, 2002; U.S. National Medal of Science, 2006; Millennium Prize, 2008; U.S. National Medal of Technology and Innovation, 2011; Kyoto Prize, 2014; and Queen Elizabeth Prize for Engineering, 2015. He also holds dozens of honorary doctorates from schools around the world.

Greatest accomplishment: Discovered we could create molecules to deliver drugs of any size or charge, which led to delivery of cancer medications, and my students, who continue to discover new ways to improve health.

Family: Met his wife, Laura, while she was completing her Ph.D. thesis in neuroscience. They married in 1989 and have three children, Michael, Sam, and Susan.

Hobbies: Was an amateur magician, now enjoys finding great restaurants when he travels.

Favorite book: *The Last Lone Inventor: A Tale of Genius, Deceit, and the Birth of Television* by Evan Schwartz. He also enjoys classic television shows and movies.

Personal motto: Dream big dreams, dreams that can change the world. Many times, you’re going to run into obstacles. If you do, don’t ever give up, just keep trying.

If you could do one thing over: I’ve been very, very lucky, and learned from the things I haven’t done well. My life might be worse off if I didn’t experience negatives as well as positives, because I grew from those negatives.

A handwritten signature in blue ink, appearing to be "R. S. Langer".



Above: Langer as a baby in Albany, NY.

Center: Langer as a high school student who was good at science and math but not much else. **Below:** With his wife, Laura, at their wedding. They met while she was working on a Ph.D. in neuroscience at MIT.



the literature,” Langer said. “I just kept plugging at it. I discovered over 200 ways to get it to not work. I just kept looking for different things to try.”

He never had a “Eureka!” moment. Instead, he developed a complex recipe of polymers, formulations, drying conditions, loadings, and other factors to do the job.

Langer and Folkman published two papers in 1976. The first, in *Science*, showed that angiogenesis inhibitors could kill cancer cells. Avastin, Nexavar, and Votrient are among the many medicines based on that research.

The second, in *Nature*, described the controlled release of large molecules. It eventually became the foundation of the controlled release drug delivery systems used to fight cancer and other diseases.

Publication in two of the world’s most prestigious journals should have opened doors. Instead, when Langer was ready to leave Folkman’s lab, no one wanted to talk with him. Most biologists and physicians simply did not believe his paper on controlled release. It flouted conventional wisdom and Langer’s complex processes were hard to duplicate.

“No chemical engineering department would hire me either,” Langer said. “Departments usually want consensus. I was doing experimental biology and that didn’t fit in with what chemical engineers did back then.”

“Benevolent Dictator”

Nevin Scrimshaw, the “benevolent dictator” who founded MIT’s department of nutrition and food science, took him on without asking his faculty for a second opinion. Langer began applying for grants and was turned down consistently.

“I still remember the review from one of the grant proposals I wrote on cancer,” he recalled. “It said, ‘Dr. Langer is an engineer. He knows nothing about biology and he knows even less about oncology.’”

“I had already isolated the angiogenesis inhibitor, but there was an inherent prejudice against engineers, especially then. I was one of the few engineers doing experimental biology work, maybe the only one. I didn’t fit into the box, and they turned it down for that reason.”

When Scrimshaw left one year later, the faculty turned on him. The professor who blew smoke in his face was not the only one to suggest he look for a new position. “It was pretty negative, but I had faith in what I was doing and thought it was important, so I kept plugging along,” Langer said. “And over time, people began to reproduce my results and the pharmaceutical companies began using my techniques.”

MIT rehired Langer. However, it took nearly 10 years after his initial paper for Eli Lilly and International Minerals & Chemicals to call about applying his work. For Langer, that meant consulting fees, research grants, and, most importantly, commercialization. But after the first experiments turned out poorly, both companies gave up.

Langer was frustrated with their lack of tenacity. So, when fellow MIT professor Alex Klibanov suggested they start a company, Langer was ready to take commercialization into his own hands. Their business, Enzytech,

eventually merged with Alkermes, and has since grown into a \$750 million biotech firm.

In many ways, this became the pattern of Langer's future success: He developed new ways to manipulate biomolecules at the nanoscale, and commercialized the results through either startups or patents.

Langer built upon controlled release to develop polymers that release drugs through the skin. Recently, working with the Bill & Melinda Gates Foundation, he modified this technology into a birth control system that lasts up to 16 years.

Langer also pioneered tissue engineering by developing a recipe of growth factors and biochemicals that he could embed in a three-dimensional scaffold that prompts cells to organize themselves into living organs. Ultimately, his team hopes to grow replacement organs.

After running the world's largest bioengineering laboratory and setting up companies, Langer has learned a lot about research and business leadership.

"First," he said, "think about important problems that can change the world and make a really big impact."

"Second, you want to have more money than less. I like to have a budget that gives people in the lab the flexibility to think big and do big experiments."

"Third," he added, "it's really important to treat people really well, and to make sure students are learning."

He also has some ideas about businesses. Many startups fail because the principals launch the company before they fully understand their technology. He believes in waiting for a clearer path to commercialization, and protecting that path with strong patent claims that include examples to make them easier to defend.

Business Partners

Choosing the right business partners—venture capitalists and business teams—is also critical. He looks for people who treat others well, though he admits pursuing both relationships and profits is difficult.

Asked about his legacy, Langer admits that even though he is a pioneer in applying engineering to medicine, his students are the best measure of his success.

"We've had 800 or 900 trainees, and they are professors at some of the best schools in the world and CEOs of companies they've started." He did not win any awards as a young engineer, but several of his students have gone on to win major awards for young investigators.

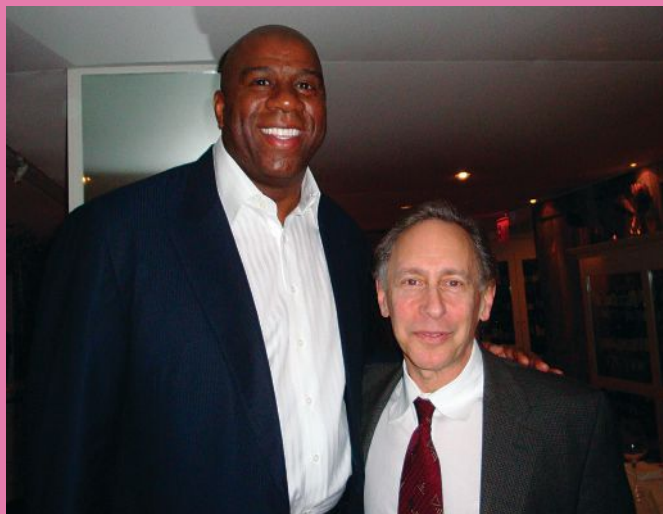
And if Langer were a young engineer today?

"I don't think I would have done the same thing today. Like that Robert Frost poem, 'The Road Less Taken,' I tried to do something new. I think today I'd be searching for a new way to have the greatest impact on the world and make it a happier place."

Alan S. Brown has been an editor and freelance writer for more than 30 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.



Above: Langer in his office at MIT. **Center:** Langer with his wife Laura after receiving the General Motors Kettering Prize for Cancer Research in 2004, one of more than 220 honors he has earned. **Below:** Langer with Magic Johnson—both earned honorary degrees at the Mount Sinai School of Medicine commencement in 2009.



Tau Beta Pi Names 271 Scholars for 2017-18

THE FELLOWSHIP BOARD has announced the selection of 271 Scholars from 679 applicants for undergraduate study during the 2017-18 academic year. Most will receive a cash award of \$2,000 for their senior year, and a few will receive \$1,000 for one semester. All awards are made on the competitive criteria of high scholarship, campus leadership and service, and promise of future contributions to the profession. They are all TBPi members.

The Alabama Power Foundation, Inc. made a gift in 1995, which is now sufficient to endow an **Alabama Power Scholarship**, awarded for the 14th time this year.

In 2005, Henry M. Alford, *MS A '27*, left a bequest to the Association sufficient to permanently endow the **Alford Scholarships**. The **Althouse Scholarship** commemorates Ernest E. Althouse, *PA A '26*, who left a bequest in 2006. The **Bloomberg Scholarship** is named for Michael R. Bloomberg, *MD A '64*, whose 2006 gift has funded one award for 11 years. The Bose Foundation made a gift in 2017 to sponsor the 11th **Bose Scholarship**.

The **Brems Scholarships** are named for Marian K. and John H. Brems, *MI Γ '46*, who left a bequest to the Association in 2016. The **Boysen Scholarship** is named for Robert L. Boysen, *NJ B '63*, who made a gift to support a scholarship for a commuter student at a New Jersey chapter of TBPi. Ruth M. and Cleveland L. Campbell, P.E., *IA A '47*, made gifts to permanently endow the **Campbell Scholarships**.

Dennis E. Crouch, *MI Γ '62*, made gifts to fund the **Crouch Scholarships**. A 2007 bequest from the estate of Richard A. Curtis, Ph.D., *OH A '64*, permanently endows the **Curtis Scholarships**. The **Dechman Scholarship** was established in 2015 by David, *VA B '82*, Ken, and Jim Dechman, *TX A '89*, to honor their father, Don A. Dechman, *TX A '57*, on the occasion of his 80th birthday.

The **Dodson Scholarships** are sponsored by Charles R. Dodson, *MD B '30*, who made generous gifts to the Association in 1998 and 1999. Placed in the C.R. Dodson Scholarship/Fellowship Fund, its investment earnings will support the program in perpetuity. The **Faidley Scholarships** are named for LeVern W. Faidley, Ph.D., *IA A '67*, who made a gift in 2017 to support two scholarships. The **Forge Scholarships** are named for Charles O. Forge, *CA Γ '56*, who left bequests to TBPi from 2010-17.

Awarded for the 9th year, the **GEICO Scholarship** is sponsored by GEICO Insurance. The 8th **Lindeburg Scholarship** is sponsored by Professional Publications, Inc., and named for its president, Michael R. Lindeburg, P.E. The wife of Eddie L. Lyons, *CA Π '76*, made gifts in his memory to finance the **Lyons Scholarships**. Thomas L. Maniscalco, DEN, *NY E '67*, made gifts in memory

of his parents, Frances and Joseph, for the **Maniscalco Scholarship**, to be given to an aerospace/mechanical or mechanical engineering student at NY Rho and NJ Beta.

The **Nagel Scholarship** is given in honor of former Secretary-Treasurer Emeritus Robert H. Nagel, P.E., *NY Δ '39*. Named Editor of *The Bent* in 1942, he became Secretary-Treasurer and Editor in 1947 and served until October 1982.

The **Record Scholarships**, awarded for the first time in 2001, commemorate Leroy E. Record, *KS A '29*, whose generous bequest will provide earnings to support awards in perpetuity.

Awarded for the first time, Donald B. Schaefer, *WI B '63*, made a gift to the Association to support the **Schaefer Scholarship**. The **Schwaller Scholarship** commemorates Shawn R. Schwaller, *SD A '95*, whose friends and family established a fund in 2007. The **Scribner Scholarships** are named for A. Clayton Scribner, *NY Γ '29*, whose bequest to the Association in 2003 permanently endows the awards.

The **Sickafoose Scholarship** is named for Kathleen A. and Robert D. Sickafoose, *IL B '50*, who left a bequest to the Association in 2012. Four **Soden Scholarships** are named for Archie D. Soden, *CA Δ '51*, who made gifts to fund scholarships in perpetuity. Elsa and Peter H. Soderberg, *CT A '68*, sponsor the Tau Beta Pi-**Soderberg Scholarships**, awarded for the 17th year.

The **Spirit of Apollo Scholarship** is supported by Philip H. Kitchens, *LA Γ '67*, to honor the legacy of the U.S. NASA *Apollo* program.

The **Van Wagenen Scholarship** honors William E. Van Wagenen, *NY Θ '78*, who made a gift in 2016 to support the program. The **Davis Scholarship** is named for N. Jan Davis, Ph.D., P.E., *AL A '77*; the **DeLoatch Scholarship** is named for Eugene M. DeLoatch, Ph.D., *DC A '59*; and the **Griffin Scholarship** is named for Michael D. Griffin, Ph.D., *MD B '77*, all of whom were honored as 2016 Tau Beta Pi Distinguished Alumni.

The **Abron Scholarship** is named for Lilia A. Abron, Ph.D., *DC A '68*; the **Olberding Scholarship** is named for Terry D. Olberding, *TN A '78*; the **Scholz Scholarship** is named for Tom Scholz, *MA B '69*; & the **Sukup Scholarship** is named for Charles E. Sukup, P.E., *IA A '76*, all of whom are 2017 Tau Beta Pi Distinguished Alumni.

The **Stabile Scholarships** are named for Vincent A. Stabile, *NY A '40*, whose gifts to the Association, along with gifts from the Vincent A. Stabile Foundation, have permanently endowed scholarships.

• Details of this year's scholars are at <https://www.tbp.org/memb/ScholarArchives/ScholarBios/ScholarBios17-18.pdf>

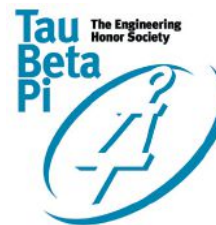
RECIPIENT	CHAPTER	FIELD OF STUDY	SCHOLARSHIP
Michael A. Abramovitch	CA Σ '18	Chemical Engineering	GEICO No. 63
Emily D. Adelson	PA Λ '17	Civil and Environmental Engineering	Scribner No. 41
Alicia V. Aguilar	OK Γ '18	Chemical Engineering	Record No. 1243
Simone L. Alexandrova	TX E '18	Chemical Engineering	Dechman No. 3
Mariia Alibekova	CO A '18	Chemical and Biochemical Engineering	Record No. 1244
Aaron G. Alphonsus	SD A '18	Computer Science	Record No. 1245
Ishit B. Amin	TX E '18	Mechanical Engineering	Stabile No. 468
Dylan P. Antonides	IN Δ '18	Mechanical Engineering	Stabile No. 469
Naveen Arunachalam	CA B '18	Chemical Engineering	Forge No. 56
Brett C. Austin	IA B '18	Biomedical Engineering	Lyons No. 2
Chad M. Austin	AL E '18	Electrical Engineering	Alford No. 12
Michelle R. Ayers	OH K '18	Chemical Engineering	Stabile No. 470
Ahmad Yazan Badri	TX E '17	Civil Engineering	Record No. 1246
Hana Bagomaan	MI E '18	Mechanical Engineering	Stabile No. 471
Goonmeet Kaur R. Bajaj	OH M '18	Computer Science	Crouch No. 2
Aakash Bajpai	MD Δ '18	Mechanical Engineering	Dodson No. 64
Carter J. Bakarich	AZ A '18	Chemical Engineering	Record No. 1247
Emmanuel O. Balogun	DC A '18	Mechanical Engineering	DeLoatch No. 1
Kenneth J. Bansah	MO B '17	Mining Engineering	Record No. 1248
James B. Barkas	NY H '17	Mechanical Engineering	Record No. 1249
Stephannie O. Benitez Merced	PR A '17	Chemical Engineering	Record No. 1250
Cassandra T. Bradley	WI A '18	Electrical Engineering	Stabile No. 472
Grace E. Brodeaur	DC B '18	Mechanical Engineering	Stabile No. 473
Mariah Brown	KS Γ '18	Biological and Agricultural Engineering	Stabile No. 474
Nathaniel F. Brown	SC A '19	Mechanical Engineering	Stabile No. 475
Samuel D. Brown	TN A '18	Electrical Engineering	Alford No. 13
Avamarie S. Brueggeman	WI E '18	Electrical Engineering	Stabile No. 476
Katherine A. Bueltel	OH Ξ '19	Manufacturing Engineering	Stabile No. 477
Christianos Burlotos	IN Γ '18	Civil Engineering	Stabile No. 478
Kyle M. Bushick	IL Γ '18	Materials Science and Engineering	Record No. 1251
Latarence J. Butts	FL H '18	Electrical Engineering	Stabile No. 479
Carlos A. Caballero	TX Z '17	Mechanical Engineering	Stabile No. 480
David J. Castelli	PA Θ '18	Mechanical Engineering	Stabile No. 481
Sophia L. Castillo	CA Z '18	Bioengineering	Forge No. 57
Landon W. Cathers	MI Z '18	Mechanical Engineering	Record No. 1252
Arunavha Chanda	NY A '18	Computer Engineering	Stabile No. 482
Michael D. Chen	TX A '19	Petroleum Engineering	Soden No. 6
Matthew R. Chow	NY N '18	Chemical Engineering	Record No. 1253
Joanna L. Ciatti	MI Γ '18	Chemical Engineering	Stabile No. 483
Alexa L. Cichon	MI Γ '17	Chemical Engineering	Record No. 1254
Jared C. Clements	TN A '18	Chemical Engineering	Stabile No. 484
E. C. Cleveland	NC Γ '18	Mechanical Engineering	Stabile No. 485
Kelly M. Conway	NY A '18	Earth and Environmental Engineering	Bloomberg No. 11
Matthew C. Cooksey	CO A '18	Chemical and Biochemical Engineering	Schwaller No. 7
Olga Cortes	TX N '17	Mechanical Engineering	Faidley No. 1
Polly Creveling	UT A '17	Mechanical Engineering	Stabile No. 486
Shanna-Leigh Davidson	NJ E '18	Biomedical Engineering	Record No. 1255
Marisa E. Davini	CA A '18	Civil Engineering	Forge No. 58
Eloise M. De Castelnau	IL Z '19	Mechanical Engineering	Stabile No. 487
Kalani S. De Silva	AZ Γ '18	Environmental Engineering	Faidley No. 2
Louis B. Deridder	NY Θ '18	Chemical Engineering	Stabile No. 488
Dillon J. Despain	UT B '18	Mechanical Engineering	Stabile No. 489
Carolyn R. Detora	MA A '18	Mechanical Engineering	Stabile No. 490
Nathaniel A. DeVera	TX I '19	Mechanical Engineering	Stabile No. 491
Lenora A. Dieyi	PA Z '18	Chemical Engineering	Stabile No. 492
Son Q. Dinh	DC B '17	Electrical Engineering	Record No. 1341
Haley J. Dishman	LA Γ '18	Mechanical Engineering	Stabile No. 493
Sarah E. Duclos	NY Θ '19	Mechanical Engineering	Lyons No. 3
Colleen E. Dunlap	WI B '19	Biomedical Engineering	Record No. 1256
Jordan L. Edmunds	CA T '18	Electrical Engineering	Forge No. 59
Nicole M. Eisenschenk	ND B '18	Chemical Engineering	Record No. 1257
Elizabeth E. Ells	VT B '18	Civil Engineering	Stabile No. 494
Karim A. Elsayed	MA A '18	Mechanical Engineering	Stabile No. 495
Adam D. Erlichman	OH A '18	Chemical Engineering	Curtis No. 10
Noam Eshed	NY Γ '18	Computer Systems Engineering	Stabile No. 567
Hannah K. Fain	KS Γ '18	Chemical Engineering	Stabile No. 496
Lezheng Fang	PA A '18	Mechanical Engineering	Stabile No. 497
Tanner M. Filben	WV A '18	Biomedical Engineering	Lyons No. 4

RECIPIENT	CHAPTER	FIELD OF STUDY	SCHOLARSHIP
Delaney Fisher	TN A '18	Chemical Engineering	Stabile No. 498
Patrick J. Fisher	ID Δ '18	Civil Engineering	Record No. 1258
Eric T. Flett	KS Γ '19	Electrical Engineering	Stabile No. 499
Justin C. Fossum	NY Σ '18	Mechanical Engineering	Stabile No. 500
Akane B. Fujimoto Wakabayashi	NY Π '18	Industrial and Systems Engineering	Stabile No. 501
Joseph D. Fulnecky	IN Γ '18	Mechanical Engineering	Stabile No. 502
Jessica Funnell	NY T '18	Bioengineering	Soderberg No. 27
Neal D. Gaffin	UT B '18	Chemical Engineering	Record No. 1259
John J. Gainer	MD Γ '18	Systems Engineering	Stabile No. 503
Chengyao Gao	KS Γ '19	Mechanical Engineering	Stabile No. 504
Jacob W. Garner	UT B '18	Chemical Engineering	Record No. 1260
Brittany N. Gary	GA B '18	Industrial and Systems Engineering	Lindeburg No. 8
Morgane C. Gaudissart	NH A '18	Civil Engineering	Scribner No. 42
James L. Gaydos	OH Γ '19	Mechanical Engineering	Stabile No. 505
Daniela S. Gil	FL ⊙ '17	Mechanical Engineering	Campbell No. 38
Olivier Gingras	AL E '18	Mechanical Engineering	Stabile No. 506
Krissy J. Govertsen	NY ⊙ '18	Civil Engineering	Van Wagenen No. 1
Christopher J. Green	NJ E '18	Electrical and Computer Engineering	Boysen No. 1
Tomas W. Green	KS A '18	Chemical Engineering	Scribner No. 38
Jacob B. Grodek	WI Γ '18	Mechanical Engineering	Record No. 1261
Elise M. Gubbins	CT A '18	Biomedical Engineering	Soderberg No. 28
Helena Guo	SC A '18	Bioengineering	Record No. 1262
Sarah R. Hamilton	IL B '19	Mechanical Engineering	Stabile No. 507
Christopher A. Hampel	OR Γ '18	Mechanical Engineering	Stabile No. 508
Austin Han	IL Γ '18	Mechanical Engineering	Stabile No. 509
Diana M. Harbach	OH ⊙ '18	Mechanical Engineering	Stabile No. 510
Jeremy D. Hardy	UT B '18	Chemical Engineering	Record No. 1263
Zachary K. Hardy	TX Δ '18	Nuclear Engineering	Record No. 1264
Micah J. Hayden	CO Z '18	Computer Engineering	Record No. 1265
Yosuke Higashi	PA K '18	Engineering	Stabile No. 511
John A. Hinkle	AL A '17	Polymer & Fiber Engineering	Record No. 1266
Jesse J. Hinricher	SD A '17	Chemical Engineering	Record No. 1267
Jack Hoeniges	IN Δ '18	Mechanical Engineering	Stabile No. 512
Melissa Hollfelder	MA E '19	Chemical Engineering	Record No. 1268
Kara G. Huie	MD B '18	Bioengineering	Record No. 1339
Mathilde M. Idoine	WA B '18	Mechanical Engineering	Record No. 1342
Jose L. Iniguez	CA Y '18	Mechanical Engineering	Forge No. 60
Shafquat T. Islam	NY P '18	Mechanical Engineering	Maniscalco No. 1
Amanda M. Jaacks	IN Δ '18	Mechanical Engineering	Stabile No. 513
Sarah A. Jakositz	NH A '18	Civil Engineering	Stabile No. 514
Louis W. Jorski	TX E '18	Mechanical Engineering	Stabile No. 515
Erin L. Kane	NY Γ '18	Chemical Engineering	Record No. 1347
Nicholas S. Karpathy	FL B '18	Civil Engineering	Stabile No. 568
Austin R. Kaul	SD A '18	Mechanical Engineering	Stabile No. 516
Aaishah O. Kelani	CA O '18	Mechanical Engineering	Forge No. 61
Morgan E. King	WV A '18	Civil and Environmental Engineering	Scribner No. 39
Tyler A. Kleinsasser	SD A '18	Civil Engineering	Record No. 1269
Melanie G. Kliegel	CA A '18	Mechanical Engineering	Forge No. 62
Atchima Klomkaew	AL Δ '18	Electrical and Computer Engineering	Davis No. 1
Phiwat Klomkaew	AL E '18	Chemical Engineering	Nagel No. 46
Michael J. Knoblauch	OH K '18	Chemical Engineering	Sickafoose No. 5
Thomas A. Koch	NY I '18	Electrical Engineering	Record No. 1343
Randy M. Koon	OH ⊙ '18	Electrical Engineering	Record No. 1270
Zachary C. Koop	MN B '18	Electrical and Computer Engineering	Record No. 1271
Lyon R. Kopsack	AK A '18	Civil Engineering	Record No. 1272
Paige M. Kordas	IL A '18	Computer Science	Record No. 1273
Rachel A. Krebs	OH ⊙ '18	Chemical Engineering	Record No. 1274
Katherine L. Krouse	TN A '18	Chemical Engineering	Stabile No. 517
Gregory R. Krueper	CA T '19	Electrical Engineering	Forge No. 63
Anna L. Kucera	KS Γ '18	Biological and Agricultural Engineering	Record No. 1275
Hannah M. Kuhl	IL A '18	Bioengineering	Record No. 1276
Amy C. Kurr	IA A '18	Materials Engineering	Sukup No. 1
Allison M. Laber	KY A '18	Civil Engineering	Record No. 1277
Alim H. Ladha	NC Γ '18	Biomedical Engineering	Record No. 1278
Cary E. Laird	AL A '18	Mechanical Engineering	Campbell No. 39
Gerald M. Lamina	NJ A '17	Biomedical Engineering	Stabile No. 518
Brianna M. Lax	MI Γ '17	Chemical Engineering	Record No. 1279
Tung T. Le	NY Δ '18	Chemical Engineering	Stabile No. 519
Patrick A. Leggieri	PA E '18	Chemical Engineering	Stabile No. 520
Claire M. Like	LA A '18	Civil Engineering	Record No. 1280

