THE BENT

OF TAU BETA PI The Engineering Honor Society SPRING 2011

Microprocessors Face Future
Getting Your Ideas Adopted
Contributors to Tau Beta Pi

CHAPTERS

ALUMNUS CHAPTERS

• *denotes active chapter*

District 1
Central Connecticut, Hartford

District 2
Buffalo, NY
Long Island Suburban, NY
Newark, NJ
New York, NY
• *Rochester, NY*
Schenectady, NY
• *Southern Tier, Binghamton, NY*

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

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

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

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Bluegrass, Lexington-Frankfort, KY
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• *Great Smoky Mountains, Knoxville-Oak Ridge, TN*
• *Louisville, KY*
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Mid-South, Memphis, TN

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Cincinnati, OH
Dayton, OH
• *Southeastern Michigan, Detroit*
Flint, MI
• *Grand Rapids, MI*
• *Ohio's North Coast, Cleveland*
Columbus, OH

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

District 9
Rolla, MO
St. Louis, MO

District 10
Houston, TX

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

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

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

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

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

District 16
Southern California, Los Angeles

COLLEGIATE CHAPTERS (244)

Chap.	*Dist.*	*Institution*
AL A	6	Auburn Univ.
AL B	6	Univ. of Alabama
AL Γ	6	Univ. of Ala. at Birmingham
AL Δ	6	Univ. of Ala. in Huntsville
AL E	6	Univ. of South Alabama
AK A	14	Univ. of Alaska Fairbanks
AZ A	13	Univ. of Arizona
AZ B	13	Arizona State Univ.
AZ Γ	13	Northern Arizona Univ.
AR A	9	Univ. of Arkansas, Fayetteville
CA A	15	Univ. of California, Berkeley
CA B	16	California Inst. of Technology
CA Γ	15	Stanford Univ.
CA Δ	16	Univ. of Southern California
CA E	16	Univ. of California, Los Angeles
CA Z	15	Santa Clara Univ.
CA H	15	San Jose State Univ.
CA Θ	16	California State Univ., Long Beach
CA I	16	California State Univ., Los Angeles
CA K	16	California State Univ., Northridge
CA Λ	15	Univ. of California, Davis
CA M	15	Calif. Poly. St. Univ., San Luis Obispo
CA N	16	California State Poly. Univ., Pomona
CA Ξ	16	San Diego State Univ.
CA O	16	Loyola Marymount Univ.
CA Π	16	Northrop Univ. (inactive)
CA P	15	California State Univ., Fresno
CA Σ	16	Univ. of California, Santa Barbara
CA T	16	Univ. of California, Irvine
CA Y	15	California State Univ., Sacramento
CA Φ	15	Univ. of the Pacific
CA X	16	California State Univ., Fullerton
CA Ψ	16	Univ. of California, San Diego
CA Ω	16	Harvey Mudd College
CA AA	15	California State Univ., Chico
CA AB	16	Univ. of California, Riverside
CA AΓ	15	San Francisco State Univ.
CA AΔ	15	Univ. of California, Santa Cruz
CO A	12	Colorado School of Mines
CO B	12	Univ. of Colorado at Boulder
CO Γ	12	Univ. of Denver (inactive)
CO Δ	12	Colorado State Univ.
