



SPRING 2025

The Bent

Of Tau Beta Pi

THE ENGINEERING HONOR SOCIETY

Killer Sun?

**New Chapter at
Fairfield University**

Tau Beta Pi NAE Fellows



The Bent

Of

Tau Beta Pi

The Engineering Honor Society

Editor: Dylan S. Lane

Managing Editor: Patricia B. McDaniel

Editorial Board: Lyle D. Feisel, Ph.D., P.E. (ret.), *IA A '61*;
James D. Froula, P.E. (ret.), *TN A '67*; Alison L. Hu, *CA I '96*;
Bridget A. Moorman, COL., USAF (ret.), *AZ B '85*; and John W. Prados, Ph.D., P.E., *TN A '54*.

Copy Editor: Angela Boles

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

On the COVER: Can our life-giving Sun deal death
blows to life and engineered infrastructure on
Earth? It not only can, but has in the past.

Artist: Dali Polivka



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See back inside cover for listing of Tau Beta Pi Chapters.



The Bent

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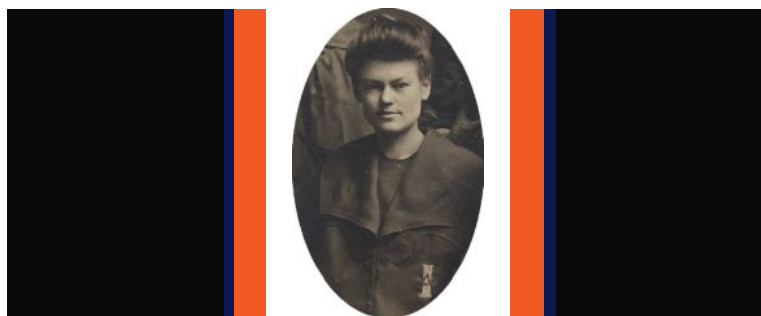
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COUNCIL'S CORNER

Colleen L. Hill-Stramsak, P.E., MIE '00, TBII 2025 Treasurer

TAU BETA PI: WHAT IT MEANS TO ME

What does Tau Beta Pi mean to you?

I've been asked this question a few times over the nearly 30 years I've been a member. First, let me tell you a little bit about my first few years at Wayne State University (MI). In the early 90's, Wayne State was primarily a commuter campus. I carpooled with my friends to and from campus every day and while I really liked the university, I didn't feel a strong connection.

My junior year, I received a letter from Tau Beta Pi, but didn't know anything about the organization and wondered if it was legitimate. I asked an engineer friend and she responded, "You MUST join! It's an amazing organization, I'm a member!" That was all it took for me to go to the Information Meeting, get my initiation folder, and small Bent to polish. The process was a bit overwhelming at first, but the current chapter members were very welcoming and it was great to get to know my fellow candidates. During the initiation process, one activity that I enjoyed was volunteering at a local charity event. I remember receiving the call that I'd been voted in as a member on my 21st birthday, little did I know that birthday present was going to provide

opportunities to foster meaningful lifelong relationships, engage in lifelong learning, and make a lasting impact.

As an undergraduate with the MI Epsilon Chapter, I served in many officer roles including social coordinator, treasurer, and president. The process taught me leadership skills, how to run a meeting, and deal with difficult situations, etc. I'm very glad that I had friends push me to take on leadership roles. As someone who is not extremely outgoing, the first step was challenging, but each time I volunteered it was less intimidating.

When I graduated with my master's degree in civil engineering and was no longer an active chapter member, I was elected as an advisor. One thing I've learned in this role is the importance of having as many advisors as possible. When one advisor is busy, another is more likely to have time and step in to assist as needed. As a past chapter president, I had organizational knowledge about which reports were necessary and what projects we had tried in previous years. It was also critical to have an advisor with university connections to help with policies and assist in obtaining the eligibility list.

I've met many lifelong friends through volunteering for Tau Beta Pi, as a student chapter officer, an advisor, serving on various committees, being part of an Alumni Chapter, and now serving on the Executive Council (EC).

I strongly recommend volunteering your time with TBII to ensure that future generations of students have an organization that embodies their ideals of integrity and excellence. There are many opportunities including roles as a chapter advisor, District Director, Engineering Futures Facilitator, various committees and task forces, or even on the EC. Visit www.tbp.org/?Opps and complete the form to volunteer your time.

Another question I get asked is, "Why did you run for the Executive Council?" When I was nominated on the floor of the 2023 Convention in Atlanta, it was an honor that other members thought I should seek election. The Convention serves as the Association's governing body, but is only in session for three days each year. The EC uses the Convention's recommendations to guide the organization. One of my goals is to help connect TBII alumni with collegiate chapters and alumni chapters.

As you grow in your career, I encourage you to donate your time and money to help students have the same or even a better experience than we had as collegiate Tau Bates.

The 2025 TBII Executive Council at last year's Convention. Left to right:

- Councillor Rachel K. Alexander, P.E., CA U '15;
- President Marla A. Peterson, AZ A '83;
- Vice President Thomas A. Pinkham IV, MA E '88;
- Councillor Ronald M. Hickling, CA E '80;
- Councillor Susan L.R. Holl, Ph.D., CA L '76;
- Councillor David J. Cowan Jr., P.E., FL E '14;
- Secretary Henry H. Houh, Ph.D., MA B '89;



- Councillor Michael J. Hand III, MI G '11; and
- Treasurer Colleen L. Hill-Stramsak, P.E., MIE '00.

COLLEEN HILL-STRAMSAK is a traffic safety engineer with the Macomb County Department of Roads (MI). She has B.S. and M.S. degrees in transportation eng'g from Wayne State University. Colleen served as MI Epsilon Chapter president, where she is currently an Advisor and is past president of the TBII Southeastern Michigan Alumni Chapter. She joined the Executive Council in 2024.

YOUR LETTERS

Send letters to tbp.media@tbp.org. Text may be edited for length and clarity; not all letters can be published.

2024 Convention Summary

I read with interest the Convention article in the Winter issue. One section outlined the New Engineering Solutions for Tomorrow (NEST) competition and the winning solution from the MI Gamma Chapter at the University of Michigan – PreCompose.

I'd be interested in reading about their solution, interpretation of 'precompose,' and a summary of the other waste management solutions which placed in the competition.

Thank you for the work you do to create a quality magazine each quarter!

Natalie Vaughan, IA Δ '92

****Editor's Note:** There were no other 2024 NEST competition submissions. The PreCompose team's presentation can be found on the NEST website at <https://tbpnest.wixsite.com/home/past-projects>

Alumni Notes Follow-up

I just read the latest edition of *The Bent* and was particularly interested in the article titled, "Highlight: A Family Farm of Engineers."

I am currently competing in a collegiate research project as part of NASA's 2025 Gateways to Blue Skies Competition: Aviation Solutions To Agriculture.

Would it be possible to facilitate a point of contact or method of communication for Mary Louise and Tim Bucher? I could really use their insight and expertise.

Samuel E. Newport, AL Δ '25

****Editor's Note:** We were able to connect Sam and the Buchers to assist him with his inquiries.

Why Do We Call it a ... ?

Lyle Feisel's Winter article is another of his excellent short histories of engineers whose contributions are important to us today.

As an electrical engineer, the article taught me much about Stokes' work in fluids and mechanics, but I find it neglected to mention a major contribution he made to electromagnetics. A vector identity called Stokes' Law allows the surface integral of the curl of a vector to be replaced by the line integral of that vector.

This is commonly used in Ampere's Law to calculate magnetic fields (such as in my book *Magnetic Actuators and Sensors*, 2nd ed. Wiley IEEE Press, 2014).

Thus, Stokes made a very important contribution to electrical engineering.

John R. Brauer, Ph.D., WI B '65

Engineering the Skeleton

I finally got around to reading Trudy Bell's Spring article and enjoyed the various aspects of materials science and adhesives that were included. I was able to buzz past the anatomy section and hope Trudy is still relatively pain free.

My undergraduate degree was in chemical engineering; however, I have been practicing emergency medicine for the last 35 years. During that time, I have encountered many untoward outcomes from total joint replacements, but that is the nature of my practice and certainly does not reflect the vast success orthopedists have enjoyed over the years — both with advances in materials science and now robotic-assisted surgery.

I hope this propitious trend continues as experts predict that both total hip and total knee arthroplasties will continue to soar, increasing by 75 and 110 percent, respectively, next year; greater increases in the years to follow [J of Rheu, 2019 Apr].

Gregory G. Simsarian, M.D., CA E '82

FROM THE EDITORS

Dylan Lane and Patricia McDaniel

After 25 years of dedicated service to the Association, Pat McDaniel retired on February 1, 2025.

She joined Tau Beta Pi in 2000 as Director of Communications & Development and began her role as managing editor of *The Bent* with the Fall 2017 issue, while also serving as Director of Marketing & Communications.

Pat shared these thoughts: "After earlier careers in mental health and law, I was grateful to have had the opportunity to experience working with and recognizing the practitioners serving society's technical needs. I am fortunate to have met some very inspiring, successful engineers — highly dedicated and focused volunteers, and amazing students. Just as important are the many dear friends I have made — you know who you are — and the co-workers who will forever be a part of my life's memories. It's been a good ride. Adios, Tau Bates."

The Bent magazine Letters Policy

The Bent invites letters to the editors addressing topics covered in the magazine. Criticism of Tau Beta Pi and its policies is permitted, but letters containing potentially libelous statements, profanities, or personal attacks will not be printed. All letters must be signed and not exceed 400 words. The editors reserve the right to edit letters for length and clarity and have the final decision to publish any letter. Some letters may appear only online. There is no guarantee that all letters received will be published. Ideas or views expressed in this magazine do not necessarily reflect the policies or opinions of the Association.

We appreciate your cooperation and understanding. If you have questions or concerns, please contact us at tbp.media@tbp.org or call 865/546-4578.

WHO'S WHO IN TAU BETA PI

Recognizing Tau Bate accomplishments

Frances H. Arnold Ph.D.

New Jersey Delta '79

will receive the 2025 Priestley Medal from the American Chemical Society, the highest honor bestowed annually by the society to recognize an individual for distinguished service to chemistry. She is being "honored for pioneering contributions to the development of directed evolution as a method for chemical & biological design." Frances is President's Council of Advisors on Science & Tech co-chair and a Caltech professor.



John O. Dabiri Ph.D.

New Jersey Delta '01

was honored with the National Medal of Science at The White House for exemplary achievement and leadership in science and engineering. A professor at Caltech, he was cited for his work on biological fluid dynamics, turbulence, and the advancement of clean energy through more efficient wind turbines. John is on the NVIDIA board of directors, a member of the Secretary of Energy Advisory Board, and a McArthur Fellow.



Clay S. Gloster Jr. Ph.D.

North Carolina Epsilon '85

received the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring honoring "the vital role teachers and mentors play in shaping the next generation of technical leaders." Clay is responsible for establishing a partnership between NC A&T and the Verizon Innovative Learning program in 2015, making it possible for local middle school students to receive mentorship and opportunities for holistic learning.



Sangeeta N. Bhatia M.D., Ph.D.

Rhode Island Alpha '90

was selected as a class of 2024 Fellow of the American Association for Cancer Research. She is a professor at the Koch Institute for Integrative Cancer Research at MIT and Director of the Marble Center for Cancer Nanomedicine. Sangeeta was cited "for innovative research dedicated to harnessing micro- and nanotechnologies for cancer diagnostics, drug delivery, and disease modeling, creating noninvasive nanosensors to detect and profile tumors."



Richard D. Gelber Ph.D.

New York Delta '69

was named an American Association for Cancer Research class of 2024 Fellow. Richard was celebrated "for contributions to improving patient care through his development of innovative biostatistical methodologies, including the Quality-adjusted Time Without Symptoms of disease and Toxicity of treatment." He is a professor at the Harvard School of Public Health, Harvard Medical School & Dana-Farber Cancer Inst.



Andrea J. Goldsmith Ph.D.

California Alpha '86

has been inducted into the Wireless Hall of Fame for "pioneering work in wireless communications" and was cited by the Wireless History Foundation as "a giant in the wireless industry" who has been "a driving force for the advancement of wireless communications since the early 1990s." Andrea is dean of Princeton's School of Engineering & Applied Science, holds 38 U.S. patents, and has received numerous international awards.



Karen L. Butler-Purry Ph.D.

District of Columbia Alpha '85

received the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. A professor of electrical engineering at Texas A&M Univ., she's been widely praised for enhancing graduate students' quality of life, educational experiences, and professional development opportunities. This is the highest honor for teachers and mentors – shaping the next generation of technical leaders, including scientists and engineers.



Dario Gil Ph.D.

New Jersey Alpha '98

was elected chair of the National Science Board (NSB) for the next two years. Dario, senior vice president and director of IBM Research, will be charged with governing NSB's Board and advising Congress and the President of the United States on policy matters related to STEM and STEM education. His election is unique in that he still works in industry and is under the age of 50 at the time of his election.



Kristina M. Johnson Ph.D.

North Carolina Gamma '81

was awarded a National Medal of Technology by President Joe Biden in January. She's a member of the Minerals Technology Board and previously served as Ohio State Univ. president and chancellor of the State Univ. of New York. Kristina has distinguished herself through research in optoelectronics, photonics, and nanotechnology that led to 46 U.S. patents and is a 2008 recipient of the John Fritz Medal (awarded by AAES).



Elects New Members

President John L. Anderson, Ph.D., *DE A '67*, announced the election of **128 new members** and **22 international members, 33 of whom are Tau Bates. The bios continue on page 48.** 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 and making major advancements... ."

Gregg T. Beckham, Ph.D., *OK I '02*

Senior research fellow, NREL. For leadership in biological and chemical catalysis for the valorization and creation of materials from waste plastics and biomass.

Rodney D.W. Bowersox, Ph.D., *AL B '88*

Associate dean for research & Professor, Texas A&M Univ. For leadership and contributions in hypersonic aerodynamics and through the development of experimental facilities and diagnostic techniques.

Robert C. Brown, Ph.D., *IA A '77*

Distinguished Professor and chair, Iowa State Univ. For engineering processes for controlled oxidation of lignocellulosic biomass and plastic wastes into low-carbon-footprint energy, fuels, and chemicals.

Patrick L. Chapman, Ph.D., *MO B '96*

Chief executive officer, Startup in Energy Systems. For the development of reliable inverters enabling large-scale photovoltaic energy system deployment.

Robert C. Cohen, *NJ I '83*

President, Digital, Robotics, and Enabling Technology, Stryker. For design contributions to orthopedic surgical procedures and devices and for additive manufacturing leadership.

Julie S. Eng, Ph.D., *CA B '89*

Chief technology officer, Coherent Corp. For contributions to high-speed optoelectronic devices and modules.

Justin S. Hanes, Ph.D., *CA E '91*

Professor, Wilmer Eye Institute, Johns Hopkins Univ. For developing innovative technologies that improve drug & gene delivery, resulting in multiple approved products.

Robert W. Heath Jr., Ph.D., *VA A '96*

Chair and professor, Jacobs School of Engineering, Univ. of California, San Diego. For contributions to the theory and practice of wireless communication.

Elizabeth A. Holm, Ph.D., *MI I '87*

Professor & dept. chair, Univ. of Michigan. For achievements in the development and application of computational methods for understanding microstructural evolution & integrated computational materials eng'g.

Russell T. Johns, Ph.D., *IL I '82*

Professor and chair, Pennsylvania State Univ. For developing thermodynamically rigorous algorithms for modeling hydrocarbon recovery processes.

Denise C. Johnson, *MI A '89*

Group president, Caterpillar Inc. For overseeing the development of zero-emission and autonomous mining equipment.

Abhay Joshi, Ph.D., *MI I '85*

President and chief executive officer, Axent Biosciences. For taking botulinum toxin medicines from initial lab-scale production to global commercialization and distribution.

Dale E. Klein, Ph.D., P.E., *MO A '70*

Endowed Professor, Univ. of Texas at Austin. For leadership in the development of programs that enhance the safety of nuclear power plants worldwide.

Michael R. Krames, Ph.D., *TX A '88*

President, Arkesso LLC. For contributions to high-brightness, visible-spectrum light-emitting diodes.

Robert E. Lee, *OH I '78*

Board member, Enedym. For leadership in automotive propulsion systems for conventional internal combustion hybrid and electric vehicles.

Maria C. Lehman, P.E., *NY N '81*

Infrastructure market leader, GHD Group. For leadership in public service and business engineering management focused on the sustainability and resilience of critical civil infrastructure.

Yueh-Lin L. Loo, Ph.D., *PA A '96*

Professor, Princeton Univ. For contributions in developing processing-structure-property relationships in organic, polymer, and hybrid electronic materials & leadership in decarbonizing shipping.

Leslie A. Momoda, Ph.D., *CA E '85*

Executive vice president, HRL Laboratories LLC. For delivering materials innovation and application of advanced technologies across diverse industry sectors, ranging from hypersonics to high performance electronics.

Alison A. Nordt, Ph.D., *NY A '92*

Director, Space Science & Instrumentation, Lockheed Martin Corp. For contributions to aerospace & space science through development of novel instruments and missions, extending understanding of the universe.

Mark D. Papermaster, *TX A '82*

Chief technology officer and executive vice president, Advanced Micro Devices. For leadership in the design and production of complex integrated circuit processors.

Kristala L. Prather, Ph.D., *MA B '94*

Professor & dept. head, MIT. For the development of innovative approaches to regulate metabolic flux in engineered microorganisms with applications to special chemicals production.

Mary M. Roybal, Ph.D., *MO B '86*

Senior principal engineering fellow (retired), Raytheon. For contributions to the structural integrity and producibility of some of the world's most advanced missile systems.

Roger Ruan, Ph.D., *OK I '88*

Professor and director, Univ. of Minnesota. For scientific and entrepreneurial contributions to the sustainable development of the circular economy within food and agricultural systems.

David V. Schaffer, Ph.D., *CA I '93*

Distinguished Professor of biochemical eng'g, Univ. of California, Berkeley. For the application of fundamental molecular and cellular engineering principles to enable the clinical success of gene and cell therapies.

Hanspeter Schaub, Ph.D., *TX A '92*

Distinguished Professor, Univ. of Colorado Boulder. For contributions to the control of satellite formations and relative orientations utilizing natural forces, including the use of electrostatics.

SawTeen See, P.E., *NY A '77*

President, See Robertson Structural Engineers LLC. For leadership in managing the innovative structural design of tall, super-tall, and other buildings.

Alice E. Smith, Ph.D., *TX I '79*

Distinguished Professor, Auburn Univ. For advancements in computational intelligence as applied to modeling and optimization of complex systems.

Eric A. Swanson, *MA Z '82*

Research affiliate, Massachusetts Institute of Technology. For contributions and entrepreneurship in biomedical imaging and optical communications.

John C. Vassberg, Ph.D., *TX A '80*

Vice president and aeronautics systems program manager, Northrop Grumman Corp. For engineering leadership enabling the deployment of the James Webb Space Telescope.

Evelyn N. Wang, Ph.D., *MA B '00*

Professor, Massachusetts Institute of Tech. For contributions to clean energy, water technology, and nanostructure-based phase change heat transfer & service to the nation.



Killer Sun?

The Sun, a seething ball of nuclear fusion and magnetic fields, occasionally hurls exceptionally powerful radiation and charged particles into interplanetary space. Woe to any unprotected high-tech electronics in the way ...

By: **Trudy E. Bell, M.A.** text ©2025 Trudy E. Bell

Shortly before noon on September 1, 1859, in Redhill, Surrey, near London, experienced British solar observer Richard Carrington was finishing his hand drawing of an unusually large group of sunspots when he saw “two patches of intensely bright and white light” break out amid the darker spots, with a brilliance “fully equal to that of direct sun-light.” Flustered by the unexpected sighting, he “hastily ran to call someone else to witness the exhibition with me;” returning in less than a minute, Carrington was “mortified to find that it was already much changed and enfeebled” and soon gone altogether. The entire freak phenomenon had lasted under five minutes.

By lucky happenstance, another solar observer, Richard Hodgson, in a nearby London suburb of Highgate, had been making his own sunspot drawing at the same time. Independently, he was dazzled by “a very brilliant star of light, much brighter than the Sun’s surface” among the same group of sunspots. Duration: about five minutes.¹

But that was only the beginning. At the Kew Gardens Observatory in London, a new instrument called a self-recording magnetograph, built to photographically monitor fluctuations in Earth’s geomagnetic field, recorded a “crotchet” or “crochet” — a hook-shaped glitch or excursion of the recording pen — at the time Carrington and Hodgson noted their perplexing transient brilliant “star” on the Sun.²

Seventeen hours later — around 4 a.m. Greenwich time on September 2, 1859, — multicolored auroras or “Northern Lights” so brilliant one could read newspaper print began dancing luridly across the dark night skies, extending south of Caribbean latitudes. Simultaneously, in telegraph offices across Britain and the United States, communications were interrupted as equipment overheated and leaping sparks scorched paper and wood, shocking operators and setting fires. The operators scrambled to disconnect the telegraph wires from the phalanxes of chemical batteries that powered them (1859 being decades before centralized distribution of electrical power).

Even so, telegraph offices miles apart recorded huge phantom currents surging through the disconnected wires, even allowing fitful signals to be transmitted among the astounded operators.³

Carrington and several other astronomers on both sides of the Atlantic strongly suspected that all the coinciding bizarre phenomena on Earth were somehow related to one another as well as to the earlier startling appearances witnessed on the Sun. Over succeeding decades, they were proven correct (recognizing that visible light and other wavelengths of electromagnetic radiation travel at the speed of light, everything else taking hours or days). Thus, dramatically were born the scientific fields of solar physics and space weather, the physics of the Sun-Earth connection.

Today, an increasing number of engineers are realizing the hazards another Carrington-sized event on the Sun could pose to the ubiquitous precision electrical and electronic assets that our 21st-century high-tech society takes for granted, both on the ground and in space.



WHAT WAS THE CARRINGTON-HODGSON EVENT?

Carrington and Hodgson are now credited with being the first to have observed a white light solar flare — and not just any old solar flare, but perhaps the largest and most energetic solar flare in modern recorded history.

A solar flare is a sudden release of electromagnetic radiation associated with sunspots. Most commonly, solar flares are observed at ultraviolet or X-ray wavelengths. Rare ones, such as the Carrington-Hodgson event, also can be seen at visible wavelengths; they are particularly energetic white light solar flares.

Solar flare strengths are categorized by their peak brightness at X-ray wavelengths into a logarithmic scale of five letters (A, B, C, M, X), where each letter represents an energy output 10 times greater than its predecessor: A-class solar flares are near background levels, B-class are 10 times greater, etc. The most powerful flares are X-class: the largest explosions in the solar system, releasing energy equivalent to over a billion hydrogen bombs in a matter of seconds.

X-class solar flares can trigger global radio blackouts on Earth and long-lasting radiation storms in the ionosphere — the charged layer of Earth's upper atmosphere some 50 to 400 miles up that modifies and reflects radio waves. The magnetic crotchet recorded at Kew in 1859 indicated the presence of just such an ionospheric disturbance, now called a "solar flare effect" (SFE), caused by extra ionization from extreme ultraviolet and X-ray radiation.

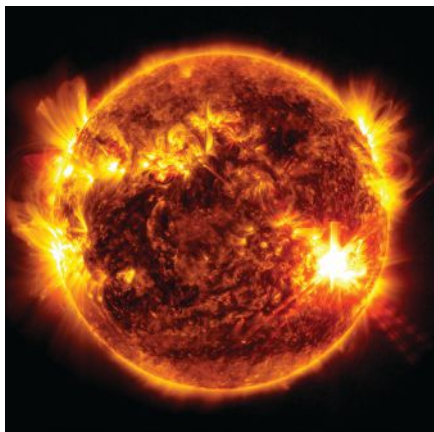
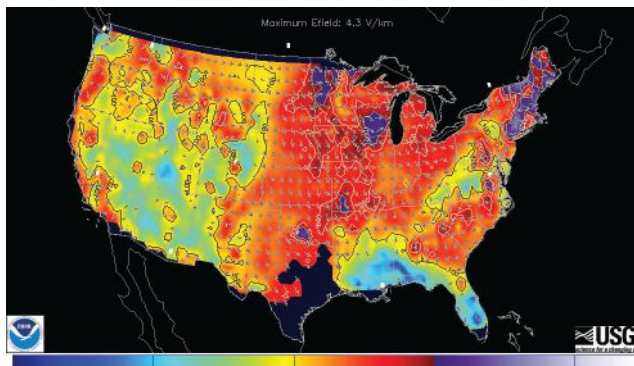


Figure 2: Across the United States on May 10 and 11, 2024, as colorful auroras danced overhead, strong electrical currents were also surging through rocks and soil. The biggest voltages along the U.S. Eastern Seaboard and in the Midwest were as much as 10,000 times normal. The May 2024 storm was, electrically speaking, about half as intense as the storm that blacked out Québec in 1989. The map is a snapshot of a real-time display of electric voltages in the ground, derived from a database of electrical conductivity of the ground, and observed disturbances of the Earth's magnetic field. Absent such activity, the map would be mostly blue. Credit: NOAA/USGS.