RECIPIENT	CHAPTER	FIELD OF STUDY	SCHOLARSHIP
Tom Y. Lin	CA A '17	Materials Science and Engineering	Forge No. 64
Schuyler Link	MA Δ '18	Biomedical Engineering	Stabile No. 521
Angela Liu	TX A '19	Biomedical Engineering	Record No. 1281
Haihao Liu	TX Γ '18	Materials Science and Engineering	Stabile No. 522
Yutong Liu	CA A '18	Bioengineering	Record No. 1282
Reid E. Long	PA Γ '18	Electrical and Computer Engineering	Althouse No. 9
John D. Lorence	LA A '18	Petroleum Engineering	Soden No. 7
Daniel J. Lovell	KS Γ '18	Computer Engineering	Record No. 1283
Maliha Lubna	AL Δ '18	Industrial and Systems Engineering	Stabile No. 523
Hana S. Macahilas	CA Y '18	Mechanical Engineering	Stabile No. 524
Zainab Mahmood	DC Γ '18	Biomedical Engineering	Stabile No. 525
Christopher Q. Mai	LA A '19	Mechanical Engineering	Stabile No. 526
Juilee N. Malavade	NJ B '18	Biomedical Engineering	Stabile No. 527
Stacy L. Mann	MI Z '17	Mechanical Engineering	Record No. 1284
Evelyn M. Marchbanks	CO A '18	Chemical and Biochemical Engineering	Record No. 1285
Alexander Martin	IL Γ '17	Mechanical Engineering	Record No. 1286
Isaac A. Mastalski	PA Λ '18	Chemical and Petroleum Engineering	Soden No. 8
Ava Mauser	NM B '18	Chemical Engineering	Nagel No. 47
Maridy M. Mazaira	MI I '18	Industrial and Systems Engineering	Stabile No. 528
Martin G. McCandless	MS A '18	Aerospace Engineering	Brems No. 2
Amy P. McClain	KS B '18	Mechanical Engineering	Stabile No. 529
Joshua S. McClellan	UT B '18	Electrical Engineering	Record No. 1287
Seth McClenahan	MA A '18	Chemical Engineering	Record No. 1288
Luke S. Merrick	VA A '18	Systems and Information Engineering	Record No. 1289
Allison L. Miller	CO A '18	Chemical Engineering	Record No. 1290
Nathan T. Mills	CO A '18	Petroleum Engineering	Soden No. 9
Thomas J. Milyo	OH A '18	Aerospace Engineering	Brems No. 3
Shannon M. Moffat	MA A '18	Mechanical Engineering	Stabile No. 530
Mohamad I.H.M. Lokman	TN B '18	Mechanical Engineering	Stabile No. 531
Courtney C. Montague	KY A '18	Mechanical Engineering	Record No. 1291
Jeremiah A. Montemayor	CA H '18	Aerospace Engineering	Brems No. 4
Kelsey C. Moss	NE A '18	Mechanical Engineering	Stabile No. 532
Austen H. Motily	WY A '17	Mechanical Engineering	Record No. 1292
Jared R. Muench	WI A '18	Biomedical Engineering	Record No. 1293
Austin Q. Ngo	TN A '18	Materials Science Engineering	Olberding No. 1
Kayla C. Niccum	NY Δ '18	Chemical Engineering	Stabile No. 533
Valerie A. Niemann	PA Z '18	Chemical Engineering	Stabile No. 534
Jacob Oberpriller	SD A '18	Industrial Engineering	Record No. 1340
Mark R. Odorizzi	PA Z '19	Architectural Engineering	Scholz No. 1
Brian C. O'Hara	MI Δ '18	Civil Engineering	Record No. 1294
Yousef H. Omar	AL E '18	Chemical Engineering	Record No. 1295
Braeden Ostepchuk	VT B '18	Mechanical Engineering	Stabile No. 535
Robert C. Owens	KY A '18	Chemical Engineering	Record No. 1296
Amelia W. Paine	MA B '18	Materials Science and Engineering	Bose No. 11
June Park	CA Δ '18	Chemical Engineering	Dodson No. 65
Bram C. Parkinson	MI A '18	Mechanical Engineering	Stabile No. 536
Jacob P. Perry	MT A '18	Mechanical Engineering	Stabile No. 537
Damon J. Petersen	UT B '19	Chemical Engineering	Record No. 1297
Stannard N. Phelps	KY A '18	Mechanical Engineering	Stabile No. 538
Brett D. Pielstick	UT B '18	Mechanical Engineering	Stabile No. 539
Gary L. Pike	AL A '18	Software Engineering	Record No. 1298
Jessica N. Pinkston	AL A '18	Chemical Engineering	Record No. 1299
Steven J. Pirvu	LA Γ '18	Biomedical Engineering	Record No. 1300
Conner D. Pitts	WA A '19	Bioengineering	Record No. 1301
Madelina R. Pratt	CA Δ '18	Biomedical Engineering	Dodson No. 66
Gabriel Prescinotti Vivan	MI K '18	Aerospace Engineering	Brems No. 5
Shiyi Qin	OH A '18	Chemical Engineering	Curtis No. 11
Maria Raggousis	PA Z '18	Architectural Engineering	Stabile No. 540
Sahej D. Randhawa	CA Ψ '18	Bioengineering	Record No. 1302
Sydney C. Reiners	CA A '19	Mechanical Engineering	Stabile No. 541
Zachary B. Ricca	RI A '18	Biomedical Engineering	Stabile No. 542
Lea J. Rice	CT A '18	Mechanical Engineering	Stabile No. 543
Vincent P. Rigoglioso	NY Δ '18	Chemical Engineering	Stabile No. 544
Carly J. Romnes	NM B '18	Nuclear Engineering	Record No. 1303
Natasha A. Rouse	DC A '18	Mechanical Engineering	Abron No. 1
Benjamin D. Russon	UT Γ '18	Mechanical Engineering	Stabile No. 545
Liam G. Saccucci-Bryan	NY Σ '19	Biomedical Materials Engineering	Record No. 1304
Zachary J. Sadler	MI A '18	Mechanical Engineering	Stabile No. 546
Vorada Sakulsaengprapha	MD A '18	Biomedical Engineering	Stabile No. 547
Stephanie E. Sandoval	AR A '17	Electrical Engineering	Record No. 1305

RECIPIENT	CHAPTER	FIELD OF STUDY	SCHOLARSHIP
Michael B. Schmithorst	SC B '18	Chemical Engineering	Record No. 1306
Garret C. Schneider	KS Γ '19	Mechanical Engineering	Stabile No. 548
Adam M. Scott	AZ Δ '18	Aerospace Engineering	Spirit of Apollo No. 5
Felicia M. Sedwick	FL A '18	Chemical Engineering	Record No. 1307
Kenneth D. Seiffert	AL A '18	Aerospace Engineering	Crouch No. 3
Tara Seigle	NY ⊙ '18	Chemical Engineering	Stabile No. 549
Genevieve C. Sertic	CT A '18	Electrical Engineering	Record No. 1344
Lorenzo J. Servedio	NY ⊙ '18	Mechanical Engineering	Stabile No. 550
Vivaswat Shastry	WY A '17	Electrical Engineering	Record No. 1308
Vineet R. Shenoy	NJ B '18	Electrical and Computer Engineering	Record No. 1346
Zachary C. Shepard	IN E '18	Mechanical Engineering	Record No. 1309
Travis A. Shoemaker	PA E '18	Civil and Environmental Engineering	Scribner No. 40
Cynthiya Shrestha	LA E '18	Mechanical Engineering	Stabile No. 551
Zane T. Shreve	OH ⊞ '18	Electrical Engineering	Record No. 1310
Benjamin H. Shumpert	SC A '16	Computer Engineering	Record No. 1311
Nathan A. Sidhu	GA A '18	Chemical and Biomolecular Engineering	Record No. 1312
Matthew J. Siomos	WV B '18	Mechanical Engineering	Stabile No. 552
Benjamin Siu	AL E '18	Chemical Engineering	Record No. 1313
Carrie A. Smith	WA Γ '18	Electrical and Computer Engineering	Record No. 1314
Elizabeth D. Smith	OH B '18	Mechanical Engineering	Stabile No. 553
Joshua R. Smith	CO Δ '18	Mechanical Engineering	Stabile No. 554
Maximilian Sonntag	GA B '18	Biomedical Engineering	Record No. 1315
Janet E. Sorrells	NY K '18	Biomedical Engineering	Stabile No. 555
Luke P. Soule	NM Γ '18	Materials Engineering	Record No. 1316
Krista L. Stribling	IN Δ '18	Civil Engineering	Record No. 1317
Abraham Stucky	PA Λ '17	Mechanical Engineering	Stabile No. 556
Matthew J. Studer	AL B '17	Chemical Engineering	Record No. 1318
Chase C. Suehiro	OR Γ '18	Civil Engineering	Record No. 1319
Emma N. Sum	OH M '18	Biomedical Engineering	Record No. 1320
Leah S. Surratt	CT A '18	Mechanical Engineering	Stabile No. 557
Michael S. Tarascio	CT B '18	Biomedical Engineering	Stabile No. 558
Samuel D. Thorpe	UT B '17	Chemical Engineering	Record No. 1321
Tyler G. Toepke-Floyd	ND A '18	Mechanical Engineering	Stabile No. 559
Phuong H. Tran	CA ⊙ '17	Biomedical and Clinical Engineering	Record No. 1322
Megan W. Tse	MA Δ '18	Biomedical Engineering	Record No. 1323
Tivon T. Tsung	GA A '18	Chemical and Biomolecular Engineering	Record No. 1324
Robert P. Tworek	TN Δ '18	Civil Engineering	Record No. 1325
Rafael E. Valbuena Urdaneta	IN Δ '18	Mechanical Engineering	Stabile No. 560
Sarah V. Vargas	FL B '18	Computer Engineering	Record No. 1326
Lyle Reynold Frank Vaz	SD A '18	Mechanical Engineering	Stabile No. 561
Amulya Veldanda	NJ Z '18	Biomedical Engineering	Stabile No. 562
Anita Venkataswamy	OH A '18	Polymer Science and Engineering	Record No. 1327
Robert Vitagliano	PA B '18	Aerospace Engineering	Griffin No. 1
Alex M. Vonderhaar	WI B '19	Biomedical Engineering	Schaefer No. 1
David H. Wahlstrom	CO A '18	Mechanical Engg	AL Power No. 14
Nathaniel Weger	IA B '18	Mechanical Engineering	Campbell No. 40
Allison K. White	IL Δ '19	Mechanical Engineering	Stabile No. 563
Logan S. White	UT B '18	Chemical Engineering	Record No. 1328
Alex W. Whittier	UT B '18	Mechanical Engineering	Stabile No. 564
Madeline B. Wiegel	CA O '18	Civil Engineering	Record No. 1329
Jared B. Wilson	CA T '18	Civil Engineering	Record No. 1330
Hannah E. Winton	SC B '18	Chemical Engineering	Record No. 1331
Chelsea Wojeski	MA E '19	Industrial Engineering	Record No. 1332
Sienna Wong	MI E '18	Biomedical Engineering	Record No. 1333
Zachary B. Wright	MO E '18	Mechanical Engineering	Stabile No. 565
Chung Yuen Yeung	PA K '18	Engineering	Record No. 1334
Robert S. Young	CA Γ '18	Electrical Engineering	Forge No. 65
Maria A. Zeballos	AR A '17	Biological Engineering	Record No. 1335
Danhui Zhang	PA E '18	Chemical Engineering	Stabile No. 566
Zige Zhang	TX A '18	Civil Engineering	Record No. 1336
Lucy Y. Zhuang	CA T '18	Biomedical Engineering	Record No. 1337
Emily M. Zinselmeier	PA Δ '17	Materials Science Engineering	Record No. 1338
Jonathan Zong	NJ Δ '18	Computer Science	Record No. 1345

The Tau Beta Pi Chapter Endowment Initiative was launched in spring 2014 to fund Association activities that support the collegiate chapters. Major Gifts Officer Sherry D. Jennings-King, Tennessee Alpha '93, shares progress and developments.



Chapter Endowment Update

BEQUEST TURNED INTO CHALLENGE MATCH

Tau Beta Pi has received a bequest from the estate of the late **Charles E. Reed, D.Sc., OH A '34**, of which \$20,000



is being earmarked for a challenge match in support of Ohio Alpha at Case Western Reserve University.

A native of Findlay, OH, Reed attended Case Institute of Technology in Cleveland. He went on to earn a doctorate in chemical engineering from MIT where he left an assistant professorship to join GE Research Laboratory as a research associate.

Reed retired as a senior vice president at GE and was inducted into the National Academy of Engineering in 1969.

The Ohio Alpha challenge match is in support of our Chapter Endowment Initiative (CEI), by which alumni, companies, and foundations can permanently endow the Association's activities that support any of our 246 student chapters. While gifts of a minimum of \$5,000 are being accepted for this effort, a total of \$100,000 is required to fully endow a chapter.

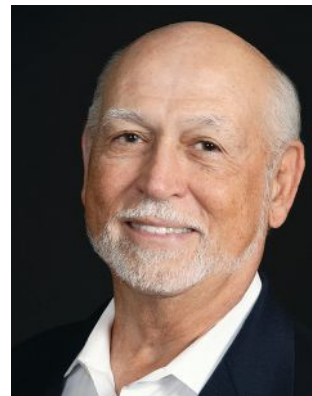
With this estate gift, TBPI conducted a mailing in August to Ohio Alpha alumni with this challenge—for every \$5,000 that is given by alumni through the CEI and earmarked for the chapter, we'll take \$5,000 out of the \$20,000 bequest and designate it for Ohio Alpha.

So if four gifts of \$5,000 are received from alumni, then the entire \$20,000 will go to the chapter's endowment. However, if only two gifts of \$5,000 are received, then we will put \$10,000 into the Ohio Alpha endowment and the remaining \$10,000 will go for operations.

In 2016, alumnus **Richard A. Derbes, OH A '68**, made the first gift of \$5,000 in support of the OH Alpha Chapter. Please consider supporting this challenge to add to Ohio Alpha Chapter's endowment!

• We have also received a challenge match of \$20,000 from alumnus **William F.H. "Bill" Sinclair, MS A '63**, in support of Mississippi Alpha at Mississippi State University.

Bill received his BSEE, and then MSEE in 1967, from Mississippi State University and his MBA in 1977 from the University of Hawaii. He has fond memories of his



time in Mississippi growing up on a farm and then heading to the university and being a part of ROTC, after which he served two and a half years in the army completing his active duty in the famed 101st Airborne Division. Bill's work with LTV (Ling-Temco-Vought) took him and his family to Honolulu for eight years and then back to the Dallas/Ft. Worth area where he retired in 2001 from

Northrop Grumman, which had acquired LTV. While in Hawaii, he obtained his P.E. license from the state. Bill remains heavily involved with his local Rotary Club and lives with his wife Barbara in Rockwall, TX.

A total of \$100,000 is required to fully endow a chapter—and we are trying to reach this level for Mississippi Alpha! In order to encourage more support, alumni from this chapter will be contacted in late summer/fall to consider giving in increments of \$5,000 to fulfill the criteria for the matches.

In 2016, **Bobby S. Shackouls, MS A '72**, made the first gift of \$5,000 in support of Mississippi Alpha. Please consider joining Bill and Bobby in supporting this move to add to the chapter's endowment.

For additional information on this opportunity or to learn more about the Chapter Endowment Initiative, please go to our website at www.tbp.org/give/chapterEndowment.cfm or contact Sherry Jennings-King, Major Gifts Officer, by phone at (612) 226-2922 or by email at sherry.jenningsking@tbp.org.

Note: The minimum gift being accepted for this initiative is \$5,000. All checks received that are designated for this initiative in an amount less than \$5,000 will be paid into Tau Beta Pi's annual fund which supports the same programs as the Chapter Endowment Initiative.

2017 Alumni Giving Program May-July Contributors

The names of 1732 Tau Beta Pi alumni who made donations to the Association in the 2017 Alumni Giving Program appear in two separate sections on the following pages. Their gifts totaling \$285,425 arrived between May 1, 2017, and July 31, 2017. Gifts received after July 31 do not appear here but will be published in the Winter 2018 issue of *The Bent*.

The generous support of each member is deeply appreciated by the Executive Council and other Association Officials. The financial resources have permitted strengthening our programs in several areas that emphasize the importance of Tau Beta Pi's basic objectives and that help all collegiate chapters and student members.

Recognition Club Donors are listed alphabetically within their chapters and appear in the first section below. Member-contributors appear in the subsequent section. Names marked with a † symbol are of deceased members in whose memory donations were made either by relatives and friends or through bequests. In addition to gifts acknowledged here, several were made anonymously through the Combined Federal Campaign and are also deeply appreciated.

Donor Recognition Clubs

The names of 1423 Tau Bates appear in this first section. They made donations to the 2017 Alumni Giving Program between May 1, 2017, and July 31, 2017, AND they have also made CUMULATIVE contributions (in some cases including matching gifts) and bequests to Tau Beta Pi through the years totaling from \$250 to more than \$1,000,000.

The Donor Recognition Clubs are part of our effort to recognize a donor's total lifetime cumulative giving to Tau Beta Pi. Such continuous support significantly contributes to the overall strength of the Association and allows our Society, with confidence in our financial resources, to plan for modest growth in our services to the engineering profession. These clubs were chartered by the Executive Council in 1986 and have been set at the following levels:

Matthews Club	500,000	Alpha Club	25,000	Chi Club	1,000
Nagel Club	250,000	Beta Club	10,000	Second Century Club	500
Williams Club	100,000	Delta Club	5,000	Founder's Club	250
Heikes Club	50,000	Zeta Club	2,500		

WILLIAMS CLUB

CA † Hennis, Lee Alan '65
Soden, Archie Deane '51
OH A Reed, Charles Eli '34
VA A White, Dudley '76

HEIKES CLUB

AZ B Myers, Jerry Elwyn '70
CA † Mieczko, Gene Leon '47

ALPHA CLUB

IA † A Fadley, LeVern William '67
LA † Kitchens, Philip Hudgins '67
MS A Sinclair, William Fredrick Hall '63
NY B Anonymous '80
NY E Hollander, Lawrence Jay '51
TX † Loewenstern Jr., Walter '59

BETA CLUB

CA † Davies III, Paul L. '83
Johnson Jr., Pitch '50
CA † Fong, Franklin Moodo '69
GA A Amelio, Gil Frank '65
Anonymous '61

IL † Rasmusussen, Warren Willis '53
IN † Lucey, Jo Ann '80
MO B McHenry, Dale '81
OH † A Robe, Richard '55
OH E Korzep, Stanley '66
SD A Gomulinski, Tricia Elizabeth '98
TX H Trich, John Albert '70
WI † Cronce, Richard Gordon '77

DELTA CLUB

AL A Bowers, Charles Judson '69
Brackney, William Michael '58
AR A Vratsinas, Gus M. '67
CA † Johnson, F. Martin '58
CA A Crews, Brian '70
CA N Joy Jr., Robert Lee '66
CA † Boyd, Robert Alan '74
CA Y Idemmill, Ethan Matthew '04
CT B Hunziker, Robert Neal '83
IL A Pfefer, Bernard Lee '47
Tracy, Mark Alfred '86
IL † Johnson, Douglas '65
IN A Katzman, James Allen '68
Vosteen, Louis Frederick '52
KY B Lambert, Linda Moore '88
Lambert, Michael Todd '88
MA A Hamel, Peter J. '81
MA B Poduska Sr., John William '59
MA Z Walker Jr., William Edward '57
MI A Luchini-Colby, Katy '99
Colby, Dirk Joel '06
MI E Hock, Roy Edward '51
Lahti, Gerald Paul '59
NE A Walcott, Gwen Sharyn '82
NJ A Forslund, Donald Charles '60
Post, Edwin Lewis '62
NJ A Lim, Yung Bong '87
NY † Bauer, Richard Carlton '66
OH A Markuson, Donald Miner '80

PA A Salamon Jr., Peter Francis '71
A Anonymous '90
SC A Harrman, Patrick '65
TN A Cook, James Michael '72
Dodge, Franklin T. '60
TX A Anonymous '63
TX † Jordan, Paul Joseph '90
VA B Hogan, James Campbell '70
WA A Asplin, Lyle Irving '59
Gunter, Robert A. '62
Swanson, Hilmer Sigfrid '76
WA B Emery, Frederic Philip '51
Moors, Donald Edward '55

ZETA CLUB

AL A Talbot, Thomas Fletcher '52
Wilhelm, William Jean '58
AL B Mosley, Talmadge Mordant '65
AZ A Carrillo, Danny J. '95
AR A Newtown Jr., Glenford Andrew '69
CA B Hammer, David A. '64
CA † Fowle, Mark C. '76
Kwok, Munson Arthur '62
Parker, Henry Whipple '45
CO A Van Dinter, Jennifer Ann '97
DC † Cooper, Reid Franklin '77
FL A O'Steen, John Andrew '67
GA A Farr, Emory Warren '54
IL A Beanblossom, Todd M. '80
Beermink, Kurt Patrick '82
IN A Houze Jr., Gerald Lucian '58
†Mason Jr., Lowell Blake '48
McDonald, John Douglas '73
Palas, Richard Francis '65
Renner, Arnold Edward '54
Teague, Stephen Michael '71
IN † Poore, Michael Francis '71
IA A Harms, Richard P. '65
Manning, Thomas William '64
IA B Schwarting, Eugene Raymond '63
KS A Meyer, Leslie D. '65
KY B Arbaugh, Andrew Carey '95
LA B Vaughan, Robin Marie '81
LA E Champagne Jr., Pierre '76
MD B Ausherman, Donald Wayne '79
MA B Giaimo III, Edward Charles '74
Grossweiler III, Philip J. '72
McKim, Thomas Francis '75
MA † Kulpinski, Richard John '59
Sullivan, Gerard Francis '68
MA E Moore, Timothy Eugene '71
MA Z Kelly, Thomas W. '80
MI B Ojala, William Keith '54
MI † Johnson, Kalin Shaw '46
Liepa, Mark Albert '81
Sarns, Richard Norman '76
Wackenhut, Thomas C. '69
MI † Klimaszewski, Richard A. '65
Kogut, Kenneth Joseph '71
Wall, Raymond J. '50
Wittman, Bernard A. '64
MI E Gomulinski, Curt Dennis '01
Kolodziej, David Gregory '59

MI Z Philippart, Nancy Lynn '80
MS A Dymale, Raymond C. '70
MS A Boozer, Drayton Daniel '66
MO A Connor Jr., John Royce '67
MO B Jinkerson, Kenneth R. '75
NV A Lovekin, James Warren '80
NH A Dycewicz, Vickie Sue '96
NJ A Gorog, Russell Mark '70
NJ B Rodgers, Douglas Noss '67
NY B Kelley, David Benjamin '51
NY † Chamberlin, Donald Melsom '67
Gray, Robin Bryant '46
NY A Zises, Matthew Scott '96
NY E Grosso, John Joseph '69
NY H Pollack, Herbert William '50
NY K McKeenan, John Hughes '46
NY N Rataj, Paul Stephen '83
NC A Hall, Michael L. '83
NC † Vadnais, Paul A. '73
OH A Oran, William Alex '63
Whittington, James Thomas '93
OH B Pollock, Havi Martin '77
Stergiopoulos, John Michael '61
OH † Riedel, Kimberly Sue '90
OH H Dechance, Richard P. '76
OH K Yannayon, Benjamin C. '05
OK A Buckingham, Alfred C. '58
OR A Milton, Stuart W. '84
PA A Berglund, Thomas A. '82
Weber Jr., John Herbert '63
PA B Moore, Albert Lloyd '56
Sturner, George R. '62
PA E Babbitt, Walter Howard '77
PA Z Dieter Jr., George Ellwood '50
RI B Dusbald, Louise Victoria '64
SC B Husband, D. Mark '83
TN A Prados, John W. '54
TX A Bethell, William Decatur '45
Tran, Tan Dai '87
TX B Bourdon III, Lynn Louis '84
Carey, Martha Darden '80
TX A Capshaw, David M. '80
TX † Clinton Jr., Daniel Darious '52
Johnson, Dennis Ray '74
Kaminski, Bryan Joseph '84
Latham, Raymond Edgar '56
Porter, Larry Gene '64
TX † Stokes, E. Xavier '78
WA A Walker, James Rodney '55
WV A Lengyel, Nicholas Martin '70
Rockenstein, Richard C. '63
WV B Ashman, Michael D. '84
Hughes II, Paul K. '71
Payne, Michael E. '81
WI A Forkner, Stanley L. '96
Larson, Nics Irving '58
WI B Hayes, John J. '81
Whittington, Laura Lee '88

CHI CLUB

AL A Anderson, Pete Lawrence '75
Glover, Martin Cochran '70
Goodwin, James William '58