CO E	12	Univ. of Colorado at Denver
CO Z	12	United States Air Force Academy
CT A	1	Yale Univ.
CT B	1	Univ. of Connecticut
CT Γ	1	Univ. of Hartford
DE A	3	Univ. of Delaware
DC A	4	Howard Univ.
DC B	4	Catholic Univ. of America
DC Γ	4	George Washington Univ.
FL A	5	Univ. of Florida
FL B	5	Univ. of Miami
FL Γ	5	Univ. of South Florida
FL Δ	5	Univ. of Central Florida
FL E	5	Florida Atlantic Univ.
FL Z	5	Florida Inst. of Technology
FL H	5	Florida A&M Univ.-Florida State Univ.
FL Θ	5	Florida International Univ.
FL I	5	Embry-Riddle Aeronautical Univ.
GA A	5	Georgia Inst. of Technology
GA B	5	Mercer Univ.
ID A	14	Univ. of Idaho
ID B	12	Idaho State Univ.
ID Γ	12	Boise State Univ.
IL A	8	Univ. of Illinois at Urbana-Champaign
IL B	8	Illinois Inst. of Technology
IL Γ	8	Northwestern Univ.
IL Δ	8	Bradley Univ.
IL E	8	Southern Illinois Univ. at Carbondale
IL Z	8	Univ. of Illinois at Chicago
IN A	8	Purdue Univ.
IN B	8	Rose-Hulman Inst. of Technology
IN Γ	8	Univ. of Notre Dame
IN Δ	8	Valparaiso Univ.
IN E	8	Trine Univ. (formerly Tri-State Univ.)
IA A	11	lowa State Univ.
IA B	11	Univ. of lowa
KS A	9	Univ. of Kansas
KS B	9	Wichita State Univ.
KS Γ	9	Kansas State Univ.
KY A	6	Univ. of Kentucky
KY B	6	Univ. of Louisville
KY Γ	6	Western Kentucky Univ.
LA A	10	Louisiana State Univ.
LA B	10	Tulane Univ. of Louisiana
LA Γ	10	Louisiana Tech Univ.
LA Δ	10	Univ. of Louisiana at Lafayette
LA E	10	Univ. of New Orleans
ME A	1	Univ. of Maine
MD A	4	Johns Hopkins Univ.
MD B	4	Univ. of Maryland
MD Γ	4	United States Naval Academy
MD Δ	4	Univ. of Maryland Baltimore County
MD E	4	Morgan State Univ.
MA A	1	Worcester Polytechnic Inst.
MA B	1	Massachusetts Inst. of Technology
MA Γ	1	Harvard Univ. (inactive)
MA Δ	1	Tufts Univ
MA E	1	Northeastern Univ.
MA Z	1	Univ. of Massachusetts at Amherst
MA H	1	Boston Univ.
MA Θ	1	Univ. of Massachusetts Lowell
MA I	1	Western New England College
Ml A	7	Michigan State Univ.
Ml B	11	Michigan Tech. Univ.
Ml Γ	7	Univ. of Michigan
Ml Δ	7	Univ. of Detroit Mercy
Ml E	7	Wayne State Univ.
Ml Z	7	Kettering Univ.
Ml H	7	Lawrence Technological Univ.
Ml Θ	7	Oakland Univ.
Ml I	7	Univ. of Michigan-Dearborn
Ml K	7	Western Michigan Univ.
Ml Λ	7	Grand Valley State Univ.
MN A	11	Univ. of Minnesota-Twin Cities
MN B	11	Univ. of Minnesota, Duluth
MS A	6	Mississippi State Univ.
MS B	6	Univ. of Mississippi
MO A	9	Univ. of Missouri-Columbia
MO B	9	Missouri Univ. of Science & Technology
MO Γ	9	Washington Univ.
MO Δ	9	Univ. of Missouri-Kansas City
MT A	12	Montana State Univ.
MT B	12	Montana Tech of the Univ. of Montana
NE A	9	Univ. of Nebraska-Lincoln
NV A	15	Univ. of Nevada, Reno
NV B	16	Univ. of Nevada, Las Vegas
NH A	1	Univ. of New Hampshire
NH B	1	Dartmouth College
NJ A	2	Stevens Inst. of Technology
NJ B	2	Rutgers Univ.
NJ Γ	2	New Jersey Inst. of Technology
NJ Δ	2	Princeton Univ.
NJ E	2	Rowan Univ.
NM A	13	New Mexico State Univ.
NM B	13	Univ. of New Mexico
NM Γ	13	New Mexico Inst. of Mining & Tech.
NY A	2	Columbia Univ.
NY B	2	Syracuse Univ.
NY Γ	2	Rensselaer Polytechnic Inst.
