

THE BENT

OF TAU BETA PI

The Engineering Honor Society

Winter 2019

**No Bent!
When Women
Were Just Given
a Badge**



Convention Report

CHAPTERS

ALUMNI CHAPTERS (78)

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**
- *Pioneer, OK*
- 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**
- *Albuquerque, NM*
- 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*
- *Orange County, CA*
- *Greater San Diego, CA*
- Southern California

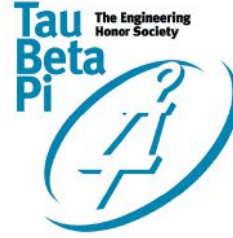
- CA Ø 16 California State Univ., Long Beach
- CA I 16 California State Univ., Los Angeles
- CA K 16 California State Univ., Northridge
- CA A 15 Univ. of California, Davis
- CA M 15 Calif. Poly. St. Univ., San Luis Obispo
- CA N 16 California State Poly. Univ., Pomona
- CA E 16 San Diego State Univ.
- CA O 16 Loyola Marymount Univ.
- CA P 16 Northrop Univ. (inactive)
- CA S 16 California State Univ., Fresno
- CA T 16 Univ. of California, Santa Barbara
- CA U 16 Univ. of California, Irvine
- CA Y 15 California State Univ., Sacramento
- CA Z 15 Univ. of the Pacific
- CA X 16 California State Univ., Fullerton
- CA Ψ 16 Univ. of California, San Diego
- CA Ω 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 C 12 Univ. of Denver
- 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 A 5 Univ. of Central Florida
- FL E 5 Florida Atlantic Univ.
- FL Z 5 Florida Inst. of Technology
- FL H 5 Florida A&M Univ.-Florida State Univ.
- FL Ø 5 Florida International Univ.
- FL I 5 Embry-Riddle Aeronautical Univ.
- GA A 5 Georgia Inst. of Technology
- GA B 5 Mercer Univ.
- ID A 14 Univ. of Idaho
- ID B 12 Idaho State Univ.
- ID G 12 Boise State Univ.
- ID A 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 A 8 Bradley Univ.
- IL E 8 Southern Illinois Univ. at Carbondale
- IL Z 8 Univ. of Illinois at Chicago
- IN A 8 Purdue Univ.
- IN B 8 Rose-Hulman Inst. of Technology
- IN G 8 Univ. of Notre Dame
- IN A 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 A 10 Univ. of Louisiana at Lafayette
- LA E 10 Univ. of New Orleans
- ME A 1 Univ. of Maine
- MD A 4 Johns Hopkins Univ.
- MD B 4 Univ. of Maryland
- MD G 4 United States Naval Academy
- MD A 4 Univ. of Maryland Baltimore County
- MD E 4 Morgan State Univ.
- MA A 1 Worcester Polytechnic Inst.
- MA B 1 Massachusetts Inst. of Technology
- MA G 1 Harvard Univ. (inactive)
- MA A 1 Tufts Univ.
- MA E 1 Northeastern Univ.
- MA Z 1 Univ. of Massachusetts at Amherst
- MA H 1 Boston Univ.
- MA Ø 1 Univ. of Massachusetts Lowell
- MA I 1 Western New England Univ.
- MI A 7 Michigan State Univ.
- MI B 11 Michigan Tech. Univ.
- MI G 7 Univ. of Michigan
- MI A 7 Univ. of Detroit Mercy
- MI E 7 Wayne State Univ.
- MI Z 7 Kettering Univ.
- MI H 7 Lawrence Technological Univ.
- MI Ø 7 Oakland Univ.
- MI 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 Δ 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 15 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 Δ 2 Cornell Univ.
- NY E 2 New York Univ. (inactive)
- NY Z 2 Polytechnic Inst. of Brooklyn (inactive)
- NY H 2 City College of CUNY
- NY Ø 2 Clarkson Univ.
- NY I 2 Cooper Union School of Engineering
- NY K 2 Univ. of Rochester
- NY Λ 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 Π 2 Rochester Inst. of Technology
- NY P 2 Polytechnic Institute of New York Univ.
- NY Σ 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 Δ 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 Δ 7 Ohio Univ.
- OH E 7 Cleveland State Univ.
- OH Z 7 Univ. of Toledo
- OH H 7 Air Force Inst. of Technology
- OH Ø 7 Univ. of Dayton
- OH I 7 Ohio Northern Univ.
- OH K 7 Univ. of Akron
- OH Λ 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
- OR A 14 Oregon Institute of Technology
- PA A 3 Lehigh Univ.
- PA B 3 Pennsylvania State Univ.
- PA G 3 Carnegie Mellon Univ.
- PA A 3 Univ. of Pennsylvania
- PA E 3 Lafayette College
- PA Z 3 Drexel Univ.
- PA H 3 Bucknell Univ.
- PA Ø 3 Villanova Univ.
- PA I 3 Widener Univ.
- PA K 3 Swarthmore College
- PA A 3 Univ. of Pittsburgh
- 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 A 6 Christian Brothers Univ.
- TN E 6 Univ. of Memphis
- TN Z 6 Univ. of Tennessee at Chattanooga
- TX A 10 Univ. of Texas at Austin
- TX B 13 Texas Tech Univ.
- TX G 10 Rice Univ.
- TX A 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 Ø 13 Univ. of Texas at El Paso
- TX I 10 Southern Methodist Univ.
- TX K 10 Prairie View A & M Univ.
- TX A 10 Texas A & M Univ.-Kingsville
- TX M 10 Univ. of Texas at San Antonio
- 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 Δ 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 Δ 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 A 8 Milwaukee School of Engineering
- WI E 8 Univ. of Wisconsin-Platteville
- WY A 12 Univ. of Wyoming

COLLEGIATE CHAPTERS (254)

- Chap. Dist. Institution
- AL A 6 Auburn Univ.
- AL B 6 Univ. of Alabama
- AL G 6 Univ. of Ala. at Birmingham
- AL A 6 Univ. of Ala. in Huntsville
- AL E 6 Univ. of South Alabama
- AK A 14 Univ. of Alaska Fairbanks
- AZ A 13 Univ. of Arizona
- AZ B 13 Arizona State Univ.
- AZ G 13 Northern Arizona Univ.
- AZ Δ 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 Δ 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.

the Bent^{of}



Winter 2019
Vol. CX / No. 1

Features

8 No Bent! Just a Badge.
by Jill S. Tietjen, P.E., VA A '76

17 The 113th Convention

26 Why Do We Call It a...?
by Lyle D. Feisel, Ph.D., P.E. (ret.), IA A '61



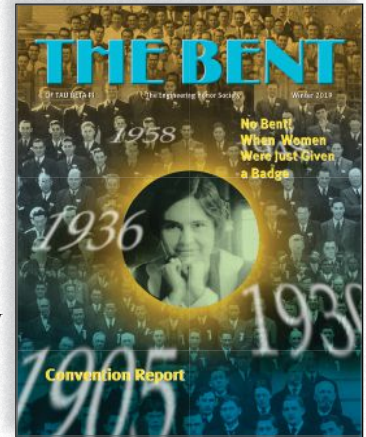
Departments

Council's Corner2
Letters5
Who's Who.....7
Caption Contest.....23
Brain Ticklers28
In The Colleges.....32
Association Briefs.....34
Chapter Eternal.....35
Alumni Notes38



Reports

New Executive Councillors.....14
President Holl Reports to Convention.....15
2018 Association Chapter Awards.....20
2018 Chapter Project Awards.....22
Contributors to 2018 Alumni Giving Program.....24
CEI Quotes on Gratefulness.....30



ON THE COVER:
Convention group photos from over the years show the evolution of TBPi as we mark the 50th anniversary of women becoming full members.
Cover artist: Dali Polivka

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 '84

*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.

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

Vol. 110 No. 1 Circulation: 83,900 Initiated Members: 594,074

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The Tau Beta Pi Association

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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

Mile High Meeting: Convention in Colorado

WITH THE WHITE-CAPPED Rocky Mountains in view, the 113th Convention was called to order in the chilly October air of the Centennial state. One of the highlights included the reactivation of the Colorado Gamma Chapter after a four-decade hiatus followed by an initiation of new members.

Addressing the Convention floor, I saw the many diverse faces of our future high achievers in business and academia. In witnessing the skilled parliamentary procedure conducted on the floor, I hope some consider the calling of public service. To be sure, Congress would benefit from a few more scientists and engineers in lieu of lawyers.

During the Convention, I was speaking with Jim Froula, our distinguished Secretary-Treasurer Emeritus. I made a remark about the mountains and learned that Jim was a fellow climber, but not just any climber—one who had summited the 50+ fourteeners in Colorado. Like Jim, I share a passion for climbing and recently completed “the list” of having summited all of Colorado’s peaks higher than 14,000 feet. We talked about the perseverance and physical suffering it took to complete the goal, while appreciating the magnificence of nature’s great cathedrals.

Pursuit of Achievement

That reminded me of the perseverance we all possess in our pursuit of achievement. Relentless small steps lead to memorable milestones. One of our members was awarded the Nobel Prize in 2018—quite an honor indeed. Such recognition is not rare for our membership. After all, we’ve been making extraordinary contributions to create a better world for over a century. Our membership archives bear this out: now 23 Nobel Prizes awarded.*

Years ago, when it was still held in Akron, OH, I attended the annual gala for the National Inventors Hall of Fame. Stories of invention are always among the most captivating. Over 60 Tau Bates are in that Hall. And, when I landed on Capitol Hill as a Congressional Science and Engineering fellow, I met a Member of Congress who is also a Tau Bate. I later found out that nearly 20 of our members have served in the U.S. Congress.*

Enhancing our image, visibility, and branding remains a pillar in our master plan. As an organization, we need to do a better job of showcasing member achievements and enthusiastically broadcast who we are.

From 2016-18, the number of eligible members for initiation steadily increased: 46,000, 48,000, and 51,000, respectively. But, 66% of those eligible did not join Tau

Beta Pi based specifically on a lack of interest in the organization. We must improve!

I believe it starts with image, visibility, and branding. That would lead to more members and ultimately more participation and support. However, I believe that branding is closely linked to another pillar: strengthening the finances of our organization.



Robust efforts to fundraise pay off in the programs we provide, the opportunities for lifelong learning, and in fostering a spirit of liberal culture amongst our colleagues.

Churchill is often attributed with having remarked that “We make a living by what we get. We make a life by what we give.” Whether Winston said it or not, the words ring true. We give in terms of time and finance; but in a competitive landscape for contributions, our message must be compelling and it must reach those who would be supporters.

A colleague recently remarked that the reality of fundraising means that most would rather drink a hemlock latte than ask for a donation from a friend or colleague. For a nonprofit, such a request must be made.

Number Donating Declined

In 1987, we had over 319,000 members. Of those, 19,695 donated, representing nearly 6% of the membership. In terms of giving, any school or nonprofit would be grateful to achieve this level. Over the last 30 years, our membership has increased each year. Meanwhile, the number giving has steadily declined. In 2018, we had over 593,000 members. Of those, 9,576 donated, representing only 1.6% of our membership. If we apply the percentage from 1987, we should hope for over 35,000 donors.

We need to do a better job communicating and engaging our members, especially those transitioning from school to career, and continue to build a stronger brand. With 248 chapters and 44 alumni chapters, we require more consistent outreach. I believe that when we strengthen the foundations of membership, we help to build a long relationship. After all, Tau Beta Pi is for life!

If you attended a Convention and enjoyed it, help to

offer that experience to future students. Contribute to the cause. Of course, we are more than a student activity. We are *life members* enriching one another through alumni activities and lifelong learning opportunities. Initiation is more than an award or an honor bestowed. It is a gateway to a growing family of engineers who tackle the challenges of our time and help to change the world.

To that end, I have a challenge of my own. Tell me the reasons why *you* give to Tau Beta Pi.

Wayne B. Paugh, J.D., LL.M.,
Florida Gamma '93, President,
wpaugh@tbp.org

*Distinguished Tau Bates are listed at <https://www.tbp.org/about/distinguished.cfm>

2019 District Conferences

THE DISTRICT PROGRAM provides a vital link between the Association and individual chapters. Each year, the Directors meet with students at regional conferences to provide both retiring and new officers opportunities to improve chapter operations and to socialize. **Interested alumni are encouraged to attend** but should email tbp@tbp.org for details. All chapters are urged to elect new officers before their District Conference.

DISTRICT	LOCATION	DATE
1	Orono, ME	TBA
2	Ithaca, NY	Mar. 2-3
3	Pittsburgh, PA	Feb. 8-9
4	College Park, MD	Mar. 30
5	Orlando, FL	Mar. 30-31
6	Chattanooga, TN	Apr. 5-6
7	Columbus, OH	Apr. 13
8	Chicago, IL	Apr. 6-7
9	St. Louis, MO	Mar. 3
10	Edinburg, TX	Apr. 13
11	Minneapolis, MN	Apr. 13
12	Boise, ID	Feb. 22-23
13	Albuquerque, NM	Apr. 13
14	Portland, OR	Mar. 2-3
15	Davis, CA	TBA
16	Riverside, CA	TBA

"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

"I cannot be more thankful for all the opportunities and experiences Tau Beta Pi has given me."

Delaney Fisher, TN A '18
2018 Fellow & Past Chapter President



Your support enables Tau Beta Pi to be a leader among engineering societies in assisting talented students, like Delaney.

The generosity of members like you help fund:

- more than 280 Scholarships of \$2,000
- 30 Fellowships of \$10,000
- Leadership training through Engineering Futures for more than 3,500 students

Please help us make 2018 our most successful year yet for deserving Tau Bates!

To make a gift, visit:
www.tbp.org/give/donate.cfm

Shout Tau Beta Pi on Pi Day, March 14

Join in the Sixth Annual Tau Beta *Pi Day*

Wear your Bent or TBP apparel
Participate in a TBP activity
Post on social media with #TauBetaPiDay

www.tbp.org/PiDay





LETTERS

Chapter Project Scholarship

• Thank you so much for choosing me for the scholarship. This money will go towards my education as I am working on a degree in biomedical engineering at the University of Wisconsin-Madison.

I will be entering my senior year at the UW and I am beyond excited to continue my education in the college of engineering.

I am involved with the Society of Women Engineers, which gives me opportunities to share my love of engineering with others and allows me to participate in professional development. I also give back to the Madison community with my involvement in Badger Volunteers, in which I volunteer once a week during the school year.

I am also the current president of my chapter. As far as my academics, I want to graduate with a degree in biomedical engineering specializing in bio-mechanics. After graduation, I would like to get into the workforce with other biomedical engineers developing new medical products.

Thank you for helping me further my education with the gift of this scholarship.

Desiree Flouro, WI A '19

• I am writing to thank you and the rest of the Tau Beta Pi Association for the academic scholarship I have been awarded. This scholarship adds to the list of countless ways my membership in TBPi has benefited my education. I cannot express enough gratitude for the financial assistance as I enter my senior year at the University of Wisconsin-Madison.

The connections I have made, the lessons I have learned, and the skills I have acquired from my involvement in my Wisconsin Alpha Chapter will surely help me to succeed as an engineer and to better contribute to society. Tau Beta Pi has given so much to me and I have aimed to pay it forward to newer members of our organization through my involve-

ment in leadership roles within my chapter. I am incredibly proud to be a Tau Beta Pi Member for Life! Once again, thanks to you and the rest of the executive leadership team for this generous academic award.

Erik A. Doersching Jr., WI A '19

Convention Thanks

• I just wanted to send in a note to say thanks for the opportunity to attend the 2018 TBP Convention in Denver as my chapter's voting delegate. Although the Convention was pretty hectic between committee and business meetings, I still learned so much about the value of TBPi and really enjoyed meeting other Tau Bates from around the country. I loved the Professional Development Sessions and the comedian, as well. You did a great job! Hopefully, I'll get to do it again one day.

Abby L. Burke, KY A '19

“Entertaining Reading”

• Compliments on Robert W. Street-er's very informative article in the fall issue. I was impressed with his description of the scientific measurements being performed at the South Pole and the conditions under which the work was being performed. I also found the article to be entertaining reading—he is a talented writer. I would look forward to some additional articles in *The Bent* on the technical work being performed in Antarctica.

Clyde L. Ware Jr., GA A '59

• Thank you for publishing Mr. Streeter's diary of his activities at the South Pole station. It is especially helpful to those of us who are too old to make such a trip ourselves; better vicariously than not at all.

Keep up the good articles.

*Myron Kayton, Ph.D., P.E.,
NY I '54*

• Thanks for publishing the truly

interesting feature by Rob Streeter, from my hometown, about his work in Antarctica! And I thought fire-fighting was interesting. Engaging story, well written.

Traute L. Parrie, WY A '82

Calculating

• For the Programmable Calculator (Fall Caption Contest): “Fantastic functions, but the battery died on me during my static's test.” True story, same era as the picture.

I now live in the Denver area and work for Lockheed Martin.

Great articles in this issue! The Antarctic one and Clara Shih.

You make me glad I got the life subscription decades ago.

George J. Flanders, IL Δ '82

Statement of Ownership, Management & Circulation

Date of filing: October 1, 2018

The Bent of Tau Beta Pi, ISSN 0005-884X, is published quarterly by The Tau Beta Pi Association, Inc., 508 Dougherty Engineering Building, University of Tennessee, Knoxville, TN 37996-2215. The annual subscription price is \$10.00. Editor is David S. Roberts, P.O. Box 2697, Knoxville, TN 37901-2697.

The magazine is owned wholly by The Tau Beta Pi Association, Incorporated, P.O. Box 2697, Knoxville, TN 37901-2697. There are no individual owners, bondholders, mortgagees, or other security holders. Nonprofit postal status has not changed during the past 12 months.

	Average No. Copies Each Issue Preceding 12 Months	Actual No. Copies Single Issue Nearest to Filing Date
Total No. copies printed (net press run)	80,378	79,432
Paid mail circulation	78,395	76,951
Sales through dealers and counter sales	0	0
Free distribution by mail (samples, complimentary)	674	658
Total distribution	79,069	77,609
Copies not distributed	1,309	1,823
Total	80,378	79,432

I certify that the statements made above are correct and complete.

—David S. Roberts, Editor



Lee A. Hennis, CA Delta 1965 On Supporting the Fellowship Program

“My parents were products of the Great Depression and taught me the importance of savings and the wonders of compound interest. Through their savings, they were able to fund my undergraduate studies at USC.

Fellowships for both my MS and MBA allowed me to complete my graduate work early in my career without the burden of student debt so prevalent today.

In later years as an engineering manager and then a consultant, I spent much of my time mentoring young engineers on how to solve technical issues. Now comfortably retired, I hope to continue this mentoring through financial support by endowing a TBP Fellowship.”

Undergraduate Scholarships: \$2,000 gift—one year award | \$40,000 gift—permanently funds one scholarship.

Graduate Fellowships: \$10,000 gift—one year award | \$200,000 gift—permanently funds one fellowship.

For more information about establishing a Fellowship or Scholarship, please contact Sherry Jennings-King, TNA '93, sherry.jenningsking@tbp.org or 612/226-2922.



WHO'S WHO

Frances H. Arnold, Ph.D., *New Jersey Delta '79*, was a 2018 Nobel Prize for Chemistry recipient with the remaining half awarded jointly to two others. She is a professor and director of the bioengineering center at the



California Institute of Technology and Advisor to CA Beta. Arnold was recognized for performing the first-ever “directed evolution” of enzymes —proteins that catalyze chemical reactions—to see if they could be tailored to work differently. Her methods are now routinely used to develop new catalysts, in turn used for “more environmentally friendly manufacturing of chemical substances, such as pharmaceuticals, and the production of renewable fuels for a greener transport sector.”