Slotkin, Arthur Lewis '68
Whitley III, Howard G. '63
AL B Helms, Robert Knight '61
Slaughter, Charles Jeff '82
AL † Braden, James Charles '76
AK A Usibelli Jr., Joseph Emil '81
AZ A Davis, Robert Allen '79
AZ B Barnett, J. Matthew '90
CA A Figueira, Michael Robert '73
Gilbert, Paul Hammond '59
Magyary, Andrew '65
CA † Hillier, Frederick Stanton '58
Roodhouse, James Greenlee '59
Sutherland, Kenneth H. '78
Taniguchi, Brian Yoshito '77
CA A Brandow, Gregg Everett '67
Hedin, Richard Allen '69
Herzberg, Donald Edward '79
Itamura, John Mindru '85
Mallis, Richard Kenneth '52
CA E Gaunt, Arnold J. '86
Hardy, Frederick Walter '65
Ohgi, Frank '60
Suyematsu, Herbert Takashi '58
CA Z Lampe, Fred Paul '79
Perrin, Michael Elton '67
CA H Burrows, Stanford '63
Zanini, David Victor '90
CA † Weisz, Dorothy M. '72
CA I Lee, Neil Yun-Liu '76
Tam, Clement '73
CA K Scanlan, Lawrence Allen '68
CA A Holl, Sue '76
CA N Chew, James S. B. '84
CA E Curry, Monica Gossman '92
Curry, Robert Stanley '94
Greco, Anna Maria Elvira '81
CA O Mulvihill, Michael Edmund '60
CA P Kraft, Lyle David '87
Owens, Lawrence Paul '82
CA Y Dawson, Carole Jeanne '85
CA † Oviatt, Heather Watson '97
CO A Anderson, Arvid Neil '54
Crichton, David Drewry '97
Peters, Richard Duane '80
Rense, John A. L. '74
Schneider, Randolph Paul '71
CO B Aronson, Haskell Harold '52
CO † Lee, Don Eward '59
Mead, Richard Wilson '63
Pearson, Larry '64
CT A Cleland, Alan S. '60
CT B Leib, David Bernard '61
Zajac, Gerald E. '68
DC B King, David Alan '68
Orzech, Joseph Miller '71
Roberts, Carol Ann '63
Roberts, John Paul '62
FL A Bowles Jr., Carl Houston '54
Burkard, Scott Lawrence '78
Flewellen Jr., William Banks '50
Johnson, Hjalma Eugene '58
Perrygo, Charles Maurice '75

FL † Giovannelli, Ronald F. '76
Houmisi, Nicholas James '74
Lyons Jr., Thomas Francis '86
Preslar, Daniel Alton '91
GA A Austin, Edward Marvin '56
Barber, Brian Robert '81
AZ A Davis, Robert Allen '79
Dishong, Jefferson Lee '66
Henderson, Richard Dean '53
Northington, Peyton Alexander '78
Sudderth, Stella K. '80
Zimmerman, Clarence D. '65
IL A Chang, Milton Mow-Tack '64
Cunningham, Lawrence K. '76
Kasper, Frank Stanley '52
Schilson, Robert Earl '50
Schuhrke, Donald Kenneth '55
Tatara, Richard Michael '78
Wilkins, Gregory Martine '92
Zartman, Charles Robert '59
IL B Kusner, William John '59
Plesniak, Michael W. '83
Uherck, Frank C. '82
IL † Cohen, Sanford Charles '58
Fenton, Suzanne Schadel '79
Henry, Thomas Peter '73
Herzing, Henry George '59
Pineault, Wayne '79
Witt, Frank A. '55
IL A Zeller, Sean Michael '92
IL E Chen, Juh W. '53
†Holscher, Joshua David '07
IN A Amaya, Mark Anthony '85
Bodemuller, Robert Alan '70
†Faddick, William Bruce '58
Paszkiert, Christine Ann '85
Risa, Kristen '69
Satterly, Paul Benson '82
Schultz, Harold Edwin '51
Suzuki, Wayne Takashi '67
Warren, Scott William '83
Weaver, S. David '59
White, Harvey Clinton '49
Wilson, Joseph Mark '50
IN B Martin, Jeffrey W. '78
IN † Fitzgerald, Edward John '86
Lockett, Dirk R. '79
IN A Vocke, Merlyn C. '55
IN E Finley, David R. '94
Tyler, Thomas Lee '54
IA A Coffman, Vance D. '67
Davenport, Delbert James '67
Hammar, Kelly Jean '89
Morse, David Sanford '52
Slater, John B. '43
Sutherland, Keith Allan '69
Wallace, Jean Ellen '81
IA B Boldt, Donald Bernard '57
Lawson, Robert Jerrold '60
Lawson, James Theodore '70
Warner, Diana Lou '73
KS B Hockett, James K. '66
KS † Dunbar, Monica Ann '91

CHI CLUB, CONTINUED

- KY A Davis Jr., Lewis Berkley '66
Gardner, Timothy Alan '75
Letton Jr., George C. '57
- KY B Minster, James R. '71
- LA A Corripio, Armando Benito '63
- LA G Cox, Mickey Dale '77
- LA W Wyche III, James Egbert '59
- LA A Blaylock, Martin Edward '61
O'Rourke Sr., Donald Joseph '51
- MD A Sadilek, Albert Charles '72
Shinham Jr., Charles Robert '71
- MD B Mentzer Jr., William R. '61
Roberts, Carla Field '82
- MA A Achilles, Heather Dale '83
Lancey, Roderic C. '51
Lescoe, James Terrence '05
- MA B Balazs, Phillip Terry '69
Butkus, Lawrence Michael '85
Chang, Nancy Tien-Tien '87
Emmba, Bob E. '63
Maskrey, Robert Harley '63
Nobel, Sanford M'Brad '58
Patterson, John Henry '80
- MA A Curtis, Jonathan '69
- MA E La Lone, James C. '70
- MA B Riddon, Stephen Allan '66
- MA Z Brown, Jeff Richard '79
Fontana, Mario H. '55
- MA H Duda, James A. '84
- MA O Allen, Karen M. '89
Chapman, David Mason '83
- MI A Berk, Kevin Jon '84
Kupfer, Michael David '83
Mueller, James Michael '70
- MI B Henriksen, Leslie Louis '58
Hutula, David Norman '66
- MI G Bonfanti, Giovanni '62
Fertel, Howard Kevin '79
Finnegan, Patrick Marion '57
Holmes, John William '65
Leeds, Thomas Murray '85
Maugh, Roger E. '85
Nobumaga, Brian A. '83
Stoddard, Frank J. '60
Washburn, John Robert '69
Williamson III, Warren Pyatt '53
- MI E Zickafosse, Michael Wayne '97
- MI Z Kovacs, Robert Lewis '86
- MI O Edwards, Steven C. '80
Spall, James Charles '79
- MS A Petrich, Gale Sean '86
Polacek, James Hills '52
- MS B Woody, Marvin David '79
- MO A Caruthers, James Ronald '69
- MO B Fennewald, Gary Joseph '73
Hahn, Gail Louise '80
Helwig, Arthur Woods '53
Leitman, Dennis W. '76
Mahin, Clifford Alan '76
Schwent, Dale Gerard '84
Diboll Jr., Wallace B. '44
- MO A Campbell, Newton A. '49
- NV A Wigchert, Albert Henry '74
NH A Kieffer, Roger Alan '61
Stirk, James A. '81
- NJ A Brechka, Thomas Michael '73
N B Rabin, Dan E. '73
N J Fenster, Saul K. '53
Otterberg, Richard Charles '71
Sharon, Anthony Peter '74
Tucker, John H. '61
- NM A Peace, Jeffrey Howard '76
Smith, B. Wayne '88
- NM B Farber, Martin John '75
Gonzales, Michael Anthony '74
Stief, Robert D. '50
- NY A Franco, Peter Flavio '76
Seckler, Howard Noel '48
- NY B Leader, Jeffrey James '85
Poulsen, Neils Ray '57
- NY G Brand, Terrance Alan '90
Goldschmidt, David Joel '91
Hirschman, Gordon Bradley '78
Huie, Joseph A. '52
Miller, Rolin Ted '46
Pennisi, Joseph Michael '89
Wadsworth Jr., Winthrop '76
Walker, Buff Arthur '60
- Zadoks, Abraham Louis '57
Zmrozec, Leonard Anthony '78
- NY A Harris, Dennis George '70
Randall, John Douglas '65
NY E Dobbins, Bob Mark '73
Koehler, George Richard '63
Niebanck, Charles F. '54
Siegel, Murray Harvey '63
Weissman, Martin J. '58
- NY Z Gersten, Marvin Charles '60
Labianna, Frank Michael '61
Mendel, Jerry M. L. '59
Parisse, Richard F. '61
- NY H Filippek, Stephen John '82
Kaplan, Howard Ronald '55
Kopp, Eugene H. '50
Kushel, Glenn Elliot '68
Lum, Jean Ping '87
- NY O Donaher, Thomas Patrick '56
Froel, John Daniel '77
- NY I Grant, Richard Joseph '88
Rolund, Michael '61
- NY K Allyn, Elwyn George '61
Peters, Kenneth Jerome '87
- NY A Kamme, Robert W. '85
NY E Snyder, John Joseph '81
NY P Kaemmerlin III, John T. '76
NY A Olenik, Anthony Michael '88
NY T Allen, William Dowell '88
Caudle, Donald Lane '85
De Haas, Cynthia '91
Ma, Robert Ping-Chung '88
MacHnik, Nicholas Jan '76
Maybee, Clarion Lee '77
Mindy, Richard Michael '66
- NC G Everett, Robert Rivers '42
Flowers III, George Horace '65
McConnell III, Ezra Lee '83
Powell, Bayard Lowery '76
Prewitt III, Richard M. '77
- NC A Jones, Luellen Barnett '83

The IRA Charitable Rollover provision is an easy, tax-wise way to make a gift to TBP! Donors aged 70½ or older may move up to \$100,000 annually from their IRAs directly to qualified charities without having to pay income taxes on it. The charitable gift amount will count against the donor's required minimum distribution (RMD).

IRA custodians may send your gift to Tau Beta Pi Association, P.O. Box 2697, Knoxville, TN 37901-2697. Our federal tax ID number is 62-0479545. If you have any questions, please visit our website at <http://www.tbp.org/give/IRARollover.cfm> or call our office at 865-546-4578 and ask for Patricia McDaniel or send an email to pat@tbp.org.



- Guelker, Eric James '90
Johnson, Joseph William '79
Knoke, Calvin Arthur '45
Martell, Donald Louis '60
Mullins, Brian William '77
Teller, Ronald Robert '73
Tennie, John Charles '64
Wolf, James F. '59
 - WI B Derra, Kenneth William '90
Jaye, Deborah Ann '03
McMorrow, Daniel Patrick '98
Pickert, Mark Allan '72
 - WY A Riley, Robert H. '82
- SECOND CENTURY CLUB**
- AL A Carey, George Walter '69
Colberg, Richard Dale '80
Miller III, Edwin H. '84
Kreim, Kenneth B. '71
 - AL B Moore, Robert A. '54
Ramsey, James David '64
 - AZ A Keiser, Jan Ann '76
 - AK A Park, Trevor Howard '97
Svenson, Arthur '66
 - AZ B Gayle, William R. '78
 - AR A Kooker, Stephen Lowell '63
Lehnen, Robert Anthony '90
Moody, Charles Roger '58
Perciful, Jerry C. '60
Sharp, Steven Harold '76
 - CA A Flerztzhim Jr., H. A. '53
Gourdin, William H. '72
Reed, Donald E. '44
Serr, Eugene E. '46
 - CA G Hicks, Robert B. '48
Kwong, Michael Yipun '95
Putt, Brian Hollis '72
 - CA A Fetterolf-Klein, Shelley Marie '82
Goodin, James Douglas '57
Iwai, Derek T. '80
Katin, Robert A. '74
Shields, Linda '84
 - CA E Yamashiro, Keith Kotsu '79
Krieger, Marc Yareed '88
Miller, Richard E. '87
Reichert, Ralph J. '67
Tamanaha, Howard S. '77
Zarin, Oren '95
 - CA Z Baueler, Richard Dennis '59
CA H Bautista, Anthony Hernandez '94
Costa, Michael '88
Hong, Chi-Seng Michael '84
CA O Hill, Jo Ann '78
Kolderup, Nils Petter '60
CA A Johnston, Brian David '95
Reese, Armin Carl William '74
Smith, Robert Press '75
Sturgeon, William Randall '70
CA N Caballero, Luis Alberto '85
Shannon, Conrad Floyd '57
Newberry, James Douglas '62
CA E Gee, Warren Alan '84
Hawkins II, John Coleman '79
Oneil, Patrick M. '82
Smith II, Gordon F. '97
Stewart, Diana Frieda '83
CA P Koehn, Calden Ray '81
Koehn, Lisa Renee '82
CA S Rubino, Kimberly Christine '95
CA Y Lindauer, John Arthur '90
CO B Erickson II, Thurston Gunnar '74
Hami, Daniel Massimo '86
Horrell, Robin S. '85
Jolley, Malcolm Carter '74
Trimbell, Thomas Steven '70
Velazquez, Jose E. '78
Watry, Michael Owen '86
CO A Middlekauff, Stephen Allen '09
CA A Gerson, Gordon '58
Lehman, Jill Fain '81
McEligot, Donald Marrius '52
CT B Brenna, Patricia Mary '81
Fappiano, Michael D. '87
White, William Richard '65
DE A Williams, Jay James '71
DE B Delgado, Antonio J. '93
Riley, Charles Christopher '83
DC F Hill, Howard Thiebaud '62
FL A Higgins, Adam Steven '03
Ireland, Ronald Joe '61
Rauth, Terry Len B. '77
Spenninger, William R. '55
Van Horn, William A. '82
 - FL B Nunez, Ramon Luis '75
FL G Suter, Bruce Wiley '72
FL A Woods, David Wayne '81
FL E Hansen, Christian Michael '88
FL H Reinert, Richard D. '94
FL O Burrow, Gregg Dunkin '11
GA A Curry Jr., John Charles '58
Faulkberry, David L. '77
Schuler, William Frederick '72
Shurbutt, J. Steven '75
Smith, Stanley Cooper '56
IL A Angus, Richard Myers '57
Droz, Jennifer Lee '92
Gull, Daniel Alan '73
Jonas, Steven G. '66
Mikitka, Robert William '54
Mueller, Vernon Charles '59
Splitt, Frank George '52
IL B McBlaine, Michael Richard '75
IL G Asbury, Michael George '83
Bicks Jr., Robert William '63
Dorn, James David '54
Kazmar, Richard Charles '71
IL A Zapinski, Susan Marie '83
IL E Sheehan, Patrick Joseph '85
IN A Bower, William Albert '67
Brinson, Robert James '60
Capasso Jr., Vincent Nicholas '54
Colville, James '59
Cross, Perry Gregory '74
De Poy, Phil Eugene '57
Ferrell, John Charles '61
Hockema, Richard Wayne '68
Horneyes, David C. '53
Kawaguchi, Ray S. '69
Millstein, Leo '70
Minniti Jr., Robert Joseph '70
IN G Armstrong, Ashley A. '15
Simons, Joseph Lee '75
IA A Burnet, George '48
Houston, M. Dean '52
Houston, Melissa Kay '95
Huber, Robin '93
Irvine, Alexander John '79
King Jr., Maurice Albert '67
Matheson, Harold Moffat '55
Paustian, Harold Herman '73
Van Zante, Dale Eugene '90
KS A Hinton, Robert Allan '61
Lovitch, Dinah '88
Neff, Cassandra J. '82
KS B Barkell Jr., James Warren '74
Straka, James Lavern '89
KS G Drumm, Robin D. '79
Walker Jr., Hugh Sanders '87
KY A Blevins, Parker Ray '64
Cook, Robert Henry '74
Mullins, Chuck '87
KY B King, David D. '76
Schuler, Walter L. '60
LA B Heausler, Thomas F. '81
Junius Jr., Ralph W. '70
Marin, Justo Enrique '79
LA G Hogan, Harry A. '79
Randall, James Benjamin '79
LA A Gannuch, Rodney Joseph '68
Halkiades, George '63
LA E Leonik, Krzysztof Christopher '91
ME A Conner, Edward John '53
Hoyer, Mark Douglas '73
Jones, Cheryl A. '78
McBurnie, Jeffrey C. '82
MD A Armstrong, John Ernest '56
Chan, Louis A. '84
Hart, Edwin Flessner '68
Howard, John Edward '65
Piedrafita, James L. '78
Sabater, Juan Miguel '60
MD B Kanofsky, Hal Steven '70
Law Jr., Preston Eugene '60
McCracken, Richard Paul '70
Roberts, Victor David '64
Wamsley, Brian Woodrow '77
Williams Jr., Robert Bernard '66
Yourshaw, Sheryl Lynn '99
MD G Dickson, Brian Wayne '93
Hamilton, Patrick John '87
Kolley, Chester Michael '85
MA A Griffith, Rebecca Anne '91
Mangiarini, Christopher A. '96
Mitschang, George W. '65
Rotelli, Maryanne Camille '88
Zlotek, David Alan '69

- MA B Delagrange, Arthur Daniel '62
Ellison, William Theodore '68
Frassinelli, Guido Joseph '48
Flut, Anthony T. '00
Niessen, Charles William '62
Smith, Thomas L. '67
Thaller, David Ben '93
Weinstein, Roy Marshall '83
- MA A Cashman, William Francis '64
Ingalls, David P. '51
Poppole, Richard Elwood '58
Savage, Paul David '77
Simon, Henry John '60
- MA E Fernald, Wayne Douglas '70
Morse, Douglas H. '84
Sciartelli, Anthony Paul '86
- MA Z Vivaldi, Isadore Louis '52
- MA H Magoffin, Michael Andrew '88
Walsh, Edmund John '83
- MI A Beimers, Charles John '69
Cubitt, E. Duane '62
Lowry, Peter Alexander '60
Patterson, Garvin Wesley '69
Watanabe, Genji Torao '72
- MI B Bentley, James H. '57
Edquist, Carl E. '77
Glidden Jr., Harry James '65
Knutilla, Robert Lloyd '51
Plutchak, Raoul E. '62
Skaugen, Borg '63
Zollinger, Howard Allison '51
- MI I Atkinson, David Eugene '60
Davis, Robert Allan '81
Fox, Michael T. '73
Gerdes, Walter '58
Harris, Frederick Allan '64
Pace Jr., George Donald '61
Pulley, Craig Martin '78
Simons, Janet Lee '77
Van Zweden, John '68
Vaughn, Wayne Allen '73
Wilkes, James Osof '54
Zevallack, Michael Richard '71
- MI A Zalk, Chester Virgil '57
- MI E Billion, Godwin Paul '75
Cleary, Gary Kenneth '71
Yee, Kingman Ethan '77
- MI Z Gillham, Gregory V. '83
Harrison, Patrick Joseph '69
Lobkovich, Thomas Michael '83
- MI I Curry, Crystal Rae '83
Kantrow, Maryann '88
- MN A Tran, Binh Van '89
Wagemaker, Tom Robert '64
- MS A Carman Jr., Jack Baker '62
Gelman, Stephen '73
Hotard, Daniel Gerard '76
Tyner, Fred Mack '93
- MS B Bruchman, Mark '79
- MO A Adams, Charles R. '65
Fitzgibbon, Robert Joseph '87
Gardner, Roger William '63
- MO B Brewer, Lawrence Oliver '77
Dalton, Thomas J. '84
McDaniels, John Louis '60
Shank, Donald Russell '67
- MT B Erickson, Elizabeth Jeffery '93
NE A Claar, Stephen Beryl '73
Cowling, Edgar Charles '75
Moore, Thomas Paul '78
- NV A Van Horn, Michael David '76
- NH A Davis, Paul Fraser '76
Lof, Richard J. '71
Qualters, Kevin Robert '85
Zecchini, Charles Robert '50
- NJ A Lapicco, Jeffrey Allen '77
N B Colarusso Jr., Remo John '83
Dola, Steven '55
Peoples, Robert '63
Thompson, Peter Daniel '78
Wasiewicz, Richard A. '69
- NJ F Bodek, Edward Joseph '51
Cordes, Robert Gerhardt '48
Jacobson, Peter Christian '69
Morgan, Dennis Ross '68
Tubello, Jeffrey '76
- NJ A Gross, Gary Robert '80
Potts, Richard Gardner '64
- NY A Chaudhry, Sohail S. '74
Muller, John '00
NY B Gorey, Anthony George '84
Ragone, Louis John '56
NY I DiFenebacher, Robert Henry '59
Greaves, Charles Joseph '60
Harnden, Stuart B. '66
Levy, Michael David '89
Opshli, Richard Bernhard '53
Schon, Edward Alan '69
Smith, Charles Alan '81
- NY A Coughlin, Corey James '91
Funke, Richard Harrison '71
Greenfield, Michael Richard '78
Johnson, William Clifford '54
Kahn, Mindy S. '89
Logan, Joseph Skinner '56
Roseman, Ann Lynn '81
- NY E Dubey, Michael Bruce '47
Markowski, Thomas G. '65
- NY Z Young, Raymond Joseph '74
NY H Prager, Jay Martin '68
NY O Gronosky, Clifford Francis '58
Marvin, Payne Drew '80
Randall, Paul William '92
Ziki, Ann Louise '86
- NY I Berger, Jack Solomon '61
Philogene, Kenneth '81
Schwartz, Richard '57
Zwillenberg, Melvin Leslie '60
- NY K Curtis, John Ottawa '66
Muller-Girard Jr., Otto '89
Singer, Bart A. '82
NY A Ganetis, George L. '78
NY M Salmon, Roger O. '66
NY N Buran, Frank '87
Deckro, Richard Floyd '72
Feldman, Scott '75
Lauerman, Melvin Edwin '92
Uhl, Thomas John '84
NY E Machuca, Luis A. '69

SECOND CENTURY CLUB, CONTINUED

Rodriguez, Ernesto '85
Triano, Salvatore John '85
NY O Lumish, Stan '78
NY II Howles, Douglas '87
NY P Cortina, Thomas J. '76
NY P Hartman, Bill Martin Robert '83
Lau, Soon '85
Lubrano, Michael '80
NC A Cutchin IV, James McKenney '62
Trivette, Wendell Allison '82
ND A Engbrecht, James Richard '59
Lopez, Angel '65
Rieder, William G. '56
Seppanen, John Louis '86
Wieschmann, David Paul '85
OH A Drier, Delmar Waldemar '52
Hazen, Ramon B. '60
Herndon, Steven Bradford '79
Koch, Carl Conrad '59
Moorhead, Kenneth Wayne '50
Richenbacher, Wayne Edward '75
Zurilla, Ronald W. '61
OH B Bobinger, Robert O. '69
Bulcher, Thibault '76
Lockard, Chad William '01
Mayer, Robert Lawrence '69
OH F Kohls, Thomas Carl '81
Nodes, Scott Everett '84
Verner, William J. '58
OH E Boulter, Brian Thomas '91
Lemmers, Robert E. '82
OH Z Payne-Gibson, Pamela S. '84
OH Z Mowery, Thomas Troy '83
Spicer, Alvin L. '67
OH H Ball, James Allan '65
Manter, Joseph M. '74
Miller, William Gilbert '83
OH O Beck, Charles William '62
Centers, Robert E. '70
Kramer, Lawrence J. '62
Sero, Raymond James '67
OH I Muskoft, Terry Edward '67
OH K Stimler, Will C. Edward '83
OK A Brown, Leslie Wray '70
Duke, Chris '83
Dunn Jr., Robert Ovington '82
Swihart Jr., John Donald '59
Wright, Roger McClain '55
OK B Harper, Lois Marie '86
Strattan, Robert Dean '58
OK F Congram, Anthony Robert '81
Krause, Lester Eugene '56
Matson, John Andrew '02
PA A Flaherty, Robert E. '68
Groff, Ronald Parker '62
Haist, Randall Matthew '80
Jones, Donald Paul '65
Swartwout, John Baxter '73
PA B Cashdollar, Barron Hamilton '57
Crecraft, Harold E. '60
Hertnecky, John A. '79
McNair Jr., Irving Maxwell '54
Overbaugh, Thomas Michael '83
Pasko, Thomas Joseph '59
Thiem, Carl William '72
PA F Bolser, William Charles '69
Chang, Yue Cathy '00
Sack, John Stuart '75
Wierzbicki, Jeannette Marie '80
PA A Lewis, Timothy '64
PA E Dadey, Kathleen Ann '81
Huber, Joseph Fowler '68
PA Z Durant, David Paul '67
Schubelle III, Charles William '60
Wagner, William Andrew '89
PA H Fruci, Natale Andrew '55
Russell, J. Frank '74
PA O Lombardi, Charles G. '65
Pela, Karen Diane '84
PA I Lorenz, Bryen E. '76
PA K Pottloff, Robert Edward '56
Shield, Carol K. '84
PA A Anselm, Gregory Alan '81
Fitzpatrick, Anthony Ryan '03
PR A Rivera, Fernando Osvaldo '68
RI A Chorney, Paul '56
DiCamillo, Peter John '75
Townsend, James Courtland '60
RI B Burger, Laurie A. '76
James, Charles Franklin '58
SC A Esley S. Slade Forrest '72
Hill, James C. '61
Marley, Brian Lee '89
Wilson, Rick Lane '81
SC B Haggerty, N. Kent '72
Pendley, Howard A. '93
SC F Lightle, Ted L. '58
Wysoczek, Thomas John '53
SD A Beck, Carl William '83
McCourtie, Bonnie R. '80
TN A Conway, Tammy Kay '82
Fugatt, Ronald Newman '65
Harper, James Robert '63
Hutsell, Wilbur Riley '68
Kee, Bennie F. '71
Oliver, Edward Earl '66
Sheffey, David Wells '66
Valk, Anthony '86
White, Robert Stanley '48
Whitehead, John Carson '61
TN B Cook, George Edward '60
TN F Adams, John Anthony '63
TN A Luttmann, Lisa M. '82
Luttmann, Mark J. '82
TN E Climer, Charles Edward '82

\$o Ea\$y to Give \$tocks or Fund\$

Giving to Tau Beta Pi has become easier for those with Fidelity, Vanguard, and T. Rowe Price non IRA or 401k accounts.

