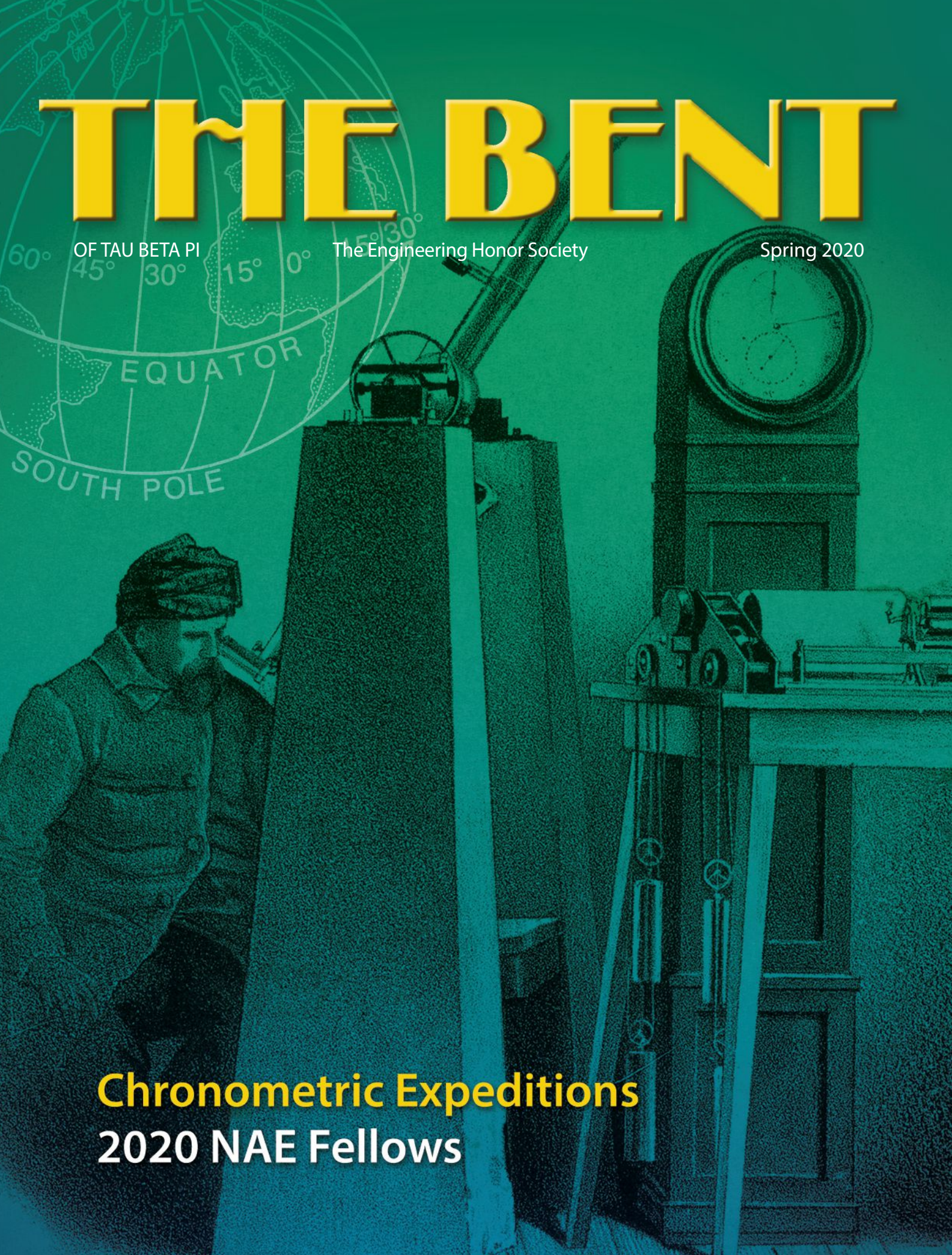


# THE BENT

OF TAU BETA PI

The Engineering Honor Society

Spring 2020



**Chronometric Expeditions**  
**2020 NAE Fellows**

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 A	13	Embry-Riddle Aero. Univ., Prescott
AR A	9	Univ. of Arkansas
AR B	9	Univ. of Arkansas at Little Rock
CA A	15	Univ. of California, Berkeley
CA B	16	California Inst. of Technology
CA G	15	Stanford Univ.
CA A	16	Univ. of Southern California
CA E	16	Univ. of California, Los Angeles
CA Z	15	Santa Clara Univ.
CA H	15	San Jose State Univ.
CA O	16	California State Univ., Long Beach
CA I	16	California State Univ., Los Angeles
CA K	16	California State Univ., Northridge
CA A	15	Univ. of California, Davis
CA M	15	Calif. Poly. St. Univ., San Luis Obispo
CA N	16	California State Poly. Univ., Pomona
CA E	16	San Diego State Univ.
CA O	16	Loyola Marymount Univ.
CA II	16	Northrop Univ. (inactive)
CA P	15	California State Univ., Fresno
CA S	16	Univ. of California, Santa Barbara
CA T	16	Univ. of California, Irvine
CA Y	15	California State Univ., Sacramento
CA F	15	Univ. of the Pacific
CA X	16	California State Univ., Fullerton
CA W	16	Univ. of California, San Diego
CA Q	16	Harvey Mudd College
CA AA	15	California State Univ., Chico
CA AB	16	Univ. of California, Riverside
CA AT	15	San Francisco State Univ.
CA AA	15	Univ. of California, Santa Cruz
CA AE	16	Univ. of San Diego
CO A	12	Colorado School of Mines
CO B	12	Univ. of Colorado at Boulder
CO G	12	Univ. of Denver
CO A	12	Colorado State Univ.
CO E	12	Univ. of Colorado at Denver
CO Z	12	United States Air Force Academy
CT A	1	Yale Univ.
CT B	1	Univ. of Connecticut
CT 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 O	5	Florida International Univ.
FL I	5	Embry-Riddle Aeronautical Univ.
GA A	5	Georgia Inst. of Technology
GA B	5	Mercer Univ.
IA A	14	Univ. of Idaho
ID B	12	Idaho State Univ.
ID G	12	Boise State Univ.
ID 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 O	1	Univ. of Massachusetts Lowell
MA I	1	Western New England Univ.
MI A	7	Michigan State Univ.
MI B	11	Michigan Tech. Univ.
MI G	7	Univ. of Michigan
MI A	7	Univ. of Detroit Mercy
MI E	7	Wayne State Univ.
MI Z	7	Kettering Univ.
MI H	7	Lawrence Technological Univ.
MI O	7	Oakland Univ.
MI I	7	Univ. of Michigan-Dearborn
MI K	7	Western Michigan Univ.
MI A	7	Grand Valley State Univ.

Chap.	Dist.	Institution
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 A	9	Univ. of Missouri-Kansas City
MO E	9	Saint Louis University
MT A	12	Montana State Univ.
MT B	12	Montana Tech of the Univ. of Montana
NE A	9	Univ. of Nebraska-Lincoln
NV A	15	Univ. of Nevada, Reno
NV B	16	Univ. of Nevada, Las Vegas
NH A	1	Univ. of New Hampshire
NH B	1	Dartmouth College
NJ A	2	Stevens Inst. of Technology
NJ B	2	Rutgers Univ.
NJ G	2	New Jersey Inst. of Technology
NJ A	2	Princeton Univ.
NJ E	2	Rowan Univ.
NJ Z	2	The College of New Jersey
NM A	13	New Mexico State Univ.
NM B	13	Univ. of New Mexico
NM G	13	New Mexico Inst. of Mining & Tech.
NY A	2	Columbia Univ.
NY B	2	Syracuse Univ.
NY G	2	Rensselaer Polytechnic Inst.
NY A	2	Cornell Univ.
NY E	2	New York Univ. (inactive)
NY Z	2	Polytechnic Inst. of Brooklyn (inactive)
NY H	2	City College of CUNY
NY O	2	Clarkson Univ.
NY I	2	Cooper Union School of Engineering
NY K	2	Univ. of Rochester
NY A	2	Pratt Inst. (inactive)
NY M	2	Union College
NY N	2	SUNY at Buffalo
NY E	2	Manhattan College
NY O	2	SUNY at Stony Brook
NY P	2	Rochester Inst. of Technology
NY B	2	Polytechnic Institute of New York Univ.
NY S	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 A	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 A	7	Ohio Univ.
OH E	7	Cleveland State Univ.
OH Z	7	Univ. of Toledo
OH H	7	Air Force Inst. of Technology
OH O	7	Univ. of Dayton
OH I	7	Ohio Northern Univ.
OH K	7	Univ. of Akron
OH A	7	Youngstown State Univ.
OH M	7	Wright State Univ.
OH N	7	Cedarville Univ.
OH E	7	Miami Univ.
OK A	9	Univ. of Oklahoma
OK B	9	Univ. of Tulsa
OK G	9	Oklahoma State Univ.
OR A	14	Oregon State Univ.
OR B	14	Portland State Univ.
OR A	14	Univ. of Portland
OR G	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 O	3	Villanova Univ.
PA I	3	Widener Univ.
PA K	3	Swarthmore College
PA M	3	Univ. of Pittsburgh
PA P	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 O	13	Univ. of Texas at El Paso
TX I	10	Southern Methodist Univ.
TX K	10	Prairie View A & M Univ.
TX A	10	Texas A & M Univ.-Kingsville
TX M	10	Univ. of Texas at San Antonio
TX N	10	Univ. of Texas Rio Grande Valley
TX X	10	Univ. of Texas at Dallas
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

Chap.	Dist.	Institution
VA B	4	Virginia Polytechnic Inst. & State Univ.
VA G	4	Old Dominion Univ.
VA A	4	Virginia Military Inst.
VA E	4	Virginia Commonwealth Univ.
WA A	14	Univ. of Washington
WA B	14	Washington State Univ.
WA G	14	Seattle Univ.
WA A	14	Gonzaga Univ.
WV A	4	West Virginia Univ.
WV B	4	West Virginia Univ. Inst. of Technology
WI A	8	Univ. of Wisconsin-Madison
WI B	8	Marquette Univ.
WI 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



Alumni Chapters (78)

- District 1**
  - 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

• denotes active chapter

# The Bent<sup>of</sup>



Spring 2020  
Vol. CXI / No. 2

**Tau Beta Pi**  
The Engineering Honor Society

## Feature

### 8 Time Traveling: Forgotten Great Chronometric Expeditions to Map the Earth by Trudy E. Bell



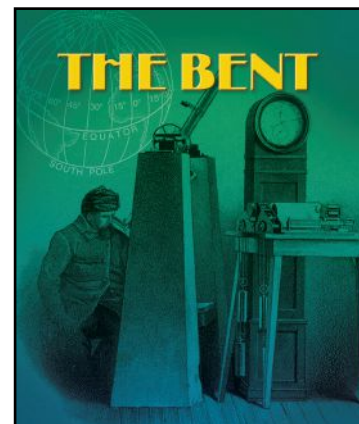
Bond Chronometer. Credit: Division of Work and Industry, NMAH, Smithsonian Institution.

## Reports

Chapter Endowment Update  
16  
Contributors to the 2019-20  
Alumni Giving Program  
20

## Departments

Council's Corner .....	2	In the Colleges.....	34
Letters .....	4	Families .....	36
Who's Who.....	6	Association Briefs.....	40
NAE Fellows .....	7	Chapter Eternal.....	42
Caption Contest.....	19	Council Minutes.....	45
Brain Ticklers .....	30	Alumni Notes .....	46



ON THE COVER:  
An Astronomical clock (standing) and Bond spring governor chronograph (on table). The astronomer sits at the eyepiece of a small astronomical transit telescope.  
Credit: Public Domain/The New York Public Library  
Cover artist: Dali Polivka

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*Tau Beta Pi was founded 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; co-founder Association of College Honor Societies; and 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 Eng'g., The University of Tennessee, Knoxville, Tennessee 37996-2215. 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](mailto:tbp@tbp.org) or to: The Bent of Tau Beta Pi / P.O. Box 2697 / Knoxville, TN 37901-2697.

Vol. 111 No. 2 Circulation: 83,900

Initiated Members: 606,417



The Tau Beta Pi  
Association

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# Making Plans and New Ideas for 2020

Another year is in the books and now we are back for a strong 2020. There are certain things that I have learned over time that seemingly never change:

1. There is always a last minute rush to get work done at the end of the year and,
2. The inevitable rush of everyone trying to make a huge impact in January of every new year.

It is in the second observation that I have learned to step back and try to make a plan to not burn out! Let's take Tau Beta Pi as an example. Every year, advisors, alumni, and students arrive at Convention excited to meet Tau Bates and do great things. Then, those members take their experiences back to school, places of employment, and even home-life, and are energized and ready to make a difference.

Unfortunately, as in most cases, they find themselves to be an island of two or less. It is very difficult to maintain a breakneck pace and make long-lasting impacts. That is not to say stop leaving Convention with great ideas and energy, but what I would advise (as I do when I notice this type of behavior at work) is to take a step back and understand what it is we are trying to accomplish. With careful planning, establishing a core team of supporters, and encouraging our members, we can make progress in areas that we want to improve.

The TBP Executive Council (EC) has undergone many transformations over the last few years. Transitioning from the Slate model, in which the same "slate" of five members serve a four year term, to our current model, as a rolling board of nine members serving staggered three year terms, the EC now undergoes an annual shift of members. Interestingly enough, the energy and excitement that new board members bring is refreshing—as throughout my tenure I have seen many great ideas and improvements brought in by new members.

Does everyone agree on a direction and initiatives? Absolutely not! However, we are always able to sit down, take a break, and revisit everyone's priorities and ideas. I would encourage our membership to take that into consideration as there is always an influx of new members bringing in new perspectives on how to make our organization grow!

At the start of every year, it is a good practice to review your strategic plan. It is easy to get caught up being "busy" yet never actually get anything accomplished. You can have a strategic plan for pretty much anything: what you want to accomplish with work, family, school, etc... but, unless you review it with some sort of frequency, you will not have a road map of where you want to go.

This Society has focused on continuous growth through alumni outreach, relevancy by increasing professional development activities, efficiencies by enabling best practices to help manage workflow through TBP Headquarters (HQ), as well as continued financial growth to provide more programming and fellowship/scholarship opportunities.

Now the question is, "How do we get there?" I can tell you this, **we will get there as one organization with different parts.** Every member brings something different but valuable to this Association and the EC believes that as Tau Beta Pi continues to grow in size and scope, we need more volunteers across the spectrum of our membership. If you have considered volunteering, but don't know how to get involved, please contact TBP HQ ([tbp@tbp.org](mailto:tbp@tbp.org)). We have a variety of working groups, alumni chapters, and student chapters that would benefit from your involvement ([www.tbp.org/Memb/Alumni.cfm](http://www.tbp.org/Memb/Alumni.cfm)).

If time is something you cannot commit to at the moment, there are other ways to get involved! For example, a donation to TBP's Alumni Giving Program is an excellent way to allow flexibility in addressing areas of concern or programs that are underfunded ([www.tbp.org/give/Opportunities.pdf](http://www.tbp.org/give/Opportunities.pdf)).

I look forward to serving as your Vice President of the TBP Executive Council and meeting you at Convention 2020 in Atlanta, Georgia.

**George J. Morales, Ph.D., Florida Epsilon '06**

TBP Vice President  
Packaging R&D Engineer  
Intel Corporation



The 2020 TBP Executive Council together in Albuquerque, New Mexico, for their January meeting. Morales is back row, second right.



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## Join the Executive Council; Candidates Sought

The 2020 TBPI Convention will elect three members to serve the 2021-23 term. They will join the six continuing members elected in 2018 and 2019.

TBPI's current Constitution and Bylaws, particularly Const. Article X, Secs. 1- 5, delineate the nominating and electing procedures and the Council's responsibilities. More information and a position description is available at [www.tbp.org/other/ECJobDescription.pdf](http://www.tbp.org/other/ECJobDescription.pdf)

Members interested in serving on the Executive Council must be nominated by a chapter—either collegiate or alumni—by April 1. The Executive Director can work with candidates needing a formal nomination.

The Executive Council is looking for members with experience in a variety of functions—management, finance, teaching, business, research, etc.

Those with knowledge in the areas of image enhancement, branding, fundraising/development, alumni relations, and advising collegiate chapters are strongly encouraged to consider running.

Executive Councillors should be able to attend three to four in-person meetings each year, plus teleconferences or committee meetings each month. They should plan to attend the annual Convention, usually requiring five days including travel.

Candidates should make arrangements to attend this year's Convention in Atlanta, GA, on October 22-24 where delegates will elect the new Council members.

Councillors are asked to also make several trips per year for new chapter inspections, installations, and District Conferences. They typically attend two District Conferences each year.

Individuals interested in serving on the Executive Council can receive more information from, and chapters can submit nominations to, the Executive Director via email to [tbp@tbp.org](mailto:tbp@tbp.org).

**"THE BEST PEOPLE"  
ENGINEERING  
JOB BOARD**

Through a partnership with Your-Membership, Tau Beta Pi offers a job board for students and alumni. Members can post resumes, browse more than 4,200 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](http://www.tbp.org/memb/jobBoard.cfm)

The Bent welcomes letters from readers regarding recent articles or relevant matters of interest. Letters should be sent to [dylan@tbp.org](mailto:dylan@tbp.org) or Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697. Please include your full name, TBP chapter, and class year. Unfortunately, we cannot acknowledge or respond to all letters that are submitted. Letters may be edited for length and clarity. Thank you!

### Interesting Winter 2020 Features

Having retired 9 years ago from my position at New Jersey Institute of Technology, I am not often in touch with folks at Tau Beta Pi, but thought I would drop this New Year's note of congratulations on an excellent issue with great interest to me.

Just to help you locate me in time and place, my academic degrees are City College of New York, BSME '65, MME '70, and City University of New York, Ph.D. '73. Although my initial chapter affiliation is NY Eta, I have had connections via various academic positions and advisory roles to TBP chapters at Manhattan College, Stevens Institute of Technology, and NJIT.

The Council's Corner article, "Decisions, Decisions..." certainly rang true for me in terms of having chosen graduate school (for my master's and the end of my Ph.D. work) as a part-time supplement to full-time professional work in industry. This may not be the traditional path for those, like me, who wound up full-time in academic administration. I especially appreciated Craig Smith's lines: "I have gotten exactly one job by applying for it, and that was the first one out of college. Every subsequent job came from networking." While this is not exactly true for me (but very close to it) – because formal applications were required for the positions I attained – but the networking part was a major feature of the successful application.

The article "A New Look at Molten Salt Reactors" was, despite my departure from technical work some time ago, very interesting since much of my professional work and some of my academic activity was involved with advanced concepts for nuclear power such as liquid metal cooled breeder reactors. This fits well with the heading of the "From the Editors" article: "Everything Old is New Again."

And a very good move to go back to the completed logo of the Bent with all outlines present. Many if not most engineers – I may be stereotypical in that regard – like to see things complete and the previous blue logo always looked incomplete with that slanted and "let the imagination fill in the missing lines" design.

Finally, a shout-out and applause for my old (oops, should say long-time) colleague and friend, Lyle D. Feisel, for his excellent article on "Why do we call it a...Joule?"

Best to all at Tau Beta Pi for the New Year!

*Ronald S. Kane, Ph.D., P.E., NY H '65*

### Molten Salt Reactor Leadership

The article *A New Look At Molten Salt Reactors* provided a wonderful condensed history of our nation's efforts to establish the technical feasibility of molten salt reactors (MSRs). This is a sad story of squandered technological leadership. When our government terminated its MSR Program in the mid-1970s, the U.S. was the world's leader in the development of MSRs. The taxpayer funded intellectual property (IP) resulting from that program was placed in the public domain.

Unfortunately, the U.S. abandoned its leadership role in developing this promising reactor technology. The website of Thorium Energy World ([www.thoriumenergyworld.com](http://www.thoriumenergyworld.com)) describes the "World's First Thorium Molten Salt Experiment in over 45 Years" in Petten, Netherlands, funded by the European Commission Laboratory Joint Research Center.

The December 6, 2017, issue of Next Big Future ([www.nextbigfuture.com](http://www.nextbigfuture.com)) reported that China will spend \$3.3 billion to build two MSR prototype reactors in the Gobi desert. These MSRs are intended for naval vessel propulsion and military drones.

In an August 2018 press release, Thorium Energy World reported that "China has built the world's first industrial scale high temperature experimental salt loop as well as the world's largest passive natural circulation loop for molten salts."

The consequences of our nation relinquishing its leadership in MSR development is described in a January 10, 2019, article from the *South China Morning Post* stating that "Oak Ridge has posted most of the technical documents the Chinese team needed to develop the technology online for free." Every dollar that we saved the Chinese government in developing its MSR technology can be deployed to other venues of economic and military competition. This article further quotes Xu Hongjie, Director of China's MSR program, as explaining that China has "now mastered the technology to produce key devices for such reactors, owning 202 patents." Perhaps our DOE policy makers could learn something from the Chinese about protecting IP and national security.

*Richard T. Redano, NC A '78*

### Environmental Impact of MSRs

The introductory box to the article states that Molten Salt Reactors are clean and produce little waste. I wish the author had discussed the full life cycle of these reactors.

Having been an original employee of the U.S. EPA, I am sensitive to environmental impacts. Most of us are somewhat familiar with the standard, fuel rod approach to nuclear reactors. There is some energy cost to getting the fuel and a cost to building the reactor, but certainly there is a net energy gain. However, the disposal of the wastes has been problematic. The engineering solution has not been accepted by the political process.

(Continued on page 5)

## LETTERS continued

### Environmental Impact of MSRs

(Letter continued from page 4)

I would have liked to see if the process of getting the molten fuel is similar to or different from the conventional process. But most of all, one needs to understand the nature of the waste from the molten salt reactor and how it will be safely accommodated in the environment.

Whenever I discuss nuclear energy with my wife, the statement “I shot an arrow into the air, it fell to the ground I know not where,” comes up. This certainly is applicable to nuclear energy. As much as it appears to be a necessary component to our energy mix, addressing climate change, there must be a solution to the end results.

It would appear to be bad engineering, if the life cycle of Molten Salt Reactors cannot be formulated before their construction is begun.

*Harlan D. Hirt, WI A '61*

## Winter 2020 Corrections

The editorial staff apologizes for the following errors:

### In The Colleges

On page 28, Daniel Berg was identified as past provost and president at Rensselaer Polytechnic University. The correct name of the institution is Rensselaer Polytechnic Institute.

### 2020 Executive Council

In the article “Newly Elected Executive Council Members” on page 14, two Executive Council members were omitted:

- **Rachel K. Alexander**, *California Upsilon '15*  
Elected in 2019 and serving as Secretary for 2020.
- **Russell W. Pierce**, *Washington Alpha '70*  
Elected in 2019 and serving as a Councillor for 2020.

**Executive Council Meeting Minutes on page 45**

## SOCIAL MEDIA

On Instagram:



[instagram.com/tau\\_beta\\_pi/](https://www.instagram.com/tau_beta_pi/)

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WordPress Blog:



[taubetapiathq.wordpress.com/](https://taubetapiathq.wordpress.com/)

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**Executive Director Curtis D. Gomulinski**, MI E '01  
Knoxville, TN (TBP HQ) [curt@tbp.org](mailto:curt@tbp.org)



**Keith A. Corzine, Ph.D., *Missouri Beta '97***, has been elected a fellow of the Institute of Electrical and Electronics Engineers (IEEE) “for contributions to topology and control of multilevel converters.” He is a professor of engineering at UC Santa Cruz, earned his degrees from the University of Missouri-Rolla (now S&T), and holds four U.S. patents related to power electronics.



**C. Daniel Mote Jr., Ph.D., *California Alpha '59***, was awarded the 2020 Benjamin Franklin Medal for “his outstanding contributions, through application of theory, analysis, and inventive experimentation, to the understanding of the dynamics of practical systems such as saws, skis, and conveyor belts, thereby increasing their safety, efficiency, and economy.” He is President Emeritus of the National Academy of Engineering.



**Arlene A. Garrison, Ph.D., *Tennessee Alpha '88***, has been named a fellow of the American Association for the Advancement of Science. She is vice president for university partnerships at Oak Ridge Associated Universities. Garrison previously served as a program director for the National Science Foundation where she led programs to strengthen research and education in science and engineering across the United States.



**Virginia “Ginny” S. Thrasher, *West Virginia Alpha '19***, Summer Olympic Games (2016) gold medalist in women’s air rifle, was selected as a NCAA 2020 Today’s Top 10 Award winner for former student-athletes and their success in athletics, in the classroom, and in the community. A recent biomedical engineering graduate, she speaks nationally at events and hopes to compete in the 2020 Olympic Games.

In November, the Rhodes Trust announced the names of 32 Americans chosen as Rhodes Scholars. Four of the recipients are Tau Bates and pictured below with short bios (left to right; top to bottom).



**Vilhelm “Billy” L. Andersen Woltz, *Massachusetts Beta '20***, studies physics and electrical engineering & computer science at MIT. He will study philosophy, economics, and politics at Oxford University. Billy is also the captain of the MIT varsity track & field and cross-country teams.

**Kritika Singh, *Massachusetts Epsilon '20***, is a bio-engineering and chemistry student at Northeastern University. Her focus is on global health issues, including starting the nonprofit Malaria Free World. She will complete a doctorate in biomedical sciences at Oxford University.



**Francisca Vasconcelos, *Massachusetts Beta '20***, is double-majoring in electrical engineering & computer science and physics at MIT. She plans to earn master’s degrees in mathematics & foundation of computer science and statistical science at Oxford University.

**Megan Yamoah, *Massachusetts Beta '20***, will pursue a master’s in economics to acquire knowledge in development economics and study how innovation can positively impact emerging economies. She majors in physics and electrical engineering at MIT.

*The three MIT images are credited to MIT and Ian MacLellan.*

# National Academy of Engineering

The National Academy of Engineering has elected 87 new members and 18 foreign associates, announced NAE President John L. Anderson, Ph.D., *DE A '67*, in early February. Election to the academy is among the highest professional distinctions accorded to an engineer. It honors those who have made outstanding contributions to “engineering research, practice, or education” and to “pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing innovative approaches to engineering education.” The 22 new Tau Beta Pi/NAE members are listed below.

**Lilia A. Abron**, Ph.D., P.E., *DC A '68*, CEO, president, and founder, PEER Consultants, P.C., (DC). For leadership in providing technology-driven sustainable housing and environmental engineering solutions in the U.S. and South Africa.

**Robert O. Ambrose**, Ph.D., *TX A '90*, division chief, software, robotics, and simulation division, NASA Johnson Space Center, (TX). For advances in dexterous space robotics, and for leadership in human-robotic teaming in space operations.

**Joel S. Emer**, Ph.D., *IN A '74*, senior distinguished research scientist, NVIDIA, (MA). For quantitative analysis of computer architecture and its application to architectural innovation in commercial microprocessors.

**John C.C. Fan**, Ph.D., *CA A '66*, president, CEO, and chairman of the board, Kopin Corp., (MA). For innovation and entrepreneurship in electronic materials and devices for displays.

**Kenneth E. Goodson**, Ph.D., *MA B '89*, professor and senior associate dean, department of mechanical engineering, Stanford University. For developments in microprocessor thermal management and nanoscale heat conduction.

**Ronald Klemencic**, P.E., S.E., *IN A '85*, chairman and CEO, Magnusson Klemencic Associates, (WA). For innovation in the design of high-rise buildings worldwide, and for research and design guidelines to advance structural engineering practices.

**Paul E. Krajewski**, Ph.D., *MI I '89*, director, global research and development, General Motors Co., (MI). For development and implementation of lightweight automotive materials.

**Thomas R. Kurfess**, Ph.D., P.E., *MA B '86*, chief manufacturing officer, Oak Ridge National Laboratory, (TN). For development and implementation of innovative digital manufacturing technologies and system architectures.

**Susan G. Margulies**, Ph.D., *NJ A '82*, professor, biomedical engineering, Georgia Tech and Emory University. For elaborating the traumatic injury thresholds of brain and lung in terms of structure-function mechanisms.

**Muriel Médard**, Sc.D., *MA B '89*, professor, electrical engineering and computer science, Massachusetts Institute of Technology. For contributions to the theory and practice of network coding.

**James A. Momoh**, Ph.D., *DC A '75*, chairman and CEO, Nigerian Electricity Regulatory Commission. For the development of electric grid optimization techniques and implementation of advanced technology and policy for emerging electric grids in Africa.

**Jayathi Y. Murthy**, Ph.D., *CA E '79*, dean and distinguished professor, School of Engineering and Applied Science, University of California, Los Angeles. For the development of unstructured solution-adaptive finite volume methods for heat, mass, and momentum transport.

**Sara E. Ortwein**, Ph.D., *TX A '80*, former president, XTO Energy Inc., (TX). For engineering leadership in the upstream sector of the oil and gas industry.

**Per F. Peterson**, Ph.D., *NV A '82*, chair in engineering, nuclear engineering, University of California, Berkeley. For experimental and analytical research contributions for the design and development of passive safety systems for advanced nuclear reactors.

**Essam Abdel Aziz Sharaf**, Ph.D., *IN A '83*, (**International Member**) professor, department of public works, Cairo University, Egypt. For leadership to modernize transportation systems in Egypt and the Middle East through scholarship, advocacy, and public policy.

**Anne K. Roby**, Ph.D., *PA O '86*, executive VP, Linde PLC, Ridgefield, (CT). For developments in oxidation processes, and for leadership in technological developments, safety, and business growth in global industrial gas companies.

**Gwynne E. Shotwell**, Ph.D., *IL I '86*, president and COO, SpaceX, (CA). For bringing affordable, commercially competitive space transportation to NASA and the U.S. National Security Space Launch.

**Russell H. Taylor**, Ph.D., *MD A '70*, professor, department of computer science, Johns Hopkins University, (MD). For contributions to the development of medical robotics and computer-integrated systems.

**Leung Tsang**, Ph.D., *MA B '71*, professor, electrical engineering and computer science, University of Michigan. For contributions in wave scattering and microwave remote sensing theories for satellite missions.

**Richard A. Vaia**, Ph.D., *NY A '91*, senior scientist, emergent materials systems, Air Force Research Laboratory, (OH). For aerospace applications of polymeric nanomaterials, and for technical leadership in materials for national defense applications.

**Charles W. Wampler II**, Ph.D., *MA B '79*, senior technical fellow, chemical and materials systems laboratory, General Motors Global R&D, (MI). For leadership in robotic systems in manufacturing, mathematical methods for robot motion and machine design, and traction battery modeling.

**Dick K.P. Yue**, Sc.D., *MA B '74*, professor, mechanical and ocean engineering, Massachusetts Institute of Technology. For contributions to ocean engineering and innovation of OpenCourseWare to make higher education freely available worldwide.

# Time Traveling: Forgotten Great Chronometric Expeditions to Map Earth

By: **Trudy E. Bell** ©2020 Trudy E. Bell

Before the telegraph, astronomers worldwide discovered that accurate marine chronometers could be used to map differences in longitudes on land.

The Royal Observatory operation between Greenwich, England, and Valentia, Ireland, in late June 1844 was as elaborate and as precise as a gold heist:

A great number of strong boxes were constructed, all exactly similar, and of such dimensions that the large flat cases could be thrust easily into any one of them (one flat case upon the other), and could there be held firmly... The strong boxes were all furnished with similar locks, which could all be opened by the same key. One of these strong boxes was attached by powerful screws to every one of the railway-carriages, steam-boats, and mail-coaches... At each of the stations where the course of any railway-carriage, steam-boat, mail-coach, or car, began or ended, an agent was stationed, who was furnished with a key which would open any of the locks. ...At the beginning of each section of the line an agent conveyed the flat cases to the carriage or steam-boat, placed them in the strong box, and locked it...at the end of that section another agent unlocked the strong box and took the flat cases out of it.<sup>1</sup>

The two flat cases rode by rail from Greenwich to Liverpool, where they were transferred to a strong box in a mail steamboat to Kingstown. They traveled by rail from Kingstown to Dublin, then atop horse-drawn mail coaches through Limerick and Tralee more than 200 miles across Ireland to Cahersiveen. The cases then were laid in the bottom of a Coast Guard boat, which ferried them across a narrow sound to the island of Valentia (also spelled Valencia), westernmost point of all Europe.

By then, it was midnight. But the hardest work of the mission still lay ahead: more than three miles of trekking on foot in darkness, climbing 900 feet over slippery grass and rugged rock—the large strong box “carried by two men, by means of two poles fixed in staples, in the manner of a sedan-chair.” Their destination: the remote summit of Feagh Main, the highest point on Valentia, atop which had been built a “paneled hut covered with canvas.”<sup>1</sup>

That humble hut was a temporary astronomical observatory, housing a transit telescope swung between two stone piers, plus several observatory clocks. No rest for the weary: right away, after the arduous journey of 620 miles, the strong box was unlocked. The two flat cases were slid out of it and opened, revealing their treasure: nestled in individual padded compartments lay 30 gleaming pocket chronometers.