John L. Anderson, Ph.D., *Delaware Alpha '67, top*, has been nominated as sole candidate for president of the National Academy of Engineering.



He is president emeritus and distinguished professor of chemical engineering at the Illinois Institute of Technology. NAE members will vote in March on the successor to current president



C. Dan Mote Jr., Ph.D., *California Alpha '59*, whose six-year term ends June 30.

Lisa P. Jackson, Louisiana Beta '83, is Apple’s vice president of environment, policy, and social initiatives, reporting to CEO Tim Cook. From



2009-13, she was administrator of the U.S. Environmental Protection Agency. Appointed by President Barack Obama, she focused on reducing

greenhouse gases, protecting air and water quality, preventing exposure to contamination, and outreach on environmental issues. Jackson now oversees Apple’s efforts to minimize its impact on the environment and is responsible for education policy programs and its worldwide government affairs.

James L. Melsa, Ph.D., *Iowa Alpha '60*, has received the American Society for Engineering Education’s Lifetime Achievement Award. He is dean emeritus of Iowa State University’s college of education and the society’s 2007-08



president. Melsa was recognized for achievements in engineering education which include leadership at Iowa State and the University of Notre Dame, and the ASEE, as well as contributions to communications and controls systems.

James A. Momoh, Ph.D., *District of Columbia Alpha '75*, has been confirmed and sworn in as chairman of the Nigeria Electricity Commission (NERC) by the African nation’s Senate.



He was previously a professor of electrical engineering and computer science with Howard University. Momoh was director of the power

program in the electrical and communications systems division at the NSF from 2001-04.

Holly E. Ridings, Texas Delta '97, has been named by NASA as its



new chief flight director. She will manage the group of 32 active flight directors and flight directors-in-training who oversee a variety of human space-

flight missions. Ridings is the first woman to lead the elite group that directs human spaceflight missions from the Mission Control Center at Johnson Space Center. She has been with NASA since 1998, after earning her bachelor’s degree in mechanical engineering from Texas A&M University.

Katherine Avery Vozar, Ph.D., *Michigan Zeta '09*, is the technology integration lead at Ford Motor Company, where she works to integrate emerging technologies into future vehicles. She earned her M.S. and doctor-



ate at University of Michigan and has received Michigan Engineering’s 2018 Outstanding Recent Alumni Award. She was honored for technical contributions to fatigue materials research as well as leadership in engineering education. This included developing a workshop to introduce Detroit high school students to engineering concepts.

This is the first of three articles to mark the 50th anniversary of women being initiated in the Association. The second will be in the Spring Bent.

No Bent! All Women Were Given Was A Badge

by Jill S. Tietjen, P.E., Virginia Alpha '76

IT MIGHT SURPRISE our current collegiate members to find out that the major engineering professional societies, including Tau Beta Pi, did not admit women for many years. When they finally decided to do so, women were often not admitted as full members but instead as “associates” or, in the case of TBPI, with a “Women’s Badge.” Indeed, it wasn’t until

decades after the institution of the Women’s Badge that women were finally able to join as full members.

This article provides context for how and when women were admitted to membership and fellowship in the professional societies, with a perspective on the number and percentages of women receiving engineering education throughout this period of history.

The Founder Societies, the five

original engineering societies that founded the United Engineering Society in 1904, include the American Society of Civil Engineers (ASCE), the American Institute of Mining Engineers (AIME) (now called the American Institute of Mining, Metallurgical and Petroleum Engineers), the American Society of Mechanical Engineers (ASME), the American Institute of Electrical Engineers (AIEE—a predecessor organization to the Institute of Electrical and Electronics Engineers—IEEE), and the American Institute of Chemical Engineers (AIChE). The years of founding are ASCE—1852, AIME—1871, ASME—1880, AIEE—1884, and AIChE—1908. None of these societies admitted women at the time of their founding.

Cultural Norms of the Time

They were reflecting the cultural norms of the time. When the United States Military Academy (USMA) was established in 1802 to educate engineers, it did not admit women. Rensselaer Polytechnic Institute (RPI), established in 1824 in Troy, NY, is the oldest surviving non-military engineering school in the U.S. and it did not admit them. In fact, prior to the Civil War, only six engineering schools existed in the U.S. and none did. Both the USMA and RPI are Eastern colleges.

The situation was different, however, in Western states where most colleges were state-supported (versus private) and co-educational from the time of their founding. Why? Because there weren’t enough male students in the less-populated West at the time to enroll and because taxpayers wouldn’t support these institutions unless their daughters could attend.

The Morrill Act of 1862 was responsible for the establishment of many of these institutions (the so-called land grant colleges). This has



Emily Warren Roebling, the first woman to address ASCE, in 1883, painted in Paris circa 1896 by French society artist Carolus Duran.



Ellen Richards, the first woman to attend, and graduate from, MIT. Photo: Library of Congress.

HISTORY OF FEMALE RECOGNITION

WHEN TAU BETA PI was founded in 1885, its original Constitution made no mention of gender, yet it took eighty-three years until the first female member was initiated.

“The document had been written at a time when there were no women in the profession, and it had been assumed that only men would join.”—Nancy Hill, *The Bent*, Fall 1985.

As far as we know today, the first female student eligible for membership was an architectural student at the University of Illinois, Ethel Ricker. In 1903, she was the top student of her senior class. Illinois Alpha was more than willing to initiate her, but her election was rejected by the Executive Council. In response, the chapter appealed the decision to the 1903 Convention. The minutes from that meeting give only a brief mention: “Moved that [the Secretary-Treasurer] be instructed to issue a bent and certificate to Miss Ethel Ricker. Motion lost. Adjourned for lunch.”

Not satisfied with merely rejecting this one student, the Convention decided to explicitly interpret the Constitution as banning women from membership: “Resolved that the Tau Beta Pi Association in Convention assembled interpret the Constitution as prohibiting the admission of women into Tau Beta Pi Association.” Backlash continued at the following Convention where delegates passed an amendment to the Constitution to specify that only men could be initiated.

The backlash was felt in other areas as well. Delegates at Convention began referencing each other as “Brother.” In the early 1900s, the topic of merging with Sigma Xi, the scientific research honor society, was debated. Several delegates listed “no further election of women” as a required concession for merging into Sigma Xi which had been initiating women since 1888. Ultimately, the 1905 Convention resolved against the merger, stating “That it is the sense of this Convention that the purpose, scope, usages and field of work, of Tau Beta Pi and Sigma Xi, are so distinctly different that we do not believe there need be conflict or competition between the two Societies.”

Twenty years later, a woman’s eligibility was again presented at Convention. Katharine Cleveland, a civil engineering student at the University of Kentucky, was the top student in the class of 1924 but could not be elected because of the previous changes.

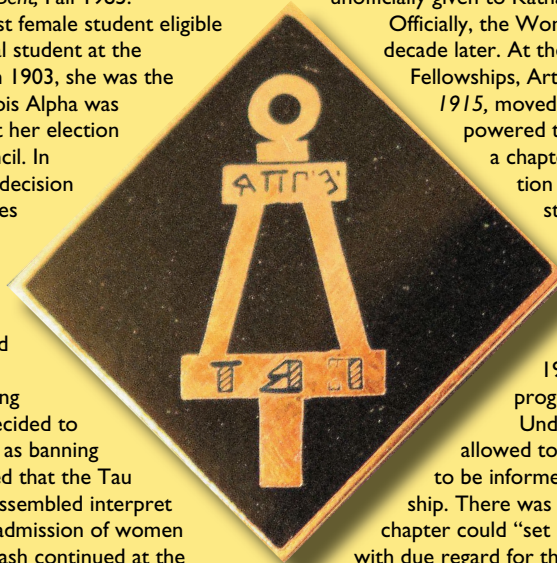
Ernest Bureau, *Indiana Alpha 1915*, an alternate delegate from Kentucky Alpha, presented her situation at the 1923 Convention. Instead of asking for full membership for her, he suggested she “be permitted to wear a silver bent” as partial recognition. The Convention approved, and the first Women’s Badge was unofficially given to Katharine.

Officially, the Women’s Badge program began over a decade later. At the 1936 Convention, the Director of Fellowships, Arthur D. Moore, *Pennsylvania Gamma 1915*, moved: “That the Executive Council be empowered to put into operation a plan whereby a chapter may give some suitable recognition to a promising woman engineering student.” According to the minutes, two specific cases of candidates were discussed, and “several delegates spoke of a need for such action.” The motion passed, but the Executive Council took until 1938 to work out the details of the program.

Under that program, women were not allowed to be elected to membership and had to be informed of their ineligibility for membership. There was no fee for receiving the badge. Each chapter could “set up special pledge duties for a woman, with due regard for the amenities.” Recipients could not be “initiated,” only “presented.” Instead of an official certificate, they received the Badge—“a small gold, black-enamelled square with a gold border, bearing a half-inch-high Tau Beta Pi Bent.”

Chapters began awarding Women’s Badges in 1939, the first under this new program to Carmen de la Vega, a chemical engineering student at Tulane University. In total, 619 Badges were awarded over the program’s thirty-year lifespan. The last Badge was awarded on January 26, 1969, to Mary Baker, an engineering mechanics student at the University of Wisconsin. That month, the Executive Council announced the successful ratification of amendments to the Constitution to admit women to full membership in Tau Beta Pi, including previous Women’s Badge recipients. On April 18, 1969, the first Women’s Badge recipient, Katharine (Cleveland) Harelson, *Kentucky Alpha 1924*, became one of the first women initiated into Tau Beta Pi.

—Allen D. Erickson, *New Mexico Gamma ’14*



been credited with democratizing higher education in the U.S. and providing colleges for the industrial classes.

The first woman to earn an undergraduate degree in engineering, Elizabeth Bragg, achieved that feat in civil engineering back in 1876 at the University of California, Berkeley. By 1880, 85 engineering colleges had been established in the U.S.

In 1893, when the Society for the Promotion of Engineering Education (later named the American Society for Engineering Education) was established, only three women were recorded as ever having received engineering degrees across the entire U.S. In addition to Elizabeth Bragg, these women were Elmina Wilson (who graduated in 1892 from Iowa State College in civil engineering) and Bertha Lamme (who graduated in 1893 from The Ohio State University in mechanical engineering with an emphasis on electricity). It is worth noting

that many women—and men—who sought employment as engineers in the late 1800s and early 1900s did not receive formal engineering education.

Women and the Professional Engineering Societies

Emily Warren Roebling was the first woman to address ASCE in 1883, defending her husband’s role as the formal director of construction of the Brooklyn Bridge. Nora Blatch de Forest became a junior member of ASCE in 1905, after graduating in the top five of her Cornell University class, but was not able to advance in the membership ranks of ASCE in spite of the lawsuit she filed. Elsie Eaves became an associate member of ASCE in 1927—achieving full membership in 1957—three decades later. She was honored as the first female ASCE Fellow.

Ellen Henrietta Swallow Richards became a full member of AIME in 1879. Although she was technically

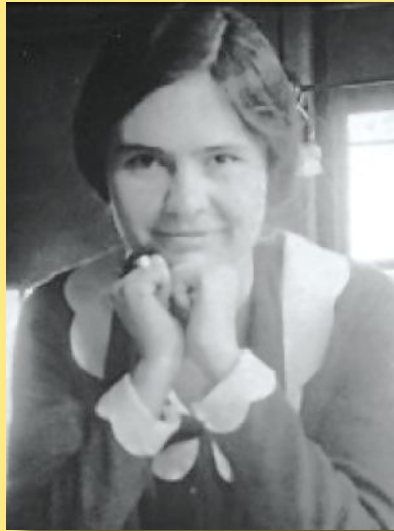
TAU BETA PI'S "FIRST LADY"

KATHARINE CLEVELAND HARELSON (1902-70), badge holder #1 and later Kentucky Alpha '24, was a 1924 University of Kentucky graduate in civil engineering. She is considered Tau Beta Pi's "First Lady" because she received Women's Badge #1. Katharine was among the first group of 155 women initiated in 1969 (shortly before her death in 1970), after the prohibition on women members was lifted.

Katharine Cleveland, born March 16, 1902, in Kenton County, KY, was a student at the University of Kentucky in the early 1920s. She likely studied under Kentucky's founding dean of engineering, F. Paul Anderson, and knew his dog, Jerry, who all but lived on campus and even accompanied his owner to classes. Like many of our engineering majors today, Katharine worked "after school" and during the summers while an undergraduate at the University of Kentucky. Her employer was the architectural firm Frankel & Curtis in Lexington, KY, where she identified her job title as "draftsman."

Katharine had a remarkable, although short, career for a female engineer in the mid-1920s. Upon graduation in 1924, she moved to San Francisco, CA, where she took a draftsman position with renowned female architect Julia Morgan from 1924 to 1926. Morgan is perhaps best known for her work on the Hearst Castle (and other Hearst buildings), in addition to the Los Angeles Examiner Building and YMCA in Chinatown. Morgan was a trendsetter, much like Katharine, being the first woman to obtain an architecture license in the state of California, in 1904. While the Julia Morgan Architectural Drawings collection at the Bancroft Library, UC Berkeley, contains drawings from Morgan's firm for the years that Katharine was employed there, inspection of several pieces did not reveal any indication of the draftsman. Therefore, we do not know which projects Katharine worked on during her time there. She did note in her 1953 TBPI Association Women's Badge Questionnaire that she took several classes in architecture at the University of California, Berkeley, while she worked for Morgan. The Berkeley's Cal Alumni Association verified that her coursework was at the graduate level.

In 1926, Katharine returned to Lexington. One wonders what prompted her to return home from what would appear to have been an excellent position for a young female engineer in the 1920s. Carol Street, Special Collections Librarian at the University of Kentucky, observed that Kentuckians "tend to love their state above any other. Particularly here in the Bluegrass, I think." Perhaps love of her home state is what drew Katharine back. In any case, Katharine took a position as a draftsman at her college employer, Frankel & Curtis, where she worked until 1927. Frankel & Curtis have a number of buildings listed on the National Register of Historic Places, including the Russell Theatre, Lexington Herald Building, and Second Presbyterian Church. As with the Julia Morgan collection at UC Berkeley,



the University of Kentucky Margaret I. King Library houses the Frankel & Curtis collection, but inspection of drawings from the time that Katharine worked there do not reveal any identifying information about the draftsman.

In 1927, Katharine left Frankel & Curtis for a draftsman position at H.A. Churchill and John P. Gillig, Architects, in Lexington, where she worked until 1929. Again, one wonders what prompted her move. While there is no way to be sure, it is interesting to note that Churchill and Gillig designed the Lexington Post Office and Federal Building (completed in 1934). The construction of this and similar buildings around the nation were spurred by the passage of the federal Public Buildings Act of 1926, which created a backlog of construction projects that necessitated reaching beyond the typical Washington, DC, architectural firms that designed post offices and federal buildings to local architectural firms in order to meet demand. Katharine's move to the firm in 1927 could have been related to Churchill and Gillig's having been awarded the contract

for the massive federal building and their associated need for additional draftsmen. Given that Churchill and Gillig had, at one time, designed post offices around the country for the federal government, it is not surprising they were picked as the architect for the Lexington building (which still exists and is considered an excellent example of Classical Revival architecture).

Katharine married civil engineer and classmate **Henry Lloyd Harelson, KY A '24**, in 1929, the same year she left Churchill and Gillig. It would have been expected back then for a woman to quit her job upon marriage, so it is not surprising this ended her career.

On her 1953 Women's Badge Questionnaire, Katharine noted "my connection with engineering for the past 24 years has been through marriage." According to the 1940 U.S. Census, Katharine had at least three children, the oldest being William Henry "Hank" Harelson born in 1930, and his sisters Katie, born around 1936, and Elizabeth, born around 1938. Hank followed in his parents' footsteps, graduating from the University of Kentucky with a B.S. in mining engineering, was a registered professional engineer and worked in underground production, had a consulting firm, and was an inspector for the Colorado Tramway Board, which inspects ski lifts.

When asked about receiving the Women's Badge, Katharine answered "Yes" to the question about whether the honor bestowed upon her by the award of the Badge was a sufficient distinction, but added that "perhaps, at the time" she would have preferred full membership. She added: "My feelings about the question shouldn't be given as much weight as the opinions of the younger women who are actually in the profession."

TBPI's First Lady, Katharine Cleveland Harelson died June 27, 1970, and is buried at Bluegrass Memorial Gardens in Lexington.

—Jenna P. Carpenter, Ph.D., *Indiana Alpha '83*

INVENTOR, TEACHER, AND PIONEER

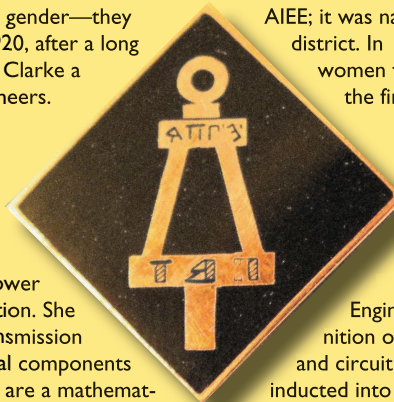
EDITH CLARKE (1883-1959), badge holder #95, wanted to be an engineer. But, when she graduated from Vassar with an A.B. in mathematics and astronomy in 1908, engineering was not offered or encouraged as a career for women. Instead, she did the same as many women of her era, she worked for three years as a teacher. After a year studying civil engineering at the University of Wisconsin, she went to work for American Telephone & Telegraph Company (AT&T) as a computing assistant. Clarke is an example of an early “computer”—women with advanced training in mathematics who performed calculations for engineers (men).

During World War I, she supervised women at AT&T who did computations for research engineers and studied radio at Hunter College, and electrical engineering at Columbia University at night. Eventually, she enrolled at MIT and received her master’s in electrical engineering in 1919, the first woman awarded that degree from MIT. On graduation, she wanted to work for General Electric (GE) or Westinghouse.

Even with her stellar credentials, no one would hire her as an engineer because of her gender—they had no openings for a woman engineer! In 1920, after a long employment search, General Electric offered Clarke a computing job, directing calculations for engineers.

But, Clarke wanted to be an electrical engineer! Since that was not the job she was offered, she left GE in 1921 to teach physics at the Constantinople Women’s College in Turkey. A year later, GE did offer her a job as an electrical engineer.

Clarke’s area of specialty was electric power systems and problems related to their operation. She made innovations in long-distance power transmission and development of the theory of symmetrical components and circuit analysis. Symmetrical components are a mathematical means by which engineers solve problems of power system losses and performance of electrical equipment.



Clarke literally wrote the textbook: *Circuit Analysis of AC Power Systems, Symmetrical and Related Components* (1943) and a second volume in 1950. This textbook, in its two volumes, was used to educate all power system engineers for many years. She published 18 technical papers during her employment at GE reflecting her status as an authority on hyperbolic functions, equivalent circuits, and graphical analysis within electric power systems. She was involved in the design of hydroelectric dams.

Clarke received a patent in 1925 for her “graphical calculator”—a method of considering the impacts of capacity and inductance on long electrical transmission lines. It greatly simplified the calculations that needed to be done. In 1926, she was the first woman to address what is now the Institute of Electrical and Electronics Engineers (IEEE)—it was then the American Institute of Electrical Engineers (AIEE). Her topic was “Steady-State Stability in Transmission Systems.”

In 1932, Clarke became the first woman to present a paper before the AIEE; it was named best paper of the year in the northern district. In 1948, Clarke was made one of the first three women fellows of IEEE. She had previously become the first female full voting member of IEEE.

After her retirement from GE in 1945, Clarke became an associate professor of electrical engineering at the University of Texas. In 1947, she rose to full professorship becoming the first woman professor of electrical engineering in the U.S.