Within each letter class, solar flare energies are more finely divided on a scale from 1 to 9, although for X-class flares the numbers can go much higher than 9. The Carrington-Hodgson white light flare has been estimated to have been in the range of X45 to X64.4.⁴ For recent comparison, the two big solar flares of last year (May 10 and 11, 2024) that caused dramatic auroras to be sighted even south of Mexico City were rated "only" X5.8 and X1.5.⁵

Flares are often, but not always, associated with coronal mass ejections (CMEs): expulsions of gigantic bubbles of solar matter threaded with magnetic field lines, which spew electrons, protons, and heavier charged particles out into the solar system. Unlike electromagnetic radiation, which travels in a straight line, the charged particles follow a spiral path of twisted magnetic fields rooted in the Sun. If a major CME happens to be ejected on a path toward Earth, its energetic solar particles can cause not only beautiful auroras in the ionosphere; they also can damage electronics on Earth or in space, and potentially harm

astronauts in orbit or even passengers in high-flying aircraft.

Such a blast of fast solar charged particles can also temporarily deform the Earth's magnetic field, causing compass directions to be unreliable. Electrical currents can be induced to flow through the Earth itself, causing spikes of energy in long power transmission lines, which can damage transformers and trigger electrical power outages.^{6a}

That is what happened during a powerful geomagnetic storm on March 13, 1989, when in less than 90 seconds the 21,000-megawatt Hydro Québec power grid collapsed, plunging the entire province of Québec and parts of the Northeastern U.S. into darkness for nine hours.⁷ Fluctuations in the Earth's magnetic field can disrupt directional drilling operations for oil and gas, which rely on magnetic sensors near the drill bit to control its accurate position and orientation.⁸ Strong magnetic fluctuations can also cause electrical corrosion of pipelines (which are essentially long wires as far as nature is concerned), and warp transformers with high currents.

Figure 1: Last year, on May 11, 2024, a large sunspot cluster produced several strong flares (one appears as the white spot to the lower right) and also coronal mass ejections (CMEs). As the CMEs reached Earth, they triggered a severe to extreme geomagnetic storm, one of the most powerful in over two decades. The National Oceanic and Atmospheric Administration (NOAA) coordinated with operators of power grids, satellites, and navigation systems to take protective actions against the induced currents from fluctuating magnetic fields, to prevent blackouts or damage to infrastructure.

Credit: NASA Solar Dynamics Observatory.

Geomagnetic storms resulting from CMEs are categorized by their own three-tier Space Weather Scale devised by the Space Weather Prediction Center (Boulder, CO) of the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS). The lowest level is Radio Blackouts or R; an intermediate level is Solar Radiation Storms or S; the most disruptive level is Geomagnetic Storms or G. Each level R, S, G is numerically divided into five intensities (1 through 5, for minor, moderate, strong, major, extreme).

Although a widespread power blackout could cause internet and cell phone service outages, the actual likelihood of a potential much-ballyhooed “internet apocalypse” directly due to solar activity is believed to be at least somewhat exaggerated in popular media. Cell phones operate on high frequencies not significantly affected by ionospheric disturbances — that is, as long as the cell phone towers have power. To ascertain the actual odds, however, in 2023 George Mason University and the Naval Research Laboratory received a five-year federal grant to study solar activity and its actual effects on electronic technologies.^{6b}

BUT WAIT, THERE’S MORE

Carrington and Hodgson may have documented the first or biggest white light solar flare in recorded history, but 1859 was not the most recent time the Sun has produced a flare of comparable magnitude.

In early August 1972, a series of solar flares (including two rare white light solar flares) were followed 14.6 hours later by a “punishing” flux of solar energetic particles so intense that it saturated the particle detectors and caused at least one defense communications satellite to fail. Geomagnetically induced currents in the Earth disrupted both electric power from Manitoba Hydro Co. to Minnesota, and communications through long-distance AT&T cables in Illinois and Indiana.

Most freakish and dangerous (1972 being late in the Vietnam war), strong magnetic perturbations triggered the near-simultaneous detonation of some 4,000 magnetic-influence sea mines in a U.S.-sown minefield off Hon La, North Vietnam. The 1972 solar storm is now viewed as a “near miss” of a Carrington-scale CME.⁹ Moreover, the flares happened between Apollo 16 and 17, the two last manned lunar missions. Had the flares occurred while astronauts were on the Moon, the crews would have been sickened from the intense radiation.

Carrington-scale flares are not even the most energetic explosions the Sun can produce. Since elementary school, many students have been taught that — fortunately for life on Earth — our beneficent Sun is a middle-aged, stable (so-called “main sequence”), quiescent, medium-sized yellow star (spectral class G2), ho-hum, despite its roughly 11-year sunspot cycle. Sure, compared to fast-burning hot blue giant stars or explosive novae or supernovae, the Sun is quiescent. But quiet is relative.

The now-defunct Sun-orbiting Kepler space telescope was launched in 2009 to look for earth-like planets around sun-like stars (spectral classes F8 to G8, that is, ranging from slightly warmer to slightly cooler than the Sun). Recent analysis of Kepler data from more than 50,000 sun-like stars reveals that statistically, approximately once a century, 5 percent of such stars emit rare “superflares” some 10,000 times more energetic than typical solar flares.¹⁰ Evidence is yet inconclusive whether our Sun has done the same in the past (although statistically it seems that superflare stars may be younger than the Sun and rotate significantly faster than our Sun’s 28-day period).¹¹

However, in 2012, a then-grad student Fuso Miyake in Japan identified a spike in radiocarbon (carbon-14) concentrations in tree rings dating to 774–775 A.D. Her findings have since been confirmed by measurements of tree rings in other parts of the world, as well as spikes in concentrations of beryllium-10 and chlorine-36 for the same years in Antarctic ice cores.¹² The evidence suggests that every few centuries or millennia, the Sun has blasted forth a particularly scalding storm of solar energetic protons (SEP).

Half a dozen such powerful Miyake events (as they are now called) have been identified as having occurred over the past 5,000 years, including as recently as 993–994 A.D., shortly before Vikings arrived in the New World. Calculations imply that the 774–775 A.D. Miyake event would have had an estimated energy equivalent to a range of X284 to X410¹³ — far more powerful than any old Carrington-Hodgson flare.

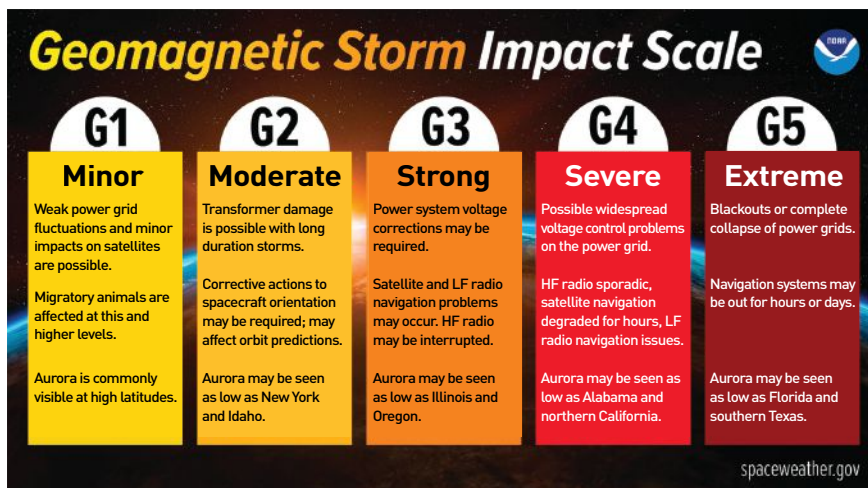


Figure 3: NOAA’s Space Weather Prediction Center has introduced three space weather scales to describe the environmental disturbances for three types of events: geomagnetic storms (G, shown here), solar radiation storms (S), and radio blackouts (R). The scales have numbered levels that convey severity, analogous to scales for ranking hurricanes, tornadoes, and earthquakes. Credit: *Spaceweather.gov*.

NO RESPITE

Lest one be lulled into complacency by the statistical rarity of such potentially devastating solar explosions, consider that flares and CMEs are far less powerful — and statistically far more common — than any Carrington-Hodgson event (much less a Miyake event) have already wreaked widespread temporary havoc on terrestrial and space-based engineered structures and high-tech services multiple times just in the Space Age.

Although well shy of Carrington-Hodgson energy levels, last year (2024) the May 10 solar flares triggered a 40-hour geomagnetic storm in the ionosphere that briefly reached the “extreme” class (G5).¹⁴ Indeed, ionospheric disturbances were great enough to distort the timing of signals received on Earth from the 24 Global Positioning System (GPS) satellites. The cause is a phenomenon called ionospheric scintillation, somewhat analogous to the twinkling of stars at visible wavelengths. The irregular timing delays make the satellites appear slightly farther away or their positions uncertain, degrading the received GPS signals’ navigational accuracy.

One down-to-Earth consequence in 2024 was that modern farm tractors, which rely on GPS signals of centimeter precision for precise directional plowing, planting, and harvesting, were idled in their fields right in the middle of spring planting season, when any delay could result in lower yields and less revenue.¹⁵ Another consequence: during the “Halloween” geomagnetic storm of late October 2003, severe ionospheric scintillation of GPS signals compelled the Federal Aviation Administration (FAA) to disable its vertical navigation service (which enables close vertical separation of aircraft in flight) for some 30 hours to ensure that passenger safety was not compromised.¹⁶

Worse, even relatively weak solar activity can pose real-world risks to high-tech systems, as the company SpaceX discovered the hard way three years ago.

Low Earth orbit is not a perfect vacuum. Satellites orbiting between about 80 to 700 km (~50 to 400 miles) altitude are actually in Earth’s “thermosphere,” a rarefied upper part of the ionosphere

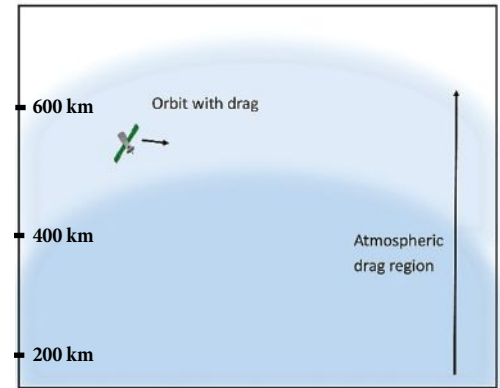
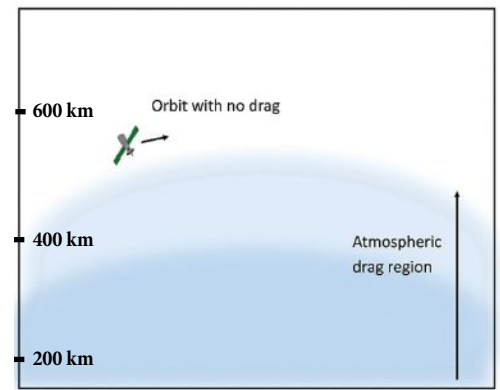
where air molecules are photoionized by solar ultraviolet radiation. An influx of energetic charged solar particles can cause the thermosphere to heat up and expand, increasing atmospheric density at higher altitudes. That, in turn, increases atmospheric resistance (drag) on satellites in low Earth orbit, causing them to lose altitude. [see Fig. 4a/b]¹⁷

Such additional drag can be significant even during a moderate geomagnetic storm. On February 3, 2022, SpaceX launched 49 Starlink communications satellites into an elongated low staging orbit (210 km x 350 km) in preparation to being boosted to their higher (~550 km) operational circular orbits. Over the next four days, however, 38 of the Starlink satellites ended up deorbiting and spiraling back to Earth, a multi-million-dollar loss. Unexpectedly, atmospheric drag was an estimated 50 percent greater than what had been predicted for a mild geomagnetic storm (G1) produced by several moderate (M1.1 class) solar flares.¹⁸

THE NOT-SO-QUIET SUN

Even near or during sunspot minimum — the few years every solar cycle when the surface of the Sun appears nearly unblemished and magnetic storms seem to have subsided — there is no respite for sensitive electronics in space. Especially during the declining phase of the sunspot cycle approaching solar minimum, relatively cool “holes” open in the Sun’s corona (its tenuous outermost atmosphere, visible as a silvery halo around the black disk of the Moon during the few minutes of totality in a total solar eclipse). In ultraviolet or soft X-ray images of the Sun, coronal holes look like vast dark areas [see Fig. 5].

Physically, coronal holes are locations primarily near the Sun’s poles where the Sun’s magnetic field lines do not close back on themselves as loops; instead, the magnetic field lines are open to interplanetary space, propelling the charged particles of the solar wind outward to speeds exceeding 500 to 1,000 km/sec. Coronal holes can persist for months (several solar rotations).



Figures 4a/b: Atmospheric drag has a significant impact on spacecraft in low Earth orbit (LEO), generally defined as an orbit below an altitude of approximately 2,000 kilometers (1,200 mi). Although the air density is low, air resistance in those layers of the atmosphere in LEO is still strong enough to produce drag and pull satellites closer to the Earth. The drag force on satellites increases when the Sun is active; at solar maximum, satellites may have to be maneuvered every two or three weeks to maintain their orbit. Credit: Trudy E. Bell/Allan W. Meyer/NASA.

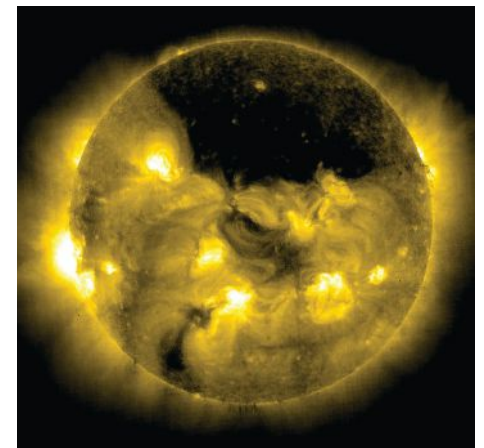


Figure 5: The European Space Agency/NASA Solar and Heliospheric Observatory (SOHO) captured this image of a gigantic coronal hole hovering over the Sun’s north pole on July 18, 2013, at 9:06 a.m. EDT. The image was taken at extreme ultraviolet wavelengths, which highlight hotter solar material, so the colder coronal hole stands out in dark relief. Credit: ESA and NASA.

When the solar wind meets Earth’s magnetic field, the particles are deflected, either away from the neighborhood altogether or into one of the planet’s two equatorially concentric ring-shaped Van Allen radiation belts [Fig. 6]. The inner belt (roughly 640 to 6,400 km high, although sources for numbers differ) is primarily made of protons originating from both the Sun and cosmic rays, and the outer belt (some 13,000 to 45,000 km high) primarily of solar wind electrons. Between the two radiation belts is a comparatively narrow slot or gap relatively clear of charged particles.

Once trapped in the outer radiation belt, energetic electrons can be accelerated to velocities well over half the speed of light, becoming so-called “killer electrons.” Although the radiation belts protect Earth’s atmosphere and life forms from destruction, relativistic killer electrons circulating in the outer radiation belt can damage spacecraft in medium Earth orbit (including GPS satellites) or in geostationary orbit (including communication satellites). Specifically, in the words of a recent study, the electrons can:

penetrate satellite surfaces and embed themselves in insulating materials and ungrounded conductors. The charge can accumulate over time resulting in the build up of high electric fields in and between materials to breakdown levels... The subsequent discharge can cause phantom commands, logic errors, erroneous data, loss of functionality and, in exceptional cases, serious harm to a satellite.¹⁹

For this reason, some medium Earth orbit satellites are inserted into orbits in the safer slot region to minimize time spent in either radiation belt. Others have no choice. GPS satellites, for example, must be at a specific altitude for the intended half-day orbits needed to maintain the 24-satellite constellation.

As already described, CMEs are one principal driver of geomagnetic storms, principally the greatest storms around solar maximum. However, coronal holes and their associated fast solar winds are the second big driver, principally causing weak to moderate geomagnetic storms around solar minimum (although CMEs, coronal holes, and other phenomena can occur at any point during the solar cycle).

Indeed, 30 of the 50 largest relativistic “killer” electron flux events over the past 20 years have been triggered by coronal holes, not by CMEs. That correlation and frequency has made some researchers wonder whether “satellites in GPS and geosynchronous orbit could be more at risk during a milder solar storm than from an extreme storm.”²⁰

HOW TO PREPARE?

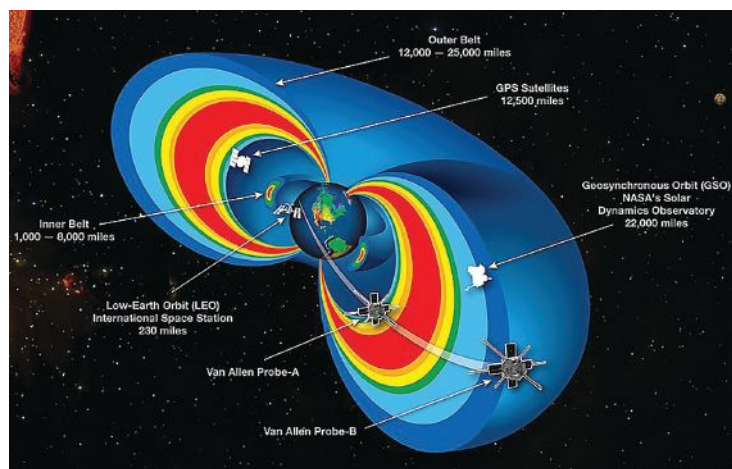
The Sun is now approaching or in solar maximum for the current cycle (called solar cycle 25), which is predicted to last through 2025 and into 2026. Are our civilian and military technologies ready with adequate defenses? The insurance industry thinks not. “A solar storm of the same magnitude of the Carrington Event hitting Earth is inevitable as historical records indicate that extreme storms of that magnitude occur every 150 years,” wrote cybersecurity expert David Piesse. “The total economic cost of such an event is estimated between \$600 billion to \$2.6 trillion” if outages are long-lasting and widespread enough to cause “a domino effect on human society.”²¹

Over the past two decades, alert systems have been set up to warn power utilities and others of powerful CMEs heading for Earth, and to forecast solar wind parameters up to a week in advance. Examples include the U.S. NOAA/NWS Space Weather Prediction Center (<https://spaceweather.gov>) and the highly readable commercial daily service SpaceWeather.com (<https://spaceweather.com>), and apps tied into them.

But there is much about the Sun and Earth that physicists and engineers do not yet understand well enough to be able to predict all potentially damaging space weather effects — and their consequences. “Only by developing our understanding of the dynamics of the Sun ... will we really be able to forecast space weather events with any certainty,” asserted meteorologist Simon Machin, manager of the U.K.’s Met Office Space Weather Programme.²²

Fundamental scientific and technical questions include: what are details of the internal dynamics of the Sun and how do they cause solar cycles? Can we know the Sun’s innards well enough to offer useful predictions — and warnings — about the Sun’s behavior? Although empirical models exist of Earth’s atmosphere and its responses to happenings on the Sun, can atmospheric drag and other factors be modeled with useful precision? How much shielding and other protections are enough to protect assets and people in orbit for various mission durations? How can findings be readily and regularly exchanged among scientific investigators and engineers domestically and internationally?

Figure 6: The Van Allen radiation belts are two donut-shaped regions encircling Earth where high-energy solar particles, mostly electrons and ions, are trapped by Earth’s magnetic field. The energetic particles can affect the performance and reliability of technologies and pose a threat to astronauts and spacecraft. Also shown are a few satellites whose orbits take them through or near the radiation belts. Credit: NASA.



Over the past decade, a growing number of white papers have laid out the urgent need for greater expertise and/or plans for predicting and mitigating space weather effects.²³ Given society's increasing demand for — and reliance on — electrical and electronic goods and services ranging from global financial transactions, robotic surgery, electric vehicles, and cryptocurrency to military surveillance, autonomous cars, streaming entertainment, and artificial intelligence, many experts urge greater concrete action to adequately protect against outages.

Gratitude for manuscript comments is expressed to Dave Dooling (retired education officer at the National Solar Observatory and retired education director of the New Mexico Museum of Space History), Allan W. Meyer (retired staff scientist, NASA Ames airborne observatories KAO and SOFIA), and Sara Meyer (Senior Technician, University of Oregon Hazards Laboratory).

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TRUDY E. BELL, M.A. (t.e.bell@ieee.org), has been an editor for *Scientific American* magazine, senior editor for *IEEE Spectrum* magazine, and senior writer for the University of California High-Performance AstroComputing Center (UC-HiPACC). This is her 35th feature article published in *The Bent* since 2002.

THE SOLAR DYNAMO

The Sun is made up of plasma—an ultrahot dense mass of charged sub-atomic particles. Through convection, solar plasma circulates from interior to surface; it also moves from equator to pole, and faster at the equator than near the poles. Together, the movements generate magnetic fields that emerge from the Sun to form spots, coronal loops, and prominences, as well as giving the Sun an overall north-south magnetic polarity. This combination of moving charges con-torts, collapses, and ultimately flips or reverses the Sun's magnetic field. Centuries ago, astronomers studying the Sun first saw the number of sunspots wax and wane roughly every 11 years. But each visible sunspot cycle is actually just half of a 22-year magnetic cycle, now called the Hale cycle, when the magnetic field flips and then returns to its original polarity. For reasons still unknown, every few centuries the solar magnetic cycle all but disappears (as happened during the Maunder Minimum, 1645–1715, about three Hale cycles) or enhances (such as Modern Maximum, 1914–2008, about four cycles).

The Sun's magnetic cycle can impact Earth. Basic electromagnetic theory teaches that given magnetism, electricity, and force, any two produce the third. Magnetism moving across a conductor produces electricity, the basis of generators. A spike in magnetic intensity spikes the current. A coronal mass ejection squeezing Earth's magnetic field in space induces strong electric currents along wires and pipelines on the ground, one form of electromagnetic pulse (EMP), which can impair or destroy electrical infrastructure through arcing and heating. Other forms of EMP can be produced by lightning and high-altitude nuclear blasts.

– Dave Dooling and TEB

Selected References listed on page 45.



Figure 7: On December 7, 2023, representatives from NASA, NOAA, the National Science Foundation, and the Air Force signed a Memorandum of Agreement for a Space Weather Research-To-Operations-To-Research Collaboration to improve U.S. forecasts and services to mitigate the effects of space weather. Credit: Bob Hyatt, NOAA.

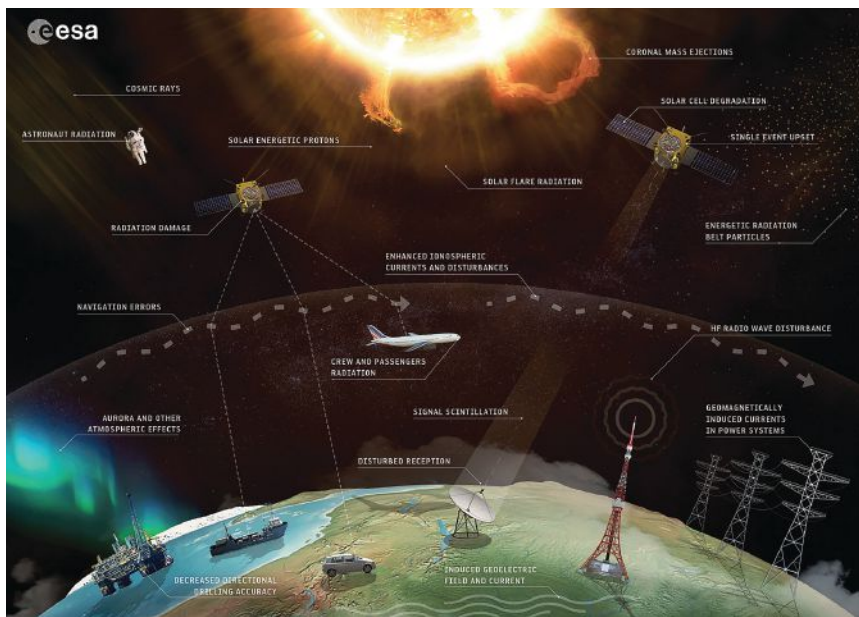


Figure 8 (left): Space weather effects on the ground can include damage and disruption to power distribution networks, increased pipeline corrosion, and degradation of radio communications. Credit: European Space Agency.

CHAPTER ENDOWMENT INITIATIVE

The Chapter Endowment Initiative (CEI) program, launched in Spring 2014, allows alumni, companies, and foundations to permanently endow the Association's activities that support any of our 257 active collegiate student chapters. Last year we reported 26 gifts/pledges and this year we have an additional 31 for the list as we strive to endow all of our chapters.

\$6,400,000

The estimated value of the Chapter Endowment Initiative fund, including growth and interest, at TBP's fiscal year-end (July 31, 2024).

MINIMUM GIFT AMOUNT:

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.

HOW YOU CAN HELP:

There are a number of ways to support this initiative. Checks can be made to: Tau Beta Pi – The Engineering Honor Society 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 Tau Beta Pi in your estate plans.

TAX-DEDUCTIBLE:

Gifts through this initiative will be reflected in an individual's total giving to TBPI. 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 law.

THE CHAPTER ENDOWMENT INITIATIVE:

You can learn more about the progress and developments of the CEI on our website, www.tbp.org/?CEI or by contacting Director of Development Sherry Jennings-King, *TN Alpha '93*, by phone at (612) 226-2922 or by email at tbp.development@tbp.org.