We have established accounts with the above companies to facilitate the transfer of appreciated stocks or mutual funds directly from a donor's account.

Your tax deductible gift will equal the day's price of the stocks or fund shares and you realize no appreciated capital gains or administrative costs from the gift.

What could be easier? Thank you to Arno W. Brill, TX A '71, and Gerald E. Myers, AZ B '70, who suggested the idea and have recently made gifts to Tau Beta Pi through this method.

For more information, contact Pat McDaniel at pat@tbp.org or call 865-546-4578.

TN Z Carney, Terrance Magoun '56
TX A Anderson, John Eldon '57
Dolezalek, Donald Robert '65
Foerster, Paul Adolph '57
Kassler, Harlan Larry '91
Tedeschi, William John '84
Weirich, Robert E. '66
TX B Easterday, Mark Louis '84
Gates, Robert Douglas '72
Houston, Scott Lee '96
Moore, Bruce F. '47
Olson, Rebecca J. '75
TX F Turner, James Ward '76
TX A Balusek, David K. '82
Hartman, Daniel Bruce '78
Kunze, Glenn Ray '77
Murthy, Prahlad N. '92
TX E Ryan III, James Joseph '70
TX Z Terrell, Norman S. '72
TX H Benson, Marvin D. '79
Collins, Clyde Williams '69
Godwin, Albert Eugene '84
Hightower, Janice M. '67
Reid, Thomas Anthony '65
TX O Pearsall, Katherine June '71
Shearer, Mark D. '80
TX I Maguire, Daniel Myron '81
UT A Jarrell, Reese Patkin '79
Soss, David Albert '71
UT F Esplin, Robert Barton '04
VT B Clark, David Thomas '81
VA A Ashton, Michael D. '74
Bowen, Kelly George '82
Jacobs, Susan Ramsey '85
Mac Glashan, Donald Welton '57
Shirley, David Eugene '65
VA B Dettmerman, Robert Linwood '53
Haight, Roger Quentin '82
Maloney, Melissa Marie '90
Spangler, C. Leigh '82
Tacey, Charles Frederick '75
VA F Swats, Charles Frederick '74
VA A Bunch Jr., Jennings B. '50
WA A Grant, Patrick William '75
Miller, Steven Claude '72
Perrault, William Richard '59
Pizzano, Robert Carl '80
Schwam, Susan Elaine '88
WA B Myers, Richard Manu '80
WV A Amrhein-Cain, Wendy Ann '94
Easterling, William S. '81
WEEKLEY Jr., Gene Rolland '63
WV B Farmer, Harry Clayton '70
WI B Fedler, Richard Edward '65
Graef, Luther William '52
Simon, James Bernard '65
Smith, Thomas M. '60
Wolf, Thomas F. '59
WI A Palmer, Mark William '90
WY A Carroll Jr., William Edward '69

FOUNDERS CLUB
AL A Murray, Scott Blansit '69
Raney, Sonya Marie '94
AL B Ashcraft Jr., James Harold '78
Moyer, Robert E. '65
Pilleteri, Joseph '74
AZ A Dambro, Mark Richard '72
Gundrey, Lana Bellus '88
AR A McKinnie, Jane L. '84
Morris, Stacey O. '73
CA A Bocast, Donald Rocco '45
Florez, Valerie Province '99
CA F Bankovitch, Walter John '87
McCloskey, David James '58
Tedrow, James A. '70
CA A Grabowski, Eric Michael '91
Knopp, Gordon Leonard '55
Stottoline, Charles A. '61
Thorne, Douglas Boyd '61
Axt, Robert D. '66
Bienstock, Bernard Joel '68
Heitrigs, Philip Lawrence '84
CA Z Anderson, Sedric E. '56
Boessow, Daniel Sherwood '57
CA H Gerken, Gary Mark '11

Krebs, Mark Edward '88
Long, Robert Ritchey '84
KY B Gray, John H. '75
Flewer, Herman R. '63
LA A Lopez, James Bradley '82
Marble Jr., Bill Ernest '61
LA F Blanche, Brian James '87
Bowie Jr., Ralph Scott '73
Hammons, Robert William '78
LA A Falterman Jr., Gerald Joseph '89
ME A Hackett, John A. '59
Healy, Edwin David '59
Whitten, Donald L. '57
MD A Hanlein, Stuart Arman '60
Hartlove Jr., Charles L. '76
Hessener, Paul Bernhart '49
Yaffe, Barry Marshall '62
MD B Cascio, Horace Eugene '77
Heuckerth, Deborah May '88
Pendorf, Paul Wadsworth '62
MD F Miller, Brian Leigh '08
MA A Allen, Owen Franklin '54
Franke, Gene Louis '73
Goodhue, William Donald '71
Marcaccio, Mario John '80
MA B Adams, Robert William '64
Honigsberg, Charles Alan '52
Liepins, Atis A. '57
Torrielli, Luisa Kathleen '98
MA A Blesso, Thomas Neal '73
Trimble, David C. '60
MA E Blaney, James '72
Laios, Takis '78
MA Z Dance, Fran John '76
Whitney, Paul Vary '59
MA O Craven, McCharles Anthony '91
MI A Amar, Jack Joseph '73
Othmer, Hans George '65
MI B Kicinski, Stephen Edward '59
MI F Bittman, Thomas Warren '70
Hubbell, Thomas W. '71
Jackson, William Longstreth '70
Kreji, John C. '73
Lipford, Rocque Edward '60
Mitchell Jr., Frank John '60
Mohr, Dale '56
MI A Parker III, William Hooper '80
Williams, William B. '55
MI E Basberg, Choules Spencer '69
Bolgian, Giovanni '70
Smith, Glenn D. '62
MI Z Alderson, Bradley Robert '86
Holland, Gerald Willard '62
Miller, Gene H. '67
MI O Long, Michael C. '84
MI I Haupt, Eric Keith '84
Haupt, Shelby Elaine '85
MN A Cabak, Michael Richard '54
Jackels, Charles Frederick '68
Smits, Talivaldis Ivars '59
MS A Prewitt, Nathan Coleman '86
MO A Weidinger, Robert Phillip '61
MO B Diemer, Charles Eugene '63
Hord, William Eugene '59
White, Kimberly Elizabeth '94
MT A Johnson, Andrew Edward '50
Kujawa, Stephan T. '73
NE A Scott, Stanley S. '53
NV B Vodrazka Sr., Walter C. '55
NH A Hewes, Robert Pennell '86
NJ A Dardis, Joseph '64
Maudulis, Alexandros '40
Newton, Thomas Joseph '58
NJ B Forster, Ronald G. N. '92
Holls, Robert Emil '62
Rocca, Jeffrey J. '78
NJ F Kasuba, Peter Francis '65
Kuchner, Robert Andrew '69
Reznak, Frederick John '69
Richardson III, Frederick Jones '75
Romash, Joseph William '69
NJ A Chen, Ephraim Jonathan '09
Kovatch, George '55
Wise, Frank W. '80
NM B Applegate, Charles Lewis '01
Olson, Eric Edward '98
NY A Spring, Peter Gordon '68
NY F Hiestand, James W. '65
NY A Sawchuk, John Andrew '71
NY E Gallo, Santo Vincent '72
Lemp, Ronald Alan '73
NY H Ucci, Donald R. '79
Wolf, Murray '48
NY O Buyck, Wesley John '55
NY I Brand, Alfred H. '67
Talts, Rudolph V. '68
NY K Cohn, Brian David '80
NY M Charlton, John William '62
Griggs, Francis E. '56
NY E Cestaro, Ronald Gerald '61
NY O Fraine, David M. '76
NY P Likourezos, George '92
Marcovici, Janik '85
Schiafone, John M J '79
NY Z Votava, Ward Eugene '62
NC A Baldwin, Bruce Richard '92
NCP A Freeze, John Mark '85
ND B Snortland, Robert Kloster '57
OH A Churchman, Joseph Sailer '67
Rush, David Harry '51
OH B Abramowitz, Daniel Jason '05
Brunk, John Cortland '80
Werner, Lawrence W. '70
OH F Howe, James Gavin '87

Stambolis, James Nicholas '70
Yates, Glen Bernard '52
OH A Essman, Joseph Edward '57
OH E Hamilton, Thomas David '59
Rackfield, Thomas Joseph '51
OH Z Jones, Barbara L. '82
OH H Bailey, William Francis '76
Choi, Maxwell Michael '91
Hannan, Shawn Michael '95
Housip, Constantine Harry '47
Regulinski, Thaddeus L. '50
OH O Hartings, James Wilfred '71
OH I Williams, David John '52
OH A Mayoras Jr., Richard C. '89
Weber, Donald William '90
OK A Hoffman, Keith Ward '75
Kahler, Jon Paul '70
OK F Chen, Daniel Hao '81
PA A Bachman, Dale Franklin '56
Lewanda, David Benjamin '02
Sind, Fred Paul '56
Tretter, Alexandra Fatula '80
PA B Fairchild, James William '81
Fairchild, Cindy Ann '82
Harper, Kenneth Lee '74
Hemler, Robert Joseph '70
Mathason, Brian Keith '92
Matalack, James L. '84
Okrent, Scott '00
Reinsnyder, Jeffrey Wayne '80
PA F Chong, Jike '01
Flaminio, Herman '62
Poleka, Allen Jack '71
PA A Berger, Bruce Sutton '54
Lucas, Jay Philip '69
PA E Manoway, Dina Marie '83
Pudliner, James David '76
Schenck, Arthur Jacob '73
PA Z Markau, David B. '84
Schey, Donald '61
Weiermillner, Eugene '68
PA O Hinkle, John Lawrence '60
McMahon, Robert William A. '63
PA I Martelli, Phil Joseph '85
PR A Negron Rivera, Dennis A. '13
Mohr, Jose R. '84
Vega-Montijo, Madeline '01
RI B Castro, Mark Y. '83
SC A Dowd III, H. '85
Dowd, Catherine Claremont '85
SC B Davis, Charles M. '58
Hendricks, Irvine H. '62
SC F Hess, Douglas R. '76
Shuler III, Hubert L. '77
Tomasiak, Donald Martin '77
TN A Broome, Joseph C. '65
Rowland, Jon Devlin '06
Straker, Edward Albert '60
TN B Aya, Will Gabriel '69
TN F Moon, William Tom '61
TN E Dodson, Gregory Austin '77
TX A Hajousky, Robert '63
Hodges, Walter Wayne '53
Melton, Bobby Curry '56
Persyn, Steve Gus '71
Reynolds, A-Lan Van Hornlein '91
Shields, David Ray '00
TX B Baker Jr., Marvin Elroy '86
Reinking, Greg Franklin '84
TX F Wolfram Jr., William Robert '68
TX A Langford, Thomas Ray '81
TX Z Crum, Floyd Maxilas '47
TX K Smith, Earl Barnett '94
UT A Forbes, Charles Robins '49
Kelley, Brenton Collier '89
Milligan, Thomas Allen '95
TYL A Rowland, William C. '77
VT B Van Domelen, John Francis '64
Zampieri, Robert P. '63
VA A Griffin Jr., Joseph Howerton '71
Griffith, Douglas Gene '61
Joki, James Anthony '80
Loucks, Steven Jay '64
VA B Arntson, Stephen Garrigan '64
Blanton, John C. '76
Shepherd, Andrea Louise '89
VA F Pronko, Mark Steven '81
WA B Galligan, William L. '52
Gimera, Michael '89
Nelson, Bruce Lee '54
Owens, William Leo '53
WV A Means, Kenneth Harvey '63
WV B Bennett, Chris John '06
Cox, William Keith '62
Mason, Michael Edward '73
WI A Anderson Jr., George James '48
WI B Black, Jennifer A. '01
Gawlik, Michal Andrew '14
Mueller, Gregory John '68
WI E Eichman, Donald Gerald '06

**In Grateful
Appreciation
of Member-
Contributors**

Special Gifts

Special gifts were received in memory of William B. Goldrick, IN A '58, from his son, Lloyd Goldrick; Mallory D. Ivanowsky, VT B '10, from Daniel T. Kruusmagi, CA H '12; John R. Luchini, Ph.D., P.E., MI F '71, from his daughter, Katy Luchini-Colby, Ph.D., MI A '99 and her husband, Dirk J. Colby, Ph.D., MI A '06; Lowell B. Mason Jr., IN A '48, from his wife, Elizabeth; Mace T. Miyasaki, MD A '60, from Stuart L. Hanlein, MD A '60; Bernard L. Pfefer, IL A '47, made a gift in memory of his wife, Rozalia. Bill Dickson, TBII T Administrator, made a gift to the Association.

MEMBER-CONTRIBUTORS, CONTINUED

AL	King, Timothy Yann '85 Novak, Thomas '75	IL	Papierski, Paul Eugene '82 Uhalt Jr., Alfred Hunt '58 Wenzel, Kevin Wayne '84	MI	Vredeveld, Donald Richard '53 Carlson, Linda Elaine '70 Elias, Lynda Ann '85	NY	Dristy, Mark Edward '85 Watkins, Matthew Ace '05 Radzivila, Raymond '49	RI	Muniz-Alfonso, Michael '02 Pagan, Francisco A. '98 Rodriguez Arce, Idalys '02		
AL	Sharp, Gary Allen '93	IL	B Hausser, Alec '81	MI	Fancher, Paul Strimple '53 Hozak, Norman Lee '59 Kuball, Elmer Franz '88	NY	Jayasekera, Shehan B. Shehan '16 Kajfasz, Gregory John '05 Shuford Jr., G. E. '65	RI	A Schwartz, Bradley Dean '77 B Palmer, Robert Perry '59		
AL	Ingersoll, Dale Marvin '15	IL	Hayward, Christopher Bryan '87 Parks, Robert Franz '88	MI	Petrosian, Boghos '82	NC	A Shuford Jr., G. E. '65	SC	A Spangenberg, Gerhard Dieter '76 Waddington, David Mark '84		
AZ	Crede, Donald E. '64 Finfrack, John William '04 Higbie, John Jacob '59 Pratt, Roger Davison '67 Riordan, Walter Carl '80	IL	Staschke, Ralph Arthur '50 Lieske, John Charles '82 Nakashige, Jan Yoshio '71	MI	A Hoban, Thomas William '60 Z Charzanowski, Michael John '90 Haehl, Clayton Wallace '69	NC	Bhanpuri, Nasir Husain '06 Russell Jr., Parvin Masters '57 Austin Jr., Billy Willis '86 Connelly, Donald P. '64	SD	A Weinacht, Daniel Joseph '84 SD B Gamble, Brice Gordon '53 Oster, Zachary James '07		
AZ	B Gembrowski, Charles Jerry '74 Smith, Kathryn Anne '84	IL	E Perez, Ivan Alejandro '12 Z Navarro, Robert W. '87	MI	H Rogers, Zack Adam '16 MN A Lefebvre, Molly Ann '11 MS A Barton, Michael Wade '12	ND	A Eiken, Dwight Carmen '73 Flegel, Mayo Frederick '62 Horlacher Jr., Alfred E. '75	TN	A Griffith, Linuel Hoyt '57 TN F Woods, George Richard '83 TX A Briggs, George Strickland '61		
AR	A Garrison, Thomas Frederick '05	IN	A Address, Keith Michael '84 Bissey, Stanley Ellis '65 Glenn, Richard Allen '49 Hall, Robert Gordon '58 Haney, Barbara Blake '79 Ichikawa, Ralph M. '57 Kruse, Alexander Sherman '08 Mendelson, Robert M. '47 Rehm, Ronald George '60 Smit, Harald Jean '88 Tarjan, Peter Paul '59 Thorndell, Richard Earl '64 Trickle, Chris Michael '13	MO	Sims, Thomas Randall '79 MO A Hawes, David E. '86 MO B Kuhn, Carol Elizabeth '62 MO F Moerner, William Esco '75 Prothro, Scott W. '85 Schroeder, Nathan Edward '82 MO E George, John A. '55 Kranz, Gene F. '54	ND	B Christianson, Eric Lloyd '79 OH A Lepley, Allen E. '50 OH B Korner, David Scott '73 Lynch III, Thomas Joseph '72 Zerkle, Ronald Dale '60	TX	F Lange, Elaine Austin '76 O'Rear III, Edgar Allen '75 South, Hugh Miles '71 TX A Davis, Forrest Clifton '76 Hall, Charles L. '72 Hunt, Julia Ann '84 Johnson, Max Edward '90 Kunz, Katherine L. '80 Mask, Russell Lane '71 McIver, Jes David '51 Patton Jr., Robert Lyle '57 Pensock Jr., Edward Peter '83 Woodall, Harold Wayne '71		
CA	A Embree, Guy Weston '44 Paoli, Richard John '62 Wade, Wallace O. '62	IN	A Buzard, Carol J. '82 Conness, Kent M. '78 Doty, Michael J. '96 Mickle, Matthew Scott '89 Philbin, Jeffrey Stephen '64	MO	Wagner, Michael William '77 NJ B Catovic, Abir A. '89 Gandhi, Arpit K. '07 Loh, Andrew '90 Lynch, John Francis '77 Ruopp, John A. '70	OH	E Amtsberg, Donald Gordon '51 Contofalsky, Douglas Edward '77 OH Z Musch Jr., Kenneth William '70 OH Ø Baylog, John Gerard '75 De Jaco, Norbert Francis '62 Glasgo, Brock Philip '10 OH I Chelmins, David Thomas '08 Lehnert, Andrew B. '63 Snyder, Sharon E. '09 OH K Pritchard, Minnie Catherine '55 OH A Stevens, Charles A. '58 OH M Linck, Tristan August '16 OK A Weeks, Albert Parker '62 OK F Goodin II, J. Riley '80 OR A Ford, Neil Ichiro '07 Hawke, Stephen R. '71	TX	E Blaschke, David Robert '69 TX H Brant, Kelly Miller '88 Koberlein, Roger Earl '78 Koberlein, David Eliot '97 TX A Pizana Jr., Robert '93 UT B Alley, Lynn David '81 Bracken, Allen T. '78 Rathke, Lane E. '89 VT A White, Janine L. '03 VA A Colen, Rodney B. '83 Hughes, Arthur Dadmum '49 Myers, Griffin Kyle '00 Smith, Robert Kyle '68 Wood II, Richard Kenneth '83		
CA	H Cox, Michael James '12 Di Biase, Debra Ann '86 McVeigh, Benoit Alexander '84	IN	A Bridges, Harold Ray '65 Doyle, Kevin Richard '71 KS A Batchman, Theodore E. '62 Harrison, Dwight Harwood '55 Lindquist, Will David '02 LA A Wolf, Henry Bernardo '67 LA F Kareh, Ahmad Ragheb '85 LA A Armentor, Bette L. '80 Costa, Eduardo C. '60	MO	A Martin, James P. '70 ME A Verrill, Christopher Lee '85 MD A Brannon, Brian Gregory '01 Ulanowicz, Robert E. '64 MD B Dorenfeld, Alan S. '67 MA A Levesque, Allen Henry '59 Marotta, Alison L. '16 Melanson, Vanessa Rose '01 Nolan Jr., James Patrick '16	NJ	F Gallagher, Thomas P. '90 Kennedy, Peter Dean '49 NJ A Lugannani, James C. '81 NM A Swift, Theresa Janine '89 NM B Luna, Larry Leo '90 NY A Markowitz, Morton '68 NY B Leader, Margaret Ellen '85 NY F Gross, Philip Murray '62 Harris, Robert Philip '74 Jacobson, Matt '14 Kehoe, Timothy Wayne '83 Sweringen, Randy Stuart '87 Wissick, William Paul '59	PA	A Granata, Dianne Marie '82 Waite Jr., Robert Francis '91 PA B Gray, Kevin Troy '85 Willis Jr., Max Stephan '53 PA F Brown, Patrick Marvin '14 Dzombak, David Adam '79 Fisher, Arthur Douglas '74 Leong, Tian Seng '10 Seaverson, Erin R. '00 PA E Baldoni Jr., Eugene '49 Fennell, William '70 Johnson, Floyd Charles '49 Phillipp, Ronald Emerson '54 Purdy III, Herbert W. '59	TX	E Blaskie, David Robert '69 TX H Brant, Kelly Miller '88 Koberlein, Roger Earl '78 Koberlein, David Eliot '97 TX A Pizana Jr., Robert '93 UT B Alley, Lynn David '81 Bracken, Allen T. '78 Rathke, Lane E. '89 VT A White, Janine L. '03 VA A Colen, Rodney B. '83 Hughes, Arthur Dadmum '49 Myers, Griffin Kyle '00 Smith, Robert Kyle '68 Wood II, Richard Kenneth '83
CA	Ø Boyd, Duane '72 K Smerk, Matthew Emerson '06 CA A Shaffer, Scott J. '84 CA N Jimenez, Ramon '95 Khacherian, Todd Lance '86 CA E Alcorn, Donald James '94 CA Ø Wong, Peter '78 CA T Kinsey, Tim Robert '16 CA Y Radimsky, Anne-Louise G. '63 CO B Greger, Leonard Robert '44 Kraft, Virgil Don '55 CT A Nixon, Walter B. '52 CT B Anderson, David K. '82 Crose, David Frederic '05 Daumais, Derek Edward '97 Hudson, Elizabeth Anne '80	IN	A Bart, Stephen F. '82 Knibbe, Todd Eric '91 Lu, Nancy Bui '16 Lyons, Gerald Edward '51 Marshall, James Louis '49 Moyer, Ilan E. '08 Tarpgaard, Peter T. '68 MA E Dow, Benjamin L. '88 MA H Nikolayeva, Olga '05 MA I Perley, Dave Eugene '11 MI A Braze, Ross D. '52 MI B Anderson, Richard O. '71 Schmitz, Eugene Joseph '52	NY	H Koss, Leonard Louis '66 NY Ø Jacobson, Geoffrey Lee '76 Schumacher, Nick W. '16 Walczak, Brian G. '14 NY I Kramer, Gordon '59 Levitsky, Myron '51 Mullan, Philip Joseph '57 NY A Glenbocki, Alexander Joseph '70 NY M Bresney, Scott Michael '05 NY N Coates, Donald Andrew '64	PA	Z Freed, Robert Lloyd '73 Laukatis, John F. '50 PA H Guy, Wayne Mark '69 Zahn, Taylor Jordan '14 PA I McClellan, Karl R. '80 Mulkern, Kevin Michael '79 PA K D'Annunzio, David Joseph '12 PA A Matey, John Gerald '78 PR A Burgos-Rubio, Concepcion N. '89 Cortes, Pedro Javier '98	TX	E Blaskie, David Robert '69 TX H Brant, Kelly Miller '88 Koberlein, Roger Earl '78 Koberlein, David Eliot '97 TX A Pizana Jr., Robert '93 UT B Alley, Lynn David '81 Bracken, Allen T. '78 Rathke, Lane E. '89 VT A White, Janine L. '03 VA A Colen, Rodney B. '83 Hughes, Arthur Dadmum '49 Myers, Griffin Kyle '00 Smith, Robert Kyle '68 Wood II, Richard Kenneth '83		
CA	Ø Wong, Peter '78 CA T Kinsey, Tim Robert '16 CA Y Radimsky, Anne-Louise G. '63 CO B Greger, Leonard Robert '44 Kraft, Virgil Don '55 CT A Nixon, Walter B. '52 CT B Anderson, David K. '82 Crose, David Frederic '05 Daumais, Derek Edward '97 Hudson, Elizabeth Anne '80	IN	A Bart, Stephen F. '82 Knibbe, Todd Eric '91 Lu, Nancy Bui '16 Lyons, Gerald Edward '51 Marshall, James Louis '49 Moyer, Ilan E. '08 Tarpgaard, Peter T. '68 MA E Dow, Benjamin L. '88 MA H Nikolayeva, Olga '05 MA I Perley, Dave Eugene '11 MI A Braze, Ross D. '52 MI B Anderson, Richard O. '71 Schmitz, Eugene Joseph '52	NY	H Koss, Leonard Louis '66 NY Ø Jacobson, Geoffrey Lee '76 Schumacher, Nick W. '16 Walczak, Brian G. '14 NY I Kramer, Gordon '59 Levitsky, Myron '51 Mullan, Philip Joseph '57 NY A Glenbocki, Alexander Joseph '70 NY M Bresney, Scott Michael '05 NY N Coates, Donald Andrew '64	PA	Z Freed, Robert Lloyd '73 Laukatis, John F. '50 PA H Guy, Wayne Mark '69 Zahn, Taylor Jordan '14 PA I McClellan, Karl R. '80 Mulkern, Kevin Michael '79 PA K D'Annunzio, David Joseph '12 PA A Matey, John Gerald '78 PR A Burgos-Rubio, Concepcion N. '89 Cortes, Pedro Javier '98	TX	E Blaskie, David Robert '69 TX H Brant, Kelly Miller '88 Koberlein, Roger Earl '78 Koberlein, David Eliot '97 TX A Pizana Jr., Robert '93 UT B Alley, Lynn David '81 Bracken, Allen T. '78 Rathke, Lane E. '89 VT A White, Janine L. '03 VA A Colen, Rodney B. '83 Hughes, Arthur Dadmum '49 Myers, Griffin Kyle '00 Smith, Robert Kyle '68 Wood II, Richard Kenneth '83		

Lyle's Latest Law

the heritage society

The Heritage Society was created to recognize those who include Tau Beta Pi in their estate plans. Becoming a member can help the Association achieve its mission. For more information, call Pat McDaniel at 865-546-4578 or visit www.tbp.org/giving.cfm

“Tau Beta Pi has been very important to me from the time of my induction in 1960 to the present. It embodies the 4 E's that have been the focus of my professional career: Engineering, Education, Excellence and Ethics. As such, it has provided inspiration and incentive to thousands of engineering students and alumni and funded hundreds of graduate fellowships. Recognizing that the good things done by Tau Beta Pi require money, Dorothy and I have supported the Society financially as we have been able. We also saw the opportunity to continue our support after we are gone by including Tau Beta Pi as a beneficiary in our wills. It is gratifying to know that the Society will continue its work well into the future and that our legacy will help it to do so.”