Clarke received the Society of Women Engineer’s Achievement Award in 1954 “in recognition of her many contributions to stability theory and circuit analysis.” In 2015, she was posthumously inducted into the National Inventors Hall of Fame for inventing the graphical calculator.

—Jill Tietjen

qualified, her ascension was no doubt facilitated by the role of her husband, a vice president of the organization. Richards was the first woman to attend and graduate from MIT, although as a “special student” without tuition so that the students, faculty, and administration, could say “no” when asked if females were enrolled. Although she completed the work for a doctoral degree at MIT, the degree itself was not awarded. In 1917, the Women’s Auxiliary of AIME was formed.

ASME admitted Kate Gleason to full membership in 1914. Kate was the exception. Lydia Weld was granted associate membership in 1915 and full membership two decades later when, in 1935, ASME granted full membership status to women.

Edith Clarke was the first woman to address AIEE

in 1926. By 1942, AIEE counted three women members and over 17,000 male members. The AIEE Fellow grade was established in 1912. Not until 1948, however, were the first three women elected Fellows—Edith Clarke, Vivien Kellems, and Mabel Rockwell.

AIChE welcomed its first female member in 1945. Other engineering societies admitted their first women members in 1920 (American Society of Automotive Engineers), 1946 (American Society of Safety Engineers; Society of Naval Architects and Marine Engineers), 1947 (Institution of Structural Engineers), and 1954 (Illuminating Engineering Society).

Representation of women in the Founder Societies in 1946 is shown in the following table:

A LIFE OF SHATTERED GENDER BARRIERS

ELSIE EAVES (1898-1983), badge holder #241 and later Colorado Beta 1920, shattered gender barriers throughout her life. After graduating in 1920 from the University of Colorado at Boulder (CU-B) with a B.S. in civil engineering (with honors), Eaves held a variety of jobs in Colorado before heading to New York City and going to work for McGraw-Hill Publishing Company. Legend has it that the editor of another organization had told her that “a woman’s place, if not in the home, is in the department store.”

She began as an assistant on market surveys for *Engineering News-Record* (ENR) in 1926. Subsequent positions included director of market surveys for ENR, director of market surveys for *Construction Methods and Equipment*, and manager of the *Business News* department. In this last position, she directed 100 staffers across the U.S. and Canada.

Her career at McGraw-Hill was a series of “firsts.” In 1929, Eaves originated and compiled the first national inventory of municipal and industrial sewage disposal facilities—which she replicated at periodic intervals.

A few years later, she compiled statistics on needed construction, which aided the passage of the Federal Loan-Grant legislation which was used to revitalize the construction industry during the 1931-35 depression. In 1945, she organized and directed the *Engineering News-Record’s* measurement of Post War Planning by the Construction Industry. This was used by the Committee for Economic Development and the American Society of Civil Engineers (ASCE) as the official progress report of the industry. It was an unprecedented index and she converted it into a continuous inventory of planned construction that has become ENR’s “Backlog of Proposed Construction.”

The index documents more than \$100 billion of construction activity. Her indexes were cited in contract escalation clauses, court testimony, and Congressional debates. She defined the limits for and edited the pilot issues of *Construction Daily*, a nationwide service.

A founding member and Life Member of the Society of Women Engineers (SWE) who served on its Board of Trustees, Eaves “always encouraged women by her active example and

participation.” She was often contacted by young women, high school counselors, and university professors looking for advice and information on careers for women in engineering.

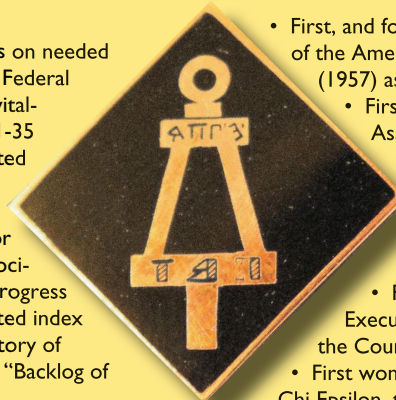
After her retirement from ENR, Eaves advised the International Executive Service Corps about construction costs in Iran and served as an advisor to the National Commission on Urban Affairs regarding housing costs.

Her extensive list of firsts includes:

- First woman to be licensed as a professional engineer in New York State
- First woman member of ASCE (as a corporate member in 1927)
- First woman to be a life member of ASCE (1962, at which time there were 54 women among 48,000 members)
- First woman elected to honorary membership of the ASCE (1979); first woman to be elected Associate Member, Fellow of ASCE



Society of Women Engineers Photograph Collection, Walter P. Reuther Library.



- First, and for a long time, the only woman member of the American Association of Cost Engineers (1957) as well as the first civil engineer
 - First woman to receive the American Association of Cost Engineer’s Award of Merit (1967)
 - First woman to receive the Honorary Life Membership Award from the American Association of Cost Engineers (1973)
 - First woman to receive the International Executive Service Corporation “Service to the Country” Award
 - First woman elected Chapter Honor Member of Chi Epsilon, the civil engineering honorary
 - First woman to receive CU-B’s Engineering Alumna Award
 - First woman to deliver the Arthur Boase Lecture for CU-B’s Department of Civil and Environmental Engineering
 - Elected a Fellow of the Society of Women Engineers in 1980, the first year that SWE elected Fellows.
- Jill Tietjen

Membership in the Founder Societies, 1946

Organization	Total Membership	Number of Women
AIEE	24,526	14
ASCE	21,100	23
ASME	20,060	33
AIME	12,600	26
AICHE	5,788	5

Lillian Gilbreth, the co-founder of the field of industrial engineering and so-called “first lady of engineering,” was made an honorary member of the Society of Industrial Engineers in 1921 as a favor to her husband, Frank Gilbreth, but not admitted to regular membership. She was the first woman elected to the National Academy of Engineering (NAE) in 1965, only one year after the 1964 establishment of the NAE.

The 1921 edition of American Men of Science lists zero women employed in engineering. The 1920 census,

however, reports that 130,000 engineers were counted and 41 of them were women, up from 21 in the 1890 census. Prior to 1920, at least 45 women were known to have graduated from college having received engineering degrees. By 1929, a total of 158 women were believed to have graduated with degrees in engineering and 53 engineering colleges (up from 35 in 1920) now admitted women. The 1940 census reports 730 women employed as engineers representing 0.3% of the total work force. No women were on the faculty of the 20 largest doctoral universities in the U.S. in 1938. In that same year, no women were employed in the federal classified civil service out of 20,000 engineers.



Lillian Gilbreth—"first lady of engineering."

Sigma Tau, the other engineering honor society (which was merged into TBPI in 1973), voted at its 1954 Conclave to admit women. The first woman initiate was an aeronautical engineering student from the University of Kansas. The honor society for liberal arts and sciences, Phi Beta Kappa, was established at the College of William and Mary, in Williamsburg, VA, in 1776. It first welcomed women as members in 1875 (the University of Vermont) and 1876 (Connecticut's Wesleyan University).

To Recognize Achievements

In 1936, Tau Beta Pi began offering a Women's Badge to recognize engineering achievements by women. The Badge did not, however, include membership in the Association. TBPI was one of the last honor societies to refuse to admit women as full members. When chapter delegates told the 1968 Convention that they would lose their charters at their schools if membership was not opened to women, the language in the Constitution was amended enabling women to become members.

The first women were initiated in 1969. The Women's Badge holders were not automatically enrolled as members, but could opt to do so. Of the 155 women initiated in 1969, 97 held the Women's Badge. Also in 1969, the first women delegates were seated at the

Convention. All sexist language in the Constitution and Bylaws was finally removed in 1978.

A major milestone in engineering education was reached in 1972 when the percentage of women receiving undergraduate engineering degrees in the U.S. reached one percent. In 1968, five women across the entire U.S. received engineering doctorates. Today, the percentages and numbers are higher but nowhere near parity.

Summary

Since the engineering profession as a whole wasn't very welcoming to women in general for many years, it isn't much of a surprise that Tau Beta Pi didn't have full women members until the middle of the twentieth century.

The lack of acceptance didn't deter many of the early women engineers who certainly demonstrated determination and persistence to make it through the education process and establish themselves in a career.

As an engineer who graduated in the third class in which women were admitted as undergraduates at my university, I am grateful that attitudes towards women's aptitudes and abilities to be successful engineers have changed at the educational institutions, within the engineering societies and within Tau Beta Pi.

Jill Tietjen is a senior member of IEEE and the president, and CEO of Technically Speaking, Inc. An author, speaker, and electrical engineer, she spent 40 years in the electric utility industry providing planning and consulting services to utilities and organizations in that industry, and served as an expert witness before public commissions. Tietjen's books include *Her Story: A Timeline of the Women Who Changed America*, and an introduction to engineering textbook, *Keys to Engineering Success*. Tietjen has received numerous awards and honors including TBPI's Distinguished Alumna Award.



\$\$ 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 insurance 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/tbpi or call 1-800-368-2734 for your free quote.



New Executive Councillors

The delegates to the 2018 Convention in Denver, CO, elected two new members to the Executive Council and re-elected one retiring member. They will serve the 2019-21 term and join six members elected in 2014 or 2017 who are serving terms that end in 2018, 2019, or 2020. The Executive Council comprises nine Tau Beta Pi alumni who serve staggered terms of three years.

The other members of the Council are Scott E. Fable, California Tau '96; Stephan L. King-Monroe, Michigan Epsilon '08; George J. Morales, Ph.D., Florida Epsilon '06, who was re-elected; Wayne B. Paugh, LL.M., J.D., Florida Gamma '93; C. Craig Smith, P.E., Tennessee Epsilon '80, George Youssef, New Jersey Gamma '01; and Mennatoallah M. Youssef, Ph.D., Virginia Gamma '04.

The new Executive Council have met and elected officers for the upcoming year. Officers are elected from among the members of the Council and serve for a period of one year. After serving as vice president for one year, the vice president automatically becomes the president the following year. The officers for 2019 include: President Wayne Paugh, Vice President Craig Smith, Secretary Scott Fable, and Treasurer Stephan King-Monroe. Executive Director Gomulinski serves as a non-voting member of the EC.

Rachel K. Alexander, California Upsilon '15, was initiated in 2013 and held collegiate chapter positions as Social Chair, President-Elect, and President. As a chapter officer, she focused on building image on campus with new posters, hand delivering invitations to candidates, and adding TBPI shirts/hoodies for purchase by members as part of initiation. Each year since 2014, Rachel has attended Convention. After graduating with a B.S. in civil engineering from California State University, Sacramento, she served as Acting Secretary and is currently President of the Sacramento Valley Alumni Chapter (SVAC). This chapter is working with local collegiate chapters to provide guidance on transitioning to the professional world with alumni panel discussions and resume workshops. Rachel is a civil engineer for Sacramento County Department of Airports. She works with contractors, consultants, and other agencies to complete projects at four airports, including Sacramento International. Previously, Rachel was with an architectural engineering firm and performed forensic investigations of structures which gave her the unique knowledge of construction defects and design repairs. As a member of the Executive Council, she wants to assist in building our image and reconnecting with alumni. Rachel looks forward to collaborating on ideas for our future growth.

Russell W. Pierce, Washington Alpha '70, prior to retiring in 2006, had a distinguished management career in aerospace, telecommunications, and consulting. For the past 26 years Russ has been a TBPI official, being appointed an Engineering Futures Facilitator in 1992 and serving as such for 24 years. From 1995 to 1999, he was also a District 5 Director and from 2002 to 2006, he was an Executive Councillor. Russ was Director of the



President Paugh introduces the new EC members, from left, Russell Pierce, Rachel Alexander, and re-elected Councillor George Morales, to the Convention.

Engineering Futures Program from 1999 to 2002 and again from 2009 until 2015. He is currently a non-faculty advisor to the Washington Alpha, Tennessee Delta, and Texas Delta (Qatar) Chapters and an Engineering Futures Facilitator. Russ is a United States citizen but was born in England and immigrated to the USA in 1961. He served four years in the U.S. Air Force before earning BS (cum laude) and MS degrees in electrical engineering at the University of Washington. Russ is a member of Eta Kappa Nu, the electrical engineering honor society. In May 1997, he earned an MBA from the Florida Institute of Technology and is a member of Delta Mu Delta, the business administration honor society. From 1999 until 2006, while serving as an information technology director with AT&T Fixed Wireless Company and then managing partner in a boutique consulting company, Russ concurrently taught business classes for the University of Phoenix. In 2004, he founded his own company, USBrit Consulting. Russ lives in Puyallup, WA, with wife, Pauli, with whom he enjoys world travel.

President Holl Reports to the 2018 Convention

State of the Association

WE ARE GATHERED here in Denver, CO, for Tau Beta Pi's 113th Convention in our 133 year history and are very proud to have sustained the organization for so long.

I am pleased to report that we remain the largest engineering society in the world with over 593,000 initiated members, 248 collegiate chapters, and 44 active alumni chapters. Through the hard work and exciting programs offered by our collegiate chapters, in 2017-18 we attracted over 9,300 new initiates. We also installed our newest chapter, Oregon Delta at the Oregon Institute of Technology, on April 14, 2018. We expelled one member convicted of violating U.S. Federal law.

The Tau Beta Pi Trust, which has been funded through generous donations and bequests through the years, was worth over \$29 million at the end of our past fiscal year (July 31, 2018). Last year, the Alumni Giving Program received over \$1.1 million from nearly 10,000 members. Many thanks to Director of Marketing and Communications, Pat McDaniel and Executive Director Curt Gomulinski who manage this program. These funds are essential as we increase the opportunities we offer.

Major Gifts Officer Sherry Jennings-King has continued to raise significant funds for our Chapter Endowment Initiative (CEI). To date, we have received support from 129 individual donors for 79 chapters. A total of 18 are fully endowed at \$100,000 or more. As with all endowed funds, the capital is not spent but the investment income is used. Of note this fiscal year is that the fund has generated income from the initial investments five years ago. As the fund grows, we anticipate an increased stream of funding for chapters and programs such as Convention, Engineering Futures, and the District Program. We are very pleased that several CEI donors are joining us at this Convention; please make sure to thank them for their generosity.

We are extremely proud of the programs we have for collegiate members. This year our 85th group of Fellowships was awarded to 31 Tau Bates for graduate study and our 20th set of Scholarships was awarded to 288 members to complete undergraduate studies. Additionally,

collegiate chapters sent representatives to the 16 Spring Conferences, 176 Engineering Futures Sessions were presented, and 26 chapters had hands-on activity sessions at local schools in the MindSet program.

Implementing our Strategic Plan

Over this past year, the focus of the Executive Council (EC) and the Executive Director has been implementing the Strategic Plan for the Association. We have five main goals:

- *Developing the Organizational Processes of the Association*
- *Enhancing the Image, Visibility, and Branding of Tau Beta Pi*
- *Improving Chapter Support and Operations*
- *Providing Relevant and Recognized Leadership and Professional Development*
- *Strengthening the Finances and Fundraising of the Association*



The Strategic Plan is the road map we use to ensure our efforts stay focused on meeting the goals of the Association. Whenever a new initiative or program request is presented to the EC, we always ask: "How will this help us meet our strategic goals?" Keeping the Strategic Plan in mind allows us to focus our time and funds to best advantage.

Achieving our Strategic Goals

We have worked on making progress on all the strategic goals and made great strides in *Developing the Organizational Processes of the Association*. With the support of the EC, Executive Director Gomulinski examined the Association's Headquarters operations and made structural changes to help us better meet our goals. The Headquarters staff was reorganized into teams focused on particular areas: chapter programs, finance & operations, marketing & communications, and development & administration. The EC followed Curt's lead and developed a committee structure to help manage us and focus our efforts.

We began working on *Enhancing the Image, Visibility, and Branding* in 2017 by commissioning a study from the Wharton School of Business at the University

of Pennsylvania. In 2018, we continued this work by evaluating the feedback from that study and the 2017 Convention Image and Marketing Committee. Then with the help of District Director Christina Harrison, we commissioned another image study from the Tippie School of Business at the University of Iowa.

To address the most immediate needs, the EC created an Association Website Task Force chaired by Councillor Scott Fable to address some image enhancement issues. At the 2018 Convention, the Image and Marketing Committee will be evaluating the results of the Tippie study, refreshing themselves on the Wharton study, the recommendations of the 2017 Image and Marketing Committee, and evaluating recommendations from the Website Task Force.

Another effort in the area of *Image and Visibility* is offering additional insignia items through the updated online store. Many thanks to Alex Cross, Assistant Director of Member Services, and his Headquarters team for their hard work. Making sure you wear your TBP gear helps people associate the organization with real people. This effort can reap large benefits in increasing visibility.

Communications Specialist Dylan Lane continues to manage our social media including *LinkedIn*, *Facebook*, *TauBetaPi4Life*, and other applications. With new jobs taking our members to a variety of locations over long careers, we need a reliable way for them to stay in touch. Remember to exchange your permanent contact information with your new friends while you are at Convention and plan to build a network through the links and apps the Association maintains.

To address the goal of *Improving Chapter Support and Operations*, in 2016 we appointed a Director of District Programs for a three year trial period. This director works closely with all District Directors and Headquarters staff to ensure the collegiate chapters have the required support to conduct the most important business of the Association—identifying eligible candidates and creating a culture where they choose to join. A positive experience in a collegiate chapter encourages members to stay active with the Association in their postgraduate careers. We are very grateful that Kelly Hammar has been serving in this role and extremely thankful to J.P. Blackford who has agreed to fill out her term after his EC term ends in December. We are also grateful to Director of Alumni Affairs Tricia Gomulinski who continues to provide support and encouragement to our alumni chapters. There were four new ones chartered in 2018. Most of you here are chapter leaders. We need your input on how best to provide support to these chapters.

Director of Engineering Futures Katy Luchini Colbry is the leader as we address the goal of *Providing Relevant and Recognized Leadership and Professional Development*. In addition to delivering the Engineering Futures curriculum, developed over the past 30 years, to nearly 4000 students during 2017-18, she created and piloted two new modules: *Equity, Inclusion & Ethics*, and *Mentoring*. Director Colbry continues to develop new training materials in the area of communications,

partnering with the National Science Foundation and Michigan State University.

Led by Treasurer George Morales and the EC Finance Committee, the Council has grappled with our budget, focusing on *Strengthening the Finances of the Association*. Together with the Headquarters staff, the EC Development Committee has been evaluating strategies to increase revenue. Over the past year, we have developed short-term and long-term moves to ensure future financial stability.

Executive Director Gomulinski continues to provide outstanding leadership to the Executive Council and the Association. As President, it is my pleasure to work closely with Curt. With his help, the EC maintains focus on achieving our strategic goals. Additionally, Curt is an effective leader of our dedicated Headquarters staff. The Association is indebted to Curt for his ability to articulate the need for our most recent changes. I am confident we are on a sound path to much success.

Executive Council

At the 2017 Convention in Dearborn, MI, we elected three new members to the Council and finally have a full nine-member board. Secretary J.P. Blackford, Treasurer George Morales, and I will end our terms on the Executive Council on December 31, 2018. At this Convention, we will hold elections for three EC seats. Those Councillors will begin their terms on January 1, 2019, and will serve for three years. George is the first member to run for re-election in this new structure. Please take the opportunity to meet with each of the candidates who are running for election at this Convention to learn about their interests in the Association and to tell them about yours. The election will be held during the Third Business Meeting on Saturday morning.

Remember, EC elections are held every year. We encourage you to get involved and look at leadership opportunities at all levels.

Programs and Celebrations

The Association is strong and continues to grow, not only in number of members but in the variety of programs we offer.

A remarkable event is taking place at this Convention—we are welcoming members to a chapter that has not held an initiation in over 40 years. Colorado Gamma, at the University of Denver, will be officially reactivated. We hope this is a result of some of our focus on becoming more visible and relevant. Congratulations Colorado Gamma!