Newly Received Gifts & Pledges

Anonymous

ARIZONA ALPHA — \$100,000
University of Arizona

David A. Grigsby, *CA Z '84*
CALIFORNIA ZETA — \$35,000
Santa Clara University
MASSACHUSETTS BETA — \$5,000
Massachusetts Institute of Technology

Nick A. Farmer, *MD B '68*
KENTUCKY ALPHA — \$20,000
University of Kentucky

R. Dudley White, *VA A '76*
VIRGINIA EPSILON — \$20,000
Virginia Commonwealth University

Anonymous
TEXAS ALPHA — \$20,000
University of Texas at Austin

Richard J. Kisloski, *VT B '67*
VERMONT BETA — \$15,000
Norwich University

Rick O. Ayres, *IL I '79*
TEXAS EPSILON — \$10,389
University of Houston

John "Fritz" Angle, *M.D., NY A '82*
NEBRASKA ALPHA — \$10,000
University of Nebraska-Lincoln

Bob & Joy Bianca, *Ph.D., CA S '90*
CALIFORNIA SIGMA — \$10,000
University of California, Santa Barbara

David D. Kilzer, *IA A '96*
TEXAS EPSILON — \$10,000
University of Houston

Jerry M.L. Mendel, *Ph.D., NY Z '59*
NORTH CAROLINA EPSILON — \$5,000
North Carolina A&T State University
LOUISIANA EPSILON — \$5,000
University of New Orleans

Michael & Tina Pierce, *CO A '90 and '89*
COLORADO ALPHA — \$10,000
Colorado School of Mines

James C. Williams, *Ph.D., P.E., NM B '76*
NEW MEXICO BETA — \$5,000
University of New Mexico
TEXAS ETA — \$5,000
University of Texas at Arlington

David J. Cowan Jr., *P.E., FL E '14*
FLORIDA EPSILON — \$9,488
Florida Atlantic University

Charles E. Cancilla, *CA Z '59*
CALIFORNIA ZETA — \$8,000
Santa Clara University

Anonymous, *MA B '67*
MASSACHUSETTS BETA — \$6,000
Massachusetts Institute of Technology

†John R. Williams, *PA B '60*
PENNSYLVANIA BETA — \$5,301
Pennsylvania State University

Dan M. Brandt, *IN A '74*
INDIANA DELTA — \$5,000
Valparaiso University

Paul N. Dackow, *MD A '76*
MARYLAND ALPHA — \$5,000
Johns Hopkins University

Franklin T. Dodge, *TN A '60*
TENNESSEE ALPHA — \$5,000
University of Tennessee

Daniel W. Duval, *OH M '60*
OHIO MU — \$5,000
Wright State University

Donald C. Forslund, *NJ A '60*
NEW JERSEY ALPHA — \$5,000
Stevens Institute of Technology

Irwin M. Jacobs, *Sc.D., NY A '56*
CALIFORNIA PSI — \$5,000
University of California, San Diego

†Howard E. Jessen, *CA B '46*
CALIFORNIA BETA — \$5,000
California Institute of Technology

Barbara & †Ralph A. Rockow, *OH I '58*
ANY CHAPTER — \$5,000

Peter F. Salamon Jr., *OH A '71*
KENTUCKY ALPHA — \$5,000
University of Kentucky

Frederick "Larry" Stiles, *TN A '71*
TENNESSEE ALPHA — \$5,000
University of Tennessee

Harold O. Svendsen, *NY I '58*
NEW YORK GAMMA — \$5,000
Rensselaer Polytechnic Institute

Richard C. Temple, *P.E., CA Θ '90*
CALIFORNIA THETA — \$5,000
California State University, Long Beach

William E. Van Wagenen Jr., *NY Θ '78*
NEW YORK THETA — \$5,000
Clarkson University

Anonymous, *PA A '90*
PENNSYLVANIA LAMBDA — \$5,000
University of Pittsburgh

The goal of this initiative is to endow all collegiate chapters to provide permanent funding for the activities that benefit the students of those chapters. Chapters with support above \$80,000 are eligible to receive grants to support their activities; Headquarters will contact the chapters once funding is available. In addition to the chapters listed on the previous page, as of January 31, 2025, the Association has received cash and pledges totaling less than \$100,000 for each of the 92 chapters here:

ALABAMA ALPHA \$5,000	COLORADO ALPHA \$60,000	MARYLAND ALPHA \$5,000	NEW YORK NU \$5,000	TEXAS ALPHA \$41,240
ALABAMA GAMMA \$35,000	COLORADO BETA \$20,000	MARYLAND GAMMA \$10,000	NEW YORK RHO \$5,725	TEXAS GAMMA \$5,000
ALABAMA DELTA \$5,000	DELAWARE ALPHA \$10,000	MARYLAND EPSILON \$5,000	NORTH CAROLINA EPSILON \$5,000	TEXAS DELTA \$30,000
ALABAMA EPSILON \$5,000	D.C. ALPHA \$5,000	MASSACHUSETTS BETA \$96,000	OHIO DELTA \$35,000	TEXAS EPSILON \$45,389
ARIZONA BETA \$10,000	FLORIDA ALPHA \$5,000	MICHIGAN ALPHA \$50,000	OHIO IOTA \$5,000	TEXAS ZETA \$10,000
ARKANSAS ALPHA \$5,000	FLORIDA EPSILON \$14,659	MICHIGAN ETA \$5,075	OHIO MU \$10,000	TEXAS ETA \$10,000
CALIFORNIA ALPHA \$50,000	GEORGIA ALPHA \$55,886	MICHIGAN IOTA \$8,040	OKLAHOMA GAMMA \$5,000	TEXAS THETA \$5,000
CALIFORNIA BETA \$45,084	ILLINOIS BETA \$5,000	MICHIGAN LAMBDA \$5,000	OREGON ALPHA \$10,000	TEXAS IOTA \$5,000
CALIFORNIA GAMMA \$72,000	ILLINOIS GAMMA \$30,857	MINNESOTA ALPHA \$25,000	PENNSYLVANIA BETA \$45,301	TEXAS KAPPA \$5,000
CALIFORNIA ZETA \$74,000	INDIANA ALPHA \$45,000	MONTANA ALPHA \$5,000	PENNSYLVANIA GAMMA \$5,000	TEXAS NU \$40,031
CALIFORNIA ETA \$35,000	INDIANA BETA \$10,000	NEBRASKA ALPHA \$50,000	PENNSYLVANIA DELTA \$5,000	VERMONT ALPHA \$5,000
CALIFORNIA THETA \$5,000	INDIANA DELTA \$5,000	NEW HAMPSHIRE BETA \$10,200	PENNSYLVANIA ZETA \$10,000	VERMONT BETA \$30,000
CALIFORNIA LAMBDA \$5,000	INDIANA EPSILON \$30,000	NEW MEXICO BETA \$10,000	PENNSYLVANIA ETA \$10,000	VIRGINIA BETA \$75,069
CALIFORNIA MU \$5,000	IOWA BETA \$35,000	NEW YORK BETA \$73,707	PENNSYLVANIA THETA \$50,000	VIRGINIA EPSILON \$20,000
CALIFORNIA NU \$5,000	KANSAS BETA \$5,000	NEW YORK ETA \$5,000	PENNSYLVANIA LAMBDA \$30,000	WASHINGTON ALPHA \$20,000
CALIFORNIA SIGMA \$10,000	KENTUCKY ALPHA \$25,000	NEW YORK THETA \$20,000	PUERTO RICO ALPHA \$10,000	WISCONSIN ALPHA \$53,120
CALIFORNIA TAU \$5,000	LOUISIANA BETA \$5,000	NEW YORK KAPPA \$27,571	RHODE ISLAND ALPHA \$20,000	WISCONSIN BETA \$5,000
CALIFORNIA PSI \$35,000	LOUISIANA EPSILON \$15,000	NEW YORK MU \$15,000	RHODE ISLAND BETA \$20,000	WISCONSIN GAMMA \$5,000
			TENNESSEE BETA \$10,000	WISCONSIN EPSILON \$5,000
				ANY CHAPTER \$50,000

Current Endowed Chapters (31) with \$100,000 or more in cash and pledges:

ARIZONA ALPHA Univ. of Arizona \$105,000	INDIANA GAMMA Univ. of Notre Dame \$125,000	MISSISSIPPI ALPHA Mississippi State Univ. \$115,000	OHIO GAMMA Ohio State Univ. \$100,000
CALIFORNIA DELTA Univ. of Southern California \$100,000	IOWA ALPHA Iowa State Univ. \$110,289	MISSOURI BETA Missouri Univ. of S&T \$100,000	OHIO EPSILON Cleveland State Univ. \$100,000
CALIFORNIA EPSILON Univ. of California, Los Angeles \$100,000	LOUISIANA ALPHA Louisiana State Univ. \$100,000	NEW JERSEY ALPHA Stevens Institute of Tech. \$105,228	SOUTH DAKOTA ALPHA SD Mines \$204,675
CALIFORNIA UPSILON Calif. State Univ., Sacramento \$100,000	MARYLAND BETA Univ. of Maryland \$135,000	NEW JERSEY DELTA Princeton Univ. \$100,000	TENNESSEE ALPHA Univ. of Tennessee \$100,000
COLORADO ZETA U.S. Air Force Academy \$100,000	MICHIGAN BETA Michigan Tech. Univ. \$100,000	NEW YORK GAMMA Rensselaer Polytechnic Inst. \$105,000	TEXAS BETA Texas Tech Univ. \$100,113
FLORIDA GAMMA Univ. of South Florida \$105,000	MICHIGAN GAMMA Univ. of Michigan \$204,912	NEW YORK DELTA Cornell Univ. \$105,000	VIRGINIA ALPHA Univ. of Virginia \$115,000
ILLINOIS ALPHA Univ. of Illinois at Urbana-Champaign \$187,520	MICHIGAN EPSILON Wayne State Univ. \$250,000	OHIO ALPHA Case Western Reserve Univ. \$100,000	WEST VIRGINIA BETA West Virginia Tech. \$108,000
	MICHIGAN ZETA Kettering Univ. \$100,000	OHIO BETA Univ. of Cincinnati \$100,000	WYOMING ALPHA Univ. of Wyoming \$100,000

Chapter Endowment Initiative Challenge Matches

There are currently five open challenge matches where alumni have stepped forward to incentivize giving from alumni. The minimum amount accepted for a match is \$5,000.



Tau Bate, **Nick A. Farmer, MD B '68**, initiated a challenge match of \$20,000 toward the endowment of the Kentucky Alpha Chapter at the University of Kentucky. To date, we've received one match of \$5,000 — three more are needed to complete this challenge. The current total raised for KY Alpha is \$25,000.



Tau Bate, **Robert H. Tolson, VA B '58**, initiated a challenge match of \$25,000 toward the endowment of the Virginia Beta Chapter at Virginia Tech. To date, no matches have been received — five are needed to complete this challenge. Due to the efforts of Bob and several alumni, the VA Beta Chapter is currently at \$75,069. With the completion of this challenge, they will reach \$100,069, thus exceeding our goal.



Tau Bate, **Jim M. Tien, Ph.D., NY G '66**, initiated a challenge match of \$20,000 toward the endowment of the New York Gamma Chapter at Rensselaer Polytechnic Institute. To date, we've received three matches of \$5,000 each (\$15,000) — only one more is needed. Due to the efforts of Jim and several alumni, the NY Gamma Chapter is currently at \$105,000. With your help toward the completion of this challenge match, we will continue to surpass the \$100,000 goal for this chapter.



Tau Beta Pi received a bequest from the estate of **Charles F. Chatfield, Ph.D., NY B '32**, of which \$20,000 was earmarked as a challenge match in support of the New York Beta Chapter at Syracuse University. To date, no matches have been received — four are needed to complete this challenge. Due to the efforts of several alumni in years past, the NY Beta Chapter is currently at \$73,707. The completion of this challenge will result in this chapter being a stone's throw away from full endowment.



Tau Bate, **Robert "Dudley" White, VA A '76**, initiated a challenge match of \$20,000 toward the endowment of the Virginia Epsilon Chapter at Virginia Commonwealth University. Four gifts of \$5,000 are needed to complete this challenge. The total raised for VA Epsilon is currently \$20,000.

The STORY BEHIND The PHOTO

Announcing the Spring 2025 “Caption This Photo” Contest!

Back to black & white at the 1996 Convention in Rapid City, SD, where petitioners from the United States Air Force Academy celebrate being granted a chapter of Tau Beta Pi. Collegiate chapter #226 (Colorado Zeta at USAFA) was installed March 8, 1997, in Colorado Springs.

How to Enter: Send us your witty caption(s) for this Convention photo. If the judges vote yours as one of the **top three** (and you have not been a previous winner), **we’ll send you a TBP t-shirt of your choice!**

Submit your entry using this form: www.tbp.org/?CaptionSub or mail to *The Bent* of Tau Beta Pi, Caption Contest, P.O. Box 2697, Knoxville, TN 37901-2697.



**DEADLINE: THURSDAY, MAY 1
5 P.M. [ET]**

Questions? Contact d.lane@tbp.org

WINNERS of the Winter 2025 “Caption This Photo” Contest:

The judges reviewed 61 entertaining captions created by 44 Tau Bates. You can read all entries, including captions and results from recent contests, at www.tbp.org/bent-features.cfm#caption. **If you are interested in serving as one of our judges, contact Dylan Lane at d.lane@tbp.org.**

1ST PLACE:

“Next year, we won’t include wind tunnel demonstrations at the Convention!”

Marsha A. Comeau, MA A '89

2ND PLACE:

“Sam demonstrates the new Tau Bate initiation ritual.”

Larry Stiles, TN A '71

3RD PLACE:

“Ok, you have ‘Y’ and ‘M’ down. We’re having a little trouble with ‘C,’ but let’s move to ‘A.’”

Nicholas L. Wolff, NE A '00

4TH PLACE:

“Who knew a 737 panel was hidden behind that wall!”

Richard R. Roll, IN B '81
(Previous t-shirt winner)



▲ At the 2024 Convention, our TBP photographer captured District 16 Director Sam Rokni, CA C '05, demonstrating his annual signature pose during a committee meeting.

**CONGRATULATIONS TO OUR
WINNERS!**



The Case of Ethel Ricker and Illinois Alpha

BY MEGAN M. HARRISON, ILLINOIS ALPHA '26

March 2025:
Women's
History
Month

“The earliest we know that Tau Beta Pi could have initiated a woman into membership was in 1903 when the Executive Council rejected Illinois Alpha’s attempt to initiate Ethel Ricker, an eligible architectural student. The matter was brought before the 1903 Convention, where the delegates affirmed the Council’s decision and resolved to interpret the Constitution as restricting membership to men. It took decades and numerous attempts by subsequent Conventions to undo that choice.”

“The Struggle: Women’s Badge to Full Membership”

— *The Bent*, Spring 2019 (page 12)

INTRODUCTION

After reading this excerpt, I wanted to know more and figured Google would have something to offer. When that didn’t work, I thought maybe there would be something in the Illinois Alpha (IL Alpha) Chapter’s office.

Nothing there either. What was intended to be a quick search turned into several weeks of looking through University Archives, old yearbooks, and 120-year-old newspaper articles in order to find anything about Ethel Ricker that still existed. There isn’t much. Some yearbooks, about a dozen newspaper articles, old board meeting minutes, a couple sketches, a small stack of personal letters, her bachelor’s dissertation, and an obituary were all I could find about Ethel’s life. However, it was enough to put together a picture of her time at the University of Illinois and the case of IL Alpha trying to initiate her into Tau Beta Pi 65+ years before women were granted full membership into the Association in 1969.

Despite the fact that Ethel Ricker passed away in 1971, she was never granted full TBPI membership, never presented a Women’s Badge, and the national organization didn’t provide any formal acknowledgment of her eligibility.

And while Ethel Ricker didn’t receive recognition during her lifetime, and she has no living relatives who will see this, my hope is that at least in part, this article provides the recognition she deserves.

ILLINOIS ALPHA

The Illinois Alpha Chapter was founded at the University of Illinois Urbana-Champaign (UIUC) in 1897, making it the Association’s 5th oldest chapter. Since then, it has initiated 10,888 members of which only 1,195 are women. This means that slightly more than ten percent of IL Alpha’s membership is female, which is due largely in part to the fact that women were not granted full membership in the Association until 1969.

Tau Beta Pi officially implemented the Women’s Badge program in 1938, although a few women were acknowledged by the Association prior to this, and given a Women’s Badge once the program was established.

Image Left: The 1905 University of Illinois Women's Basketball team with Ethel Ricker (front row, 2nd from left).
Courtesy of the University of Illinois Archives, 0011233, Record Series 2/4/2, Box 1, Folder: Kinley, David, 1895.

This program gave recognition to eligible women while still withholding full membership. In total, 619 women were given the Women's Badge, with six of them being from UIUC. The IL Alpha recipients of the Women's Badge are:

Marianna Margaret Schroeder, #9
architectural engineering (1943)

Betty Lou Bailey, #93
mechanical engineering (1950)

Sydney B. Berry, #136
architecture (1951)

Gloria E. Winkel, #150
engineering physics (1954)

Chung Sul Youn, #177
chemical engineering (1955)

Meilnte O. Tapulionis, #216
chemical engineering (1958)

Not only is Ethel Ricker not present on this list, but she was pledged to membership almost twenty years before the first unofficial Women's Badge was presented to Katharine Cleveland Harelson of Kentucky Alpha in 1924.

Additionally, Ethel wasn't just eligible for membership; but was top of her junior class. The Executive Board of IL Alpha discussed her case for two years, and it was brought before the TBP Convention in 1903. Despite this, she was not given a Women's Badge once the program was established in 1938, or full membership in the Association in 1969, even though both were within her lifetime.

ETHEL S. RICKER

Ethel was born on April 12, 1883, to Nathan Clifford and Mary Carter (Steele) Ricker. Her father was initiated into Tau Beta Pi at UIUC (IL Alpha) in 1898 and became a professor of architecture (1873-1917) and served as Dean of the College of Engineering from 1878-1905.

In 1900, Ethel Ricker began her studies at the University of Illinois, pursuing a degree in architecture. As a freshman, she joined the architecture club alongside both parents, with her father as a member and her mother as an associate member. Ethel would remain in the architect's club throughout her time at the university.

Additionally in her freshman year, she made the Varsity Women's Basketball team as the left guard. She went on to play on the team during her four years at the university in various positions. The yearbook from her senior year states that, "The position of center guard is ably filled by Ethel Ricker who played for three years on the preparatory team. She made the Varsity her freshman year and the close of the basketball season this year will see the close of her fourth year of good, faithful work."

In her sophomore year, she served as the class historian and pledged with the Kappa Alpha Theta sorority, remaining active with the chapter for several years.

At that time, the University of Illinois junior class was in charge of publishing that year's yearbook, and during her junior year, Ethel was on the staff, contributing to the 1904 *Illio Yearbook*.

Her bachelor's thesis "A Summer Resort" was presented in June of 1904 and she was the only woman to graduate from the college of engineering with a bachelor's degree that year. Ethel was also only the third woman to graduate from the Univ. of Illinois with an engineering degree, preceded by Mary Louisa Page in 1879, with a degree in architecture; and Mel Dora Stritesky, also with an architecture degree in 1897.

Not much is known about Ethel Ricker post-graduation. However, a few personal letters and postcards from the N.C. Ricker Papers give some insight into her personal life, but provide no details on a professional career. She lived in the Champaign-Urbana area until 1927, when she sold the family home and moved to the Chicago area.

A simple obituary was printed in the *News Gazette*: Ethel Ricker, 88, died Saturday (Aug. 21, 1971) at the Golf-Mill Nursing Home, Glenview, IL. Graveside services were at Woodlawn Cemetery, Dr. Kermit Gregory officiated, and there were no survivors.



Ethel Ricker in childhood, 1895.
Courtesy of the University of Illinois Archives, 0011226, Record Series 2/4/2, Box 1, Folder: Kinley, David, 1895.

Image of Nathan C. Ricker, *IL A* 1872.

He was the first person in the United States to receive a degree in architecture.

Nathan began teaching at the University of Illinois in 1872 and created the curriculum for the architectural engineering program there in 1890.

He designed several of the buildings on campus, including the one in which he dedicated 40 years of his life teaching architecture.



ETHEL RICKER'S TAU BETA PI ELIGIBILITY

The IL Alpha board meeting minutes, housed in the University Archives, provided a complete account of the process the chapter went through in an effort to initiate Ethel. The passages below are only a portion of the mentions of this case, but all passages where definitive action was taken on the matter have been included.

"The president instructed Cor. Sec. Provine to write to the Gen. Sec. concerning the eligibility of women to join T.B.P."

— September 19, 1902

In 1902, TBPI Constitution Article V, Section 2 stated that, "Membership shall be open to all those students in any class who, up to the beginning of the last year of their course, or as specified in Section 3, shall have maintained an average rank in scholarship in the first quarter of the class, with a general average grade of not less than seventy-five percent, or the equivalent thereof."

Article V Section 3 goes on to state that, "The student who shall have the highest record at the close of the second year of the course, shall be eligible at the beginning of his junior year; and in case this student does not return to college in his junior year, the student second in rank shall be eligible."

While the Constitution did not explicitly restrict Tau Beta Pi membership to men at this time, no women had been initiated in the 17 years the Association had existed.

"Bro. Whitsitt submitted the following as eligible to T.B.P."

Junior: Miss Ethel Ricker

Seniors: Chamberlain, Green, Wilson J. W., Sussex, Skinner, Le Fourd, and Seymour."

— October 7, 1902

In the early 1900s, IL Alpha initiated several members of the senior class and the top member of the junior class, in keeping with the Constitution. In 1902, upon receiving the list of eligible students, not only was Ethel Ricker's name present, but she was the sole eligible member of the junior class.

"Discussion was had upon the question of the eligibility of women as members of the association of T.B.P."

Bro. Gage moved that Ethel Ricker be invited to join T.B.P. Seconded by Bro. Atwood and carried.

Moved and seconded M. T. Chamberlain be invited to join T.B.P. Amended to include the remainder of those eligible. Motion as amended carried. The following being elected.

Ethel Ricker, Martin T. Chamberlain, Charles H. Green, Joseph W. Wilson, Elgie R. Skinner, James W. Sussex, and Budd W. Seymour."

— October 14, 1902

There is no mention of a major objection to Ethel Ricker's membership anywhere in the IL Alpha board meeting minutes, and she was elected to membership alongside the rest of the eligible students. At this time, IL Alpha would publish the list of students elected to Tau Beta Pi in the *Daily Illini* newspaper, and Ethel's name was published in this list on October 17, 1902.

"Bro. Kuss moved and it was seconded that a committee of three be appointed to write up a complete account from the beginning of the case of Ethel Ricker. Motion carried. Pres. Duffy appointed Bros. Provine, Kuss, and Whitsitt."

— December 17, 1902

IL Alpha had submitted Ethel's name to the Executive Council, who rejected her election. The chapter decided to appeal the case at the next Convention which would be held on November 28, 1903, as there was no Convention held in 1902. In preparation, a committee was assembled to defend her case. This committee is mentioned frequently in the remainder of the board meeting minutes, providing updates on the assembly and presentation of these documents.

"Moved and seconded that the Pres. appoint a committee to see Dean Ricker and instruct him that Miss Ricker be asked to wear the colors of Tau Beta Pi, if she wishes until definite action is taken in the matter."

— February 19, 1903

Approval for the initiation of Ethel Ricker would have to wait until the next National Convention, which was several months away. Given that she met the scholastic requirements, the chapter decided to allow her to represent the organization until an official decision was made. There is a significant gap between this entry and the next mention of Ethel, so it is assumed that no actions were taken between the time of this entry and the Convention.

"Report of delegates to convention

Rejection of women-interpretation.

...

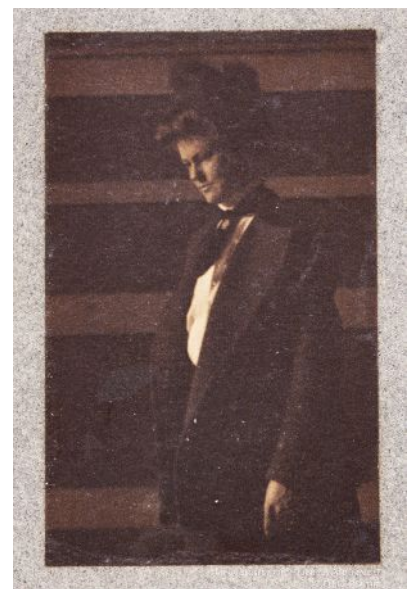
Moved and seconded report of delegates to be accepted.

Henry moved that a committee be appointed to find out how alumni members feel in regard to taking Miss Ricker with full membership. Carried.

Malcolm moved that chair be a committee to lay before Miss Ricker action of convention. Carried."

— December 2, 1903

The 1903 Convention was held on November 28 in Cleveland, Ohio. At this Convention, the IL Alpha Chapter presented Ethel Ricker's case. Her membership was rejected on the premise that the Constitution could be interpreted where 'students' meant 'male students.'



Ethel Ricker in suit, 1905.
Courtesy of the University of Illinois Archives, 0011229, Record Series 2/4/2, Box 1, Folder: Kinley, David, 1895.

“AT THIS TIME (1904), THE ASSOCIATION DECIDED THAT IT WOULD GIVE NO FORMAL RECOGNITION TO ETHEL RICKER. DESPITE THIS, IL ALPHA BELIEVED THAT SOME FORM OF RECOGNITION SHOULD BE GIVEN ...”