Lyle's Law creator and frequent contributor to The Bent, Lyle D. Feisel, Ph.D., P.E. (Ret.), Iowa Alpha '61, is dean emeritus of the school of engineering and applied science at SUNY at Binghamton. His new series Why Do We Call it a...? appears each Summer and Winter.



Lyle and Dorothy during a visit to the ancient Moroccan city of Fez.

Executive Director's Report

By: **Curtis D. Gomulinski**, Michigan Epsilon '01



Members of the California Psi Chapter grab a photo together following their annual officers' retreat. Photo Courtesy of Tejas R. Gopal, CA Ψ'19.

OVERALL, the year 2016-17 was excellent in nearly every respect, and the trust investments reached record levels. Support by alumni through volunteer efforts and annual contributions was excellent, while corporate and university financial support of the Convention and *The Bent* remained high. The 4th annual Tau Beta Pi Day was held on March 14. Over 100 collegiate and alumni chapters again held events in conjunction with the celebration. Over 10,500 members now receive *The Bent* electronically which is an increase of 4,700 members over last year. Interest in maintaining a relationship or reconnecting with the Association continued to be strong with hundreds of members attending conferences and alumni events.

CHAPTERS

The 2016 Convention granted a charter to Brigham Young University-Idaho, formally installed as Idaho Delta on March 4, 2017. An article about the installation was published in the Summer 2017 issue of *The Bent*.

An inspection committee visited the Oregon Institute of Technology in February, and a petition from this

school will be considered by the 2017 Convention. No additional petitions for new chapters were received.

One alumni chapter was chartered (North Texas in the Dallas-Ft. Worth area), one was reactivated (Milwaukee, WI, area), and Southern California went inactive; 41 of 74 alumni chapters are active.

A total of 229 collegiate chapters (also 229 in 2016) completed annual surveys that listed approximately 1,363 projects. A report on the contents of the survey will be published in the November 2017 issue of *The Bulletin*.

MEMBERSHIP

The chapters initiated 9,842 members in 2016-17, negligibly down from last year and the fourth highest in the past 25 years. This included 9,427 undergraduates, 323 graduate students, 51 alumni, and 41 eminent engineers. Tau Beta Pi's initiated membership on July 31, 2017, was 583,540, and an estimated 65,000 are deceased.

During the year, about 48,000 engineering students in the 246 TBP chapter schools were scholastically eligible for membership in the top fifth of their senior or the top eighth of their junior classes. About 33% of these were members of TBPI at the

close of the year—the same as last year. About 3% were not initiated, chiefly because of their chapters' failure to hold spring ceremonies. The remaining 64% indicated a lack of interest in membership, down from 66% last year.

Tau Beta Pi chapter schools graduate about 94% of all B.S. engineers at 429 schools with ABET EAC-accredited programs and six schools without accreditation. Twenty-nine chapters held only one election and initiation of new members, one school did not conduct an initiation, and all others held two or more. Five chapters held an initiation without approval. Four members resigned during the year, and none were expelled.

CONVENTION

The 111th Convention was held October 6-8, 2016, in San Diego with the Greater San Diego Alumni Chapter and California XI, Psi, and Alpha Epsilon as hosts. The meeting was fully reported in the Winter 2017 issue of *The Bent* and the November 2016 issue of *The Bulletin*. The 2017 Convention will be hosted by the Ann Arbor Area Alumni Chapter and Michigan Gamma in Ann Arbor and Dearborn.

The 2016 Convention: authorized the Executive Council to amend the Articles of Incorporation to meet Federal, State, and IRS regulations; approved one bylaw change to allow partial-term fellowships and a package of amendments to the Constitution to set the size of the Executive Council, clarify when a Council member can be re-elected, and refined the nomination and election process, which was ratified by the chapters and reported in the Winter 2017 issue of *The Bent*; reviewed the status report regarding the general revision to the Constitution and Bylaws and made suggestions for improvement; increased the allowed reimbursement rate for en-route breakfasts for the 2017 Convention and left the other

rates at the levels set for the 2016 Convention; allowed a special reimbursement of child care expenses for a delegate; approved a special accommodation for a sign language interpreter to attend the model initiation for a student member; accepted the invitation from Colorado Alpha, Beta, and Epsilon and the Front Range Alumni Chapter to host the 2018 Convention; accepted the invitation from Ohio Gamma to host the 2019 Convention in Columbus; provided recommendations to enhance the Engineering Futures Program; granted four curriculum appeals; modified the terms of current Executive Councillors to align with the new Council structure approved in 2015; elected three new members of the Executive Council; and made several recommendations to the Executive Council for further study.

OFFICIALS

The TBPI Executive Council with term expirations includes Treasurer A.J. Passman and President N. Pih (2017); Councillor J.P. Blackford, Vice President S.L.R. Holl, and Secretary G.J. Morales (2018); and Councillors W.B. Paugh, G. Youssef, and M. Youssef. Council meetings were held on Aug. 18, Sep. 2 & 15, Oct. 5 & 20, Nov. 17, and Dec. 2-3 & 15, 2016, and Jan. 19, Feb. 16, Mar. 18-19, Apr. 20, May 18, and June 3-4, & 15, 2017. Tau Beta Pi has five appointed directors with responsibilities in major areas of its interest: K.L. Colbry as Director of Engineering Futures, E.J. D'Avignon as Director of Rituals, T.E. Gomulinski as Director of Alumni Affairs, K.J. Hammar as Director of the District Program, and S.J. Steadman as Director of Fellowships. Members of the Fellowship Board include C.W. Caldwell, M.M. Darrow, S.C. Dao, and R.E. Efimba. The Trust Advisory Committee, which directs investment activities of the corporate trustee, includes R.F. Smith (chair), H.W. Lange, and J.W. Johnson Jr.

District Directors and Engineering Futures Facilitators as of July 31 are to the upper-right.

The International Headquarters staff, which is located on the Knoxville campus of the University of Tennessee, includes members Executive Director C.D. Gomulinski,

District Directors

District 1	Haley H. Smestad Lauren J. Swett	Stacey L. Forkner Thomas F. Schaub Jr.
District 2	Anthony M. Olenik Thomas A. Pinkham IV Jason Rogan Lara L. Spinelli	District 9 K. Cody Johnson Raymond P. LeBeau Will D. Lindquist
District 3	Justin M. Glasgow Christopher C. McComb Jon M. Sonsteby	District 10 Madison R. Herman Gary L. O'Day Jr. Jose E. Suarez
District 4	Edward P. Gorzkowski III Melissa L. Morris Michelle Nanney Russell L. Werneth	District 11 Christina M. Harrison James C. Hill
District 5	David J. Cowan Jr. Josuan Hilerio-Sanchez Meghan C. Ferrall-Fairbanks	District 12 George K. Miyata Gregory M. Newcomb Matthew T. Pittard
District 6	Laura M. Martin Crystal L. McCartney Ellen S. Styles	District 13 Jeffrey G. Dabbling Allen D. Erickson C. Christopher Stemple
District 7	Timothy D. Anderson Michael J. Hand III Warren C. Roos	District 14 Ian J. Frank Janette A. Keiser
District 8	Bruce A. DeVantier	District 15 Aaron R. Alpert Daniel T. Kruusmagi Christopher W. Potts
		District 16 Neal T. Bussett Sam Rokni Stacey H. Ross

Engineering Futures Facilitators

District 1	Stephen Kramer James P. Sandman	District 9 Matthew W. Ohland Michael D. Czebatul
District 2	Annette M. Brenner Andrea J. Pinkus	District 10 Timothy J.F. Luchini Dennis J. Tyner
District 4	Joseph P. Blackford Cathy G. Gorzkowski Richard Della Rovere Dennis A. Negron Rivera Angadbir S. Sabherwal	District 12 Stewart R. Baskin Nancy F. Gray Kirstie T. Weimer
District 5	Vanessa A. Bechtold Andrew K. Lloyd	District 13 Wayne B. Paugh William P. Cleveland
District 6	R. Tracy Choat Wendy A. Harper Ellen S. Styles	District 14 Cheryl Cheng Diana Hasegan Felipe A. Leon Julia M. Nolan
District 7	Y. Andy Boucher Dirk J. Colbry	District 15 Yue C. Chang Stephan L. King-Monroe
District 8	Steven P. DeCabooter	District 16 Scott V. Eckersall

Director of Chapter Programs R.E. Hawks, Major Gifts Officer S.D. Jennings-King, and twelve additional employees (see *tbp.org*).

AWARDS

Tau Beta Pi's top chapter prize, the R.C. Matthews Outstanding Chapter Award, was bestowed on District of Columbia Alpha for the excellence of its total program in 2016-17. An honorable mention went to Alabama Epsilon. The R.H. Nagel Most Improved Chapter Award was given to Wisconsin Alpha; honorable mentions went to Maryland Delta and Vermont Beta. J.D. Froula Most Improved Membership honors were

extended to North Carolina Gamma; honorable mentions were presented to California Upsilon and North Dakota Alpha.

The Headquarters staff gave 33 Chapter Excellence Awards (successor to the Secretary's Commendation and the Membership Award) to chapters for high quality reporting, excellent chapter operations, and a commitment to improving initiation rates. Chapter Project Awards were presented to 35 chapters for ingenuity and creativity in activities.

MEMBER AWARDS

The 2017 Outstanding Advisor was selected by a committee of an engineering dean and two past winners:

W.T. Davis, Ph.D., (chair); E.A. Stephan, Ph.D.; and B.L. Walcott, Ph.D. The recipient of a \$1,000 cash award and an equal sum to be presented to his dean's discretionary fund is LeVern W. Faidley, Ph.D. *IA A '67*, Iowa Alpha's Chief Advisor. [See page 11.]

The alumnus recognition selection committee consists of three District Directors: G.K. Miyata (chair), E.P. Gorzkowski III, Ph.D., and M.C. Ferrall-Fairbanks. They were charged with selecting the recipients of the TBP-McDonald Mentor Award and the Distinguished Alumnus Award. The 2017 TBP-McDonald Mentor will be presented to Daniel F. Dolan, Ph.D., *MN A '70*. The 2017 Distinguished Alumnus Awards will be presented to Lilia A. Abron, Ph.D., P.E., *DC A '68*; Terry D. Olberding, *TN A '78*; Donald T. "Tom" Scholz, *MA B '69*; and Charles E. Sukup, P.E., *IA A '76*. [See pages 10, 12-13.]

The 2017 Laureates were selected by a committee of three District Directors: A.M. Olenik (chair), J.A. Keiser, P.E., J.D., and J. Hilerio-Sanchez. They chose three Laureates from ten nominees made by ten chapters. The 2017 Laureates are Kasey M. Cooper, *AL A '18*; Kevin Fraser, *NC G '17*; and Simone M.M. Stanley, *DC A '17*. [See pages 14-15.]

During the year, the Executive Council gave 7 Resolutions of Appreciation, 14 Distinguished Service Awards, and 1 Superior Service Award to collegiate chapter advisors and Association Officials for service to TBP.

Top 10 Fellowship and Scholarship Funds by Value on July 31, 2017		
Fund	2016	2017
Record Scholar./Fellow. Fund	\$5,167,000	\$5,859,000
Stabile Scholarship Fund	\$4,269,000	\$4,840,000
TBP Fellowship Fund	\$1,944,000	\$2,290,000
Forge Scholarship Fund	\$513,000	\$585,000
Anderson Fellowship Fund	\$350,000	\$404,000
Dodson Scholar./Fellow. Fund	\$351,000	\$399,000
Stark Fellowship Fund	\$314,000	\$371,000
Best Fellowship Fund	\$284,000	\$336,000
Zimmerman Fellowship Fund	\$277,000	\$317,000
Forge Fellowship Fund	\$272,000	\$312,000

PROGRAMS

Sixteen districts held at least one conference last year and conducted meetings during the 2016 Convention, and directors visited many chapters during the year. The Directors and the Council cancelled the normal June 2017 meeting to reduce expenses.

ENGINEERING FUTURES

The Engineering Futures Program presented a total of 176 training sessions to 3,677 individuals by 32 volunteer facilitators to develop the leadership skills of student members during 2016-17. This award-winning program helps prepare engineering students for their careers by enhancing their overall personal effectiveness through interpersonal-skills and teamwork-development seminars.

FELLOWSHIPS

The 84th fellowship group, comprising 25 students, 24 with stipend, will do graduate work in 2017-18 and was announced in the Summer 2017 *Bent*. Fellows with stipends are paid cash grants of \$10,000 each.

GRANTS

The Council made a single grant under each of the Greater Interest in Government (GIG) and the Student Assistance Programs.

MINDSET PROGRAM

MindSET promotes efforts to support math and science programs that contribute to enhanced preparation of students in the K-12 system. More than 35 TBP chapters hosted hands-on activity sessions with local schools. At the close of the fiscal year, approximately 7,000 elementary, middle, and high school students had participated in MindSET sessions. In 2016-17, 13 grants totaling \$1,000 were issued to 8 chapters for MindSET projects. Nearly 30% of collegiate chapters report participating in K-12 and tutoring activities last year.

SCHOLARSHIPS

The 19th group of 271 TBP Scholars, who will complete their undergraduate engineering studies in 2017-18, are announced in this issue. [See page 28.] All Scholars receive a cash grant of \$1,000 or \$2,000 for their senior academic year. Since the program began in 1999, Tau Beta Pi has given and committed \$4,923,000 to 2,510 students.

In the TBP Chapter Performance Scholarship Program, \$8,500 in scholarships were available to students selected by 17 chapters.

Six \$1,000 scholarships were funded by the Society (for a 19-year total of 118) in 2017-18 for incoming freshman engineering students through the national program conducted by the Society of Automotive Engineers (SAE).

OTHER ACTIVITIES

Tau Beta Pi has maintained its affiliations with the American Association for the Advancement of Science and the Association of College Honor Societies and its association membership in the American Society for Engineering Education. The Executive Director is Tau Beta Pi's official representative to these organizations.

Tau Beta Pi partners with JobTarget to offer a web-based job board—The Best People—and maintains other valuable benefits for members. Over 5,000 jobs were posted on July 31.

The Association was a contributing society to DiscoverE 2017 (formerly National Engineers Week).

Tau Beta Pi will be a titanium sponsor and host a booth at the 2018 USA Science & Engineering Festival in Washington, DC. Approximately 365,000 people attended the April 2016 event which celebrated and promoted the STEM disciplines. The Association's booth featured an adaptation of an egg-drop activity.

Members of the Executive Council, Executive Director Gomulinski, and other Association Officials met with alumni at receptions and gatherings at 16 District Conferences and 15 other events held across the country.

Tau Beta Pi has maintained its classification under Section 501(c)(3) of the U.S. Internal Revenue Code as a tax-exempt, charitable and

educational, non-private organization and is exempt from sales tax in 16 states. Collegiate chapters are separately classified under Section 501(c)(7) of the code, except Michigan Gamma, which is classified under Section 501(c)(4).

FINANCES

The financial condition of TBPI at the close of the fiscal year was strengthened by substantial capital gains in the trust, and giving by alumni remained strong. Excess expense over revenue was \$4,065,000. Assets increased in 2016-17 by \$4,143,000 to a total of \$29,178,000.

FINANCIAL POSITION STATEMENT

The several named trust funds are commingled and invested under the jurisdiction of the TBPI Trust Advisory Committee. The trustee is the trust department of the PNC Bank in Cleveland, OH, and performed satisfactorily during the year.

Investment earnings of the funds, less trustee fees and including capital gains, are used for the purposes indicated by the fund titles: paying fellowship and scholarship stipends, paying for *Bent* magazines delivered to life subscribers, paying project grants to chapters in the MindSET and Greater Interest in Government Programs, supporting the Convention, and financing many useful activities of the collegiate chapters. A breakdown of the portion of the trust for each major program area is shown to the right. Overall, net earnings of the investments, including security sales and market gains, were 18.2%; the previous year's figure was -1.3%. Paid investment earnings were \$675,000; net investment market gains were \$3,567,000.

Securities held by the trustee on July 31, 2017, are carried at market value of \$26,966,000, an increase of 17.0% from the previous year, and comprise holdings in 15 non-overlapping, no-load mutual funds. Equity securities constituted 90% of the total trust funds.

The current liability in fellowships and scholarships is for those stipends committed in 2016-17 for payment in 2017-18 to student recipients. The 2017 Convention liability includes the assessments paid by new initiates during the year and \$39,000 in gifts from corpo-

rate and university sponsors. The deferred *Bent* subscription liability is for both annual subscriptions and the four-year subscriptions for new members included in the Association's initiation fee. The liability for delivering future magazines under four-year subscriptions is entered on the books at the time of initiation.

The decrease in *Bent* life subscription liability was countered by 64 new life subscribers. Life subscription fees are recorded as a liability because of the commitment against the annual earnings of those fees to pay for copies of *The Bent* to be delivered. This liability represents the total value of all life subscriptions in force on July 31, 2017, at their enrollment-fee prices, less an actuarial proportion of \$1,301,000 recognized as revenue since 2004. Upon the death of a life subscriber, their paid fees are transferred on the books to the Fellowship Fund and are reported as revenue.

The net assets of the Association increased by \$4,065,000 mainly due to the gain of value in the trust of \$3,927,000. A subsidiary report details the changes during the year in individual funds, which posted mixed results due to market volatility.

STATEMENT OF ACTIVITIES

Chapter and initiation fees (shown less *The Bent* subscription and Convention support) increased by

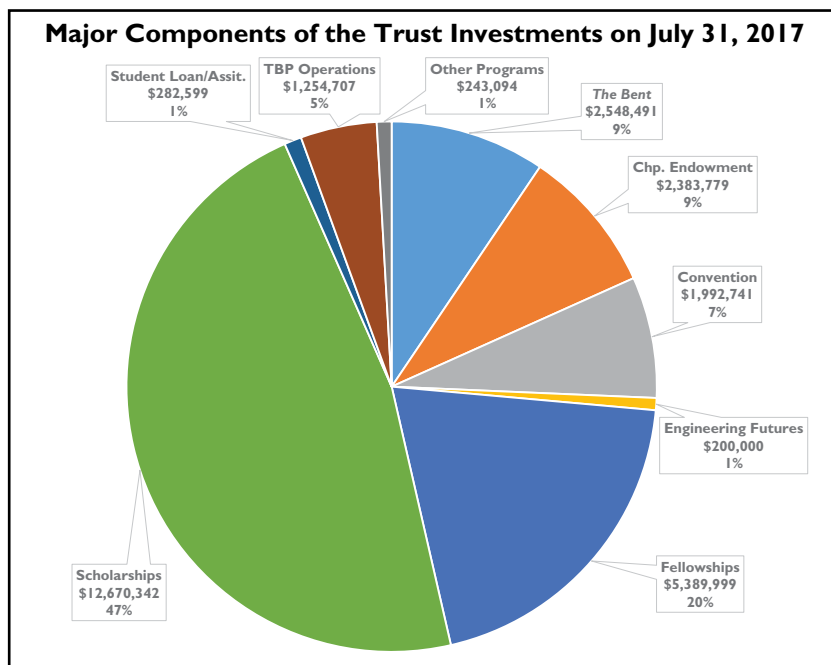
\$98,000 primarily due to the increased initiation fee of \$10 per new member.

Convention revenue consists of assessments for the 2016 Convention, \$64,000 in gifts, and \$116,000 from alternate delegates and visitors.

Bent publication revenue decreased by \$30,000 due to reduced recruitment advertising which was partially offset by the increased 4-year subscription price; expenses fell by \$26,000 due to more members switching to electronic delivery and lower advertising costs. Total investment earnings and market gain on the Life Subscription Fund increased by \$469,000. In 2016-17, the invested fund gained \$1.78 per life copy delivered, compared with the previous year's loss of \$0.14. Earnings per life copy exceeded expenses by \$0.84, versus last year's loss of \$1.14 per copy.

The total of interest and dividends in 2016-17 decreased by \$472,000. The net gain on investments was \$3,567,000 reflecting reported changes in market value.

The 11 major chapter programs (denoted with a (C) in front of their name under Expense) usually reflect an operating loss. Convention expenses rose by \$23,000 and include the cost of attendance by one student delegate from each collegiate chapter, alternate delegates, alumnus delegates, chapter advisors,



THE TAU BETA PI ASSOCIATION
STATEMENT OF FINANCIAL POSITION
 On July 31, 2016 and 2017

ASSETS

<i>Current Assets</i>	<i>2017</i>	<i>2016</i>
Cash and cash equivalents	\$ 738,939	\$ 665,426
Accounts receivable		
Chapters	91,935	91,523
Student loans	23,564	25,528
<i>Bent</i> life subscription installments	1,574	2,130
Pledges	177,500	152,336
Trust contributions	200,000	0
Other	12,375	21,220
<i>Total Receivables</i>	<u>506,948</u>	<u>292,737</u>
Inventory	54,577	43,518
Split-interest agreements, cur. portion	81,791	80,928
Prepaid expenses	36,008	76,190
<i>Total Current Assets</i>	<u>1,418,243</u>	<u>1,153,799</u>
<i>Depreciable: Furniture and equipment</i>	122,028	124,603
Less accumulated depreciation	<u>(112,068)</u>	<u>(111,790)</u>
<i>Total Depreciable</i>	9,961	12,813
<i>Other Assets</i>		
Investments	26,975,072	23,062,159
Split-interest agreement, net of cur. portion	<u>775,151</u>	<u>801,684</u>
	\$27,750,223	\$23,863,843
TOTAL ASSETS	\$29,178,426	\$25,035,456

LIABILITIES AND NET ASSETS

<i>Current Liabilities</i>	<i>2017</i>	<i>2016</i>
Accounts payable		
Chapters	\$ 0	\$ 1,815
Laureate awards	11,500	7,500
Fellowships/Scholarships	797,000	637,000
Other	10,834	72,863
Accrued expenses	56,751	58,405
Deferred Convention revenue	137,020	126,010
Deferred <i>Bent</i> revenue, current	100,371	105,294
Annuities payable, current portion	<u>19,037</u>	<u>19,037</u>
<i>Total Current Liabilities</i>	1,132,513	1,027,923
Deferred <i>Bent</i> subscription revenue	125,764	114,029
<i>The Bent</i> life subscriptions	1,126,723	1,159,991
Annuities payable, net of cur. portion	<u>84,475</u>	<u>89,735</u>
<i>Total Long-term Liabilities</i>	<u>1,336,962</u>	<u>1,363,755</u>
TOTAL LIABILITIES	2,469,475	2,391,678
<i>Net Assets</i>		
Unrestricted:		
Undesignated	533,232	471,820
Designated	8,381,261	7,388,759
Temporarily restricted	10,052,099	7,764,728
Permanently restricted	<u>7,742,359</u>	<u>7,018,471</u>
TOTAL NET ASSETS	<u>26,708,952</u>	<u>22,643,778</u>
TOTAL LIABILITIES & NET ASSETS	\$29,178,426	\$25,035,456

Financial statements have been audited.

and visitors—but not by Association Officials. Part of the increase reflects a more expensive Convention location, offset in part, by changes to reduce on-site expenses.

Expenses for fellowships and scholarships rose by \$172,000 because more scholarships and fellowships were given. Revenue for these awards includes matching gifts from corporations, alumni contributions specifically earmarked by donors, and trust earnings. Fellowships and scholarships comprise the major philanthropic program of the Society—made possible by gifts from alumni, friends, and participating corporate firms.

CONTRIBUTIONS FROM ALUMNI

Total contributions and bequests increased by \$489,000 during the fiscal year. An increased number of designated gifts and bequests for scholarships, fellowships, and the Chapter Endowment Initiative represent most of this increase. Tau Beta Pi's Annual Giving Campaign brought in gifts of \$1,148,000 (up 16.3%) from 10,052 donors (up 0.9%), including 553 new donors (up 21.3%). Their names were published in each issue

of *The Bent*. Included in the total is \$53,000 allocated to the Fellowship, Scholarship, and Engineering Futures Programs from 276 companies that match gifts from employees.

The Society was included as an eligible organization in the 2016 national Combined Federal Campaign (CFC) which brought in \$4,600 in gifts. TBI discontinued its affiliation with the CFC in 2017 due to increased expenses which would have negatively impacted the funds received from the campaign.

INITIATION FEES

Tau Beta Pi's low Association initiation fee covers the cost of the official badge, membership certificate, copies of the *Constitution and Bylaws* and *Information Book*, and a four-year subscription to *The Bent*. The initiation fee has been \$55 since August 1, 2016, and includes \$10 that is used for partial support of the annual Convention.