We are excited to celebrate the 50th anniversary of women being allowed to be full members of Tau Beta Pi. At the 1968 Convention, the body voted to allow women engineering students to be considered for full membership. The chapters ratified the change to the Constitution and the first women were initiated in 1969. Prior to that, there were many years when eligible women were not recognized at all. In 1936, the Convention authorized awarding a Women's Badge, and (Continued on page 31)

Denver Hosts 2018 Gathering Tau Beta Pi's 113th Convention

THE 113th Convention of Tau Beta Pi was held in Denver, CO, October 11-13, 2018. These 470 members represented 223 collegiate chapters and 31 alumni chapters on behalf of the entire organization. Of the total, 312 were students and 158 were alumni. Chapter advisors totaled 18, some partially reimbursed by Tau Beta Pi. An additional 115 non-member guests, recruiters, volunteers, and consultants participated in Convention activities and enjoyed the Rocky Mountain hospitality.

Colorado Alpha, Beta, and Epsilon and the Front Range Alumni Chapter hosted the Society's third annual meeting in Colorado. The Arrangements Chair was **Keats M. Dormont, CO B '18**, who led the host committees in such duties as transportation, publicity, and hospitality.

Headquarters for this Convention was the Denver Marriott Tech Center in southeast Denver. All meetings were held at the hotel. Comprised of 43 booths hosted by recruiters from graduate engineering programs and corporations, the Recruiting Fair enhanced Friday's activities.

Committee meetings commenced on Thursday morning prior to the official opening of Convention that afternoon. **Don P. McMillan,**

PA A '81, returned on Thursday evening to entertain attendees with his "Engineer@Heart" comedy routine.

Four business meetings were held, beginning with Thursday's session when the President's Report for the Executive Council was presented. [See page 15.] Following the first meeting, attendees enjoyed an informal welcoming reception, where they could socialize, meet the Executive Council candidates, and learn more about activities and programs of the Association at information booths. Friday's banquet, sponsored by the University of Virginia, featured the presentation of the 2018 McDonald Mentor and Laureates as well as keynote speaker, **Jill S. Tietjen, P.E., VA A '76**, president and CEO of Technically Speaking, Inc., who spoke of the important decisions you make in your career and life. The Alumni and Chapter Awards Banquet on Saturday evening brought Convention business to a close when the 2018 Distinguished Alumni and chapter award winners were honored.

Almost all business at TBPi Conventions is handled

by committees. Seven standing committees are called for in the Constitution, three *ad hoc* committees were appointed, and half of the collegiate and alumni chapter voting delegates served on a committee.

Full details of the business meetings are recorded in the official Minutes posted on the Convention website, www.tbp.org/conv/2018/conv.cfm. Major actions of the Convention are reported in this article.



Jill Tietjen delivers the keynote address on Friday evening. Convention photos by **Christopher "Kiffer" J. Creveling, UT A '13**.

Petitions Review & Reactivation

The committee reviewed a request to reactivate Colorado Gamma which had gone inactive in 1975 when engineering education ended at the University of Denver. With the restoration of engineering education there, the Convention approved the request and witnessed the initiation of new members and the formal reactivation on Saturday afternoon. This brings the number of active collegiate chapters to 248. The committee also reviewed a number of changes to the Constitution regarding the petitioning process. The Convention approved the changes which are subject to ratification by the chapters.

Constitution & Bylaws

The Constitution and Bylaws Committee diligently worked through three charges which included ten proposals to modify the Constitution and Bylaws. On the recommendation of the committee, the Convention adopted, by the required three-fourths vote, seven amendments to the Constitution. These changes are subject to ratification by the collegiate and alumni chapters and include:

1. Clarify that an institution or advisor determines scholastic eligibility for graduate students.
2. Adjust when the Advisory Board approves graduate student eligibility and when documents are submitted.
3. Clarify a District Director's role in mediating a candidate's objection to duties assigned by a chapter.
4. Allow the Convention and Executive Council to modify official and trial programs, respectively.
5. Change the deadline for Executive Council nominations to July 1.
6. Adjust when Executive Council nominations are allowed from the floor of Convention.



7. Refine the Executive Council election process to address situations where an unopposed candidate does not receive a majority vote.

Financial Affairs

Understanding the complexity of Tau Beta Pi's financial status presents a challenge for students each year, but the Chapter and Association Financial Affairs Committee democratically reviewed all financial matters and concluded that the Association's financial health is in order.

The committee recommended, and the Convention adopted, to maintain allowable Convention expenses at the 2019 Convention at the same level as set for the 2018 Convention including \$8, \$8, and \$12 for en-route breakfast, lunch, and dinner, respectively, and \$10 for breakfast and \$12 for lunch, when applicable, at Convention. The group worked effectively with chapters to resolve debts and reviewed the 2017-18 auditor's report and Executive Director's report.

The committee reviewed the 2018-19 budget and made several recommendations to the Executive Director and Executive Council to address the Association's financial situation. A proposal to raise the initiation fee by \$20 was rejected.

Initiation

The Rituals Committee organized an impressive Model Initiation ceremony for 8, 14, and 11 students from Colorado Alpha, Beta, and Gamma, respectively, and 1 eminent engineer from Colorado Beta. The committee reviewed and accepted changes to the instructions recommended by the 2017 Convention. They also requested that Headquarters implement a change to the Report of Election so chapters can request accommodations.

Awards

The Awards Committee worked long hours in reviewing the 2017-18 records of the chapters and in selecting the recipients of the R.C. Matthews Outstanding Chapter Award, the R.H. Nagel Most Improved Chapter Award, and the J.D. Froula Most Improved Membership Award. Announcement of these awards and the 18 honorees of the Chapter Performance Scholarship Program are reported in detail on pages 20-21. The committee reviewed progress on an electronic project reporting system and provided feedback to Headquarters.

Future Convention

The Convention reviewed proposals from four cities to host the 2021 Convention. The invitation to host the 2021 Convention in Knoxville, TN, was accepted.

2018 Tau Beta Pi Laureates

The attendees enjoyed both meeting and hearing about

the diverse achievements of Laureates **Amy C. Kurr**, *IA A '18*, and **Krista L. Stribling**, *IN Δ '18*. Councillor Stephan L. King-Monroe presented a commemorative plaque and \$2,500 check to Ms. Kurr and spoke of the work of Ms. Stribling who was unable to attend the Convention.

Tau Beta Pi-McDonald Mentor

The attendees learned about 2018 McDonald Mentor **James C. Hill**, Ph.D., *CA Γ '62*, professor emeritus of chemical and biological engineering at Iowa State University. Councillor George Youssef presented Dr. Hill his engraved commemorative medallion, lapel pin, \$1,000 check, and another \$1,000 for his chapter.

Outstanding Advisor

Councillor Scott E. Fable announced that there was not a recipient of the Outstanding Advisor Award as no nominations were received. He encouraged delegates to return to their chapters and nominate one of their excellent advisors for this award.

Distinguished Alumnus

Councillor C. Craig Smith cited the career accomplishments of the 2018 Tau Beta Pi Distinguished Alumnus Award recipients **William L. Collins Jr.**, *FL Γ '75*, inventor and retired electrical engineer; **Aprille J. Ericsson**, Ph.D., *DC A '86*, member of technical academic boards at the National Academies and MIT, motivational speaker, and part of NASA's speaker's bureau; **James E. Halligan**, Ph.D., P.E., *IA A '62*, past president of Oklahoma State University and former State Senator of Oklahoma; and **Gary D. Hoover**, *IA A '61*, member of numerous boards at ISU and Wartburg College including the ISU Foundation's Board of Governors and Wartburg College Board of Regents. Councillor Smith presented commemorative plaques, and a TBPI scholarship of \$2,000 was given in honor of each recipient to a student this summer.

Chapter & Professional Development

The Chapter Development Program included Interactive Chapter Exchanges (ICE) and district meetings. Many delegates expressed appreciation for the usefulness of the ICE sessions which included a brainstorming and problem solving session followed by two interactive sessions with outstanding chapters presenting and answering questions. This year saw the continuation of the popular Professional Development Sessions conducted in parallel to committee meetings on Thursday evening alongside the Recruiting Fair, and on Friday evening. Attendees could select from 37 different sessions ranging from "Effective Teams Begin with Effective Team Members" to "Networking through Conversation."

2019-21 Executive Councillors Elected

Three members ran to serve on the Executive Council. Each candidate was introduced, made presentations, and stood for election on Saturday morning. After several ballots, the Convention elected **Rachel K. Alexander, CA Y '15**, and **Russell W. Pierce, WA A '70**. [See biographies on page 14.] and re-elected **George J. Morales, FL E '06**. They will join the six Councillors whose terms continue through 2019 and will take office on January 1, 2019. The Executive Council serves as Tau Beta Pi's Board of Directors.

Other Business

The *ad hoc* Alumni Chapters made several recommendations to the Executive Council and the Director of Alumni Affairs. The Convention approved a recommended increase of the alumni chapter charter fee from \$40 to \$100.

The *ad hoc* Image and Marketing Committee put in long hours reviewing the status of Tau Beta Pi's website and branding. They provided a number of recommendations to the Executive Council and the Convention approved chartering the Website Task Force and an *ad hoc* Website Committee at the 2019 Convention. The Convention also approved a new logo and requested the Executive Council develop an implementation plan to roll out the new logo.

The *ad hoc* Program Review Committee examined appeals by two chapters to include two non-ABET/EAC curricula in their bylaws as eligible curricula for new members. The Convention granted the appeals from Florida Alpha and New Jersey Epsilon to consider students in their human-centered computing and engineering entrepreneurship programs, respectively, eligible for membership in Tau Beta Pi. The Convention also approved the committee's recommendation to amend the Constitution to require programs that are not ABET-EAC accredited or have the same name as an ABET-EAC accredited program be appealed and approved by the Convention. This is subject to ratification by the chapters.

The Resolutions Committee recommended, and the Convention adopted, a resolution setting the size of the Executive Council at nine members. They were also responsible for thanking the host chapter members, officials, generous alumni and sponsors, award winners,



Advice is dispensed at the Grad School and Corporate Recruiting Fair.

Assisted by . . .

Tau Beta Pi gratefully acknowledges the following Convention recruiters and sponsors:

Diamond Level	New Jersey Inst. of Technology
GEICO	New York Univ. Tandon School of Engineering
University of Virginia SEAS	Northwestern Univ.
Platinum Level	McCormick SEAS
George Washington University SEAS	Pennsylvania State University College of Business
Northrop Grumman PPI	Purdue University, COE
Raytheon	Ramboll
Ricoh USA Inc.	Rensselaer Polytechnic Inst.
Univ. of Colorado Denver CEAS	Stevens Inst. of Technology
University of Pittsburgh Swanson School of Engg.	Texas Department of Transportation
U.S. Navy	Texas Instruments
Gold Level	Tufts Univ. Graduate School of ASE
Colorado School of Mines Boulder CEAS	University of Colorado
Jacobs	University of Kansas
NC State Engineering Online	University of Michigan COE
Northeastern University COE	University of Michigan ECE
Sandia National Laboratories	University of Missouri COE
Silver Level	Univ. of Southern California School of Engg.
AimLock, Inc.	Virginia Commonwealth University
BAE Systems, Inc.	West Virginia Univ. COE & Mineral Resources
Columbia University SEAS	Worcester Polytechnic Institute
FedEx Express	Bronze Level
Iowa State University COE	The PhD Project
Keck Graduate Institute	Torch Technologies
Lehigh University CEAS	
Michigan Technological Univ.	
Missouri Univ. of Science & Technology	
MIT Leaders for Global Operations	

Headquarters staff, volunteers, and others for all the good things that happened to Tau Beta Pi during the year. The Chair of the Resolutions Committee, on behalf of the entire Association, concluded her remarks to Convention with a succinct inspirational message to the delegates:

Over the past few days at the 113th Convention, we have had the incredible opportunity to meet motivated students, dedicated leaders, and successful professionals from across the world. We've had the opportunity to share our experiences and wisdom with one another, and most of all, express our passion for engineering as fellow Tau Bates. Needless to say, I am humbled by the opportunity to stand before engineers of such caliber. We sincerely thank you all for your time tonight and for making this Convention so memorable. We hope you have enjoyed your time in Denver and look forward to your attendance next year at the 2019 Convention in Columbus, Ohio.

Association Awards

Outstanding Chapter: Ohio Iota

OHIO IOTA at the Ohio Northern University was chosen as the recipient of the 2017-18 R.C. Matthews Outstanding Chapter Award.

The Convention Awards Committee cited the chapter for its strong membership record and diversity of projects. Their project report detailed activities in the community, on campus, social events, and professional development. Highlights include helping judge the Ada Science Fair, hosting space at the College of Engineering Welcome Fest promoting tutoring options, and participating in the Kappa Phi Sing-a-Thon.

Leaders for 2017-18 (Fall—Spring) were President Katie S. Cooperrider, Vice President Miranda K. Huddle, Treasurer Cyler E. Caldwell, Recording Secretary Chelsea M. Cousins, and Corresponding Secretary Braden J. Davies.

Advisors are Laurie K. Laird (Chief), Heath J. LeBlanc, Robert L. Ward, and Juliet K. Hurtig.



Ohio Iota Chapter officers Hayley E. Schiavone, current Corresponding Secretary, and Brandon L. Emshoff, current President, with then TBII Vice President Wayne Paugh.

Improved Membership: New Jersey Delta

THE HEADQUARTERS STAFF and Executive Council established the J.D. Froula Most Improved Membership Award in 2011 to honor the retiring Executive Director, Secretary-Treasurer, and Editor.

Mr. Froula presented this year's award to New Jersey Delta at Princeton University.

The award recognizes the chapter which has increased the number of electees initiated in each of the previous three years. Other considerations are the percentage increase and the number of initiates.

New Jersey Delta leaders for 2017-18 were Presidents Daniel E. Wood and Bhaskar Roberts, Vice Presidents, Eric A. Mitchell and Emily K. de Jong, and Treasurer, Recording Secretary and Corresponding Secretary Catherine Chen, then Recording Secretary and Treasurer Robert J. Buline.

Advisors were Howard A. Stone (Chief), Michael E. Mueller, Mansour Shayegan, and A. James Link.

\$9,000 in Scholarships

Eighteen chapters, each of which received Chapter Project Awards for three consecutive years, were given \$500 scholarships.

CHAPTER	INSTITUTION	DELEGATE
ALABAMA EPSILON	UNIVERSITY OF SOUTH ALABAMA	TANNER HICKMAN
CALIFORNIA ALPHA	UNIVERSITY OF CALIF., BERKELEY	NEEL RAMAN
CALIFORNIA EPSILON	UNIVERSITY OF CALIFORNIA, L.A.	JONATHAN LEE
CALIFORNIA ETA	SAN JOSE UNIVERSITY	POLO TRAN
CALIFORNIA PSI	UNIVERSITY OF CALIF., SAN DIEGO	ANSEL BLUME
FLORIDA ALPHA	UNIVERSITY OF FLORIDA	KELSEY STADNIKIA
FLORIDA GAMMA	UNIVERSITY OF SOUTH FLORIDA	STEVEN DIAZ
FLORIDA THETA	FL. INTERNATIONAL UNIVERSITY	ALEJANDRO MARTIN
IOWA ALPHA	IOWA STATE UNIVERSITY	BRANDEN MOREAU
MARYLAND BETA	UNIVERSITY OF MARYLAND	TONLE BLOOMER
MARYLAND DELTA	UNIV. OF MARYLAND, B'MORE CO.	BLAIR LONDON
MICHIGAN GAMMA	UNIVERSITY OF MICHIGAN	KEVIN GREENMAN
MICHIGAN EPSILON	WAYNE STATE UNIVERSITY	VINCENT ISOPI
N. MEXICO GAMMA	N. MEX. INST. OF MINING & TECH.	MELISSA FREEMAN
OHIO IOTA	OHIO NORTHERN UNIVERSITY	BRANDON EMSHOFF
TENNESSEE ALPHA	UNIV. OF TENNESSEE, KNOXVILLE	MARIAH LAFOND
TEXAS ALPHA	UNIVERSITY OF TEXAS AT AUSTIN	ZEKE CHAN
WISCONSIN ALPHA	UNIV. OF WISCONSIN-MADISON	DESIREE FLOURO

2018 Convention

Most Improved Chapter: New Mexico Beta

THE R.H. NAGEL Most Improved Chapter Award was established in 1971 to recognize major improvement in chapter development.

The 2018 recipient was New Mexico Beta Chapter at the University of New Mexico.

The Awards Committee said that only two years ago the chapter held no meetings, conducted no projects, and initiated only one new member.

The restart has been a success and led the chapter to be honored. The new foundation was set through holding at least one chapter event every week on average for three months of the semester.

Leaders for 2017-18 were President Ava Mauser, Vice Presidents Carly J. Romnes and Sandra Stangebye, Treasurer and Recording Secretary Kimberly M. Denman, and Corresponding Secretary Melanie B. Schneider.

Advisors were Allen D. Erickson (Chief), J. Derek Tucker, Julie M. Harvie, and Charles B. Fleddermann.

Arkansas Alpha at the University of Arkansas received an honorable mention for promoting the chapter's image on campus, for conducting projects, and granting members early access to the STEM Career Fair.

Excellence Marked

Executive Director Curtis Gomulinski presented certificates to these chapters to mark excellence in their organization and administration—100% or more with distinction are in bold face:

Chapter Excellence Awards

Alabama Alpha	Michigan Epsilon
Alabama Delta	New Mexico Alpha
Alabama Epsilon	New Mexico Beta
Arizona Alpha	New Mexico Gamma
Arizona Beta	New York Delta
Arizona Gamma	Ohio Alpha
Arizona Delta	Ohio Theta
Arkansas Alpha	Ohio Iota
California Alpha	Ohio Kappa
California Epsilon	Ohio Lambda
Florida Gamma	Ohio Nu
Indiana Gamma	Texas Theta
Iowa Alpha	Texas Mu
Michigan Gamma	Wisconsin Beta



New Mexico Beta officers Colleen Chlastawa, Chapter President, Shamiso Chirenda, Chapter Vice President, and then TBII Vice President Wayne Paugh.



Executive Director Curtis Gomulinski and District 12 Director and Colorado Beta Advisor Greg Newcomb, CO B '06, check up on the facts of the matter during a Convention business meeting.