The 1903 Convention minutes read as follows:

“Moved and supported that Tau Beta Pi Association in Convention (has) assembled (and) place(d) itself on record as in favor of the admission of women into full membership in Tau Beta Pi Association. Motion lost.

Moved that the E. C. be instructed to issue a bent and certificate to Miss Ethel Ricker. Motion lost. Adjourned for lunch.

Afternoon session opened at 2:45 P.M. The following resolution was introduced:

Resolved that Tau Beta Pi Association in Convention assembled interpret the Constitution as prohibiting the admission of women into Tau Beta Pi Association. Adopted.”

“Meeting called to order by Pres. and minutes of last meeting read and approved. Mr. Malcolm gave report of committee concerning what recognition should be given Miss Ricker in view of the fact that the national constitution does not allow the admission of women. Report read that no medal was obtainable and that a parchment certificate be given her. Moved + carried that a set of resolutions be drawn up expressing the necessary points be drawn up, lettered on parchment and given to Miss Ricker.”

— May 4, 1904

At this time, the Association decided that it would give no formal recognition to Ethel Ricker. Despite this, IL Alpha believed that some form of recognition should be given to her, and a committee had been assigned to address this issue. This document would be presented to Ethel more than two years after her initial invitation to Tau Beta Pi.

“Mr. Whitsitt produced Miss Ricker’s document. The method of presentation was discussed. On a motion by Mr. Shoemaker, it was decided to invite Miss Ricker to

attend the next banquet in order that a formal presentation of the document could be made.

A motion was made and carried that the document referred to above be framed before being given to Miss Ricker. Mr. Whitsitt was appointed to see about the frame. It was left to the president to decide who shall present the document.”

— October 19, 1904

While Tau Beta Pi did not offer Ethel formal recognition, IL Alpha decided to invite her to their banquet and present her with a certificate acknowledging her place at the top of the junior class. There is no insight into the contents of this letter and it was not present among Ethel Ricker’s personal documents that had been donated to the University.

“Mr. Matthews moved that the National Convention be urged to come to some definite conclusions in regard to the admission of women into membership in Tau Beta Pi. This was carried. Lost.

A motion was made by Mr. Malcolm that a rising vote be taken to determine the standing of our chapter in regard to the admission of women to membership in Tau Beta Pi. This was carried and it was found that the chapter is against the admission of women.

Mr. Clay moved the delegates be instructed to vote against the admission of women to membership in Tau Beta Pi. This was carried.”

— November 21, 1904

The 1904 Convention was held November 25-26 in Cleveland, Ohio. Prior to attending, the IL Alpha Chapter voted on its official stance in regard to women joining Tau Beta Pi.

The 1904 Convention minutes have no specific mention of Ethel Ricker’s case or the admission of women. However, in a vote regarding an affiliation with Sigma Xi, the Scientific Research Honor Society, the affiliation was voted against,

with four out of eleven chapters citing that they wanted to continue to restrict the admission of women, given that Sigma Xi allowed all eligible students admission.

“Mr. Mc Millan also presented Miss Ricker with the resolutions adopted by Illinois Alpha, May 4th-1904.”

— November 29, 1904

This is the final mention of Ethel Ricker in the meeting minutes from IL Alpha. A *Daily Illini* article from November 24, 1904, provides a more detailed summary.

“At this part of the program, Mr. McMillan, 1904, in a very appropriate speech presented Miss Ethel Ricker in the name of Illinois Alpha, with a set of engrossed resolutions. Miss Ricker’s University work in Architecture during her Freshman and Sophomore year was the highest in the 1904 class of the College of Engineering, but a law of the national organization providing that men only may become active members, prevented the honor of full membership in Tau Beta Pi being conferred upon Miss Ricker. In its appreciation of her work, the local chapter presented her with these appropriate resolutions, beautifully engrossed and framed.

Miss Ricker responded with a very interesting speech, in which she expressed her appreciation of the honor conferred upon her.”

“It was decided that no women are to be admitted to membership in Tau Beta Pi. The constitution was changed so as to have it understood that only male members are eligible.”

— December 7, 1904

MEGAN HARRISON is an engineering physics major at the University of Illinois Urbana-Champaign where she serves as IL Alpha Chapter vice president and runs the chapter’s K-12 Outreach program.

Using Pythagorean's theorem on the right triangles formed by the dotted lines indicated, $h^2 = w^2 - y^2 = x^2 - (z + y)^2$. Rearranging this gives $x^2 - w^2 = (z + y)^2 - y^2$, and plugging this into the result for A_1 shows that $A_1 = \pi((z + y)^2 - y^2) = A_2$ and it follows, perhaps somewhat surprisingly, that $A_1/A_2 = 1$.

4: There are **16** different “non-congruent” dies for the standard arrangement of numbers, and **240** different dies when there are no constraints on opposing numbers. In the first case, sides 1, 4, and 5 are symmetric when rotated 90°. Sides 2, 3, and 6 each independently have two different possible orientations for their pips, totaling $2^3 = 8$ configurations. However, a die can be either “left-handed” or “right-handed” and still preserve the requirement that opposite faces sum to seven. To illustrate, with face 1 facing up, along the adjacent faces we can read 2453 clockwise (left-handed) or counterclockwise (right-handed). Therefore, the total number of configurations is $2 \times 8 = 16$. In the second case, we can assume one face is up. There are 5 choices for the bottom number and 6 unique ways to wrap the 4 remaining numbers around the edges, for a total of 30 unique number arrangements. We again have $2^3 = 8$ configurations covering the orientations of the pips, leading to a total of $30 \times 8 = 240$ configurations.

5: 858682 + 78682 + 930 = 938294 is the solution to ELEVEN + SEVEN + TWO = TWENTY. $E \neq 0$ and it is immediately apparent that $T = E + 1$ so $E \neq 9$. Looking at the thousands column, the only possibility is there was a carry of 2 and $E = 8$, making $T = 9$. From the tens column, the carry to the hundreds column cannot be 2, but must be 1. With this determined, there are three possible pairs of numbers for V and N : $V = 5$ and $N = 0$; $V = 7$ and $N = 4$; and $V = 6$ and $N = 2$. $V = 5$ and $N = 0$ is ruled out because the ones column would have an impossibility. Considering $V = 7$ and $N = 4$, the carry into the tens column must be 1, so $W = 2$. This leaves two possibilities for O : 5 or 3.

If $O = 5$, this prevents any viable mapping for $L + S = 11$. So $O = 3$, and $Y = 1$. $L + S = 11$, so L must be 5 or 6. However, in these two cases, ELEVEN = 858784 or 868784 respectively, and neither are divisible by 11. It must be then, that $V = 6$ and $N = 2$. There can now be no carry into the tens column, so $W = 3$. This leaves two possibilities for O : 1 or 0. If $O = 1$, this prevents any viable mapping for $L + S = 12$. So, $O = 0$ and $Y = 4$. $L + S = 12$, so L must be 7 or 5. However, in the first case, ELEVEN = 878682 is not divisible by 11. The second case has ELEVEN = 858682 which is divisible by 11, so $L = 5$ and $S = 7$, completing our analysis.

BONUS:

The frequency of oscillation is $f = (1/(2\pi)) \sqrt{g/L \cos \theta_0 - \Omega^2 \cos^2 \theta_0}$, where θ_0 is the solution to the equation $\Omega^2(R + L \sin \theta_0) = g \tan \theta_0$. If we take our reference origin to be a height L below the center of the rods' rotation, and define θ as the angle between the vertical and the pendulum support, we can find the position vector of the pendulum mass: $\mathbf{r} = (R + L \sin \theta) \cos \Omega t \mathbf{i} + (R + L \sin \theta) \sin \Omega t \mathbf{j} + L(1 - \cos \theta) \cos \mathbf{k}$ and, through differentiation, the corresponding velocity vector:

$$\mathbf{v} = [-\Omega(R + L \sin \theta) \sin \Omega t + L \dot{\theta} \cos \theta \cos \Omega t] \mathbf{i} + [\Omega(R + L \sin \theta) \cos \Omega t + L \dot{\theta} \cos \theta \sin \Omega t] \mathbf{j} + L \dot{\theta} \sin \theta \mathbf{k}$$

The kinetic energy of the mass is $T = 1/2 m v^2$ where the squared speed can be found from $v^2 = |\mathbf{v}|^2$ with some careful arithmetic:

$$T = 1/2 m [\Omega^2(R + L \sin \theta)^2 + L^2 \dot{\theta}^2].$$

The potential energy of the mass is: $V = -mgL(1 - \cos \theta)$. From these two results, we can form the Lagrangian $\mathcal{L} = T - V = 1/2 m [\Omega^2(R + L \sin \theta)^2 + L^2 \dot{\theta}^2] + mgL \cos \theta - mgL$.

We can now use the Euler-Lagrange equation to describe the motion of the mass: $0 = d/dt \partial \mathcal{L} / \partial \dot{\theta} - \partial \mathcal{L} / \partial \theta$.

Plugging into this equation, we find: $0 = mL^2 \ddot{\theta} - mL\Omega^2(R + L \sin \theta) \cos \theta + mgL \sin \theta$.

The generalized momentum $\partial \mathcal{L} / \partial \dot{\theta} = 0$ [this can be verified by calculating the Hamiltonian], so $\partial \mathcal{L} / \partial \theta = 0$, and $\Omega^2(R + L \sin \theta) = g \tan \theta$.

There is no clean closed form for the solution for θ in this equation,

but it could be solved numerically. Let us call the solution to the previous θ_0 . For small angles of oscillation, we can assume some $\theta = \theta_0 + \Delta\theta$ and plug this into our equation of motion. Note $\ddot{\theta} = \Delta \ddot{\theta}$. Ignoring the small $(\Delta\theta)^2$ terms and noting the cancellation of the $O(1)$ terms, we [eventually] arrive at:

$$0 = L(\Delta \ddot{\theta}) + [g/\cos \theta_0 - \Omega^2 L \cos^2 \theta_0](\Delta\theta).$$

This well-known second order differential equation has the form of a standard pendulum with:

$$f = (1/(2\pi)) \sqrt{g/L \cos \theta_0 - \Omega^2 \cos^2 \theta_0},$$

where $\Omega^2(R + L \sin \theta_0) = g \tan \theta_0$

COMPUTER BONUS:

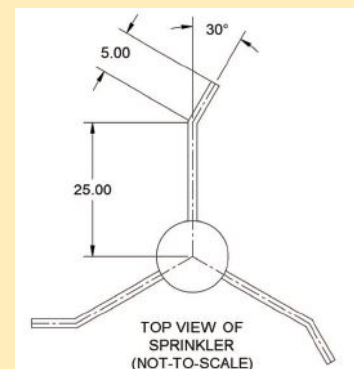
The 51st number in the defined sequence is **P(602112) = 1,752,877,625,172,707**.

A brute force approach can be improved upon by noting that for $N > 3$, $P(N)$ has either 2 or 3 digits in base N . Creating only odd palindromic numbers in base N and checking the binary representation significantly reduces the search space and computation time. The columnist is interested to know if and when $P(N)$ has 4 or more digits when represented in base N for any $N > 3$.

New Spring Problems

1: Lawn Sprinkler

A lawn sprinkler rotates about a vertical pipe through which water flows to the rotating arms. The arms, which are parallel to the ground, are straight for 25 cm (from the center), then bend 30 degrees, and are straight for another 5 cm.



Water leaves the nozzles at 10 m/s. Assuming no friction at the rotating bearing and no air resistance, what is the angular velocity in RPMs of the sprinkler at steady state?

BTs continue on page 22

— John R. Sellars

New Spring Problems

Continued from page 21

2: Matching Pairs

Take four red and four black cards from a standard deck, shuffle them, and play the following game. Spread the cards out in a line face up without changing their order. Now remove any adjacent pairs of the same color. Of course, removing adjacent pairs may create other adjacent pairs which can be removed. If you remove all the cards, you win. What is your probability of winning? Express your answer as a ratio of integers.

—*Mathematics Magazine*

3: Old Philosophers

Under the spreading chestnut tree in the garden of St. Jude's College are reposing five professors of philosophy. Each is reading a stout volume written by a different one of the others. To be precise, Prof. Aristotle wrote the work being read by the author of 'Understanding Understanding.' Prof. Baralippton is perusing the work by Prof. Castellio's uncle. Prof. Descartes is deep in 'Words of Wisdom,' which is dedicated "To My Dear Friend and Mentor, Professor Castellio." Prof. Einstein is reading the book by the man reading 'Yesterday was Tomorrow.' The author of 'Zeno' is reading 'Xenophilia as a Categorical Imperative,' written by the man reading the book by the man reading the book written by Prof. Castellio. Who wrote these milestones of philosophic progress? Fill out the following table:

Professor	Wrote ...	Is Reading ...
Aristotle		
Baralippton		
Castellio		
Descartes		
Einstein		

—*Tantalizers* by Martin Hollis in
New Scientist

4: Horse Betting

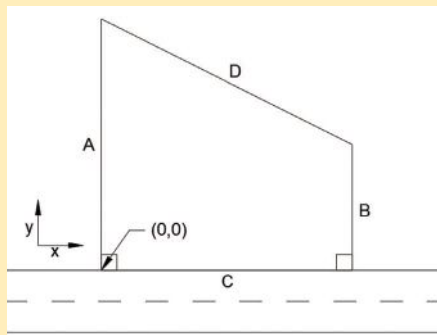
At a local track, one of the races has only 4 horses entered, and the odds being offered are as follows: Ace: 2 to 1. Bandit: 5 to 2. Comet: 6 to 1. Duke: 6 to 1.

Odds of M to N means that for every dollar bet on a winning horse, the bettor will win M/N dollars and have their dollar bet returned. How can you lay your bets to come out \$10 ahead, no matter who wins? (Of course, no real race track would have such odds!)

—**Byron R. Adams**, TX A '58

5: Trapezoid Lot Surveying

A lot in the shape of a trapezoid fronts on a road, such that the parallel sides of the trapezoid are perpendicular to the road.



A surveyor is asked to divide this lot in two with a single straight line in such a way that the two parts have the same area and the same frontage along the road. Show how to do this in a way that does not involve trial and error. (The surveyor can measure distances and construct parallel or perpendicular lines of known distances. Angles cannot be measured.)

—**Irving S. Reed**, CA Δ '44

BONUS: Sphere Packing

What is the maximum number of spheres 1 cm in diameter that can be packed into a cubical box 12 cm on a side? You cannot cut any spheres. Explain how you do it – describe the packing arrangement – you may provide sketches.

—*Mathematical Visitor*
by Artemas Martin

COMPUTER BONUS: Semiprimes

In the range from 1 to 1,000,000,000, there are over 50 million prime numbers, and many more semi-prime numbers. A semiprime is an integer that is the product of exactly two, not necessarily different, primes. What is the longest string of integers between two semiprime numbers that does not contain a prime number? Include the two semiprime numbers in your answer.

As an example, between semiprimes 1502 and 1507 there is a string of 4 integers without a prime.

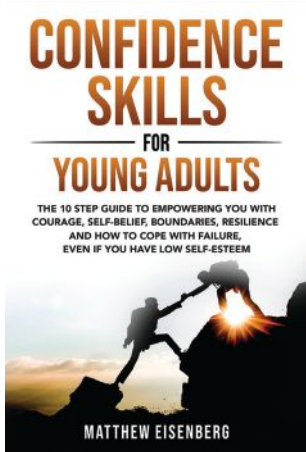
— *The Prime Number Connection*

Email your answers to any or all of the Spring Brain Ticklers to BrainTicklers@tbp.org or by postal mail to **Dylan Lane, Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697**. The method of solution is not necessary. The Computer Bonus is not graded. Where possible, exact answers are preferable to approximations. The cutoff date for entries to the Spring column is the appearance of the Summer *Bent* which typically arrives in mid-June (the digital distribution is days earlier). We welcome interesting problems that might be suitable for the column. 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,

— **K.D. Berthold**, TX B '04

Authors

Recently published a book? If so, we would like to recognize you! Send details and a cover image to d.lane@tbp.org.
 Note: Due to the popularity of this section, submissions are first come, first served, as room allows. Thanks!



Matthew Eisenberg
 New Jersey Alpha '69

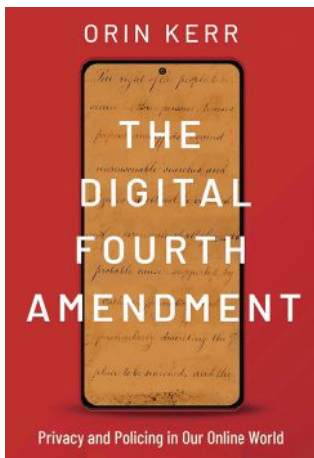
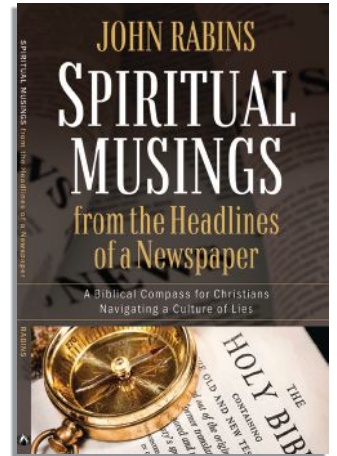
Confidence Skills for Young Adults

Author and engineer, Matt's journey from the Bronx to founding his own high-tech company inspired him to write this book. In it, he's created a transformative guide after realizing that crucial life skills are not taught in schools. The book covers self-awareness, critical thinking, communication, coping with failure, boundaries, and more. Matt's mission: to elevate societal consciousness by empowering youth to navigate life with confidence and purpose.

John M. Rabins, Ph.D., O.D.
 Ohio Eta '78

Spiritual Musings from the Headlines of a Newspaper: A Biblical Compass for Christians Navigating a Culture of Lies

This book, John's third, follows the award-winning *Defined by Fire: Seven Life-Changing Lessons from Devastating Tragedy and Spiritual Musings ...*. It contains articles regarding controversial issues that divide us as a country – topics such as skin color, gender identity & sanctity of life and is useful for grounding readers in what the Bible says about things that matter.



Orin S. Kerr, JD
 New Jersey Delta '93

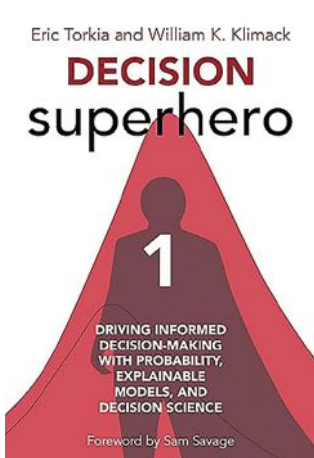
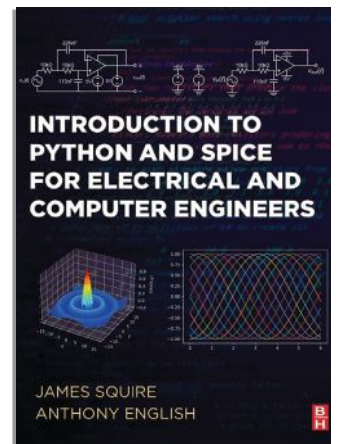
The Digital Fourth Amendment

Delve into the legal world of how courts are interpreting the Fourth Amendment in the digital age with a law professor whose scholarship has been relied on in the field. The book explains the challenges courts confront as they translate old protections to a new technological world, with the latest cases and rulings. Informed by legal history and the latest technology, it gives courts a blueprint for legal change to adopt and restore our constitutional rights in the computer age.

James C. Squire, Ph.D., P.E.
 Virginia Delta '89

Introduction to Python and Spice for Electrical and Computer Engineers

This textbook serves as a gentle introduction to programming in Python for freshmen/sophomores through engaged, problem-based learning, supported by discipline-specific content. It covers topics such as matrix algebra, complex exponentials, and plotting using examples drawn from circuit analysis, signal processing, and includes ABET-required topics such as ethics & career education.



William K. Klimack, Ph.D.
 Ohio Eta '99

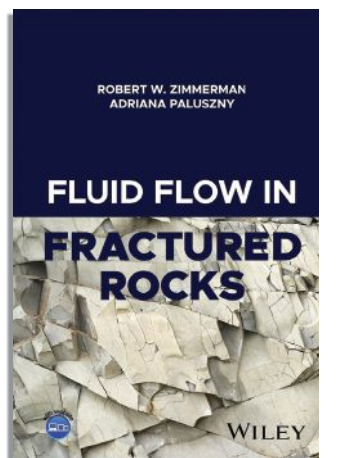
Decision Superhero (Book 1)

Bill and his co-author want to share how understanding your decisions should direct your analysis. We make decisions in a context where stakeholders will affect outcomes. Understanding decisions includes drawing on psychology, using processes developed in the field of decision analysis. These analysis techniques span the spectrum of those developed in operations research. Bill is a retired U.S. Army Colonel who served on the faculty at West Point & also worked in the energy and pharmaceutical sectors.

Robert W. Zimmerman, Ph.D.
 New York Alpha '77

Fluid Flow in Fractured Rocks

Robert is chair of rock mechanics at Imperial College in London, UK. His new book, co-authored with colleague Adriana Paluszny, was praised by Ruben Juanes of MIT as follows: "In this book, world-leading experts Zimmerman and Paluszny present a didactic and insightful synthesis of the physics, mathematics, and computational modeling of fluid flow in fractured rock, that is destined to become the definitive treatise on the subject for many years to come."



Alumni Giving

Donor Recognition Clubs

The Donor Recognition Clubs are part of our effort to recognize a donor's total lifetime cumulative giving to Tau Beta Pi. **THANK YOU** to the 3,100 Tau Beta Pi alumni and others who made donations to the Association totaling \$995,352 between November 1, 2024, and January 31, 2025. The names of donors whose gifts were received after January 31 do not appear here but will be published with the Summer 2025 issue. These club names and amounts, established by the TBII Executive Council, are set at the following levels:

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Led TBII/Sigma Tau merger

NOTES:

1. Names preceded by SPEC denote gifts from non-members.
2. Names marked with a † symbol are of deceased members in whose memory donations were made either by relatives and friends or through bequests.



Franklin Club
Capt. Thomas C. Crane, USN Ret.
 MD B '62
"Student engineers hold the future of America in their hands. I am pleased to support TBIT in that effort."



Clarke Club
Jerry M.L. Mendel, Ph.D.
 NY Z '59
"Helping others to succeed is a wonderful feeling."

Downing, Moore, Forman & Pre-Club Members

Due to the number of alumni contributors, the Downing, Moore, Forman, and Pre-Club Members will be acknowledged on our website at: www.tbp.org/?AGP. All donations are essential to the continued success of the Association, but as print costs rise with each issue,

these donors will be listed with all of the other contributors in a protected PDF document. If you have questions or concerns, please contact tbp.development@tbp.org. Thank you for your understanding as we strive to produce an enjoyable and cost-effective magazine for our readers.