## Linking Time with Longitude

Dava Sobel’s 1995 bestselling book *Longitude* described how beginning in 1714 the British Board of Longitude offered princely awards for any device or technique that could reliably ascertain longitude at sea. Prizes ranged up to £20,000—equivalent to about £2.5 million today—for nailing longitude to within half a degree (i.e., to within about 27 miles at 40 degrees latitude). Over decades, John Harrison submitted five different prototypes he built of chronometers—the most accurate clocks built up to then; by the 1770s, he ultimately received a series of payments approximately equal to the prize.

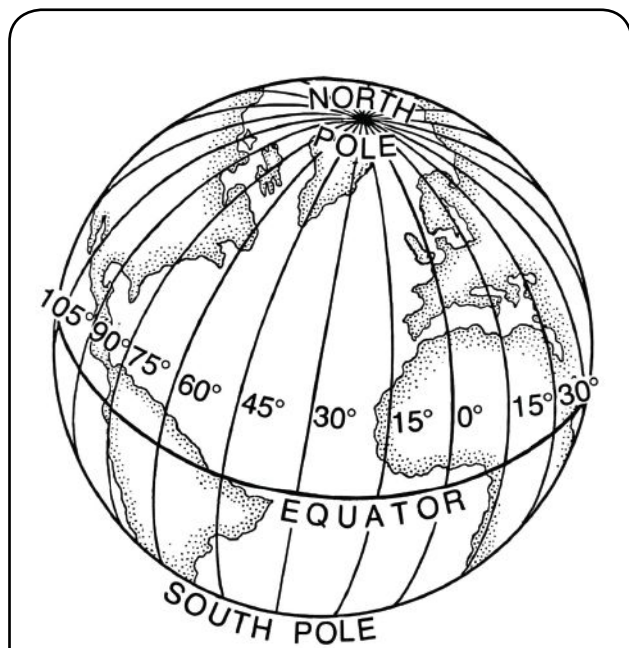
The principle behind using a chronometer to determine longitude is this: longitude bears a fixed relationship to time. Anywhere on Earth at local solar noon, the sun is directly on the meridian—the imaginary line running due north-south through that location’s zenith. If one such location is defined as 0 degrees longitude, then it can serve as Earth’s “prime meridian”—the reference longitude from which every other location on Earth can be determined.



Box marine chronometer, shown face-down to display the mechanism, was made by Charles Frodsham of London between 1844-60. Parkinson & Frodsham chronometers were among the 92 chronometers used in the U.S. Coast Survey transatlantic chronometric expeditions (1849, 1850, and 1851), which sought to precisely measure the difference in longitude between the Royal Observatory, Greenwich, and the Harvard College Observatory. This chronometer, from the Ladd Observatory collection at Brown University, was later modified by Wm. Bond & Son of Boston to be used with the telegraph). Credit: Wikimedia Commons

The Royal Observatory at Greenwich was established as the UK prime meridian in 1721, but Paris in France, Berlin in Germany, Cadiz in Spain, and cities in other countries established their own prime meridians. Given the vastness of the Atlantic Ocean, there was also serious debate whether there should be an American prime meridian.

A marine chronometer needed to be accurate and precise enough to serve as a portable time standard, keeping Greenwich time (or the time of any other desired meridian) in the midst of the trackless ocean during a voyage. Each midday, a sailor with a sextant determined the moment of the ship's local noon (i.e., sun on the meridian); then, he immediately checked the ship's chronometer to determine the time on the prime meridian, and from the difference calculated the ship's longitude at sea. The best chronometers had an error in their rates corresponding to a longitude error of several to many miles over a month-long voyage.



Because there are 24 hours in a solar day and 360 degrees of longitude around the globe, every hour of time corresponds to 15 degrees of longitude. Conversely, every degree of longitude is equivalent to 4 minutes of time. However, because meridians of longitude converge at the poles, the physical distance represented by a degree of longitude varies with latitude, exceeding 69 miles at the equator but spanning only 53 miles at 40 degrees north or south latitude, and even less closer to the poles. Credit: Pearson Scott Foresman/Public Domain

### Chronometric Technology Race

Harrison's triumph, although the end of Sobel's book, was not the end of the story. In fact, his invention triggered a chronometric technology race.

You'd think that every shipping company would have immediately jumped on reproducing and fielding Harrison's invention. But for a good quarter-century, hardly any chronometers were built or used in commercial shipping. Among other reasons, the invention needed significant improvements, including the ability to keep accurate time despite daily changes in ambient temperature. The devices were also extremely expensive, the equivalent of half a year's pay for an average day laborer. Moreover, the late 1700s and early 1800s were decades before the standardization of the inch and other units of measurement enabled interchangeable parts and mass production of faithful replicas.

Nonetheless, the British Empire built its might on seafaring, and the Admiralty sought the best chronometers for military navigation. So, scores of clockmakers around major British—and European, and later American—ports and cities began inventing and manufacturing their own chronometers, striving for designs ever more compact and ever more accurate and reliable. In 1805, the Admiralty ruled that before chronometers could be sold, they needed to pass exacting official tests.

Moreover, in the 1820s—decades before the telegraph brought virtually instantaneous point-to-point communication, and the spread of railroads compelled the adoption of regional time zones—it became clear to a number of astronomers and cartographers that a vision first articulated centuries earlier was at last within reach: good marine timekeepers could be used to determine longitudes of *fixed locations on land* as well as transient locations of ships at sea.

### The Mapping Conundrum

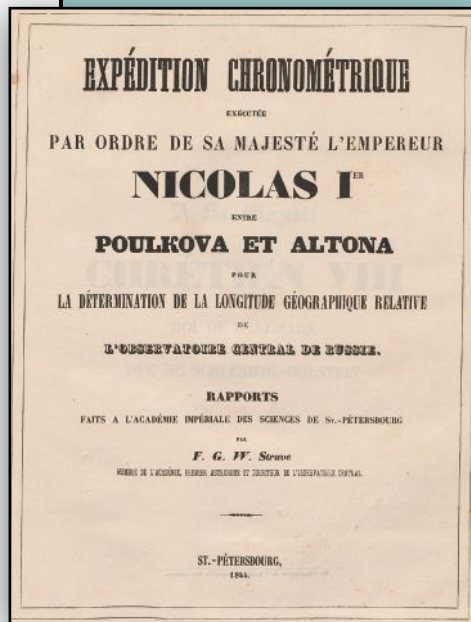
It is difficult now—in the 21<sup>st</sup> century when satellite mapping, instantaneous international communications, and GPS accurate to feet are at everyone's fingertips—to grasp just how unmapped the Earth was two centuries ago. Although many nations surveyed borders and triangulated key landmarks in their interiors to produce charts and to inventory natural resources, meshing local, regional, and national maps together was a challenge.

Problem was, various astronomical methods of determining differences in longitude gave inconsistent results. Several key methods involved the moon—but the moon's motion (which is mathematically complex, as it feels the gravitational pull not only of Earth but also of the sun) was only imperfectly known. As a result, in the early 19<sup>th</sup> century, where different maps met, meridians of longitude sometimes differed from one another by a mile or more.

Enter the chronometer. In 1821, Danish-German astronomer Heinrich Christian Schumacher (founding editor of the major international astronomical journal *Astronomische Nachrichten*, still published today) used chronometers to determine the difference in longitude between two points nearly 200 miles apart (Copenhagen, Denmark, and Hamburg, Germany) within a second of time, corresponding to a longitude error of maybe 100 feet.

Title page of the report on the major chronometric expedition run by Wilhelm Struve, director of the Pulkovo Observatory in Russia (near present-day St. Petersburg, and then the observatory with the largest telescope in the world), published in 1844. It was the first of two major

expeditions Pulkovo ran in the 1840s to determine the longitude of Pulkovo with respect to Altona and Greenwich. Credit: ETH-Bibliothek Zürich/Public Domain Mark



In 1822 and 1823, by order of the Board of Longitude, British astronomer John Lewis Tiarks (who had just surveyed the U.S.–Canadian boundary) conducted the first chronometric expeditions between Falmouth, Dover, and the island of Madeira (southwest of Portugal some 1,350 miles away) on behalf of the Admiralty. He compared the resulting chronometric longitudes to those determined by the Trigonometrical Survey of the Board of Ordnance—a precision triangulation of angles and distances among 300 key landmarks across Great Britain (including Ireland and Wales) that had been underway since 1791.

To Tiarks’s dismay, both of his chronometric expeditions revealed that the longitude differences across Britain measured by the Trigonometrical Survey were proportionately (depending on distances between points) up to three seconds of time (i.e., up to some 250 feet) too small. Given the Survey’s then-unprecedented nominal precision of *hundredths* of a second of time (i.e., less than a foot), Tiarks suspected that the discrepancies arose from variations in the shape of the Earth away from a perfect oblate spheroid over long distances.

### Earth’s Figure

Schumacher’s and Tiarks’s findings inspired several major national and international chronometric expeditions over the next two decades, each more ambitious than the last. It was during this heyday, in summer 1844, that Astronomer Royal George Biddle Airy—director of the Royal Observatory, Greenwich—extended the network of longitudes to the westernmost point of Europe with the elaborate chronometric expedition between Greenwich and Valentia. The 30 borrowed pocket chronometers in the two flat boxes traveled by rail, boat, carriage, and foot back and forth nine times, traveling more than 10,000 miles. The Valentia expedition revealed that the difference in longitude between the observatories at Feagh Main and Greenwich was 0h 41m 23.23s of time, and gave some hints about the uneven local shape of the Earth under England and Ireland.

Thus, by the mid-1840s, chronometric expeditions had revised the longitudes of key points from Moscow to Valentia—an east-west distance exceeding 2,000 miles. “It therefore has now become our duty to complete the chain which shall unite us more intimately with the Observatories of the Old World,” declared William Cranch Bond, director of the Harvard College Observatory in Cambridge, Mass.<sup>2</sup>

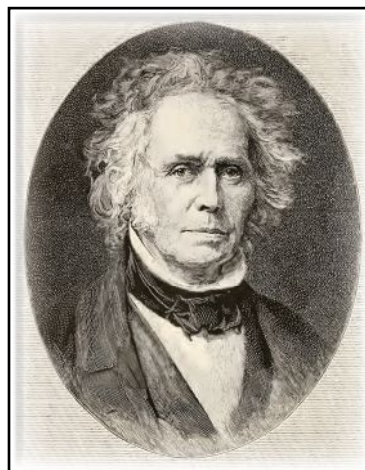
Bond’s proposal: nothing less than a grand transatlantic chronometric expedition, spanning another 3,000 miles across the ocean from Boston to England’s major port of Liverpool.

William Cranch Bond (1789–1859), founding director of the Harvard College Observatory, also owned a watch and clock shop Wm. Bond & Son in Boston, Mass. There, he and his sons rated the “going” of ships’ marine chronometers, which were used to determine a ship’s longitude to aid navigation. After large, fast steamships began regular mail delivery across the Atlantic Ocean, in 1849, Bond hit upon the idea of a grand transatlantic chronometric expedition to definitively measure the longitude of the Harvard observatory with respect to the Royal Observatory, Greenwich. Credit: Popular Science Monthly 47 (July 1895), opposite page 289

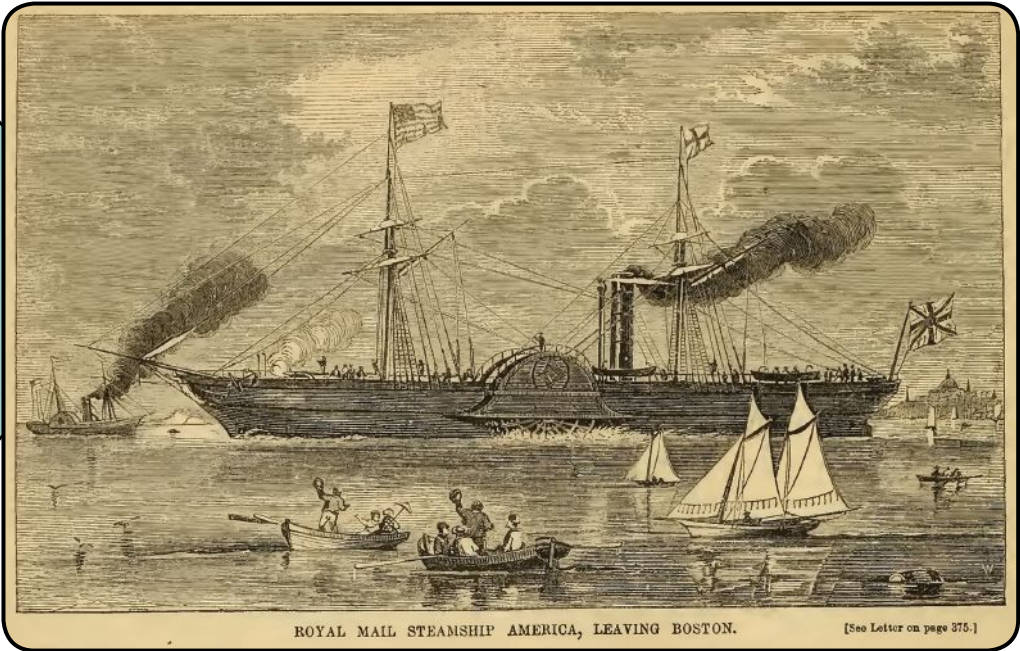
### Transatlantic Ambitions

The son of a Boston clock and watch maker, Bond grew up in his father’s shop Wm. Bond & Son, proving himself to be mechanically inventive and astronomically adept. In 1815, in the era when marine chronometers were still scarce and difficult to obtain, 26-year-old Bond built the first marine chronometer made in the United States. Soon, he found his excellent mechanisms to be in high demand by Boston sea captains. Eventually, Bond headed the shop, and later was joined by two of his grown sons.

Bond also began offering a valuable new precision service to merchant and government ships arriving or departing Boston Harbor: rating the “going” of their chronometers, and providing exact local time from astronomical observation of sun and stars. Because every early 19<sup>th</sup> century chronometer was essentially a one-off mechanism, even if its parts were fashioned and assembled by the same artisan, no two were identical. And, although chronometers were then the best mechanical clocks in the world, they weren’t perfect: despite bimetallic temperature compensation, their rates slightly varied over days or weeks as springs unwound or as lubricants changed viscosity with age.



The America was the first of a new, larger, faster class of wooden paddle-wheel steamships (249 feet long and over 1,800 tons) that allowed Samuel Cunard's British and North American Royal Mail Steam-Parcel Co. to begin offering weekly mail service between Boston and Liverpool. The America herself entered service in 1848; she and the five other vessels in her class were in service until the 1860s. For the most part, these were the ships that carried the chronometers for the U.S. Coast Survey chronometric expeditions 1849–51 and 1855. Credit: Gleason's Pictorial Drawing-Room Companion 6(24): 375, June 17, 1854



Instead, what mattered was that a chronometer maintained a consistent, steady rate of losing or gaining time, despite temperature changes or jostling during travel on land or sea, so that linear equations could be used to *calculate* the precise time at particular moments.

By 1815, Bond also was closely associated with Harvard College, which that year sent him to Europe to look at European observatories astronomical and instruments. In 1839, Harvard also invited him to head up its first modest observatory (Dana House) and eventually oversee the founding and construction of the major new Harvard College Observatory (still existing). In June 1847, Harvard mounted a refracting telescope with a lens 15 inches in diameter—a virtual twin to the largest telescope in the world at Pulkovo, Russia—and also a large transit circle for positional observations. Harvard provided Bond with a house but no salary from 1839-46, so by day, he continued operating his Boston shop Wm. Bond & Son. Bond also led longitude operations for the U.S. Coast Survey—the nation's largest scientific agency—which was charting many boundaries and coastlines of the New World.

**Bond's proposal: nothing less than a grand  
chronometric expedition spanning the Atlantic Ocean**

In the latter 1830s, steamships were replacing sailing vessels, reducing the average time of a transatlantic crossing from over a month to under two weeks. Several British steamship companies were founded to deliver mail between the UK and ports in Canada and the U.S. But in Britain, ships' chronometers were rated by individual clock and watchmakers around various British ports, and set to local time of unknown accuracy.

In 1844, the brand new Liverpool Observatory at Waterloo Dock was completed with a gleaming new transit instrument for daily astronomical determinations of time. The observatory's primary mission was accurately and officially rating marine chronometers to *Greenwich time* even though Liverpool was 230 miles distant and 12 minutes of longitude west of Greenwich. The new Liverpool Observatory was also a key station in Airy's 1844 chronometric expedition between Greenwich and Valentia.

The next year (1845), the English government awarded a 13-year contract to the British and North American Royal Mail Steam Packet Co., headed by Samuel Cunard, to dispatch a steamship every two weeks carrying mail west from Liverpool to Boston. From 1845-48, Bond experimentally kept meticulous lists of Greenwich time as shown on chronometers of the Cunard mail steamers and calculated the resulting longitude differences.

After Cunard's introduction of a larger, more powerful steamship the *America* in 1848, which immediately set transatlantic speed records, Bond wondered: could fast mail steamers provide a low-cost alternative to the monumental expense of a dedicated U.S. government transatlantic chronometric expedition—which, for completeness, also would yield longitude determinations on eastbound voyages as well?

In early 1849, Bond broached his big idea to John Hartnup, founding superintendent of the Liverpool Observatory, asking for cooperation in making observations and seeking advice re renting or borrowing chronometers. Hartnup immediately obtained promises of support from Astronomer Royal Airy and other key British observatory directors and chronometer makers. Armed with this news, on March 12, Bond wrote to Alexander Dallas Bache, superintendent of the U.S. Coast Survey.

Bache instantly saw the merit of Bond's proposal, well recognizing that the longitude of the Harvard College Observatory in Cambridge was the best-determined point in the nation—indeed, a de facto American prime meridian from which many American longitudes were measured.<sup>7,26</sup> So, things moved fast. By April, Bond and Bache were estimating costs for Coast Survey funding (just over \$3,600—equivalent to at least \$122,000 in 2018 dollars<sup>3</sup>—primarily for renting and insuring chronometers and paying their cost of passage), to begin immediately for the summer sailing season. The next month (May 1849) Bache wrote out the first check, and Bond sent his son Richard (a partner in Wm. Bond & Son) to England to coordinate British operations.

## Mysterious Errors

By the end of 1849, when operations were ended for the stormy winter season, Bond reported that he and Hartnup had “exchanged” 175 chronometers across the Atlantic. (Note: they did not use 175 unique chronometers, but a smaller number—47 to 60 in the 1849–50 season; 12 or 13 chronometers were carried in each of 14 one-way voyages back and forth across the ocean, yielding the total of “exchanges.” Adding to the confusion, both the Bonds and other astronomers often used just the word “chronometers” as shorthand for “exchanges of chronometers.”)

But their results revealed an unpleasant surprise: the eastbound voyages consistently showed a longitude difference three seconds of time greater than the westbound voyages. How could that be?

Although this 1849 chronometric expedition was 170+ years ago, Bond’s drive to squeeze out every possible source of experimental error for repeatable precision was exactly what scientists and engineers do today. Bond strongly suspected that some temperature difference caused the chronometers to gain or lose time en route. It was well known that diurnal temperatures on land

*Table highlights a few of the most influential international chronometric expeditions up through the U.S. Coast Survey transatlantic expeditions. Over the three years 1849–51, the Bonds sent a total of 92 individual chronometers on 19 one-way voyages both eastward and westward. In 1855, another six voyages were made (three round trips). Note: The Bonds’ letters and reports contain discrepancies in numbers of unique chronometers (and in the number of exchanges), not least of all because the rates or other operation of some chronometers proved to be unreliable, so their readings were later rejected; also, the most reliable chronometers were used multiple years. Credit: Trudy E. Bell*

swung through greater extremes than at sea. But why direction of travel seemed to make a difference was mystifying. Bond also wondered about the jostling of the chronometers when they were sent by rail between the Liverpool and Greenwich observatories to obtain true Greenwich time, or by carriage between Wm. Bond & Son in Boston, and the Harvard College Observatory to obtain true Cambridge time.

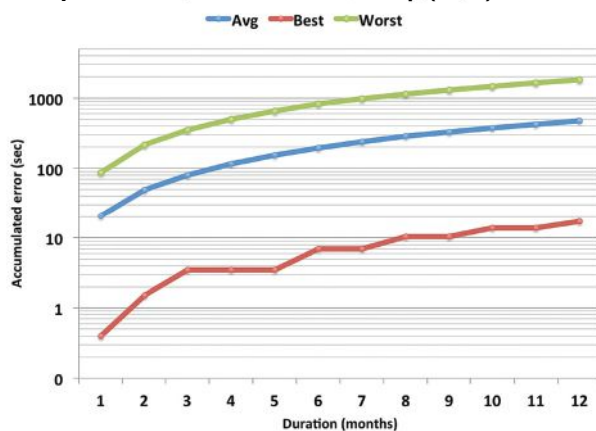
Clearly, another year of expeditions was necessary. Indeed, there were two more years. During the winters of 1850 and 1851, Bond systematically rated the going of the chronometers at different temperatures, exposing them to Cambridge’s subfreezing outdoor temperatures down to 0°F and baking them in ovens up to 105°F. He also subjected them to vibration testing in a horse-drawn carriage pulled over the frozen mud ruts in the road between Boston and Cambridge.

Each year, the Coast Survey’s Bache fronted about \$4,000 for expenses, and the chronometers were put onto the mail steamers in late spring. Beginning in 1850, Bond detailed a Harvard astronomer to accompany the chronometers back and forth across the ocean, to wind them every day or so, and to take several daily readings of times, temperature, and barometric pressure, thereby eliminating any variability from ships’ officers performing those tasks. In 1851, that Harvard astronomer also quantified the “personal equation” (reaction time) of Hartnup in timing transits at the Liverpool Observatory to ensure consistent observing protocols on both sides of the Atlantic. By then, telegraph wires had been installed between Cambridge and Boston, so Harvard time was telegraphed to Wm. Bond & Son, eliminating the need to convey chronometers to the observatory. (It was another decade before the Liverpool and Greenwich observatories were telegraphically connected.)

**Table.**  
**A Few Major Chronometric Expeditions 1822-55**

Year(s)	Lead Astronomer(s)	Number of		Between which geographical points	Sponsor
		Chronom's	Exchanges		
1822	John Lewis Tiarks	15		Greenwich & Falmouth, England/Island of Madeira	British Admiralty
1823	John Lewis Tiarks	24		Greenwich & Falmouth & Dover, England	British Admiralty
1824	Tiarks & Schumacher	28, 35		Altona, Denmark/Greenwich, England/European points	British Admiralty
1820s-30s	Robert Treat Paine	varied	up to 351	27 points around Massachusetts (at least 1 per county)	Mass. State Legislature
1833	Lt. Gen. Fyodor Schubert	56		3 circuits around the Baltic Sea (several dozen points)	Russian Emperor Nicolas I
1843	F.G.W. Struve	81		Pulkova, Russia/Altona, Denmark	Russian Emperor Nicolas I
1844	F.G.W. Struve & O.W. Struve	86		Altona, Denmark/Greenwich, England	Russian Emperor Nicolas I
1844	George Biddell Airy	30		Greenwich, England/Valentia, Ireland	British Admiralty
1844-48	William Cranch Bond (informally)		373	Boston, Mass./Liverpool, Eng.: westbound mail steamers	Harvard College Observatory
1849-50	W.C. Bond/John Hartnup	44 to 60	175	Harv.Coll.Obs./Liverpool Obs: voyages both ways	U.S. Coast Survey
1851	W.C. Bond/John Hartnup	37	369	Harv.Coll.Obs./Liverpool Obs: voyages both ways	U.S. Coast Survey
1855	W.C. Bond/John Hartnup	52	248	Harv.Coll.Obs./Liverpool Obs: thermometric exped.	U.S. Coast Survey

## Survey of 1700 Chronometers, Hartnup (1863)



*John Hartnup’s testing of 1,700 chronometers at the Liverpool Observatory gave an average error of 6 miles in a month or 136 miles in a year (the best ones had a fifth that error while the worst ones had error four times greater). But Hartnup’s measurements were made in 1862–63, so in the 1840s likely the average error would have been greater. This modern chart showing the error as seconds of time was devised by retired U.S. Naval Observatory astronomer Richard E. Schmidt, based on tabular data by Hartnup published in the July 1, 1863 issue of *The Horological Journal**

In November 1851, Bond wrote a warm letter of thanks to Hartnup and the Liverpool Observatory committee. Then Bond, his son George, and Coast Survey analysts spent four years crunching through all the laborious mathematics (by hand in that pre-calculator age) and writing up a detailed 150-page report. Along the way, brief summaries of their measured longitude difference between the Liverpool and Harvard observatories (4h 44m 30.10s) from the chronometric expeditions of 1849–50–51 were published.

In 1855, Bache supported one last set of chronometric expeditions between Boston and Liverpool, even more stringently quantifying variations in temperature to eliminate any possible east-west longitude discrepancy. For that expedition, Bond also invented a special “thermometric chronometer” without temperature compensation to monitor alongside the regular marine chronometers, to provide an ongoing record of the effect of diurnal variations in temperature on its rate of going during each voyage.

Astronomical clock (standing) and Bond spring governor chronograph (on table) were displayed at the 1851 Great Exhibition of the Works of Industry of All Nations, held in London’s specially built Crystal Palace—an event considered to be the first world’s fair. The astronomer (possibly George Phillip Bond) sits at the eyepiece of a small astronomical transit telescope likely similar in size to the one mounted in the temporary observatory atop Feagh Main for the Astronomer Royal’s 1844 chronometric expedition between Greenwich, England, and Valentia, Ireland. Credit: Public Domain/The New York Public Library



### Forgotten Triumph

Altogether, the Harvard and Liverpool observatories recorded 1,065 exchanges—greater than any previous or later chronometric expeditions. The final longitude difference determined between Cambridge and Greenwich was 4h 44m 30.82s. “Cambridge is now the central geographical point of this Continent,” exulted George P. Bond. “... Our longitude has, undoubtedly, been investigated with more care than that of any other spot on the globe.”<sup>4</sup>

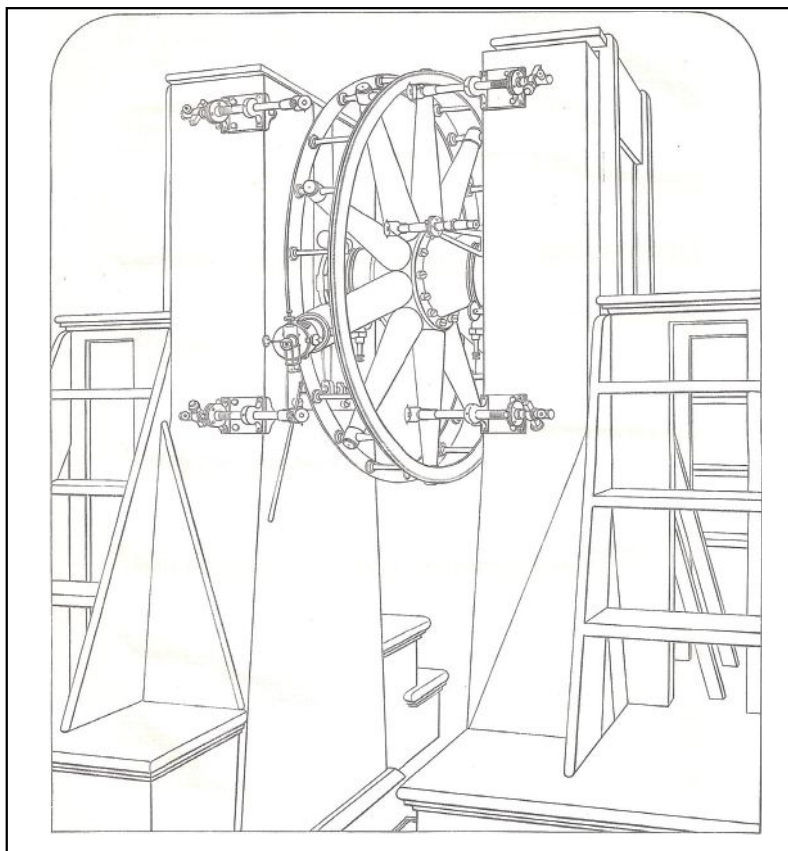
Because its position was so minutely determined, for the next four decades the Harvard College Observatory served as a de facto American prime meridian—until the advent of uniform standard time zones and the official international agreement established Greenwich, England, as the world’s prime meridian in 1884. Telegraphic means of determining longitude differences superseded chronometric expeditions as fast as wires could be strung, including undersea transatlantic cables that began providing nearly instantaneous telegraphic communications in 1866 (see “The Victorian Global Positioning System” *The Bent*, Spring 2002).

However, the 1850s—the decade preceding the Civil War—were a time of financial retrenchment for the U.S. Coast Survey. Needing to make tough choices, Bache underwrote the final preparation of reports, but deferred the expense of printing. However, none of the full-length reports prepared were ever published—only brief summaries. So, the rich, fraught history of these monumental chronometric expeditions still lies buried in half a dozen boxes of handwritten letters and report drafts in the archives of Harvard University in Massachusetts and the archives of the U.S. Coast Survey at the National Oceanic and Atmospheric Administration (NOAA) in Washington, D.C.

Nonetheless, well into the early 20<sup>th</sup> century, chronometric methods of determining longitudes remained a standard tool for the Coast Survey, especially useful in astronomical and exploring expeditions to remote regions without telegraphic communications.

Gratitude is expressed to Richard E. Schmidt—retired U.S. Naval Observatory astronomer who in 2019 published a detailed history of the Liverpool Observatory and has also researched the 1855 chronometric expedition—for very helpful comments on the manuscript, and for providing or suggesting several illustrations and useful sources.

The large transit circle at the Harvard College Observatory, one instrument used to accurately determine local time from the stars for rating chronometers (among other types of observations), was installed between two piers in November 1848. Made by Troughton & Simms in London, the telescope had a lens of  $4\frac{1}{4}$  inches in aperture and 5 feet focal length. The circles, engraved with angular measurements, were 4 feet in diameter and read with eight microscopes (four are visible on the piers). The Liverpool Observatory was equipped with a slightly smaller transit instrument. Credit: *Annals of the Astronomical Observatory of Harvard College*, vol. 1, part I (1856), p. xlvii



## Selected References

Much of this research is based on unpublished letters and draft reports residing in the Harvard University Archives (in UA V 630.349.1 Box One, in folders mostly categorized by year), supplemented by published reports of the U.S. Coast Survey. To conserve space, only published references for direct quotes are given (readers desiring the full list of 29 references may contact the author).

- 1 Airy, George B., "Account of the Measurement of the Astronomical Difference of Longitude...from Greenwich to the Island of Valentia...," *Memoirs of the Royal Astronomical Society* 16: 55–174, 1847.
- 2 Bond, William C., "Report of the Director to the Visiting Committee of the Board of Overseers of Harvard University." 1849. In "History and Description of the Astronomical Observatory of Harvard College." *Annals of the Astronomical Observatory of Harvard College*. vol. 1, part 1, Appendix, 1856.
- 3 Measuringworth.com, specifically [https://www.measuringworth.com/calculators/uscompare/result.php?year\\_source=1849&amount=3600&year\\_result=2019](https://www.measuringworth.com/calculators/uscompare/result.php?year_source=1849&amount=3600&year_result=2019) \$122,000 is according to the Consumer Price Index, but many other comparators would yield a much higher number. N.B., \$3,600 in 1849 was more than double W.C. Bond's salary of \$1,500 as director of the Harvard College Observatory, which then had one of the two largest telescopes in the world.
- 4 Quoted in Stephens, Carlene, "Astronomy as a Public Utility," *Journal for the History of Astronomy* 21: 30, Feb. 1990.

## About the author



Trudy E. Bell, M.A. ([t.e.bell@ieee.org](mailto:t.e.bell@ieee.org)), former editor for *Scientific American* and *IEEE Spectrum* magazines and former senior writer for the University of California High-Performance AstroComputing Center, is author or co-author of a dozen books and 600+ articles. She is a contributing editor for *Sky & Telescope* and an editorial board member for Springer's *Historical & Cultural Astronomy* series of books. This is her 30th feature for *The Bent*.

# Richard Schwartz 2019 Queen Elizabeth Prize for Engineering: GPS

By: **Stuart E. Kirtman**, *New York Iota '88*

At a December 2019 ceremony held in Buckingham Palace, Tau Bate Richard Schwartz, *NY Iota '57*, received the 2019 Queen Elizabeth Prize for Engineering (QEPrize) for his pioneering work in the development of the Global Positioning System, popularly known as GPS. Using signals transmitted from satellites orbiting the Earth, a GPS receiver can determine its position, and obtain accurate time information, almost anywhere on the planet.