32 Chapter Project Awards

At the 2018 Denver Convention, Chapter Project Awards for outstanding performance during 2017-18 were presented to the following chapters:

Ray Thompson, TBIT

CHAPTER / INSTITUTION	NO. PROJECTS	CHAPTER / INSTITUTION	NO. PROJECTS
AL E University of South Alabama • Helped first years face challenges, gain insight	36	MI Γ University of Michigan • Hosted the 2017 annual Convention	130
AZ A University of Arizona • Helped with Space Day at Children's Museum	26	MI E Wayne State University • Prepared boxes of food for families at Thanksgiving	28
AR A University of Arkansas • Helped to clean up around Lake Fayetteville	23	MI Θ Oakland University • Helped at the Student Organic Farm	20
CA A University of California, Berkeley • Helped SWE to expose young kids to science	47	NM B University of New Mexico • Sorted food for Roadrunner Food Bank	28
CA E University of California, Los Angeles • Demonstrated science to elementary students	41	NM Γ New Mexico Inst. of Mining and Technology • Hosted Socorro Hospital Spring Tea fundraiser	16
CA H San Jose State University • Competed at the Engineering Olympics	33	NY K University of Rochester • Took Chemistry Week to elementary students	35
CA Y California State University, Sacramento • Planted trees for Sacramento Tree Foundation	41	NY T Binghamton University • Designed new storage space for local church	20
CA Ψ University of California, San Diego • Introduced Mexican orphans to science/technology	62	OH I Ohio Northern University • Helped provide Christmas for those in need	22
CO A Colorado School of Mines • Bombarded "castle" in E-Day trebuchet contest	21	OH K University of Akron • Repaired toys for children with disabilities	19
FL A University of Florida • Took part in community outreach projects	33	OH Λ Youngstown State University • Raised awareness of honor societies on campus	15
FL Γ University of South Florida • Judged at Robofest World Championship	60	TN A University of Tennessee • Handed out candy during Boo at the Zoo	29
FL Θ Florida International University • Helped Boy Scouts earn merit badges	21	TX A University of Texas at Austin • Volunteered to plant, transport, and mulch trees	84
IL Δ Bradley University • Introduced engineering to elementary kids	14	VT B Norwich University • Took part in E-Week engineering contests	15
IA A Iowa State University • Helped girls in Taking the Road Less Traveled	58	WI A University of Wisconsin-Madison • Helped to teach children about scientific concepts	28
MD B University of Maryland • Made sandwiches to help feed the hungry	24	WY A University of Wyoming • Planned and staged CEAS Awards Banquet	10
MD Δ University of Maryland, Baltimore County • Volunteered with First Lego League competition	33		
MI B Michigan Tech. University • Walked dogs for Humane Society	24		

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

DREAM UP A WITTY caption for this snapshot from Tau Beta Pi's photo archives! If the judges vote yours as one of the best, and you have *not* been a previous winner, you will win a TBPi t-shirt of your choice!

The picture at right, which appeared in the Fall 1978 *Bent*, shows chemical engineering major Martha L. Tinkle, *NM A '79*, as she demonstrates her project to Professor George W. Lucky, *NM A '44*, New Mexico Alpha Advisor; and Michael E. Austin,

TX A '58, District 13 Director and engineering professor at the University of Texas at El Paso.

Submit your entries to pat@tbp.org, or mail them to HQ by Monday, February 4, 2019.

The Fall 2018 contest picture below appeared in the Winter 1979 issue and shows Elbert L. Sneed Jr., *OK Γ*



'79, Chapter President, and Cecelia A. Ingram, *OK Γ '80*, Chapter Vice President, as they discuss the use of a programmable calculator at an Oklahoma Gamma calculator learning session.

The judges deliberated over an all-time record of 63 captions submitted by 41 readers. The decisive winner was this caption from Darrell J. Scott, *NC Δ '82*:

"I hope this came with a case to fit on my belt."

There was a tie for second place between Dennis A. Negron Rivera, *PR A '13*, with: **"When mom and dad took selfies in school."** and this entry from Edward S. Matukonis, *PA A '73*: **"Now that is cool— Punch in 461437, read it upside down and you have the birth-place of TBPi! (LEHIGH)."**

Ed has been a previous winner, so t-shirts are on the way to Darrell, Dennis, and third place winner Joseph J. DiBella, *MA Δ '82*, for this caption: **"I love it honey but most fiancées get a diamond ring."**

Thanks again to all of you who have participated in the contests and for making us laugh.



2018 Alumni Giving Program August-October Contributors

The names of 568 Tau Beta Pi alumni who made donations to the Association in the 2018 Alumni Giving Program appear in two separate sections on the following pages. Their gifts totaling \$249,545 arrived between August 1, and October 31, 2018. Gifts received after October 31 do not appear here but will be published in the Spring 2019 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.

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The names of 478 Tau Bates appear in this first section. They made donations to the Alumni Giving Program between August 1, and October 31, 2018, 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	Founders Club	250
Heikes Club	50,000	Zeta Club	2,500		

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MI A Colbry, Katy Luchini '99
MI G Anonymous '78
MI E Gomulinski, Curt D. '01
MO B McHenry, Dale '81
NY A Jacobs, Irwin Mark '56
OK A Morris, Jay Kevin '81
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SD A Gomulinski, Tricia E. '98
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Smith, Thomas M. '60

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- Seay II, Charles T. '63
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- MI F Berno, Jeffrey William '63
- Bloomer, Craig D. '80
- Bloomer, Kristina M. '81
- Linker, John Joseph '44
- Linnell, J. Scott '78
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- MI A Renauer, Joseph Gerard '74
- MI Z Gomez, Lloyd E. '55
- MI O McMahon, Kathleen S. '82
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- NJ A Weinmann, Winston E. '80
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- NY B Gorey, Anthony George '84
- NY F Dupier, Dennis George '61
- Ives, Jon Robert '61
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- Lopez, Angel '65
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- Nair, Suresh N. '83
- OH F Powell, David Allen '71
- OH Z Badik Jr., Thomas B. '85
- OH H Chi, Maxwell Michael '91
- OH I Marone, Victor D. '59
- OK F Krause, Lester Eugene '56
- OR A Wilt, Jay N. '74
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- Good, Michael L. '78
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- Zahora, Kenneth R. '76
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- Rummier, William D. '59
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- SD A Addy, Tad LeRoy '58
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- Zabriskie, Kenneth A. '80
- TN Z Pyle, Angela Diana '91
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- TX F Lucas, Raymond David '60
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- Tausche, Paul Everett '48
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- WI F Figurski, Mark Anthony '83


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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, email Sherry Jennings-King at sherry.jenningsking@tbp.org 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.

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Special Gifts

Special Gifts were received in memory of Gene A. Dodson, AL B '57, from his wife, Frances; William M. Goryl, NJ A '44, from his children; Harrison W. Sigworth Jr., OR A '68, from his family and from Kathleen Siva; and Jack Wing, Ph.D., CA A '51, from Margaret and Jimmie Wing, CA A '52. A gift in honor of Tau Beta Pi President, Susan L.R. Holl, Ph.D., CA A '76, was given by Carolyn M. Primus, Ph.D., IL A '73.

Why do we call it a...Coulomb?

by Lyle D. Feisel, Ph.D., P.E. (Ret.), Iowa Alpha '61

IN THE PROCESS of understanding, describing, and measuring the phenomena of electricity, the most commonly encountered units are the volt and the ampere. Note what they have in common. A volt is the measure of electric potential and is best defined by the statement that it takes one joule of energy to move one coulomb of charge through a potential difference of one volt. An ampere is the measure of electric current, with one ampere defined as the flow of one coulomb per second. The common element in those definitions is the coulomb, which is the unit we use to measure the quantity of electric charge. So, how do we define a coulomb? Since this article isn't intended as a dissertation on the derivation of units, we will skip

This is the fourth in a series of articles that explore the history of science and engineering. One way in which this history has been preserved is in the names of the scientific units that we commonly use. Those units will serve as starting points for these articles as we explore "Why do we call it a...?"

the technical definition and simply say that one coulomb of charge is equal to the charge of 6.242×10^{18} protons. That's a batch. But, what we want to know is why it is called a coulomb.

Like many units, the coulomb is named for an individual, in this case, Charles-Augustin Coulomb who was born in 1736 and died in 1806. Coulomb was a French engineer (engineer, mind you) who, in mid-career, became interested in basic science and made several important contribu-

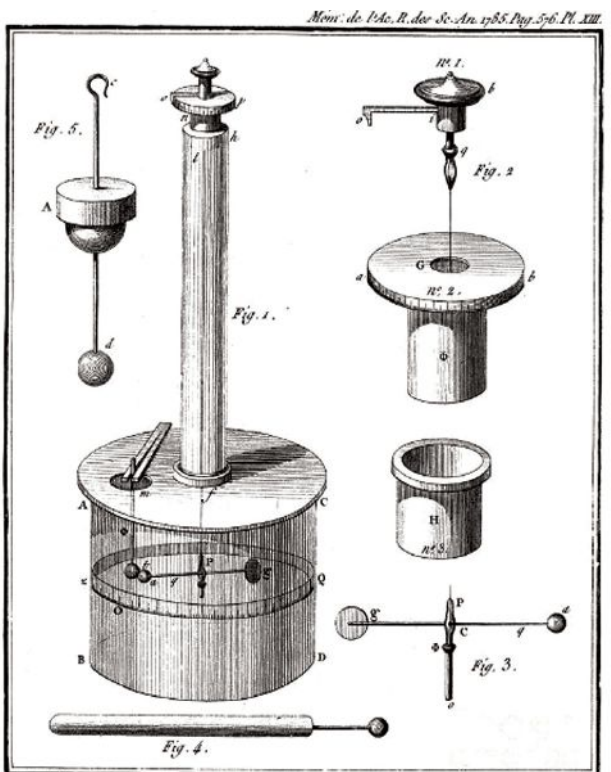
tions in various fields. He was born on June 14, 1736, in Angoulême, a small city in southwestern France, but lived much of his early life in Paris. As was often the case with our scientific forebears, he was born into a wealthy family that could support his education in the classic subjects of language, literature, and philosophy as well as astronomy, mathematics, and chemistry. When his father developed some financial problems, Coulomb left Paris, moving to Montpellier where his interest in science continued to develop.

Competitive Examination

At this point, Coulomb made a decision that readers of *The Bent* will probably agree demonstrates how smart he was; he decided to become an engineer. After boning up on his mathematics, he took a competitive examination and, in 1760, was admitted to École du Génie, the new (1758) French college of engineering. (I must pause here and point out that "génie" is the French word for genius and is the root of "ingénieur," the French word for engineer. I pause humbly, of course.)

Some 18 months later, Coulomb graduated as a full-fledged military engineer and was commissioned a lieutenant in the French Army Corps of Engineers. For the next twenty years, he did some very serious engineering in the French colonies of the West Indies as well as in France. The kind of work he did—building forts, port facilities, etc.—would be called civil engineering today. Around 1780, he became more interested in fundamental science and began to publish articles about his original research, including a basic model of friction that is still called coulomb friction. He also became interested in electricity and magnetism and published several papers that contributed significantly to the understanding of those phenomena.

I remind the reader that in 1780 electricity meant static electricity. The voltaic pile—what we would call a bat-



Coulomb's torsion balance.



Charles-Augustin Coulomb, painted in 1794 as a lieutenant general of engineers by Louis Hierle.

tery—would not be invented for another twenty years, so there was no source of electric current. Indeed, the very concept of current didn't exist. Static electricity, however, had been studied extensively. It was well known that when certain materials were rubbed with certain other materials, they would attract or sometimes repel small objects and could also produce spectacular—and painful—discharges. However, very little had been done about quantifying this phenomenon through measurement and mathematical analysis. If someone wanted to make measurements, they first had to invent and build the instruments to do so. It is here that Coulomb made his contribution to electrical science.

One instrument he built was based on the principle of the torsion balance. If torque is applied to a filament—a thread, a wire, or a rod—the filament will twist by an angle that is linearly proportional to the torque applied. If the filament is long and its diameter is small, a significant twist will be produced by a very small torque which can be created by a very small force acting on a lever arm. Coulomb used this simple but useful concept to build an extremely sensitive instrument for measuring minuscule forces such as the forces of electrostatic attraction and repulsion.

Coulomb's torsion balance is shown in the accompanying figure. The crossbar at the bottom of the filament has a foil-covered pith ball at one end and a combination

counterweight/damping vane at the other. An identical ball is given a charge from an electrostatic generator and then lowered through the hole in the top of the test chamber. When the charged ball touches the one on the crossbar, the two balls share the charge equally and then repel each other, causing the crossbar to rotate and twist the filament. By turning the knob at the top of the filament, the crossbar is brought back to its original position and the twist that was required is a measure of the repulsive force between the two charged bodies.

It is left as an exercise for the reader (where have you heard that one before?) to devise other experiments that could be conducted using the electrostatic torsion balance. Through these experiments, Coulomb was able to demonstrate that the repulsive force is proportional to the magnitude of the charges on the two pith balls. He was also intrigued with the recent discovery by Sir Isaac Newton (who will be the subject of a future article) that the force of gravity is inversely proportional to the square of the distance separating two bodies. Could the same be true for electrostatic forces? Coulomb demonstrated that it was indeed true and that the equation describing electrostatic attraction and repulsion—now known as Coulomb's Law—is of the same form as the one describing gravitational attraction.

More Complicated

However, Coulomb didn't stop with his characterization of attraction and repulsion of electric charges. Using his torsion balance and the same techniques, he also demonstrated that magnetic phenomena followed the same inverse square law as gravity and electricity. This was more complicated, of course, because magnetic monopoles (probably) do not exist. So, he used long thin magnets and assumed there was an effective monopole near the end of the magnet. Since the other effective monopole was at the other end of the long magnet, it had a minimal effect on the experiment. The existence of the Earth's magnetic field was also a complicating factor and he had to devise ways to nullify its effect.

Charles-Augustin Coulomb was the quintessential engineer/scientist. He used engineering principles to design scientific instruments and then used those instruments to satisfy his scientific curiosity about electrostatic phenomena. More than anyone else, he explored, learned about, and described the behavior of electric charge. And that's why we call a coulomb a coulomb.

Lyle D. Feisel, Ph.D., P.E. (Ret.) is dean emeritus of the school of engineering and applied science and professor emeritus of electrical engineering at Binghamton University. Following service in the U.S. Navy, he received B.S., M.S., and Ph.D. degrees in electrical engineering from Iowa State University. From 1964 to 1983, he was a member of the faculty of the South Dakota School of Mines and Technology, serving as head of EE from 1975-83. Feisel was a national visiting professor at Cheng Kung University in Tainan, Taiwan, during 1969-70, and served as the founding dean of engineering at SUNY Binghamton from 1983 to 2001. He was named Tau Beta Pi Outstanding Alumnus in 2002. Feisel is a life fellow of the IEEE and a fellow of ASEE and NSPE.



Brain Ticklers

RESULTS FROM SUMMER

Perfect

*Dechman, Don A.	TX A '57
*Gee, Albert	CA A '79
Gee, Nora W.	CA A '79
*Gerken, Gary M.	CA H '11
*Griggs Jr., James L.	OH A '56
Gulian, Franklin J.	DE A '83
Gulian, William F.	Son of member
Johnson, Mark C.	IL A '00
*Norris, Thomas G.	OK A '56
*Richards, John R.	NJ B '76
*Roche, James R.	IN Γ '85
Roche, Kevin M.	Son of member
Schmidt, V. Hugo	WA B '51
*Slegel, Timothy J.	PA A '80
*Spong, Robert N.	UT A '58
*Strong, Michael D.	PA A '84

Other

Alexander, Jay A.	IL Γ '86
Aron, Gert	IA B '58
Beaudet, Paul R.	Father of member
Bohdan, Timothy E.	IN Γ '85
Budd, Christopher M.	AZ B '94
Cohn, Ronald P.	PA Z '72
*Couillard, J. Gregory	IL A '89
Dahmen, Randall R.	WI A '85
Edge, Billy L.	GA A '71
Fogel, Arlene Beck	MA Δ '77
Handley, Vernon K.	GA A '86
Hasek, William R.	PA Γ '49
Hawkins, Debbie S.	Wife of member
Hedegard, Alan H.	IN A '64
Janssen, James R.	CA Γ '82
Jordan, R. Jeffrey	OK Γ '00
Lalinsky, Mark A.	MI Γ '77
Mahoney, John	Non-member
Marrone, James D.	IN A '87
Marrone, James I.	IN A '61
McCullough, Charles R.	AL B '12
Mettler, Kelly M.	CA Δ '10
Mettler, Rick A.	WA B '81
Rentz, Peter E.	IN A '55
Rentz, Mark	Son of member
Roggli, Victor L.	TX Γ '73
Ross, Karen M.	IN A '79
Sauer, Daniel M.	MI B '05
Schweitzer, Robert W.	NY Z '52
Shepperd, Stanley W.	MA B '70
Svetlik, J. Frank	MI A '67
*Thaller, David B.	MA B '93
*Voellinger, Edward J.	Non-member
Zison, Stanley W.	CA Θ '87

*Denotes correct bonus solution

SUMMER REVIEW

Nearly every entry correctly answered problem #3, the algebra problem taken from the 2004 classic cult movie, *Mean Girls*. Admittedly, the columnist expected the problem

to be easy, although it did help North Shore HS win the Illinois State Mathletes championship. Tickler #5, concerning choosing pairs of socks from a drawer, was the most challenging regular problem, and nearly as difficult as the Bonus. Only about two-thirds of respondents answered #5 correctly. The problem was computationally intensive and some found it counterintuitive that the two weekdays in the solution were not the same.

FALL ANSWERS

1

$$\text{SIXTEEN} + \text{TWENTY} + \text{TWENTY} + \text{TEN} + \text{TWO} + \text{TWO} = \text{SEVENTY}$$

$$3092665 + 276528 + 276528 + 265 + 271 + 271 = 3646528$$

Arrange the addends above each other and designate the columns from right to left as C_1 to C_7 . Since there is no carry from C_6 to C_7 , T must be less than 5. So, start by assigning a value (1, 2, 3, or 4) to T. Note that C_4 consists only of T's and E's, so if we have a value for T and can estimate the carry from C_3 , we can calculate E. Now, C_6 consists only of T's, E's, and an I, so we can calculate I. Also, C_3 is composed of only N's, T's, and an E, so we can calculate N and C_1 . One other observation that can be made is that X and V are closely coupled (see C_5) and C_2 is made up of only O's, Y's, and N's, so O and Y are also closely coupled. At this point, five of the letters have values assigned and five do not, but we have a relationship between X and V, so if we pick a value for X from the unused values the corresponding value of V must also be one of the unassigned values. Finally, two of the last three values must work for Y and O. S can have any value, so we need not be concerned about S. Care needs to be exercised to carefully keep track of carries. The unique answer presented above results when $T = 2$. No valid solutions are found for other values of T.

2 Hook (H) caught 16, Line (L) caught 8, and Sinker (S) caught 2

fish. For H to know, H has exactly one factorization with two different numbers. So, H is either a product of two different primes, or a cube, or a fourth power of a prime. For L to know, L cannot be a prime larger than 3, but could be a square or cube of either 2 or 3. Since S is an even number, the only choices are: $2 \times 3 = 6$, $2 \times 4 = 8$ and $2 \times 8 = 16$. Since George (G) determines the others, $L < G < H$, therefore, $H = 16$, $L = 8$, $S = 2$.

3 4562 is number of ways (order does not matter) that a \$100 bill can be changed using \$1, \$2, \$5, \$10, \$20, and \$50 bills. The bills \$1, \$2, and \$5 must sum to a multiple of 10, such as $10m$, for m in the range of 0 to 10. Now, one can find that the number of ways of getting $10m$ using 1, 2, and/or 5 is $(4 + (10m + 4)^2) / 20$. On the other hand, the problem of breaking $100 - 10m = 10(10 - m)$ into 10's, 20's, and 50's is equivalent to that of writing $10 - m$ as the sum of 1's, 2's, and 5's. That is $\text{floor}((4 + (10 - m + 4)^2) / 20) = \text{floor}((4 + (14 - m)^2) / 20)$. The two parts can be combined via a dot product to get: $1 \times 10 + 10 \times 8 + 29 \times 7 + 58 \times 6 + 97 \times 5 + 146 \times 4 + 205 \times 3 + 274 \times 2 + 353 \times 2 + 442 \times 1 + 541 \times 1 = 4562$.

4 Fourteen queens can be placed on a chess board so that each queen could capture exactly two other queens. There are two basic arrangements, as shown below:

QQQ-Q-Q-	QQ-Q----
-----Q	----Q--Q
-----Q	Q-----
Q-----	-----Q
-----Q	Q-----
Q-----	--Q---Q
----Q--	Q---Q--
Q--Q-Q--	--Q---Q-

5 Three weighings are all that are needed to find which (if any) of the 12 bottles have pills that are heavy. Weigh $1 + 2 + 4 + 8$ pills from four bottles. Repeat for next four bottles

and last four bottles. Each weighing will determine which (if any) of the four bottles are heavy.