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 NY K Knox, Keith Thomas '70
 OH Γ Beans, Bill '53
 RI B Keddie, William Joseph '59
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 TX Δ Fox, Craig Alan '77
 TX H Trich, John Albert '70
 WA B Moors, Donald Edward '55
 WI A Anonymous '64
 WY A Steadman, John W. '64
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 CA Δ Anderson, Vincent Carl '83
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 DE A Anonymous '70
 FL A Anonymous '99
 Anonymous '00
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 Fenton, Harvey Albert '58
 Sladek, John Richard '77
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 MI H Hock, Darryl Allen '81
 MI Λ Repke, Wesley Ryan '09
 MS A Jerome, Dennis C. '67

MO B McHenry, S. Dale '81
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 NJ Δ Mendelsohn, Andrew Jay '77
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 NY Δ Kemp, Thomas Ward '59
 NY Z Mendel, Jerry M. L. '59
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 NC A Johnson Jr., Jim William '77
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 Story, Franklyn H. '81
 CA A Ikeda, Kenneth Akira '62
 CA Γ Bowerman, Lawrence John '69
 Holmen, Bob Richard '85
 Ullman, Marc Albert '83
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 Warner Jr., John Hilliard '63
 CA H Kruusmagi, Daniel Thomas '13
 CA I Pickett, Stephen Euan '75
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 Okpizs, Alexander Edward '91
 Clark, David James '99
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 CA O Turhollow, Charles Bernard '81
 CA Y Mukhar, Marwan John '93
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FL A Bolton, Chuck Houston '62
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GA A Fawcett, Clint Douglas '92
 Mowrey, Dan B. '65
 Sitton, John H. '88
IN A Barker, Kenneth Dale '64
 Carlson, Richard Alan '70
 Roth, Ruth Nancy '70
 Shaffer, Gerald Harley '74
 Badger, Jerry Delon '62
IN B
IN Γ Buran Jr., Joseph Edward '75
KS B Patton, Robert Eugene '70
LA A Richardson, John Daniel '72
MD A Monmonier, Mark '64
MD B Jansen, Russell Onas '74
 Schaefer Jr., William Joseph '70
MA B Goldstein, Andrew Carl '69
 McKim, Tom Francis '75
 Walsh, Eamon Francis '03
MA Δ Patkin, Murray Solomon '64
MA Z Smith, Richard Gregory '78
MI A Spindler, Jeffrey David '79
MI B Leven, Peter Johannes '93
MI Γ Battel, Steven J. '79
 Padzieski, Robert Joseph '70
 Poy, Alfred Lim '91
 Sarns, Richard Norman '76
 Seidel, David Allen '81
 Culver, Walter '60
MI Δ Boileau, James Maurice '87
MI E Strebendt, Richard Ernest '65
MN A Sandell Jr., Nils Richard '70
MO Γ Philipp, Patrick William '98
 Rossetti, Dave Joseph '74
MT A Collins, Doug Macnab '71
 Royer, Lindy George '61
NH A Dycewicz, Vickie Sue '96
NJ A Ghosh, Subhendu '89
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NJ Γ Petruch, Raymond A. '84
 Raia, Lawrence A. '65
NM A Smith, Jeffrey A. '84
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OH Δ Hastings, Hal Leon '78
OH H Bowers, Keith Allen '91
OH M
OR A Cantwell, Gary Kenneth '80
PA A Wagner, Theodore Walter '71
PA Γ Robb, Frank Jay '73
PA Θ Caramanico, Thomas A. '71
SC B Endler, Elizabeth Elaine '98
SC Γ Davis III, Emmett Irwin '79
TN A Froula, Jim DeWayne '67
 Riggs, Donna R.H. '87
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TN B Nobles-Harris, Ellen Marie '69
 Pentecost, Gene Edgar '50
 Skoglund, Paul Albert '89
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TX Z Norwood, Larry Dwight '73
TX Θ Barrett, Jerry George '70

UT A Dewey, William Alonzo '67
VT A Ketcham, Ken James '68
 Scribner, Charles Franklin '70
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VA B Anderson, Mark Evan '76
 Harras, Edgar Daehn '67
WA A Pierce, Russ W. '70
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WI A Przedpelski, Zygmunt '53
WI B Hutton, Teresa Jean '91

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AL A Trapane, Karen Louise '82
AL Γ Haggard, Warren O. '94
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 Usibelli Jr., Joseph Emil '81
AZ A Chen, Daniel J. '83
 Erickson, Kenneth Lynn '68
 Soukup, David Joseph '76
AZ B Latta, David Raymond '89
AR A Gunderman, Tony Raymond '89
 Hunt, Gary Wayne '84
 Newtown Jr., Glenford Andrew '69
CA A Butner, David Norman '61
 Fong, Kirby William '67
 Hoe, Albert '92
 Magyary, Andrew '65
 Wilhoite, W. Clinton '85
CA Γ Dohner, John Walter '72
 Hetzel, Geoff Orin '82
 Marks, Stuart Warren '84
CA Δ Sansbury, James Douglas '66
 Itamura, John Mindru '85
 Moretti Jr., Vincent Carlos '78
 Zehrbach, Bill Ernest '69
CA E Gritton, Eugene Charles '63
 Karagozian, Ann Renee '78
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 Simsarian, Greg Garabed '82
 Wenck, Jim Carl '77
CA Θ Yoshizumi, Steven Akira '88
CA I Lawson, Wayne Alan '69
CA I Kuspa, Joe Anthony '93
CA Λ Hafer, Edward Henry '70
 Pickles, William Raymond '80
 Yung-Rubke, Belinda '80
CA M Tucker, Naftalia France '89
CA N Smith, Michael P. '84
CA O Alvarez, Desi '75
CA P Andersen, Eric Kenneth '79
CA Y Lindauer, John Arthur '90
CO A Schneider, Randy Paul '71
CO B Aerstin, Franklyn George '64
 Blackwelder, Ron F. '64
 Frey, Bryce Alfred '56
CO Γ Mead, Dick Wilson '63
 Ton, Scott Marshall '74
CO Δ Fisher, James Eberly '78
 Mehring, James Warren '72
CT A Fischer, Edward Michael '89
 Livingston, Robert McLean '57
CT B Devin, Maurice Roger '73
 Killingbeck, David R. '77
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DC A Gathungu, Peter Maina '93
DC B King, David Alan '68
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 Ratto, Christopher R. '07
DC Γ Haldeman, Paul Metz '70

FL A Botwinik, Steven M. '95
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 Layman, Robert William '68
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FL Γ Copeland Jr., Edwin '73
 Dip, Anthony '86
 Jones, William David '74
FL Δ Paulley, Jason '93
GA A Dishongh, Jefferson Lee '66
 Monk, Robert Franklin '63
 Rogers, Don Edwin '63
 Zimmerman, Clarence David '65
IL A Barchenger, Kimberly '06
 Buboltz, Lisa Ann '01
 Jones, Doug Warren '80
 Ostrodka, David Leon '70
IL B Hughes, Joseph L A '79
 Lewis, Ted Howard '68
 Uherek, Frank C. '82
IL Δ Hachtel, Dale Arnold '68
IL E Garfield, Bill Michael '83
IL Z Glait, Scott Steven '84
 Woyna, Mark Anthony '87
IN A Grot, Arnold Stephen '71
 Hall, Thomas Wayne '67
 Hanover, Marilyn Kay '78
 Hohn, Richard Edward '82
 Rea, David Richard '62
 Reitz, Richard Alan '63
 †Suzuki, Wayne Takashi '67
 Weigand Jr., Karl Russell '66
 White, Stan Archibald '57
IN B Mills, Matthew Dillon '87
 Noblitt, Niles Leonard '73
 Rosenbarger, Donald Glenn '78
IN Γ Kukla, James Alfred '72
 Schuster, Gregory Michael '77
IN Δ Hartman, Richard Carl '63
 Schmalz, Peter B. '69
IA A Derr, Curtis R. '85
 Paris, Stephen Warren '75
 Puffett, George E. '83
IA B Gozali, Paul '85
 Smith, Richard Kenneth '60
KS A Knapp, Roy Marvin '63
 Leamon, Rich Gaylord '67
 Meyer, Leslie D. '65
KY A Rhoads, Harold Spencer '88
KY B Hundley, John Smith '87
 Hundley, Theresa E. '87
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LA A Compton, Ronnie Ray '72
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 Williams, Colleen Daniel '82
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 Perrin III, Shepard Francis '83
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 Jeffs, Alan Robert '73
MD A Lu, Stanley '95
 Tate, David Marshall '84
MD B Bohse, Michael Edward '85
 Brierley, Harold Milton '65
 Chase, Ronald John '71
 Lambrechts, James Russell '73
 Perkins, Michael Joseph '95
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CA Σ '90
"Encouraging young engineers to pursue their dreams, achieve excellence, and participate in professional societies and their community."

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MA Δ	Harty Jr., Frederick Russel '61 Munsey, Michael C. '89 Smeglin, Anthony Michael '76	NY K	Abrardo, Joseph M. '72	RI B	Bradley, Ken Alan '81 Brady III, William James '80 Lamoureux, Suzanne May '82
MA E	Bittner, Douglas E. '83 Pinkham IV, Tom A. '88 Ridlon, Stephen Allan '66	NY Λ	Gluszak, Timothy John '88	SC A	Harmon, Leon Carroll '71
MA Z	Harrison, C. Brett '64 Poulin, James Edward '66	NY N	Deierlein, Charles '82	SC B	Bradey, Jeffery Ervin '85 Harris, Raymond E. '87 Thomas Jr., Cunningham P. '58 Van Zee, John William '75 Wilson Jr., Robert Lewis '69
MI A	Chaffee, Stanley Wendell '74	NY O	Mathews, Joseph Raymond '81 Snyder, William Joseph '81	SC Γ	Lowndes III, William '51 Reed III, Hank McDavid '85
MI B	Sandretto Jr., Peter Patrick '64 Vojtech, Larry Joseph '69 Wacker, Don Herbert '52	NY P	Imbrogno, Christina '14 Imbrogno, Joe Michael '12	TN A	Baker, Jon Pankey '74 Jennings-King, Sherry Denise '93 Layman, Terry '77 Mossman, David Charles '67 Steelman, Joshua Scott '01
MI Γ	Engelhardt, Larry Norbert '77 Frederick, Frank Thomas '71 Insprucker III, John Louis '78 Pendleton III, Win Kent '62 Prescott, Thomas J. '69 Reines, Jose '59 Smithies, Henry '49 Washburn, John Robert '69	NC A	Vebeliunas, Rimas V. '74 Deitrick, Kurt Frederick '78 Maybee, Clare Lee '77 Phoenix, John Stuart '77 Walker, Gary Kenneth '70 Ando, Robert Ryoichi '73 Duncan, Matthew Albert '07 Franks, Marla Jane '79 Linker, Edward Markham '47 Vadnais, Paul A. '73 Hinkle, Mark Otis '96	TN B	Burnett Jr., Wilton Wright '67 Kepper III, James Henry '71 Marianelli, Walter David '75 Buell, Phillip Ray '95 Mancini, Vincent Eugene '86 McLeod, Jeffrey Keith '83 Glasow, Brian Scott '99 †Howerton, Lloyd Foster '51 Klump, D. Craig '77 Peterson, Robert Adrian '80 Wilson, Randy Wayne '97
MI E	Durisin, Mike John '81	NC Δ	Allen, James A. '88	TN Γ	Bueller, Phillip Ray '95
MI H	Johncox, Robert Allen '83	NC E	Jacobsen, John W. '69	TN Δ	Mancini, Vincent Eugene '86 McLeod, Jeffrey Keith '83 Glasow, Brian Scott '99 †Howerton, Lloyd Foster '51 Klump, D. Craig '77 Peterson, Robert Adrian '80 Wilson, Randy Wayne '97
MI Θ	Garrity, Stephen Daniels '72 Garrity, William Edwards '70	ND A	Dehen Jr., James John '80	TX A	Gilmer, Tracy F. '80 Hunter, David George '79 Raghavan, Krishna Kumar '81 Spahn, Rex Lee '80 Weisinger Jr., William Samuel '62 Zimmerman, Keith Donald '89 Hon, Richard Wai-Leung '67 Brewster, William Howard '94 Falk, Nathan Max '75 Godwin, Albert Eugene '84 Nicholson, James Eric '75 Thompson, James A. '72 Foster, Ottis Charles '82
MN A	Petes, Douglas John '84 Tucker, Randy Lewis '83	ND B	Hamilton, Joshua J. '09	TX B	Gilmer, Tracy F. '80
MS A	Backus, Alan Orin '78 Backus, Patricia Michel '78 Siler, Raymond David '83 Sutphen, Fred Marshall '73	OH A	Hamilton, Edward L. '73 Harner, Brian Lee '85 Pollock, Flavil Martin '77	TX Γ	Hunter, David George '79
MO A	Myles, Thomas Daniel '82	OH B	Bouman, Robert William '60 Condit, Dale O. '66 Dietz, James Francis '69 Howland, Smith Eugene '69 Orkins, James E. '66 Anonymous '86 †Riedel, Nelson Andrew '67 Shelley, Bill Raymond '74 Wolff, Mark Frederick '88	TX Δ	Spahn, Rex Lee '80 Weisinger Jr., William Samuel '62 Zimmerman, Keith Donald '89 Hon, Richard Wai-Leung '67 Brewster, William Howard '94 Falk, Nathan Max '75 Godwin, Albert Eugene '84 Nicholson, James Eric '75 Thompson, James A. '72 Foster, Ottis Charles '82
MO B	Ash Jr., Richard Lawrence '70 Bondi, James Oliver '71 Davis, Jon Timothy '85 Ernest, Terry Lee '82 Peat, Robert James '79 Sedovic, Pete Stephen '81 Byrne, Clare Theresa '78 Chambers, David Hugh '80 Anonymous '99	OH Γ	Pollock, Flavil Martin '77 Bouman, Robert William '60 Condit, Dale O. '66 Dietz, James Francis '69 Howland, Smith Eugene '69 Orkins, James E. '66 Anonymous '86 †Riedel, Nelson Andrew '67 Shelley, Bill Raymond '74 Wolff, Mark Frederick '88	TX E	Hon, Richard Wai-Leung '67
MT A	Pearce, Mary Ann '76	OH Δ	Felice, Conrad William '79 Moore, Mathew Franklin '62 Kubinec, William Richard '67	TX H	Falk, Nathan Max '75 Godwin, Albert Eugene '84 Nicholson, James Eric '75 Thompson, James A. '72 Foster, Ottis Charles '82
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NJ B	Fletcher, Leroy Stevenson '58 Kaufman, Peter Andrew '84 Kunyz Jr., Joseph John '73 Mauermeyer, Henry A. '72 Lisle Jr., Thomas K. '69 Peace, Jeffrey Howard '76 Busch, Robert Douglas '72 Carr, Donald Joseph '77 Spearot, James Anthony '67 Bond, Paul William '72 Geschwindner Jr., Louis Fred '67 Kulis, Edward James '75 Lequar, James Kay '87 Thal Jr., Herbert Ludwig '53 Weinberg, Richard Sheldon '81 McCloskey III, Charles Carroll '71 Rubin, Lowell '61 Beckeman, Bill Jerault '79	OH K	Maki, Luke Richard '78	VA A	Garner, Patrick Lynn '72 Hardy Jr., Edward Ira '69 Harris, Wesley Leroy '64 Wadsworth, Robert Manning '82 Jones, John Hamilton '73 Long, David A. '91 Reading, Christopher Russell '00 Payne Jr., LF '67
NJ Γ	Mauermeyer, Henry A. '72 Lisle Jr., Thomas K. '69 Peace, Jeffrey Howard '76 Busch, Robert Douglas '72 Carr, Donald Joseph '77 Spearot, James Anthony '67 Bond, Paul William '72 Geschwindner Jr., Louis Fred '67 Kulis, Edward James '75 Lequar, James Kay '87 Thal Jr., Herbert Ludwig '53 Weinberg, Richard Sheldon '81 McCloskey III, Charles Carroll '71 Rubin, Lowell '61 Beckeman, Bill Jerault '79	OH Λ	Murphy, Charles James '77	VA B	Long, David A. '91 Reading, Christopher Russell '00 Payne Jr., LF '67
NJ Δ	Lisle Jr., Thomas K. '69	OH M	Dull, Daniel D. '90	VA Δ	Confer, Peggy Jean '81
NM A	Peace, Jeffrey Howard '76	OK A	Bastron, Victor Christian '66	WA A	Baker, Walter Lee '74
NM B	Busch, Robert Douglas '72	OK B	Royce, Robert Michael '73	WV A	Lengyel, Nicholas Martin '70 Raines, Linda N. '83
NY B	Carr, Donald Joseph '77	OK Γ	Basore, Paul Alan '78	WV B	Raines, Linda N. '83
NY Γ	Spearot, James Anthony '67 Bond, Paul William '72 Geschwindner Jr., Louis Fred '67 Kulis, Edward James '75 Lequar, James Kay '87 Thal Jr., Herbert Ludwig '53 Weinberg, Richard Sheldon '81 McCloskey III, Charles Carroll '71 Rubin, Lowell '61 Beckeman, Bill Jerault '79	OR A	Jones, Reilly '75 Leonard, Jim Phillip '77 Milton, Stuart W. '84 Tuttle, Neil James '09 Hernjak, James Gregory '96 Lasser, Howard Gilbert '50 Nisley, Elmer Edward '74 Best, William Joseph '80 Kolivosky Jr., John Edward '92 Weston, Matt Wayne '93 Wisman, Craig Burton '75 Sheker, Robert E. '91 Mansfield, Brian David '91 Ebner, Alan Martin '61 Kasoff, David '55 Hotchkiss, Jeff R. '69 Daniels Jr., Harold E. '66 Schoenberger, Lewis Robert '84 Hovanec, Andrew Stephen '58 Schurko, Robert John '78 Blasini, Francois Rene '82 Sanchez, Hector Luis '76	WI A	Delucca, Gregory James '59 Stahl, Bernhard '63 Dschida, Linda Maria '82 McMorrow, Daniel Patrick '98 Mooney, Thomas Joseph '79 Whalen, David Alan '91 Cavalli, Matthew N. '98 Cook, Norman L. '79 Gallensky, Neil Ellis '82
NY Δ	McCloskey III, Charles Carroll '71	OR Γ	Tuttle, Neil James '09	WI B	McMorrow, Daniel Patrick '98 Mooney, Thomas Joseph '79 Whalen, David Alan '91 Cavalli, Matthew N. '98 Cook, Norman L. '79 Gallensky, Neil Ellis '82
NY E	Rubin, Lowell '61	PA A	Hernjak, James Gregory '96 Lasser, Howard Gilbert '50 Nisley, Elmer Edward '74 Best, William Joseph '80 Kolivosky Jr., John Edward '92 Weston, Matt Wayne '93 Wisman, Craig Burton '75 Sheker, Robert E. '91 Mansfield, Brian David '91 Ebner, Alan Martin '61 Kasoff, David '55 Hotchkiss, Jeff R. '69 Daniels Jr., Harold E. '66 Schoenberger, Lewis Robert '84 Hovanec, Andrew Stephen '58 Schurko, Robert John '78 Blasini, Francois Rene '82 Sanchez, Hector Luis '76	WI Δ	Whalen, David Alan '91
NY Θ	Beckeman, Bill Jerault '79	PA B	Best, William Joseph '80 Kolivosky Jr., John Edward '92 Weston, Matt Wayne '93 Wisman, Craig Burton '75 Sheker, Robert E. '91 Mansfield, Brian David '91 Ebner, Alan Martin '61 Kasoff, David '55 Hotchkiss, Jeff R. '69 Daniels Jr., Harold E. '66 Schoenberger, Lewis Robert '84 Hovanec, Andrew Stephen '58 Schurko, Robert John '78 Blasini, Francois Rene '82 Sanchez, Hector Luis '76	WY A	Cavalli, Matthew N. '98 Cook, Norman L. '79 Gallensky, Neil Ellis '82



FAIRFIELD UNIVERSITY

Image Credit: Fairfield University. Susan C.

The petition for Connecticut Delta at Fairfield University, to be established as the 264th Chapter of Tau Beta Pi, was approved by the 2024 Convention. The chapter will be installed May 2, 2025.

ABOUT FAIRFIELD UNIVERSITY

Founded in 1942, Fairfield University is a modern Jesuit Catholic University with a strong foundation in the liberal arts and rooted in one of the world's oldest intellectual and spiritual traditions. Fairfield offers 50+ majors, and more than 50 master's degree programs, doctoral programs, and graduate certificates in a wide variety of fields. As a Jesuit university, Fairfield is deeply rooted in a tradition of education that emphasizes the pursuit of faith, justice, and service to others as foundational principles.

At the heart of Fairfield's educational philosophy is *cura personalis*, or "care of the whole person," mind, body, and spirit — a concept inspired by the Spiritual Exercises of St. Ignatius of Loyola. This approach encourages holistic development of the student, not just academically, but with a focus on the individual's unique talents and

aspirations. Additionally, the Jesuit commitment to global engagement ensures that diversity and inclusion — across cultures, ideas, and traditions — are integral to the Fairfield experience. The university's approach is designed to prepare students not only for academic and professional success, but also for lives of meaningful contribution to the global community.

Fairfield University offers a broad spectrum of academic and professional programs, all unified by a liberal arts and humanistic perspective. Regardless of major, all undergraduates complete the *Magis Core Curriculum*, that emphasizes traditional humanities as a complement to specialized majors and professional training. Across all programs, Fairfield is committed to preparing liberally-educated professionals who can address the complex challenges of modern society with skill, integrity, and compassion.

THE SCHOOL OF ENGINEERING AND COMPUTING

Fairfield's School of Engineering and Computing (SEC) exemplifies the university's mission by equipping students with the knowledge, skills, and values necessary for impactful careers in engineering and technology. The SEC offers undergraduate and graduate programs in biomedical, electrical, and mechanical engineering, as well as computer science, designed to prepare students for success in rapidly evolving fields. Combining rigorous academics with real-world applications, the school fosters innovation, professional development, and personal growth.

Through signature events like *StagHack*, a student-led hackathon and the SAE Baja Competition, where students design and build off-road vehicles, Fairfield engineers have the opportunity to apply their skills in practical and competitive settings.

These events not only challenge students technically but also connect them with industry leaders, providing valuable insights and networking opportunities.

The School of Engineering and Computing emphasizes experiential learning, blending classroom instruction with industrial internships, research opportunities, and community-based projects. Students graduate with not only a strong theoretical foundation but also the practical experience needed to excel in professional settings. This hands-on approach reflects the Jesuit ideal that engineering is fundamentally a “service to humanity” profession, addressing societal challenges and promoting equity, particularly for underserved populations.

Graduates of the School of Engineering and Computing are well-rounded professionals equipped with expertise in engineering principles and a broad understanding of communications, critical judgment, ethics, and social responsibility. Key highlights of the school’s offerings include:

- Bachelor of Science programs in electrical, biomedical, and mechanical engineering accredited by the Engineering Accreditation Commission of ABET, ensuring the highest standards of academic quality.
- Integration of Fairfield’s *Magis Core Curriculum*, which fosters critical thinking and lifelong learning while preparing students to lead inspired lives.
- Opportunities for leadership development, technical excellence, and meaningful contributions to society through innovative projects and community engagement.

The SEC’s mission aligns with Fairfield’s Jesuit values by preparing students to address real-world challenges, contribute to the common good, and pursue lives of leadership and purpose.

Recent Fairfield University graduate and engineering honor society member.



SAE Baja Competition vehicle. Image credit: Fairfield University Media Center.

A HISTORIC MILESTONE: TBP CHAPTER ESTABLISHMENT

Fairfield SEC will reach a historic milestone this semester in establishing the Connecticut Delta Chapter of Tau Beta Pi. This achievement reflects years of dedication and collaboration by students and faculty. The initiative was led by Maeve O’Connell ’25 and Matt Manduca ’25, with guidance from Dr. Susan Freudzon, professor of practice of electrical and biomedical engineering and CT Delta Chief Advisor. Their efforts culminated in a successful presentation of Fairfield’s petition at the 2024 TBPI Convention in South Dakota, where it received overwhelming support from representatives of universities across the nation. The chapter will be officially installed this spring along with its first initiation ceremony.

The journey to establishing a TBPI chapter began in 2021, when members of Fairfield’s local engineering honor society, Tau Beta Phi, initiated the petition process. This involved compiling a detailed proposal showcasing the strength of Fairfield’s engineering programs, which meet Tau Beta Pi’s rigorous standards, including ABET accreditation.



The proposal highlighted the society’s achievements in professional development and community service, such as food drives for the Campus Ministry food pantry and alumni networking events.

STUDENT LEADERSHIP AND FUTURE INITIATIVES

Ms. O’Connell, CT Delta Chapter president, described the Convention experience as inspiring, emphasizing Fairfield’s strong retention rates and personalized student-faculty relationships as key advantages. Mr. Manduca, vice president, expressed gratitude for the opportunities Fairfield has provided throughout his academic career and excitement about contributing to the chapter’s future.

Looking ahead, the CT Delta Chapter plans to engage in a variety of initiatives, including:

- Community service projects such as food drives, beach clean-ups, and outreach programs to support underrepresented communities;
- Alumni networking events to foster connections between current students and industry professionals; and
- Mentorship programs to guide underclassmen and cultivate leadership skills.

These initiatives reflect Fairfield’s commitment to nurturing well-rounded, socially conscious engineers who are prepared to make a positive impact in their communities and beyond.

O’Connell and Manduca encourage future Fairfield engineers to embrace leadership opportunities and emphasize that collaboration and dedication can lead to transformative achievements within organizations like Tau Beta Pi.

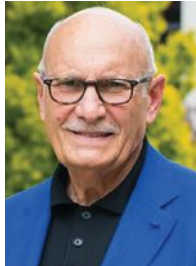
IN THE COLLEGES

Tau Bates having an impact at institutions of higher learning

Diran Apelian Ph.D.

Pennsylvania Zeta '68

Diran was awarded the Worcester Polytechnic Institute's (WPI) Presidential Medal, honoring "accomplishments that embody the technological humanist ideal" A Distinguished Professor at UC Irvine, he's a former provost and faculty member at WPI, where he founded the Metals Processing Institute. Diran was cited for leadership, innovative research, and entrepreneurship in materials science & eng'g.



Elizabeth R. Cantwell Ph.D.

New York Omicron '82

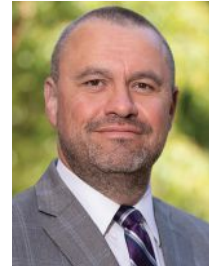
Elizabeth was appointed the 12th president of Washington State University, beginning on April 1. She's currently president of Utah State Univ.'s 30-campus system, composed of centers across Utah and online. Elizabeth previously oversaw an \$825 million annual research portfolio at the University of Arizona and has a Ph.D. in mechanical engineering from UC Berkeley.



Kenneth T. Christensen Ph.D.

New Mexico Beta '95

Kenneth was selected as chancellor of the University of Colorado (Denver). He previously worked at the Illinois Institute of Technology (IIT), serving as provost, senior VP for academic affairs, and chief academic officer. Kenneth also served as IIT Dean of Engineering for two years and has B.S. and M.S. degrees in mechanical eng'g and a Ph.D. in theoretical & applied math.



SPOTLIGHT: Florida Atlantic University (FAU)

Tech Job Training — Researchers in the Colleges of Education and Engineering & Computer Science received a grant from the U.S. Department's Office of Special Education and Rehabilitative Services to increase the capacity and participation of transition-age youths and working-age adults with disabilities in high demand technology jobs. The project aims to inspire, counsel, and create opportunities in technology career interests. FAU's **Javad Hashemi, Ph.D., FL E '81**, co-principal investigator and inaugural chair of the dept. of biomedical eng'g and associate dean for research said, "Our goal is to use tech-driven education to enhance and complement learning and training in engineering fields among people with any form of disability."