STUDENT LOANS

No new loans were made to members in 2016-17. Five loans were repaid, none were written off during the year, leaving 14 outstanding on

July 31, 2017, with a principal balance of \$23,564. Since inauguration in 1932 of the program, 1,802 loans have been made to student members for a total of \$898,000.

PUBLICATIONS

During 2016-17, the four issues of *The Bent* contained a total of 208 pages, and 397,000 copies were delivered to paid subscribers. This represents no change in paid copies above the previous year's circulation total. Engineering and graduate-school recruitment advertising for the year totaled 8.6 pages, a 36% decrease from the previous year. Total production cost of the magazine per paid copy was \$0.94, down from \$1.00 the preceding year.

New *Bent* life subscribers numbered 64 (down from 84), bringing total life subscriptions to 80,394. Of all the life subscribers enrolled since 1929 when the plan was instituted, 13,811 are deceased, and their fees totaling \$411,900 have been transferred to the Fellowship Fund in accord with the Constitutional requirement.

An average of 89 copies per issue

THE TAU BETA PI ASSOCIATION

STATEMENT OF ACTIVITIES

For the years ended July 31, 2016 and 2017

REVENUE	Unrestricted	Temporarily	Permanently	2017	2016
		Restricted	Restricted		
Initiation and chapter fees and fines	\$ 327,685			327,685	229,698
Chapter and individual sales	183,769			183,769	196,495
Contributions and bequests	1,247,838	338,623	749,557	2,336,018	1,847,037
Convention	278,674			278,674	265,026
Bent publication	171,567			171,567	201,334
Net life subscription fee transfer	37,983			37,983	23,895
Student loan interest	1,232			1,232	1,306
Miscellaneous/ Net gain on equipment sales	5,323	9,040		14,363	13,882
Interest and dividends	256,628	418,069		674,697	1,146,695
Net gain (loss) on investments	1,441,157	2,125,793		3,566,950	(1,415,132)
Change in value of split-interest agreements			(25,670)	(25,670)	(23,354)
Net assets released from restrictions	586,674	(586,674)	-	0	0
TOTAL REVENUE	4,538,531	2,304,851	723,887	7,567,269	2,486,702
EXPENSE					
Program services					
(C) Advisor Program	24,244			24,244	24,939
Alumni Program	78,835			78,835	70,028
Bent publication	372,819			372,819	398,879
(C) Bulletin production	20,613			20,613	20,323
(C) Chapter and initiate supplies	362,175			362,175	328,084
(C) Convention	652,025			652,025	628,955
(C) Cost of chapter and individual sales	147,285			147,285	158,887
(C) District Program	226,265			226,265	238,606
(C) Engineering Futures Program	143,127			143,127	156,647
Fellowship & Scholarship Program	867,495			867,495	695,134
(C) Greater Interest in Government Program	5,428			5,428	5,101
(C) K-12 MindSET Program	33,064			33,064	35,285
(C) Laureate Program	14,728			14,728	14,787
McDonald Mentor Program	5,820			5,820	6,260
(C) Student Assistance Program	4,132			4,132	2,161
Student Loan Program	6,682			6,682	6,131
Total program services	2,964,737			2,964,737	2,790,206
General and administrative	271,947			271,947	267,938
Alumni Giving Program	265,412	0	0	265,412	262,279
TOTAL EXPENSE	3,502,096			3,502,096	3,320,423
CHANGE IN NET ASSETS	1,036,435	2,304,851	723,887	4,065,174	(833,722)
Net assets, beginning of year	7,852,939	7,770,738	7,020,471	22,643,778	23,477,500
Net assets, end of year	\$8,897,014	10,069,579	7,742,359	26,708,952	22,643,778

Financial statements have been audited.

in 2016-17 was delivered to annual renewal subscribers, 38,160 copies to original four-year subscribers, and 61,008 copies to life subscribers, for a total of 99,257 paid copies per issue. The total number of paid copies for the Summer 2017 magazine was 99,571.

The Association is indebted to the alumni who serve as judges and writers of the Brain Ticklers column: H.G. McIlvried III, Ph.D. (chair), J.C. Rasbold, J.R. Stribling, Ph.D., and F.J. Tydeman.

THE BULLETIN

During 2016-17, the four issues

contained a total of 43 pages, and no copies were printed. All issues are available on the website. Published chiefly for sharing information with student members, officers, and advisors of the collegiate chapters, the newsletter is a valuable means of exchanging project ideas and distributing advice and guidelines related to chapter operations.

OTHER COMMUNICATIONS

New editions of the *Constitution and Bylaws and Eligibility Code* and the *Information Book* were printed in August 2016 and September 2015, respectively. Other bro-

chures and materials were updated and reprinted throughout the year.

Tau Beta Pi's presence on social media continued to increase. Over 28,800 members are part of our LinkedIn group, 890 people follow @taubetapi on Twitter, 4,100 people "like" TBPI and 400 people are in the "Tau Beta Pi for Members" group on Facebook, and over 5,000 people read our blog with daily news over 7,000 times last year. The website has received over 52.5 million visits since its creation and contains a wealth of operational and historical information about the Society. Visit tbp.org to find the latest TBPI news!



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 email or write the Editor for additional facts (if available) concerning the following deceased members. The assistance of all is earnestly sought in reporting the deaths of Association members, with appropriate details, including date of death and full name. You may report the death of a member by sending an email to chapter.eternal@tbp.org.

- AL A '43 **Lovell Jr., Powell Murray**; no details.
'49 **Brewer, James Edward**; November 5, 2010.
'51 **Downs Jr., Sanford Wesley**; April 28, 2017.
'56 **Howell, John Elbert**; March 14, 1998.
- AL B '34 **Watts, Roscoe Preston**; April 9, 2000.
'42 **Stockton, Frederick Douglas**; July 30, 2015.
'50 **Sweat Sr., Robert Herrington**; June 24, 2017.
'51 **Bryan, William Ted**; November 14, 2016.
- AZ A '59 **Stewart, Robert Wesley**; February 4, 2011.
'68 **Schade, Karl William**; January 13, 2017.
- AZ B '54 **Robinson, Thomas Jefferson**; March 31, 2016.
- AR A '41 **Campbell, Hugh Emory**; December 6, 2003.
'51 **Lovell, Robert James**; July 23, 1991.
'69 **Brown, William David**; March 30, 2017.
- CA A '42 **Kaprielian, Elmer Foster**; May 27, 2017.
'50 **Lammers, Thomas Ralph**; February 2, 2017.
'50 **Luoto, Reino**; March 30, 1995.
'51 **Murdock, Roy Kenneth**; March 17, 2013.
'55 **Fletcher Jr., Frederick F.**; December 31, 2010.
'55 **Hargrove, Richard Oliver**; March 29, 2017.
'60 **Prescop, Val**; November 22, 2008.
- CA B '44 **Schlinger, Warren Gleason**; February 10, 2017.
'57 **McDonald, William True**; October 4, 2016.
- CA Γ '43 **Baer, Oliver Albrecht**; April 7, 2011.
'59 **Curtis, Robert Herman**; May 3, 2017.
'61 **Rising, Lynn Mason**; no details.
- CA Δ '37 **Dekema, Jacob**; April 16, 2017.
'07 **Yeargan, Joseph Ryan**; March 31, 2017.
- CA E '49 **Tribus, Myron**; August 31, 2016.
'57 **Chambers, Robert Allen**; no details.
- CA Θ '65 **Maslow, Charles**; April 17, 2017.
- CA I '63 **Bolduc, Raymond August**; July 23, 2016.
- CA AA '15 **Klein, Nickolas Joseph**; March 30, 2017.
- CO A '50 **Reid, Robert C.**; May 18, 2006.
'05 **Hahn, Scott Franklin**; July 27, 2004.
- CO B '48 **Vogelsang Jr., Stanley John**; August 26, 2005.
'74 **Harris, Karen Lee Walker**; June 13, 2017.
- CT A '30 **Tavanlar, Eligio Jovellanos**; 1995.
'42 **Cohn, Seymour Bernard**; September 9, 2015.
'43 **Campbell, David Vernon**; May 3, 2010.
'49 **Wogrin, Conrad Anthony**; March 8, 2017.
'50 **Parker, Robert Hughes**; no details.
'51 **Hemlock, Walter Francis**; January 23, 2015.
'55 **Gow, Robert H.**; May 2, 2017.
'57 **Jordan, Michael Hugh**; May 25, 2010.
- CT B '48 **Wellock, Robert Raymond**; April 13, 2016.
- FL A '87 **Fitzgerald, David Paul**; June 27, 2017.
- FL Δ '60 **Whitehouse, Gary Edward**; March 31, 2017.
- GA A '40 **Johnson, Verne Wesley**; June 12, 2017.
'43 **Bunzl, Rudolph Hans**; October 16, 2016.
'47 **Thomas Sr., Ralph Middleton**; May 30, 2014.
'51 **Campbell, Donald Arthur**; October 2, 2011.
- IL A '40 **Hazen, Dan Francis**; November 5, 2016.
'41 **Klane, Frank**; August 12, 2015.
'43 **Munie, Delmar Edward**; June 13, 2016.
'48 **Wiseman, Robert Swern**; August 23, 2013.
'53 **Honath, Harold Fred**; June 15, 2017.
'57 **Chan, Shu-Park**; February 22, 2013.
- IL B '44 **Nash, William Arthur**; May 21, 2008.
'49 **Droby, Henry Stanley**; no details.
'50 **Hausknecht Jr., Otto John**; June 17, 2017.
'53 **Campbell, John Anthony**; December 15, 1999.
'55 **Bremigan, Richard Owen**; November 25, 2016.
- IL Γ '55 **Durant, John Bertram**; March 7, 2016.
'56 **Herzing, Paul Henry**; July 27, 2016.
- IN A '42 **Threlfall, John Brooks**; June 1, 2017.
'42 **Traylor, William Hugh**; February 5, 2005.
'42 **Vanderbilt Jr., Vern Corwin**; April 10, 2017.
'45 **Davis Jr., Calvin Russell**; December 2016.
'45 **Riley Jr., Frank Henry**; June 20, 2015.
'46 **Dudek, Edward Frank**; February 4, 2011.
'46 **Duncan, Betty Marie**; February 5, 2017.
'46 **Henderson, James B.**; April 9, 2017.
'46 **Nitschke, Norman E.**; April 11, 2017.
'48 **Lott, Charles Philip**; December 27, 2016.
'48 **Mason Jr., Lowell Blake**; May 6, 2017.
'49 **Schleck Jr., Carl Joseph**; October 4, 2012.
'52 **Haworth Sr., Donald Robert**; May 15, 2017.
'55 **Carmichael, Donald Charles**; September 21, 2007.
'56 **Chong, Gary Lin Kee**; December 14, 2016.
'57 **Haynes, Jack Austin**; June 1, 2014.
'58 **Goldrick, William Bruce**; August 12, 2016.
'59 **Massena, Fredric**; June 5, 2015.
'63 **Northrup, Paul William**; April 11, 2001.
'68 **Gahimer, John Stephan**; April 29, 2008.
'70 **Huff, Linda Lou**; May 25, 2017.
- IN B '49 **Stewart, Allen Stanley**; January 8, 2013.
'58 **Eubank, Philip Toby**; August 26, 2011.
- IA A '42 **Welch, Lester Lorenz**; June 10, 2017.
'46 **Howe, Stanley M.**; April 21, 2017.
'46 **Roberts, Lester Alaric**; February 28, 2013.
'46 **Schroder, Eldon Leon**; April 11, 2017.
'50 **Fletcher, Keith Lloyd**; July 7, 2017.
'53 **Meinert, Harry Mathais**; June 7, 2016.
'58 **Secret, Bruce Gill**; June 24, 2017.
'91 **O'Brien, John David**; March 31, 2017.
'17 **Sechi, Deidre Elizabeth**; April 24, 2017.
- IA B '47 **MacDonald, Robert Wayne**; no details.
'47 **Patterson, Howard Samuel**; December 21, 2007.
'50 **Petska, Leonard John**; June 28, 2017.
'56 **Faris, Lary Lea**; April 25, 2017.
- KS A '50 **Finke, Howard Gilbert**; October 26, 2015.
'50 **Nelson, John Armand**; February 25, 2017.
'51 **Fisher, Thomas Morton**; September 8, 2013.
'52 **Farris, George Eddy**; June 12, 1996.
- KY A '49 **Wise, William Harold**; April 22, 2007.
- LA A '49 **McClatchey Jr., Lloyd Delbert**; January 9, 2017.
'51 **Arnold Jr., Thomas Herbert**; no details.
'73 **Tabony Jr., John Heller**; June 14, 2013.
'50 **Mitchell, Fred Wharton**; June 16, 2014.
'66 **Suhren III, Anton Theodore**; June 9, 2016.
- ME A '44 **Cole, Henry Bogardus**; October 11, 2015.
'46 **Lyman, John Robert**; October 31, 2014.
'51 **Nason, Robert Purinton**; October 22, 2016.
'54 **Mastrobattista, John B.**; July 13, 2017.
- MD A '45 **Durney Jr., Harry Augustine**; September 3, 2006.
'66 **Bloomfield, Stefan David**; August 15, 2004.
- MD B '41 **Gannon Sr., William Francis**; November 9, 2016.
'50 **Magruder, Chester Harding**; October 14, 2012.
- MA A '43 **Messer Jr., Behrends**; August 28, 2006.
'50 **Stewart, Arlington Kenneth**; May 27, 1993.
- MA B '44 **Hooker Jr., Charles John**; March 20, 2017.
'48 **Montgomery, James Blakeslee**; August 29, 2008.
'52 **Werthan Jr., Bernard**; May 5, 2017.
'54 **Riley Jr., Charles Leo**; March 2, 2007.
'62 **Peak, John Carl**; April 26, 2017.
'74 **Armstrong, Robert John**; October 22, 2016.
- MA Δ '45 **Foster, Arthur Rowe**; January 25, 2017.
- MA E '44 **Dizer Jr., John Thomas**; March 23, 2017.
'46 **Katz, Adolph I.**; May 28, 1997.

	'47	Moore Jr., Frederick Arnold; June 5, 2011.			'50	Whitney, Roger Knopp; June 18, 2017.
	'49	Colten, Bernard; November 2, 2016.			'57	Selig III, Ernest Theodore; August 7, 2016.
	'52	Riley, Francis Herbert; November 10, 1997.		NY E	'44	Appleton, Hyman; November 2016.
	'54	Lockhart, Newton Frederick; June 3, 2016.			'53	Marsocci, Velio Arthur; September 14, 2016.
MA Z	'51	Forster Jr., Clifford John; May 7, 2017.			'55	Horak, Rudolph Thomas; July 1, 2017.
	'52	Chajes, Alexander; 2012.			'69	Chin, Edward Gim Ho; July 11, 2017.
	'54	Douglas, James Merrill; February 15, 2017.		NY Z	'50	Silberberg, Martin Yale; March 30, 2017.
	'54	Sunderland, James Edward; May 24, 2016.		NY H	'43	Pistrang, Joseph; October 11, 2014.
	'57	Ritchie, William Edmond; April 23, 2016.			'48	Cohen, David; May 16, 1993.
	'59	Ohnesorge, Thomas Edward; March 1, 2017.			'48	Kaufman, Harry; October 16, 2011.
	'60	Howie Jr., Douglas Stuart; June 3, 2017.			'52	Ross, Gerald F.; October 10, 2016.
MA H	'52	McLaughlin, Robert James; February 22, 2017.			'55	Cohen, Jules Bernard; September 4, 2013.
MI A	'48	Bachman III, Charles William; July 13, 2017.		NY Θ	'51	Cohen, Leon; November 26, 2010.
	'56	Marcus, Jerald Jules; April 22, 2017.		NY I	'50	Katzauer, Paul; no details.
MI B	'50	Campbell, Patrick J.; September 23, 2006.			'63	Sandler, Ivan Seth; August 4, 2015.
	'58	Fayas, Duane George; March 14, 2017.			'67	Conforti, Robert Francis; July 18, 2004.
	'70	Kull, Robert Harold; September 13, 2004.			'89	Jovanovic, Adrian Burton; June 17, 2017.
MI Γ	'43	Taylor, Frank Carter; December 20, 2016.		NY Λ	'43	Renda, John Domenic; December 2016.
	'44	Cobb, Ralph David; December 10, 2016.		NY M	'64	Hassib, Ekram Ibrahim; May 20, 2017.
	'44	Jones, Donald Everett; December 27, 2012.		NY N	'81	Green, Anthony; November 30, 2016.
	'48	Marble, Joseph Daniel; July 2014.		NY P	'75	Rackow, Gary Paul; March 16, 2010.
	'51	Stuart, Glenn Allen; May 9, 2017.		NC A	'43	Lowen, Walter; May 3, 2006.
	'55	Hutchison, Robert Camden; May 17, 2017.			'57	Singleton Jr., June; January 19, 2016.
	'56	Coats, Keith Hal; September 13, 2016.			'66	Rahmani, Abdul M.; November 26, 2008.
	'57	Richards, Charles Gilbert; June 5, 2017.		NC Γ	'47	Madlon, Eugene August; June 17, 2011.
MI Δ	'53	Simmons, Thomas Smith; May 13, 2017.			'47	Wilson, Alexander Chester Robinson; 2010.
	'55	Romberg, Edward J.; June 11, 2016.			'65	Flowers III, George Horace; March 24, 2017.
MI E	'72	Zahn, Thomas Grigg; June 10, 2017.		ND A	'48	Sletten, Harold L.; July 28, 2013.
MI H	'48	Tech, Kurt O.; September 18, 2016.			'56	Maris, Rudolph M.; June 12, 2017.
MN A	'45	Boller, Robert Andrew; April 27, 2017.			'58	Eng, Leonard Allen; November 2, 2016.
	'49	Fenne, Donald William; August 27, 2010.		ND B	'48	Fletcher, Alan Gordon; December 22, 1999.
	'58	Johnson, Philip Arvid; April 27, 2017.		OH A	'38	Rose, Gene Fuerst; May 8, 2008.
	'66	Christie, Lance Arling; November 2, 2012.			'67	White, Thomas Gaylord; July 5, 2017.
MS A	'61	Jones, Richard Henry; May 23, 2017.		OH B	'51	Knodel, Robert Milton; February 19, 2014.
MO A	'43	Hogan, Joseph Charles; August 18, 2016.		OH Γ	'49	Cross, Gordon Guy; June 6, 2016.
	'65	Cormier, Joseph Floyd; May 10, 2017.			'52	Rauch, Conrad Joseph; March 2017.
	'65	De Young, Lance Gerard; April 15, 2017.			'52	Vukovich Jr., Milan; May 26, 2017.
MO B	'41	Puetz, William Michael; December 18, 2005.			'54	Kozel, William John; May 6, 2016.
	'55	Mann, Kenneth Earl; April 15, 1992.			'70	Winchell, William Olin; June 2, 2004.
	'56	Campbell, Lowell Gale; May 20, 2016.			'82	Freund, David Howard; May 1, 2017.
	'58	Schaefer, Orville Leon; May 9, 2017.		OH Δ	'55	Fletcher Jr., Joseph Albert; April 25, 2017.
MO Γ	'51	Huemmler, Howard John; April 19, 2016.			'57	Koslover, Monty; June 19, 2013.
MT A	'48	Lindner, Gordon M.; May 25, 2017.		OH E	'59	Gibbons Jr., Thomas Leo; October 12, 2016.
	'64	Larson, Peter Michael; September 1, 2015.			'67	Svarovsky, James Edward; January 5, 2017.
NH A	'48	Paوزه, Daniel Edward; October 24, 2010.		OH H	'74	Morton, Robert Wayne; March 20, 2017.
	'50	Blanchard Jr., Ralph Sumner; May 26, 2016.			'82	Hall, Norman Dwight; May 3, 2017.
NJ A	'41	Damm, John Albert; August 22, 2015.		OH Θ	'59	Marous, Joseph John; April 28, 2017.
	'50	Uster, Paul Edward; March 24, 2015.		OK A	'38	Feldman, William Joel; October 18, 2015.
	'51	Berendsen Jr., Charles G.; December 29, 2016.			'42	Guinan, Homer Ray; March 24, 2014.
	'54	Olsen, James Franklin; July 31, 2016.			'44	Clarke Jr., Joseph Booker; May 15, 2017.
NJ B	'48	Dell, Curtis George; March 14, 2017.			'46	Macy, Ralph Edward; August 21, 2014.
	'49	Page, Robert Henry; October 25, 2016.			'50	Pipkin, Omer Allen; no details.
NJ Γ	'74	Ward, David Bruce; March 25, 2017.			'52	Gibson Sr., Richard Arlen; April 27, 2017.
NJ Δ	'74	Fang, San-Chin; December 8, 2015.			'84	Blackshaw, John Moore; June 20, 2008.
NY A	'50	Difranco, Julius Vincent; November 15, 2015.		OK B	'88	Leland, John Michael; February 21, 2017.
	'52	Berghahn, Walter George; February 7, 2012.		OK Γ	'66	Stevens Jr., Gladstone Taylor; December 10, 2015.
	'56	Carter, Mark C.; September 26, 2015.		OR A	'43	Handelin, Charles Boyd; December 19, 2014.
	'70	Sussmann, Richard Charles; October 9, 2015.			'57	Rasmussen, Maurice Lea; November 16, 2013.
NY B	'40	Fogelsonger, Robert Benjamin; October 31, 2016.		PA A	'50	Spangler, Grant Edward; May 18, 2017.
	'41	Hill, Richard Conrad; July 13, 2016.			'51	Barth Jr., Charles Adolph; October 14, 2014.
	'48	Booth Jr., Elwood Frederick; June 26, 2016.			'72	Balliett, Thomas Andrew; June 6, 2017.
	'49	Lewis, Douglas Trevor; May 27, 2017.			'81	Renshaw, Daniel Travis; May 8, 2016.
NY Γ	'46	Blanch, Edward James; June 1, 2017.		PA B	'41	Blanning, Robert Bressler; August 25, 1998.
	'46	Hubbell, Richard Grandin; March 15, 1991.			'44	Cohen, George Herrman; May 17, 2016.
	'48	Bower, Robert Edward; September 1, 2010.			'49	Boedecker, Ray Frederick; April 16, 2017.
	'48	Eibsen, Robert Louis; May 16, 2016.			'58	Strawbridge, Lee Everett; October 24, 2014.
	'50	Philbrick, John Douglas; February 25, 2010.		PA Γ	'48	Bertelson, Peter Clark; July 24, 2016.
	'51	Valerio, Francis Robert; October 2, 2016.			'49	Sapper, David Ivan; March 5, 2017.
	'53	Dunnells, Robert Edgar; August 21, 2016.			'51	Riley, William Franklin; January 6, 2000.
	'54	Jordan Jr., Kenneth Louis; November 6, 1991.			'60	Sullivan, Jeremiah David; July 7, 2016.
	'60	Montoya, Benjamin Franklin; December 19, 2015.		PA Δ	'48	Duerig, Alfred Walter; April 25, 2017.
	'71	Yuen, Albert; no details.			'49	McCracken, Donald William; April 4, 2017.
NY Δ	'44	Moore, Franklin Kingston; November 21, 2016.		PA E	'43	Sergy, Walter Thomas; July 7, 2013.
	'48	Persons Jr., Robert Wayne; July 18, 2017.			'50	Ciardelli Jr., John Charles; May 2, 2017.
	'50	Reiff Jr., Albert Theodore; June 3, 1991.			'63	Miller, Richard A.; February 12, 2014.