Bonus A has **32** on his forehead and B has **530** on his forehead. If the sum of squares can be done in only one way, such as $13=2^2+3^2$, then A will know the two numbers used to form the sum of squares and, therefore, the sum. So, the sum of squares must be done in two different ways. Any group with the sum that has only one sum of squares being two ways (such as 9: $5^2+4^2=41$, $7^2+2^2=53$, $8^2+1^2=65=7^2+4^2$) will be solved by B. So, we need the sum having two ways to do sum of squares in two ways. We need to alternate between those two as follows:

$m+n$	m^2+n^2	m	n
{ 16,	130,	9,	7 }
			$130 = 11^2+3^2 = 9^2+7^2$
{ 14,	130,	11,	3 }
			$14 = 13+1 = 11+3$
{ 14,	170,	13,	1 }
			$170 = 11^2+7^2 = 13^2+1^2$
{ 18,	170,	11,	7 }
			$18 = 17+1 = 11+7$
{ 18,	290,	17,	1 }
			$290 = 13^2+11^2 = 17^2+1^2$
{ 24,	290,	13,	11 }
			$24 = 23+1 = 13+11$
{ 24,	530,	23,	1 }
			$530 = 23^2+1^2 = 19^2+13^2$
{ 32,	530,	19,	13 }

This is the only chain that is this long.

Another way to look at this is as follows. Create a list L of ordered pairs (m,n) such that integers m and n are relatively prime. (The logicians are smart enough to track an infinite number of pairs in L , but the judges found $m < n < 40$ to be sufficient.) As a consequence of A's first statement, remove pairs (m,n) from L where m^2+n^2 is unique. B's first statement makes us then remove pairs (m,n) from the updated L , where $m+n$ is unique. Repeat three more times each, corresponding to subsequent statements by A and B, updating L each time. At the point when A makes their fifth statement, L contains exactly one pair with a unique sum of squares, $13^2+19^2=530$,

from A which can determine his number, 32.

Computer Bonus 7442, 28658, 148583, 177458, and 763442 are five different positive integers such that the sum of any two of them is a perfect square.

NEW WINTER PROBLEMS

1 My elder son has just entered as a freshman at Cornell University (NY Δ). Being a California native, I was naturally concerned how he would adjust to his first chilly winter there in Ithaca. Find a unique solution to the following cryptarithm to alleviate my fears: CORNELL + STUDENT = ENDURES. Standard rules apply: each different letter stands for a different digit and each different digit is always represented by the same letter; leading zeros are not allowed.

—Jeffrey R. Stribling, CA A '92

2 In the World of Bonkers, the ditty for remembering the numbers of days in their months runs as follows:

'Nineteen days hath Cucumber, Strawberry too, and the number of days there are in Tiddleywinks is just the same as 'tis in Jinks, which is seven whole days more than the ten there are in Pinafore. With the month of Collywobble, diary makers have some trouble; thirteen days if year is even, forty-four if odd. And Stephen quite the least of Bonkers' months, in fact it's sometimes called the runt, as you can easily understand, since it hath but four days and another two in years of Heaven (that's if the year's date ends in seven).'

There are five days in each week —Joyday, Funday, Laughday, Blissday, and Workday, in that order.

In the year 17 a.b. (after bliss) the King of Bonkers went off for his holiday on Funday, Strawberry 17th and returned, just over 7 weeks later, on Blissday, Tiddleywinks 8th. In the year 19 a.b., there were

exactly 10 weeks from Collywobble 41st to Pinafore 7th. Note that Collywobble is the first and most important month of the seven which comprise the year.

What is the order of the seven months of the Bonkers' year? Given Strawberry 13th was a Workday in the year 21 a.b., what day of the week was Collywobble 2nd?

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

3 Find the smallest rational x for which $x-5$, x and $x+5$ are all squares of rational numbers (that is, each number can be written as some p^2/q^2).

—Mathematical Tournament
from 1225

4 Primeministan County has a cluster of small towns interconnected by a series of roads, such that there is only a single route between any two towns. Interestingly, when sorted by distance, the ten routes in the county (measured in km) are unique consecutive primes. What is the minimal total road length in Primeministan? How many towns are there and how are the roads connected in this topology?

—Hunter W. Hagadorn,
PA E '59

5 Start with a 10 cm square piece of paper and color in a 3 mm wide red border on both sides along and including all four edges. Fold the paper so that no red shows, not even a corner or an edge. Paper must either fully wrap around an edge or the edge must be recessed at least 3 mm from the outer perimeter of the folded shape (and be covered) to be considered hidden. If the paper has been folded and a new fold makes more than one crease, the new fold is considered as only one fold. What is the minimum number of folds required?

—The Man in the Milk Carton
by Stephen Barr

Bonus Frank has a tablecloth covered with 1 cm diameter black polka dots. The polka dots form

a square grid with 2 cm between neighboring centers. He takes a flat 4 cm by 4 cm piece of clear plastic and paints four 1 cm diameter circles on it in the same pattern as on the tablecloth. After laying the tablecloth on a flat surface, he randomly tosses the piece of plastic onto it. To three significant figures, what is the probability that none of the polka dots on the plastic will overlap any portion of any of the polka dots on the tablecloth?

—Don A. Dechman, TX A '57

Computer Bonus In the range from 1 to 1,000,000,000, what is the longest string of consecutive integers without a semiprime? A semiprime is an integer that is the product of exactly two (not necessarily different) primes. As an example, 96 to 105 is a string of 10 integers without a semiprime.

—Howard G. McIlvried III, PA Γ '53

Postal mail your answers to any or all of the Brain Ticklers to **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 Winter column is the appearance of the Spring *Bent* which typically arrives in late March (the digital distribution is several days earlier). The method of solution is not necessary. The Computer Bonus is not graded. We additionally welcome any interesting problems that might be suitable for the column. Entries will be forwarded to the judges who are **H.G. McIlvried III, PA Γ '53**; **F.J. Tydeman, CA Δ '73**; **J.C. Rasbold, OH A '83**; and the columnist for this issue,

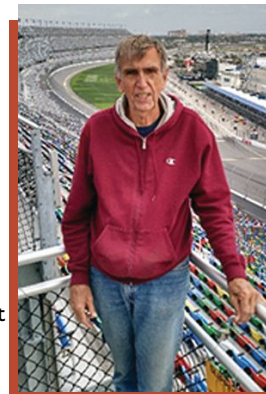
—J.R. Stribling, CA A '92

Stories of "Gratefulness"



Tau Beta Pi Major Gifts Officer, **Sherry Jennings-King, TN A '93**, shares stories of "gratefulness" during this holiday season. Contact Sherry for more information on the Chapter Endowment Initiative at sherry.jenningsking@tbp.org.

Sherry,
Very nice article on the Chapter Endowment Initiative in the Spring 2018 issue of *The Bent*. You look good in a hard hat. The last sentence in the Randy Alexoff interview expresses my feeling: It's nice to know you've left a legacy for future engineering students. Thanks for making that happen for me.



—Steve Ricks, IN A '63
Chapter Endowment Initiative donor, pictured at Daytona International Speedway.



Note from CA Alpha at UC Berkeley students to Paul Cocotis, CA A '90, Chapter Endowment Initiative donor:

Dear Paul,

This spring, TBPI HQ informed us that you had given to our Chapter Endowment Fund. Our officers would sincerely like to thank you for your contribution. The endowment fund will greatly help our chapter continue its mission of excellence in academics and contributions to the community.

CA Alpha holds a variety of professional workshops and industry info-sessions and provides an exam database, resume critiques, and mock interviews free to all Berkeley students. Again, thank you so much for your contribution. It gets us one important step closer to attaining our goals as an honor society.

—Laura E. Brandt, CA A '18
Chapter President

President's Report

(Continued from page 16)

although the question was examined many times, the Women's Badge was the only recognition offered until 1969. This is a remarkable anniversary and thanks to a team of volunteers led by Director of Alumni Affairs Gomalinski, the celebratory articles and activities will begin to roll out later this year.

Another important milestone this year is the 30th anniversary of Engineering Futures. This program has grown in size and impact over the years and the modules are the foundation of our professional development efforts. There will be Engineering Futures Sessions at Convention and chapters are encouraged to schedule sessions on campus throughout the academic year.

And as I mentioned earlier, this is the 85th anniversary of the Fellowship Program and 20th anniversary of the Scholarship Program.

Constitution and Bylaws Revision

At the 2017 Convention in Dearborn, an updated version of our Constitution and Bylaws was approved. The chapters ratified the revisions this spring. We are continuing to evaluate various sections to ensure all situations are addressed for our members and chapters. The Constitution and Bylaws, Petitions, and Program Review Committees will be working hard at this Convention to consider and recommend further changes.

Opportunities

Like many of you, when I joined TBPI, I knew I was joining an honor society, but I didn't know much more about membership. As I sat through the initiation ceremony, I found it really spoke to me and I knew this was an organization that mirrored my values; I especially appreciated that it was interdisciplinary and we were required to get to know people outside of our classrooms.

As an undergraduate, I was active in my chapter, CA Lambda at the University of California, Davis. I was the Treasurer and had the opportunity to correspond with then Secretary-Treasurer Bob Nagel.

After I graduated, I worked, went to graduate school, earned my Ph.D., and joined the faculty at California State University, Sacramento. One of the first questions I asked of a colleague was, "How do I become an Advisor for the Tau Beta Pi chapter?" "Sadly," he replied, "we don't have a chapter at Sac State." I knew it was important to my colleagues because many of them had framed TBPI certificates on their walls! I have always wanted more for my students than even the many opportunities I had, so I could not allow that situation to continue.

I revived my correspondence with Secretary-Treasurer Nagel to inquire about forming a chapter. I worked with my college, some extraordinary students, the at-the-time new Secretary-Treasurer, Jim Froula, and we were successful in creating a chapter that was installed in 1984. Since then, I have served in a variety of roles nationally and locally, from Chief Faculty Advisor to member of the Executive Council.

It was my local involvement that gave me the national opportunities, and in 2013, I was fortunate to have been

approached by Russ Pierce about running for the Executive Council in what turned out to be the last "slate" election. Together with J.P. Blackford, George Morales, Alan Passman, and Norman Pih, we formed the Elevate Slate. We were elected and I have been on the EC since 2014 and President for 2018.

When I accepted the invitation to join the Association more than 40 years ago, I had no idea there was a vibrant national organization, or Convention, and certainly never thought of being President...but here I am.

Volunteering with Tau Beta Pi has been an incredibly rewarding part of my life. But, I didn't plan it—staying involved with an organization that had a purpose, giving freely and fully, spending time with my fellow Tau Bates—that was the plan.

It has been a privilege and honor to serve on the Executive Council and as President of Tau Beta Pi (and I still miss Alan and Norm).

I didn't have a title in Tau Beta Pi when I started trying to make a contribution. Being a leader does not require a title. You are all leaders here; take advantage of your natural gifts.

As some of our more mature colleagues can attest, opportunities will occur throughout your career. Grab every chance you can. And if one is not presented to you, make it happen.

I urge all of you leaders to take the opportunity to continue to serve this important organization at all levels.

I guarantee you that service in support of Tau Beta Pi will be one of the most rewarding aspects of your career and you will be making an impact on the entire engineering profession.

Thank you and have a great Convention!

2018 PRESIDENT

Sue L.R. Holl, Ph.D., *California Lambda '76*, has served as an Executive Councilor since 2014, was Vice President for 2017 and President for 2018. She served on the TBPI Fellowship Board for some 20 years. Sue earned her B.S. (double major—electrical engineering and materials science and engineering), her M.S. (materials science and engineering) from the University of California, Davis, and her Ph.D. in materials science and engineering from the University of California, Berkeley. She worked at Sandia National Laboratories, Lawrence Berkeley Laboratory, and has been on the mechanical engineering faculty at California State University, Sacramento, since 1980. Her research area is electronic devices. Sue is Chief Faculty Advisor to the California Upsilon Chapter and has held several offices for the Sacramento Valley Alumni Chapter. She has begun an early retirement program and is now serving as president of the CSUS Retirees Association. Sue is active in her community and enjoys a very full life in the Sacramento region with her family and friends. **Tau Beta Pi FOR LIFE!!**



IN THE COLLEGES

SPOTLIGHT

Six-figure Salaries

Financial news company *24/7 Wall Street* has reported that several engineering or engineering-related job categories are among the 77 occupations in the U.S. that average six-figure salaries.

The report authors compiled a list following a review of the average annual salaries for more than 800 occupations from the Bureau of Labor Statistics.

Of the 142.5 million employed Americans, nearly 8% (or a little more than 11 million people) work in professions where the average salary is at least \$100,000 a year—and several of those are directly or indirectly related to engineering.

The 10 engineering jobs that appeared on the list are below, along with their rank on the list and average salary:

- 67. Mining and geological engineers
· Average annual wage: **\$103,710**
- 61. Electronics engineers (except computer)
· Average annual wage: **\$106,760**
- 60. Sales engineers
· Average annual wage: **\$106,950**
- 55. Nuclear engineers
· Average annual wage: **\$108,910**
- 53. Engineering professors
· Average annual wage: **\$109,830**
- 48. Chemical engineers
· Average annual wage: **\$112,430**
- 43. Aerospace engineers
· Average annual wage: **\$115,300**
- 39. Computer hardware engineers
· Average annual wage: **\$119,650**
- 20. Architectural and engineering managers
· Average annual wage: **\$146,290**
- 17. Petroleum engineers
· Average annual wage: **\$154,780**

Women's Ph.D. Issue

Having female peers—even just a few of them—can increase a woman's odds of making it through her Ph.D. program in STEM, says a new working paper from the National Bureau of Economic Research.

Based on a sample of graduate students in STEM programs at Ohio

public institutions, women in Ph.D. cohorts with no female peers were about 12% less likely than men to earn a doctorate within six years.

One standard deviation in the share of female students in a cohort increased a woman's chance of “on time” graduation by about 5%. Much of that difference was attributed to a reduction in the dropout rate in the first year of graduate school.

The findings were most pronounced in programs that are typically male-dominated.

Inside Higher Ed commented: “This idea isn't new. Advocates of women in STEM have long emphasized the importance of gender-inclusive environments, along with support networks of peers and mentors, in sealing the so-called leaky pipeline to the Ph.D. But the new study adds a quantitative dimension to the discussion.”

Souping-up Majors

The University of Illinois at Urbana-Champaign is updating and reinvigorating a number of traditional majors by combining them with computer science, reports *The Chronicle of Higher Education*.

The Chronicle says this is part of a trend where college administrators say that when “majors aren't thriving,” they are compelled to either “soup them up or let them go.”

The reasoning is that liberal-arts, arts, and agricultural fields increasingly encompass data analysis that requires computer-science skills.

On the other hand, Massachusetts' Assumption College “is simply cutting some declining majors, especially in the humanities, and banking on entirely new programs.”

Foreign Grads Stay On

More than half of the nearly 1.5 million foreign students who graduated from U.S. colleges and universities between 2004 and 2016 stayed in the country to work in STEM fields through the federal government's

Optional Practical Training program, data show.

The Pew Research Center said enrollment in the OPT program by foreign STEM graduates has grown by 400% since 2008, with most students coming from Asia.

PEOPLE

Gabrielle G. Gaustad, Ph.D., *New York Sigma '04*, has been named as the new engineering dean at Alfred



University. She returns to Alfred University from Rochester Institute of Technology, where she was an associate professor of materials engineering

and master of science program coordinator for the institute for sustainability. Gaustad has served on the institute's admissions and retention committees, chairing it for the past five years, and has also been involved with marketing the institute.

Pamela H. Obiomon, Ph.D., *Texas Kappa '90*, has become dean of the college of engineering at Prairie View A&M University. The Prairie



View alum and Texas Kappa Advisor had been a faculty member in the department of electrical and microelectronic engineering since 2003. In 2013,

Obiomon became department head serving one of the largest programs in the college. She earlier taught at Rochester Institute of Technology and worked in the Shuttle Avionics Integration Laboratory at the Johnson Space Center in Houston, TX.

Jim Rankin, Ph.D., *South Dakota Alpha '78*, is now president of the

South Dakota School of Mines & Technology. He was the chief research officer and professor of electrical engineering at the University of Arkansas. Previously at Ohio



University, the South Dakota native and SDSMT alum was interim vice president for research, associate dean, professor of electrical engineering, and director of the avionics engineering center.

Silvanous J. Udoka, Ph.D., Oklahoma Gamma '89, has become dean of Clark Atlanta University's school of business administration. He previously served as professor and chair of the department of management, with a joint



appointment in the department of industrial and systems engineering, at North Carolina A&T University.

FACILITIES

University of Texas at Austin has been awarded a \$60 million grant by the National Science Foundation to build a new supercomputer. It will reportedly be among the fastest in the world. The Frontera supercomputer is expected to come online in summer 2019.

Among the firms playing a role in the effort are Dell EMC, Intel Corp., Data Direct Networks, Mellanox, Nvidia, Green Revolution Cooling, Amazon.com Inc., Google Inc., and Microsoft Corp.

The San Antonio Business Journal said the computer "would be the fifth most powerful supercomputer in the world," if it were completed today. It is expected to be used for "analyzing particle collisions from Europe's Large Hadron Collider, modeling global climate change and improving hurricane forecasting."

Case Western Reserve University and Siemens "plan to educate the next generation of electrical engineers in the digital grid of the future," reported *The Cleveland Plain Dealer*.

The company has invested \$1.2 million to create the Siemens Digital Grid Lab where CWRU undergraduates can learn about the digital grid. This concept envisions a communications network laid alongside the existing electrical network and able to integrate solar- and wind-generated energy with energy from traditional sources.

Case electrical engineering and computer science professor and Ohio Alpha Advisor **Kenneth A. Loparo, Ph.D., Ohio Epsilon '72**, said the digital grid may be a reality as soon as 2020 or 2025. He added: "It's absolutely critical that we begin to educate students on what the challenges will be and equip them with the tools to deal with the new digital frontier."

University of California, San Diego is receiving a \$16.3 million grant from the National Science Foundation to upgrade its outdoor shake table earthquake simulator. This will give a truer sense of the fury erupted when big earthquakes erupt around the globe.

The San Diego Union-Tribune reported that the facility "is the largest of its kind and has conducted experiments that have led to tougher building and design codes for bridges and housing. But it can only move structures backward and forward."

Engineers will use the grant to "modify the table so that it also can move up and down, right and left, and simulate the pitch, roll and yaw that can come with ground motion. Collectively, these movements are called the 'six degrees of freedom.'"

Colorado School of Mines is "offering the world's first degree programs in space resources—essentially mining in outer space," said *National Public Radio*.

"A small but growing number of startups expect this to be very

big business sooner than a lot of us might think," added the report. It went on to say that such studies could eventually inform efforts to establish facilities to extract fuel for deep space missions from resources on the moon or asteroids.

Angel Abbud-Madrid has been studying space resources at the School of Mines for two decades and directs the new degree programs. He said there is a lot in space that humans could find useful.

Rensselaer Polytechnic Institute has launched a new research center to pursue cutting-edge research in vertical takeoff and landing (VTOL) aircraft technologies.

MOVE—The Center for Mobility with Vertical Lift—will work on the emergent field of multi-rotor electric VTOL, or eVTOL. A new class of both electric and hybrid electric aircraft is being envisioned for a range of applications from package and payload delivery to air taxis.

Stony Brook University is receiving \$25 million in New York State funding to begin developing a new \$100 million state-of-the-art engineering and applied sciences building, reports *Newsday*.