New Trine University Engineering Scholarships —

Thanks to funding provided by **Dr. Jerry L. Allen, IN E '78**, a Trine trustee and his wife Jorja, a Trine alumna, new scholarships offering \$2,000 toward tuition for new students enrolling in the School of Engineering and Computing are now available. Dr. Allen earned a bachelor's degree in mechanical engineering from Tri-State University (now Trine University), built Vikimatic Sales into a \$110 million distributor of fiber optic products, and holds eleven patents. This scholarship, like Trine's School of Engineering and Computing, will be named after the Allens. In addition, it was recently announced that a new computer science degree program will launch at Trine in fall 2025. For more details on the scholarship requirements visit trine.edu/allen.

Amy S. Fleischer Ph.D.

Pennsylvania Theta '91

Amy started in January as dean of Boise State University's College of Engineering. Since 2018, she held the dean of engineering position at the California Polytechnic State University, San Luis Obispo. Amy, an internationally recognized research expert in thermal management of electronic systems, has led 42 research grants, published two books, and serves on the ASEE National Engineering Dean's Council as vice chair.



Miles Greiner Ph.D.

California Alpha '79

Miles was appointed by President Biden to the U.S. Nuclear Waste Technical Review Board, an independent federal agency that reviews the DOE's nuclear waste management activities and provides recommendations to the Secretary of Energy and Congress. A University of Nevada, Reno, professor, his area of expertise is thermal analysis of large, multi-layered nuclear packages, used for transporting/storing radioactive waste.



Sharon C. Glotzer Ph.D.

Michigan Gamma '87

Sharon is the 2024 recipient of the FOMMS Medal honoring profound and lasting contributions to the development of computational methods and their application to the field of molecular-based modeling and simulation. She is a Univ. of Michigan Distinguished Professor of chemical eng'g whose research on computational assembly aims toward predictive materials design of colloidal and soft matter.



Marjorie R. Jenkins M.D.

Tennessee Gamma '89

Marjorie has been named vice president for Health Affairs and dean of the School of Medicine & Health Sciences at the University of North Dakota. In the dual role of VP and dean, she'll serve as chief fiduciary officer for the Division of Health Affairs and chief academic officer for the School of Medicine. Most recently, she was dean of the Univ. of South Carolina School of Medicine Greenville & a prof. of internal medicine.



Pamela M. Norris Ph.D.

Virginia Gamma '87

Pamela will be the first woman to serve as dean of the University of Delaware College of Engineering. An internationally known scientist in nanoscale heat transfer, she's an award-winning educator, former professor of mechanical and aerospace eng'g, and vice provost of research at George Washington University. Pamela previously served as a TBI Virginia Alpha Advisor and VA Gamma Chapter officer.



Brian M. Tande Ph.D.

North Dakota Beta '98

Brian was named president of South Dakota School of Mines. He held the role of dean, College of Engineering and Mines at the University of North Dakota (UND) for five years, where he also served as a ND Beta Chapter Advisor. Brian has worked in a variety of other leadership roles at UND such as dept. chair and has a ChemE Ph.D. from the University of Delaware.



FACILITIES: University of Kansas Research Center

— The National Science Foundation (NSF) has awarded the University of Kansas \$26 million to establish a new Gen-4 Engineering Research Center — Environmentally Applied Refrigerant Technology Hub (EARTH) — that will create a sustainable and circular refrigerant economy. NSF's Engineering Research Centers bring universities and businesses together to strengthen the competitive position of American industry in the global marketplace. **Mark B. Shiflett, Ph.D., NC A '88**, Distinguished Professor in the Department of Chemical & Petroleum Engineering, director of the Wonderful Institute for Sustainable Engineering, and a KS Alpha Chapter Advisor, will lead the EARTH Center.

Contract for Partnership to Design New Drone Facility

— The University of Memphis (UofM) and researcher **Eddie L. Jacobs, D.Sc., AR A '85**, are looking to improve the odds of successfully flying a drone in heavy rains or on extremely windy days after securing a \$9.2 million contract to design and construct a facility to develop & test drones capable of operating in adverse weather. Sponsored by the Office of Naval Research and the Naval Surface Warfare Center – Carderock Division, the facility will be located on President's Island at the William Morgan Large Cavitation Channel. Dr. Jacobs, senior researcher at the Center for Applied Earth Science & Engineering Research and UofM professor of engineering, is lead on this project in collaboration with researchers at other schools.

Levi T. Thompson Jr. Ph.D.

Michigan Gamma '81

Levi was appointed as dean of the College of Engineering at the University of South Florida. Most recently, he was the College of Engineering dean at the University of Delaware. An accomplished researcher, Levi's work on nanostructured materials for catalytic and energy storage applications has generated 14 patents and the co-founding of T/J Technologies, which was acquired by A123 Systems.



Stephen W. Tsai D.Eng.

Connecticut Alpha '52

Stephen was awarded the AIAA Daniel Guggenheim Medal honoring notable achievements in advancing the safety and practicality of aviation. A Stanford Univ. Research Professor Emeritus, he was cited "for foundational contributions to the mechanics of composites over a distinguished 60-year career, resulting in laminate theory and failure criteria that are the basis of modern aerospace composite structures."



Bevlee A. Watford Ph.D.

Virginia Beta '81

After retiring in September 2024, Bevlee was conferred the title of professor emerita, associate dean emerita and executive director emerita by the Virginia Tech (VT) Board of Directors. Known for pioneering the Center for the Enhancement of Engineering Diversity in the College of Engineering, she also held roles at VT such as director of the Ware Lab and associate dean of academic affairs. Bevlee is also a past ASEE president.



Executive Council MEETING MINUTES

Summary from an Executive Council (EC) Meeting — August 2023.

August 18, 2023 Virtual

The following consent items were adopted as presented and include:

- Ratification of the decision made by the Executive Council (EC) to accept the recommendation of the Alumnus Recognition Subcommittee and award the 2023 McDonald Mentor Award to **Richard J. Spontak, PA B '83**, and the 2023 Distinguished Alumnus Award to **Edward D. Basta, OH E '82**; **Brenda J. Chan, MI B '03**; and **H. Alan Mantooh, AR A '85**.
- At the request of the Director of the District Program, Stacey L. Forkner:
 - Reappoint **Sam Rokni, CA C '05**, as a District 16 Director to a term starting 7/1/23 and ending 6/30/26.
- At the request of the Director of Engineering Futures, Katy L. Colbry:
 - Appoint **Christopher B. Eaker, TNA '00**, as an Engineering Futures Facilitator to a term beginning 7/1/23 and ending 6/30/26; and
 - Reappoint **Carmen I. Daoud, WI A '20**, as an Engineering Futures Facilitator-in-Training to a term beginning 7/1/23 and ending 6/30/24.
- At the request of Executive Director Curt Gomulinski:
 - Award a Resolution of Appreciation to **Elizabeth L. Brooks, CT A '20**; for three years of service on the Student Advisory Board; and
 - Award a Resolution of Appreciation to **Mark R. Odorizzi, PA Z '19**; for three years of service on the Student Advisory Board.
- At the request of Membership Committee Chair Chetan G. Date:
 - Reappoint **Chetan G. Date, AZ B '84**, to the Membership Committee to a term beginning 7/1/23 and ending 6/30/26; and
 - Reappoint **Susan L.R. Holl, CA L '76**, to the Membership Committee to a term beginning 7/1/23 and ending 6/30/26.
 - Appoint **Nikhil Reddy Mummadi, NYP '21**, to the Membership Committee to a term beginning 7/1/23 and ending 6/30/26; and

- Appoint **Elizabeth A. Kroll, MI E '24**, to the Membership Committee to a term beginning 7/1/23 and ending 6/30/26.

Special Orders:

Mr. Gomulinski presented the FY24 budget (Aug. 2023-July 2024). He reviewed the budget at high-level and explained reasoning for the FY24 and expense targets, noted several key revenue components and expense categories, discussed how the trust spending guide is incorporated, and demonstrated how the EC could review the detailed budget by each program/class. After discussion, the motion to approve the FY24 budget, as presented, was adopted with a proviso that the budget be reviewed and adjusted at the Oct. 2023 in-person EC meeting. Mr. Gomulinski also noted that the reports from the auditors were provided last month and no additional information had been provided. Treasurer Hand & the Finance Committee reviewed the audit information and expressed no concerns. After discussion, the motion to approve the audits for FY20 (2019-20) & FY21 (2020-21) were adopted.

Special Orders:

- Mr. Gomulinski indicated that several groups within the Association had requested funding to send fully paid representatives to the

Convention. He also noted that at least 25 collegiate chapters had not filed Convention Credentials and would unlikely be represented this year. The EC then approved covering travel and onsite expenses for a subset of officials and committee representatives.

- Mr. Gomulinski reported that he and Alex Cross had not taken action during the pandemic regarding chapters not conducting an initiation during an academic year. However, the Constitution automatically places such chapters on probation. After reviewing the initiation records for the past five years, 14 chapters should have their probations ended by the EC while 16 chapters will remain on probation including three effective August 1, 2021; five effective August 1, 2022; and eight effective August 1, 2023. Follow up letters will be sent to the administration at the impacted schools.
- Action on *ad hoc* committees was discussed and Mr. Gomulinski remarked that Const. Art. IX, Sec. 6 requires the EC to authorize Conv. committees beyond those stated in the Constitution. A motion was then approved to appoint the *ad hoc* committees for the 2023 Convention.

STAY CONNECTED

Follow us on social media and tag us at **#taubetapi**, so we can see your TBIT images and videos.

INSTAGRAM:



[instagram.com/taubetapiofficial/](https://www.instagram.com/taubetapiofficial/)

WORDPRESS BLOG:



taubetapiathq.wordpress.com/

FACEBOOK:



facebook.com/TauBetaPiHQ/

X:



twitter.com/TauBetaPi

LINKEDIN:



linkedin.com/groups/101390/

YOUTUBE:



youtube.com/c/TheTauBetaPiAssociationInc

Seeking Nominations for Executive Council and Director of Alumni Affairs

The 2025 TBPI Convention will elect three members to serve on the Executive Council (EC). Interested Tau Bates must be nominated by an alumni or collegiate chapter no later than July 1, to be eligible for election.

The Executive Director can work with candidates needing a formal nomination.

Those with experience in a variety of functions: business, finance, management, research, teaching, etc., and those with knowledge in the areas of advising collegiate chapters, alumni relations, branding, fundraising/development, and image enhancement are strongly encouraged to apply.

Read the position description at: www.tbp.org/?ECjob for additional information.

If you know of a qualified candidate or are interested in learning more, review this letter, at www.tbp.org/?ECnom

Nominations can be sent via email to tbp@tbp.org.



TBP Executive Council members present an award at the 2024 Convention.



Indianapolis AC receives an award at the 2024 Convention from Tricia Gomulinski.



The Association is seeking candidates for the volunteer position of Director of Alumni Affairs. The three-year term would begin July 1, 2025.

The Director of Alumni Affairs strives to stimulate alumni member interest in Tau Beta Pi and work with the officers of the 52 active alumni chapters to successfully run and grow their chapters. Additionally, the Director guides the formation of new or reactivating alumni chapters, organizes and hosts alumni events around the country, and connects alumni and collegiate chapters.

The Director of Alumni Affairs must be a Tau Bate alumni. It is also desired that the Director be an alumni chapter member with knowledge of the organization of the Association.

For more info, view the Director of Alumni Affairs Position Description at: www.tbp.org/?AlumDir

Interested candidates should send their resume and a letter of interest to tbp@tbp.org by May 15, 2025.

The Baltimore Alumni Chapter members enjoy a group bowling activity.

WANTED: VOLUNTEERS FOR CONVENTION

The Association is interested in identifying members who might wish to serve in supporting roles at future TBPI Conventions. The Collegiate and Alumni Chapters and Association Officials may submit nominations for permanent Convention Chair to the Executive Council by June 1 of the Convention year for which the Chair will be selected. This member must be familiar with Robert's Rules of Order and should have experience in conducting meetings with that philosophy. At the same time a Convention Chair is selected, a Convention Parliamentarian will be selected. This member must have experience in using Robert's Rules of Order and have resources to help the Chair during Convention.

To assist the Chair and Parliamentarian in their duties, Tau Beta Pi also seeks volunteers to serve as the Tellers Committee Chair and Credentials Committee Chair.

Funding is available to cover most, if not all, of the expenses for these volunteers to attend the Convention; this includes travel, lodging, and meals.

These volunteers must be able to attend the Convention in Albuquerque, NM, from October 30 through November 1, 2025. Candidates should express their interest to the TBPI Executive Director (tbp@tbp.org) no later than June 1. Please include your resume and indicate the position for which you wish to apply.



Olivia and Alvin Lee

Tau Beta Pi Families

Do you have a spouse, sibling, parent, son/daughter, or grandparent, who is a member of Tau Beta Pi? If so, we would like to recognize you in a future Tau Beta Pi Families. Send your information and even a family photo to tbp.media@tbp.org.

BI-SPOUSAL:

Nicholas R. Abu-Absi, OH Z '96
Susan A. Abu-Absi, OH Z '96

Elizabeth C. Baier, NY I '85
Christopher P. Lent, NY I '84

Juan C. Barinaga, FL A '91
Zoe M. Barinaga, FL A '94

Christine E. (Holl) Bell, CA A '09
Michael M. Bell, CA Y '15

Mary L. Bucher, CA Z '87
Timothy Bucher, CA A '86

Kevin L. Haehl, IN A '89
Moira G. McClymont, TN B '89

Jennifer L. Lentner, MI K '96
Kurt P. Lentner, MI K '95

Beth H. Schumacher, NY N '82
Daniel L. Schumacher, NY N '82

Jordan M. Senff, ND B '15
Tyler A. Voegele, ND B '14

CENTENARIANS:

James A. Brown Jr., MO Γ '50
b. December 24, 1921
d. June 10, 2024

Robert C. Brunson Jr., GA A '43
b. Unknown
d. January 24, 2024

Adrian H. Dykema, MI B '44
b. August 2, 1922
d. December 17, 2023

Harry L. Emmons Jr., NJ B '40
b. June 9, 1917
d. June 10, 2023

Frederick C. Hull, MI Γ '37
b. November 9, 1915
d. December 2, 2021

Thomas W. Kidd, CO B '44
b. October 1, 1923
(living)

Melvin H. Lill, MI A '48
b. April 12, 1923
d. April 27, 2023

John F. Maurer, MI Γ '45
b. September 22, 1923
d. October 3, 2023

Edward J. Plomer Jr., MI A '43
b. July 29, 1921
d. February 8, 2022

Allan E. Reynolds, IN A '43
b. January 1, 1923
d. June 20, 2024

James L. Schmitt, WI B '47
b. August 28, 1922
d. March 14, 2024

Ted Tyler, KS A '48
b. November 1, 1921
d. December 6, 2022

Amos O. Winsand, CO B '52
b. October 15, 1923
d. February 17, 2024

Louis Witten, MD A '41
b. April 13, 1921
(living)

SIBLINGS:

The Battey Brothers
David J., MI B '93
Peter J., IA A '98

The Fabrycky Brothers
Alan L., AR A '69
†**Wolter J.**, OK Γ '62

The Ferary Twin Brothers
Giovanni W., GA A '26
Joseph, GA A '26

The Gathman Brothers
James R., IA A '79
Wayne A., IA A '73

The Hand Brothers
Brendan D., MI A '19
Michael J. III, MI Γ '11
Sean P., MI A '14

The Harris Brothers
John G., MA B '83
Joseph E., DE A '77

The Herrin Brothers
James C., NC Δ '81
Randy C., NC Δ '83

The Jacene Siblings
Cullen M., MA A '26
Megan, MA A '24

The Kocer Twin Brothers
Landon J., SD B '25
Luke J., SD B '25

The Levene Brothers
Howard B., PA Δ '93
Robert A., PA Δ '89

The Schweiger Brothers
Daniel R., AL B '19
Thomas F., AL B '22

MULTI-GENERATION:

The Abu-Absi Family

Nicholas R., OH Z '96 (father)
Susan A., OH Z '96 (mother)
Lina R., MA E '24 (daughter)

The Barinaga Family

Juan C., FL A '91 (father)
Zoe M., FL A '94 (mother)
Zoe I., FL A '23 (daughter)

The Battaglini Family

Dorena J., CO A '91 (mother)
Dagny J., OR Γ '23 (daughter)

The Battey Family

John C., IA A '63 (father)
David J., MI B '93 (son)
Peter J., IA A '98 (son)

The Bonner Family

Robert C., MI A '60 (father)
Robert H., MI A '84 (son)

The Bonsell Family

James M., PA A '86 (father)
Katherine E., MT B '25 (daughter)

The Brown Family

†**George G.**, MI Γ 1917 (grandfather)
Virginia J., WY A '79 (granddaughter)
 †**George M.**, WA B 1929 (uncle)

The Bucher/Reginato Family

Louis Reginato, CA Z '60 (grandfather/father)
Mary L., CA Z '87 (mother/daughter)
Timothy, CA A '86 (father)
Steven A., CA Z '21 (grandson/son)

The Faltens Family

Andris, MA B '62 (father)
Tanya A., CA A '89 (daughter)

The Gathman Family

Wayne A., IA A '73 (father/uncle)
Timothy D., CO B '07 (son/cousin)
James R., IA A '79 (father/uncle)
Nicole, WI A '23 (daughter/cousin)
Tyler J., IA A '19 (son/cousin)

The Greene Family

†**George A. Jr.**, CA Z '50 (father)
Christopher G., CA Γ '82 (son)

The Haehl/McClymont Family

Clayton W., MI Z '69 (grandfather/father)
Kevin L., IN A '89 (father/son)
Moira G. McClymont, TN B '89 (mother)
Kristin E., IN A '17 (granddaughter/daughter)

The Harris Family

John G., MA B '83 (father)
Maya J., FL A '24 (daughter)
Joseph E., DE A '77 (uncle)

The Klanderman/Jordan Family

Kent A., WI A '58 (uncle)
Gregory A., NY Δ '92 (nephew)
Elizabeth J. Jordan, IL A '08 (sister-in-law)

The Lee Family

Alvin Y., CA Γ '92 (father)
Olivia Y., CA Γ '24 (daughter)

BELOW: (Left) Brothers David and Peter Battey with father John.

(Middle) The Abu-Absi family after Lina's graduation with the Northeastern University campus Bent monument.

(Right) The Barinaga family of Florida Gators with Juan and Zoe celebrating Zoe's graduation.



MULTI-GENERATION:

The Lent/Baier Family

†**Andrew E. Jr.**, *NY I '58* (father/grandfather)

Christopher P., *NY I '84* (father/son)

Elizabeth C. Baier, *NY I '85* (mother/daughter-in-law)

Alexander F., *WA A '18* (son/grandson)

The Miller/Berthold Family

†**Kenneth G.**, *MI A '51* (father/grandfather)

James R., *TX A '87* (father/son)

Kris D. Berthold, *TX B '04* (son/grandson)

Ryan M. Berthold, *CA A '05* (son/grandson)

The Moore Family

John H., *PA A '68* (father)

†**Douglas M.**, *PA O '99* (son)

The Muegge Family

Coleen J., *KY B '93* (mother)

Katelyn I., *KY A '26* (daughter)

The Nadolsky Family

David S., *MI B '87* (father)

Jacob S., *TX B '27* (son)

The Nelson Family

David A., *NC G '84* (father)

Julia, *AL E '24* (daughter)

The Reams/Varin Family

James D., *KY A '59* (father)

Melanie R. Varin, *IN A '83* (daughter)

The Richardson Family

Joseph D., *MS B '88* (father)

Hannah, *AL E '25* (daughter)

The Russ Family

Samuel H., *GA A '86* (father)

Angela C., *AL E '24* (daughter)

The Schweiger Family

Robert F., *MI A '89* (father)

Daniel R., *AL B '19* (son)

Thomas F., *AL B '22* (son)

The Seneviratne Family

Waruna P., *KS B '98* (father)

Dimitri S., *KS B '24* (son)

The Shofner Family

Terrence D., *MO B '73* (father)

Rebecca A., *MO G '24* (daughter)

The Townsend/Siegele Family

†**Wesley H.**, *MI B 1930*

Frank C., *FL A '62*

Joyce C. Siegele, *FL A '91*

Kirk W. Siegele, *GA A '27*

Images and details on page 37.

The VanDeValk Family

William A., *NY O '81* (father)

Joseph R., *NY O '25* (son)

The Vasko Family

Susan D., *OH G '79* (mother)

Alexander J., *IN B '15* (son)

The Walters/McCarthy Family

Carol A., *TX H '77* (mother/grandmother)

Robert R., *OK A '65* (father/grandfather)

Terri, *TX A '88* (daughter/mother)

Kate I. McCarthy, *CO B '23*

(granddaughter/daughter)

The Yang Family

Joseph T., *CA B '86* (father)

Jacqueline O., *NY A '24*

(daughter)

Russell A., *CT A '25* (son)

The Zerbel Family

†**David W.**, *MI G '56* (father)

Rebecca R. Powell, *CA A '85*

(daughter)



ABOVE: (Left) Tau Bate fathers and daughters at the University of South Alabama after an Alabama Epsilon initiation. (L to R): Hannah Richardson, *AL E '25*, with Assoc. Professor Joseph Richardson, *MS B '88*; Professor David Nelson, *NC G '84*, with Julia Nelson, *AL E '24*; and Angela Russ, *AL E '24*, with Assoc. Professor Samuel Russ, *GA A '86*. (Right) The Yang family (Joseph and Russell) at Jacqueline's Columbia University graduation.

TAU BETA PI FAMILIES HIGHLIGHT: ONE FAMILY — FOUR GENERATIONS OF TAU BATES



The first three generations of Townsends together at Joyce's initiation. Left to right: Joyce, Wesley & Frank.



Wesley H. Townsend became the initial family member to join Tau Beta Pi in 1930 at Michigan Technological University (MI Beta Chapter). Wesley passed away in 2000.

Subsequently, his son, **Frank C. Townsend, Ph.D., FL A '62**, joined TBPI as an eminent engineer at the University of Florida, where he served as FL Alpha Chapter Chief Advisor.

In 1991, Frank's daughter **Joyce C. Siegele**, (née Townsend) added a third generation, after also joining the FL Alpha Chapter.

Finally, Joyce's son (Wesley's great-grandson) **Kirk W. Siegele, GA A '27**, brought the family to four generations of Tau Bates after joining at Georgia Tech in 2024.

This is an awesome accomplishment that deserves recognition, and we thank Dr. Townsend for sharing the great news!

(Image to left) In 2024, from left to right: Kirk Siegele, Joyce Siegele, and Frank Townsend.



Submit 2025 Association Award Nominations



The following Association award nominations are due by **April 1**:

Laureate Program:

recognizes members who excel in areas outside of engineering (arts, athletics, service, and diverse achievements).

Nomination reference letters must be emailed to HQ.

Selections will be made in June by a committee of District Directors appointed by the Executive Council.

Winners will be announced in July, and each will receive \$2,500 and a recognition plaque.

McDonald Mentor Award:

celebrates TBP educators and engineers who have consistently supported the personal and professional development of their students and colleagues as mentors or advisors.

The winner receives an engraved medallion, replica pin, \$1,000 honorarium, and the nominating chapter receives \$1,000.



Outstanding Advisor Award:

recognizes exceptional performance among the Association's Chapter Advisors. The winner receives a plaque and \$1,000, and the nominating chapter's dean receives \$1,000 for their discretionary fund.

All award recipients are invited to the annual Convention. Information and nomination instructions are available for all three awards on the TBPI website:

www.tbp.org/awards.cfm

CHAPTER ETERNAL

Our fellow Tau Bates who are gone, but never forgotten.

The condensed style of these notices is made necessary by the Association's large membership and space limitations in *The Bent*. You may contact 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, including full name and date of death. You may report the death of a member by sending an email to tbp.memberupdate@tbp.org. Members that were 100+ years when passing are identified with "Cent."

ALABAMA

BETA AL B

Kimbrough Jr., Harvey P., '48, Dec. 18, 2023.
Yost, Carl W., '58, November 8, 2024.

ARIZONA

ALPHA AZ A

Melody, Thomas J., '70, April 11, 2024.

BETA AZ B

Wilcox, Ronald S., '71, December 2, 2024.

ARKANSAS

ALPHA AR A

Barr, James Claeborne, '55, July 31, 2024.
Driggers, William Jennings, '59, Oct. 7, 2024.
Lewis, Charles Glenn, '62, March 13, 2023.

CALIFORNIA

ALPHA CA A

Bridges, William Bruce, '56, Nov. 1, 2024.
Homsy, George Mitchell, '65, May 5, 2024.

GAMMA CA Γ

Gable, Robert Elledy, '56, November 29, 2024.
Montgomery, Michael D., '58, March 24, 2022.
Hill, James Christian, '62, Dec. 19, 2024.

DELTA CA Δ

Lang, Charles Arthur, '56, August 12, 2022.

ETA CA H

Vierra, George Joseph, '68, Dec. 20, 2024.