Estimated to impact billions of people throughout the world, GPS is one of the greatest advances in global positioning and navigation since the mid-1700s when England's John Harrison devised a rugged, seaworthy clock with sufficient accuracy and precision that it could be used to determine longitude using time-based methods, thus enabling chronometric navigation (see page 8).

Awarded biennially, the QEPrize is often considered to be the Nobel Prize equivalent for engineering: its winners are selected by a distinguished panel of judges, it is conferred upon the recipients by the British royal family, and it comes with a substantial sum of money. For their roles in the development of GPS, Prince Charles presented Schwartz and three of his colleagues, Bradford Parkinson, James Spilker, and Hugo Fruehauf, with trophies at a formal ceremony, and the four winners shared a cash payment of GBP 1 million (approximately USD 1.3 million).

The GPS system comprises three main segments: a "Space Segment" consisting of a constellation of satellites located more than 12,000 miles above Earth, a "Control Segment" with centers that issue commands to maneuver the satellites and adjust and monitor their on-board systems, and a "User Segment" consisting of the radio receivers whose positions are to be determined. By decoding specially encoded radio transmissions from the satellites, the User Segment receivers determine the difference in the arrival times of signals from several satellites and use that, along with the known positions of the satellites, to compute the receiver's location (which is typically presented as latitude, longitude, and altitude). To function properly, a receiver must acquire signals from at least four satellites, and Schwartz, a vice president during the 1970s at Rockwell International, and his team were awarded a 42-million-dollar contract to design, build, and place into space the first four satellites that would serve as proof-of-concept to determine the viability of GPS.

Schwartz, who holds a B.E. in mechanical engineering from Cooper Union and an MBA from Pepperdine



*His Royal Highness The Prince of Wales (left) presents the 2019 QEPrize award to Richard Schwartz. Credit to the Queen Elizabeth Prize for Engineering Foundation*

University, assembled a multidisciplinary group that successfully built and launched the first GPS satellite only 44 months after the contract was awarded and had all four satellites fully operational within nine more months. One of the challenges faced was the need for each satellite to provide an extremely accurate

timestamping of its transmissions. Doing this required the use of an atomic clock that could meet stringent size, weight, and performance criteria, and the design of such a timepiece for the satellite was an extraordinary achievement. The four satellites, which contained redundant systems and were built to exacting specifications, not only provided evidence of the likelihood of success of the complete GPS system, but they also demonstrated that it was possible to obtain significant program cost savings by designing satellites with a long lifespan.

GPS receivers were once expensive and large, but as a result of technological advances, their cost and size have been dramatically reduced. Relatively inexpensive receivers that are approximately the size of a thumbnail and are capable of determining their position to within a few meters or better can now readily be obtained, making GPS an affordable, practical, and useful method for navigating by car, boat, and plane, locating cell phones placing emergency calls, tracking shipping containers, studying geological trends, surveying land, creating maps, tracking exercise progress, exploring new locations, aiding search and rescue efforts, and myriad additional applications including many which have yet to be discovered.

After his work with GPS, Schwartz continued with an illustrious career in aerospace. At Rockwell, he advanced to become the Executive VP of their space shuttle program and later the President of their Rocketdyne Division. He subsequently joined the Hercules Aerospace Company as its President and remained in that position until the company was sold to Alliant Techsystems (ATK). At ATK, he served as CEO and Chairman of the Board until his retirement in 2000. Schwartz is a member of the GPS Hall of Fame and the Space Technology Hall of Fame, a Director at Frequency Electronics, Inc. and at Astronautics Corporation of America, and the recipient of the NASA Public Service Medal, the Air Force Quality Award, and the Cooper Union Gano Dunn Award.

More information about the QEPrize can be found at the website [qeprize.org](http://qeprize.org).

# Chapter Endowment Initiative

## Update

The Chapter Endowment Initiative (CEI) is our program, by which alumni, companies, and foundations can permanently endow the Association's activities that support any of our 250 student chapters. Last year, we reported 38 gifts/pledges and this year we have another 33 to add to the list as we strive to endow all of our chapters.

At this time, endowed chapters at the level of \$100,000 or more include:



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

Sherry at TBP Headquarters in Knoxville, Tennessee (Go Vols!).

California Delta	University of Southern California	\$100,000
California Upsilon	Cal. State University, Sacramento	\$100,000
Illinois Alpha	Univ. of Ill., Urbana-Champaign	\$130,000
Indiana Gamma	University of Notre Dame	\$125,000
Iowa Alpha	Iowa State University	\$110,289
Louisiana Alpha	Louisiana State University	\$100,000
Maryland Beta	University of Maryland	\$110,000
Michigan Beta	Michigan Technological University	\$100,000
Michigan Gamma	University of Michigan	\$104,912
Michigan Epsilon	Wayne State University	\$250,000
Michigan Zeta	Kettering University	\$100,000
New Jersey Delta	Princeton University	\$100,000
New York Delta	Cornell University	\$105,000
Ohio Beta	University of Cincinnati	\$100,000
Ohio Gamma	The Ohio State University	\$100,000
Ohio Epsilon	Cleveland State University	\$100,000
S. Dakota Alpha(1)	S. Dakota Sch. of Mines & Tech.	\$100,000
S. Dakota Alpha(2)	S. Dakota Sch. of Mines & Tech.	\$100,000
Texas Beta	Texas Tech University	\$100,000
Virginia Alpha	University of Virginia	\$115,000
Wyoming Alpha	University of Wyoming	\$100,000

### How to Help

There are a number of ways to support this initiative. Checks can be made out to "Tau Beta Pi—The Engineering Honor Society" and sent to Tau Beta Pi, Attention: Curtis Gomulinski, Executive Director, P.O. Box 2697, Knoxville, TN 37901-2697. Other options include gifts of highly appreciated stock held for over one year as well as matching gifts, IRA rollover gifts, and including TBP in your estate plans.

### Tax-deductible

Gifts through this initiative will be reflected in an individual's total giving to Tau Beta Pi. As a non-profit organization, we are exempt from federal income taxes under Section 501(c)(3) of the Internal Revenue Code. Your gift is tax-deductible to the full extent allowed by the law.

### Contact Sherry

For more information on the CEI, please check out our website at [www.tbp.org?CEI](http://www.tbp.org?CEI) or contact Sherry by phone at (612) 226-2922 or by email to [sherry.jenningsking@tbp.org](mailto:sherry.jenningsking@tbp.org).

The value of the Chapter Endowment Initiative fund, including growth and interest, at the end of TBP's fiscal year (July 31, 2019) was \$3,817,000.

### Challenges/Matches

We currently have several challenge matches open in support of the following chapters:

Alabama Gamma	University of Alabama at Birmingham	Justin Glasgow, IA B '05	\$15,000
California Epsilon	University of California, Los Angeles	Anonymous	\$5,000
California Eta	San Jose State University	George Trebaol, CA H '75	\$10,000
Indiana Epsilon	Trine University	Alan Dausman, IN E '77	\$15,000
Maryland Beta	University of Maryland	Thomas Crane, MD B '62	\$5,000
Michigan Alpha	Michigan State University	Katy & Dirk Colbry, MI A '99/'06	\$15,000
New York Beta	Syracuse University	Charles Chatfield, NY B '32	\$15,000
Ohio Alpha	Case Western Reserve University	Charles Reed, OH A '34	\$5,000
Ohio Delta	Ohio University	Richard Robe, OH Δ '55	\$15,000
Pennsylvania Theta	Villanova University	John Hennessy, PA Θ '73	\$20,000

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

# New Gifts and Pledges Received

<b>Justin M. Glasgow, M.D., Ph.D., IA B '05</b> <b>\$20,000</b> for AL Gamma at University of Alabama at Birmingham	<b>Irwin M. Jacobs, Sc.D., NY Δ '56</b> <b>\$5,000</b> for CA Psi at University of California, San Diego
<b>James S. Eastman, WA A '53</b> <b>\$10,000</b> for WA Alpha at University of Washington	<b>Dennis C. Jerome, MS A '67</b> <b>\$5,000</b> for MS Alpha at Mississippi State University
<b>William I. Koch, MA B '62</b> <b>\$10,000</b> for MA Beta at Massachusetts Institute of Technology	<b>Howard E. Jessen, CA B '46</b> <b>\$5,000</b> for CA Beta at California Institute of Technology
<b>Michael &amp; Tina Pierce, CO A '90 and '89</b> <b>\$10,000</b> for CO Alpha at Colorado School of Mines	<b>Beverly and Kenneth Jinkerson, MO B '75</b> <b>\$5,000</b> for MO Beta at Missouri Univ. of Science and Tech.
<b>John B. Slater, IA A '43</b> <b>\$10,000</b> for IL Gamma at Northwestern University	<b>Ralph W. Junius Jr., LA B '70</b> <b>\$5,000</b> for LA Epsilon at University of New Orleans
<b>R. Dudley White, VA A '76</b> <b>\$10,000</b> for NY Gamma at Rensselaer Polytechnic Institute	<b>Sandi and Kevin Kayse, CO B '78</b> <b>\$5,000</b> for CO Beta at University of Colorado at Boulder
<b>Michael E. Payne, WV B '81</b> <b>\$8,000</b> for WV Beta at West Virginia Univ. Institute of Tech.	<b>David D. Kilzer, IA A '96</b> <b>\$5,000</b> for CA Eta at San Jose State University
<b>Robert M. Ferencz, Ph.D., OH A '80</b> <b>\$6,824</b> for OH Alpha at Case Western Reserve University	<b>Raymond R. LaFrey, MI A '61</b> <b>\$5,000</b> for AL Epsilon at University of South Alabama
<b>Cheryl &amp; Leo P. Champagne Jr., LA E '76</b> <b>\$5,117</b> for LA Epsilon at University of New Orleans	<b>Robert E. Levin, Ph.D., CA Γ '53</b> <b>\$5,000</b> for CA Gamma at Stanford University
<b>John F. Angle, M.D., NY Δ '82</b> <b>\$5,000</b> for NE Alpha at University of Nebraska-Lincoln	<b>Leo Millstein, IN A '70</b> <b>\$5,000</b> for IN Alpha at Purdue University
<b>Norton Boothe, IL Γ '50</b> <b>\$5,000</b> for IL Gamma at Northwestern University	<b>Bobby S. Shackouls, MS A '72</b> <b>\$5,000</b> for MS Alpha at Mississippi State University
<b>Nick A. Farmer, MD B '68</b> <b>\$5,000</b> for MD Beta at University of Maryland	<b>William F.H. Sinclair, MS A '63</b> <b>\$5,000</b> for MS Alpha at Mississippi State University
<b>Billy W. Friar, Ph.D., VA B '58</b> <b>\$5,000</b> for OH Mu at Wright State University	<b>Mark C. Smith, OR A '89</b> <b>\$5,000</b> for OR Alpha at Oregon State University
<b>Brett and Michelle Galloway Foundation, CA Γ '85</b> <b>\$5,000</b> for CA Gamma at Stanford University	<b>Jerry C. Steenhoven, CA N '77</b> <b>\$5,000</b> for CA Nu at California State Poly Univ., Pomona
<b>Mary and Clinton R. Gilliland, GA A '59</b> <b>\$5,000</b> for GA Alpha at Georgia Institute of Technology	<b>Gus M. Vratsinas, AR A '67</b> <b>\$5,000</b> for AR Alpha at University of Arkansas
<b>William R. Goodin, Ph.D., CA E '75</b> <b>\$5,000</b> for CA Epsilon at University of California, Los Angeles	<b>Russell L. Werneth, MD B '64</b> <b>\$5,000</b> for MD Beta at University of Maryland
	<b>Anonymous, TX Z '86</b> <b>\$5,000</b> for TX Zeta at Lamar University

# Stanley Korzep, OH E '66

The Stanley Korzep Endowment for the Ohio Epsilon Chapter at Cleveland State University.  
Editor's Note: Stanley Korzep passed away on October 19, 2019, after a long battle with cancer.

While his father was not electrically inclined, he picked up on Stanley's curiosity with electric circuits at age 5 encouraging him to learn Morse code and to take the Federal Communications Commission (FCC) test for his amateur radio operator/ham license. At age 9, he earned call sign W8NXX, met older ham operators, and built his first receiver and transmitter. In high school, he was repairing radios for his friends.

Fenn College (now Cleveland State University) required a "co-op" curriculum, so Stan studied computers while working at Addressograph-Multigraph and telephone systems while at Lorain Products. Stan notes, "The education I received working with experienced engineers was invaluable." Courses at Fenn were made easier by the co-op system because he had already learned the topics taught by the professor and ultimately his good grades led to an invitation from Tau Beta Pi.

Five years at Fenn were fertile ground to meet classmates who also were ham operators and evenings were spent "on the air" working calculus problems and comparing notes. Stan jokes that co-op income was inadequate for living expenses and weekend activities quickly became TV service.

At graduation, his co-op experience and weekly electronic repair provided a good inclusion into a very slim resume. One short sentence included the Greek letters ΤΒΠ and spoke volumes about his ability to perform assigned tasks.

Stan discovered there were four more letters that were helpful in a different way: ARRL, the American Radio Relay League, which published the magazine *QST* and was dedicated to ham operators containing articles related to building radios, transmitters, and antennas. Timely articles were written by fellow *hams* about communications equipment then in the early stages of development. The *QST* articles were far ahead of books as the technology advanced through wired telegraph, to AM radio, FM radio, and single sideband (SSB) transmission and as tube electronics rapidly became transistor circuits.

Stan's first real job had a good foundation and discrete component electronic design was state of the art in 1966 with a bright future. Magnavox located in Fort Wayne, Indiana, provided the challenge and taught him the fine art of working with other engineers on a team. Five years at Magnavox provided him an excellent background in Radio Frequency (RF) design of an early satellite navigation receiver and an early cable television tuner.

At that point in his career, Stan married a young lady who lived in Orlando, Florida. Nancy Palvisak quickly sold the Orlando climate as more appealing than cold Indiana winters, so Stan began a career at Martin Marietta Orlando (renamed Lockheed Martin). The newly created electronics division was very fruitful for



RF designers. Stan worked on teams creating a miniature hand-held radio for the Department of Justice and a mobile telephone control unit for Canadian Bell. Martin Marietta encouraged him to broaden his horizons to include a launch control for the Assault Breaker missile and an interface for a Pilot Night Vision System with an AH1S helicopter.

As Stan approached retirement, he realized that he missed the enjoyment of ham radio. Contract work allowed him to mix hobby with part-time work for his first retirement attempt. After a few short stints at other companies, he found Industrial Smoke and Mirrors a very pleasant place to end his career in electronic engineering design and fabrication.

Looking back on many years, Stan notes, "I think my late father might agree that I had a moderate amount of success. I did not do it alone: I had help from everywhere and everyone. Three major sources of help stand out, and I owe each of them a big thank you. The mandatory co-op education system at Fenn College added immeasurably to my engineering education. The Greek letters ΤΒΠ on my resume got me into almost any interview. Lastly, the American Radio Relay League represents several 'amateur radio operators' worldwide, every one of them willing and eager to help me with an electronic problem. I thank them all."

He adds, "My gift to the Ohio Epsilon Chapter at Cleveland State University towards the Tau Beta Pi endowment is my way of trying to repay all who have helped me along the way. I think it is called 'Paying It Forward.' To all my fellow members, past, present, and future: I wish each of you great success in your future engineering endeavors, and I encourage each of you who do attain that great success to remember Tau Beta Pi when you pay it forward."

Stan lived in Orlando with wife Nancy and three children, each with a master's degree in business, software, and medicine, respectively.

## CAPTION CONTEST

SEND US your best caption(s) for this photo from *The Bent* archives. If the judges vote yours as one of the top three, and you *have not* been a previous winner, we'll send you a TBII t-shirt of your choice.

In this issue's contest image, right, Patrick R. Turner, *MI B '81*, and Michigan Beta advisor Gary P. Agin, Ph.D., *KS A '63*, attempt to locate themselves in the group photo of the 1980 Convention held in Tulsa, OK.

Submit your clever captions to [pat@tbp.org](mailto:pat@tbp.org) or mail them to HQ by Monday, May 4, 2020.

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



The Winter 2020 contest photo, right, which first appeared in the Winter 1980 issue, shows then District 9 Director Ralph E. Warmack, Ph.D., *MO A '67*, preparing a slide show for his district meeting at the 1979 Convention in Lincoln, NE. We were pleasantly surprised to hear from Ralph Warmack who let us know that the slide show in question was District 9's proposal (accepted) to host the 1980 Convention in Tulsa, Oklahoma.

Our panel of judges, which included Dr. Warmack, pondered over a whopping 68 entries from 36 members.

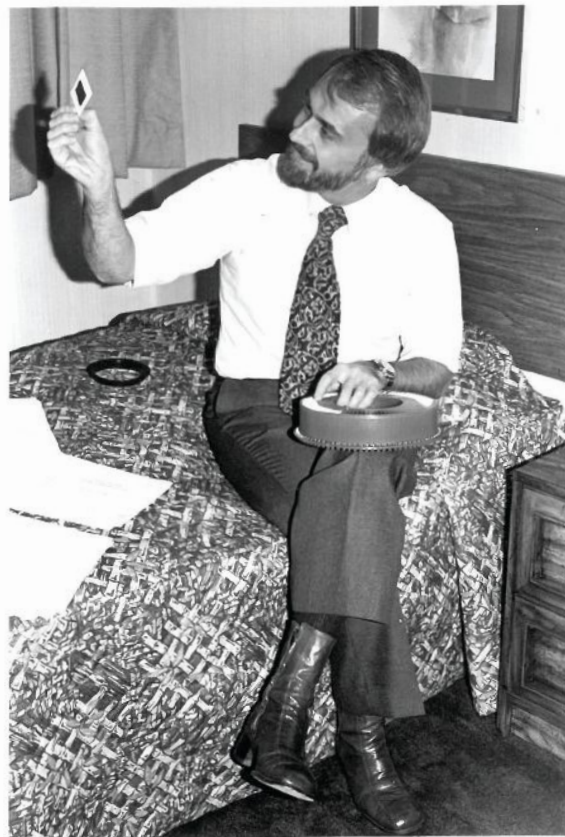
Here's the number one caption from Michael L. Hecht, *NJ A '81*: **"What did you think I meant when I invited you up to my room to see my slide show?"**

Two captions by previous winner Robert McMillan Jr., *MA D '69*, placed second and third: **"This should satisfy my audience. Last year they said my presentation 'lacked transparency.'"** and, **"Do you think anyone will notice that I cut my tie out of this bedspread?"**

Nicholas J. Grecco, P.E., *NY H '69*, another first-time winner, submitted the fourth place caption: **"If I leave this in, I'll be thrown out of lots more than the Convention."**

Michael and Nicholas, your t-shirts are on the way! Thank you and congratulations. Readers, please keep the great captions coming!

All 68 entries, including captions and results from recent contests, can be viewed online at [www.tbp.org/pubs/captionContest.cfm](http://www.tbp.org/pubs/captionContest.cfm).



# 2019-20 Alumni Giving Program November-January Contributors

The names of 3,672 Tau Beta Pi alumni and others who made donations to the Association in the 2019-20 Alumni Giving Program appear in two separate sections on the following pages. Their gifts totaling \$1,448,030 arrived between November 1, 2019, and January 31, 2020. Names preceded by SPEC denote gifts from non-members. **Gifts received after January 31 do not appear here but will be published in the Summer 2020 issue of The Bent.**

The generous support of each member is deeply appreciated by the Executive Council and 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. Pre-club 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 and are also deeply appreciated.

## Donor Recognition Clubs

The names of 3,126 Tau Bates and others appear in this first section. They made donations to the Alumni Giving Program between Nov. 1, 2019, and Jan. 31, 2020, AND they have also made CUMULATIVE contributions (in some cases including matching gifts) and bequests to TBP 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. Such continuous support significantly contributes to the overall strength of the Association and allows us, with confidence in our financial resources, to plan for growth in our services to the engineering profession. These clubs were chartered by the Executive Council in 1986 and have been set at the following levels:

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

### MATTHEWS CLUB

IA A †Moyer, James Hardy '51

### WILLIAMS CLUB

RI A Anonymous '72

TX A Brill, Arno William '71

### HEIKES CLUB

SPEC Zeigler-Lyons, Nancy '00

MD A Bloomberg, Michael R. '64

MD B Farmer, Nick Arthur '68

MI † Clark, Terry Blue '69

OH E Pasadyn, Ronald Chester '70

WY A Schoenborn, Renee Margal '85

### ALPHA CLUB

CA E Goodin, William Rex '75

IN A Ford, Steven Richard '80

IN E Dausman, Alan Vernon '77

IA A Faidley, LeVern William '67

LA † Kitchens, Philip Hudgins '67

MI Z Thebert, Alan Wilbert '57

MS A Shackouls, Bobby Stone '72

OH † Beans, Bill '53

PA A Goldstein, Steven Saul '65

SD A Gomulinski, Tricia E. '98

### BETA CLUB

CA B Jessen, Howard Ellsworth '46

CA A Davis, John Leo '60

Fong, Franklin Moodo '69

CA H Trebaol, George Olivier '75

CO A Armentrout, Michael Lee '94

Pierce, Michael Craig '90

Pierce, Tina Lara '89

CO B Kayse, Kevin Stewart '78

Kidd, T. Wayland '44

Anonymous '78

CT B Hunziker, Robert Neal '83

DE A Anonymous '70

FL B Crews, Renard Calvin '70

GA A Gilliland, Clinton Redmond '59

IL B Clewett, Thomas Alan '88

IA B Glasgow, Justin Mathew '05

LA A Comeaux, Keith A. '89

LA † Samuels, Katie '86

LA E Champagne Jr., Pierre '76

MA A Fenton, Harvey Albert '58

MI A Colbry, Dirk J. '06

Colbry, Katy Luchini '99

MI † Anonymous '78

Crouch, Dennis Eugene '62

MI E Simmons, Charles David '50

Gomulinski, Curt Dennis '01

Tillinger, Steven Jay '68

MS A Jerome, Dennis C. '67

MO B Jinkerson, Kenneth R. '75

MT B Samuels, Blake Robert '84

NH A Sherman, John Lincoln '54

NY † Van Wageningen, William E. '78

NC A Johnson Jr., Jim William '77

OH A Ferencz, Robert Mark '80

OH B Anonymous '82

OH † Ross, Elliot Bennett '69

OK A Morris, Jay Kevin '81

TN A Hopkins, John A. '88

Pih, Norm '82

TN † Hall, Kristofer Brian '98

TX A Knight, Graham B. '48

Mickelson, Kent Burdell '77

TX † O'Dell, Stewart Conn '78

TX H Trich, John Albert '70

UT A Morrison, Michael George '88

WA A Eastman, James Scoville '53

Okita, Richard Y. '56

WV A Baker, David Wesley '76

WV B Payne, Michael E. '81



**Michael Payne postponed installing his new HVAC system to support WV Beta students. Image of the delayed installation above.**

WI A Beutler, Arthur Julius '48

Anonymous '64

WI B †Hurlbert, Gordon Charles '46

WI † Cronce, Richard Gordon '77

### DELTA CLUB

AZ A Milan, John M. '67

AZ B Story, Franklyn H. '81

Stout, Roger Paul '77

AR A Vratsinas, Gus M. '67

CA A McCune Jr., Earl William '79

CA B Lippey, Jerry '55

Marshall III, J. Howard '57

CA † Shombert, Lee Alan '79

CA † Galloway, Brett Donavon '85

CA E Kovacevich, Richard Marco '65

CA E Miller, Jeffrey Clark '83

Tozaki, Ronald Yuji '74

CA † Koblitz, Gordon Frank '66

Smith, Gregory W. '75

CA I Piekett, Stephen Euan '75

CA A Domning, Edward Ernest '84

Holl, Sue '76

CA N Caddock Jr., Richard E. '72

CA E Hickey, Jessica P. '88

Hickey, Robert William '88

CA O Turhollow, Charles Bernard '81

CO A Knight, William James '79

Musser, Jack William '72

CO B Harris, James Robert '68

CO A Laughlin II, George Thomas '75

CT B Chatfield, Larry Allen '71

DC B Youssefmir, Paul '78

FL A Bolton, Charles Houston '62

Kalter, Howard Leo '66

Lewis, Becky Ann '04

Uhler, Robert Bruce '74

FL E Cowan Jr., David James '14

GA A Driggers, Herbert H. '63

Fawcett, Clinton Douglas '92

IL A Fue, Harold '57

Tracy, Mark Alfred '86

IL B Bernhardt, John Edward '89

IN A Barker, Kenneth Dale '64

Katzman, James Allen '68

Ricks, Stephen Wayne '63

Sedlacek, Warren Richard '45

IN A Spring, Bradford Hall '59

Steechholz, Jonathan M. '72

IA A Carlson, Mary Terese '78

Krambeck, Scott David '82

KS B Mueller, Robert Lynn '67

LA B Legendre III, Emile Joseph '60

LA † Mohr, James Donald '55

Rivers, John Vernon '63

ME A Brigham, Ernest Bennett '53

MD B Ausherman, Donald Wayne '79

Sabio, Vincent Joseph '86

MA A Duris, Robert Alan '74

MA B Evans, Lary Lewis '67

Freeman, Reed Harlow '61

Goldstein, Andrew Carl '69

Poduska Sr., John William '59

MA A Coutts, Robert Bruce '72

Patkin, Murray Solomon '64

MA E Sladek, John Richard '77

MA Z Grzeslak, Kazimierz T. '88

MA A Lewis, Nelson David '73

Walker Jr., William Edward '57

MI A Spindler, Jeffrey David '79

MI † Battel, Steven J. '79

MI E Frye, James Henry '51

MI H Horlitt, Henry Bessemer '47

MI A Repke, Wesley Ryan '09

MS A Benton, William Daniel '71

MO † Gibbs, Kenneth Paul '76

Kilert, Albert Harold '63

Philipp, Patrick William '98

NH A Dycewicz, Vickie Sue '96

NJ A Post, Edwin Lewis '62

NJ † Petrich, Raymond A. '84

NJ A Mendelsohn, Andrew Jay '77

NM B Slominski, Paul '78

NY † De Groot III, Ward Walton '54

Gorin, Ralph Edgar '70

Kemp, Thomas Ward '59

NY H Butterman, Heidi Carol '79

NY I Judd, Robert Paul '78

NY K Muller-Girard, Otto Theodore '52

OH † Ridel, Kimberly Sue '90

OK A Hall, Ralph Roy '64

OR A Lynch, Stanley Clark '73

PA A Wagner, Theodore Walter '71

PA † Gigliotti, Michael Philip '73

PR A Garcia, Carlos E. '77

SC B Gibbons, Joseph Harrison '56

TN A Froula, Jim DeWayne '67

Trundle, Max Don '72

TN B Layne, Peggy Edith '80

Nobles-Harris, Ellen Marie '69

TN A Chauvin, Wendy M. '89

Stewart, John Dale '78

TX A Anonymous '63

TX † Barrett, Jerry George '70

UT A Eide, Eric Norman '89

UT † Patnier, Michael James '71

VA A Pitzer, William Groh '75

Powell, Joseph Broun '78

VA B Breeser, Jeffrey William '83

## Special Gifts

*Received in memory of Daniel Banks, PA Δ '54, from his family; Thaddeus Boardman, NJ A '52, from his family; Darcy Repke Boyk from twin brother Wesley Repke, MI A '09; Elizabeth Clegg from Lee Clegg Jr., PA A '59; Lawrence Daniel, LA A '43, from Colleen Williams, LA A '82; Lindell Davidson, NC Γ '49, from his family; Gene Dodson, AL B '57, from his wife; Clifford Gronosky, NY Θ '58, from his wife Ruth; Hollace Garnett, OK B '83, from Scott Rhodes; Gordon Hurlbert, WI B '46; and in honor of David Volpe, MI Z '71, and Michael Volpe, TN B '06, from Mary Volpe; William Hyman, NY I '65, from Jill Almaguer, TX Δ '83; Murray Kosoff, who supported & encouraged my studies, from daughter Heidi Buttimer, NY H '79; Jimmy Miyamoto, CA E '59, from his sister; Nick & Kaliope Nicols from George Nicols, MI Γ '85; Col. Robert Peach, TN A '51, from daughter Judith Peach, TN A '77; Gladys Pedrosa from Luis Perez, PR A '88; Gerald Schueman, WA A '61, from wife Margaret; David Ross Sr., OH E '73, from his wife; S. James Ryckman, MI A '38, from S. James Jr. and Diane Ryckman; Gurbachan Singh from Jersey Krupp, VA E '20; Joseph Westlake, KS A '55, from Donald Palik for scholarship fund; Mark Whelchel, CA P '87, from C. Bart Sullivan, CA P '86, to honor good friend & fellow engineer; and Gwen Zelac from Ronald Zelac, IL A '62.*

- WA A Pierce, Russ W. '70
- WA B Cass, Robert Dennis '83
- WI A Yee, Paul Yuen-Po '70
- ZETA CLUB**
- SPEC Anonymous '00
- AL A Rowell, William Johnston '69
- AL B Acee, Elaine '76
- AL Δ Koelbl, Terry Gene '84
- AK A Dombrowski, Roger Alan '69
- AZ A Erickson, Kenneth Lynn '68
- AR A Newtown Jr., Glenford A. '69
- CA A Alpert, Aaron Richard '10
- CA B Hammer, David A. '64
- CA Γ Bowerman, Lawrence John '69
- CA Δ Dobbis, Michael Wayne '66
- CA E Simsarian, Gregory Garabed '82
- CA H Battersby, Leslie Charles '98
- CA A Coombs, Richard Allen '75
- CA O Treinen, James Patrick '85
- CA P Andersen, Eric Kenneth '79
- CA Y Gruspe, Nancy T. '88
- CO A Van Dinter, Jennifer Ann '97
- CO B Aersstin, Franklyn George '64
- CO Γ Pearson, Larry '64
- CT A Fischer, Edward Michael '89
- CT B Killingbeck, David R. '77
- DE A Hyer, Frank Sidney '58
- DC A Belcher, Wade D. '70
- DC B King, David Alan '68
- DC Γ Altamore, Annette '79
- FL A Layman, Robert William '68
- FL B Tilles, Arno William '85
- FL Γ Copeland Jr., Edwin '73
- GA A DeLoach Jr., Thomas Clifton '69
- IL A McGinnis, Gerald Edward '58
- IL B Hughes, Joseph L. A. '79
- IL Δ Hachtel, Dale Arnold '68
- IL Z Woyna, Mark Anthony '87
- IN A Carlson, Richard Alan '70
- IN B Badger, Jerry Delon '62
- IN Γ Boehnen, Daniel A. '72
- IA A Derr, Curtis R. '85
- IA B Aron, Gert '58
- KS A Knapp, Roy Marvin '63
- KS Γ Bucher, William Alexander '76
- KY A Bauer, Arthur Robert '63
- LA A Compton, Ronnie Ray '72
- LA B Buessinger, Robert Ford '78
- Perrin III, Shepard F. '83
- Quarles, Harry Fred '74
- Cornish, Merrill A. '67
- JEFFS, Alan Robert '73
- Johnson, Christine E. '82
- Tate, David Marshall '84
- Booth, Andrew William '64
- Jansen, Russell Onas '77
- Rowland, Wilson '51
- Schaefer Jr., William J. '70
- Merritt Jr., Charles R. '85
- Miller, Brian Leigh '08
- Chace, Brian David '69
- Descoteaux, Kenneth G.d '89
- Chang, Nancy Tien-Tien '87
- Gilkes, Alan Martin '68
- McKim, Thomas Francis '75
- Stevens, Janet Marie '72
- Cetti, Richard Phillip '70
- Harrison, C. Brett '64
- Lastella, Michael James '72
- Poulin, James Edward '96
- Leven, Peter Johannes '93
- Stromp, John Edward '78
- Vukovich, Robert James '83
- Wacker, Don Herbert '52
- Albrecht, Terry Erwin '67
- Bell, Lawrence David '68
- Engelhardt, Larry Norbert '77
- Padzieski, Robert Joseph '70
- Pepper, Julia Lynn '84
- Reines, Jose '59
- Seidel, David Allen '81
- Smithies, Henry '49
- Stewart, Steve Russell '66
- Trankle, Thomas Lynn '77
- Dietrich, Robert William '57
- Boileau, James Maurice '87
- Thompson, George W. '55
- Pascany, Kenneth Michael '86
- Garrity, William Edwards '70
- Peters, Timothy Gene '78
- Weary, Franklin Grimm '70
- Ash Jr., Richard Lawrence '70
- Eldred, Benjamin Todd '96
- McElyea, Thomas Edward '72
- Peat, Robert James '79
- Rossetti, David Joseph '74
- Collins, Douglas Macnab '71
- Gorog, Russell Mark '70
- Fletcher, Leroy Stevenson '58
- Krumins, Aivars Edgars '75
- Kunyz Jr., Joseph John '73
- Raia, Lawrence A. '65
- Yu, Jeffrey Chih-ping '89
- Peace, Jeffrey Howard '76
- Smith, Jeffrey A. '84
- Carr, Donald Joseph '77
- Cole, Marie Rosa '84
- Lequar, James Kay '87
- Stallman, Thomas Frank '59
- Thal Jr., Herbert Ludwig '53
- Dougherty, Jack William '59
- Jones, Paul Skeen '51
- Randall, John Douglas '65
- Hellman, Martin Edward '66
- Rubin, Lowell '61
- Pasquarelli, Louis Ralph '73
- Varon, Michael '73
- Kaylor, James M. '88
- Dujmich, Louis Charles '78
- Abrardo, Joseph M. '72
- Schmitt, Robert E. '71
- Czuba, John Stanley '78
- Sherman, Lawrence Joseph '74
- Runowich, Carl Joseph '84
- Baxter, Scott Charles '85
- Stalzer, Jeffrey '74
- Solaski, Thomas P. '85
- Olenik, Anthony Michael '08
- Vercaemert, Carol Starnes '76
- Anapol, Edward '76
- Franks, Marla Jane '79
- Linker, Edward Markham '47
- Hinkle, Mark Otis '96
- Jones, Luellen Barnett '83
- Allen, James A. '88
- Biery, Kurt Alan '85
- Hamilton, Joshua J. '09
- Ikedo, George Toshinori '54
- Klinich, Kathleen Ann '90
- Whittingham, John Thomas '93
- Hamilton, Edward L. '73
- Harnet, Brian Lee '85
- Pollock, Flavil M. '77
- Becher, Charles D. '72
- Guins, Thomas S. '69
- Hagenlocker, Edward '62
- Howland, Smith E. '69
- Orkins, James E. '66
- Schauwecker, Harry E. '52
- Sing, Edward Yuke '43
- Wolff, Mark Frederick '88
- Moore, Mathew F. '62
- Zelms, Charles Michael '73