The funding will be used to start the architectural design and planning of a 100,000-square-foot building that will include classroom, lab, and manufacturing shop space.

The school's college of engineering and applied sciences currently uses several buildings, many of which were built decades ago, said dean **Fotios Sotiropoulos, Ph.D., New York Eta '92**.

Texas A&M and **University of Texas at Austin** have each received a \$20 million donation from J. Mike Walker, a graduate of both schools. He is the former chairman, president, and CEO of Houston-based Dril-Quip Inc.

The cash will go to support the departments of mechanical engineering and both schools have announced their engineering colleges will be renamed in Walker's honor.



ASSOCIATION BRIEFS

ASSOCIATION VOLUNTEERS

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

- **William W. Provett**, *NJ Γ '69*—District 4 Director
- **Andrew I. Doyka**, *TN Γ '17*—District 6 Director
- **S. Thomas Stewart**, *AL A '14*—District 6 Director
- **Tonya J. Whitehead**, *MI E '15*—District 7 Director
- **Janette A. Keiser**, *AK A '76*—Engineering Futures Facilitator

TBPI wishes to thank the following retiring volunteers:

- **Kelly J. Hammar**, *IA A '89*—Director of the District Program for 2 years
- **Brian M. Leslie**, *MA A '14*—District 1 Director for 1 year
- **Michelle Nanney**, *TX Δ '96*—District 4 Director for 2 years
- **Laura M. Martin**, *KY A '14*—District 6 Director for 2 years
- **Crystal L. McCartney**, *AL Δ '08*—District 6 Director for 3 years
- **Timothy D. Anderson**, *KY Γ '12*—District 7 Director for 4 years
- **Jeffrey G. Dabling**, *UT B '00*—District 13 Director for 16 years
- **Stacey H. Ross**, *CA K '06*—District 16 Director for 11 years
- **James P. Sandman**, *TX Z '11*—Engineering Futures Facilitator for 6 years

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 four District Directors with the following years of service to the collegiate chapters as of July 31, 2018:

- **Bruce A. DeVantier**, *IL E '77*—6 Years
- **George K. Miyata**, *WA Δ '10*—6 Years
- **Gregory M. Newcomb**, *CO B '06*—6 Years
- **Neal T. Bussett**, *CA Ξ '09*—6 Years

Five Engineering Futures Facilitators have served the Society for 12 and 6 years as of July 31, 2018:

- **Stephan L. King-Monroe**, *MI E '08*—6 Years
- **Yue C. Chang**, *PA Γ '00*—18 Years
- **Andrea J. Pinkus**, *NY Δ '97*—18 Years
- **Annette M. Brenner**, *OH K '92*—24 Years
- **Michael D. Czebatul**, *OK A '92*—24 Years

We also give special recognition to the following:

- **James W. Johnson Jr.**, *NC A '77*—36 years of service including work as Assistant District Director, Executive Councillor, Association President, and member of the Trust Advisory Committee
- **Jeffrey G. Dabling**, *UT B '00*—16 years as a D13 Director
- **Kelly J. Hammar**, *IA A '89*—12 years including work as a D10 Director and Director of the District Program

Alumni Visit World's First Nuclear Sub

Ming De Lin, *New York Gamma '01*, left, and Hubert Denis, *Missouri Delta '16*, second left, along with friends and family of the Central Connecticut Alumni Chapter went to the Submarine Force Museum in Groton, CT, on Veterans Day. It has the world's first nuclear submarine. They went on board as part of the museum visit and are pictured in a representative control room where instruments and controls for diving, surfacing, and steering the submarine are located.

To join an alumni chapter, contact the Director of Alumni Affairs, Tricia Gomulinski, at tricia@tbp.org. Visit www.tbp.org/Memb/Alumni.cfm to check on local alumni events.





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 | '46 | Gaines, Albert Lowery; November 2, 2017. | '51 | Hardman, William Miller; November 17, 2017. | |
| | '49 | Shelton, Robert Atherton; May 4, 2000. | '54 | Hunsinger, John Stewart; October 24, 2010. | |
| | '50 | Crowson, Rufus Jackson; no details. | '58 | Bowen Jr., David; September 16, 2017. | |
| | '68 | Maheras, James George; August 31, 2018. | IL A | '43 | Gauthier, C. J.; January 14, 2005. |
| | '68 | Owen, Wayne Alan; August 25, 2018. | '44 | Ackmann, Lowell Eugene; August 16, 2015. | |
| AL B | '51 | Wisdom, Jack Henry; February 19, 2016. | '50 | Barthel, Harold Oscar; August 3, 2005. | |
| AL Γ | '50 | Page, Robert W.; November 4, 2017. | '50 | Casler, Max Stuart; April 6, 2003. | |
| AZ A | '53 | Hickman, John Earl; January 11, 2016. | '50 | Skinner, Roger E.; May 14, 2002. | |
| AR A | '49 | Russell Jr., William Franklin; December 22, 2014. | '51 | Maki, William Math as; no details. | |
| | '50 | Harrison, Roy Clayton; November 23, 2001. | '54 | Hutchinson, Paul Irving; no details. | |
| | '50 | Henry Jr., Elbert Augustus; no details. | '55 | Lewis, Eugene Walter; no details. | |
| | '50 | Whistle, Joy William; January 19, 2015. | '58 | Becker, Richard Charles; June 8, 2018. | |
| | '54 | Ogden, Charles Ray; September 5, 2014. | '58 | Skinner, James Lewis; no details. | |
| CA A | '41 | Ludwig, Russell George; August 11, 2018. | IL B | '41 | Rasof, Bernard; no details. |
| | '48 | Payse Jr., Victor; no details. | '41 | Skoller, Marvin; no details. | |
| | '49 | Gerstle, Kurt Herman; February 20, 2013. | '43 | Vanderploeg, Peter Frank; no details. | |
| | '49 | Gunn, Jack T.; June 5, 2001. | '44 | Bonthron, Robert John; no details. | |
| | '50 | Gregg, Alexander Kennedy; November 9, 2003. | '48 | Van Ness, Seward Hawley; May 20, 2014. | |
| | '50 | Johnson, Albert William; no details. | '49 | Brunauer, Ernest Adolph; no details. | |
| | '51 | Wing, Jack; September 15, 2018. | '49 | Koncel, Edward Frank; July 10, 2011. | |
| | '52 | Ball, John Wesley; June 17, 2016. | '49 | Thayer, William Risslou; March 12, 2009. | |
| | '53 | Sergeyevsky, Andrey; November 7, 2010. | '50 | Gradle, John Andrew; January 17, 2007. | |
| CA B | '50 | Cox, William Parker; April 20, 2013. | '50 | Miller, Donald Edwin; October 26, 2004. | |
| CA Γ | '46 | Norton, Richard C.; August 19, 2018. | '50 | Wollscheid, Norman T.; August 15, 2018. | |
| | '47 | Mallinckrodt, Albert John; March 2, 2018. | '54 | Miyasaki, John Kenji; October 4, 2018. | |
| | '50 | Frost, Alfred Grant; September 28, 2011. | '61 | Yurka, George Emil; August 6, 2017. | |
| CA Δ | '49 | Bellamy, Charles Wayne; October 7, 2003. | IL Γ | '46 | Weertman, Julia Randall; July 31, 2018. |
| CA E | '50 | Bender, Fred Arno; no details. | '47 | Hitt, George L.; no details. | |
| | '51 | Waller, Robert Wyman; August 23, 2018. | '48 | Hronek, Robert Louis; no details. | |
| | '54 | Stear, Edwin Byron; September 21, 2017. | '50 | Breed, Allen Kent; no details. | |
| CA K | '75 | Sliwoski, Robert Henry; October 14, 2018. | '50 | McNeer, Charles Selden; July 29, 2018. | |
| CA O | '50 | Frisman, Mark Morris; January 13, 2016. | IL Δ | '73 | Smith, Rodger Andrew; October 23, 2018. |
| CO A | '50 | Quiett, Frederick Terrence; June 3, 2001. | IL Z | '47 | Patterson, Robert William; April 12, 2018. |
| CO B | '41 | Heckman, Earl Landis; June 6, 2006. | IN A | '47 | Seefeldt, Waldemar B.; December 14, 2015. |
| | '43 | Kern, Robert Edward; July 10, 2017. | '48 | Edelsohn, Charles Robert; no details. | |
| | '44 | Uberoi, Mahinder Singh; no details. | '49 | Ballinger, James E.; October 19, 2003. | |
| | '45 | Bridges, Jack Edgar; June 18, 2018. | '50 | Custer, James Corkey; October 12, 2018. | |
| | '45 | Otsuki, Julius Akira; no details. | '50 | Eastes, J. Warren; July 28, 2005. | |
| | '46 | Arnberg, Benjamin Thomas; March 29, 2016. | '50 | Forgey, Harry L.; no details. | |
| | '47 | Iverson, Clair Holland; February 10, 2011. | '50 | Harter, George Arthur; September 19, 2017. | |
| | '49 | Mueller, Anson Gilbert; August 29, 2016. | '50 | Petty, Leonard Beck; no details. | |
| | '49 | Zurick, Vernon Joseph; no details. | '50 | Roll, Irwin Bob; January 21, 2013. | |
| | '50 | Tulin, Leonard George; August 23, 2016. | '51 | Allen, Charles Gilpin; November 8, 2016. | |
| | '50 | Wright, Virgil Lester; September 22, 2007. | '51 | Buck, Robert Allan; no details. | |
| | '57 | Frederick, Nolan Vincent; no details. | '51 | Demboski, Stanley Francis; September 14, 2018. | |
| | '59 | Clement Jr., George W.; October 4, 2018. | '51 | Russell, William John; January 1, 2003. | |
| CT A | '49 | Mathews, Robert Fowler; August 3, 2003. | '51 | Wainwright, William Lloyd; May 24, 2017. | |
| | '51 | Scherer Jr., Harold Nicholas; October 10, 2017. | '52 | Denning, Roy Louis; June 27, 2006. | |
| | '52 | Nixon, Walter Barry; August 22, 2017. | '53 | Longley Jr., Richard Morison; August 13, 2012. | |
| CT B | '51 | Dabora, Eliahou K.; no details. | '56 | Cooper, David Bourie; June 16, 2018. | |
| DC A | '57 | Bryant, Bynum Andrew; October 6, 2018. | '59 | Kirkham, Frank Stevens; January 20, 2018. | |
| FL A | '49 | Evans, Anderson Pierce; November 25, 2006. | '72 | Askins Jr., Harold William; September 25, 2018. | |
| | '50 | Harrison, Dalton S.; January 17, 2002. | IN B | '52 | Rennels, John Raymond; August 9, 2010. |
| | '50 | Rouzie, James Winder; March 8, 2015. | '56 | Carpenter, Stanley Robert; October 12, 2018. | |
| | '74 | Brown, Phillip Ralph; July 28, 2015. | IA A | '43 | Sohlberg, Erik Thompson; November 9, 2007. |
| FL B | '50 | Anderson, George Francis; May 18, 2010. | '44 | Thompson, Gerald Luther; November 9, 2009. | |
| FL Γ | '48 | Scott, Linus Albert; September 18, 2017. | '46 | Lundsgaard, Warren Lee; no details. | |
| FL E | '65 | Dunn, Stanley Eugene; September 26, 2008. | '48 | Tappel, Aloys Louis; November 25, 2017. | |
| GA A | '46 | Dufford, Donald Eugene; April 23, 2004. | '49 | Windhelm, Lee Stephen; March 24, 2017. | |
| | '46 | Englund, Ralph Caldwell; May 21, 2007. | '49 | Zigrang, Denis Joseph; August 31, 2018. | |
| | '50 | Mock Jr., George Bernard; September 4, 2017. | '50 | Simpson, Leroy Edward; March 24, 2004. | |
| | '51 | Duggan Jr., Robert Stone; January 8, 2018. | '66 | Hage, John Kennard; October 19, 2015. | |

- IA B '49 **Meier, Mark Frederick**; November 25, 2012.
 KS A '50 **Dickey, Dick**; no details.
 '50 **Gibson, James Alfou**; no details.
 '50 **Miller, John David**; July 2, 2008.
 '50 **Mullin Jr., Charles Edward**; no details.
 '51 **Schrader, David Hawley**; November 7, 2017.
 '62 **Harper, Larry Joe**; no details.
 KY B '51 **Larson, George Peter**; March 14, 2017.
 LA A '48 **Hurstell, Malcolm Leo**; September 4, 2007.
 '58 **Shaffer, Allen Ardis**; September 22, 2018.
 LA B '48 **Gagliano, Nicholas Joseph**; March 25, 2018.
 '50 **Bywater, George Pilsbury**; September 21, 2018.
 ME A '44 **Evans Jr., Weston Sumner**; no details.
 '50 **Hede, Richard Iver Charles**; January 27, 2002.
 '50 **Palmer, Osmond Frederick**; December 5, 2016.
 MD A '49 **Lummis, Henry Maxwell**; May 4, 2018.
 '50 **Chandler Jr., Albert Norris**; November 21, 2002.
 '60 **Kretzchmar, Richard J.**; September 27, 2017.
 MD B '42 **Tompkins, Howard Edwards**; December 5, 2009.
 '43 **Marsden, James Nathan**; May 2, 2007.
 '50 **Asendorf, Stephen Edgar**; May 19, 2002.
 '50 **O'Brien, Noel Gordon**; February 22, 2005.
 MA A '44 **Carrabino, Joseph Dominic**; July 17, 2017.
 '44 **Highberg, Carle W.**; October 10, 2006.
 '60 **Snively, Fred Strook**; September 21, 2017.
 MA B '37 **Wood, Duane Oren**; July 7, 2018.
 '45 **Berlage, Thomas Nicolas**; January 30, 2018.
 '48 **Munck, Allan Ulf**; April 29, 2016.
 '48 **Oard, William Murray**; January 21, 2017.
 '49 **Campbell, Bruce**; November 20, 2015.
 '50 **Cook, Nathan Henry**; July 13, 2005.
 '50 **Snedeker, Robert A.**; February 3, 2016.
 '51 **Cann, Roald**; May 15, 2011.
 '51 **Fernald, George Herbert**; no details.
 '51 **Lander, Horace Norman**; September 20, 2003.
 '52 **Myer, John Randolph**; February 17, 2016.
 MA Δ '40 **Pollard, David Frank**; September 25, 2018.
 '45 **Young, Wendell Stratton**; no details.
 '46 **Collamore, Frank Norris**; March 20, 2018.
 '49 **Giunta, Armand Theodore**; April 3, 2006.
 '50 **Osborn, Henry Hooper**; no details.
 '53 **Stanfield, Robert B.**; January 12, 2017.
 MA E '53 **Bedrosian, Harry**; September 11, 2018.
 '54 **Jepson, John Willisford**; September 19, 2018.
 '54 **Loneragan, Edward Leo**; September 5, 2018.
 '73 **Nowell, Randall Justin**; May 28, 2015.
 MA Z '65 **Cheever, Herbert Lawrence**; no details.
 MI A '50 **Landon, John Morris**; April 20, 2006.
 '51 **Zerfas, Gerald Jacob**; June 24, 2017.
 MI B '50 **Sundlie, Lawrence James**; September 9, 2006.
 '58 **Henriksen, Leslie Louis**; September 6, 2018.
 MI Γ '44 **Willits, Samuel Pierson**; April 5, 2012.
 '46 **Fradenburgh, Evan Albern**; May 15, 2006.
 '48 **Sikorovsky, Eugene Frank**; September 30, 2018.
 '48 **Wilterdink, Bernard William**; no details.
 '49 **Hamilton Jr., Ralph Edwin**; no details.
 '49 **Slagter, Neil**; November 26, 2005.
 '50 **Kaplan, Herman W.**; June 20, 2003.
 '50 **Payne, Louis David**; June 26, 2013.
 '51 **Hill, Donald Stanford**; no details.
 '53 **Norquist, Warren Elliot**; March 14, 2018.
 '59 **Hirst, David Kennedy**; no details.
 MI Δ '51 **Marsden, John Thomas**; August 21, 2008.
 '57 **Graytock, Robert Arnold**; October 10, 2018.
 MI E '47 **Abramovitz, Marvin F.**; April 8, 2000.
 '47 **Beyer, Frank Rudolph**; June 22, 2015.
 '54 **Mathis, Logan Harold**; February 22, 2018.
 '54 **Ross, Louis Robert**; no details.
 MI Z '50 **Wienbrauck, Paul Gottfried**; no details.
 MN A '47 **Chapin Jr., George Gilman**; no details.
 '50 **Borgeson, Roger Dennis**; July 28, 2001.
 '51 **Peterson, Robert Lloyd**; September 26, 2009.
 MS A '48 **Hill, Charles W.**; April 4, 2006.
 '49 **Cherry, James Cecil**; June 4, 2011.
 '49 **Holland Jr., Hoyt Thomas**; October 18, 2018.
 '54 **Mooney Jr., Joseph F.**; March 24, 2016.
 '68 **Parks Sr., Joseph Worthy**; October 10, 2018.
 MO A '58 **Roupe, George A.**; October 29, 2018.
 '79 **Smart, Steven Tracy**; September 25, 2018.
 MO B '42 **Johnk, Carl T. A.**; May 24, 2015.
 '49 **Stobie Jr., Allan Black**; August 19, 2018.
 '50 **Wargo, Lewis Lincoln**; September 30, 2005.
 '55 **Roesler, Ralph Ralph**; October 13, 2012.
 MO Γ '49 **Koch, Robert Wotring**; November 26, 2011.
 '49 **Miller Jr., Walter Lafayette**; September 29, 2009.
 '49 **Zingre, Richard Blake**; August 23, 2016.
 '50 **Beitch, Leonard**; March 10, 2002.
 '50 **Jenkins, James Morton**; August 19, 2012.
 '50 **Jonas, Roland George**; January 13, 2013.
 '50 **Wakefield, Donald Anderson**; April 23, 2006.
 MT A '48 **Glasscock, Wilford R.**; no details.
 '52 **Peterson, Robert William**; January 1, 2003.
 MT B '49 **Griffiths, Vernon**; July 30, 2017.
 NH A '49 **Janetos, Lewis Evangelos**; September 22, 2018.
 '52 **Jacobsmeier Jr., John Henry**; May 24, 2018.
 NJ A '51 **Zusi, Franklin Edward**; no details.
 '55 **Wright, Thomas Joseph**; April 8, 2010.
 NJ B '50 **Hubbard, James Robert**; September 12, 2007.
 NJ Γ '38 **Mehrbach, Elliott**; August 29, 2005.
 NJ Δ '49 **Wannamaker, Edward Jones**; January 7, 2004.
 '55 **Kovatch, George**; June 15, 2018.
 NM A '51 **Hernandez, John Whitlock**; June 28, 2018.
 '53 **Gonzales, Omega Santiago**; August 26, 2018.
 '55 **Paczynski, Alexander Stephen**; March 26, 2012.
 NY A '49 **Blechar, Henry E.**; October 26, 2016.
 '50 **Berman, Robert**; June 20, 2013.
 '50 **Dolan, John Edward**; March 17, 2018.
 NY B '41 **Renner, Charles Foster**; no details.
 '42 **Detor, Robert E.**; September 22, 2018.
 '46 **Steadman, Lewis Tilden**; March 26, 2017.
 '48 **Straub, Carlton Morey**; November 25, 2017.
 '49 **Borst, Kenneth Joseph**; March 16, 2018.
 '50 **Erikson, Victor Herbert**; October 19, 2005.
 '50 **Guarino, Michael Robert**; April 11, 2013.
 '50 **Hassett, Robert Patrick**; no details.
 '50 **Schilling, Edmund Franklin**; April 14, 2016.
 '51 **DeVoe, Howard Gittings**; February 17, 2002.
 '53 **Kenline, Paul Alan**; July 31, 2017.
 '57 **Goldner, Norman Daniel**; September 15, 2013.
 '62 **Murphy, Edward C.**; April 11, 2004.
 NY Γ '44 **Litsios, John**; March 11, 2018.
 '44 **Tompkins Jr., James Haviland**; no details.
 '50 **Barry, Walter Campbell**; January 1, 2003.
 '50 **Brower Jr., William Bartley**; January 15, 2007.
 '50 **Canellos, James**; no details.
 '50 **Fisher, John Richard**; March 28, 2005.
 '50 **Matalas, Charles Peter**; December 3, 2001.
 '50 **Poland, William Longstreth**; July 29, 2017.
 '52 **Staub, Fred Wolf**; March 15, 2018.
 '53 **Whish, Arthur Miller**; March 10, 2013.
 '55 **McKendree, John Deanne**; September 29, 2018.
 NY Δ '47 **Wallace, Emmett**; February 9, 2005.
 '50 **Guran, Elmer Joseph**; March 20, 2018.
 '52 **Thorne Jr., Henry Calder**; March 18, 2011.
 '59 **Metzner, Rudolph C.**; September 5, 2017.
 '79 **Skrobala, Thomas A.**; January 13, 2017.
 NY E '50 **Foreman, Kenneth M.**; February 2, 2017.
 '50 **Testa, Joseph Eugene**; June 19, 2000.