THETA CA Θ

Ashmore, Lloyd Owen, '81, Dec. 28, 2024.

IOTA CA I

Jackley, Donald Neil, '62, May 6, 2024.
Hashimoto, Rikio, '70, June 11, 2024.

MU CA M

Kelsey, Donald John, '82, November 6, 2024.

COLORADO

ALPHA CO A

Glenn, Thomas G., '66, December 26, 2024.

BETA CO B

Chronis, George Henry, '62, January 3, 2025.
Matzen, Vernon Charles, '66, Dec. 7, 2023.

GAMMA CO Γ

Hall, James Carlton, '62, June 8, 2024.
Wittrock, Edward Paul, '63, August 5, 2024.

CONNECTICUT

ALPHA CT A

Ortoli, Ernest S., '61, July 13, 2022.

BETA CT B

Thompson, Gerald F., '50, July 24, 2024.

DELAWARE

ALPHA DE A

McMaster, Lee Patrick, '64, February 8, 2024.

FLORIDA

BETA FL B

Silveira, Silvio Arturo, '72, March 13, 2023.

DELTA FL Δ

Peter III, Emmett B., '78, Dec. 24, 2023.

GEORGIA

ALPHA GA A

Johnson, Ellis L., '60, February 20, 2024.
McKeown, Patrick George, '65, Dec. 5, 2024.

ILLINOIS

ALPHA IL A

Kehlet, Alan B., '51, no details.
Shaffer, Eric John, '81, February 15, 2022.
Smith, Alvin, '87, no details.
Gahvari, Hormozd Benjamin, '03, Oct. 3, 2016.

BETA IL B

Johnson, Richard K., '52, no details.

GAMMA IL Γ

Derlacki, Walter Richard, '45, Nov. 29, 2024.

INDIANA

ALPHA IN A

Bobbeck, Andrew H., '48, December 14, 2017.
Hemdal, John F., '57, January 19, 2024.
Drobish, William Edison, '60, July 20, 2024.
Snow, Thomas B., '60, May 21, 2023.
Zimmer, Ralph Wildy, '64, December 26, 2024.
Monell Jr., Gilbert Finley, '66, March 9, 2024.

DELTA IN Δ

Neargarder, Patrick Richard, '65, no details.

IOWA

ALPHA IA A

Hardie, John McGraw, '50, February 12, 2021.
Phelps, James William, '51, January 30, 2024.
Kunz, Richard Lee, '67, January 26, 2024.

KANSAS

ALPHA KS A

Stockton, Robert S., '45, August 28, 2017.
Umholtz, Robert Carl, '51, January 4, 2025.
Turner, Charliene Grace, '80, January 8, 2024.

KENTUCKY

ALPHA KY A

Distler, Raymond J., '51, January 13, 2025.
McGraw Jr., Woodson W., '64, Dec. 9, 2024.

LOUISIANA

BETA LA B

Bland, Robert F., '48, December 5, 2024.

GAMMA LA Γ

Harper, Thomas Gerald, '52, no details.
Harlan, Leo F., '54, December 4, 2024.

DELTA LA Δ

Ledoux, Will Anthony, '62, July 12, 2020.

MARYLAND

BETA MD B

Lyons, John Winship, '52, March 14, 2024.
Walther, Martin David, '79, no details.

MASSACHUSETTS

BETA MA B

Ward Jr., Albert Anthony, '54, no details.
Roberts, Edward B., '57, February 27, 2024.
Omura, Jimmy K., '62, August 29, 2024.
Hirz, Peter James, '69, July 27, 2024.

DELTA MA Δ

Surtees, Robert Elliott, '55, Dec. 23, 2023.
Dolinsky, Larry Robert, '57, July 30, 2022.
Cashman, William F., '64, Sept. 22, 2022.
Onipede, Oladipo, '90, January 9, 2024.

EPSILON MA E

Tucker, Eliot Francis, '62, February 4, 2022.
Fish Jr., William Gerald, '72, Nov. 18, 2012.

MICHIGAN

ALPHA MI A

Chamberlain, Adrian Ray, '51, Oct. 7, 2024.

BETA MI B

Smith, Richard Earl, '48, March 12, 2018.

GAMMA MI Γ

Sperlich, Harold Keith, '51, January 20, 2025.
Wolf, Louis William, '52, September 6, 2009.
Moriarty, Brian Michael, '58, Nov. 20, 2018.
Seidel, Erwin Michael, '62, July 28, 2024.



California Gamma '62

James C. Hill, Ph.D.

December 19, 2024

Joined Iowa State Univ. faculty in 1971, helping establish the PrISum solar car racing team. He served as TBII District 11 Director since 1995, IA Alpha Chpt. Advisor since '78, and TBII Outstanding Advisor & McDonald Mentor awardee.



Massachusetts Beta '65

Edward B. Roberts, Ph.D.

February 27, 2024

At the age of 17, came to MIT and stayed for 71 years. There, he earned four degrees, became the youngest-tenured professor, earned the first Ph.D. in systems dynamics, and created & researched the field of entrepreneurship.



New York Iota '71

David R. Yarkony, Ph.D.

November 22, 2024

A world leader in theoretical chemistry and member of the Johns Hopkins Univ. Dept. of Chemistry, since 1977. His research changed scientists' understanding of radiationless decay ushering in conical intersections.



Oklahoma Gamma '57

Neal A. McCaleb, P.E.

January 7, 2025

Appointed Oklahoma's first Secretary of Transportation, later held ODOT Director position, and was a 2021 TBII Distinguished Alumnus. A Chickasaw Nation member, he also served in the OK House of Representatives.

DELTA MI Δ

Knight, Paul E., '84, September 29, 2024.

EPSILON MI E

Strewski, Chester F., '49, August 23, 2002.
Walrad, John Francis, '58, August 2, 2024.

ZETA MI Z

Reedy, John Michael, '74, January 25, 2019.
Farrell, Adam Martin, '09, February 13, 2021.

MINNESOTA

ALPHA MN A

Frohbach, Hugh Finch, '48, July 13, 2020.
Currier, Randolph G., '68, Sept. 2, 2024.

MISSOURI

BETA MO B

Williams, Ronald Ray, '63, July 12, 2022.
Adams, James Edward, '64, February 6, 2024.
Stevens, Robert E., '85, no details.

GAMMA MO Γ

Seddon Jr., Bruce, '48, June 10, 2008.

MONTANA

ALPHA MT A

Ylinen, Robert E., '63, July 2, 2024.

NEVADA

ALPHA NV A

Athey, James M., '82, no details.

BETA NV B

Pepper, Darrell Weldon, '68, Oct. 18, 2022.

NEW HAMPSHIRE

ALPHA NH A

Maynard, Nelson Charles, '60, Oct. 13, 2023.

NEW JERSEY

ALPHA NJ A

Fugardi, Joseph F., '52, December 1, 2024.
Luehman, Kent William, '75, no details.

BETA NJ B

Howell, Jeffrey Mathews, '68, no details.

GAMMA NJ Γ

Katz, Allen, '64, June 20, 2024.
Praschak, Joseph John, '73, Feb. 14, 2024.

NEW YORK

ALPHA NY A

Mayer, Ernest, '62, July 1, 2023.

BETA NY B

Forrest, Lester, '50, no details.
Monson, John Arthur, '58, June 8, 2024.
Thompson, John Irven, '76, October 20, 2023.

GAMMA NY Γ

Stafford, William H., '49, March 29, 2014.
Albrecht, Norman Peter, '59, no details.
Brain, Marshall D., '83, November 20, 2024.

DELTA NY Δ

Hallagan, Charles Winspear, '48, Nov. 9, 2024.
Bernhard, Richard Harold, '56, Oct. 10, 2024.
Dougherty, John William, '59, Feb. 19, 2022.
Shen, Hwa Nien, '69, March 24, 2021.
Warner, John Jeffrey, '72, January 2, 2025.

EPSILON NY E

Greenfield, Robert Henry, '66, Nov. 11, 2024.

ETA NY H

Pope, Michael, '44, March 3, 2023.

THETA NY Θ

Couch, James Phillip, '59, Dec. 12, 2018.

IOTA NY I

Grum, Allen Frederick, '53, October 17, 2024.
Yarkony, David R., '71, November 22, 2024.

LAMBDA NY Λ

Gagliardi, George N., '52, December 17, 2024.

NU NY N

Cronin, Patrick James, '68, Sept. 7, 2024.
Dole, Teresa K., '81, June 20, 2024.

XI NY Ξ

Scala Jr., Anthony J., '74, March 28, 2024.

NORTH CAROLINA

ALPHA NC A

Kellogg, Lewis A., '82, December 27, 2024.

GAMMA NC Γ

Bullard, John Carson, '47, Sept. 3, 2024.

NORTH DAKOTA

ALPHA ND A

Sack, Larry Elroy, '59, February 26, 2024.

OHIO

ALPHA OH A

Hazen, Ramon B., '60, December 9, 2024.

ETA OH H

Pritchard Jr., Harley H., '75, Sept. 9, 2023.
Berry, John Mills, '76, November 3, 2024.
Ratcliff, Alan H., '86, October 21, 2024.

THETA OH Θ

Pazdalski, Walter, '64, no details.

OKLAHOMA

ALPHA OK A

Dearing, Durward Olney, '49, Jan. 31, 2008.
Wainerdi, Richard Elliott, '52, March 17, 2021.
Alworth, Charles Wesley, '65, Jan. 2, 2025.

GAMMA OK Γ

McCaleb, Neal A., '57, January 7, 2025.
Fabrycky, Wolter J., '62, November 6, 2024.

OREGON

ALPHA OR A

Engesser, William F., '41, January 29, 1998.

PENNSYLVANIA

ALPHA PA A

Talhelm, Donald Lee, '59, Nov. 10, 2024.

BETA PA B

Thompson, Fred C., '50, January 15, 2025.

EPSILON PA E

Santo, William John, '53, June 28, 2024.
Eisele III, Edward H., '63, November 19, 2024.
Wettlaufer, John Richard, '64, Oct. 22, 2023.

ZETA PA Z

Okada, Richard Francis, '54, August 13, 2023.

ETA PA H

Sawicki, Frank Joseph, '73, Dec. 28, 2024.

RHODE ISLAND

ALPHA RI A

Pomeroy, Philip George, '46, June 1, 2014.
Steen, Paul Herman, '75, September 4, 2020.

SOUTH CAROLINA

GAMMA SC Γ

Macdonald, J. Ross, '44, March 30, 2024. **Cent.**

TENNESSEE

ALPHA TN A

Deatherage Jr., James H., '87, Dec. 2, 2024.

BETA TN B

Heath, David Shauck, '53, December 9, 2024.

TEXAS

ALPHA TX A

Howerton, Lloyd Foster, '51, no details.
Womack, David Paul, '65, July 21, 2017.
Williamson, Raleigh S., '71, Nov. 27, 2024.

BETA TX B

Betts, Charles Albert, '65, April 29, 2024.
Herlin, Bruce George, '66, August 31, 2023.

GAMMA TX Γ

Maxfield, Robert Roy, '64, August 13, 2024.
Netravali, Arun N., '69, November 4, 2021.

DELTA TX Δ

Solis, Jose Luis, '65, December 26, 2024.

ETA TX H

Redwood, William John, '76, Dec. 13, 2023.

UTAH

ALPHA UT A

Gogarty, William B., '53, March 31, 2024.

VERMONT

ALPHA VT A

Sanders, Richard Webster, '59, Oct. 7, 2023.

VIRGINIA

ALPHA VA A

Coleman, George Whitney, '45, no details.
Bass III, Lucien Lloyd, '63, January 17, 2025.
Scherer, William T., '80, October 30, 2024.
Fuller, Wayne Robert, '82, October 3, 2016.

BETA VA B

Dollard, Joseph Stumpt, '51, May 11, 2014.
Friar, Billy Wade, '58, March 1, 2022.
Ammons, Larry R., '66, October 27, 2024.
Motyka, Timothy John, '78, January 29, 2024.

WEST VIRGINIA

ALPHA WV A

Landes II, Junior H., '64, May 24, 2021.

WISCONSIN

ALPHA WI A

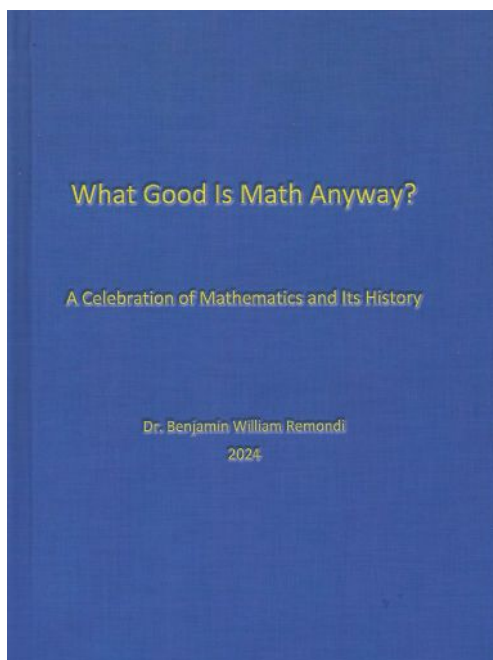
Holmes, John Thomas, '58, Nov. 28, 2023.
Skofronick, James G., '59, November 4, 2024.
Suess, Manfred Edward, '64, January 4, 2025.

BETA WI B

Beranek, Stanley, '51, April 18, 2014.
Mertz, Robert Leroy, '56, March 21, 2017.
Lambert, Roger Thomas, '68, Nov. 27, 2024.

SPECIAL

Luchini, Tamara Wyckoff, January 23, 2025.



Benjamin W. Remondi, Ph.D.
Delaware Alpha '67

Benjamin spent his early years on a farm in Maine. The 1957 launch of Sputnik had a profound impact and led him to earn a BSEE and an M.S. in mathematics at the Univ. of Delaware. He worked for NASA at Wallops Island (VA) and on the NOAA GOES and TIROS weather satellites. Benjamin then earned an M.S. in space technology from Johns Hopkins Univ. and a Ph.D. in aerospace engineering from the Univ. of Texas at Austin. He worked on GPS from 1982 to 2008 and developed novel positioning methods, including millimeter accuracy surveys with GPS and a centimeter accuracy method called RTK.

The following is the full Preface, page 1 (Chapter 1), and pages 82-83 (Chapter 6) of Remondi's book.

PREFACE

What I have intended with this publication is to inspire a love and/or appreciation of mathematics for both young and old. Much effort has been given to developing an intuitive feel for both results and methods. I have emphasized that technology such as going to the moon, or the development of wireless communications, could not have been done without mathematics.

This pair, The 'Method of Exhaustion' of Eudoxus has been used to convince the reader of the resulting formulas derived, and more to the point, to generate a certain comfort level with infinity. The methods of 'Proof by Contradiction' and the method of 'Mathematical Induction' have been used. The notion of proving something, forevermore, is relatively new – perhaps 2500 years. Before that, rules of thumb were satisfactory.

The book starts slowly at an intuitive geometric level and picks up speed later. The last three chapters reach trigonometry, analytical geometry, and calculus. The appendix hurries through additional topics.

An important theme in the book is an attempt to answer a question I have heard so many times in my life: "What good is math anyway?" This question has several interpretations.

CHAPTER 1 WHAT GOOD IS MATH ANYWAY?

This is a question that I have been asked many times – even by well-informed regular people. Sometimes they appear to be open to a thoughtful reply, but not always. It is an easy question to ask. However, the question is not necessarily easy to answer – either by a mathematician or by a math historian.

It seems like a stupid question at first. I remember teaching calculus at the University of Delaware. A student would ask a question that would seem pretty lame. But I would hold my tongue and reflect. A stupid question is sometimes not stupid at all. It might or might not have been sent stupidly, but it might not be stupid at all. Stupid questions that are hard to answer are often not stupid questions.

The first problem in answering the title question is: What is mathematics anyway? Does the questioner mean numbers, arithmetic, algebra, geometry, calculus, or maybe higher mathematics they have some vague awareness of? Maybe they had to study it but never had to use it. My brother tells me he had to study algebra, but he never used it. He was happy playing with engines. He says he had very little interest in algebra and barely squeaked by. I loved it from the start like Mrs. Katherine Johnson from 'Hidden Figures;' so, it was easier for me to learn it. I was an engineer involved in satellite orbits and GPS positioning and navigation. I never seemed to have enough mathematics to do what I wanted to do. To be brief, I needed vastly more than is presented in this book. I constantly had to learn more mathematical methods and techniques to achieve my goals or achieve more efficient results.

Tens of thousands of years ago hunter gatherers marked on animal bones for various reasons. That might have been the most advanced math of that era. I doubt if anyone asked, “What good are marks on bones?” – but maybe they did. They probably knew what the marks meant and considered them useful because they understood them. Who knows?

CHAPTER 6 π AS A PARABLE

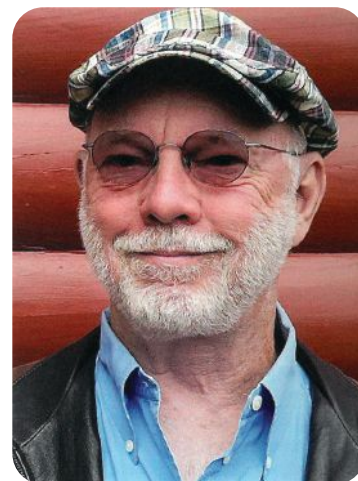
We are going to use π as an example of mathematical development. The discovery of π is a good example because it has good and bad anecdotes. π shows several main drivers of science and mathematics: need, curiosity, competition, and fame. All these forces show up in various ways in all human endeavors from romance to politics to wealth to literature and to mathematics. Historically, need often comes first. The value of π was needed at some level simply to compute rough estimates of resources for a project or rough estimates for how much volume is in a vessel. π is useful for determining the diameter of a tree.

Do we ‘degrade’ ourselves to measure it, or do we use geometry or other mechanisms to estimate it. Yes, there was a time when it was uncouth or degrading to demonstrate by measuring versus pencil and paper or theory. I know that is hard to believe. Aristotle presents a famous example of this. He believed that pure reason or logic could discover all truths. That is why he claimed that orbital paths had to be circular (they are not), and why a 10-pound rock should fall 10 times faster than does a 1-pound rock (it does not). Next, we get competition as to who can determine more digits of π or who can memorize more digits of π . Then there is fame – which is somewhat different from competition. Not mentioned yet is the result of curiosity: an unexpected discovery.

Early values of π were good enough – for government work!

Some of the earliest values of π , that historians are aware of, were 3 , $25/8$, $28/9$, $256/81$, $\sqrt{10}$. Let’s review some of these briefly. The ratio 3 is famous because it can be determined from a passage in the Bible. It describes the construction of a fountain or similar object with specifications regarding its height, diameter, and circumference. It states that the diameter should be 10 units and the perimeter should be 30 units. The sad part is the Bible does not claim that the ratio of the circumference of a circle to the diameter is exactly 3 . If one assumes the Bible was dictated by God this would not be an unreasonable conclusion, I guess. However, even God might not have wanted construction time to be wasted worrying about exactness to 100 places! That remark is meant to be ridiculous. Would not God be wise enough to tell workers that $\pi = 3$ would be good enough for making the fountain? But if one takes the Bible as a document of centuries of human oral histories, written down once there emerged an alphabet, then one might not want to take it so literally. This interpretation – as a documentation of oral history – is analogous with Homer’s *Iliad* and *Odyssey* – which were finally written down once there emerged an alphabet (and some form of paper, I might add).

The Babylonians came up with $25/8$ (3.125) and the Egyptians arrived at $256/81$ (3.160). These cultures were able to function very well with these values. They are both around 0.5% of the true value. That means a cylindrical vessel containing 100 liters (approximately 26.4 gallons or roughly $18'' \times 18'' \times 18''$) would be computed wrong by a couple of cups. In early Chinese history 3 and $\sqrt{10}$ (i.e., 3.162) were used for π . The latter is close to the Egyptian value.



Dr. Remondi whose book is now available in hardback on eBay.

The Method of Exhaustion used in earlier chapters of this book was first described by Antiphon and/or Eudoxus, it seems. Archimedes applied it within the numerical abilities of his times. As described in the last chapter, he could have started with a square or hexagon inscribed in a circle. The choice of a hexagon was somewhat more efficient. The regular hexagon was great for this purpose because it comprises exactly six equilateral triangles with central angles of 60 degrees. Bisecting the angle and the associated chord yields a regular 12 -sided polygon which consumes more area of interior of the circle than the regular hexagon. Obviously, this process can continue until either the circle or the human is exhausted. Archimedes was content to demonstrate the process and carried it to a total of four doublings. Thus, he stopped at the regular 96 -sided polygon with a value for π of about 3.14 and the inequality $3 + 10/71 < \pi < 3 + 10/70$. He used both inscribed and circumscribed polygons as discussed in the previous chapter. There is little doubt that he could have gone farther. With a better number system, the effort would have been much easier, and he would have noticed the improvement trend as we discussed in the previous chapter. But no matter.

ASSOCIATION BRIEFS



The Kansas City Alumni Chapter trivia team.



GSMAC Director Donna Riggs soldering toys.

ALUMNI ACTIVITY: KANSAS CITY (KS) ALUMNI CHAPTER

There was a packed crowd on hand and formidable competition as a team of Kansas City Alumni Chapter members participated in a Tuesday “Taco and Trivia” night. The event took place on January 14 at The Brew Lab in Overland Park, KS. Thanks to the participants for coming out in the cold and **congratulations** to the team for taking home third place!

Credit: Brent J. Barcus, *NY G '02*, for the image and summary. Want to join the chapter? Send an email to: KCAumni@tbp.org

ALUMNI ACTIVITY: GREAT SMOKY MOUNTAINS (TN) ALUMNI CHAPTER

In December (2024), three members of the Great Smoky Mountains Alumni Chapter (GSMAC) volunteered with Knox Makers to help adapt toys for children with disabilities. This is the second year GSMAC has assisted with this annual holiday event. Those in attendance:

Terry D. Olberding, *TN A '78*,
Donna R.H. Riggs, P.E., *TN A '87*, and
Christopher L. Whaley, *TN A '94*.

Learn more about GSMAC activities by contacting: GSMAC@tbp.org



JOIN AN ALUMNI CHAPTER TODAY!

Visit: www.tbp.org/?ACcontact or contact Tricia Gomulinski at t.gomulinski@tbp.org, to discuss opportunities to join and the steps for establishing a chapter in your area.

Image Left: The Chicago Alumni Chapter hosted its first in-person event of the year on January 19 at the Griffin Museum of Industry. It was both fun and informative for members and their families.

WELCOME TAC ASSOCIATION COMMITTEE MEMBER



Alexandra F. Nicoletti, NC E '11, was appointed by the Executive Council as a **Trust Advisory Committee (TAC)** member to a term beginning October 10, 2024, and ending June 30, 2027. She's a partner at Camber Creek and supports the firm's deal flow, diligence, transactions, and portfolio management while serving on numerous portfolio company boards.

Prior to joining Camber Creek, Alexandra worked in real estate private equity; her roles included acquisitions and asset management positions at leading real estate investing and operating companies globally, including Brookfield Properties & Norges Bank.

She has closed commercial real estate transactions and managed portfolios totaling over \$10 billion in value. Alexandra began her career in real estate investment banking at Goldman Sachs. She received a B.S. from Duke University with a double major in civil engineering and economics, where she served as NC Gamma Chapter vice president. Visit our website to view all TBPI Boards and Committee members at: www.tbp.org/boards-and-committees.cfm

Also, a special welcome to our new Tau Beta Pi District Directors:

Nicholas R. Divilbiss, KS G '25, in District 9; and

Rebecca R. Seemann, ND B '23, in District 11.

FRESHMAN STEM SCHOLARSHIPS:

Every year, six incoming college freshmen are awarded a TBP – SAE International Engineering Scholarship of \$1,500 to pursue an engineering degree from an ABET accredited program.

Christopher Dantoni (Staten Island, NY) mechanical engineering at Stevens Institute of Technology (NJ)

Clara Drysdale (Fort Collins, CO) civil engineering at Stanford University

Kathryn Files (Austin, TX) electrical & computer engineering at Rice University (TX)

Paige Georgeou (Canonsburg, PA) materials science & engineering at Virginia Tech

Trevor Hendrix (Calhan, CO) agricultural engineering at Oklahoma State University

Audrey Rosenow (Modesto, CA) industrial engineering at Cal Poly State University, San Luis Obispo

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NEST is a yearly TBP competition where members in a group submit solutions that address a general topic chosen by the Convention body each year. We classify these submissions as EGGS, or Engineered for the Greater Good Solutions (EGGS). Students are encouraged to work in teams and present their unique EGGS to Convention to try and persuade alumni and industry sponsors that their ideas are the best investment to solve the NEST challenge.

**GET STARTED.
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TBP.ORG/NEST



Selected references: (Due to space limitations, many URLs are not included)

The first six-episode season of the British political thriller TV series *COBRA*, released in 2020 by Sky One, explores possible societal reaction to the prolonged outage of the U.K. power grid by a powerful solar flare and resultant CME and EMP.