PA Z '40 **Raub, Samuel Henry Stelz**; October 6, 2009.
'48 **Daly Jr., James Albert**; July 9, 2006.
'50 **Snader, Earle Stuart**; June 25, 2009.
'64 **Noel, Bruce William**; June 18, 2017.
'69 **Kauffman, Conrad Bruce**; July 8, 2009.
PA H '50 **Rayeski Sr., Thomas John**; October 16, 2011.
'50 **Wendle Jr., Jesse Gale**; May 29, 2017.
PA Θ '56 **McEowen, James Royce**; July 8, 2014.
'63 **O'dekirk Jr., James Buell**; March 6, 2015.
'65 **Furlong, Harry Francis**; January 28, 2015.
'72 **Mikowychok, David Joseph**; August 13, 2016.
RI A '48 **Epstein, Henry David**; December 24, 2016.
RI B '83 **Niles, Thomas Edward**; May 17, 2017.
SC A '44 **Mann, Joseph Griffin**; January 3, 1999.
'83 **Reid, David Hawthorne**; 2017.
SC B '37 **Davis, Harry Willard**; April 26, 2017. [Cent. 126]
'50 **Wylie, Charles Joseph**; January 18, 2017.
'63 **Pace, Marshall Osteen**; June 25, 2017.
SC Γ '50 **Davis Jr., Emmett Irwin**; May 17, 2017.
'53 **Evans Jr., Samuel Godfrey**; May 31, 2017.
SD A '57 **May, Bill B.**; June 6, 2016.
'78 **Rabenberg, Llewellyn K.**; November 18, 2016.
SD B '50 **Buesing, Richard T.**; March 15, 2006.
TN A '41 **Hinsdale, James Gilmer**; August 19, 2016.
'43 **Howell, Albert Leo**; June 12, 2011.
'49 **Miller Jr., William Prescott**; January 2, 2005.
'51 **Weathersby, William E.**; May 18, 2017.
'52 **Oliver, Ben Frank**; no details.
'56 **Adams, Benjamin Strickler**; May 22, 2017.
'59 **Messer, Hugh Alvey**; November 14, 2012.
'60 **Tschantz, Bruce A.**; June 28, 2017.
TN B '51 **Buchanan, Joel Raymond**; May 7, 2017.
'58 **Piper, Henry Burton**; August 9, 2016.
TN Γ '59 **Darling, James Patrick**; July 14, 2017.
TX A '55 **Rauhut, James Brent**; May 21, 2017.
'56 **Doores, Richard Allen**; November 8, 2014.
TX B '57 **Wise, Monte Joe**; April 23, 2015.
TX Γ '41 **Peet, Nicholas Peter**; June 22, 2017.
'55 **Bravenec, Frank Richard**; July 9, 2017.
'60 **Miller, Myrl J.**; December 25, 2016.
'63 **Herring, Robert Bruce**; December 12, 2012.
TX Δ '42 **Whitmore, Harry Esler**; April 15, 2004.
'43 **Holland, Charles Donald**; March 29, 2009.
'44 **Kettleborough, Charles Fred**; May 21, 2010.
'48 **Wirsching, Joseph Edward**; June 2016.
'49 **Devenport Jr., Loyd Vernice**; January 1, 2012.
'49 **Foster, James Henry**; March 20, 2017.
'50 **Wise, William Bert**; May 26, 1998.
'51 **Bradley, Robert Stanley**; 2017.
'52 **Dobbins Jr., Edward Bashford**; October 10, 2012.
'54 **Davison, James Lloyd**; March 29, 2017.
TX E '75 **Triola, Larry Charles**; April 27, 2017.
TX Z '68 **Smirl, Arthur Lee**; December 10, 2016.
TX H '84 **Kalkhoran, Iraj M.**; 2016.
UT A '44 **Wolfe, Russell**; January 17, 2015.
'52 **Ong Jr., John Nathan**; March 6, 2017.
VT B '54 **Sparrell, James Kirkwood**; September 17, 2015.
'10 **Ivanowsky, Mallory Downs**; June 26, 2017.
VA A '30 **Andrews Jr., Edwin Eads**; July 23, 2004.
'54 **Kelly, James Leslie**; June 9, 2017.
'54 **Stickle, Robert Lewis**; May 27, 2017.
'58 **Rodeffer, Charles Cline**; April 8, 2016.
VA B '48 **Rogers Jr., Richard Ovid**; November 18, 2008.
'51 **Campbell, Fred Tyler**; July 9, 2007.
'53 **Blottner, Frederick Gwynn**; May 15, 2017.
'79 **Hatfield, Bennett K.**; May 22, 2016.
'87 **Shifflett, Sharon LuAnne**; no details.
VA Δ '49 **Watling, Edward T.**; February 8, 2016.
VA E '16 **Ducic, Chris James**; November 1, 2015.
WA A '46 **Gillen, Raymond Daniel**; December 12, 2009.
'48 **Durand, Harlan Porter**; March 16, 2014.
'51 **Tanemura, Ted Kazuo**; April 15, 2017.
'52 **Lovell, Stuart Estes**; March 27, 2001.
'68 **Searing, John Emery**; April 26, 2017.
WA B '40 **Weber, Warren Robert**; 2012.

'48 **Kerns, Gene McLean**; May 12, 2015.
'51 **Miller, Lawrence Charles**; February 17, 2017.
'53 **Yates, David Arthur**; April 2, 2017.
'91 **Wagner, David George**; December 29, 2016.
WV A '41 **Poland, Howard Earl**; November 28, 2007.
'48 **New, Robert Francis**; April 27, 2014.
WI A '44 **Caldwell, John Robert**; February 4, 2017.
'48 **Dodge, Daniel Vernon**; August 20, 2003.
'50 **Erickson, Bert Kenneth**; April 2, 2017.
'50 **Hauser, Ralph Irving**; May 17, 2013.
'52 **Wiedman, Ronald Earl**; April 14, 2017.
WI B '59 **Baars, Arnold Monroe**; June 4, 2014.

TAU BETA PI PLANNED GIVING

Tau Beta Pi's 26-page guide to planned-giving opportunities shows how your support can benefit both TBPi and your personal 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 call 865-546-4578.



TBPi Directory

EXECUTIVE COUNCIL

President Norman Pih, TN A '82 norman@tbp.org
#10, 811 W. Cherry Ave., Flagstaff, AZ 86001

Vice President Susan L.R. Holl, Ph.D., CA A '76 sue@tbp.org
1813 Saint Ann Court, Carmichael, CA 95608

Secretary George J. Morales, Ph.D., FL E '06 george@tbp.org
16815 S. 34th Way, Phoenix, AZ 85048

Treasurer Alan J. Passman, FL A '06 alan@tbp.org
3624 S. Hubert Ave., Tampa, FL 33629-8408

Joseph P. Blackford, DC Γ '95 jpb@tbp.org
Unit 408, 522 21st Street NW, Washington, DC 20006-5017

Wayne B. Paugh, LL.M., J.D., FL Γ '93 wpaugh@tbp.org
P.O. Box 4706, Greenwood Village, CO 80155

Mennatoallah M. Youssef, Ph.D., VA Γ '04 myoussef@tbp.org
1028 Autumn Harvest Drive, Virginia Beach, VA 23464

George Youssef, NJ Γ '01 gyoussef@tbp.org
Apt 428, 421 Bernard St., Costa Mesa, CA 92627

INTERNATIONAL HEADQUARTERS

Executive Director Curtis D. Gomulinski, MI E '01
P.O. Box 2697, Knoxville, TN 37901-2697 curt@tbp.org

Telephone: 865/546-4578
Fax: 865/546-4579

Email: tbp@tbp.org
Website: www.tbp.org

Award-Winning EF Program Moves With the Times

By Katy Luchini-Colbry, Director of Engineering Futures



EF Facilitators gather in Chicago. Front Row, L to R: Tracy Choat, Stewart Baskin, Secretary George Morales, Annette Brenner, Cathy Chang, Nancy Gray, Christie Hasbrouck, Dennis Negron Rivera, Director of Engineering Futures Katy Luchini-Colbry, Timothy Luchini, Executive Councillor Wayne Paugh, and Singh Sabherwal. Back Row, L to R: William Cleveland, Ellen Styles, Cheryl Cheng, Wendy Harper, Felipe Leon, Executive Councillor J.P. Blackford, Dirk Colbry, and Andy Boucher.

OUR AWARD-WINNING Engineering Futures (EF) program provides professional skills training for engineers. Over the last three decades, the program has helped thousands of students and alumni develop their communication and leadership skills. Currently, the curriculum includes five modules that cover: interpersonal communication skills; team work; meetings; creative problem solving; and presentation skills.

EF sessions are highly interactive and designed for groups of 15-25 people; typically, they are hosted by student or alumni chapters on weekends around the country.

Facilitators Gathered

EF Facilitators are TBPI members who volunteer their time and expertise to help the Association provide high-quality professional skills training for students and alumni. The program received the 2007 ASEE Excellence in Engineering Education Collaboration Award. In July, 20 facilitators gathered near Chicago for a day of training and program planning. The first item on the agenda was the report from the Director of Engineering Futures (DEF): during the 2016-17 academic year, the EF program had about 35 facilitators who offered 176 sessions serving 3,677 participants.

This is the largest number taking part in at least five years, and was a 25% increase over the previous year. Much of this rise was due to a new pre-registration system, which allowed chapters to track interest and recruit participants in advance, resulting in more sessions reach-

ing the ideal size of participants.

Most of the current EF curriculum materials are reaching the end of their lifecycle, and the facilitators spent time discussing options for refreshing current offerings and expanding the program catalog. While there is broad support for expanding EF, the consensus is that the focus should remain on professional skills training, rather than discipline-specific or technical skills training. In the short-term, the DEF is exploring options for integrating existing curriculum from other sources into the program; for example, a module on “Equity & Inclusion” developed by the National Research Mentoring Net-

work was presented to the facilitators during their July meeting, and will be offered as part of the professional development sessions at Convention this fall.

Longer-Term Project

In the longer-term, TBPI plans to partner in the development of new curriculum materials for an expanded Engineering Futures program. Dirk Colbry, Ph.D., *Michigan Alpha '06*, an EF Facilitator, and Katy Luchini-Colbry, Ph.D., *Michigan Alpha '99*, Director of Engineering Futures, are co-investigators for a project to develop training materials to assist cyberinfrastructure professionals in strengthening their interpersonal communications, teamwork, and leadership skills. The National Science Foundation has awarded about \$500,000 to fund this project for three years, hosted by Michigan State University with support from a number of regional and national partners, including Tau Beta Pi.

“This project will develop flexible, open-source curriculum materials that can be adapted to different audiences,” said Luchini-Colbry. “While our immediate focus will be on preparing cyberinfrastructure professionals to collaborate more effectively with scientists and engineers from many disciplines, by partnering with the Engineering Futures program we hope to eventually expand the curriculum to serve a broader population of students and professionals.”

• Visit www.tbp.org/memb/EF.cfm for more about the modules, how to host a session, or become a facilitator.



ASSOCIATION BRIEFS

ASSOCIATION VOLUNTEERS

Tau Beta Pi is pleased to welcome the following new Association Officials:

- **David J. Cowan Jr.**, *FL E '14*—District 5 Director
- **Allen D. Erickson**, *NM G '14*—District 13 Director
- **Justin M. Glasgow**, M.D., Ph.D., *IA B '05*—D3 Director
- **Raymond P. LeBeau**, Ph.D., P.E., *VA A '90*—D9 Dir.
- **Michelle Nanney**, *TX D '96*—District 4 Director
- **Dennis A. Negron Rivera**, *PR A '13*—Engineering Futures Facilitator
- **Gary L. O'Day Jr.**, *TX E '16*—District 10 Director
- **Christopher W. Potts**, *CA U '16*—District 15 Director
- **Angadbir S. Sabherwal**, *IA A '16*—Facilitator in Training
- **Jon M. Sonstebly**, *PA B '95*—District 3 Director
- **Lara L. Spinelli**, *NJ G '14*—District 2 Director
- **Jose E. Suarez**, *LA E '10*—District 10 Director

TBPI wants to thank the following retiring volunteers:

- **Brien C. Dux**, *MI E '14*—District 7 Director for 2 years
- **Scott E. Fable**, *CA T '96*—District 15 Director for 16 years
- **Brenda A. Kramer**, *KS G '95*—District 9 Director for 15 years
- **Rebecca A. Lewis**, *FL A '04*—District 5 Director for 11 years
- **Lisa A. Matta**, *OH Z '97*—Engineering Futures Facilitator for 19 years
- **Alan J. Passman**, *FL A '06*—Engineering Futures Facilitator for 7 years
- **Anne K. “Katie” Samuels**, *LA G '86*—Engineering Futures Facilitator for 6 years
- **George Youssef**, *NJ G '01*—District 2 Director for 6 years

HEADQUARTERS VISITORS

- Joseph P. Blackford**, *DC G '95*, Washington, DC; August 17, 2016.
- Susan L.R. Holl**, Ph.D., *CA L '76*, Carmichael, CA; November 30, 2016.
- Joseph P. Blackford**, *DC G '95*, Washington, DC; November 30, 2016.
- Brad Gray**, Visitor, Nashville, TN; November 30, 2016.
- Wayne B. Paugh, LL.M., J.D.**, *FL G '93*, Greenwood Village, CO; November 30, 2016.
- Alan J. Passman**, *FL A '06*, Tampa, FL; December 1, 2016.
- George J. Morales**, Ph.D., *FL E '06*, Phoenix, AZ; December 1, 2016.
- Sherry D. Jennings-King**, *TN A '93*, Maple Grove, MN; December 1, 2016.
- George Youssef**, *NJ G '01*, Costa Mesa, CA; December 1, 2016.
- Mennatoallah M. Youssef**, *VA G '04*, Virginia Beach,

VOLUNTEER RECOGNITION

Tau Beta Pi depends on many generous alumni to keep our programs and chapters running strong. We thank all of our volunteers for their time, energy, and commitment.

In particular, the Society recognizes two District Directors with the following years of service to the collegiate chapters as of July 31, 2017:

- **Ian J. Frank**, *NY P '09*—6 years in District 14
- **Jason Rogan**, *NY R '93*—24 years in District 2

Four Engineering Futures Facilitators have served the Society for 12 and 6 years as of July 31, 2017:

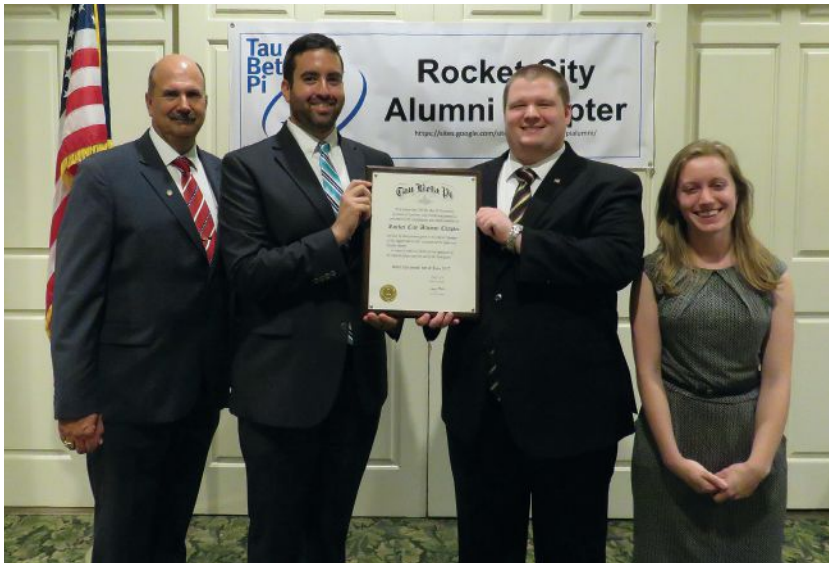
- **Richard Della Rovere**, *NJ G '10*—6 years
- **Diana Hasegan**, *PA E '10*—6 years
- **Ellen S. Styles**, *AL D '85*—6 years
- **Julia M. Nolan**, *CA L '03*—12 years

• We also recognize **Ronald M. Hickling**, *CA E '80*, who has served the Association since 1981 in a variety of volunteer capacities. Ron was an Assistant District 15 Director for 5 years, District Director for 6 years, and Director of Engineering Futures for 4 years. He has served as Convention Parliamentarian 5 times and 2017 will mark his 25th time as Convention Chair.

• It is with great sadness that we report the unexpected passing of **Mallory D. Ivanowsky**, *VT B '10*, on June 26, 2017. She served as the Vermont Beta Chapter President from 2009-10 and assumed the role of District 1 Director in May 2016. She will be greatly missed by many.

- VA**; December 1, 2016.
- Norman Pih**, *TN A '82*, Flagstaff, AZ; December 1, 2016.
- Nick Gomulinski**, Visitor, Columbus, OH; January 3, 2017.
- Dennis and Nancy Gomulinski**, Visitors, Warren, MI; January 3, 2017.
- Norman Pih**, *TN A '82*, Flagstaff, AZ; January 7, 2017.
- Susan L.R. Holl**, Ph.D., *CA L '76*, Carmichael, CA; January 7, 2017.
- Lonnie E. Snyder**, *SD A '94*, Thornton, CO; March 30, 2017.
- Ames C. Hwang**, *TX B '88*, Mercer Island, WA; May 26, 2017.
- Joseph P. Blackford**, *DC G '95*, Washington, DC; June 22, 2017 and August 3, 2017.
- Katy L. Colbry**, Ph.D., *MI A '99*, Okemos, MI; August 7, 2017.

ROCKET CITY ALUMNI CHAPTER INSTALLED



The Rocket City Alumni Chapter (RCAC) in Huntsville, Alabama, was installed on June 2, by Association Councillor J.P. Blackford, *DC G '95*, and Executive Director Curt Gomulinski, *MI E '01*, at the Huntsville Country Club. Nearly 50 student and alumni members attended, including 2016 Distinguished Alumni N. Jan Davis, Ph.D. P.E., *AL A '77*, and Michael D. Griffin, Ph.D., *MD B '77*. Shown above with the chapter charter are officers Ken D. Philippart, *MI G '84*; Jayme S. Berstell, *AL D '12*; Joshua D. Crook, *AL D '12*; and Tamara Statham, *AL D '12*.

- The **Los Angeles Alumni Chapter** was approved by the Executive Council on August 12. Join the LA alumni email list by contacting Riley E. Winship at lataubetapialumni@gmail.com. The **Orange County Alumni Chapter** is also forming. Contact Kyle J. Dominguez at octaubetapialumni@gmail.com to join them.
- Thirty-five people attended an event on June 3 at the Brio Tuscan Grille in Tampa. Executive Council members and Curt and Tricia Go-

mulinski joined FL G students and advisors, plus several members of **The Tampa Bay Alumni Chapter** and their guests.

- The **Milwaukee Area Alumni Chapter** was recently reactivated. Contact Aaron M. Hartwig at aaronhartwig7@gmail.com to join their email list and hear about upcoming activities.
- Alumni in **Northern Oklahoma** gathered on July 25 to discuss establishing an alumni chapter. If you live within 75 miles of Stillwater, which includes Tulsa and Oklahoma City, and you are interested in joining, contact Kurt P. Rouser at kurt.rouser@okstate.edu.
- Area alumni and students from several chapters joined the Executive Council for dinner at Blue Mesa Southwest Grill in **Arlington, TX**, on August 12.
- The **Sacramento Valley Alumni Chapter** hosted Executive Director Curt Gomulinski at a small hors d'oeuvres event on July 16. Volunteering with California Upsilon, they assisted with parking and cashing at the Capital Airshow on September 9 and 10.

To join an alumni chapter, contact the Director of Alumni Affairs, Tricia Gomulinski, at tricia@tbp.org.

WELCOMING EVENT IN SAN DIEGO



The **Greater San Diego Alumni Chapter** hosted their 2nd annual Beta Bites Back BBQ to welcome new graduates to alumni status and encourage them to join an alumni chapter. The June 24 event, held at NTC Park in Liberty Station on Point Loma, was attended by more than 20 students, alumni, and friends.



Brain Ticklers

RESULTS FROM SPRING

Perfect

Alverson, Robert L.	OH B '85
Beaudet, Paul R.	Father of member
*Couillard, J. Gregory	IL A '89
Eanes, Robert S.	TX Γ '67
*Gee, Albert	CA A '79
Gee, Nora W.	CA A '79
Gee, Aaron J.	CA Ψ '16
*Griggs Jr., James L.	OH A '56
*Hurd, Jonathan A.	MA B '79
*Johnson, Mark C.	IL A '00
LaCroix, Daniel J.	MI B '18
Mangis, J. Kevin	VA A '86
*Norris, Thomas G.	OK A '56
Schmidt, V. Hugo	WA B '51
*Sheiman, Arthur E.	CA B '81
Slegel, Timothy J.	PA A '80
Spong, Robert N.	UT A '58
Stein, Gary M.	FL Δ '04
Strong, Michael D.	PA A '84
*Verkuilen, William W.	WI B '92
Willard, Duane J.	NY © '71

Other

Aron, Gert	IA B '58
Benedict, Daniel H.	PA H '09
Bertrand, Richard M.	WI B '73
Beutner, Thomas J.	IN A '87
Christiansen, Reed L.	MN A '83
*Conway, David B.	TX I '79
Dechman, Don A.	TX A '57
Edge, Billy L.	GA A '71
Ehrgott Jr., Charles	FL E '92
Fogel, Arlene Beck	MA Δ '77
*Gerken, Gary M.	CA H '11
Grewal, Rashi	NJ Γ '09
Handley, Vernon K.	GA A '86
Harvey, Arthur J.	OH A '83
Hasek, William R.	PA Γ '49
Heierman, William E.	GA A '64
Heutchy, David A.	PA Γ '69
*Johnson, Roger W.	MN A '79
*Jones, John F.	WI A '59
Jones, Jeffrey C.	Son of member
Kovalick, Albert W.	CA H '72
Lalinsky, Mark A.	MI Γ '77
Lowe, Michael	MT A '15
Marks, Lawrence B.	NY I '81
Marks, Benjamin	Son of member
Marrone, James I.	IN A '61
McNulty, Whitney P.	LA A '85
Medvecz, David J.	IN A '83
Minnick, Michael V.	SC A '81
Pendleton III, Winston	MI Γ '62
Prince, Lawrence R.	CT B '91
Prine, John G.	WA B '67
Quan, Richard	CA X '01
Rentz, Peter E.	IN A '55
Richards, John R.	NJ B '76
Rizzo, Robert J.	NY Γ '72
Rubin, James D.	MI Γ '82
Schweitzer, Robert W.	NY Z '52
Sigillito, Vincent G.	MD B '58
Snelling, William E.	GA A '79
Summerfield, Steven L.	MO Γ '85
Vinoski, Stephen B.	TN Δ '85
*Voellinger, Edward J.	Non-member
Yuan, Feibi	OH Γ '15

* Denotes correct bonus solution

SPRING REVIEW

The response to the Spring Ticklers was surprising, with more than 60 entries. We haven't had that many for a long time. Perhaps the column was a little easier than usual and encouraged more readers to submit their answers. The easiest regular problem was No. 4 about the four digits forming 24 different integers, with only one wrong answer. The hardest was No. 3 about the paving stones. The Bonus proved to be rather difficult, with only half the responses containing answers and only a third of those being correct.

SUMMER ANSWERS

Readers' entries for the Summer Ticklers will be acknowledged in the Winter *Bent*. Meanwhile, here are the answers.

1 Tatiana's age is **14**. This tickler can be solved without knowing the polynomial. Observe that when two numbers are substituted into a polynomial $f(x)$ with integral coefficients, the difference between the two resulting values $f(i) - f(j)$ is divisible by the difference of the two numbers $i - j$. We deduce this because any constant drops from the difference, and only like powers of i and j remain, which are always divisible by $i - j$.

Let t denote the age of the child. We know from the conversation that $t > n > 7$. Since $n - 7$ divides $85 - 77 = 8$, n must be one of 8, 9, 11, or 15. Because $t - 7$ divides 77, t must be 14, 18, or 84. To have $t - n$ divide 85, the difference must be 5, 17, or 85. Of the possible values, $14 - 9 = 5$ fits, so $n = 9$ and $t = 14$.

2 Each floor is an annulus, that is, the shape of an ordinary washer. The area of the hexagon floor is **900π m²**, its outside perimeter is **120π m**, and its height above the ground is **(5√241)/2 m**. Let floor i be defined by the regular polygon with i sides. The

circumradius of the polygon defines the radius R_i of the outer circle of the annulus. The apothem of the polygon defines the radius r_i of the inner circle. For a polygon with i sides, the ratio of the two radii $r_i / R_i = \cos(\pi / i)$, for $i > 2$. The area of the annulus is the difference of the areas of the two circles, or $A_i = \pi(R_i^2 - r_i^2)$.

Viewing the cross section of the building, let R_s be the radius of the outer hemisphere, and r_s be the radius of the inner hemisphere. Define h_i as the distance from the ground to floor i . Observe that $h_i^2 + r_i^2 = r_s^2$ and $h_i^2 + R_i^2 = R_s^2$. Combining to eliminate h_i and rearranging, $R_i^2 - r_i^2 = R_s^2 - r_s^2$. The right hand side is fixed by the radius of the two hemispheres, so we can conclude the area of each floor is identical.

We know from the problem that floor 4 is defined by a 60m square. Then $r_4 = 30$, $R_4 = 30\sqrt{2}$ and $A_4 = 900\pi$ m². So $A_4 = A_6 = 900\pi$ m². Combining $r_i / R_i = \cos(\pi / i)$ with $R_i^2 - r_i^2 = 900$, $R_i^2(1 - \cos^2(\pi / i)) = 900$, or $R_i = 30/\sin(\pi / i)$. It follows that $r_i = 30/\tan(\pi / i)$. For $i = 6$, $R_6 = 60$ m and the outer perimeter on floor 6 is $(2\pi)60 = 120\pi$ m.

Finally, use the fact that $h_4 + 5 = h_3$ to compute R_s . We can compute $R_3^2 = (30/\sin(\pi / 3))^2 = 1200$ and $R_4^2 = (30/\sin(\pi / 2))^2 = 1800$. Substituting into $h_4^2 + R_4^2 = R_s^2$, we get $h_4^2 + 1800 = R_s^2$. Substituting into $h_3^2 + R_3^2 = R_s^2$, we get $h_4^2 + 10h_4 + 1225 = R_s^2$. Combining the two and simplifying gives us $h_4 = 57.5$. Substituting back into $h_4^2 + 1800 = R_s^2$ gives $R_s^2 = 5106.25$. Using $h_6^2 + R_6^2 = R_s^2$, $h_6 = \sqrt{(5106.25 - (30/\sin(\pi / 6))^2)} = \sqrt{1506.25} = (5\sqrt{241})/2 \sim 38.81$ m.

3 The number is **24**. The number must be two digits, so that adding 18 reverses the digits. Let x be the first digit, and y the second. The first condition is equivalent to the equation $(10x + y) = 3xy$. The second condition is $(10x + y) + 18 = (10y + x)$ or simply, $x + 2 = y$. Substituting the second into the first, $11x + 2 = 3x(x + 2)$ which simplifies to $3x^2 - 5x$

$-2 = 0$. That is, $x = 2$ or $x = -\frac{1}{2}$. The digit x must be an integer, so $x = 2$, $y = 4$, and the number is **24**.