- OH H Campbell, John Joseph '76
- OH M Bowers, Keith Allen '91
- OK B Royce, Robert Michael '73
- OR A Bishop, Donald Lee '65
- PA A Sherman, William J. '60
- PA B Anderson, Charles A. '57
- PA Γ McElvried III, Howard George '53
- PA Δ Bordogna, Joseph Raymond '55
- PA E Mansfield, Brian David '91
- PA H Boldt, Charles Martin '73
- PA Θ Baddorf, David Lee '80
- PA A Honath, Mark F. '80
- RI A Fleming, Read T. '77
- RI B Luz, James J. '80
- SC A Dalrymple, Gerald Andrew '83
- SC B Endler, Elizabeth Elaine '98
- SC Γ Davis III, Emmett Irwin '79
- SD B Ufford, Donald A. '87
- TN A Hueser, David Lee '76
- TN B Jennings-King, Sherry Denise '93
- TN A Carroll, Billy Dan '64
- TX A Clark, Glynn A. '48
- TX Γ Turvey, Harry Douglas '73
- TX Δ Barger, David Carl '71
- TX E Bailey, Robert Richard '70
- TX H Worden, Sue Janine '78
- TX A Alsop, Albert Walter '80
- UT A Davidson, Stuart Wayne '83
- UT Γ Friedman, Steven Michael '91
- VT A Cimonetti, William James '59
- WI B Whittington, Laura Lee '88
- WI A Whalen, David Alan '91
- WY A Cook, Norman L. '79
- WI B Gallensky, Neil Ellis '82
- CHI CLUB**
- AL A Anderson, Pete Lawrence '75
- AL B Babcock, Roger Lee '57
- AL Γ Gilbert, Rodney Carson '67
- AL E Zozulin, Alexander Joseph '89
- AK A Braun, David Robert '77
- AZ A Bailey, Harold Earl '71
- AZ B Bell, Edward Anthony '72
- AZ Γ Bruening, Brenda I. '82
- AR A Peters, Brett Avery '87
- CA A Paigne, Michael Robert '73
- CA B Creutz, Michael John '66
- CA Γ Dixon, Young Lewis '52
- CA A Agajanian, Shoochanig Diana '79
- CA E Anton, Philip Sean '85
- CA Z Benson, Chris Alan '84
- CA Beyer, Danny Joseph Arthur '15
- CA H Broadston, Robert Dean '94
- CA Q Hoekstra, Gerben N. '66
- CA I Haan Sr., George Thomas '69
- CA A Hamilton III, Edsel Poston '72
- CA B Johnson, Wesley Walter '66
- CA C Koppany, Charles Robert '63
- CA D Nakatani, David Takeshi '63
- CA E Nishimoto, Gregg Isaac '76
- CA F Zaatar, Mohammed Omar '88
- CA G Hedin, Richard Allen '69
- CA H Johnson, Wesley Walter '66
- CA I Masumura, Robert A. '62
- CA J McDonnell, John Donnell '60
- CA K Quan, Alan Chung '00
- CA L Shaw, Neil Allan '76
- CA M Testa, Lori Ann '01
- CA N Wellstand, Joseph Stephen '68
- CA O Yoshizumi, Steven Akira '84
- CA P Bensch, Charles Alan '84
- CA Q Downey, James Bryant '62
- CA R Masnada, Dante Angelo '75
- CA S Vlahutin, Paul Andrew '65
- CA T Wagner, R. Arthur '61
- CA U Broadston, Robert Dean '94
- CA V Cirigliano, Richard Louis '93
- CA W Khalili, Azita M. '83
- CA X Kruusmagi, Daniel Thomas '13
- CA Y Hoekstra, Gerben N. '66
- CA Z Kawahara, Lester Mitsuto '80
- CA A Lawson, Wayne Alan '69
- CA B Thabault, Charles W. '91
- CA C Haan Sr., George Thomas '69



**Bill Cimonetti** is a proud charter member of Vermont Alpha since its founding in 1958.

- Ketcham, Kenneth James '68
- VT B Scribner, Charles Franklin '70
- VA A Cobb, Eben Charles '77
- VA B Harpel, Barbara McLaughlin '96
- VA C Orphan, Victor John '62
- VA D Adams III, George Bunch '78
- WA A Jones, John Hamilton '73
- WA B Lindvall, Scott Guthrie '80
- WA C Marcus, Larry Allen '72
- WA D O'Byrne Jr., Michael Edward '61
- WA E Grossman, Robert James '59
- WA F Gossman, Robert James '59
- WA G Schmidt, V. Hugo '51
- WA H Costanza, Russell Vincent '62
- WA I Ashman, Michael D. '84
- WA J Dehart II, Robert Elwood '72
- WA K Raines, Linda N. '83
- WA L Delucca, Gregory James '59
- WA M Forkner, Stacey L. '96

Kuspa, Joseph Anthony '93  
Schluer, David Wesley '82  
CA K Humphreys, Evan '75  
CA A Chargin, David Anthony '97  
Stanley, Richard Loren '79  
CA M Clark, David James '99  
Johnson, Bruce William '78  
Mitsuoka, Jeffrey Minoru '79  
Rodgers, Patrick James '80  
CA N Jordan, Patrick Anthony '87  
Lopez, Michael Howard '95  
Mayer, Robert James '85  
Reukauf, Paul James '70  
Ruud, John Emil '73  
Smith, Michael P. '84  
Veit, Brian Richard '98  
CA E Baxley, Paul Alma '81  
Patterson, Richard Harold '74  
Preston, Kimberly Denise '96  
CA O Caballero, Ross Charles '72  
Campbell, William James '65  
Fiedler, James Michael '78  
Fitzsimons, Michael Joseph '79  
Page, John Arnold '61  
CA P Owens, Lawrence Paul '82  
CA S Black, Stephen H. '85  
Frankel, Craig Alan '86  
CA Y Alexander, Joseph W. '06  
Alexander, Rachel Kristin '15  
Davis, Sean Thearon '94  
Dawson, Carole Jeanne '85  
Intagliata, John David '93  
Shelly, Ronald W. '62  
CO A Cochran, Noelle Renee '86  
Kranzler, Irvin '54  
Rense, John A. L. '74  
CO B Blackwelder, Ron F. '64  
Eason, Ernest Day '71  
Frey, Bryce Alfred '56  
Furman, Michael Lee '80  
Hidahl, Jerry Paul Edward '77  
McBride, Michael James '73  
Richards, Lawrence Garnold '61  
Sorensen, Chris David '79  
Strange, Lynn M. '81  
Wood, John Everett '71  
CO A Mehrling, James Warren '72  
CT A Bennett, Beth Anne '91  
Bugel, Robert Harry '45  
Cooper, Richard Craig '63  
Lehman, Jill Fain '81  
McLeod, Christopher Kevin '77  
Troutman, John Leo '65  
CT B Altschuler, Stephen '54  
Devin, Maurice Roger '73  
Follette, Jean Marie '73  
Taylor, Kenneth Doyle '71  
Whittlesey, Richard Allen '64  
Zajac, Gerald Edward '68  
DE A Buehler, John Henry '68  
Packard, Lawrence Bruce '88  
DC A Gathungu, Peter Maina '93  
Wimberly, Mark Oliver '77  
DC B Ford, Martha '74  
Gaffney, Joseph M. '83  
Lee, Wah H. '73  
DC F Sonstey, Ormulv '74  
FL A Daniher, Peter Michael '66  
Evans Jr., Andrew Joseph '75  
Furman Jr., Thomas '66  
Gordon Jr., Horace Cadwell '64  
Gunson, William Edgar '50  
Hayden, James George '69  
Iwens, Ralph Peter '62  
Townsend, Frank Charles '62  
Vargas, Clark '71  
FL B Ault, Richard Harold '64  
Elhaggar, Suzanne '93  
Gonzalez, Cristina Maria '79  
Jennings IV, Tipton Davis '54  
Sipes, Alesia Jones-Parra '84  
FL F Collins Jr., Bill Louis '75  
Garcia, Gerardo Pascual '83  
Giovannelli, Ronald Frank '76  
Houmis, Nicholas James '74  
Lancor, Barbara Jean '79  
Paugh, Wayne Bruce '93  
FL E Skemp, Susan H. '81  
GA A Backhaus, George Peter '83  
Burgess, John Milton '61  
Coons, Louis Whately '81  
Cooper Jr., Basil Pearson '65  
Dishongh, Jefferson Lee '66  
Hilton, Joanne Louise '80  
Kaduck Jr., William Walter '76  
Milhollen, Linda Scott '70  
Monk, Robert Franklin '63  
Oslick, Rochelle '83  
Parker, Jonathan Edward '59  
Peatman, John Burling '56  
Sudderth, Stella K. '80  
Sullivan, Francis Joseph '86  
ID A Ahlschlager, Alan Douglas '87  
IL A Anderson, Donald Denton '80  
Barchenger, Kimberly '06

Bein, Robert Walter '56  
Boehm, Ronald Jack '81  
Brown, Harold Thomas '68  
Buboltz, Lisa Ann '01  
Davison, Brian C. '87  
Flitman, Jeff Edward '82  
Gromala, Edward Joseph '79  
Hanus, Daniel Joseph '86  
Jones, Douglas Warren '80  
Kasper, Frank Stanley '52  
Knox, T. '86  
Kuske Jr., John Anthony '61  
Lenzini, Peter Arnold '75  
Olson, Robert David '88  
Ostrodka, David Leon '70  
Rose, Richard C. '79  
Saltzman, Jay Adam '90  
Schoenberg, Kurt Francis '72  
Schub, Linda Gail '79  
Smith, Leslie Garrett '48  
Splitt, Frank George '52  
Vogel, Rick M. '80  
Wilkins, Gregory Martin '92  
Williams, Allan Richard '71  
Zielinski, Edward Lee '74  
IL B Gurney Jr., Donald P. '59  
Kinast, John Arthur '79  
Kusner, William John '59  
Lewis, Burton A. '48  
Plesniak, Michael W. '83  
Thomas Jr., Stanley Robert '72  
IL F Cohen, Sanford Charles '58  
Davis Jr., Charles Freeman '48  
Dietrich, George Wayne '66  
Guest, Howard Brandon '81  
IL A Klasing, Wayne Gill '65  
Krueger, Dale Richard '78  
IL E DeVantier, Bruce Allen '77  
IL Z Glat, Scott Steven '84  
IN A Amaya, Mark Anthony '85  
Bower, William Walter '67  
Brodie, Bruce Rogers '65  
Bullions III, Robert Jackson '64  
Cross, Perry Gregory '74  
Delleur, Jacques William '49  
Dries, David James Anthony '76  
Egilsrud, Richard Leslie '81  
Hall, Thomas Wayne '67  
Hanover, Marilyn Kay '78  
Hendryx, Kevin S. '81  
Herendeen, Robert Oliver '65  
Hohn, Richard Edward '62  
Lambert, Ralph Edward '68  
Paniaguas, John Steven '73  
Rea, David Richard '62  
Roby, Dennis Edgar '60  
Roth, Robert Howard '72  
Rushworth, James Lynn '58  
Schwiesow, Ronald Lee '62  
Shaffer, Gerald Harold '74  
Sheets, Dennis Neal '67  
Shulaker, Edward Ray '72  
Stokes, Ronald Blaine '60  
Sublette, Ivan Hugh '49  
Thompson, Curtis Brooks '51  
Tucker, James Anthony '66  
Tyver, Steven Elliot '74  
Woonsam, Thomas Jay '65  
IN B Friel, Leroy '57  
Hamilton, Charles Edward '59  
Martin, Jeffrey V. '78  
Noblitt, Niles Leonard '73  
Osburn, Richard Kimmel '67  
Rosenbarger, Donald Glenn '78  
Ruddick, Everett Lindley '64  
Waterman, Robert Carl '70  
IN G Fitzgerald, Edward John '86  
Flynn, Michael Joseph '89  
Galeziewski, Thomas Michael '78  
Hawes, William Michael '78  
Kast, Steven James '69  
Kukla, James Alfred '72  
Lane, James K. '82  
Lombard, Michael Gerard '76  
Schuster, Gregory Michael '77  
IN D Brems, Robert Ronald '63  
Hartman, Richard Carl '63  
Lorenz, Mark Jeffrey '80  
Schmalz, Peter B. '69  
Valenti, Paul M. '01  
IN E Lund, Stephen R. '80  
IA A Carosella, Sandy L. '88  
Coffey, Leo Frederick '64  
Cowles, Harold Andrews '49  
Dagestino, Kathryn Ann '79  
Drumm, Alfred Wendall '64  
Kuivanen, David Paul '78  
Liu, Lee '57  
Maifield, Christopher James '95  
Mankowski, Alan Thomas '68  
Morse, David Sanford '52  
Paris, Stephen Warren '75  
Sellew, Roger Franklin '59  
Van Zante, Dale Eugene '90  
Veenstra Jr., Henry Robert '71

Wolfmeyer, Paul Albert '66  
Zwiebel, Jeffrey Lee '82  
IA B Coe, Roger Norman '57  
Gozali, Paul '85  
Lawson, James Theodore '70  
KS A Benso, William Eldon '59  
Black, Arthur Geiger '70  
Hinton, Robert Allan '61  
Leamon, Rich Gaylord '67  
Remsburg, James Carleton '57  
Suelter, Leonard George '58  
†Westlake, Joseph Edward '55  
KS B Brown, Cheryl Ann C '82  
Howe, Donald Craig '78  
KS F Dunbar, Monica Ann '91  
McKimmis, Steve Ray '74  
KY A Cook, Robert Henry '74  
Letton Jr., George C. '57  
Midkiff Jr., Kenneth Clark '79  
Rhoads, Harold Spencer '68  
KY B Hundley, John Smith '87  
Hundley, Theresa E. '87  
Milhollen, Garland Bruce '79  
Jodrie, Mary Clare '85  
Yee, Ngai Sandy '82  
LA A Crawford Jr., Richard Haygood '82  
Levert Jr., Freddie Joseph '62  
Millar, John S. '68  
Nelson Jr., George Gus '52  
LA B Bourgeois, Brian Steven '82  
Bourgeois, Edit Jorgelina '91  
Marko, William Alexander '81  
Paul Jr., Howard Cochran '80  
Rickman, Philip Mark '83  
LA F Ball Jr., Pete Gordon '61  
Bertsch, Paul Jeffery '79  
Bertsch, Susan A. '80  
Giering III, Edmund Jacob '80  
Reneau, Daniel Dugan '63  
Wright, Cameron H. G. '83  
LA A Daylight, Martin Edward '61  
Garber, James Daniel '66  
O'Rourke Sr., Donald Joseph '51  
Young, Ronald Dale '66  
ME A Atkinson III, Landy Guy '78  
Blackstone, Bradford Earl '91  
Blackstone, Jill Ellen '92  
Degon, Robert John '66  
Havey, Mark Douglas '73  
Jones Sr., Jeffrey A. '75  
Musk, Jeffrey Hill '86  
Palmer, Gerald Milton '61  
Plesset, Robert Jordan '81  
MD A Capecci, Dennis W. '79  
Cessna Jr., Lawrence Clyde '61  
DiGiorgio, Joseph Brun '54  
Kuchta, Francis W. '53  
Lu, Stanley '95  
Scheinin, Warren M. '74  
Shinham Jr., Charles Robert '71  
Wiseman Jr., William Joseph '64  
MD B Antony, Roger William '71  
Bohse, Michael Edward '85  
Brownstein, Barry Jay '68  
Cook, Gordon Douglas '81  
Dinkle, Ralph Edward '65  
Hardesty, Donald Roy '64  
Jochum, Thomas Andrew '77  
Kirschbaum, Alan Ira '71  
Lambrechts, James Russell '73  
Perkins, Michael Joseph '95  
Yourshaw, Sheryl Lynn '99  
MD A Iannuzzi, Jo '96  
MA A Achilles, Heather Dale '83  
Auclair, Jared Robert '01  
Bernaacki, Stephen Edward '70  
Oakes, Michael Willard '77  
MA B Brandes, Richard David '57  
Ciaramaglia, Frederick Joseph '69  
Clark, Ronald Channing '56  
Claus Jr., John Seebold '54  
Ditmeyer, Steven Roland '63  
Efimba, Bob E. '63  
Hladik, Karen Jean '78  
Martel, Philip Omer '72  
Maskrey, Robert Harley '63  
Patterson, John Bryan '68  
Smallwood, Richard Dale '57  
Spradlin, Louis Woodson '57  
Zelazo, Ronald Elliot '66  
MA A Bloch, Frederick Hersh '68  
Colen, Frederick Haas '69  
Curtis, Jonathan Greely '69  
DiPerna, Richard Arthur '66  
Harty Jr., Frederick Russel '61  
Hildebrandt, Eric Michael '92  
Savage, Paul David '77  
MA E Calvo, Alberto Bruno '70  
Hayden, Thomas Lee '62  
Jonah, Maxwell Victor '55  
Lichtig, John Forrest '83  
Linscott, Anne Wiklord '80  
Payne, Robert Joseph '86  
Ridlon, Stephen Allan '66  
MA Z Gusciora, Kenneth Henry '69

Koch, Robert F. '79  
Lynch, David Peter '82  
MA H Whiteley, Norman Lyle '75  
MA O Burns, Nancy E. '84  
MI A Chaffee, Stanley Wendell '74  
Griffin, Albert Walter '80  
Houthoofd, Janet Marie '76  
Mueller, James Michael '70  
†Ryckman, Jim James '38  
Santoro Jr., Thomas Vincent '66  
Tscharner, Christopher G. '83  
MI B Edquist, Carl F. '77  
Lindgren, Douglas LeRoy '69  
Maki, Steven Michael '76  
Plutchak, Raoul Edward '62  
Sandretto Jr., Peter Patrick '64  
Skaugen, Borg '63  
Sonsalla, Tim Carl '95  
MA F Ardis, Robert Boyd '46  
Connable, Tenho Sihvonen '42  
Davies, John Richard '50  
Delgass, William Nicholas '64  
Drago, Gary Alan '75  
Earl, George Clayton '66  
Fertel, Howard Kevin '79  
Friess, John George '57  
Goodell, Charles Edward '43  
Gray, Jeffrey James '94  
Guttman, Richard Theodore '60  
Hammond, Donald Dwight '52  
Hickcox, Timothy Earl '65  
Kasper, Alan R. '62  
Kleinau, Julie Ann '84  
Lisicki, Gayle Barill '79  
Lisicki, Raymond Edward '78  
Maicka, Raymond Edward '86  
Maker, Pamela Allyn '81  
Malloch, Charles Delridge '57  
Mellingner, Robert B. '94  
Nicols, George '85  
Pearl, John Christopher '61  
Poy, Alfred Lim '91  
Prescott, Thomas J. '69  
Rigge, Lawrence Allen '83  
Roof, Richard Rundel '51  
Sanguinetti, John Winston '70  
Scott, Richard A. '57  
Seidel, E. Michael '62  
Stagner, Charles Evan '86  
Taylor, Mark Edward '74  
Toliver, Christopher Michael '74  
Zuk, David Michael '70  
MI A Conti, Mark '76  
Minnich, Katherine Patricia '78  
MI E Brooks, Vern Eugene '60  
Chudd, Richard Alan '66  
Durrin, Michael John '81  
King, James Bartholomew '65  
King-Monroe, Stephen Lee '08  
Moses, Michael Joseph '00  
Mutzelburg, Ronald Edward '68  
Sluchak, Thomas John '77  
Zickafoose, Michael Wayne '97  
MI Z Foraker Jr., David Ernest '58  
Gomez, Lloyd E. '55  
Lachele, Roger Eric '75  
Reardon, Robert Warren '74  
Roth, Maureen Lynn '91  
Scarlatti, Michael George '76  
Volpe, David Randall '74  
Wozniak, Curtis Steven '78  
MI H Hill, Scott S. '83  
Johncox, Robert Allen '83  
Johnston, Richard '78  
Nelson, David Arthur '85  
MI O Bryson, James '98  
MN A Braaten, David Laverne '75  
Duscha, Lloyd Arthur '45  
Larson, Michael Lane '59  
Loughlin, James Paul '85  
McLeod, Gary Wayne '70  
Severson, John Albert '72  
Thompson, Richard Alvin '77  
MS A Barnett, Kerney Luther '71  
Cargile, James Donald '81  
Hilkert, James Michael '71  
Jones, Donald Rush '61  
Linder, Richard A. '57  
Mills, Marvin Leon '65  
Siler, Raymond David '83  
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Yates, Michael Douglas '74  
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Valentine, Clifton C. '68  
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Currie, Wayne Lee '59  
Donaldson, Albert L. '75  
Gritz, Ludwig Adam '58  
Henderson, Betsy Lynn '84  
Kehoe, Martin James '72  
Myles, Thomas Daniel '82  
Oehrke, Timothy Chris '75  
Stiefermann, Michael Charles '86  
MO B Benson, William Alan '77

# IRA Charitable

The IRA Charitable Rollover provision is an easy, tax-wise way to make a gift to TBP! Donors aged 70½\* or older may move up to \$100,000 annually from their IRAs directly to qualified charities without having to pay income taxes on it. The charitable gift amount will count against the donor's required minimum distribution (RMD). The \*SECURE Act signed into law Dec. 2019, raised the RMD age to 72. This change only applies to those who turn 70½ in 2020 and beyond. IRA custodians may send your gift to Tau Beta Pi Association, P.O. Box 2697, Knoxville, TN 37901-2697. Our federal tax ID number is 62-0479545. If you have any questions, visit our website at [www.tbp.org?IRA](http://www.tbp.org?IRA) or send an email to [sherry.jenningsking@tbp.org](mailto:sherry.jenningsking@tbp.org).

## ROLLOVER

- Parsons Jr., Donald Francis '70
- Talhelm, Donald Lee '59
- Wentzel, Alan Ray '75
- PA B Andrichak, Stephen Michael '58
- Aughenbaugh, Gregg Warner '67
- Best, William Joseph '80
- Bradt, Andrea '76
- Ciua, James Allen '72
- Cohen, Bruce Alan '72
- Kolivosky Jr., John Edward '92
- Kutz, Scott Allen '71
- Magnus, John C. '48
- Matthias, Tracey Dawn '89
- Naffin, Richard Keith '06
- Ross, David Stanley '69
- Solar, Ronald Jay '72
- Weston, Matthew Wayne '93
- Wilt, Kenneth Douglas '84
- PA I Costanza, Charles Peter '63
- Helper Jr., Arleigh Pritchard '67
- Husak, Alan David '65
- PA A Besarab, Anatole '65
- Lewis, Timothy '64
- Sheker, Robert E. '91
- Sokal, Alan M. '68
- PA E Coffey, James M. '75
- Kulicki, John Milton '65
- PA Z Anderson, John A. '79
- Hunt, Steven David '80
- Kasoff, David '55
- Anonymous '84
- Shaffer, David Eugene '78
- Weggel, John Richard '64
- PA H Gilman, Thomas Carter '66
- Hotchkiss, Jeffrey R. '69
- Keil, Alan James '72
- McDonnell, Robert William '48
- Stiger, David Laverne '83
- Swartz, William Ewing '54
- PA O Corradino, Joseph Carmen '65
- Lacz, Walter '69
- Woods Jr., Howard James '77
- PA I Haigh, Bruce Whittemore '71
- Schoenberger, Lewis Robert '84
- PA K Beseler, Jan W. '88
- PA A Schurko, Robert John '78
- PR A Cruz-Zeno, Elvin J. '88
- Fermainnt, Carlos Juan '84
- Hilerio Sanchez, Josuan '07
- Negron Rivera, Dennis A. '13
- Sanchez, Hector Luis '76
- RI B Brady III, William James '80
- James, Charles Franklin '58
- Karnes, Jeffrey S. '80
- Silva, Ronald Ernest '74
- Verrier, Donald Charles '54
- SC A McCormack, Jack C. '48
- Prothro, Joseph E. '63
- Scherer, John Harry '65
- Snider, Eric H. '75
- Speed, Penelope Ann '87
- Stecker, Marc Kevin '82
- SC B Brady, Jeffery Ervin '85
- Feldmann, Andrew Russell '89
- Haggerty, N. Kent '72
- Harris, Raymond E. '87
- Shippey Jr., Kelley Ford '64
- Skvoretz, Jonathan Maxwell '95
- Walden, Gary R. '81
- SC I Adkins Jr., Henry Grady '66
- Gooley, Thomas Joseph '55
- Julich, Thomas Frank '76
- Pastrick, Harold Lee '58
- Reed III, Henry McDavid '85
- SD A Berggren, Mark Harry '76
- Friesz, Ross Michael '02
- SD B Becklund, Lori Sue '83
- TN A Bowers, Robert Wesley '68
- Chambers, George Philip '58

- Ernest, Terry Lee '82
- Ferrell, C. Stuart '64
- Feurer, John Alphense '70
- Jenkins, Glenn Willard '59
- Kyser, Dale Anthony '83
- Miller, Michael John '74
- Myers, Kenneth Raymond '72
- Sedovic, Pete Stephen '81
- MO I Stevens II, Oramel Dale '72
- Burgi, Charles Edwin '51
- Byrne, Clare Theresa '78
- Chambers, David Hugh '80
- Dyson, Karen Anne '81
- Dyson, Peter Bernard '80
- Fisher, John William '56
- Anonymous '99
- MT A Courville, George Eugene '59
- Egeland, Monte Dean '81
- Osgard, Dennis M. '62
- Pearce, Mary Ann '76
- Whitcomb, David L. '64
- MT B Jackson, Darron Boyd '86
- McDonnell, Kathleen Gayel '83
- NE A Criswell, Marvin Eugene '65
- Doerr, Eric Arthur '88
- Hoffman, Ernest Gerhard '68
- Kaminski, Wayne Alan '79
- Patterson, Roger Kent '73
- Paxton, William Glenn '87
- Steube, Milan Ray '74
- Stransky, David Wayne '92
- NH A Dooley, George H. '53
- Littlefield, Raymond S. '73
- Scharfe, Alan Charles '78
- NJ A Bendelius, Arthur G. '58
- Ghosh, Subhendu '89
- Greenip Jr., John Francis '66
- Hoyt III, John George '76
- MacMillan Jr., Duncan James '66
- Murphy, Kevin Jay '78
- Sussmann, Kenneth Philip '72
- Waricka, Peter Thomas '71
- NJ B Borovec, Ronald Bryan '79
- Bubenick, David Virgil '73
- Cohen, Robert Bruce '77
- Colarusso Jr., Remo John '83
- Herrmann, Eric Peter '69
- Kaufman, Peter Andrew '84
- Rabin, Dan E. '73
- Tanner, Bob Brand '64
- Thompson, Peter Daniel '78
- Wollmann, Norman P. '81
- York, Brian J. '82
- NJ I Angyal, Stephen '63
- DeWaal, Johannes '70
- DiDomenico, Michael John '65
- Padgett, Richard J. '72
- Pecca Jr., John Anthony '87
- Reitano Jr., Anthony James '72
- Rij, Jerry Jerome '72
- Sharon, Anthony Peter '74
- Vandemeulebroeke, Leon C. '89
- NJ A Brown, Geoffrey Scott '83
- Lisle Jr., Thomas C. '69
- Meyer, John Edward '81
- Wolff, Richard John '72
- NM A Bradt, David Jay '81
- James, Jonathan Christopher '97
- NM B Busch, Robert Douglas '72
- Farber, Martin John '75
- Salas, Thomas M. '85
- NM I Perna, Trina '84
- Spicer, Mark Jonathan '84
- NY A Epling Jr., William Young '83
- Selius, Albert O. '87
- Silbert, Glenn Richard '75
- Zimmerman, Robert W. '77
- NY B Bickley, Thomas Duane '78
- Chandler, George Dennis '70
- Roberts, S. William '58
- Spearot, James Anthony '67
- Storrs, Edward Lee '81
- NY I Blakeman II, Robert Denis '89
- Bornhorst, Bernard Richard '60
- Brown Jr., Alfred Winsor '66
- Bruch, Charles Gregory '59
- Buck, Frederick Alan '76
- Lyden, Michael Joseph '78
- Lynch, Karen Michelle '86
- Lynch, Michael Francis '87
- McCormick, Peter Elliott '80
- Miller, Rollin Ted '46
- Natale, Michael Robert '02
- Sacks, Alexei Hiram '90
- Schultz, Stephen Parker '70
- Staudinger, James Robert '77
- Walczak, Dennis James '76
- Walter, Buff Arthur '60
- Weinberg, Richard Sheldon '81
- NY A Carino, Nicholas Joseph '69
- Elko, Michael Joseph '89
- Frantz Jr., Rolf A. '66
- Heineman, Duane Thayer '58
- Hui, Eric C. '90
- Kahn, Mandy S. '89
- McCloskey III, Charles Carroll '71
- Sasso, Joseph Allen '70
- NY E Bernstein, Joseph Herman '50
- Dobbins, Bob Mark '73
- Febesh, Melvin '47
- Hendrickson, John Laurence '71
- Kammenzind, Henry A. '50
- Koehler, George Richard '63
- McConnell, Donald Patrick '71
- Niebanck, Charles F. '54
- Rosen, Fredric Kenneth '62
- Wilson Jr., Ernest George '66
- NY Z Brook, John Walter '56
- Choma, Peter '73
- Chu, Lawrence Joseph '71
- Keller, Norman Kurt '58
- Labianca, Frank M. '61
- Mendel, Jerry M. L. '59
- Parisse, Richard F. '61
- Sindel, Fred Hans '59
- Tuchband, Stuart Martin '63
- NY H Beron, Michael '71
- Kern, Frank John '70
- Lauer, Spencer David '67
- Minton, Evelyn Ann '73
- Schlein, Robert George '72
- Valecourt, Jean-Mary K. '85
- Wu, Randall '75
- NY O Beckeman, William Jerauld '79
- Crompton, Kenneth H. '67
- Marvin, Mayne Drew '80
- McKenney, John Lee '62
- Meyer, Bruce George '69
- Suran, Jerome J. '49
- Ziki, Ann Louise '86
- NY I Cassella, Judith Ann '71
- Schwartz, Richard '57
- Telesco, John Charles '69
- Trentacosta, Joseph Daniel '69
- NY K Ablowitz, Mark Jay '67
- Alcaro, Domenic John '87
- Brown, George Albert '48
- Dennis, William John '74
- Hinshaw, David John '86
- Peters, Kenneth Jerome '87
- NY A Fillo, John Paul '74
- Kamme, Robert W. '85
- Widmann, Bradley Howard '69
- Grant, Donald '91
- NY M Hansen, Jean Marshall '77
- Meador, Lyla Rebecca '86
- Montgomery, Michael Earl '75
- Rest, George B. '75
- Sutter, Richard Randall '71
- NY N Aloysius, Ronald J. '85
- Gluszak, Timothy John '88
- Havas, Donald William '67
- Humphrey, David Kenneth '67
- Kocher, Lawrence Harold '67
- Mann, Michael '77
- Morris, George Craig '63
- Stearns, Richard Earl '67
- NY E Greer, David A. '84
- Mathews, Joseph Raymond '81
- Sanderson, Ellen Irene '81
- Snyder, William Joseph '81
- Steinle, Kathleen Susan '77
- NY O Putnims, Zigmunds Andis '78
- Venezia, Frank Bennett '90
- NY P Barber, R. Todd '87
- DeVoe, Charles George '76
- Drexel, Peter George '69
- Fluker, Jon L. '88
- Kaemmerlen III, John T. '76
- NY P McBrien, William J. '87
- Pooran, Nakechand R. '90
- Roldan, Mark Joseph '85
- Wong, Wai Kin '85
- NY T Chacko, Vinny James '09
- Torres, Peter '02
- NC A Baer, Richard Tobias '63
- Burkart, Alex Raymond '72
- Daniels, Eric Andrew '85
- De Haas, Cynthia '91
- Hutcherson, Rodney Neal '82
- Karesh, Lewis James '81
- MacHnik, Nicholas Jan '76
- Maybee, Clarion Lee '77
- Redano, Richard Theodore '78
- Shepherd, Steven Olin '94
- Skinner, James Orville '73
- Weirs, Gregory '91
- White, Samuel Ernest '69
- Wynegar, Kathleen M. '86
- Younts III, William Ernest '79
- NC I Ando, Robert Ryoichi '73
- Bullard, John Carson '47
- Chambers, William Forrest '60
- Duncan, Matthew Albert '07
- Farst, Douglas Edson '79
- ND A Dahlin, Earl Charles '58
- Herbold, Frederick Jon '69
- Jacobsen, John W. '69
- Lopez, Angel '65
- McLaughlin, Jenny Louise '84
- Sauvageau, Donald Richard '70
- ND B Jesh, Mark Steven '86
- OH A Bacevice Jr., Anthony E. '70
- Brichford, Thomas Kenning '55
- Cross, Matthew David '05
- Fernbacher, John Matthew '62
- Oravec, Joan Marie '71
- Smialek, Jim L. '68
- Smialek, Robert Louis '65
- Weddell, James Kenneth '76
- Zeis, John Frederick '62
- OH B Burger III, George Dean '68
- Dobashi, Harry Hideo '68
- Fazzoni, Gregory Francis '76
- McCarthy, Martin David '70
- Oliver, Fred William '65
- Ruebusch, Robert Joseph '70
- Shields, John L. '75
- Wood, Ronald Eugene '89
- Yost, David Brian '87
- OH I Bouman, Robert William '60
- Condit, Dale O. '66
- Del Tosto Jr., Joseph J. '87
- Del Tosto, Judith M. '87
- Hoover, Thomas Edwin '56
- Jester, Donald John '67
- Kinzel, Evelyn Kay '69
- Kinzel, Gary Leo '68
- Kirner-Prize, Susan M. '85
- Kovach, Karl David '85
- Mendelsohn, Richard H. '71
- O'Neal, Joe Edward '55
- Anonymous '86
- Riedel, Nelson Andrew '67
- Robinette Jr., William Henry '68
- Zeller, Hugh James '66
- OH A Brown III, Claude M. '74
- Felice, Conrad William '79
- Hild Jr., Wilbur Henry '64
- Miller, Truesdell Charles '64
- Nussbaum, Lael Edward '68
- OH E Cull, Ronald Carl '70
- Derkaschenko, Alex '74
- Evans, John Arthur '59
- Kubinec, William Richard '67
- OH Z Allman, Susan Jane '85
- Babula, Maria '89
- Busbey, Bruce C. '84
- Frederick, Wm G. D. '58
- Herman, Madison Rachelle '13
- OH H Beurket Jr., Raymond Thomas '63
- Breuder, Andrew Joseph '70
- Fraass, Ronald Guy '78
- Kohlhaas, Richard L. '62
- Nelson, James Ralph '65
- Schmoll, Joseph Herman '81
- Schneider, Greg Richard '80
- OH O Doyle, James Thomas '65
- Luhan, John Bernard '70
- Sink Jr., Robert Dean '87
- Unverferth, R. S. '74
- Walter, Kenneth Leo '63
- OH I Schilling Jr., Walter William '97
- Strausbaugh, Patrick Dennis '86
- OH K Duffy, Stephen Francis '78
- Maki, Luke Richard '78
- Paridon, Charles Albert '81
- Wielopolski, Richard John '76
- OH A Krueger, Karl Hermann '73
- Murphy, Charles James '77
- Suhar, Richard Allen '83
- OK A Kriete, Vance Ralph '63
- Lamp, Maurice Bernard '89
- Wustenberg, John Walter '84
- OK B Schmude, Donald Jude '86
- OK I Basore, Paul Alan '78
- Dean, Philip Maxwell '74
- Freese, William Ernest '50
- Havner, Kerry S. '55
- Miani, Lino M. '86
- OR A Andresen, Kenneth Wayne '53
- Beard, James Lewis '61
- Buxton, Charles Edward '62
- Davis, Donald Arthur '51
- Geer, Jack Douglas '52
- Jones, Reilly '75
- King, Warren Edward '69
- Marsa, Arnold Ray '49
- Niedermeyer, Rex '77
- Pengelly, David Douglas '78
- Wilt, Jay N. '74
- OR B Buchanan, Marlowe James '92
- PA A Barndt, Ronald LaMar '58
- Bradley Jr., Charles William '51
- Bradley, Gordon Hoover '62
- Brownie, Thomas John '71
- Fowler Jr., W. Beall '59
- Gallela, Nancy Marie '85
- Hernjak, James Gregory '96
- Hjorth, Beverly Ellen '79
- Koppes, Alan Wayne '53
- Krobotoh, Michael Edward '72
- Labovitz, Judith Ann '86
- Labovitz, Stuart Lewis '85
- Melvin, William Larkin '89