1. Both men's brief firsthand accounts (R.C. Carrington, "Description of a Singular Appearance in the Sun on September 1, 1859" and R. Hodgson, "On a curious Appearance seen in the Sun") were published together in the same issue of *Monthly Notices of the Royal Astronomical Society* vol. 20 (1859), pp. 13–16.
2. Hugh S. Hudson, "Carrington Events," *Annual Review of Astronomy and Astrophysics* 59(2021): 445–477, p. 449.
3. One highly readable book detailing the 1859 Carrington event and consequences is Stuart Clark, *The Sun Kings: The Unexpected Tragedy of Richard Carrington and the Tale of How Modern Astronomy Began* (Princeton University Press, 2007). First-hand accounts of the auroras and the telegraph operators' experiences can be found in M.A. Shea and D.F. Smart, "Compendium of eight articles on the 'Carrington Event' attributed to or written by Elias Loomis in the *American Journal of Science*, 1859–1861," part of a single-topic special issue of *Advances in Space Research* 38(2006): 313–385.
4. Edward W. Cliver, et al., "Extreme Solar Events," *Living Reviews in Solar Physics*, 19:2 (2022) pp. 108–109 {full review article is 143 pages long} <https://doi.org/10.1007/s41116-022-00033-8>.
5. NASA Goddard Space Flight Center, "Continued Strong Solar Flare Activity: May 10–14, 2024," <https://svs.gsfc.nasa.gov/14589/>.
- 6a. Tony Phillips, "Rocks and Soil Electrified by the May 10th Superstorm," Spaceweather.com, May 26, 2024. See also "What are solar flares?" European Space Agency.
- 6b. Doug Bonderud, "Solar Storms: Is an Internet Apocalypse Imminent?" Northrup Grumman, March 28, 2024. Also, John Hollis, "Mason scientists to work with the U.S. Navy to avert an 'internet apocalypse'," August 9, 2023.
7. Government of Canada, "Chronology of Events," <https://www.spaceweather.gc.ca/tech/se-chr-en.php#year1989>.
8. Sarah J. Reay, et al., "Space Weather effects on drilling accuracy in the North Sea," *Annales Geophysicae* vol. 23, pp. 3081–3088, November 2005; also Mikhail Kruglyakov, et al., "A Proper Use of the Adjacent Land-Based Observatory Magnetic Field Data to Account for the Geomagnetic Disturbances During Offshore Directional Drilling," *Space Weather* vol. 20(12), 25 pages, November 18, 2022 <https://doi.org/10.1029/2022SW003238>.
9. Delores J. Knipp, et al., "On the Little-Known Consequences of the 4 August 1972 Ultra-Fast Coronal Mass Ejects: Facts, Commentary, and Call to Action," *Space Weather* vol. 16, pp. 1635–1643, November 10, 2018, <https://doi.org/10.1029/2018SW002024>. (Newspaper archives about many earlier dramatic solar storms can be found at <https://www.solarstorms.org/SRefStorms.html>.)
10. Valeriy Vasilyev et al., "Sun-like stars produce superflares roughly once per century," *Science* vol. 386, No. 6727, pp. 1301–1305, Dec. 12, 2024, doi: 10.1126/science.adl5441.
11. Edward W. Cliver, et al., "Extreme Solar Events," *Living Reviews in Solar Physics*, 19:2 (2022), pp. 109–111.
12. The single-year precision of dating Miyake events has offered archaeologists a way of pinpointing dates of major historical events. See, for example, Michael Price, "Marking Time," *Science* vol. 380, Issue 6641, pp. 124–128, April 14, 2023.
13. Reference 11, pp. 108–109.
14. J. A. Gonzalez-Esparza, et al., "The Mother's Day Geomagnetic Storm on 10 May 2024: Aurora Observations and Low Latitude Space Weather Effects in Mexico," *Space Weather* vol. 22, issue 11 (November 2024), <https://doi.org/10.1029/2024SW004111>, pp. 1–3 of 17. A few days later on May 14, there was an even stronger solar flare rated as X8.7.
15. David Wallace, "Solar storm knocks out farmers' high-tech tractors..." *The Conversation*, March 18, 2022; updated May 13, 2024.
16. National Research Council, *Severe Space Weather Events — Understanding Societal and Economic Impacts* (The National Academies Press, 2009), p. 8, <https://doi.org/10.17226/12643>.
17. W. Scott Shambaugh, "Doing Battle with the Sun: Lessons from LEO and Operating a Satellite Constellation in the Elevated Atmospheric Drag Environment of Solar Cycle 25," presentation at the 4S Symposium, Palma de Mallorca, Spain, May 2024.
18. Yoshita Baruah et al., "The Loss of Starlink satellites in February 2022: How moderate geomagnetic storms can adversely affect assets in low-earth orbit," *Space Weather* vol. 22 (2024); also T. E. Berger et al., "The thermosphere is a drag: The 2022 Starlink incident and the threat of geomagnetic storms to low earth orbit space operations," *Space Weather* vol. 21(2023), 15 pages.
19. N.P. Meredith et al., "Strong relativistic electron flux events in GPS orbit," *Space Weather* vol. 22, December 2024, 19 pages.
20. Reference 19.
21. David Piesse, "Solar Storms and Cyber Security," International Insurance Society, 6 June 2024.
22. Quoted by Ellie McCann for the British publication *The Engineer*, 8 January 2024.
23. See, for example, the Office of Science and Technology Policy, *Implementation Plan of the National Space Weather Strategy and Action Plan*, National Science and Technology Council, December 2023; also Department for Business, Energy & Industrial Strategy, *UK Severe Space Weather Preparedness Strategy*, September 2021.

ALUMNI NOTES

Your fellow Tau Bates are interested in news about **you**.



ARIZONA ALPHA '83

Kathryn A. McCarthy Ph.D.

Kathryn was awarded the 2024 E. Gail de Planque Medal by the American Nuclear Society, recognizing exemplary accomplishments by a woman in the fields of nuclear science and engineering. She is director of the U.S. ITER Project Office, managed by ORNL, and oversees all aspects of the intl. ITER fusion project.



ARIZONA BETA '11

Katrin "Kat" Guillen Ph.D.

Kat recently began a new position as Vice President, Head of Strategy & Operations at Cellarity, where she has worked since 2021. Kat also serves on the University of Oklahoma College of Engineering Board of Advisors and has B.S. degrees in kinesiology and MechE with a Ph.D. in biomedical engineering.



CALIFORNIA IOTA '14

Marco A. Solis

Marco was recently promoted at E2 Consulting Engineers, Inc. to Vice President, Project Delivery. In his decade of experience in the natural gas and energy industry, he has managed successful programs and complex initiatives. Marco's mechanical eng'g bachelor's degree is from Cal State LA.



INDIANA DELTA '03

Dayna R. Johnson P.E.

Dayna has achieved Fellow Grade in SWE "for broad and transformational leadership and dedication to helping women engineers realize their full potential." Director of technical consultants, sustainable growth solutions for Ecolab, she's a past IN Delta Chapter vice president with a civil eng'g B.S.



IOWA ALPHA '86

Mark L. Milliman

Mark is now CEO of Emerson Grow USA focusing on indoor agriculture. He is also involved in community outreach and recently ran for the Colorado State House of Representatives. Mark is active as a leader in the IEEE Denver Section, helping to bring ICC 2024 to Denver, and with the TBII Front Range Alumni Chapter.



KANSAS GAMMA '07

Daniel A. Gramer P.E.

Daniel, a 16-year veteran of design practice with involvement in multiple LEED buildings, is now mechanical dept. manager in the Aviation & Federal Division at Burns & McDonnell. He has experience incorporating sustainable electrical, lighting, and plumbing design and achieving Platinum LEED levels.



MASSACHUSETTS ZETA '17

Ashley L. Kaiser Ph.D.

Ashley started a new position in Dec. 2024 as Scientist II - materials characterization & testing at Lila Sciences (an AI company). She is a process development leader with chemical & materials expertise in model-driven experimental design and validation, NDSEG Graduate Fellow, and is passionate about STEM outreach.



PENNSYLVANIA ZETA '95

Robert J. Dinan P.E., CCM

Robert was promoted to Director of Construction Management and Commissioning at GREYHAWK, a construction & consulting firm (NJ). He has 30 years of professional experience, is leading the company's involvement on \$300+ million of new projects, and is a decorated U.S. Army Reserve Colonel.



NORTH CAROLINA ALPHA '88

Basil Hassan Ph.D.

Basil was recognized with the AIAA Distinguished Service Award "for more than three decades of exemplary service at the national, technical, and regional levels, as well as with publications, honors and awards, and the AIAA Foundation." He is Director, Engineering Sciences Center, at Sandia National Laboratories.



SOUTH CAROLINA GAMMA '12

Lt. Matthew R. Fann P.E.

Matthew, Facilities Engineering Dept. head at Base Charleston (SC), received the 2024 Coast Guard Engineer of the Year Award for identifying a life-threatening shock hazard to all personnel working on shore. He is now eligible for the National Society of Professional Engineers Federal Engineer of the Year Award.

Send news about promotions, honors, civic activities, weddings, etc. to Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697 or to tbp.media@tbp.org. Deadlines: May 1 for **Summer** issue and August 1 for the **Fall** issue. Include a recent head shot, name, address, chapter/class year, and email address or phone number. We cannot accept graduation announcements. Thank you!

FLORIDA ALPHA

Pamela L. Dickrell, Ph.D. (mechanical eng'g)

Robert Ferl, Ph.D. (biology)

Juan Gilbert, Ph.D. (computer science)

Jian Li, Ph.D. (electrical eng'g)

At the Florida Alpha Chapter's Fall 2024 initiation ceremony, four eminent engineers joined Tau Beta Pi alongside 65 new student members.

Dr. Dickrell ('05) is the associate dean for Student Affairs at the University of Florida (UF) College of Engineering and a professor with the dept. of eng'g education. Her research focuses on effective teaching methods and hands-on learning opportunities.

Dr. Ferl ('80) is a Distinguished Professor and director of UF's Astraeus Space Institute. He is best known as the first NASA-funded university researcher to conduct his experiments in space.

Dr. Gilbert ('00) is an Endowed Professor and chair of UF's Department of Computer & Information Science and Engineering. He leads the Computing for Social Good Lab, which focuses on projects at the intersection of people, technology, and society, and received a 2024 National Medal of Technology and Innovation for developing a secure and accessible voting system that accommodates voters with disabilities.

Dr. Li ('91) is a professor with the department of electrical and computer engineering and director of the UF Spectral Analysis Lab. She is an IEEE fellow and holds an honorary membership in the European Academy of Sciences.



TBP Eminent Engineers (left to right): Jian Li, Robert Ferl, and Pamela Dickrell at the Florida Alpha ceremony.

MISSOURI BETA

Janet L. Kavandi, Ph.D. (chemistry)

In November 2024 at the Missouri University of Science and Technology, Dr. Kavandi became a Tau Beta Pi (eminent engineer) during the fall 2024 initiation hosted by the Missouri Beta Chapter.

Dr. Kavandi ('80) earned an M.S. degree in Chemistry from Missouri S&T in 1982 and a doctorate from the University of Washington.

She was a NASA shuttle astronaut on three shuttle flights: STS-91, STS-99, STS-104, and served as Director of the NASA Glenn Research Center (OH) from 2016-19.

As NASA's Glenn Director, Dr. Kavandi led the introduction of NASA's Artemis program and installed a new set of professional standards, called "Glenn's 7 Expected Behaviors," based on the HEROICS acronym.

Dr. Kavandi has been recognized with a Presidential Rank Award, NASA's Distinguished Service Medal, two NASA Outstanding Leadership Medals, two Exceptional Service Medals, and was inducted into the U.S. Astronaut Hall of Fame at Kennedy Space Center in 2019.



STS-104 Mission Specialist Janet Kavandi adjusts her helmet as she dons her launch and entry suit before heading to the launch pad, July 12, 2021. Credit: NASA.



Left to right: Missouri S&T COE Dean David Borrok, MO Beta Chapter President Louis Blessing, Eminent Engineer Janet Kavandi, and MO Beta Chapter Advisors Steve E. Watkins and David Bayless.

2025 DISTRICT CONFERENCE SCHEDULE

District 1: April 5-6
VT Alpha – Burlington

District 2: April 5-6
NY Tau – Binghamton

District 3: April 11-12
PA Gamma – TBD

District 4: April 4-5
NC Alpha – Raleigh

District 5: March 1-2
FL Alpha – Gainesville

District 6: February 7-8
TN Gamma – Cookeville

District 7: April 4-5
MI Kappa – Kalamazoo

District 8: April 12-13
IL Beta – Chicago

District 9: March 8
MO Beta – Rolla

District 10: April 12
LA Alpha – Baton Rouge

District 11: April 12
MN Alpha – Minneapolis

District 12: March 8-9
ID Gamma – Boise

District 13: April 5
NM Beta – Albuquerque

District 14: February 22-23
OR Gamma – Portland

District 15: March 8
CA Lambda – Davis

District 16: February 22-23
CA Nu – Pomona

**Note: Conference dates are subject to change.
For the latest information, check our website at:**

www.tbp.org/districts.cfm#conf-schedule

Class of 2025 NAE Members

Continued from page 5.

Jim D. Wiethorn, Ph.D., TX A '73
Founder and chairman, International Crane & Construction Safety Solutions LLC. For research on and analysis of crane accidents, saving lives through improved technology and training.

Julie B. Zimmerman, Ph.D., VA A '97
Vice provost for planetary solutions and professor, Yale Univ. For leadership in education and the development of green technologies that enhance the sustainability of engineered systems.

The 33rd Tau Bate was elected as an international member of the National Academy of Engineering. Dr. Benediktsson earned his master's degree in electrical engineering from Purdue University.

Jon A. Benediktsson, Ph.D., IN A '86
Rector/president and professor, faculty of electrical & computer eng'g, University of Iceland, Reykjavik. For contributions to design and application of advanced machine learning and morphological methods in information analysis of multisource sensing data.

Member Change of Address

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6 Inactive chapters shown in **BLUE**

A = ALPHA Δ = DELTA H = ETA K = KAPPA N = NU Π = PI T = TAU X = CHI
 B = BETA E = EPSILON Θ = THETA Λ = LAMBDA Ξ = XI P = RHO Y = UPSILON Ψ = PSI
 Γ = GAMMA Z = ZETA I = IOTA M = MU O = OMICRON Σ = SIGMA Φ = PHI Ω = OMEGA

AL ALPHA Auburn University
BETA University of Alabama
GAMMA Univ. of Ala. at Birmingham
DELTA Univ. of Ala. in Huntsville
EPSILON Univ. of South Alabama
AK ALPHA Univ. of Alaska Fairbanks
AZ ALPHA University of Arizona
BETA Arizona State University
GAMMA Northern Arizona University
DELTA Embry-Riddle Univ., Prescott
AR ALPHA University of Arkansas
BETA Univ. of Ark. at Little Rock
CA ALPHA UC Berkeley
BETA Calif. Institute of Technology
GAMMA Stanford University
DELTA University of Southern Calif.
EPSILON UC Los Angeles
ZETA Santa Clara University
ETA San Jose State University
THETA Calif. State Univ., Long Beach
IOTA Calif. State Univ., Los Angeles
KAPPA Calif. State Univ., Northridge
LAMBDA UC Davis
MU Calif. Poly St. Univ., San Luis Obispo
NU Calif. State Poly Univ., Pomona
XI San Diego State University
OMICRON Loyola Marymount Univ.
PI Northrop University (inactive)
RHO California State Univ., Fresno
SIGMA UC Santa Barbara
TAU University of California, Irvine
UPSILON Calif. St. Univ., Sacramento
PHI University of the Pacific
CHI California State Univ., Fullerton
PSI UC San Diego
OMEGA Harvey Mudd College
ALPHA ALPHA Calif. St. Univ., Chico
ALPHA BETA UC Riverside
ALPHA GAMMA San Francisco St. Univ.
ALPHA DELTA UC Santa Cruz
ALPHA EPSILON Univ. of San Diego
CO ALPHA Colorado School of Mines
BETA Univ. of Colorado Boulder
GAMMA University of Denver
DELTA Colorado State University
EPSILON Univ. of Colorado at Denver
ZETA U.S. Air Force Academy
CT ALPHA Yale University
BETA University of Connecticut
GAMMA University of Hartford
DE ALPHA University of Delaware
DC ALPHA Howard University
BETA Catholic Univ. of America
GAMMA George Washington Univ.
FL ALPHA University of Florida
BETA University of Miami
GAMMA University of South Florida
DELTA University of Central Florida
EPSILON Florida Atlantic University
ZETA Florida Institute of Technology
ETA FL A&M Univ.-FL State Univ.
THETA Florida International Univ.
IOTA Embry-Riddle Aero. Univ.
GA ALPHA Georgia Institute of Technology
BETA Mercer University
GAMMA Georgia Southern Univ.
DELTA University of Georgia
ID ALPHA University of Idaho
BETA Idaho State University
GAMMA Boise State University
DELTA Brigham Young Univ.-Idaho
IL ALPHA Univ. of IL at Urbana-Champaign
BETA Illinois Institute of Technology
GAMMA Northwestern University
DELTA Bradley University
EPSILON S. Illinois Univ. at Carbondale
ZETA University of Illinois at Chicago
IN ALPHA Purdue University
BETA Rose-Hulman Inst. of Technology
GAMMA University of Notre Dame
DELTA Valparaiso University
EPSILON Trine University
ZETA Indiana Univ.-Purdue Univ. Indpls.
IA ALPHA Iowa State University
BETA University of Iowa
KS ALPHA University of Kansas
BETA Wichita State University
GAMMA Kansas State University

KY ALPHA University of Kentucky
BETA University of Louisville
GAMMA Western Kentucky University
LA ALPHA Louisiana State University
BETA Tulane University
GAMMA Louisiana Tech. University
DELTA Univ. of Louisiana at Lafayette
EPSILON University of New Orleans
ME ALPHA University of Maine
MD ALPHA Johns Hopkins Univ.
BETA University of Maryland
GAMMA U.S. Naval Academy
DELTA Univ. of Maryland Baltimore Co.
EPSILON Morgan State University
MA ALPHA Worcester Polytechnic Inst.
BETA Massachusetts Inst. of Tech.
GAMMA Harvard University (inactive)
DELTA Tufts University
EPSILON Northeastern University
ZETA University of Mass. at Amherst
ETA Boston University
THETA Univ. of Massachusetts Lowell
IOTA Western New England Univ.
KAPPA Merrimack College
MI ALPHA Michigan State University
BETA Michigan Technological Univ.
GAMMA University of Michigan
DELTA University of Detroit Mercy
EPSILON Wayne State University
ZETA Kettering University
ETA Lawrence Technological Univ.
THETA Oakland University
IOTA Univ. of Michigan-Dearborn
KAPPA Western Michigan Univ.
LAMBDA Grand Valley State Univ.
MN ALPHA Univ. of Minnesota-Twin Cities
BETA Univ. of Minnesota, Duluth
MS ALPHA Mississippi State University
BETA University of Mississippi
MO ALPHA Univ. of Missouri-Columbia
BETA Missouri Univ. of Science & Tech.
GAMMA Washington University
DELTA Univ. of Missouri-Kansas City
EPSILON Saint Louis University
MT ALPHA Montana State University
BETA Montana Tech. of the Univ. of MT
NE ALPHA Univ. of Nebraska-Lincoln
NV ALPHA University of Nevada, Reno
BETA Univ. of Nevada, Las Vegas
NH ALPHA Univ. of New Hampshire
BETA Dartmouth College
NJ ALPHA Stevens Institute of Technology
BETA Rutgers University
GAMMA New Jersey Inst. of Tech.
DELTA Princeton University
EPSILON Rowan University
ZETA The College of New Jersey
NM ALPHA New Mexico State University
BETA University of New Mexico
GAMMA NM Inst. of Mining & Tech.
NY ALPHA Columbia University
BETA Syracuse University
GAMMA Rensselaer Polytechnic Inst.
DELTA Cornell University
EPSILON New York Univ. (inactive)
ZETA Brooklyn Polytechnic (inactive)
ETA City College of CUNY
THETA Clarkson University
IOTA Cooper Union School of Eng'g.
KAPPA University of Rochester
LAMBDA Pratt Institute (inactive)
MU Union College
NU SUNY at Buffalo
XI Manhattan College
OMICRON SUNY at Stony Brook
PI Rochester Institute of Tech.
RHO NYU Tandon School of Eng'g.
SIGMA Alfred University
TAU Binghamton University
UPSILON U.S. Military Academy
NC ALPHA North Carolina State Univ.
BETA Univ. of North Carolina (inactive)
GAMMA Duke University
DELTA Univ. of NC at Charlotte
EPSILON NC A&T State University
ZETA East Carolina University
ETA Western Carolina University

ND ALPHA North Dakota State University
BETA University of North Dakota
OH ALPHA Case Western Reserve Univ.
BETA University of Cincinnati
GAMMA Ohio State University
DELTA Ohio University
EPSILON Cleveland State Univ.
ZETA University of Toledo
ETA Air Force Institute of Tech.
THETA University of Dayton
IOTA Ohio Northern University
KAPPA University of Akron
LAMBDA Youngstown State Univ.
MU Wright State University
NU Cedarville University
XI Miami University
OK ALPHA University of Oklahoma
BETA University of Tulsa
GAMMA Oklahoma State University
OR ALPHA Oregon State University
BETA Portland State University
GAMMA University of Portland
DELTA Oregon Institute of Tech.
PA ALPHA Lehigh University
BETA Pennsylvania State University
GAMMA Carnegie Mellon University
DELTA University of Pennsylvania
EPSILON Lafayette College
ZETA Drexel University
ETA Bucknell University
THETA Villanova University
IOTA Widener University
KAPPA Swarthmore College
LAMBDA University of Pittsburgh
MU Penn State Erie, Behrend College
PR ALPHA University of Puerto Rico
QATAR ALPHA Texas A&M Univ. at Qatar
RI ALPHA Brown University
BETA University of Rhode Island
SC ALPHA Clemson University
BETA University of South Carolina
GAMMA The Citadel
SD ALPHA S. Dakota Sch. of Mines & Tech.
BETA South Dakota State University
TN ALPHA University of Tennessee
BETA Vanderbilt University
GAMMA Tennessee Tech. University
DELTA Christian Brothers Univ.
EPSILON University of Memphis
ZETA Univ. of Tenn. at Chattanooga
ETA Lipscomb University
TX ALPHA University of Texas at Austin
BETA Texas Tech. University
GAMMA Rice University
DELTA Texas A&M University
EPSILON University of Houston
ZETA Lamar University
ETA Univ. of Texas at Arlington
THETA Univ. of Texas at El Paso
IOTA Southern Methodist University
KAPPA Prairie View A&M University
LAMBDA Texas A&M Univ.-Kingsville
MU Univ. of Texas at San Antonio
NU Univ. of Texas Rio Grande Valley
XI University of Texas at Dallas
UAE ALPHA American Univ. of Sharjah
UT ALPHA University of Utah
BETA Brigham Young University
GAMMA Utah State University
VT ALPHA University of Vermont
BETA Norwich University
VA ALPHA University of Virginia
BETA Virginia Poly. Inst. & State Univ.
GAMMA Old Dominion University
DELTA Virginia Military Institute
EPSILON Virginia Commonwealth Univ.
WA ALPHA University of Washington
BETA Washington State University
GAMMA Seattle University
DELTA Gonzaga University
WV ALPHA West Virginia University
BETA West Virginia Univ. Inst. of Tech.
WI ALPHA Univ. of Wisconsin-Madison
BETA Marquette University
GAMMA Univ. of Wisconsin-Milwaukee
DELTA Milwaukee School of Eng'g.
EPSILON Univ. of Wisconsin-Platteville
WY ALPHA University of Wyoming

ALUMNI CHAPTERS

82 ALUMNI CHAPTERS
52 ACTIVE

30 Inactive chapters shown in **BLUE**

DISTRICT 1
Central CT, Hartford
Greater Boston Area, MA

DISTRICT 2
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Central Jersey, NJ
Long Island
Suburban, NY

Newark, NJ
New York City, NY
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Puerto Rico
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DISTRICT 6
Bluegrass, Lexington-Frankfort, KY
UT ALPHA University of Utah
BETA Brigham Young University
GAMMA Utah State University
VT ALPHA University of Vermont
BETA Norwich University
VA ALPHA University of Virginia
BETA Virginia Poly. Inst. & State Univ.
GAMMA Old Dominion University
DELTA Virginia Military Institute
EPSILON Virginia Commonwealth Univ.
WA ALPHA University of Washington
BETA Washington State University
GAMMA Seattle University
DELTA Gonzaga University
WV ALPHA West Virginia University
BETA West Virginia Univ. Inst. of Tech.
WI ALPHA Univ. of Wisconsin-Madison
BETA Marquette University
GAMMA Univ. of Wisconsin-Milwaukee
DELTA Milwaukee School of Eng'g.
EPSILON Univ. of Wisconsin-Platteville
WY ALPHA University of Wyoming

DISTRICT 7
Ann Arbor Area, MI
Central MI, Lansing
Cincinnati, OH

DISTRICT 7
Columbus, OH
Dayton, OH
Flint, MI
Ohio's North Coast, Cleveland
SE Michigan, Detroit
West Michigan, Grand Rapids

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

DISTRICT 9
Kansas City, KS
Pioneer, OK
Rolla, MO
Scissortail, OKC-Norman, OK
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 Vly, CA
SF Bay Area, CA
SF Peninsula, Palo Alto, CA

DISTRICT 16
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