NY Δ	2	Cornell Univ.
NY E	2	New York Univ. (inactive)
NY Z	2	Polytechnic Inst. of Brooklyn (inactive)
NY H	2	City College of CUNY
NY Θ	2	Clarkson Univ.
NY I	2	Cooper Union School of Engineering
NY K	2	Univ. of Rochester
NY Λ	2	Pratt Inst. (inactive)
NY M	2	Union College
NY N	2	SUNY at Buffalo
NY Ξ	2	Manhattan College
NY O	2	SUNY at Stony Brook
NY Π	2	Rochester Inst. of Technology
NY P	2	Polytechnic Institute of New York Univ.
NY Σ	2	Alfred Univ.
NY T	2	Binghamton University
NY Y	2	United States Military Academy
NC A	4	North Carolina State Univ. at Raleigh
NC B	4	Univ. of N.C. at Chapel Hill (inactive)
NC Γ	4	Duke Univ.
NC Δ	4	Univ. of North Carolina at Charlotte
NC E	4	North Carolina A&T State Univ.
ND A	11	North Dakota State Univ.
ND B	11	Univ. of North Dakota
OH A	7	Case Western Reserve Univ.
OH B	7	Univ. of Cincinnati
OH Γ	7	Ohio State Univ.
OH Δ	7	Ohio Univ.
OH E	7	Cleveland State Univ.
OH Z	7	Univ. of Toledo
OH H	7	Air Force Inst. of Technology
OH Θ	7	Univ. of Dayton
OH I	7	Ohio Northern Univ.
OH K	7	Univ. of Akron
OH Λ	7	Youngstown State Univ.
OH M	7	Wright State Univ.
OH N	7	Cedarville Univ.
OH Ξ	7	Miami Univ.
OK A	9	Univ. of Oklahoma
OK B	9	Univ. of Tulsa
OK Γ	9	Oklahoma State Univ.
OR A	14	Oregon State Univ.
OR B	14	Portland State Univ.
OR Γ	14	Univ. of Portland
PA A	3	Lehigh Univ.
PA B	3	Pennsylvania State Univ.
PA Γ	3	Carnegie Mellon Univ.
PA Δ	3	Univ. of Pennsylvania
PA E	3	Lafayette College
PA Z	3	Drexel Univ.
PA H	3	Bucknell Univ.
PA Θ	3	Villanova Univ.
PA I	3	Widener Univ.
PA K	3	Swarthmore College
PA Λ	3	Univ. of Pittsburgh
PR A	5	Univ. of Puerto Rico
Rl A	1	Brown Univ.
Rl B	1	Univ. of Rhode Island
SC A	5	Clemson Univ.
SC B	5	Univ. of South Carolina
SC Γ	5	The Citadel
SD A	12	South Dakota School of Mines & Tech.
SD B	11	South Dakota State Univ.
TN A	6	Univ. of Tennessee
TN B	6	Vanderbilt Univ.
TN Γ	6	Tennessee Tech. Univ.
TN Δ	6	Christian Brothers Univ.
TN E	6	Univ. of Memphis
TN Z	6	Univ. of Tennessee at Chattanooga
TX A	10	Univ. of Texas at Austin
TX B	13	Texas Tech Univ.
TX Γ	10	Rice Univ.
TX Δ	10	Texas A & M Univ.
TX E	10	Univ. of Houston
TX Z	10	Lamar Univ.
TX H	10	Univ. of Texas at Arlington
TX Θ	13	Univ. of Texas at El Paso
TX I	10	Southern Methodist Univ.
TX K	10	Prairie View A & M Univ.
TX Λ	10	Texas A & M Univ.-Kingsville
TX M	10	Univ. of Texas at San Antonio
UT A	12	Univ. of Utah
UT B	12	Brigham Young Univ.
UT Γ	12	Utah State Univ.
VT A	1	Univ. of Vermont
VT B	1	Norwich Univ.
VA A	4	Univ. of Virginia
VA B	4	Virginia Polytechnic Inst. & State Univ.
VA Γ	4	Old Dominion Univ.
VA Δ	4	Virginia Military Inst.
VA E	4	Virginia Commonwealth Univ.
WA A	14	Univ. of Washington
WA B	14	Washington State Univ.
WA Γ	14	Seattle Univ.
WA Δ	14	Gonzaga Univ.
WV A	4	West Virginia Univ.
WV B	4	West Virginia Univ. Inst. of Technology
Wl A	8	Univ. of Wisconsin-Madison
Wl B	8	Marquette Univ.
Wl Γ	8	Univ. of Wisconsin-Milwaukee
Wl Δ	8	Milwaukee School of Engineering
Wl E	8	Univ. of Wisconsin-Platteville
WY A	12	Univ. of Wyoming