# the heritage society

The Heritage Society was established in 2001 to recognize and honor those who continue the tradition of outstanding support by remembering TBI in their plans. Heritage Society members (living members listed below) have included a provision in their estate plans to benefit the Association and have informed TBI of this commitment. Their support is gratefully acknowledged, and their names will appear each spring.

- |  |  |  |
|--|--|--|
| Albrecht, Terry E., <i>MI</i> '67                        | Fleming, John R., <i>IA</i> B '50                | Pierce, Russell W., <i>WA</i> A '70                |
| Anonymous, <i>IL</i> A '55                               | Forslund, Donald C., <i>NJ</i> A '60             | Regula, Ph.D., Donald W., <i>MI</i> E '63          |
| Anonymous, <i>MA</i> B '66                               | Froula, P.E., James D., <i>TN</i> A '67          | Lt. Col. Rij, Jerry J., (USAF Ret.), <i>NJ</i> '72 |
| Basta, Edward D., <i>OH</i> E '82                        | Fue, Harold, <i>IL</i> A '57                     | Sax, Franklin S., <i>MO</i> '75                    |
| Bateman, Terry S., <i>CA</i> '58                         | Gendron, Roger J., <i>IL</i> B '55               | Schmoller, Ralph H., <i>OH</i> A '61               |
| Beans, Ph.D., E. William, <i>OH</i> '53                  | Gent, Michehl R., <i>TX</i> A '63                | Siller Jr., Ph.D., Curtis A., <i>TN</i> A '66      |
| Brill, Arno W., <i>TX</i> A '71                          | Gomulinski, Curtis D., <i>MI</i> E '01           | Slafer, Loren L., <i>CA</i> A '68                  |
| Burns, Carlisle V., <i>NY</i> A '50                      | Gomulinski, Tricia E., <i>SD</i> A '98           | Smith, Richard J., Ph.D., <i>IA</i> A '69          |
| Campbell, P.E., Cleveland L., <i>IA</i> A '47            | Haynes, Ph.D., P.E., Charles D., <i>AL</i> B '62 | Smith, Rodger F., <i>WI</i> A '64                  |
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| Chamberlain, Ph.D., P.E., Adrian R., <i>MI</i> A '51     | Hord, William E., <i>MO</i> B '59                | Stella, P.E., Damien F., <i>AK</i> A '82           |
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| Colbry, Ph.D., Dirk J., <i>MI</i> A '06                  | Jennings-King, Sherry D., <i>TN</i> A '93        | Taber, Norma J., <i>MO</i> '80                     |
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| Cook, Norman L., <i>WY</i> A '79                         | Kern, Jack C., <i>CA</i> K '71                   | Tolson, Robert H., <i>VA</i> B '58                 |
| Capt. Crane, Thomas C., (USN Ret.), <i>MD</i> B '62      | Kirschman, Ph.D., Randall K., <i>CA</i> A '66    | Tydemann, Frederick J., <i>CA</i> A '73            |
| D'Avignon, Edward J., <i>NY</i> B '88                    | Kitchens, Philip H., <i>LA</i> '67               | Weissman, Martin J., <i>NY</i> E '58               |
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| Feisel, Ph.D., P.E., Lyle D., <i>IA</i> A '61, & Dorothy | McDonald, Capers W., <i>NC</i> '74               | Widmann, Bradley H., <i>NY</i> A '69               |
| Fellner, Kenneth M., <i>AZ</i> A '84                     | Maniscalco, DEN, Thomas L., <i>NY</i> E '67      | Williams, David C., <i>TX</i> B '47                |
| Fisher, James E., <i>CO</i> A '78                        | Orkins, James E., <i>OH</i> '66                  | Zuurbier, George W., <i>IL</i> A '53               |
|  | Peterson, Charles C., <i>UT</i> A '68            |  |

Please contact Sherry Jennings-King at [sherry.jenningsking@tbp.org](mailto:sherry.jenningsking@tbp.org) if you wish to be included as a member of the Heritage Society.

- |                                       |   |                                      |                                      |
|---------------------------------------|---|--------------------------------------|--------------------------------------|
| Ellis, Jeffrey Thomas '93             | Uher, Edward L. '65                     | Ray II, Robert E. L. '74             | AL ' ' Sahawneh, Mary Christine '76  |
| Hickman, Charles Edward '57           | TX ' Cox, Bill E. '76                   | VA ' McGowan, David Michael '89      | AL ' Fortune, Julie Lynn '01         |
| Hunt, Roy Joe '67                     | Fisher, John David '70                  | VA ' A Gehr, David R. '68            | AK ' A Darrow, Margaret Marie '02    |
| Jackson, Karen Elizabeth '81          | Hagler, Marion Otho '63                 | Michael, Glenn P. '66                | Leonard, Leroy Edward '72            |
| King, Gregory Tyler '93               | Hunter, David George '79                | WA ' A Chandler, Alan Scott '77      | AZ ' A Liu, Elson Yee-Hsin '01       |
| Miller, Freddy M. '79                 | Johnson, Terry Robert '55               | Draup, John Albert '56               | Park, Trevor Howard '97              |
| Peach, Judith Elaine '77              | Lodal, Jan Martin '65                   | Follet, Mark Samuel '74              | AZ ' B Takinen, Scott Alan '79       |
| Riggs, Donna R.H. '87                 | Sandmann Jr., Charles William '82       | Fosberg, Theodore Michael '59        | Wilson, Richard Allen '72            |
| Rogers, Marvin Dale '70               | TX ' Barksdale, Donald Lee '55          | Matteson, James Harris '66           | AZ ' F Adler, James Robert '84       |
| Sharp, Jason Wayne '02                | Boedecker, Tom Jay '64                  | Ogg, Daniel Grant '85                | AR ' A Ball, Donald Harlin '66       |
| Shoemaker Jr., John E. '67            | Cox, Ralph Frank '54                    | Reichel, Jerel Dave '66              | Brady, Mark Jeffrey '83              |
| Ward, Joanne Schach '81               | Crosser, Robert Earl '50                | Rosen, Donald George '58             | Johnson, Mark Clayton '84            |
| TN ' B Brown, George Arthur '55       | Hudson, Steven Mark '77                 | Smith, Jeffrey Francis '82           | Moody, Charles Roger '58             |
| Brown, Kevin George '85               | Knowles, David Wayne '80                | WA ' B Barlow, Thomas Martin '57     | Stice, James Edward '49              |
| Convery, Thomas Patrick '02           | Kramm, Robert C. '81                    | Hartup Jr., John Dewey '50           | CA ' A Caldwell, Charles William '64 |
| Green Jr., Thomas Bagley '75          | Kunze, Glenn Ray '77                    | Hudspeth, James Charles '88          | Holzer, Peter John '79               |
| Heflinger, Richard Scott '72          | Pollock, Stephen Theodore '70           | Langley, Duane Douglass '55          | Morihiro, Steve '79                  |
| Kepper III, James Henry '71           | Pulley, Paul Winfred '87                | Wahl, David John '62                 | CA ' B Colgrove, Robert Charles '81  |
| Lyle, Stephen Michael '79             | Simpson, Stancy Jean '79                | WA ' A Campion, Paula JoAnne '00     | Dryden, Eugene Hunter '55            |
| Macchio, Gregory John '84             | Spahn, Rex Lee '80                      | WV ' A Bibbee, Dennis Evans '75      | Royden, Constance S. '80             |
| Pentecost, Gene Edgar '50             | Woram, Brian James Anthony '81          | Blackshaw, George Lansing '58        | Sato, Kazuhiko '51                   |
| TN ' F Badiru, Adedeji B. '79         | TX ' E Herrmann, Edwin Peter '67        | Boggs, Mark Steven '80               | Scandella, Carl John '66             |
| Britton, Thomas Carter '88            | TX ' H Godwin, Albert Eugene '84        | Campbell, Donald Franklin '78        | CA ' F Bankovitch, Walter John '87   |
| Buell, Phillip Ray '95                | Hoffman, Heather Brun '92               | Engle, Geoffrey Stuart '94           | Ellgas, Robert Alan '74              |
| Crawford Jr., Walter Keith '62        | Sanampudi, Padmavathi V. '95            | Fleischer, Charles John '70          | Fisher, Benjamin Paul '74            |
| Perkins, William Samuel '54           | Thompson, James A. '72                  | Gould, Marvin Burl '63               | Kwong, Michael Yipun '95             |
| Steelman, James Taylor '71            | Totten, Dwight Lee '66                  | King, Staci Renee '96                | Landers, Carl Francis '88            |
| TN ' Z McClumphy, Jonathan David '02  | Williams, Larry Donal '80               | McClung Jr., William Duane '88       | Madden, Christopher J. '85           |
| TX ' A Badgwell, Thomas Alan '92      | Witt III, Arthur William '68            | Ramsey, Walter Jackson '74           | Mitchell, Donald Beckley '59         |
| Cardwell, John Wesley '68             | TX ' O Foster, Ottis Charles '82        | Rowe Jr., Eldridge Eugene '68        | Nagel, John Frederick '91            |
| Caudle, Brian Hall '77                | Havo, Karen Patricia '86                | Tilton, Charles Henry '67            | Rassieur, Robert Terry '79           |
| Courtney Jr., Lonzo Cleveland '58     | Putnam, Judd Lee '73                    | Tompkins, Joseph Andrew '77          | Sharp, Eugene Darrell '54            |
| Crippen, Robert L. '60                | TX ' K Van Landingham, David J. '74     | Zimmerman Jr., Albert Ray '58        | CA ' A Bovich, Emil Joseph '57       |
| Damek, Herman Andrew '97              | TX ' A Davis Jr., Hulen Mack '80        | WV ' B Lorkowski, Timothy Walter '93 | Griffith, Glen Arthur '72            |
| Dodge, Nathan B. '68                  | Carter, Jason Oliver '87                | Stevens, Ellen Weber '84             | Lawson, William Edward '62           |
| Edgar, Arlen Lewis '57                | Carter, Norhanani B. '87                | Thornton, James Richard '81          | MacDonald, Kirk Stewart '70          |
| Glasow, Brian Scott '99               | Coon, John W. '91                       | WI ' A Berman, Neil Sheldon '55      | Oslick, Harvey Raymond '87           |
| Godfrey, Thomas Gray '63              | Perez, Romeo Rene '82                   | Guelker, Eric James '90              | Rey, Daniel '66                      |
| Haschke, Chester Glen '50             | Wallace, Weldon Lee '74                 | Page, Chris Scott '90                | CA ' E Bienstock, Bernard Joel '68   |
| Herring, David M. '55                 | UT ' A Dewey, William Alonzo '67        | Schuh, Peter O. '63                  | Goodkin, Mitchell Arthur '68         |
| Kopecky, Johnny Anthony '65           | Lamph, Jane Ann '80                     | Senty, James Anton '60               | Hollar, Ray Randolph '78             |
| Le Bleu, Robin Boyce '65              | Piccolo, John Frank '58                 | Sieker, Frederick A. '70             | Krigger, Marc Yared '88              |
| Lyle Jr., Fred F. '62                 | UT ' B Enke, Glen Graham '62            | Wulff, Kurt Henry '63                | Lepore, Robert Gerard '76            |
| Marshall, James L. '72                | Hart, Robert Evan '73                   | WI ' B Hutton, Teresa Jean '91       | Nelson, Alphonzo G. '69              |
| Matlock, John Hudson '67              | Thompson, James Rowley '76              | Jaye, Deborah Ann '03                | Ray, Harold B. '63                   |
| Meers, Steven Wayne '72               | VT ' A Butterfield, William Forrest '67 | Kleinvehn, Lynn Allen '65            | Reichert, Ralph Jeffrey '67          |
| Moorman, Charles Travis '59           | Goddard, Eric Hapenny '86               | McMorrow, Daniel Patrick '98         | Stein, Eugene P. '68                 |
| Parma, George Francis '85             | VT ' B Berkman, Richard Lewis '69       | Mooney, Thomas Joseph '79            | Tipton, Howell Jack '61              |
| Reese, Francis Edward '75             | Henry, Thomas Arthur '70                | Smith, Thomas M. '60                 | Vehrencamp, John Edward '50          |
| Rusch, Stephen E. '84                 | VA ' A Barrell, Charles Davidson '70    | Wick, Paula M. '81                   | Egan, Thomas Vincent '88             |
| Stanbery, Sam R. '64                  | DeYoung, John Howie '99                 | WI ' F Wilhelm, James Joseph '69     | Sako, Mitchell E. '79                |
| Sweet, Paul Alan '70                  | Evans, Gary Kyle '77                    | Simon, Karen Anne '83                | CA ' H Bahr, Alfred Joseph '58       |
| Thompson Jr., Chance Olcott '53       | Forziati Jr., Kenneth Thomas '92        | WY ' A Lester, Roger N. '87          | CA ' O Carpenter, Victoria Marie '07 |
| White, Karen Leigh '84                | Garner, Patrick Lynn '72                | Riley, Robert Hugh '82               | Hill, Jo Ann Lucy '87                |
| Whitesides Jr., John Lindsey '65      | Harris, Wesley Leroy '64                | <b>SECOND CENTURY CLUB</b>           | Lowe, William Warren '79             |
| TX ' B Berthold, Kristopher David '04 | Matthews, Nancy Neuman '81              | SPEC Sevy, Elizabeth '00             | Schuck, Charles Michael '65          |
| Cummins, Ronald Allen '75             | Roesch III, Maurice Albert '78          | Hardy, Joseph Fletcher '74           | Skalka, Gregory Dennis '82           |
| Evans III, Peter '80                  | VA ' B Doughty, Gary Springer '77       | Melton, James Bruce '77              | Smith, John Mervin '70               |
| Gilmer, Tracy F. '80                  | Long, David A. '91                      | AL ' B †Dodson, Gene Austin '57      | Stone, Ronald E. '66                 |
| Larkin, Rebecca J. '89                | Motyka, Timothy John '78                | Pearson, Marcus Lowell '63           | Wiering, Larry Arthur '77            |
| Stinson, John Michael '66             | Nowotarski, Adam Alexander '91          | Vickers, William Korth '88           | CA ' I Au, James T. '61              |





	Michelson, Darlene Sue '86		Kirkpatrick, Steven Edward '80		Kirby, Herb '61		Hubbell, Thomas W. '71	
VA F	Rhodes, Marvin Deavers '63		Lightcap, William Lawrence '86		Kurr, Amy Catherine '18		Lazaroff, Joseph Louis '62	
	Hartelius, John Taft '80	CA N	Hammond, Timothy Nicholas '74		Rockne, Allan Kert '66		LeVine, David Michael '63	
WA A	Rausch, Leonard Earl '80		Melton, Richard D. '72		Tekippe, George L. '69		Mohr, Dale '56	
	Allen, James F. '74		Tougas, Gary Francis '79		Tennant, Jerry Ronald '61		Myers, John William '87	
	Bullock, Dennis Eugene '76	CA E	Van Alst, Eric Richard '87	IA B	Burda, Kenneth James '68		Plecha, David Anthony '83	
	Chou, Chung-Kwang '75		Akers, David James '75	KS A	Asher, Gary Lee '65		Plecha, Gayle Eileen '83	
	Davis, Beverly Ziegler '80		Hollestelle, Scott C. '90		Horner, J. Michael '70		Rice, Philip Alfred '59	
	Haug, Eric V. '76	CA P	Chhouk, Bounmy Namboun '92		Moon, Marion Francis '56		Stoughton, Herbert Warren '73	
	Levin, Marc E. '80		Gharibian, William '92	KS B	Obrien, Harry Glenn '59	MI A	Hemmingger, Joseph Anthony '69	
	McNees, Jackson Lowry '68	CA P	McPherson, Glenn Allen '79		Higley, Gerald Dale '66		Kudlac, Gregory Alan '86	
	Miller, Stefan John '63	CA S	Harper, Michelle Ore '87	KS F	Doud, Galen Charles '90		Kudlac, Maureen Theresa '86	
	Pizzano, Robert Carl '80	CA T	Bird, Brian Allan '89		Gudenkauf, Wayne Anthony '93		Lott, Adriano P. '63	
	Purdy, Catherine Patricia '72	CA A	Rubick, Jondavid Henry '08		Miller, Laurence F. '64	MI E	Grant, Robert Michael '75	
WA B	Reavis, Gretchen Marie '84	CO A	Benjes III, Skip Henry H. '87		Turner, Keith Spencer '74		Opiela, Kenneth Steven '78	
	Aaserude, Robert Gerald '84		Benjes, Stephanie Ellen '86		KY A	Buemi Jr., Joseph Michael '74	Walton, Gregory Francis '71	
	Comstock, Lori A. '78		Gardner, G. Curtis '76		Cates, Terry Duane '83		MI Z	Carpenter, Janet Marie '82
	Owens, William Leo '53	CO B	Bradley, James Oliver '56		Heaberlin, James Leslie '56		Carpenter, Robert Daniel '82	
	Peters, Janna Jill '99		Grasmick, Allen D. '74		Hill, Glenn Carter '65		Kipp, Carl Robert '83	
	Sarles Jr., Daniel A. '83		Kannolt, James Rodger '58		Knight, Arthur Holt '65		Landis, Richard Wayne '69	
WA F	Sarles, Vivian Beatrice '80		Morgan, James Irving '55		Krebs, Mark Edward '88		Tidrow, Raymond Alvin '65	
WV A	Brooks, Forest Clyde '70		Olson, David Roderick '79		Worden, Eric W. '10		TYkoski, Paul J. '76	
	Deakins, Ralph Richard '58	CO A	Blakeley, Jeb Edward '78		LA A	Bergeron Jr., Sam William '56	MI H	Brow Jr., Duane A. '03
	Harbaugh, Gerry Wain '71		DeCrescentis, Joseph Michael '92		Bourgeois, Karl Francis '75		Kipp, Eric Michael '98	
	Kacik, Richard John '84		Gonzalez, Julio Jorge '91		Bullard, Salem C. '63		Longenecker, James R. '94	
	Means, Kenneth Harvey '63		Longino, James L. '81		Davis, Stephen Drake '79	MI O	Roman, Jeffrey Michael '01	
	Pellegrin, John Daniel '73	CO Z	Wood, Charles Wade '76		Miller Jr., Frank C. '62		Bhatt, Bhushan L. '63	
	Weekley Jr., Gene Rolland '63	CT A	Greiner, William Earl '66		Petitbon, John B. '86		Long, Michael Charles '84	
WV B	Cox, William Keith '62		Ronalds, Hugh Churchill '58		Vora, Suresh M. '73		Maki, Jean Courtwright '85	
	Farmer, Harry Clayton '70	CT B	Daunais, Derek Edward '97		LA F	Mercer, Audley A. '59	MI I	Haupt, Eric Keith '84
	Janeshak, Anthony Martin '74		Jacoby, Ronald '87		Sutton, Jerry Kent '67		Haupt, Shelby Elaine '84	
WI A	Diedrich, Donald Leo '69	CT F	Sokolov, Daniel John '92		LA A	Gautreaux, Craig Anthony '79		Schuster, Mike Edward '96
	Fahrbach, David Rolland '69	DE A	Bower, G. Ronald '62		LA E	Suarez, Jose Eduardo '10	MN A	Bradskel, Richard Gregory '58
	Farrington, Harold Frederick '80		Dominy, Kenneth Stafford '90		ME A	Healy, Edwin David '59		Goldstein, Richard J. '48
	Flakas, Gerald Kenneth '66		Gorman, Harry H. '59		Legatos, Nicholas Androyannis '55		Lemke, John David '88	
	Jens, Barry Lee '64		Konchar, Janelle Amy '06		Theriault, Lucien Joseph '51		Marpe, Donald Edward '57	
	Johnson, Brian Keith '87		Kiesling, Dean Arthur '69		Verrill, Christopher Lee '85		Ness, Valoree Jean '73	
	Nesbitt, John David '82	DC A	Coleman, Don Michael '60		MD A	Fick, Steven Earl '73	MS A	Hatcher, Warren Andrew '72
	Niemeyer, John Allen '68		Drew Jr., Vernon Overton '61		Horowitz, Harvey Allen '63		Kyzar, Ralph Andy '67	
	Pristelski, James Stanley '66	DC F	Dugger, W. Emmanuel '82		Yaffe, Barry Marshall '62		Moffett, James K. '84	
	Severson, Roger Eugene '76	FL A	Adams, Donald W. '89		MD B	Bloom, Seymour '59	MO A	Amigoni Jr., Alex Joseph '66
	Tausche, Paul Everett '48		Geiger, John Robert '77		Cicotte, Anthony Thomas '71		Katz, Manfred '53	
	Washechek, Howard Charles '50		Julian, Harold Vincent '74		Flewellling, Arthur Samuel '69		Ramberg, Jeffrey Robert '82	
WI B	Bell Jr., Robert Bernhard '61		Scharadt, Craig Russell '99		Gillum Sr., Michael Joseph '91		Washam, Breck Ray '90	
	Bella, Robert A. '65		Shamblin, G. Richard '72		McCoy, Charles Michael '68		Weese, John R. '74	
	Kriofsky, Tom Allan '60	FL F	Helgeson, Robert Clarence '68		Rader, Richard Andrew '62		White, Kimberly Elizabeth '94	
	Lenz, Marsha Joann '86		Smith, Shaina Maryann '99		Rosen, Robert Harold '65	MO F	Chamberlin, Charles Edward '71	
	Lubinski, Paul John '87	FL A	Carlsson, Leif A. '80		Spieler, Philip '64		Kessell, Martin James '85	
	Marcouiller, Roger Albert '60		Morales, George Jason '06		MD E	Weinert Jr., William Eric '83		Mitzel, Kevin Raymond '95
	Mueller, Gregory John '68	FL Z	Hoo Fatt, Marlon Dean '88		MA A	Boggio, Joseph Edward '58		Weber, Walter Herman '48
	Schnabl, Val J. '67		Tracy, William Andersen '06		Manning, Robert James '88		Wessling, Donald Richard '93	
WI F	Searing, Lawrence Gilbert '73	GA A	Allison, Patton Manuel '08		Wright, Neal Timothy '76	MT A	Cornelius, David Michael '60	
WI A	Otto, Michael John '76		Andrews, Harry William '70		Bulzacchelli, John Francis '88		Jeffries, William Ramey '42	
WY A	Gerloff, James Robert '00		Daniel, John Kent '70		Buncher, Charles Ralph '60	NH A	Peck Jr., Delbert Emery '77	
	Bowen, Douglas Glenn '75		Gannaway, George Thomas '61		Chiappetta, Vincent Funk '73		Gitschier, Herman Joseph '68	
	Hill, Janet Lynn '95		Hawkins, John Philip '67		Fuhrman, Linda Robeck '86		Granoft, Mark S. '82	
	Simon, Ronald Wayne '81		Newberg, George Edward '84		Gootenberg, Jonathan Samuel '13		Hewes, Robert Pennell '86	
			Nix Jr., Frank Eugene '60		Greene, David Lockwood '68		Johnson-Battista, Christine M. '87	
			Weber, Eric Dean '87		Hartatos, Nicholas John '52	NJ A	Amato, Corrado '76	
		IL A	Allison, Herman Dean '69		Hartzell, Frank Carlisle '53		Daugert, Richard David '88	
			Kuo, Franklin '56		Kim, Gina '02	NJ B	Horowitz, Daniel Austin '99	
			McDowell III, Charles William '94		Post, Allen Edward '66		Jagodinski, Lorraine W. '84	
			Miller, David Archer '61		Sedor, Gerald '70	NJ F	Budzyn, Ludomir Alexander '90	
			Toy, Mae Y. '75		Thompson, Hugh A. '62		Della Rovere, Richard '10	
			Wenzel, Kevin Wayne '84		Torrielli, Luisa Kathleen '98		Dittrick, Dennis William '69	
		IL B	Burnley, Robert Todd '89		Wampler, Charles Weldon '79		Lerner, Marshall Aron '62	
			Fenner, Joel Stewart '07		Weston, Theresa Ann '80		Natale, Patrick James '70	
			Todd, Daniel R. '86		Wiegner, Allen Walter '69		Pisz, Frank Andrew '71	
AZ A	Berry, Robert Lee '67	IL F	Bettinger, Paul C. '85		MA A	Curless, Richard Walter '66		Stevens, Barry Arnold '67
	Brusch, Richard Gervais '65		Parks, Melvin Jay '52		Dibeneditto, Joseph Peter '71	NJ A	Maienschein, Jon Lee '74	
	Spagon, Patrick D. '68		Pector, Scott Walter '78		Fisher, Evelyn C. '74	NM A	Dietzman, W. Bruce '71	
AZ B	Ivan, William Thomas '92		Puette, Robert Lee '64		Fogel, Arlene Beck '77	NM B	Buck, Cindy Jo '90	
	Rasmussen, Brenda Kay '91		Won, Danny John '77		Kaklamanos, James '08		Walter, Ainslie Bruce '74	
AZ A	Samei, Hossain Md '19		Andrew, Stephen Peter '82		Levin, Neil '80	NY A	Madia, Joseph '82	
AR A	Chastain, J. Dee '59	IN A	Berman, Mitchell Leonard '74		Manoogian, David Victor '64		Spring, Peter Gordon '68	
	Dockery, David Eugene '76		Brennan Jr., Paul John '46		Orenstein, Mark Allan '66	NY B	Bugiada, Robert Joseph '79	
	Morris, Stacey O. '73		Brumund, William Frank '64		Raisler, Richard Allen '72		Bunn, K. Wayne '67	
	Walton, Trent Avery '81		Carpenter, Randall Wells '82		Serota, Steven '82		Jeffers, Richard David '73	
CA A	Chew, Richard Sung '85		Derrick, David Gaskill '68	MA E	Ames, Elizabeth Ellen '73		Mossman, Allen Leonard '49	
	Chu, Jeffrey M. '82		Hamilton, Robert John '58		Burke, John J. '84	NY F	Berman, Charles Henry '64	
	Fretter, Ernest Fred '67		Heyer, Harold William '55		Duston Jr., Donald Roy '79		Kaplan, Steven Howard '67	
CA F	Boehme, Carl R. '70		Koskie, R. Edward '52		Trementozzi, Venus Ka-Ting '84		Patsos, Daniel Alexander '05	
	Viegas, John Robert '58		Mills, Michael Stephen '69		Tsang, Janis Ka Ping '87		Savrick, Martin '60	
CA A	Dussia, Brent Alan '73		Rehm, Ronald George '60		Tsang, Paul Tze Leung '84		Schmidt, Richard Quentin '56	
	Richter, Ronald Scott '73		Riley, Daniel Wayne '71	MA Z	Fennessey, Neil Merrick '83		Smith Jr., Martin Gilbert '59	
CA E	Asaro, Catherine Ann '78		Shimp, Alan Burke '55		Tan, Edwin Joseph '94	NY A	Allen, Frederick Graham '44	
	Green, Robert A. '72		Snook Jr., Carl Thomas '63		Marchese, Paul S. '89		Gorlin, William Barrie '85	
	Hinchey, John Dennis '65		Stiffler, William Theodore '84	MA O	Zawacki, David Vincent '98		Ku, Katharine '71	
	Madni, Asad Mohamed '69		Thurman, Sam Wesley '83	MI A	Amar, Jack Joseph '73		Lazar, Dale Steven '74	
CA Z	Boessow, Daniel Shermood '57		Trickle, Chris Michael '13		Clements, Donald Paul '68		Munch, William Dexter '76	
CA O	Asahina, David Takashi '78		Zygmunt, Roger Walter '74		Clemlents, Daniel Lee '65		Sawchuk, John Andrew '77	
	Florez, Paul Mark '06	IN B	Bechtel, Alan Alan '64		MI B	Abplanalp, Laura '82	NY E	Brolin, Stephen Joseph '57
	Koerber, Matt James '95		Roll, Richard Russell '81		Hupy, Craig Allan '83		Jesaitis, Algirdas Joseph '67	
	Young, Allen Paul '73	IN F	Chou, Robert Vincent '61		Goethe, Paul Kenneth '49		Reber, Raymond Andrew '63	
CA I	Kwong, Ray S. '65		Colleran, William Thomas '83		Ilax, Susan Bernice '77		Choi, Stephen '73	
	Thompson, Michael Young '71		Romzick, Peter Gerard '81		Lindberg, John Robert '52	NY Z	Gold, Harris '58	
CA A	Bachand, Edward Nicholas '76		Walsh, John Steinemann '80		Schoof, Louis Walter '65		Levine, Howard Stanley '63	
CA M	Calia, Kristin Denise '95	IN A	Kastman, Kenneth Herbert '66		Thoune, Diane Lynn '98		Shuocki, Vincent Paul '67	
	Hermanson, Glenn E. '87	IN E	Hosack, Mack B. D. '88		MI F	Bulleri, Andrew Anthony '60	NY H	Badalamenti, Salvatore '75
	Hume, Curtis Shen '80		Miller, Walter Preston '87		De Boer, Douglas F. '78		Fautale, Charles '63	
	Inhoff, Tim A. '87	IA A	Eybers, Lance Carl '81		Hale, Kimberly Ann '93		Palazzo, Cosimo J. '60	
			Gallagher, Richard F. '59		Hicks, Martha Kay '63		Sugin, Leonard '55	
							Wong, Keith Kin '79	