4 In the order from **SUN** through **SAT**, the code numbers for the days of the week are **10, 5, 6, 9, 4, 7, 8**. Observe that, of the integers between 1 and 10, the numbers 2, 4, 6, 8, 10 share the common factor 2, the numbers 3, 6, 9 share the common factor 3, and the numbers 5, 10 share the common factor 5. (The factor 4 is shared by 4 and 8, but that is a subset of the numbers that share the factor 2.) Of the seven days of the week, **N** is found in **SUN** and **MON**, **U** is found in **SUN**, **TUE**, and **THU**, **E** is found in **TUE** and **WED**, **T** is found in **TUE**, **THU**, and **SAT**, and finally, **S** is found in **SUN** and **SAT**. The **U**, **T**, and **S** days overlap, forming a larger group of 4 days, so those days must be coded from the multiples of 2. The **N** and **E** groups already each have one member that is a multiple of 2, so **SUN** and **TUE** each must be one of 6 or 10, and **MON** and **WED** must come from 3 or 9, and 5. Suppose **TUE** is 10, then **WED** is 5. Since maximum **THU** is 8, there is no **MON** small enough such that **MON+TUE** < **WED+THU**, and conclude that **TUE** is not 10. Therefore **TUE = 6, SUN = 10, MON = 5**. So **MON+TUE=11**, and since maximum **THU = 8, WED > 3**, so **WED = 9. FRI** has no common letters with other days, therefore must be either 1 or 7. **FRI = 7** because if **FRI = 1** then **FRI + SAT <= 9**.

We must choose **THU** and **SAT** from 2, 4, 8: **SAT** must be more than 2 greater than **THU** to ensure that $9 + THU > 7 + SAT$, so **SAT = 8** and **THU = 4**.

5 The five Tau Bates can order a total of 15 dishes in their three visits. Ordering a dish twice in the same meal will uniquely identify it. Also ordering a dish just once will uniquely identify it. They can identify three items the former way, and three more in the latter way. The remaining three can be determined on a unique pair of days. For example:

A	B	C	D	E	F	G	H	I
2			1			1	1	
	2			1		1		1
		2			1		1	1

On the first day: **AADGH**. Dish **A** is identified by the one that arrives twice. Second day: **BBEGI**. Dish **G** is known as the one that came also on day 1 and dish **B** is the one appearing twice. Third day: **CCFHI**. Dish **H** is the one served on days 1 and 3. Dish **I** served on days 2 and 3. Dish **C** twice on day 3, dish **D** only on day 1, dish **E** only on day 2, and dish **F** only on day 3.

Bonus The best solution that we found is **2-12-60, 2-14-35, 2-15-30, 3-5-15, and 3-6-10**; where the numbers indicate the denominators of unit fractions. The baker slices her loaf in 2-3-12-15-60, and the two apprentices 2-3-14-15-35 and 2-5-6-10-30 respectively. If the skill constraint is removed on the baker or the apprentices, five other solutions are possible, involving the alternative slicings 2-3-11-15-110 and 2-4-5-30-60 by one of the bakers.

Computer Bonus BDA8779, $= 90,224,199_{10} = 39^5$, **CEE2744**, $= 148,035,889_{10} = 23^6$, **ITI0801**, $= 13,841,287,201_{10} = 343^4 = 49^6 = 7^{12}$. A naive, brute force approach is to enumerate all legal license plates, and then test to see which ones meet the x^y such that $y > 3$ criteria. A more efficient algorithm might recognize that the largest x such that $x^4 < \text{ZZZ9999}_{36}$ is 529, then test pairs in the range for x from 2 to 529 and y from 4 until $x^y > \text{ZZZ9999}_{36}$. With those limits, a program needs only examine about 23,000 x,y pairs, which is considerably more tractable than the brute force method. Other optimizations to reduce the search space are possible. The judges produced solutions on multiple programming platforms that generated the solutions in less than a second.

NEW FALL PROBLEMS

1 Aunt Alice is a bit hard of hearing, so that when her nephew Ned asked

various neighbors some questions about their house numbers, she failed to hear the answers, though she heard the questions fine. Ned has lived on Christmas Crescent for some time, and his aunt knows Ned's number, but Alice has only just bought a vacant house there, but Ned doesn't know that. The Crescent has houses numbered rather curiously from 5 to 105, inclusive.

Ned asked the same three questions to three people, first to **X**, then to **Y**, then to **Z**, who live in separate houses on the Crescent. The questions were:

- (i) *Is the number of your house a multiple of 4?*
- (ii) *Is it a perfect square?*
- (iii) *Is it a multiple of 9?*

No two sets of three answers were exactly the same. After hearing **X**'s answers, Ned says to him: "If I knew whether your house number is greater than 83, I would know what it is." (Alice heard her nephew say this and was able to write down **X**'s number correctly.)

After hearing **Y**'s answers, Ned says to him: "If I knew whether your number is greater than 50, I could tell you what it is." (Alice heard her nephew say this, and as she happened to know that **Y**'s number is greater than her own, she was able to write it down correctly.)

After hearing **Z**'s answers, Ned says to him: "If I knew whether your house number is greater than 30, I could tell you what it is." (Alice heard this and notes with interest that her own number is certainly less than **Z**'s. But she too has no way of deciding whether **Z**'s number is greater than 30. However, being anxious to continue building her reputation for logical deduction and intuition, guessed that it was greater than 30 and wrote down the number, which, fortunately was quite correct.)

What are the house numbers of Ned, Alice, **X**, **Y**, and **Z**?

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

(Continued from page 52)

2 The Rev. Obadiah Slope does not actually care about soccer but, since becoming a Rural Dean, he likes to seem as if he does. So he takes a dutiful interest in the local league (each team plays each other team once in a season). “How is it going this year, my son?” he recently asked the retired tax inspector who acts as secretary.

“Well, it’s not finished yet you know,” was the answer, “even though only four sides are competing this time. Parminster United have so far played two games and lost them both, with three goals for and six against in total. Quondam Athletic have also played two, winning one and drawing the other, with a total of four goals for and three against. Real Episcopi have drawn one and won two, totaling two goals for and none against. And Salem Dynamo...”

“Splendid! Splendid!” Rev. Slope broke in, conscious that the lunch hour was nigh and suddenly remembering that, “I must see a man about a misericord.”

What was the score in each of Salem’s matches?

—A Tantalizer by Martin Hollis in *New Scientist*

3 On a 12-hour analog clock, at what time near 8:18 are the hands symmetric about 6, that is, 6 splits the angle between the minute and hour hands? At what time near 8:18 is the clockwise angle from the hour hand to the minute hand the Golden Mean fraction of the whole circle, that is, the angle between the minute and the hour hands is $360^\circ(\sqrt{5} - 1)/2$? Express your two answers (to the nearest millisecond) in the form hh:mm:ss.ttt.

—Allan Gottlieb’s Puzzle Corner in *Technology Review*

4 In the game of tennis, two players hit a ball back and forth across a net into a defined court. A player loses a point by either hitting the ball outside the court or failing to return a ball before it has bounced twice. The first player to win four points, provided he is ahead by at

least two points, wins the game. Thus, the final score can be 4-0, 4-1, 4-2, 5-3, 6-4, etc. The same player serves for a complete game, and on each point he has two chances to make a successful serve. Assume a player has a probability, p_1 , of a successful first serve, a probability, p_2 , of a successful second serve if the first serve is bad, a probability q_1 of winning a point if his first serve is good, and a probability q_2 of winning a point if his second serve is good. If he is serving, what is his probability w of winning a point (in terms of p ’s and q ’s)? What is his probability g of winning the game (in terms of w)? If $p_1=0.8$, $p_2=0.7$, $q_1=0.6$, and $q_2=0.5$, what are w and g ?

—H.G. McIlvried III, *PA Γ ’53*

5 Solve this cryptic addition with the usual rules: different letters are different digits, same letter is same digit, no leading zeros, base 10. FIVE + FIVE + TEN + TEN + TEN + TEN + THIRTY = EIGHTY.

—*Journal of Recreational Mathematics*

Bonus Four square blocks of sizes from 1^2 up to 4^2 can be fitted into a 7×5 rectangle (as shown), but not into a smaller rectangle. As you take a larger series of blocks, $1^2, 2^2, 3^2, \dots, n^2$, it is not always easy to choose the rectangle which will accommodate them with the least “waste”. With $n=4$, the minimum waste is 5. What size rectangles give the minimum waste for $n=11$ and for $n=12$? Consider the rectangle as a $p \times q$ grid, and draw in the n squares. Next, fill in each of these squares with digits; 1 for the 1^2 square, 2 for the 2^2 square, 3 for the 3^2 square, ... Use a

for 10^2 , b for 11^2 , etc. Use a dash for wasted space. Present your answers as q rows of p digits, as indicated in the example below.

```
3334444
3334444
3334444
2214444
22-----
```

—Stephen Ainley in *New Scientist*

Computer Bonus Find the (base 10) count of and the sum of all palindromic numbers between 1 and 100,000,000_{base}, inclusive, for bases 2 through 10, inclusive. A palindromic number is a number which reads the same forward and backward.

—Rolf B. Karlsson, *MI Z ’96*

Postal mail your answers to any or all of the Brain Ticklers to **Curt Gomulinski, Tau Beta Pi, P. O. Box 2697, Knoxville, TN 37901-2697** or email to *BrainTicklers@tbp.org* as plain text only. The cutoff date for entries to the Fall column is the appearance of the Winter *Bent* which typically arrives in early January (the digital distribution is several days earlier). The method of solution is not necessary. We welcome any interesting problems that might be suitable for the column. The Computer Bonus is not graded. Curt will forward your entries to the judges who are **H.G. McIlvried III, PA Γ ’53**; **J.C. Rasbold, OH A ’83**; **J.R. Stribling, CA A ’92**, and the columnist for this issue,

—**F.J. Tydeman, CA Δ ’73**

"THE BEST PEOPLE" ENGINEERING JOB BOARD

Tau Beta Pi is proud to offer a job board for students and alumni. Members can post resumes, browse over 4,500 engineering jobs, faculty positions, and internships, and employers may browse resumes.

New opportunities are posted on our home page daily and a full list of openings are available by visiting www.tbp.org/memb/jobBoard.cfm

TELL US THE TALE...WIN A T-SHIRT!

THINK UP some witty captions for this snapshot from Tau Beta Pi's photo archives, and if yours is judged one of the best, you will win a t-shirt of your choice!

The photo below, which appeared in the Winter 1974 issue of *The Bent*, shows dignitaries at the head table of the Initiation and Awards Banquet at the 1973 Convention in



Gainesville, FL. TBPI Vice President Mancil W. Milligan, Ph.D., P.E., *TN A '56*, enjoyed an after-dinner cigar as his wife Arlys looked on.

Please submit your entries to pat@tbp.org, or mail them to HQ by Monday, November 6, 2017.

The Summer 2017 contest picture on the right, also from the Winter 1974 issue, shows American Electric Power (AEP) Company Fellows, Edward M. Blocker, *MA E '73*, second left, and Charles J. Pencinger, *NJ G '73*, third left, with unidentified officials. The two were studying for masters degrees in power engineering at Rensselaer Polytechnic Institute. That was all the information we had about this photo at the time. However, Norman B. Johnsen, *NY Z '57*, wrote, "I think the person on the right is Donald Cook, president and chairman of AEP. At the time, AEP sponsored a graduate fellowship, which I think was named after Philip Sporn (*NY A 1917*), former AEP president and a major leader in the power indus-

try. The power engineering program at Rensselaer was under the direction of Eric T.B. Gross (*IL B 1920*), a professor who had previously been at Illinois Tech in Chicago. I studied at Tech when he was there and I joined AEP in 1962—and left to work in the southwest in 1976." Thanks, Norman!

From a field of 27 captions submitted by 14 Tau Bates, two female *Bent* readers were the victors this time capturing first, second, and runner-up places.

The overwhelming winner was this caption from Emily E. Ingram, *TX B '84*:

#1) "Boys, we are going to give the Beatles a run for their money!"

In second place is this entry from Isa L. Ferrall, *NC G '15*:

#2) "Now listen here, with great power, comes great responsibility."

Congratulations to both of you and we hope you will proudly wear your t-shirts.

Our runners-up were:

#3) "The Tau Beta Pi Caption Committee meets to select its next winner." from Joseph R. Brenner, *VA Δ '55*, and

#4) "This company is working through some tough changes right now. In times like these, you can't just be resistors, you have to be transformers." also from Isa Ferrall.

Thanks again to all of you who have participated in the contest for this issue and over the years! We look forward to reading your truly creative work.



\$\$ Benefit for Members

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

Did you know that GEICO provides a discount to Tau Beta Pi members on their auto insurance, which benefits Tau Beta Pi whenever a member gets a quote? Members could save up to an additional 8% on car insurance. Also, GEICO can help you find great insur-

ance rates on motorcycle, homeowners, renters, boat, and much more. Get a free quote today to see how much you could save with GEICO. It will be a very wise decision! Visit www.geico.com/greek/tbp or call 1-800-368-2734 for your free quote.



CHANGE OF ADDRESS ✍ THE BENT

Name _____ Chapter _____ Class _____

New Address _____ Effective date of new address _____

New City _____ State _____ Zip _____ Email _____

Email information to: member.update@tbp.org

Or complete this form and mail to: *Tau Beta Pi / P.O. Box 2697 / Knoxville, TN 37901-2697*



ALUMNI NOTES

California Alpha

Brian D. Noble, Ph.D., '91, is the new chair of computer science and engineering at the University of Michigan. Noble has been on the U-M faculty since 1998, and associate dean for undergraduate education at the college of engineering since 2013. Under his leadership, the college launched an interdisciplinary undergraduate program in data science and expanded the hands-on multidisciplinary design program.



Colorado Alpha

Hannah L. Cooling, '13, won the Rock 'N' Roll New Orleans Marathon women's division with a time of 2:50:28. She graduated with a bachelor's degree in chemical engineering and was a member of the Colorado School of



Mines cross country team. Cooling is a previous chapter president and TBI Scholar. She now works as an engineer for ExxonMobil. Her success has motivated her to run the California International Marathon this December with hopes to qualify for the Olympic Trials.

Colorado Zeta

Lt. Col. Raja J. Chari, USAF, '99, was among those selected by NASA for the 2017 astronaut candidate class. He was serving as commander of the 461st Flight Test Squadron and director of the F-35 Integrated Test Force. Astronaut candidates report to Johnson



Space Center, Houston, TX, for two years of training. They could then be assigned to any of a variety of missions, including: performing research on the International Space Station, launching from American soil on spacecraft built by commercial companies, and departing for deep space missions on NASA's new *Orion* spacecraft and Space Launch System rocket.

District of Columbia Beta

Anthony J. Lamanna, Ph.D., P.E., '97, has joined Arizona State Univer-



sity as program chair of the school of construction, and professor of alternative delivery methods and sustainable development. He was recently elected a fellow of the American Concrete Institute, and is a member of their educational activities committee as well as other technical committees. He was also elected a fellow of the ASCE, and is an evaluator for both ABET and the American Council for Construction Education.

Illinois Alpha

Stephen F. Cowap, '84, is starting production on a low-cost micro wind turbine. It will make affordable elec-



tricity available to power a light for several hours and/or charge up to four cell phones. Cowap has founded the REVOLT wind company with a program for people to donate windmills to charities for distribution to energy poor areas of the world. He is also establishing a world-wide affiliate program that will give anyone the chance to generate income by receiving commission on sales.

Victoria L. Coverstone, Ph.D., '85, has joined the University of Miami's



college of engineering as the new chair of the department of mechanical and aerospace engineering. According to the news announcement, she is the first woman to chair a department in the college. Previously, Coverstone was associate dean for undergraduate studies and a professor in the department of mechanical engineering at Texas Tech University. She also led the Engineering Opportunities Center.

Indiana Beta

Richard R. Roll, P.E., '81, is now working as an environmental engineer for the Buffalo, NY, office of GHD, an international consulting engineering firm. He is assisting various clients with issues of water supply and wastewater treatment.

Missouri Beta

Richard L. Ash Jr., '70, director of the St. Charles, MO, department



of parks and recreation until his retirement in 2005, was awarded a 2016 Honorable Cornelius Amory Pugsley Medal, recognizing contributions to the promotion and development of public parks and conservation in the U.S. Previously he worked for The James Foundation in St. James, MO (1968-79).

Nebraska Alpha

Stuart O. Nelson, Ph.D., '50, received the career excellence award at the Institute of Electrical and Electronics Engineers (IEEE) international instrumentation and



measurement technology conference in Turin, Italy. Nelson was a research engineer for the U.S. Department of Agriculture at the University of Nebraska, Lincoln, and the Russell Research Center in Athens, GA, and retired with 55 years of federal service in 2007. He conducted pioneering research on the dielectric properties of crops and treatment of agricultural products with radio and microwave energy.

New York Omicron

Glenn S. Spitz, '87, has received the Dilling Award, the highest honor



of AIM, Inc., the association for the automatic identification industry. Webscan, Inc., the company founded by Spitz in 1995, was recently acquired by Cognex Corporation, a leader in machine vision technology. Spitz is continuing at Cognex as director of ID engineering for verification products.

North Carolina Alpha

Charles R. "Chip" Martin, Ph.D., '73, has been selected by the Nevada



National Security Site (NNSS) as "Distinguished Engineer." He was honored "for formulating numerous projects that will posture the NNSS for a much expanded set of future missions." Martin is chief nuclear officer of National Security Technologies LLC and serves as an adjunct professor of nuclear engineering in the mechanical engineering department at the University of Nevada, Las Vegas. He spent more than 20 years as a senior engineer with the Defense Nuclear Facilities Safety Board.

Pennsylvania Beta

Michael H. Cosh, Ph.D., '96, has been awarded an Arthur S. Fleming Award from



George Washington University's school of public policy and public administration for his contributions to satellite remote sensing of soil moisture. The award recognizes outstanding federal employees who are in their first 15 years of service. He is a research hydrologist at the USDA Agricultural Research Service in Beltsville, MD.

Pennsylvania Delta

R. Donald Bartusiak, Ph.D., '77, is chief engineer, process control



for ExxonMobil Research and Engineering based in Spring, TX. He was elected as the founding co-chair of the open process automation forum that is defining industry standards for an open, secure, and interoperable process automation system architecture. As of May 2017, a total of 57 organizations, including operating companies, control system vendors, hardware and software suppliers, and system integrators, are members of the forum.

Texas Beta

Francisco A. Figueroa, Ph.D., '67, received his doctorate in systems



engineering management from Texas Tech University in May 2017, exactly 50 years after receiving his bachelor's degree in electrical engineering from Texas Tech. His dissertation was on risk management systems at universities and colleges. Figueroa also published his first children's book, *Mitzi, the Dish Rag Dog*.

Virginia Alpha

Karen E. Aspelin, P.E., '91, has opened a new transportation engineering firm,



MaxGreen Transportation Engineers, LLC, in Colorado Springs, CO. Aspelin serves on the Institute of Transportation Engineers' international board of direction and is also on the board of the Southern Colorado chapter of ASCE. She is a registered professional engineer in Colorado, New Mexico, Texas, and Idaho.

Wisconsin Alpha

Bruce A. Dale, '79, has retired as chief subsurface engineer from ExxonMobil after 36

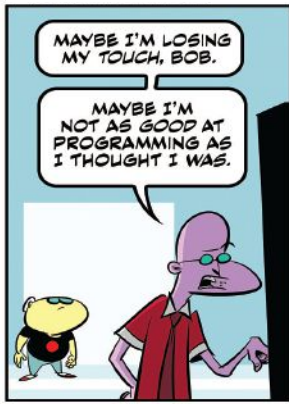


years. He served in both technical leadership and management capacities in R&D and field operations. Dale was a visionary to the company's upstream business for "engineering well performance to the physics limit," encouraging collaboration and innovations throughout worldwide operations. For three decades, he promoted the use of advanced simulation (FEA, CFD, PFC) and visualization technologies. Dale holds 25 related U.S. patents.

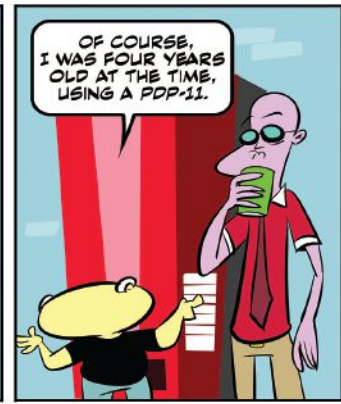
Write Your Own Note!

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, P.O. Box 2697, Knoxville, TN 37901-2697 or to alumnote@tbp.org. Material for publication must be received for the **Spring** issue by February 1, **Summer** issue by May 1, **Fall** issue by August 1, and **Winter** issue by November 1. Include name, address, chapter, class year, and email address or phone number. Thank you!

The PC Weenies



WWW.PCWEENIES.COM



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

2014 KRISHNA M. SADASIVAM WWW.PCWEENIES.COM

Advertisers' Index

ADVERTISER	WEB ADDRESS	PAGE NO.
Lincoln Labs	www.ll.mit.edu/employment	3
NSA	IntelligenceCareers.gov/NSA	Cover 4

Member Benefits

SEE COMPLETE LIST at tbp.org/memb/benefits.cfm

- **GEICO**—additional discounts on automobile insurance.
- **LinkedIn**—join 26,000 members in our official group for professional networking and career discussions. (Search: Tau Beta Pi Engineering Honor Society)
- **Local Hospitality**—access to a worldwide inventory of hotels at exclusively discounted rates.
- **LTCFP**—long-term care outreach and education program with access to favorable rates on long-term care insurance.
- **SIRVA Home Benefits**—discounts on real estate, mortgages, and moving services.
- **PPI**—discounts on professional licensing exam review materials (FE/EIT, PE, LEED, & more).
- **TBP Job Board**—post a resume online and browse through hundreds of engineering jobs at top companies.

Tau Beta Pi Insignia

Integrity and Excellence in Engineering

Call 865-546-4578, or visit the online store at www.tbp.org/store.cfm for complete pricing and availability of colors and sizes. Orders are accepted online, over the phone, or by mailing this form with payment.

Member's Name: _____ TBP Chapter & Class: _____

Shipping Address: _____ Day Phone: _____

_____ Email: _____

Item Description	Quantity	Price
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Mail your order and check to:
 TAU BETA PI
 P.O. BOX 2697
 KNOXVILLE, TN 37901-2697

Total Amount Enclosed: _____

ORDERING INFORMATION: ALLOW 4 TO 6 WEEKS FOR DELIVERY OF JEWELRY & CERTIFICATES & 10 WEEKS FOR DELIVERY OF CUSTOM-MADE RINGS.

TAU BATES...

Show your Commitment to Excellence.

10k Gold \$168/169



Gold finish \$29/30

OFFICIAL ENGRAVED BENT CHARM/PIN

10k Gold \$94/95



Gold finish \$27/28

SMALL BENT CHARM/PIN


10k Gold \$95



Gold finish \$25


TIE TACK/ RECOGNITION BUTTON

\$607




SIGNET RING 10K YELLOW GOLD

\$551




SEAL RING 10K YELLOW or WHITE GOLD

\$9.50



BENT FLAT CASTING

\$16.50




BRONZE PAPER-WEIGHT CASTING

\$47



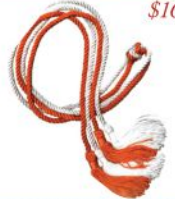
STERLING SILVER TIE TACK

\$29



GRADUATION STOLE

\$16




HONOR CORD

3 for \$5



INK PENS BLUE/BLACK

\$99



CROSS PEN

3 for \$30 and 4 for \$37




CERAMIC MUGS (\$13 per mug)

\$13



MEMBER CERTIFICATE

\$5



USB CAR CHARGER W/ TBPi IMPRINT

\$41



\$50 add \$2

GOLF SHIRTS (GREG NORMAN)

\$25



INSIGNIA LICENSE PLATE FRAMES

\$16



STAINLESS STEEL TRAVEL MUG

\$16



ENGINEER SHIRT 12 COLORS (XXL-\$18)

\$28



HOODIES (2XL-\$33) 14 COLORS

\$15



STRUCTURED CAP

Order Your TAU BETA PI
Official Insignia

AT WWW.TBP.ORG (PAYPAL) OR CALL (800/828-2382) FOR CREDIT CARD ORDER.



It's not only **WHAT** you do,
It's **WHY** you do it.



What's your expertise?

Is it a STEM field or business? Foreign language or intelligence analysis? Security or counterintelligence?

Whatever your field, NSA has a position that mixes your expertise with our mission:

The safety and security of our families, our communities and our country.

Apply today
IntelligenceCareers.gov/NSA

- Intelligence Analysis
- Intelligence Collection
- Foreign Language Analysis
- Computer Science
- Cyber
- Engineering and Physical Sciences
- Mathematical Sciences
- Business, Accounting and Budget
- Inspection, Investigation and Compliance
- Law and Legal Services
- Medical and Occupational Health
- Security and Law Enforcement
- Human Resources
- Education and Training
- General Administrative Support
- Communication and Public Affairs
- Infrastructure and Logistics
- Paid Internships, Scholarships and Co-Op



U.S. citizenship is required.
NSA is an Equal Opportunity Employer.



NSA

WHERE INTELLIGENCE GOES TO WORK®