NY Z '53 **Rennick, Robert Frederick**; August 25, 2009.
 '50 **Frank, John Carlin**; April 6, 2014.
 '50 **Glass, Benjamin**; no details.
 '50 **Hoerrner, William**; no details.
 '50 **Ward, Robert Leonard**; November 7, 2003.
 NY H '44 **Robbins, Joseph Ezra**; August 5, 2015.
 '50 **Sklansky, Jack**; September 29, 2018.
 '62 **Aldrich, Herbert**; March 31, 2018.
 '62 **Avins, Jeremiah**; April 17, 2018.
 NY Θ '49 **Mueller, Eugene Theodore**; April 30, 2014.
 '50 **Lipe, John V.**; July 12, 2017.
 '54 **Glass, Harry Joseph**; April 24, 2003.
 NY I '41 **Nack, Herman**; October 25, 2010.
 '44 **Diamond, Joseph Morris**; June 6, 2015.
 '51 **Ryffel, Henry H.**; March 8, 2012.
 NY A '51 **Zizza, Michael**; November 19, 2011.
 NY N '50 **Wolcott, Edward Oliver**; March 12, 2002.
 '74 **Ludke, William Edward**; May 15, 2017.
 NC A '50 **Diehl, James Lineback**; no details.
 '50 **Leonard, Gerard Eugene**; October 8, 2015.
 '51 **Neely, Clyde Caldwell**; October 7, 2018.
 '53 **Skinner, Edgar Durant**; September 27, 2004.
 NC Γ '42 **Everett, Robert Rivers**; August 15, 2018.
 '50 **White Jr., Arthur Remington**; July 23, 2007.
 '61 **Buehler, Martin George**; May 16, 2018.
 ND A '52 **Heltemes, Robert Bruce**; April 18, 2018.
 '53 **Beattie, Arlo Claud**; April 24, 2012.
 '57 **Flynn, Kenneth DeWayne**; September 19, 2018.
 OH A '50 **Korsnak, Andrew**; November 2, 2009.
 '50 **Murdoch, Joseph Bert**; September 21, 2018.
 '50 **Stryffeler, Samuel James**; no details.
 '51 **Kearns, Warren Kenneth**; March 24, 2007.
 '66 **Wilhelm Jr., Robert Gordon**; August 20, 2018.
 OH B '55 **Glass, Donald Howard**; November 12, 2014.
 '85 **Drake, James LaVerne**; June 5, 2017.
 OH Γ '44 **Harris, Edward Fertel**; February 22, 2017.
 '47 **Snedaker Jr., Robert Hume**; September 15, 2015.
 '49 **Canter Jr., Walter Herman**; November 16, 2000.
 '49 **Miyake, Nobuo**; December 19, 2017.
 '49 **Stradley, Norman Henry**; October 5, 2018.
 '50 **Finneran, Thomas Joseph**; no details.
 '50 **Retzke, Franklin Albert**; September 1, 2003.
 '50 **Schorr, Donald George**; May 12, 2009.
 '59 **Cyrus, Jack Dean**; June 24, 2002.
 OH Δ '48 **Moss, Cruse Watson**; August 21, 2018.
 '50 **English, Forrest Smith**; February 17, 2015.
 OH E '43 **Jonke, Albert A.**; no details.
 '51 **Gedeon Jr., Louis**; October 14, 2015.
 OH Z '61 **Brandeberry, James E.**; September 10, 2018.
 OH H '73 **Schafrik, Robert Edward**; July 10, 2018.
 OK A '44 **Skinner Jr., Wickliffe**; no details.
 '48 **Dorris, Allen Dean**; May 13, 2002.
 '49 **Rennie, Preston George**; March 28, 2003.
 '50 **Adams, Kenneth Marvin**; March 31, 2004.
 '50 **Lynd Jr., Lloyd Albert**; June 7, 2006.
 '56 **Trombla, James Lee**; November 7, 2018.
 OR A '50 **Koester, David Carl**; February 6, 2006.
 '68 **Sigworth Jr., Harrison W.**; September 19, 2018.
 PA A '37 **Patterson, William Presbury**; March 9, 2018.
 '50 **Anderson, Frank Olaus**; December 12, 2006.
 '50 **Scriptunas, Vito Anthony**; November 24, 2009.
 PA B '50 **Bachman, Joel Zelder**; October 12, 2005.
 '50 **Stauffenberg, Malcolm Edgar**; July 16, 2011.
 '51 **Stinner, Samuel C.**; October 29, 2013.
 PA Δ '49 **Aaron, Marvin Robert**; June 16, 2007.
 '50 **Kaskey, Baylen**; February 21, 2003.
 '52 **Field, David Eugene**; January 26, 2015.
 PA E '48 **Blaauw, Gerrit Anne**; March 21, 2018.
 '50 **Krautter, Henry John**; August 22, 2005.
 PA Z '50 **Barry Jr., John Keaton**; July 17, 2001.
 '51 **Marshall III, Thomas**; May 24, 2006.
 '60 **Ricci, Anthony G.**; October 2, 2018.
 PA H '50 **Wright, Clyde Robert**; October 18, 2013.
 PA Θ '50 **O'Sullivan, Walter Ridgely**; no details.
 RI A '50 **Clark, Richard Youngstrom**; August 24, 2004.
 RI B '65 **Sullivan Jr., Edmund Joseph**; September 15, 2018.
 SC A '45 **Becker, Carl Lewis**; May 16, 2006.
 '50 **Haynes Jr., Grover C.**; November 25, 2016.
 SC B '48 **Summer Jr., Charles F.**; December 22, 2017.
 '49 **Millar Jr., Ralph Elliott**; no details.
 SC Γ '58 **Ahearn, Joseph August**; July 11, 2018.
 TN A '50 **Reid, Harold P.**; no details.
 '58 **Perry, Larry Thomas**; October 11, 2018.
 '67 **Moore, Oscar Eugene**; January 2, 2018.
 '83 **Bishop, Thomas Michael**; January 8, 2018.
 TN B '48 **Gibson, Walter Claude**; February 27, 2014.
 '50 **Postel, Charles William**; October 8, 2011.
 TX A '49 **McCarty, Frederick Briggs**; June 29, 2014.
 '50 **Bennett, Willard Burke**; May 15, 2016.
 '50 **McIlheran Jr., Thomas A.**; November 3, 2008.
 '50 **O'Brient Jr., Earl James**; September 18, 2014.
 '50 **Zabcik, Daniel David**; August 17, 2016.
 '51 **Von Rosenberg, Charles Ernest**; April 29, 2015.
 '55 **Roselius, Ronald Reginald**; October 10, 2007.
 '58 **McCullough, Charles Ellis**; September 16, 2018.
 '61 **Huff, Charles F.**; August 30, 2013.
 '62 **Eargle, John M.**; no details.
 TX B '49 **Crawford, Donald Kenneth**; July 2, 2016.
 '50 **Gettys, Homer Marshall**; February 4, 2015.
 '50 **Von Struve III, Henry C.**; March 24, 2012.
 TX Δ '49 **Hull, Richard Donald**; February 16, 2011.
 '50 **Brannan, Warren Guss**; July 4, 2005.
 '50 **Sims, William Henry**; July 24, 2002.
 '51 **Hooper Jr., Wallace**; April 15, 2012.
 '51 **Woolley, Carroll Ainsley**; May 7, 2002.
 TX E '76 **Gentry, Paul F.**; no details.
 TX Z '47 **Crum, Floyd Maxilas**; August 3, 2018.
 TX H '72 **Carruth, Carl**; February 1, 2015.
 TX I '49 **Coleman, Richard Reil**; September 7, 2000.
 '50 **Heizer, Kenneth W.**; April 30, 2005.
 UT A '48 **Gibson, Dale Campbell**; November 29, 2016.
 '50 **Kourbelas, Nick Steve**; May 28, 2016.
 VT B '52 **Crawford, David Coleman**; September 12, 2018.
 VA A '60 **Drewry, James Edwin**; October 6, 2018.
 VA B '47 **Fetter, Robert Barclay**; July 15, 2018.
 '47 **Tomlin Jr., Charles Howard**; August 2, 2018.
 '49 **Gregg Jr., Henry Townes**; February 20, 2009.
 '49 **Linkous, Clovis Emanuel**; January 13, 2008.
 '51 **Bonner, Marvin Malcolm**; February 16, 2003.
 '52 **Agee, Marvin Harless**; no details.
 '53 **Darnell, Walter Thomas**; November 3, 2018.
 '76 **Randolph, Joseph Peyton**; no details.
 WA A '44 **Glass, Ira Albert**; no details.
 '49 **Anderson, Marvin William**; no details.
 WAB '45 **Gregg, Vincent Paul**; January 29, 2010.
 '48 **Buehler, Walter Douglas**; May 13, 2018.
 '50 **Aldrich, Robert Adams**; March 10, 2009.
 '59 **McClelland, Robert Lloyd**; August 26, 2017.
 WV A '49 **Vaughan, Allen Hubert**; April 14, 2010.
 '49 **Wagner, John Lawrence**; March 23, 2009.
 '49 **Wiebe, Donald**; January 28, 2016.
 '50 **Holland, Donald Ray**; February 21, 2015.
 WI A '42 **Brann, John Newman**; June 10, 2016.
 '45 **Gekas, Socrates Charles**; January 17, 2018.
 '50 **Strohman, Robert Emerson**; no details.
 '50 **Wagner, James Bartel**; no details.
 '53 **Rennat, Harry Olaf**; August 11, 2012.
 '55 **Schumaker, Dale Howard**; November 2, 2018.



ALUMNI NOTES

30 Under 30

GreenBiz network announced its 30 Under 30 class for 2018 of inspiring young leaders demonstrating the world-changing promise of sustainability in their everyday work. It included two Tau Bates:

Devan L. Tracy, *New York Tau*, '13, is a senior energy engineer at Lockheed Martin in Washington, DC. She works on energy efficiency and renewable energy projects across Lockheed Martin's 500 manufacturing and other facilities worldwide. Devan's role involves assessing the cost and benefit of a project, developing the scope of work, and choosing vendors.

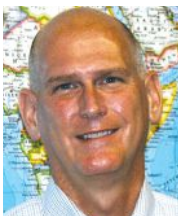


Rachana Vidhi, Ph.D., *Florida Gamma*, '14, grew up in India's Bihar State with six hours of electricity each day, plus battery and kerosene lamps. Now, she is a senior engineer with NextEra Energy in Juno Beach, FL, working to integrate batteries into solar power plants. Rachana designed inverters to capture more DC power directly from solar panels, reducing the energy losses that happen with conventional solar-plus-battery design.



Arizona Alpha

Kris J. (K.J.) Nygaard, Ph.D., '85, has been appointed to the TexNet Technical Advisory Committee by Texas Governor Greg Abbott. The committee advises the Bureau of Economic Geology on the use of the funding, including



the TexNet Seismic Monitoring Program and collaborative research relationships between universities in Texas. Nygaard is senior stimulation consultant for the ExxonMobil Upstream Research Company.

California Epsilon

Carissa N. Eisler, Ph.D., '10, has been chosen to be an assistant professor of chemical and biomolecular engineering at the UCLA school of engineering. She is currently a postdoctoral fellow at UC Berkeley and Lawrence Berkeley National Laboratory and will start at UCLA next July.



California Tau

Arwa S. Aweiss, '03, is flight test director for NASA's unmanned aircraft system traffic management project at Ames Research Center in Mountain View, CA. She oversees flight testing that involves the FAA, industry, and academia to find ways for millions of drones to some day fly in U.S. airspace, even over populated areas and out of view of their operators. Prior to that, she worked for Bechtel designing the international airport in Qatar.



Charlotte D. Papp, '15, has joined the Peace Corps and traveled to Guinea for training as an agroforestry volunteer. She had worked as a biologist at Lake Arrowhead and in various positions at Arrowbear Music Camp. During



the first three months of her service, Papp will live with a host family in Guinea to become immersed in the language and culture. She will then be assigned to a community, where she will live and work for two years.

DC Gamma

Jon A. Schmidt, P.E., '92, is serving a one-year term as president of the National Council of Structural Engineers Associations (NCSEA). He has been on the organization's Board of Directors since 2015, having spent the previous ten years chairing the editorial board for its magazine. Schmidt is a senior associate structural engineer in the aviation and federal group at Burns & McDonnell in Kansas City, MO.



Indiana Alpha

Anne E. McLaren, Ph.D., '01, has received the Spark Award, presented by the Society of Women Engineers to those who excel at mentoring the women around them. McLaren, a technical advisor and reliability engineer for engine builders Cummins, Inc., has been involved with Big Brothers Big Sisters for over a decade.



Indiana Epsilon

David R. Finley, Ph.D., P.E., '94, has become president of North Central Michigan College. Previously, he spent more than two years as the provost and vice president for academic affairs (interim) at Lake



Superior State University where he also served as dean of the college of business and engineering from 2012-18. Earlier, Finley was vice president of academic affairs at Trine University. He began his career as an environmental consultant.

Massachusetts Delta

Blair A. Silver, J.D., '05, has joined Banner & Witcoff, Ltd. as an Of



Counsel attorney in their Washington, DC, office. According to the announcement, he brings more than a decade of legal experience in complex, high-tech

intellectual property disputes and related appellate matters, having practiced before the Supreme Court. Previously, Silver practiced IP and appellate litigation at Gibson, Dunn & Crutcher LLP. He earned his J.D., cum laude, from Georgetown University Law Center in 2008.

New York Alpha

Ravi A. Netravali, Ph.D., '12, has been chosen to be an assistant professor of computer science at the UCLA school of engineering. His honors include the Internet Research Task Force's Applied Networking Research Prize and a Qualcomm Innovation Fellowship. He joins UCLA in January.



New York Gamma

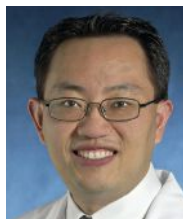
Courtney M. Dumont, Ph.D., '09, has been appointed an assistant



professor in the department of biomedical engineering at the University of Miami college of engineering. Her research interests include therapies

for nervous system repair, biomaterial development, and vascular engineering.

Ming De Lin, Ph.D., '01, has become clinical research director of North



America for Visage Imaging at Yale-New Haven Hospital in Connecticut. He is directing research in the academic-industry partnership context to

leverage AI and machine learning in the enterprise diagnostic imaging space. Lin, who is an Advisor to Connecticut Alpha, is also the chief engineer and operations manager of Yale Radiology Research Lab.

New York Iota

Gabriel H. Loh, Ph.D., '98, is the 2018 recipient of the ACM



SIGARCH Maurice Wilkes Award based on his outstanding contributions to the advancement of die-stacked computer architectures. Loh is a

fellow design engineer at Advanced Micro Devices (AMD). He has been a key technical leader on multiple research proposals for the U.S. Department of Energy and has generated more than 60 U.S. patents.

Oklahoma Alpha

Andrew C. Taylor, P.E., '81, has become senior manager for license



renewal services in the nuclear power technologies group at Sargent & Lundy LLC in Chattanooga, TN. Taylor directs preparation of nuclear

power plant license renewal applications. He also serves as a member of external review committees for the U.S. Department of Energy Light Water Reactor Sustainability Program and as a visiting ethics lecturer at engineering colleges. Taylor recently completed a 30-year career with Entergy Nuclear. He lives with his wife in Signal Mountain, TN.

Oklahoma Gamma

Cara A. Cowan Watts, Ph.D., '97, has received a special service award



from the American Indian Science and Engineering Society (AISES). The award, in recognition of her commitment, service, and dedication to AISES,

was presented at the 2018 national conference in Oklahoma City. She is CEO and principal owner of Tulsa Pier Drilling near Claremore, OK.

Tennessee Alpha

Mark K. Cox, P.E., '89, has been elected a member of the National



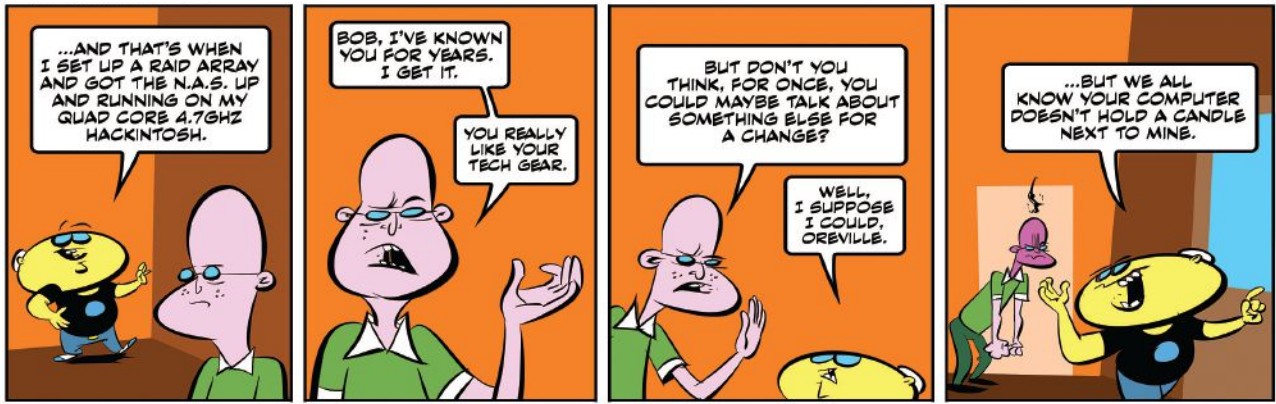
Academy of Construction. He is senior vice president, chief manufacturing, supply chain, and engineering officer for Eastman Chemical in Kingsport, TN.

The NAC cited him as a leader in process safety management and for continuous improvement in capital efficiency. Cox holds U.S. and international patents in process technology developed during his 32 years with Eastman.

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!

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- **Local Hospitality**—access to a worldwide inventory of hotels at exclusively discounted rates.
- **TBP4Life**—a private community mobile app and web platform for mentoring & networking opportunities [tbp.vineup.com/].
- **SIRVA Home Benefits**—discounts on real estate, mortgages, and moving services.
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The office will be closed in observance of the following holidays:

- | | | | |
|-------------------|--------------------|-----------------------------|------------------|
| • New Year's Day | • Memorial Day | • Thanksgiving | • Christmas |
| • President's Day | • Independence Day | • Friday after Thanksgiving | • New Year's Eve |
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