Harper, Steven Russell '06	MA ⊕	Catron, William L. '93	NY I	Capuzzi, A. Michael '01	PA H	Misiewicz Jr., Raymond F. '79
Klarner, Abigail Antoinette '01		Vasilos, Thomas '50		Hayward, David Joseph '77		Cook, David Michael '04
Krol, Allan Monforte '94	MA I	Perley, Dave Eugene '11		Kramer, Gordon '59		Guy, Wayne Mark '69
Maguire, John Anthony '79	MI A	Glover-Cutter, Kira Marina '01		Nelson, Ivan '60		Hertz, Robert Goldberg '50
Mohler, Jeffrey Dean '77		Maier, Dirk E. '87		Wilkowski, Stephen '80	PA ⊕	Mighell, Edwin R. '52
Primus, Carolyn M. '73		Potvin, Deborah L. '91	NY K	Frantz, Christopher John '88		Cacciopalle, Michael '07
Smith, Dale Clarence '48		Scheetz, Howard Ansel '50	NY N	Alexandridis, Paschalis '89		Cocchetto, Alan Matthew '83
Wilkowski, Larry Charles '79		Vannice, Merlin Albert '64		Rietz, Ralph W. '89		Glessner, Alfred J. '64
Zelac, Ronald Edward '62	MI B	Burnette, Keith Thomas '64		Scaccia, Carl '68	PA A	Beese, Robert Emery '90
Parks, Robert Franz '88		Eldridge, John Lennox '84	NY E	Drotar, Matthew Raymond '18		Condon, Kevin Lester '84
Rosen, Edward Marshall '52		Erickson, Steven Charles '90		Pierro, Frank '76		Filey, Justin Paul '99
Staschke, Ralph Arthur '50		McKindies, Gerald Thomas '50		Mercandetti Jr., Anthony John '99	RI A	Schwartz, Bradley Dean '77
Park Jr., David B. '59	IL F	Price, Leslie Edwin '52		Zuccaro Jr., Richard Joseph '74	RI B	Berube, Richard Henry '62
Calhoon, Walter Allen '64	IL A	Roell, Larry R. '63	NY O	Blumrich, Mattias A. '86		Di Spirito, Karen Marie '87
Anaglate, David Kwasi '03	IL Z	Shroff, Avanti C. '65	NY P	Case, Gerald E. '96	SC A	Pate, Joseph '16
Davidson, Patricia R. '02		Simpson, Stuart P. '59		McClellan, Nathan Allen '11		Pate, Thomas Michael '76
Steinkoenig, Glen Lee '95		Sowers, Donald Lewis '59	NY P	Chen, Benny '90	SC B	Henry, Peter James '08
Albrecht, Robert William '57	IN A	Banghart, Edmund K. '83		Lanzarone, John Richard '78		Lindner, Stephanie M. '98
Andress, Keith Michael '84		Cantor, Rebecca Jamie '04		Setiawan, Amanda Putri '14	SC F	Bailey Jr., Wendell Barr '99
Bissey, Stanley Ellis '65		Geck, Paul Emil '67	NY Σ	McCauley, James Weymann '61		Burns, James A. '60
Harr, Calvin Dean '73		Lady, Kyle Alexander '10	NY T	Imburgia, Michael James '11		Jones, Shane P. '02
Horton, James Alan '71		Sanabria, David Anthony '90		Schiavo, Michael Frances '94	SD A	Sankey, Jeffrey Ray '91
Kenny, Michael Douglas '63		Sherman, Steven Randall '92	NC A	Corcoran, Kermit C. '04		Anderson, Roger Alan '79
Longstreet, Robert Alan '67	MI A	Ryntz Jr., Edward Frank '61		Rudisill, Jacob M. '75		Anderson, Sandra Kay '79
Love, James Richard '50		Schott, Jeffrey James '80	NC F	Kayagil, Turan Altay '07	TN A	Bryan, Catherine Burns '83
Mendelson, Robert M. '47	MI E	Petrucci, Brian S. '87		Midkiff, Scott Fugate '79		Cole, Joshua Hugh '97
O'Connell, Patrick Shane '76		Whitehead, Tonya J. '17	NC A	Brooks, Jacob Martin '21		Dickerson, Will K. '56
Ohlrich, Fredrick David '70	MI Z	Reuter, David Fredrick '73		Honeycutt, Alexander Falkner '20		Dunn, Robert Emmett '73
Schilling, William Joseph '55	MI H	Lindeman, William John '92	ND A	Brakke, Bruce Lawrence '59		Eichelman, Alan William '01
Tarjan, Peter Paul '59		Moskal, Tammy Marie '91	ND B	Johnson, Arnold Frederick '59		Foster, Erick Robert '12
Walls, Joseph Donald '49		Orr, Christopher Wayne '07	OH A	Andersen, Kayla Brooke '17		Thach Jr., Nathan Raymond '64
Gemmer, Baron Guye '85	MI ⊕	Weichselbaum, Helga M. '80		Delanis, Richard John '72		Wilmoth, Kenneth Overton '63
Doty, Michael J. '96		Quinn, Tom Ryan '18	TN B	Susilo, Susan '86		Horn, Lawrence Harrison '48
Duffner, John David '06	MI I	Burtka, Christopher Aaron '04	TN F	Valentine, Russell Wayne '02		Doyna, Andrew Isaac '17
Durr, Christopher Jacob '10		Freeman, Shawn Alan '92		Widmer, Mark Thomas '84		Hamby, James A. '69
Helenbrook, Kathleen Ann '89		Hornsby, Bart Andrew '94	OH B	Nathan, David Levi '87	TN E	Thomson, Matt N. '80
Berndt II, Robert John '83		Pollatz, Ben James '18		Proakis, John '59	TN Z	Barnhardt, David Marshall '00
Hilgendorf, Don William '62	MN A	Johnson, Dale E. '65		Swanson, James A. '94	TN A	Briggs, George Strickland '61
Veres, James Stephen '74	MS A	Brasher, Cecil Keith '59	OH F	Conkle, Harold Nicholas '72		Breuggenjohnann, Marcia Lynne '82
Osipov, Michael Anthony '84		McKay, Walter Jasper '65		Crawshaw, James Robert '54		Chan, Kin Foong '96
Armstrong, William S. '52	MO A	Weber, Arthur Rudolph '47		Hammersmith, Paul August '85		Hull, Don James '69
Buffington, Gregory D. '67	MO B	Johnson, James Charles '56		Likavec, Michael Thomas '00		Morrow, Jack D. '72
Jochimsen, Ronald David '72		Kuhn, Carol Elizabeth '62	TX B	Neal, Richard L. '64		Underwood, Joe Byron '65
Oaks, Berton Eugene '71		Mokhtari, Shawn '84		Nokes, Sue Ellen '82		de Villa, Emma Christine '07
Sherman, Donald Harold '65	MO F	Rowley, Blair Arlie '62		Seipel, Frank Edward '93		Garza, Santos '85
Weber, Stephen Earl '76		Becker, Jennifer Leah '01	TX F	Williams, Robert Lloyd '60		Winder, Charles Franklin '12
Miller, Daniel Paul '93		Burns, Steven Michael '81		Zalewski, Lawrence Philip '98		Dobbin, Douglas George '83
Schaefer, Dean Allen '66		Fleschner, William Louis '67	OH A	Buda, Steven M. '88		Gruneich, Grant Richard '65
Isbell, Cletus Howard '58	KS A	Koester, Donald Raymond '52		Denner, Dylan Andrew '19	TX Δ	Horwitz, Michael E. '57
Kliwer, Max E. '49		Peters, Christopher John '09		Logan, Lauren H. '10		Bounds, David Carlyle '58
Kulp Jr., Carl Raymond '82		Schmitt, Mark Alan '93	OH E	Contofalsky, Douglas Edward '77		Brown, Robert Calvin '51
Lake, Orley Leon '61	MO Δ	Muller, Maureen Ann '17		Rodgers, Thomas Frank '69		Davila Labastida, Jose Carlos '17
Prim, John Ernest '67	MT A	Adamich, Jeremy E. '02		Sturik, Tom S. '85		Johnson, Max Edward '97
Ridder, Wendell Clayton '60		Bohac, Charles E. '69	OH Z	Walker, Edward Philip '74		Kriska, Jeremy Todd '97
Brane, Kevin Lee '78		Ries, Jerome Leonard '76	OH H	Cross, Stephen Edward '77		Kriska, Lindsey Kutach '83
Stafford, Harold LeRoy '67	MT B	Sielinsky, James Walter '62		Heil, Michael Lloyd '86		Lloyd, Stephen Vaughn '72
Feeley, Ryan Patrick '02	NE A	McElfresh, Nathan Alan '93	OH ⊕	Glasco, Brock Philip '10		Mask, Russell Lane '71
Scholer, Charles Frey '56		Silver, Harry Irvin '71	OH I	Busch, Charles L. '63		McClung, David Allen '73
Myers, Chester James '60	NV B	Schwob, Michael Anthony '92		Homan, Gregg G. '86		Newsome Sr., Robert Reese '90
Sims, Daniel James '84		Stauffer, James Joseph '92	OH K	Brenner, Annette Marie '92		Waugh, Michael Scott '79
Edkins, Laura '18	NH A	Hutchins, C. Kenneth '53		Crow, John Francis '85	TX E	Agrawal, Anuradha R. '94
Schmitt Jr., George Frederick '62		Jacobson, Kaitlyn Elizabeth '11		Heldman, Chris Randall '19		Coneway Jr., Rick '73
Gautreaux, Paul Joseph '91	NJ A	Menafra, Domenic Bernard '04	OH A	Turocy, Tayah Dale Marie '18	TX H	Bhatt, Tanay Mahendra '05
Kile, Winston Eddie '66		Reinhardt, Will Michael '18		Mazurik, Mark Douglas '92		Hartman, Kenneth Wayne '97
Graf, Peter William '95	NJ B	Smith, Alexander Paul '07	OH M	Moore, Leah Beth '10	TX ⊕	Brown, Michael Lynn '82
Dufrene, Philip Edward '77		Biermann, Erik K. '95		Wintermute, Cody Lee '18	TX K	Royer, Midge Hill '05
Dugas, Caffery James '08		Cornell, Jay Bradford '83	OK A	Johnson, Melanie Diane '00	UT A	Heining, Suzanne '86
Randazzo, Bert J. '92		Jani, Ravina '18		Martin, James David '62	UT B	Pyon, Jay Chae '96
Gill, Thomas Alexander '84		Ruopp, John Alan '70	OK B	Rhoads, Dale Malcolm '03		Rathke, Lane E. '89
Goodell, Trenor Franklin '91	NJ F	Catalan, Jose Artemio J. '96		Golic, John Paul '78	UT F	Tullis, Richard Lamond '84
Martin, James Philip '70		Sain, Edward Robert '72	OK F	Clark III, Robert Allan '10	VT B	Ruesch, Jonathan Paul '18
Ray, Robert Andrew '65		Shilling, Norman Z. '66		Islam, Khondker Moinul '91		Kling, Lloyd Edwin '57
Richard, Maurice Bernard '78	NJ Δ	Luggannani, James C. '81	OR A	Marx, Kenneth Donald '61	VA A	Kmet, Peter Nicholas '75
Johnson, William Andrew '71		Seitman, David Todd '74		McElmurry, Barry Randall '59		Cahen Jr., George Lemuel '70
Stammerjohn Jr., Lambert W. '72	NM B	Sierchio, James Gerald '72	OR B	Kordonowy, Gerard Allen '92	VA B	Painter, James Walter '68
Thodupunuri, Sunny '18		Bryant, Frank Thomas '80		Riley, Kevin James '18		Reid, Robert Erskine '64
Wells II, Linton '75		Lauben, David Norman '90	PA A	Doty, Robert Kenneth '68		Reiser, Stephen Jay '80
Baer, Michael '69	NM F	Waterman, Kim Lawrence '84		Dreyer, Darlene Anne '97		Bennett, James Preston '60
John, Elcia Marie '03		JohnTony, Jason Paul '10	PA B	Lamparter, Robert William '72	VA F	Powell Jr., Robert Curtis '13
Munach, Arnold Samuel '58	NY A	Morrison, Jeffrey Steven '68		Polyniak, Gregory Joseph '95		Sroka, Kristin Elaine '02
Watts, Chester James Todd '09		Thatcher, M. Llewellyn '59		Solender, Peter Edward '62		Street, Robert Ellsworth '72
Astar, William '94	NY B	Chamberlain, Steven Craig '68	PA B	Walsh, Christopher Dearborn '88	VA Δ	Edwards, Woodrow Hunter '07
Sklutias, John Paul '79		Geary, David Frederick '62		Del Rosso, Gerard Domnick '93	VA E	Rainey, Paul '14
Asaro, Lisa Anne '02		Utz, Sarah Ann '18		Dexter, Ryan Joseph '98	WA A	Radford Jr., Norman D. '65
Bingel, Robert Adrian '92	NY F	Barbash, William Arthur '55		Glaviano, Meghan Lynn '18		Krupp, Jersey Ann '20
Edelson, Robert Ellis '63		Crouse, Edward Michael '86		Gray, Kevin Troy '85		Brannian, James Benjamin '83
Knibbe, Todd Eric '91		Hidalgo, Fausto Gaston '44		Hurley, Francis X. '63	WA B	McCabe III, James Virgil '67
Lippitt, A. Warren '72		Jacobson, Matt '14		Johnson, Michael Benjamin '08		Paepere, Gale Robert '85
Lyons, Gerald Edward '51		McKee, Paul Dickson '17		Joseph, Robert Alan '75		Barnes, Robert Keith '80
Moomaw, Dick Frank '76		Pabisz, Ronald Arthur '96		Patterson, David Alan '88		Baxter, Donald Wallace '74
Morales, Lina Veronika '82	NY Δ	Trolle, John Charles '66	PA F	Trautz, Todd Joseph '07		Sexton, Tj James '18
Mur-Miranda, Jose Oscar '95		Vaughan, David Michael '90		Krouskop, Andrew Carter '73	WV A	Veenhuizen, Scott '66
Quinlan, Alicia Veronica '68		Lux, Jeffrey P. '86		Nicolai, Nilo Anthony '62		Panger, Peyton Elizabeth '19
Filene, Robert Joseph '63		Ristas, Lombro James '71		Silvey, Jeffrey David '96	WI A	Shuck, Lowell Zane '58
Halberg, Walter '60		Schwartz, Ricky Glen '78		Valarezo, Christopher J. '06		Bradley, Cassie Thea '18
Heller, Ethan B. '07	NY E	Zola, Jeff Sol '91	PA Δ	Boalick, Scott Russell '87		Schroeder, Jeffrey Alan '96
McMillan Jr., Robert '69		Leonard, Donald John '56		DeNunzio, Andrea Gayle '05	WI B	Simka, Harsono '91
Sorgi, Aladino D. '61		Mennerich, Kenneth Arthur '65		Kaskin, Jonathan David '71		Pearson, Lance William '95
Bearse, Harvey Stewart '56	NY H	Chakraborty, Sankar '88		Lehr, Harry James '58		Ries, John N. '63
Gadon, Charles Bennett '80		Fillos, John '66	PA E	Akbar, Shahzad '73	WI F	Sonntag, Ronald Charles '61
Marcenut, Robert Andrew '72	NY ⊕	Herriges, Catherine M. '82		Bera, John Peter '70		Hartwig, Aaron Michael '16
Tarentozzi, Ralph '85		Cipollina, Joseph Domenick '09		Gehman, Philip Anderson '56	WY A	Gallagher, Paul V. '84
Watkins, Gordon Harvey '77		Seger, Edward Samuel '78		Encarnado, Florendo Sumera '83		Larson, Lisa Jean '00
Cazesault, Paul '74		Smith, Bakari Imaan '17	PA Z	Freed, Robert Lloyd '73		Riggs, G. Scott '96
Richardson, Alan M L '70		Walczak, Brian G. '14				
Lee, David James '89						

RESULTS FROM  
FALL

Perfect

*Bohdan, Timothy E.	IN	Γ	'85
*Couillard, J. Gregory	IL	A	'89
*Gaston, Charles A.	PA	B	'61
*Gerken, Gary M.	CA	H	'11
*Gulian, Franklin J.	DE	A	'83
Gulian, Joseph D.	Son of member		
*Harvey, Arthur J.	OH	A	'83
*Norris, Thomas G.	OK	A	'56
*Slegel, Timothy J.	PA	A	'80
*Weinstein, Stephen A.	NY	Γ	'96

Other

*Bannister, Kenneth A.	PA	B	'82
Barr, Robert A.	IL	E	'85
Coffman, John R.	MA	B	'66
Dechman, Don A.	TX	A	'57
Fogel, Arlene Beck	MA	Δ	'77
*Griggs Jr., James L.	OH	A	'56
Handley, Vernon K.	GA	A	'86
Johnson, Roger W.	MN	A	'79
Jordan, R. Jeffrey	OK	Γ	'00
Kistler, Aaron J.	TX	H	'90
Lalinsky, Mark A.	MI	Γ	'77
Leonard, Wyatt A.W.	member-relative		
Marks, Lawrence B.	NY	I	'81
Marks, Benjamin Laxer, Teven	Son of member member-relative		
*Melton, Walter C.	TX	A	'56
Parks, Christopher J.	NY	Γ	'82
Riedesel, Jeremy M.	OH	B	'96
Roggli, Victor L.	TX	Γ	'73
*Schmidt, V. Hugo	WA	B	'51
Sigillito, Vincent G.	MD	B	'58
*Spong, Robert N.	UT	A	'58
Spring, Gary S.	MA	Z	'82
Summerfield, Steven L.	MO	Γ	'85
Zison, Stanley W.	CA	Θ	'83

\*Denotes correct bonus solution

FALL REVIEW

Regular Problem #2 (antimagic square) had 63 percent correct, #4 (pizza) had 74 percent correct, and the Bonus question (circles in sector) had 70 percent correct answers.

While 19 years is the most common difference between consecutive Blue Moons on New Year's Eve, it is not the average as some readers pointed out. One reader referred to a website that has results for 10,000 years and the average is 29.2 years. We accepted any of those answers.

WINTER ANSWERS

**1** PROPS + KUDOS = HOWARD translates to **60369 + 74839 = 135208**, and LABOR + OF + LOVE + FOR + OVER = 60 + YEARS translates into **25768 + 61 + 2604 + 168 + 6048 = 60 + 34589** if YEARS is prime. This problem, like Howard's tenure as a judge, is a long one! Unfortunately, we don't have enough space to include it here. For those of our readers who are interested, the complete solution is available at [www.tbp.org/pubs/brainTicklers.cfm](http://www.tbp.org/pubs/brainTicklers.cfm).

**2** Cate and Adam went to Doha, Dawn and Brad went to Elba, Emma and Chet went to Agra, Anne and Doug went to Bali, and Beth and Evan went to Cork.

Reflecting on Cate's statement, it is clear that regardless of whether she or her husband is the liar, she will recount the opposite of what is true. Emma is, therefore, married to Chet. Since Chet could not have gone to Elba, Dawn is clearly a liar, and Beth was not in Doha. Because of Dawn's prevarications, we know Adam lies (and cannot be married to Dawn) and Beth tells the truth when she states that she is not married to Adam. Since Adam cannot be married to Anne, he must be married to Cate who must speak with veracity. Doug goes to Bali, and, therefore, cannot be married to Beth, leaving only Anne as a possibility for his betrothed. This leaves Beth married to Evan, and Dawn as Brad's bride. Evan is a liar, so Chet did not go to Doha after all. Chet must have gone to Agra and Cate is the only lady who could have gone to Doha. Adam, therefore, did not travel to Elba—Brad did, and Evan must have gone to Cork; this completes the pairings.

**3** The latitude at which the sun is directly overhead at noon is  $\arcsin(\sin(23^\circ)\sin((t-t_{VE})(360^\circ)/Y))$  degrees, where  $Y$  is the length

of an Earth year. If the sun is directly overhead a given point on the Earth's surface, the latitude of this point is nothing other than the declination of the sun. Consider three great circles: the equator, the ecliptic (which crosses the equator at an angle equal to the Earth's axis tilt), and the hour circle which passes through both poles and the image of the sun on the ecliptic. These three circles form a spherical triangle. Let the length of the side on the ecliptic be  $a$  and note its associated angle is  $A = 90^\circ$ . The length of the side on the hour circle is the latitude  $b$ , with associated angle  $B = 23^\circ$ .

Using the law of sines for spherical triangles, we have  $\sin b/\sin B = \sin a/\sin A$ , which can be rearranged to give  $\sin b = \sin a \sin B/\sin A$ . Since a circular orbit is assumed, orbital speed is constant and, therefore, the length of  $a$  is directly proportional to the time since the sun transited the equator at the vernal equinox. As  $t_{VE}$  is known, we can write the proportionality as  $a = (t-t_{VE})(360^\circ)/Y$  since we know the sun will move  $360^\circ$  along the ecliptic over the course of an Earth year  $Y$ . Plugging this in and solving for  $b$  gives us the final result shown above.

**4** The wind speed was approximately **7.53 km/h**, and in calm air, the trip would take about **24.25 minutes**. We can write the expression of power exerted  $P = Fv$ , where  $F$  is the force used to overcome air drag. Since Griggs was able to cycle forward in spite of the headwind, and the tailwind has the same magnitude as the headwind, we need not concern ourselves with air *assistance*. As such, we know the force can be written as  $F = k(v_{\text{bike}} - v_{\text{wind}})^2$ , when we do not expect a negative  $F$ . If the morning trip of 10 km took 30 minutes, then  $v_{AM} = 20$  km/h. The afternoon trip took 20 minutes, so  $v_{PM} = 30$  km/h. Since power is constant, we can equate the power for the two one-way trips:  $k(v_{AM} - v_{wind})^2 v_{AM} =$

$k(v_{PM} + v_{wind})^2 v_{PM}$ . Cancelling  $k$  and plugging in the known values, and rearranging gives  $(20 + v_{wind})/(30 - v_{wind}) = \sqrt{(3/2)}$ . Solving for  $v_{wind}$  gives:  $v_{wind} = (30\sqrt{(3/2)} - 20)/(1 + \sqrt{(3/2)}) = 130 - 50\sqrt{6} \approx 7.53$  km/h. The power exerted in calm air today is once again the same, so we can write:  $k(v_{AM} - v_{wind})^2 v_{AM} = k(v_{today})^3$ . Cancelling  $k$  and plugging in the known values once again gives  $v_{today} = 10(750 - 300\sqrt{6})^{1/3} \approx 24.75$  km/h, and the time needed to complete a one-way trip is  $10/v_{today} = (1440(5 + 2\sqrt{6}))^{1/3} \approx 24.25$  minutes.

**5 The minimum number of crossings in the braid is six.** To achieve this, consider holding the leather such that the long dimension is vertical, with the dark-stained side facing you. Grab the bottom right corner and curve it around to the back of the strip so the dark-stained side is facing away from you. Slide this corner through the right slit from behind, and subsequently slide it through the left slit from the front. While holding the top of the leather strip in a fixed position, adjust things so the corner you were holding has switched places with the bottom left corner, both of which now have the light side showing. At this point, the top left strip has a half twist and ends at the bottom right, while the top right strip has a half twist and ends at the bottom left, and the middle strip has three half twists. Now, grab the bottom right corner again, and curve it around the front of the strip so that the dark-stained side briefly faces you as you swing it through the bottom of the left slit from behind and through the bottom of the right slit from the front. When done, hold the top of the strip fixed and adjust things so that the corner you are holding becomes the bottom left corner with the dark-stained side facing you once again. At this point there will be no half twists in any of the three strips, and there will be a total of six crossings. Incidentally, this process can be repeated for long strips. Each set of the above moves will result in another six crossings as the braid grows.

**Bonus.** One solution for the circumferences of the two spheres is: **415,280,564,497/348,671,682,660** and **676,702,467,503/348,671,682,660**. The solution to the Bonus is rather complicated, and we don't have enough space to include it here. For those of our readers who are interested, the complete solution is available at [www.tbp.org/pubs/brainTicklers.cfm](http://www.tbp.org/pubs/brainTicklers.cfm).

**Computer Bonus.** For primes greater than 14,713 and less than 1 billion, there are **5 sequences** of thirteen prime numbers with a maximum gap of 8 between primes. The first primes in each sequence are 86,966,771, 172,039,573, 296,931,731, 369,008,657, and 875,753,231.

### NEW SPRING PROBLEMS

**1** I started with 10 cards with a different digit on each card. After discarding one card, I used the remaining nine cards to form a two-digit prime, a three-digit prime, and a four-digit prime (with no leading zeros). Even if I told you what the sum of these three primes was, you would not be able to deduce the digit I discarded; but if, in addition, I told you that the middle two digits of the sum were each equal to the digit I discarded, then you would be able to deduce the sum of the three primes I found. What was that sum?

—Susan Denhan in *New Scientist*

**2** On each day of a non-leap year, I gave my daughter a new penny, which I obtained directly from the U.S. Mint and which I, consequently, assumed to be of standard weight. I learned, however, that there had been a minor production problem at the Mint one day during the year, and a few pennies had been released (I don't know on which day) that were heavier or lighter than standard. Assuming my daughter's penny collection contains at most one off-spec penny, what is the minimum number of weighings with a common two pan balance scale needed to determine whether or not she has an odd penny; and, if she

does, which is the odd penny and whether it is heavier or lighter than standard?

—The Puzzle Corner in *Technology Review*

**3** Solve the following cubic cryptarithm. All the usual rules apply: the same letter always represents the same digit, each digit is represented by a unique letter, and there are no leading zeros.

$$ABCDE = (A + B + C + D + E)^3$$

—Source Unknown

**4** Brag is a poker-like game played with a standard deck of 52 cards, but a hand consists of only three cards instead of the usual five. The possible hands that can be dealt are defined below:

- (1) Royal flush (AKQ in same suit)
- (2) Straight flush (sequence of 3 cards in same suit)
- (3) 3 of a kind (3 cards of same denomination)
- (4) Straight (sequence of 3 cards representing at least 2 different suits)
- (5) Flush (3 cards in same suit but not in sequence)
- (6) Pair (2 cards of same denomination plus an unmatched 3rd card)
- (7) High card (3 unmatched cards—2 or 3 different suits and 3 different denominations, not in sequence)

Aces can be high or low for a straight. How many of each type of hand are there? Present your answer as a table with 7 rows and 2 columns. Enter the numbers 1 to 7 in column 1 (no need to repeat the whole definitions); in column 2 list the number of different ways of being dealt each type of hand. Be careful not to double count. For example, if you count all the straight flushes, you will be counting the Royal Flushes twice.

—*The Ultimate Book of Card Games* by The Diagram Group

**5** What is the remainder when the number  $2^{4,700,063,497}$  is divided by 4,700,063,497?

—*Prime Numbers, the Most Mysterious Figures in Math* by David Wells

Brain Ticklers continue on page 32.

## BRAIN TICKLERS

Continued from page 31.

**Bonus.** Consider a chain (loop or circle) of length  $L = n(n+1)/2$  with links of integral lengths 1, 2, 3, 4, ...,  $n$ , occurring sequentially. You desire to tightly wrap the chain around three posts that form the vertices of an equilateral triangle with vertices a distance of  $S = L/3$  apart, so that the posts occur exactly at a break between two links. The smallest example of such a chain has  $n = 9$  links; for this chain,  $S = L/3 = 9(10)/6 = 15$ ; one post is between links 3 and 4, the second post is between links 6 and 7, and the third post is between links 8 and 9, so the three sides are  $(4 + 5 + 6)$ ,  $(7 + 8)$ , and  $(9 + 1 + 2 + 3)$ . What is the largest chain with less than 1,000 links that will form an equilateral triangle? What is the shortest chain that can be wrapped around 3 posts in more than one way? Make the usual simplifying assumptions: the chain and the corner posts have zero radii, there is no overlap where the ends of the chain join, etc.

— The Puzzle Corner in  
*Technology Review*

**Computer Bonus.** Find three consecutive triangular numbers whose sum is a perfect square. The first such set is  $15 + 21 + 28 = 64 = 8^2$ . What is the third such set? A triangular number is a number of the form  $n(n + 1)/2$ , where  $n$  is a positive integer.

—*Elementary Number Theory*  
by David M. Burton

Postal mail your answers (the method of solution is not necessary) to any or all of the Brain Ticklers to **Dylan Lane, Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697** or email to [BrainTicklers@tbp.org](mailto:BrainTicklers@tbp.org) as plain text only. The cutoff date for entries to the Spring column is the appearance of the Summer *Bent* which typically arrives in mid-June. (The digital version is a few days earlier). We welcome any interesting problems that might be suitable for the column. The Computer Bonus/Double Bonus is not graded. Dylan will forward your entries to the judges who are **F.J. Tydeman, CA Δ '73**; **J.C. Rasbold, OH A '83**; **J.R. Stribling, CA A '92**; and the columnist for this issue,

— **H.G. McIvried III, PA Γ '53**

## TWO CHAPTER PETITIONS RECEIVED

Two petitions for new collegiate chapters of Tau Beta Pi have been received.

The Tau Engineering Honor Society has operated at Georgia Southern University since 2017. The institution is a public research university with a flagship campus in Statesboro. Founded in 1906 as a land grant college, Georgia Southern is the fifth largest institution in the University System of Georgia and is the largest center of higher education within the southern half of Georgia. Georgia Southern is classified as a Doctoral and Research Institution and consists of eight primary colleges.

In 2010, Georgia Southern received approval to offer three new engineering degrees: bachelor of science in civil engineering, bachelor of science in electrical engineering, and the bachelor of science in mechanical engineering.

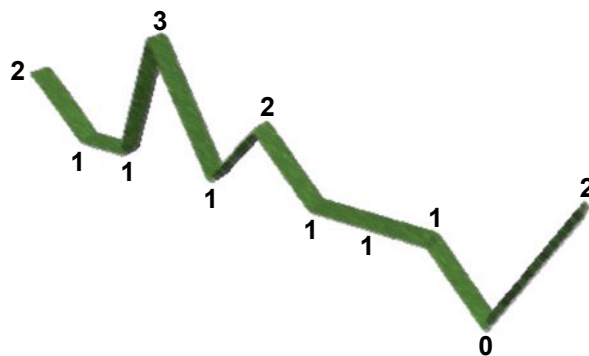


Chart above is the number of new chartered chapters per year of Tau Beta Pi in the last eleven years (2010 thru 2020).

As of March 2020, the total number of TBPi collegiate chapters will be 256, with six inactive chapters.

Petitioning chapters must be approved by the Executive Council and the Convention. Georgia Southern would be TBPi GA Gamma Chapter and Merrimack College would be TBPi MA Iota Chapter.

The Merrimack College of Engineering Honor Society has operated at Merrimack College since December 13, 2017. The institution is a selective, private college in Boston, Massachusetts. It was founded in 1947 in North Andover, Massachusetts, by the Order of St. Augustine with “an initial goal to educate World War II veterans.”

The college features more than 100 career-focused undergraduate, professional, and graduate programs. Three engineering bachelor's degrees are offered in civil, electrical, and mechanical.

The campus encompasses 220 acres and 40 buildings with the library named after the founder of the college, Rev. Vincent A. McQuade.



## **Judy and Ron Pasadyn, OH Epsilon '70 Endowed Scholarship**

**“Thank you for the news about the Judith L. and Ronald C. Pasadyn Scholarship for a chemical or biomedical engineering student in our Ohio Epsilon Chapter at Cleveland State University.**

**Send along my thanks from all of us here for this most generous donation. It is alumni donations like this that allow TBP, and our local collegiate chapters, to continue the great work we do for the student members, for our local communities, and for the engineering profession in general.”**

**Best Regards, Ed Basta, OH E '82  
Non-Faculty Advisor, OH E;  
Member, Ohio's North Coast Alumni Chapter (ONCAC);  
Past TBP President**



**Undergraduate Scholarships:** \$2,000 gift—one year award | \$40,000 gift—permanently endows one scholarship.  
**Graduate Fellowships:** \$10,000 gift—one year award | \$200,000 gift—permanently endows one fellowship.

**For more information about establishing a Fellowship or Scholarship, contact Sherry Jennings-King, TN A '93, [sherry.jenningsking@tbp.org](mailto:sherry.jenningsking@tbp.org) or 612/226-2922.**

PEOPLE

**Andrew P. Armacost, Ph.D.** (Brig. Gen.), *Illinois Gamma '89*, has been selected as the next president of the University of North Dakota. He previously served as Dean of the Faculty at the U.S. Air Force Academy and has 30 years of active duty. His bachelor's degree in industrial engineering is from Northwestern University.



**David W. Barnett, D.Sc.**, *Washington Alpha '87*, has been named Provost and Vice President (academic) of Lakehead University (Canada). Previously, he served as Dean of Faculty Engineering and Interim Provost, earned a bachelor's degree in electrical engineering from Bradley University, and worked on electromagnetic signature analysis in the aerospace industry.



**Joanne M. Belovich, Ph.D.**, *Pennsylvania Gamma '85*, has been appointed Interim Dean of the Washkewicz College of Engineering at Cleveland State University. Her research specialties include transport in biomedical systems and in biofuel production. She also serves as an Ohio Epsilon Chapter Advisor.



**Mung Chiang, Ph.D.**, *California Gamma '00*, is Dean of Engineering at Purdue University and will take a one-year leave of absence to provide vital expertise to the U.S. Department of State on the economic security of the nation's global technology initiatives, such as artificial intelligence, energy infrastructure, and trusted microelectronic chips.



**Susan K. Fullerton, Ph.D.**, *Pennsylvania Beta '02*, received the 2019 Marion Milligan Mason Award from the American Association for the Advancement of Science for extraordinary research contributions in ion transport at the molecular level and for moving the field forward towards next-generation electronic devices. She is an assistant professor at Univ. of Pittsburgh.



**Tevis D. Jacobs, Ph.D.**, *Pennsylvania Delta '03*, received a CAREER Award from the National Science Foundation to improve nanoparticle performance and advance the understanding of micro- and nano-surfaces. He is an assistant professor in the mechanical engineering and materials science department at the University of Pittsburgh.



SPOTLIGHT

**Research Helping Coral Survive**

Part of a multi-university team **Nastassja A. Lewinski, Ph.D.**, *TX G '06*, is researching ways to help coral survive. She is an assistant professor at Virginia Commonwealth University and is receiving funds over two years as part of a larger National Science Foundation grant to develop a line of similar coral cells and to investigate changes at the cellular level in coral biomineralization, symbiosis, and wound healing in response to various chemicals.

"Corals have primarily been studied at the organism level, both in nature and in aquaria," Dr. Lewinski said. "In this project, we will study coral at the cellular and polyp levels in order to better capture molecular changes."

She also serves as the Chief Advisor to the Virginia Epsilon Chapter of Tau Beta Pi.

**The Prize Money for the Defense Advanced Research Projects Agency**

**Competition** was won by a team from the University of Florida (GatorWings) and has now been given to the lead researchers to distribute as they wish. There had been a university policy declaring prize money belonged to the university, but now the team, including professor **John M. Shea, Ph.D.**, *SC A '93*, will share the \$2 million prize. The university's administration said future decisions about enacting such a policy would be determined through collective bargaining.

"Our goal is to reward the people whose hard work and ideas enabled us to be successful in the competition," Dr. Shea said.

With his cut, Shea plans to take his family on a nice vacation. "They didn't get to see much of me, at times, for three years," he said.

## PEOPLE

**Bruce E. Jarrell, M.D., Delaware Alpha '69**, has been named Interim President of the University of Maryland, Baltimore. Previously, he served as Executive VP, Provost, and Dean of the University's interdisciplinary graduate school. His bachelor's degree is in chemical engineering from the University of Delaware.



Credit Matthew Paul D'Agostino

**Kevin S. Jones, Ph.D., Florida Alpha '80**, a distinguished professor in materials science and engineering at the University of Florida, was awarded a 2019 SEC Faculty Achievement Award from the Southeastern Conference. The award recognizes faculty with outstanding records in research and scholarship.



**Ann R. Karagozian, Ph.D., California Epsilon '78**, has been appointed the inaugural director of The Promise Armenian Institute by the UCLA International Institute. She is also a distinguished professor of engineering, serves on the board of trustees of the American University of Armenia, and is a CA Epsilon Chapter Advisor.



**Ka Yee C. Lee, Ph.D., Rhode Island Alpha '86**, has been named Provost of the University of Chicago. Previously, she was a professor in the department of chemistry and Vice Provost for Research at UChicago. Her undergraduate degree is in electrical engineering from Brown University.

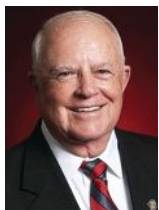


Credit Jean Lachat

**Nathan S. Mosier, Ph.D., Nebraska Alpha '97**, has been appointed department head of agricultural and biological engineering at Purdue University, where he is also a professor. His research focuses on biofuels, bioprocess engineering, and bioseparations and he has been inventor on four awarded U.S. and international patents.



**Randall A. Odom, Texas Lambda '57**, was inducted into the Texas A&M University-Kingsville College of Engineering Hall of Fame for 2019. His 40-year career in the oil and gas industry included serving as vice president of three corporations and being recognized as a supercomputing expert in the field of seismic data processing.



**Sarah J. Watzman, Ph.D., Ohio Gamma '13**, received the U.S. Dept. of Energy's Early Career Research Award for research focused on recovering waste heat in products such as automobiles and converting it into electricity using magnetic fields. She is an assistant professor of mechanical engineering at the University of Cincinnati.



**A. Scott Weber, Ph.D., New York Nu '77**, has been named Provost and Executive Vice President for Academic Affairs at the University at Buffalo. He has served as a professor of civil engineering, VP for student life since 2017, and as interim provost since September. His bachelor and master's degrees are in civil engineering from Virginia Tech.



## FACILITIES

**South Dakota School of Mines & Technology** has received a \$3.6 million donation, the largest in school history, from the estate of Willard and Billie Kaye Goodman for the department of civil engineering. The gift doubles the department's operating budget and will provide opportunities for lab facilities, faculty endowments, and graduate student stipends.

**University of Maine** will receive \$1 million from Pratt & Whitney to help bring new technology to students as part of a new engineering center. The groundbreaking is expected for spring 2020 and there are plans to name the center's machine tool suite and provide updated space for mechanical technology students in recognition of Pratt & Whitney's support.

**University of Virginia** is the recipient of the largest donation in the School of Engineering's history from alumnus Greg Olsen, who was persuaded by the late UVA Engineering Associate Dean **Avery Catlin, Ph.D., VA A '44**, to pursue his graduate degree. The gift will enable UVA to recruit and retain scholars, endow graduate fellowships, and fund resources for the dean's strategic investment.

**Centenarians**

- Tenho S. Connable, *MI* Γ '42  
b. September 6, 1919
- Edwin F. Goodman, *NY* Γ '41  
b. April 27, 1919  
d. January 18, 2020
- Howard E. Grantz, *NY* Z '39  
b. June 20, 1917  
d. November 20, 2019
- Vincent U. Muirhead, *KS* A '41  
b. February 6, 1919  
d. April 30, 2019
- Norman R. Scott, *MI* Γ '41  
b. May 15, 1918  
d. August 30, 2018
- Nelson B. Tharp, *IL* Γ '41  
b. July 6, 1919  
d. January 10, 2020



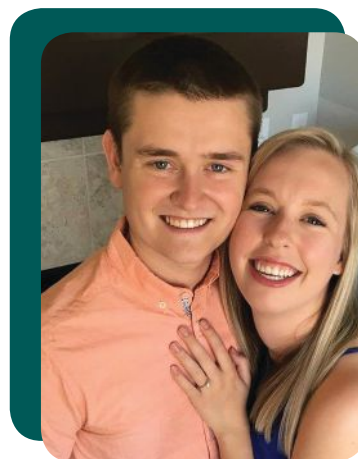
Tenho celebrated her 100<sup>th</sup> birthday with a "dance the night away" Century Ball.

**Bi-Spousal**

- Emily K. Behan, *UT* Γ '19  
Jacob W. Behan, *UT* Γ '19
- Charis J. Ellis, *CO* Δ '19  
Zachary S. Ellis, *CO* Δ '19
- Gary D. Fryer, *WA* B '68  
Sandra K. Fryer, *WA* B '69
- Raymond M. Guydosh, *PA* Γ '67  
Ruth E. Guydosh, *PA* Γ '69
- Jean-Celeste M. Kampe, *MI* B '80  
Stephen L. Kampe, *MI* B '81
- Brenda R. McLaury, *OK* B '93  
Brenton S. McLaury, *OK* B '91
- Garland B. Milholen, *KY* B '79  
Linda S. Milholen, *GA* A '70
- John W. Norton Jr., *MI* Γ '06  
Jessica R. TerBush, *MI* Γ '03
- Robert L. Olberding, *TN* A '82  
Terry D. Olberding, *TN* A '78
- Katharine A.S. Padulo, *CA* Γ '68  
Louis Padulo, *CA* Γ '53
- Margaret S. Skujins, *WV* A '69  
Ojars Skujins, *WV* A '68
- Brandi M. Stevens, *OH* Θ '17  
Kevin C. Stevens, *OH* Θ '14

**Siblings**

- The Alsharari Brothers  
Fahd, *KS* B '19  
Sattam S. Sr., *KS* B '20
- The Aufdenberg Twins  
Andrew, *MO* A '21  
Nathan A., *MO* A '21
- The Babiec Brothers  
Joseph R. Jr., *MA* B '91  
Walter E., *MA* B '95
- The Balasingam Siblings  
Arjun V., *CA* Γ '18  
Namrata, *CA* Γ '19
- The Blazanin Siblings  
Gina M., *ND* A '20  
Scott A., *IA* A '19
- The Bryan Twins  
David W., *OR* Γ '21  
Gregory J., *OR* Γ '21
- The Budnik Siblings  
Daniel J., *CT* B '81  
Eileen M., *CT* B '85
- The Brunton Twins  
Ann M., *AZ* A '20  
Edward D., *UT* Γ '19
- The Collingwood Twins  
Bruce I., *MA* Z '84  
Jeffrey F., *MA* Z '84
- The Diamantides Sisters  
Leah C., *PA* E '20  
Nicole C., *PA* H '14
- The Effiong Sisters  
Precious M., *TX* K '20  
Unyime M., *TX* K '19
- The Estrada Twins  
Jaime Jr., *CA* I '21  
Jonathan, *CA* I '21
- The Greeley Brothers  
Duncan A., *TN* A '16  
Ian M., *TN* A '20
- The Greenlee Twins  
Aidan J., *ME* A '21  
Liam, *ME* A '21
- The Haces-Garcia Twins  
Arturo, *TX* Λ '20  
Francisco, *TX* Λ '19
- The Keys Brothers  
Jeremy F., *KY* A '20  
Samuel W., *KY* A '20
- The Klimek Brothers  
Jared I., *OH* N '19  
Ryan W., *OH* N '21
- The Kohls Brothers  
August M., *OH* B '20  
Noah D., *OH* B '19
- The Kotter Brothers  
Caleb A., *CO* A '20  
Joshua H., *KY* B '18
- The LeBeau Brothers  
Francis W., *VA* A '92  
Raymond P., *VA* A '90
- The Lukas Brothers  
Brandon E., *IL* Z '19  
Michael J., *IL* Z '19
- The Macke Brothers  
Christopher J., *IN* A '11  
Eric J., *IN* Γ '09
- The Meacham Twins  
Rachael, *NY* Θ '21  
Rebecca, *NY* Θ '21
- The Mencin Sisters  
Jennifer M., *CO* A '19  
Pamela S., *CO* A '07
- The Michels Twins  
Colin T., *TX* Δ '19  
Connor A., *TX* Δ '19



Zachary and Charis (Tinker) Ellis were married in Fort Collins, CO, on August 11, 2017. Both graduated from Colorado State University with engineering degrees.

## Siblings

### The Oikonomou Brothers

Michail, *NY A '18*  
Panagiotis, *NY A '20*

### The Oran Brothers

Haluk, *MO A '76*  
Kenan, *MO A '78*

### The O'Reilly Twins

Andrew, *CT B '21*  
Timothy, *CT B '21*

### The Parlier Sisters

Noelle M., *WA Γ '02*  
Samantha A., *WA Γ '99*

### The Penkowski Sisters

Blasine, *IN A '84*  
Cheryl A., *IN A '83*

### The Peterson Twins

George B., *IA A '19*  
Thomas G., *IA A '19*

### The Rochat Brothers

Raymond A., *TN A '57*  
Vernon E., *TN A '58*

### The Roose Brothers

Charles E., *AZ B '86*  
Gerald R., *AZ B '79*

### The Saccucci-Bryan Brothers

Aidan L., *NY Σ '22*  
Liam G., *NY Σ '19*

### The Sarraffe Brothers

John J., *IN Δ '84*  
Paul R., *IN Δ '83*

### The Schaffer Twins

Eric J., *IA B '20*  
Mitchell, *IA B '20*

### The Schuh Brothers

Daniel R., *IL A '15*  
Jonathon K., *IL A '13*

### The Shine Twins

Brendan M., *NJ A '21*  
Timothy M., *NJ A '20*

### The Shumate Twins

Rachel N., *LA Γ '19*  
Rebecca P., *LA Γ '19*

### The Sizemore Siblings

Joseph D., *WI B '20*  
Mary K., *WI B '19*

### The Slominski Twins

Matthew R., *NY N '20*  
Tyler J., *NY N '19*

### The Sorkin Twins

David, *OH Ξ '21*  
Matthew P., *OH Ξ '21*

### The Squeri Twins

Andrea N., *NY Γ '20*  
Jessica M., *NY Γ '20*

### The Stackhouse Siblings

Joshua A., *CO A '20*  
Nicole T., *CO A '19*

### The Vitter Siblings

Jeffrey S. Jr., *IN Γ '10*  
Jillian St. R., *IN Γ '07*

### The Wegman Brothers

Clem J., *OH Θ '87*  
Robert S., *OH Θ '88*

### The Wessel Siblings

Allen B., *IN A '97*  
Andrea D., *IN A '98*

### The Widman Brothers

Douglas C., *NJ B '73*  
Elmer R., *NJ B '71*

### The Zappi Brothers

Alex M., *LA Δ '21*  
Kyle E., *LA Δ '18*

## Multi-Generation

### The Anglin Family

Richard L. Jr., *OH A '67* (father)  
Brian R., *CA Δ '18* (son)

### The Attenweiler Family

Andrew N., *OH Θ '86* (father)  
Craig J., *OH Θ '15* (son)

### The Bowlus Family

†Omer E., *IN A '35* (father)  
Daniel A., *IN A '59* (son)

### The Brown Family

Martin J. Jr., *KY B '87* (father)  
Marty VI, *KY B '19* (son)

### The Bucknell/Rauth Family

†Richard L., *WA A '53* (father)  
Terry Jean B. Rauth, *FL A '77* (daughter)

### The Bussett Family

Gary, *CA Ξ '83* (father)  
Kyle H., *CA Ξ '19* (son)  
Neal T., *CA Ξ '09* (son)

### The Cadman Family

Theodore W., *PA Γ '62* (grandfather)  
Marcus B., *VA B '13* (grandson)  
Julia A., *VA B '20* (granddaughter)

### The Chirgwin Family

William A., *NH A '83* (father)  
Christopher W., *NH A '12* (son)

### The Colwell Family

†William T., *IL A '20* (grandfather)  
Tracy B., *CA A '91* (grandson)

### The Cwiertny Family

Anthony J., *GA A '65* (father)  
David M., *CA A '00* (son)

### The Devine Family

Nancy A., *IN A '86* (aunt)  
Monika K. Hoke, *OR A '19* (niece)

### The Durkee Family

Brian E., *TN Δ '87* (father)  
Ryan J., *TN A '20* (son)

### The Dyess Family

†James R., *MS A '70* (father)  
Matthew B., *MS A '04* (son)  
Mark V., *MS A '07* (son)

### The Fagel/Payne Family

Lawrence W., *NJ A '59* (grandfather)  
Christopher D. Payne, *PA Z '18* (grandson)

## Multi-Generation

### The Frei Family

Scott D., *UT B '94* (father)  
Joshua S., *UT B '19* (son)

### The Garbecki Family

Brian E., *MA I '95* (father)  
Matthew B.R., *NY Γ '20* (son)

### The Hausheer/Pugh Family

Thomas G., *IL B '70* (father)  
Elizabeth R. Pugh, *IN A '12* (daughter)

### The Hokay Family

Sanjay H., *CO Δ '81* (father)  
Nikhil, *IL Γ '14* (son)  
Maya M., *PA Γ '17* (daughter)

### The Kadoma Family

Ignatius A., *VA A '91* (father)  
Atte, *IA A '20* (daughter)  
Kowe, *FL H '21* (daughter)

### The Kalshoven Family

James E. Jr., *TN A '69* (father)  
Josephine M., *NH B '19* (daughter)

### The Kelly/Vandevoorde Family

John B., *OH Θ '67* (grandfather)  
Colleen A. Vandevoorde, *LA B '91* (daughter)  
Christine M. Vandevoorde, *CA A '16* (granddaughter)  
Nicolas B. Vandevoorde, *CA E '19* (grandson)

### The Kovach Family

Ronald M., *OH Γ '59* (father)  
Karl D., *OH Γ '85* (son)  
Kyle M., *PA Λ '09* (grandson)

### The Lim Family

Boon Ng, *KS B '87* (mother)  
Chantelle Y.Y., *NY K '19* (daughter)

### The Lombardi Family

Charles O., *AZ B '86* (father)  
Charles M., *AZ B '18* (son)

### The Longwell Family

Harry J. Jr., *LA A '63* (grandfather)  
Paxton J., *LA A '86* (father)  
Madison E., *LA A '17* (daughter)  
Harrison J., *LA A '19* (son)

### The Margetts Family

John R., *UT Γ '97* (father)  
Adam R., *UT Γ '00* (brother)  
Kathryn, *UT Γ '20* (daughter)

### The Marino Family

†Salvador A., *AL A '51* (father)  
Sal M., *AL A '91* (son)

### The McKetta Family

John J. Jr., *TX A '36* (father)  
Robert A., *TX A '72* (son)

### The McLaury Family

M. Wayne, *OK B '62* (grandfather)  
Brenton S., *OK B '91* (father)  
Brenda R., *OK B '93* (mother)  
Cameron S., *OK B '20* (grandson)

### The Messuri Family

Dominic A., *OH Λ '75* (father)  
Michael D., *OH Λ '17* (son)  
Marie, *OH Λ '20* (daughter)  
Anthony, *OH Λ '20* (nephew)

### The Parker/Bebel Family

Alice C., *NC A '70* (mother)  
Joseph C. Bebel, *CA Δ '08* (son)

### The Peterson Family

Michael L., *IA A '89* (father)  
Luke M., *MI Γ '19* (son)  
Zach A., *MI Γ '19* (son)

### The Petitbon Family

John B., *LA A '86* (father)  
Christiane E., *LA A '19* (daughter)

### The Pratt/Kowalski Family

Victor W., *MI Z '59* (grandfather)  
Colleen P. Kowalski, *MI Θ '17* (granddaughter)



Donald P. Sheeran, *OR B '19*, and son Jacob graduated together from Portland State University on Father's Day 2019.

Don (right) earned his bachelor's degree in mechanical engineering while working at CenturyLink.

His son Jacob (left) earned his bachelor's degree in electrical engineering and is now pursuing a graduate degree.

## Multi-Generation

The Replogle Family  
 †Joe O., *PA B '52* (father)  
 Kriss K., *MA B '82* (son)

The Rohde Family  
 Steve M., *NJ F '67* (father)  
 Mitchell M., *MI F '94* (son)

The Roundy Family  
 Jared C., *UT F '94* (father)  
 Caitlin, *UT F '20* (daughter)

The Schlak Family  
 Gerard A., *CO B '62* (father)  
 Robert P., *TX B '91* (son)

The Sciacca Family  
 Joan M., *CA M '87* (mother)  
 Jacob, *AZ B '14* (son)

The Shehata Family  
 Sherif T., *MD B '89* (father)  
 Sahar S., *MD B '19* (daughter)

The Spiratos/Synnott Family  
 George A., *RI B '61* (grandfather)  
 Kristin E. Synnott, *FL Δ '18* (granddaughter)  
 (Pictured below)

The Stein Family  
 †Ralph P., *NY Δ '49* (father)  
 S. Joshua, *IL Z '91* (son)

The Stephan Family  
 †David G., *OH F '52* (father)  
 Dean D., *OH B '81* (son)

The Toole Family  
 Joe L. II, *TX K '91* (father)  
 Joe L. III, *TX K '18* (son)

The Turnbull Family  
 Eric W., *AL A '43* (grandfather)  
 Sandra M., *MI F '03* (granddaughter)

The Van Hoften Family  
 James D.A., *CA A '66* (father)  
 Jamie J., *CA F '99* (daughter)

The Vozza Family  
 Angelo O. Jr., *MI A '92* (father)  
 Angelo O. III., *MI F '18* (son)

The Wakumoto Family  
 Steve R., *CO Δ '82* (father)  
 Sarah R.M., *CO Δ '20* (daughter)

The Walters Family  
 †Roy H., *WI A '33* (grandfather)  
 Warren C. Roos, *OH A '99* (grandson)

The Wolock Family  
 †Irvin, *MD A '43* (father)  
 †Melvin M., *MD A '48* (brother)  
 Bruce S., *MD A '79* (son)

The Yamartino Family  
 †Ernest J. Sr., *MA E '47* (father)  
 Ernest J. Jr., *MA Δ '72* (son)

The Zola Family  
 Jeffrey S., *NY Δ '91* (father)  
 Matthew, *CO B '21* (son)

The Zotos Family  
 †John, *MA E '54* (father)  
 Frederic P., *MA E '87* (son)



Kristin Synnott with her grandfather George Spiratos.

“Papou” worked for the Naval Underwater Ordnance Station and retired as a mathematics teacher.

Kristin is an industrial engineer with the Siemens Energy Co.

## ALUMNI GATHERINGS



The Albuquerque Alumni Chapter was installed on January 18<sup>th</sup> by Executive Director Curtis Gomulinski, *MI E '01*.

The TBP Executive Council was also present after attending their in-person January meeting in Albuquerque.

There are 46 active TBP Alumni Chapters.

Interested in joining an alumni chapter? Contact the Director of Alumni Affairs, Tricia Gomulinski, [tricia@tbp.org](mailto:tricia@tbp.org) or visit [www.tbp.org?area=Alumni](http://www.tbp.org?area=Alumni) to check on alumni events.



The North Carolina Alpha Chapter and Research Triangle (NC) Alumni Chapter co-hosted an Alumni Panel at NC State University on January 21, 2020. Students from NC Alpha, NC Zeta, and Campbell University tapped the panel's expertise with a broad array of questions, such as: What skills transfer between jobs and fields? and How to choose a graduate advisor?

Distinguished alumni panelists—from a Microsoft software engineer, to a Duke University MD/Ph.D. student, to a NC State Professor of chemical engineering—shared helpful tips and advice. Afterwards, the group networked and socialized. Special thanks to Robert Goldman, *NY T '80*, Erika Chelales, *LA B '18*, Catherine Wagner, *NC A '20*, the Research Triangle Alumni Chapter, and the NC Alpha Chapter officers for organizing the event.

Image credit: Meriem Laroussi, *NC A '22*, and summary courtesy of Emily J. Mengel, *MS A '11*.

## ALUMNI GATHERINGS



The officers of the Ohio North Coast Alumni Chapter (Cleveland/Akron) held their annual planning meeting in January to map out the scaffold of activities for 2020. Left to right: Matthew J. Walsh, *FL Z '14*, (Secretary), Adam E. Wallaart, *OH E '18*, (Vice President), Shelton D. Caruthers, Ph.D., *IA Γ '89*, (President), and Bradley L. Paton, *OH Γ '85*, (Treasurer).

The Puget Sound Alumni Chapter held a winter social at a Seattle boutique winery. The attendees used the opportunity to elect new officers. Those in attendance were a representative cross section of the chapter's membership in terms of their geographical distribution and career status. Check out our upcoming events and activities on our website <https://tbppsac.wordpress.com/> If you're just traveling through the Seattle area, reach out to us, we would love to meet you!

The Tau Beta Pi Alumni Retreat is scheduled for May 15-16 in Knoxville, TN. Activities include a tour of TBPI HQ, "Tales about TBPI – A Look at Interesting TBPI Tidbits" with Executive Director Curt Gomulinski, workshops, and a final dinner at Calhoun's On The River. The event is aimed at alumni chapter officers but all TBPI alumni are invited to attend. Register by Thursday, May 7, 2020.

[www.tbp.org?Retreat](http://www.tbp.org?Retreat)

## HEADQUARTERS VISITORS

**George A. Brown**, *TN B '55*, Rochester, NY; July 10, 2019.  
**Rev. Richard R. Andre**, *NY K '96*, Austin, TX; September 3, 2019.  
**Katy L. Colbry**, Ph.D., *MI A '99*, Okemos, MI; September 13, 2019, and January 20, 2020.  
**Stacey L. Forkner**, *WI A '96*, Waterford, WI; September 13, 2019.  
**C. Craig Smith**, P.E., *TN E '80*, Knoxville, TN; September 13, 2019.  
**Lauryn N. Carver**, *OK A '19*, Norman, OK; October 24, 2019.

**Daniel S. Karami**, *OK A '19*, Norman, OK; October 24, 2019.  
**James D. Froula**, P.E. (ret.), *TN A '67*, Farragut, TN; November 20, 2019.  
**John P. Nelms**, *TN G '20*, Cookeville, TN; January 15, 2020.  
**Michael L. Peterson**, *IA A '89*, Waterford, MI; January 20, 2020.  
**Menna M. Youssef**, Ph.D., *VA G '04*, Burke, VA; February 20, 2020.  
**George Youssef**, *NJ G '01*, Bloomfield, NJ; February 21, 2020.

The condensed style of these notices of death is made necessary by the Association'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 Tau Bates, 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](mailto:chapter.eternal@tbp.org).

AL A '45 **James, Jesse Clopton**; April 11, 2019.  
 AL B '35 **Boniface Jr., Edmund A.**; December 25, 2007.  
 '52 **Croxton Jr., Eugene Luke**; December 14, 2018.  
 AZ B '97 **Evans III, Ralph Carroll**; October 5, 2019.  
 AR A '50 **Wikman, Andrew Olaf**; January 1, 2018.  
 '58 **Powers, Thomas Lee**; no details.  
 '65 **Glass, Ronald Wayne**; October 30, 2019.  
 CA A '41 **Krueger, William Jensen**; July 24, 2004.  
 '48 **Harris, Bruce Jerome**; September 15, 2019.  
 CA B '50 **Corbató, Fernando José**; July 12, 2019.  
 '55 **Dryden, Eugene Hunter**; December 31, 2019.  
 '61 **Brown, Lawrence David**; February 21, 2018.  
 CA Γ '49 **Maneatis, George Arthur**; December 17, 2018.  
 '58 **Codiga, Richard Maurice**; November 10, 2019.  
 CA Δ '48 **Pryor, John Andrew**; no details.  
 '58 **McMakin, Robert Gordon**; February 22, 2013.  
 CA E '51 **Allinson, William Lyman**; December 29, 2019.  
 '58 **Mortenson, Lee Newel**; October 5, 2018.  
 '59 **Miyamoto, Jimmy Yuko**; August 23, 2013.  
 CA Z '63 **Hensley, Henry Paul**; March 31, 2019.  
 CA H '17 **Carlberg, Tyler Ross**; July 19, 2019.  
 CA M '81 **Hamilton, Nancy Jeanne**; October 24, 2019.  
 CA P '58 **Liao, Sam Y.**; no details.  
 '62 **Brahma, Chandra Sekhar**; February 3, 2020.

### IN MEMORY

**Chandra Brahma, Ph.D., California Rho '62**, passed away at the age of 78. He was the first awarded ASCE Outstanding Civil Engineer, the first CSPE Outstanding Professional Engineer (Central Valley), and 1997 TBII Distinguished Alumnus. He also chaired the ASCE committee on minority programs.

CO B '42 **Fricke, Roger Henry**; August 11, 2006.  
 '44 **Vick-Roy, Thomas Rogers**; March 26, 2018.  
 '46 **Ross, James Knox**; August 28, 2018.  
 '47 **Behring, William E.**; March 16, 2018.  
 '48 **Coloff, Pete**; February 13, 2018.  
 '77 **McKittrick, Joanna M.**; November 15, 2019.  
 CO Δ '54 **Baldwin, Lionel Vernon**; June 26, 2019.  
 '90 **Sorensen, Clayton Duane**; March 13, 2018.  
 DE A '51 **Cantera, Nicholas**; November 9, 2019.  
 '58 **Alsworth, Robert Fay**; September 21, 2019.  
 FL A '58 **Leduc, Kenneth Clayton**; October 10, 2009.  
 FL Γ '50 **Luce, John Wharton**; January 2, 2020.  
 '76 **Guliani, Karen Rose Marie**; November 8, 2016.  
 FL H '95 **Todd, Robert Wade**; October 17, 2017.  
 GA A '36 **Brown, James Goodwyn**; February 19, 2015 [Cent].  
 '36 **Moore Jr., Thomas Carlyle**; July 3, 2008.  
 '47 **Joiner, Walton Burgin**; May 6, 2018.  
 IL A '35 **Clark, James Gordon**; no details.  
 '41 **Kuehn, Ralph Erwin**; no details.  
 '44 **Schmitz, William R.**; November 24, 2017.  
 '48 **Geraldson Jr., Gerald**; June 4, 2012.  
 '52 **Gibson, Richard Ernest**; September 10, 2018.  
 '58 **Wolfe, Gene Henry**; April 15, 2018.  
 '63 **Massey, James Weston**; November 20, 2019.  
 IL B '50 **Krueger, Robert Gustav**; November 23, 2008.  
 '72 **Divine, Larry John**; November 17, 2019.  
 IL Γ '41 **Tharp, Nelson Beach**; January 10, 2020.  
 '45 **Crane, Morton Jack**; December 19, 2019.  
 '48 **Starrett, David Edward**; May 15, 2004.  
 '65 **Drummond, William Eric**; January 17, 2020.  
 IL Δ '46 **Turner, John Sanford**; January 18, 2017.  
 IN A '42 **Smith, Joseph E.**; June 26, 2019.  
 '45 **Garber, William**; July 12, 2016.  
 '45 **Peters, Norman Kenneth**; March 16, 2019.  
 '46 **Radavich, John F.**; November 29, 2019.  
 '46 **Younger, William Harvey**; no details.  
 '49 **Fiedler, Howard Charles**; February 6, 2018.  
 '49 **Sidenstick, James Edgar**; March 12, 2002.  
 '50 **Andes II, Charles Scovil**; August 16, 2017.  
 '50 **Blaisdell, William Horace**; November 25, 2014.  
 '50 **Carson, Robert Leslie**; December 12, 2019.  
 '50 **Tam, George Merlin**; June 4, 2010.  
 '51 **Stainback Jr., Frank Pleasants**; June 8, 2008.  
 '52 **Wieland, Earl Randolph**; December 3, 2019.  
 '57 **Hercamp, Richard Dean**; February 3, 2020.  
 '59 **Clack, Randall Gene**; February 20, 2015.  
 '59 **Dillmann, Charles Warner**; June 22, 2010.  
 '59 **Fair, Donald Max**; July 13, 2006.  
 '70 **Wolford, James Carroll**; December 1, 2019.  
 '73 **Von Fange, Reinold Meier**; October 20, 2019.  
 IN B '45 **Maienschein, Fred Conrad**; February 3, 2020.  
 '47 **Brand, George William**; May 23, 2019.  
 '68 **Gerhart, Philip M.**; January 27, 2017.  
 IA A '41 **Chaloud, John Hoyt**; November 19, 2014.  
 '49 **Schult, Eugene Duane**; December 18, 2019.  
 '56 **Andersen, Robert Marinus**; December 5, 2019.  
 '58 **Steddom, John William Newton**; June 2, 2006.  
 IA B '50 **Fuller, Ray Alvin**; December 18, 2019.  
 '54 **Gyrog, Donald Alex**; February 7, 2007.  
 '56 **Baker, Bill Richard**; January 6, 2020.  
 KS A '35 **Dickie, Herman Ford**; October 27, 2004.  
 '41 **Muirhead, Vincent Uriel**; April 30, 2019 [Cent].  
 '46 **Smith, Robert Emmett**; September 8, 2019.  
 '49 **Robinson, John Hamilton**; December 26, 2013.  
 '51 **Halstead, John Louis**; April 18, 2002.  
 '53 **Swift, George W.**; January 20, 2008.  
 '54 **Douglass, Lee Seymour**; February 12, 2016.  
 '55 **Westlake, Joseph Edward**; November 30, 2019.  
 KS B '58 **Shumard, Jack Lee**; December 13, 2016.  
 KS Γ '50 **Cutler, Verne Clifton**; June 18, 2018.  
 '18 **Cook, Jeffrey Robert**; December 29, 2018.  
 KY A '49 **Noble, David H.**; January 21, 2020.  
 '57 **Webster, John Reid**; September 11, 2019.  
 '59 **Hoskins, Raymond Eugene**; October 13, 2016.  
 '60 **Conger, William Lawrence**; no details.  
 KY B '58 **La Chance, George M.**; August 29, 2007.  
 '74 **Lesmeister, Stephen Curtis**; December 12, 2019.  
 LA A '43 **Kuttruff, Louis Carl**; December 27, 2018.  
 '44 **Jackson, James Edward**; March 12, 2012.  
 '48 **Cole, Roy Quitman**; November 2, 2019.  
 '59 **Allison, Hansell Jack**; October 21, 2019.  
 LA Γ '47 **Malone, James William**; January 23, 2020.  
 '66 **Flowers, Woodie Claude**; October 11, 2019.  
 LA Δ '60 **Whitehead, Walter Richard**; March 3, 2019.  
 ME A '36 **Gordon, Richard Oliver**; September 12, 2014 [Cent].  
 MD A '43 **Keller, Earl William**; February 13, 2016.  
 '52 **Peinado Jr., Arnold Benicio**; March 14, 2019.

- MD B '49 **Gold, Irwin Lester**; April 17, 2019.  
'53 **Williams Jr., Paul Lyle**; February 19, 2019.  
'61 **Bracken, Richard Townend**; October 17, 2019.  
'64 **Lease, James Robert**; November 24, 2019.  
'76 **Hamers, Robin Bennet**; January 9, 2020.
- MA B '39 **Forrester, Jay Wright**; November 16, 2016.  
'42 **Berkey, Donald C.**; August 17, 2019.  
'43 **Ottinger Jr., Harry**; October 24, 2006.  
'46 **Tulin, Marshall Peter**; August 31, 2019.  
'47 **Dengler, Carl Eugene**; October 29, 2005.  
'48 **Birmingham, Bascom Wayne**; no details.  
'48 **Zimmerman, William R.**; November 6, 2019.  
'57 **Stoll, Paul James**; March 8, 2016.  
'67 **Chan, Yupo**; February 5, 2020.
- MA Δ '44 **Blumenthal, Edwin Irving**; November 17, 2013.  
'50 **Hobden, Victor Norman**; April 5, 2017.  
'54 **Hart, James Leonard**; June 6, 2012.  
'67 **Noonan, Joseph P.**; April 10, 2018.
- MA E '50 **Carrabes, Marcello John**; November 1, 2019.  
'51 **Starr, William Charles**; February 1, 2019.
- MA Θ '98 **Wood, David Nelson**; September 30, 2014.
- MI A '48 **Breznsy, Robert Matthew**; December 22, 2019.
- MI B '38 **Pavlis, Frank Edward**; August 24, 2018 [Cent.].  
'50 **Smalter, Donald Joseph**; February 4, 2015.
- MI Γ '38 **Stuart, George Norman**; no details.  
'50 **Eldridge, Morton Triphagen**; May 25, 2016.  
'50 **Hosford, William Fuller**; December 28, 2018.  
'52 **Arpaci, Vedat Salih**; August 31, 2018.  
'52 **Brunais, Ellsworth George**; July 23, 2018.  
'55 **Schrenk, Walter John**; October 31, 2018.  
'58 **Ward, Samuel Robert**; January 26, 2008.  
'92 **Maxwell, Scott Eric**; April 2, 2019.
- MI Δ '52 **Mihaly, Louis Charles**; April 24, 2019.  
'54 **Cairns, James Robert**; November 1, 2018.  
'56 **Balcerzak, Marion John**; December 18, 2018.
- MI E '59 **Weidman, Kenneth G.**; June 7, 2018.  
'91 **Perkins, Thomas Marion**; May 8, 2011.
- MN A '61 **Avery, Carlos Preston**; November 15, 2019.
- MS A '35 **Palmer, Lamar Neal**; no details.  
'52 **Wells Jr., Lee Roy**; July 21, 2019.  
'53 **Cook, Bobby Joe**; March 9, 2014.  
'65 **Deas, Ernest Berry**; November 27, 2019.  
'69 **Ritger, Sharon Hardin**; April 25, 2019.
- MO A '55 **Busby, Harold Duane**; August 7, 2019.  
'59 **Casey, Rockford Delano**; December 2, 2019.  
'60 **Monsees, James Eugene**; August 5, 2019.  
'65 **Dotson, William Paul**; November 12, 2019.
- MO B '44 **Sineath, Henry Howard**; October 8, 2017.  
'71 **Hazen, Michael Ransom**; December 16, 2019.
- MT A '37 **Winberg, Carl Alexander**; October 20, 2019 [Cent.].  
'41 **Melnick, Charles Howard**; January 28, 2019.  
'56 **Johnson, Richard Merrill**; October 20, 2019.
- NV A '99 **Sendelweck, Patrick Kim**; March 22, 2017.
- NH A '67 **Leavitt, Robert Gordon**; no details.
- NJ A '42 **Klein, Robert Lawrence**; January 22, 2018.  
'45 **Tanneberger, Herbert Ernest**; July 2, 2018.  
'52 **Boardman, Thaddeus Joseph**; January 13, 2019.  
'52 **Streckfuss Jr., Harry C.**; December 19, 2019.
- NJ B '58 **Fiorito, Edward**; April 27, 2009.
- NJ Γ '37 **D'Onofrio, Michael**; no details.  
'41 **Misra, Raj Pratap**; August 4, 2007.  
'63 **Miners, Richard Henry**; September 11, 2019.  
'68 **Daniello, George Thomas**; February 18, 2017.
- NJ Δ '43 **Glassman, Irvin E.**; December 14, 2019.
- NY B '50 **Pennock, Robert Edward**; February 10, 2019.  
'52 **Kennelly, Edward Joseph**; October 7, 2019.  
'58 **Koonce, George Robert**; April 25, 2019.  
'58 **Reinheimer, Harry Joseph**; November 20, 2012.
- NY Γ '41 **Goodman, Edwin Francis**; January 18, 2020 [Cent.].  
'45 **Aldinger, Donald John**; December 30, 2016.  
'45 **Hatch, Robert Lynwood**; August 6, 2018.  
'48 **Hansen, Arthur Edward**; April 17, 2003.  
'48 **Rummel, Paul Kent**; September 15, 2003.  
'49 **Butler, Tod**; March 20, 2014.  
'49 **Cahill Jr., Michael Joseph**; December 10, 2018.  
'49 **Skala, George Frank**; November 27, 2001.  
'55 **Viens, Charles Herman**; December 24, 2019.  
'56 **Zachmanoglou, Eleftherios C.**; October 12, 2018.
- NY Δ '54 **Flattau, Theodore**; no details.  
'65 **Moore, William Bassett**; no details.
- NY E '60 **Sommers, Bernard D.**; January 25, 2019.  
'73 **Lavin, Joseph Martin**; February 19, 2019.
- NY Z '39 **Grantz, Howard E.**; November 20, 2019.  
'52 **Schink, Frank Edward**; September 21, 2017.
- NY H '47 **Peaceman, Donald William**; June 19, 2017.  
'49 **Nadel, Norman Allen**; June 14, 2019.  
'54 **Shinners, Stanley M.**; August 22, 2019.
- NY Θ '50 **Davis, Donald M.**; November 25, 2019.  
'58 **Gronosky, Clifford Francis**; April 28, 2019.
- NY I '35 **Wolf, Charles Andrew**; January 22, 2003.  
'50 **Agresta, Joseph Anthony**; May 14, 2011.  
'65 **Hyman, William Albert**; July 31, 2019.
- NY M '60 **Guntur, Rao R.**; February 28, 2019.  
'64 **Budynas, Richard Gordon**; June 30, 2019.
- NY Ξ '75 **Loscri, Anthony**; May 7, 2018.
- NC A '83 **Montgomery, Kathy Sue**; August 9, 2018.
- NC B '36 **Gordy, Thomas Daniel**; no details.
- NC Γ '47 **Millenson, Donald Harvey**; no details.  
'49 **Davidson, Lindell Alf**; November 1, 2019.  
'58 **Copeland, Darryl Wade**; January 5, 2013.  
'63 **Rolle, Carl Frederick**; December 27, 2019.
- ND A '58 **Mellum, Lowell Clayton**; no details.  
'00 **Anderson, Chad Robert**; February 12, 2018.
- OH A '47 **Wittmer, Arthur Leland**; December 21, 2015.  
'48 **Koinis, Frank J.**; September 13, 2012.  
'60 **Cook, Harry Edgar**; September 12, 2019.
- OH B '53 **Hettrick, Robert Neil**; June 29, 2018.  
'62 **McDonel, James Dwight**; August 6, 2019.  
'62 **Stuwe, Charles Wesley**; December 5, 2019.  
'68 **Williams, Kenneth Eugene**; November 11, 2019.
- OH Γ '49 **Meyers, Frederick David**; December 9, 2019.

### IN MEMORY

**Frederick Meyers, P.E.**, *Ohio Gamma '49*, passed away at the age of 93. He spent 30 years as an engineer/executive with Owens-Corning Corp. and was Faculty Emeritus at The Ohio State University. In addition, he served as chair of the OSU engineering graphics dept., OH Gamma Chapter advisor, and was 1972 Ohio Engineer of the Year.

- '53 **Starr, Sterling Verne**; June 13, 2018.
- OH Δ '63 **Waymann, Horst Fritz**; no details.
- OH E '73 **Ross Sr., David Edward**; July 27, 2019.
- OK A '55 **Culbertson, John Luttrell**; December 9, 2019.  
'56 **Haynes, John Hays**; January 11, 2020.  
'63 **Hedding, Truman Johnson**; July 17, 2017.  
'93 **McClure, Joseph Robert**; October 21, 2005.
- OK B '83 **Rhodes, Hollace Faye**; May 31, 2018.
- OK Γ '49 **Allen, Roy Lester**; no details.
- OR A '62 **Ballen Jr., Thomas Joseph**; November 9, 2019.
- PA A '53 **Huester, Peter Kenneth**; March 20, 2017.
- PA B '42 **Burkhart, V. Russel**; March 14, 2009.  
'48 **Dunn, William A.**; no details.  
'51 **Holt, H. Robb**; June 2, 2019.  
'51 **Miller, Robert Irwin**; December 27, 2019.  
'53 **Houk, Donald R.**; July 28, 2019.

- '56 **Falkie, Thomas Victor**; November 1, 2019.  
 '73 **Stockburger, Richard**; December 14, 2019.  
 '90 **Vorhauer, George Randall**; September 22, 2016.  
 PA Γ '48 **Faigen, Ivan Miles**; no details.  
 '51 **McAdoo Jr., John Dare**; December 28, 2019.  
 '55 **Smith Jr., Paul Letton**; May 10, 2019.  
 '74 **Pferdehirt, Wayne P.**; August 26, 2019.  
 PA Δ '49 **Cole, Melvin Charim**; no details.  
 '54 **Banks, Daniel**; June 24, 2019.  
 PA E '44 **Schell, George Washington**; September 26, 2010.  
 '48 **Albert, William Stuart**; December 6, 2006.  
 '50 **Grover, Anson Roy**; April 11, 2018.  
 PA Z '37 **Hessey, Frederick Earl**; no details.  
 '42 **Seemiller, Joseph C.**; no details.  
 '44 **Simon, R. Morton**; no details.  
 '47 **Mammarella, Ernest J.**; August 3, 2019.  
 PA H '67 **Conard, Walter Savery**; January 4, 2020.  
 PA Θ '45 **Adams, Raymond Francis**; October 8, 2015.  
 '65 **O'Donnell III, William F.**; December 15, 2019.  
 PA I '95 **Lynch Jr., Kenneth Mark**; May 23, 2016.  
 PA K '46 **Lengyel, Albert**; August 9, 2011.  
 PR A '70 **Caballero-Alvarez, Jaime**; November 17, 2019.  
 RI A '47 **French, Harry Banks**; December 7, 2018.  
 SC A '52 **Morgan Jr., Thomas W.**; November 11, 2019.  
 '58 **Bethea III, Thomas Jesse**; January 25, 2019.  
 '58 **Connor Jr., Laurence Neuman**; March 12, 2016.  
 '58 **Renwick, William Hamilton**; November 1, 2008.  
 SC B '58 **Byrd, Patrick Nye**; July 18, 2015.  
 '58 **Owen, Gene Hood**; April 3, 2012.  
 SC Γ '49 **LeTellier, Carroll Nance**; March 27, 2019.  
 '50 **Good, Mary Lowe**; November 20, 2019.

### IN MEMORY

**Mary Good**, Ph.D., *South Carolina Gamma '50*, passed away at 88. An award-winning chemist and a founding faculty member of the chemistry department at the University of New Orleans, she was the first woman elected to the board of the American Chemical Society, and served as president. Mary was Under Secretary for Technology, U.S. Dept. of Commerce 1993-97.

- '53 **Wysockey, Thomas John**; July 9, 2019.  
 '56 **Robbins, Richard James**; May 30, 2019.  
 SD A '13 **Zacher, Jonathan Edward**; July 15, 2019.  
 TN A '37 **Ledbetter, Elred Raymond**; April 1, 2000.  
 '49 **Hill Jr., Robert McCullough**; July 10, 2019.  
 '49 **Kerr, Arthur Cecil**; December 6, 2019.  
 '52 **Key, Jesse Alexander**; November 9, 2019.  
 '58 **Newell Jr., Paul Haynes**; November 7, 2017.  
 '62 **Shane, Richard Macferran**; August 19, 2019.  
 '92 **Malarkey, Connie H.**; January 17, 2020.  
 TN B '43 **Bogle Jr., Eugene Reese**; November 21, 2017.  
 '75 **Parrish Jr., Thomas F.**; December 14, 2019.  
 TN Γ '48 **Crocker, Glenn H.**; October 15, 2019.  
 '49 **Pace Jr., Robert Evans**; September 25, 2019.

- TN E '58 **Hall, W. Richard**; October 9, 2006.  
 TX A '52 **Boardway, John C.**; November 17, 2017.  
 TX B '49 **Nichols, Peyton**; November 14, 2018.  
 '91 **Lingnau, James A.**; November 6, 2019.  
 TX Γ '47 **Schultz, William Phil**; November 21, 2019.  
 TX Δ '49 **Williams, Walter Lazenby**; December 26, 2019.  
 '57 **Skillman Jr., Charles Spencer**; July 3, 2018.  
 '58 **Robertson, Raymond Coy**; no details.  
 '59 **Boswell, Jimmy D.**; December 1, 2018.  
 TX Z '58 **Levosky, John Melvin**; February 10, 2016.  
 TX H '50 **Cragon, Harvey George**; September 15, 2018.  
 TX Θ '82 **Reyes, Kenneth Charles**; April 13, 2010.  
 TX I '44 **Bartel Jr., Herbert Herman**; June 5, 2014.  
 TX K '75 **Miles, Gerald Paul**; August 9, 2019.  
 TX Λ '92 **Christ Jr., Carl Henry**; November 27, 2008.  
 UT A '44 **Quate, Calvin F.**; July 6, 2019.  
 VA A '47 **Nickell, Grason Templeton**; June 26, 2017.  
 '52 **Humphris, Robert R.**; November 20, 2019.  
 '67 **Kirk, R. Gordon**; September 6, 2018.  
 VA B '50 **Grinnalds, Thomas Jefferson**; March 18, 2013.  
 '50 **Hawkins, Robert Cleo**; December 18, 2018.  
 WA A '48 **Collins, Gordon Dent**; November 4, 2019.  
 '60 **Rife, David Charles**; October 8, 2019.  
 '64 **Schueman, Gerald Martin**; July 3, 2019.  
 WA B '44 **Watkins, Jack Burton**; November 13, 2019.  
 '61 **Mende, Gordon A.**; July 16, 2014.  
 '09 **Boyer, Michelle Ann**; June 3, 2019.  
 WI A '35 **Goldberg, Harold**; no details.  
 '41 **Suckow, Milton Alvin**; no details.  
 '42 **Wright, William Nickey**; no details.  
 '43 **Swoboda, Thomas James**; August 4, 2015.  
 '49 **Ames, Lionel Harvey**; April 4, 2017.  
 '49 **Henke, Russell Warren**; November 2, 2015.  
 '50 **Bischel, Lavern John**; October 30, 2004.  
 '50 **Keymar, John Albert**; July 14, 2018.  
 '50 **Krueger, Rudolph Norman**; no details.  
 '51 **Arndt, Richard Harold**; October 24, 2007.  
 '60 **Oliver, Floyd Forrest**; no details.  
 WI B '48 **Peters, Carl Nicholas**; March 12, 2019.  
 '49 **Eckl, Alfred Robert**; November 12, 2014.  
 '49 **Fromm, Daniel Francis**; January 13, 2018.  
 '49 **Semrad, Edward Vincent**; November 30, 2017.  
 '50 **Mangotich, Edward**; December 1, 2015.  
 '50 **Sem, Robert Jack**; November 19, 2016.  
 '50 **Waldschmidt, Kenneth John**; May 18, 2019.  
 '50 **Wieland, Donald George**; September 9, 2009.

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# Executive Council Meetings

## The Executive Council met by WebEx on April 10, 2019

The Council approved Mary Ann Susavidge, *PA Z '89*, as a District 3 Director to a term ending 6/30/21. Award Selection Committee appointments include: Melissa L. Morris, *WV A '06*, to the Laureate Selection Committee to a term ending 6/30/21; Raymond P. LeBeau, *VA A '90*, to the Alumnus Recognition Selection Committee to a term ending 6/30/20; Daniel T. Kruusmagi, *CA H '13*, to the Alumnus Recognition Selection Committee to a term ending 6/30/21. Terms were adjusted for the Outstanding Advisor Selection Committee and include: Elizabeth A. Stephan, *OH K '93*, to 6/30/19; Bruce L. Walcott, *IN A '81*, to 6/30/2020; and Robert L. Ward, *OH I '88*, to 6/30/21.

Two governance policies were approved: Executive Director Responsibilities and size of the Executive Council. The Convention Program Planning Committee voted to have all delegates serve on a committee and move the Recruiting Fair to Thursday. The Council approved the June EC meeting location in San Francisco, CA.

Executive Director Gomulinski presented the status of ratification to the Council and strategies to improve voting during the next process. Secretary Fable moved and the Council approved, to vote in favor of all nine amendments for any chapter that did not cast a ballot or submitted an invalid ballot.

## The Executive Council met by WebEx on May 8, 2019

The Council approved the following: Resolution of Appreciation to Justin M. Glasgow, *IA B '05*, for his two years of service as a District 3 Director.

The William and Zeda Beans Scholarship Fund, through the generosity of E. William Beans, *OH G '53*, and the Ronald and Judy Pasadyn Professional Fund, through the generosity of Ronald C. Pasadyn, *OH E '70*, were established.

Three governance policies were approved: Documentation Control, Executive Council Responsibilities, and Executive Council Meeting Standing Rules.

The Development Committee report was presented and the EC authorized Director Gomulinski to hire an Annual Giving Officer, with target employment date as 6/8/19.

Director Gomulinski presented the University of Arkansas Little Rock (UALR) TBB Inspection Report, with a recommendation that UALR TBB local honor society proceed with a formal petition to this year's Convention and meet the conditions identified in the UALR TBB Inspection Report.

## The Executive Council met in San Francisco, CA, June 29-30, 2019

The Executive Council approved the following: TBI Discipline Policy; HQ Retirement Plan Update; District Director Reappointment Memo; Engineering Futures Reappointment Memo; Service Recognition; and Corporate Resolution of Power of Attorney & Signing Authority.

The following Engineering Futures Facilitators with new three year appointments to end 6/30/20 include: Stewart R. Baskin, *FL E '13*; Y.A. (Andy) Boucher, *MI G '08*; R. Tracy Choat, *TN G '83*; William P. Cleveland, *MS A '10*; Michael D. Czebatul, *OK A '92*; Richard Della Rovere, *NJ G '10*; Amy C. Kurr, *IA A '18*; Felipe A. Leon, *FL Q '99*; Timothy J.F. Luchini, *SD A '11*; Christopher C. McComb, *CA R '12*; Matthew W. Ohland, *FL A '96*; Wayne B. Paugh, *FL G '93*; and Kirstie T. Weimer, *NY T '11*. Andrea J. Pinkus, *NY D '97*, to be reappointed as an EFF for a three year term ending 6/30/21.

The Council voted a Distinguished Service Award to Charles W. Caldwell, *CA A '64*, for six years of service on the Fellowship Board and a Resolution of Appreciation to Margaret M. Darrow, *AK A '02*, for four years of service on the Fellowship Board.

The report of the Alumnus Recognition Selection Committee was presented and four recipients were recommended for the 2019 Distinguished Alumnus Award: Wayne T. Davis, *TN A '73*; David L. Ford Jr., *IA A '67*; William E. Jennings, *GA A '85*; and Abdallah H. Yabroudi, *NY B '78*. The Alumnus Selection Committee selected: Martha C. Mitchell, *WI A '89*, as the McDonald Mentor. The report of the Laureate Award Selection Committee was presented and four recipients were recommended: Kendra K. Noneman, *ID G '20*; Casey Main, *IN D '19*; Rose C. Ridder, *PA K '20*; and Kelli L. Swenson, *WI G '19*. Kurt P. Rouser, *OH H '11*, was chosen by the Outstanding Advisor Award Selection Committee.

Katy Colbry, *MI A '99*, Director of Engineering Futures, presented her report which included an overview of the Engineering Futures Program activities and proposed changes to the EF Program.

President Paugh reported on activities relating to a potential U.S. Senate Resolution; 2020 Convention speakers; donor visits; Convention Recruiting Fair; and connections with Society of Hispanic Professional Engineers. Treasurer Fable reported on the TAC meeting and use of a money market account. Vice President Smith reviewed policies regarding the recent Constitution & Bylaws revisions. Councillor Alexander reviewed the Chapter Survey & processes, and suggested a TBI advisor training program. Councillor M. Youssef reported on the Convention Planning Committee and an optimized schedule was approved. Councillor Pierce presented the Image & Marketing Committee report including a recommendation to revise the seal to official Bent proportions and define proper use of the new logo and seal.

Your fellow Tau Bates are interested in news about you. Send items about civic activities, honors won, weddings, promotions, etc. to Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697 or to [dylan@tbp.org](mailto:dylan@tbp.org). Material for publication must be received by May 1 for the **Summer** issue and August 1 for the **Fall** issue. Include name, address, chapter/class year, and email address or phone number. Thank you!



#### Alabama Beta

**Clyde L. Chambliss Jr., P.E., '92**, was named 2019 Outstanding Public Official by the American Society of Civil Engineers (ASCE), for “impeccable service and dedication to the State of Alabama, as well as the civil engineering profession and land surveying professionals.” He serves the AL Senate (30th district), since 2014.



#### California Gamma

**Lance M. Inouye, Esq., '68**, was inducted into the University of Hawai'i at Mānoa College of Business annual Hall of Honor as a distinguished alumnus. He is president & CEO of Ralph S. Inouye Co., Ltd., a local construction company and previously served as a deputy attorney general for the State of Hawaii.



#### California Delta

**J. Scott Goldstein, Ph.D., '97**, was recently promoted to the rank of Major General in the U.S. Air Force, where he is the mobilization assistant to the Under Secretary of the Air Force. He also serves as CTO of ENSCO, Inc., and earned his doctorate in electrical engineering from the University of Southern California.

*SUN/Julia Malakie*



#### Louisiana Epsilon

**Yelena A. Rivera, P.E., '09**, was named the American Society of Civil Engineers Outstanding Young Civil Engineer in Louisiana. She is an engineer at C.H. Fenstermaker & Associates, LLC. She has a civil engineering degree from UNO and is chair of the Louisiana Civil Engineering Conference Show.



#### Massachusetts Theta

**Christine M. Clancy, P.E., '06**, was appointed as the Department of Public Works commissioner for the City of Lowell (MA). Clancy had been the City Engineer since 2018. She graduated from University of Massachusetts Lowell with a bachelor's degree in civil and environmental engineering.



#### Michigan Gamma

**Jeffrey C. Sen, '83**, recently joined Siemens AG in a senior customer-facing role managing implementations of digital industries software solutions. Previously, he worked in IT at Hewlett-Packard and completed 30 years of military service as a U.S. Navy Captain, including three years on a nuclear-powered cruiser.

*Courtesy of VHB*



#### Ohio Kappa

**Cristina C. Pastore, '03**, was named an *Engineering News-Record* 2019 Top Young Professional. She is a traffic engineer/transportation planner with Kimley-Horn, recently appointed to the 1<sup>st</sup> advisory board for GA Tech's School of City and Regional Planning and to the GA steering committee for Million Women Mentors.



#### Rhode Island Beta

**Rachel A. Dooley, P.E., '10**, was named to the *Engineering News-Record* New England's Class of 2020 Top Young Professionals. She is working as a transportation engineer with VHB company focused on traffic signal design and traffic control plans. Her bachelor's and master's degrees were earned at URI.



#### Wisconsin Gamma

**Douglas E. Machkovech, '20**, was awarded a Legion of Valor Bronze Cross, given annually to eight outstanding U.S. military science cadets in recognition of scholastic excellence in military and academic subjects. He majors in mechanical engineering at the Univ. of Wisconsin-Milwaukee, and served as TBPI chapter secretary.

### Florida Alpha

**Jenna R. Jambeck, Ph.D., '96**, is an associate professor in the college of engineering and Director of the Center for Circular Materials Management in the New Materials Institute at the University of Georgia. She is a National Geographic Fellow (since 2018) and co-lead source to the Sea Plastics Initiative. Her 20-year career has focused on understanding where trash comes from, how it gets managed, where it ends up after it's collected, and how it ends up en route to sea.



Jenna Jambeck Credit: UGA / Andrew Tucker

Her work on plastic waste inputs into the ocean published in *Science* magazine has been recognized by the global community and translated into policy discussions by the Global Ocean Commission, in testimony to U.S. Congress, in G7 and G20 Declarations, and the United Nations Environment Programme. She is co-developer of the mobile app Marine Debris Tracker, a tool to facilitate a growing global citizen science initiative that has documented the location of over 1 million litter and marine debris items removed from our environment throughout the world.

## STUDENT ATHLETE PROFILES



### Indiana Beta

**Eric S. Kirby, '21**, was selected as first team CoSIDA NCAA Div. III Men's Soccer Academic All-American. He was also named to the first-team all-HCAC this season, led his team in points, and majors in computer engineering at Rose-Hulman Institute of Technology.



### Maryland Alpha

**Louisa L. Kishton, '20**, was selected as first team CoSIDA NCAA Div. III Academic All-American and helped lead her volleyball team to an undefeated national championship in 2019. She was the Centennial Conference Scholar Athlete of the Year and AVCA Second Team All-American. She is MD Alpha Chapter secretary.



### Massachusetts Alpha

**Amanda "Mandy" G. St. Germain, '20**, was selected as first team CoSIDA NCAA Div. III Women's Soccer Academic All-American. She is a goalkeeper and maintains a 4.0 GPA while majoring in biomedical engineering at Worcester Polytechnic Institute.



### New York Theta

**John Furcick, '20**, was selected as first team CoSIDA NCAA Div. III Men's Soccer Academic All-American. He is a two-time Academic All-American, double majors in civil and environmental engineering, and is captain & a midfielder on the varsity soccer team.



### Ohio Iota

**Haley M. Moses, '20**, was selected as first team CoSIDA NCAA Div. III Women's Soccer Academic All-American. She is a mechanical engineering student, midfielder, and recording secretary of the OH I Chapter. She was also selected as a United Soccer Coaches Association third team All-American.



### Tennessee Epsilon

**Stasia M. Mallin, '20**, was named to the U.S. Soccer Coaches All-America Team and to the CoSIDA NCAA Div. I Women's Soccer Academic All-America first team. She is a biomedical engineering student at the University of Memphis and the holder of the AAC career assists record with 29.

# TRUE TALES from the TESTBENCH...

Fellow engineers: the story you are about to read is *true*. Only the *names* have been changed to protect the guilty.

Words / Art:  
Krishna M. Sadasivam  
krishnadraws.com



Have a true, humorous tale from your engineering experience that you'd like to see in a future TTRT comic? Send your submission for consideration to [dylan@tbp.org](mailto:dylan@tbp.org)

## Advertiser Index

ADVERTISER	WEB ADDRESS	PAGE NO.
Purdue Online	<a href="http://PurdueEngineeringOnline.com">PurdueEngineeringOnline.com</a>	page 3

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- **GEICO**—additional discounts on automobile insurance.
- **LinkedIn**—join 29,500 members in our official group for professional networking and career discussions (search: Tau Beta Pi Engineering Honor Society).
- **Local Hospitality**—access to a worldwide inventory of hotels at exclusively discounted rates.
- **PPI**—20 percent discount on professional licensing exam review materials (FE/EIT, PE, & more).
- **TBP Job Board**—post a resume online and browse through hundreds of engineering jobs at top companies.

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# Tau Beta Pi

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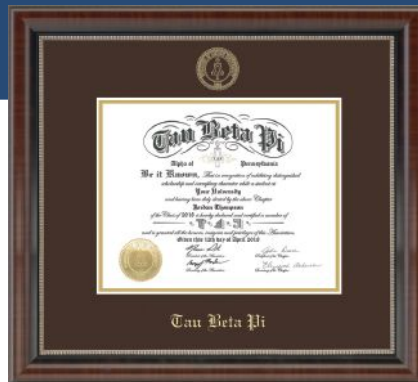
## STORE



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# Tau Beta Pi Convention

October 22-24

Atlanta, Georgia

Sheraton Atlanta Hotel

2020



**RECRUIT** the best and the brightest and **SPONSOR** activities at the annual **Tau Beta Pi Convention!**

By participating in the Convention, you can showcase your company and gain national exposure among top engineering achievers and leaders.

### **Recruiting Fair – Thursday, October 22**

As a member, you know that Tau Bates are among the brightest and most talented engineers in the country. Your company will want a chance to hire more valuable employees like you!

Meet diverse candidates from 250 colleges and universities, most of whom hold leadership positions in their chapters.

Receive online access to the resumes of nearly 1,500 TBPI students from most engineering curricula and computer science.

Booth fees start at \$750 for Tau Beta Pi's Recruiting Fair.

Visit [www.tbp.org/conv/careerFair.cfm](http://www.tbp.org/conv/careerFair.cfm).

### **Sponsorships**

Gain added visibility and speaking opportunities by sponsoring one of the Convention meals. Range is \$1,450 to \$15,000 (Banquets, Breakfasts, Lunches, Refreshment break).

Visit [www.tbp.org/conv/sponsorshipOpps.cfm](http://www.tbp.org/conv/sponsorshipOpps.cfm).

Through contacts by our member-employees, TBPI has formed relationships with companies like BAE Systems, FedEx, DeNovo, Power Costs, Inc., Sandia, Texas Instruments, and Torch Technologies, who saw the value in hiring fellow members.

Contact Pat McDaniel at [pat@tbp.org](mailto:pat@tbp.org) for more info.