the Bent of Tau Beta Pi
The Engineering Honor Society
SPRING 2011
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founded at Lehigh University, South Bethlehem, Pennsylvania, June 15, 1885, by Edward H. Williams Jr., A.B., A.C., E.M., Sc.D., LL.D. (1849-1933). Key and name registered in U.S. Patent Office. Member, American Society for Engineering Education and (co-founder) Association of College Honor Societies. Affiliate, American Association for the Advancement of Science.

Features

ON THE COVER:

Alan Brown examines the history of microprocessors, and he reports how multicore processors are starting to use billions of transistors to compute in the future.

Cover artist: Dali Polivka

Reports

Departments

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

Growing Leaders

"I have been really working hard this semester to get our name out, but it is a challenge because it seems that every member in Tau Beta Pi is actively involved in at least two other organizations."

I met Andrew Wohlrabe, a super-motivated student at the 2010 Convention. As the Georgia Beta President, Andrew gave a very honest and frustrated reply to my inquiry about whether his chapter reaches out to freshmen and sophomores. One could tell he felt it was a herculean task to sway people to wade towards any TBΠ project in a sea of competition.

Don't blame the student officers or advisors at Georgia Beta. It happens on every campus because so many students get the flood of invitations to join "the" club on campus. The logical left brain gets log jammed when there are too many choices. Think of the menu at the Cheesecake Factory. The left brain slips into analysis paralysis with many seemingly equal things present. How do we get TBΠ to be the meaty entrée that's the top choice?

Our Association has faced competition since its 1885 inception. TBΠ was not the first to touch land. Add the fact that we draw only from the top tier of juniors and seniors, most of whom are already involved in their departmental societies like ASCE, AIChE, IEEE, etc., before our invitation to be considered for membership ever arrives. Thus, the ominous question weighs like an anchor—how in this modern world with so-much-available can TBΠ ever dream to stand out?

There are two reasons to propound: TBΠ's cross-departmental membership and the French phrase, *noblesse oblige*.

We are the only honor society that umbrellas all the fields of engineering. We are a cross-section of all the highest knowledge in every engineering field. Being the top tier, we have the noble obligation to lead. But we need experience in leadership.

Fortunately, TBΠ established the Engineering Futures Program in 1988. TBΠ caught my attention in 1994 because it was the only society at the University of Florida that brought leadership training to me. I was not an officer, nor did I have to travel to a conference. I was being offered free leadership training with the EF seminars on campus because I had proven to others that I strove for excellence. TBΠ was the only organization saying "We see you as a leader. Now, it is our job to help you reach your full potential."

In response to Andrew's heavy realization of the difficulty of motivating members to rally for TBΠ, I wrote:

> "To keep TBΠ membership active, ask yourself if your chapter has given its members an identity? Do they know that they are to continue to better themselves, not just through books alone, as leaders too? Do they believe that they are to be role models for freshmen and sophomores? Do they feel any responsibility to ensure that the leadership in engineering continues, grows, and matures with time?

> Leadership is much more than being the boss. Leadership is an altruistic endeavor. Leadership is about strengthening your inner-self (not the ego) so you can give your ideas to the world. The capacity to be a great leader is innate in many; yet few are taught how to nurture this talent.
>
> A young virtuoso spends hours at the piano to hone her talent. Likewise, leadership needs time and effort to mature to its full potential."

It is an honor to have a student speak with me about the challenges and frustrations of leading a TBΠ chapter. I am always thankful for these earnest discussions. Andrew took my message, formulated his own words, and went forth on a mission to ignite his officers with the understanding of who they are.

One week later, Andrew responded: "The officers are very pumped. They shocked me, actually, when they just kept shooting ideas my way. Usually they are constantly watching the time, but when I explained the program to them, they zoned right in on it. It was great!" That was the seed of Mercer University's pilot leadership workshop for freshmen and sophomore dean's-list students that was held during Eweek 2011. This seed will sprout to become a mighty Georgia Beta Chapter for many years to come.

Always remember who <u>you</u> are as a Tau Bate.

—**Solange C. Dao,** P.E., *Florida Alpha '95, Vice President*

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TAU BETA PI
PLANNED GIVING

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

Topics include:

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

To request a copy, email:
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Tau Beta Pi
P.O. Box 2697
Knoxville, TN 37901-2697

MENTOR NOMINEES DUE APRIL 1

TBΠ MCDONALD MENTOR AWARD

Marion and Capers W. (*North Carolina Gamma '74*) McDonald and TBΠ established an award to celebrate excellence in mentoring and advising among TBΠ educators and engineers. The honor recognizes those who have consistently supported the personal and professional development of their students and colleagues through mentorship.

As engineering educators or as professionals in industry, government, or service organizations, these TBΠ mentors contribute to our engineering community in many ways, serving as effective advocates and guides in both professional and administrative matters. They show true concern for individuals, support an environment for developing talents, and have earned respect and recognition for their contributions to their field and to the greater community.

Recipients of the TBΠ-McDonald Mentor Award are presented a special medallion and a $2,000 cash award ($1,000 to honoree and $1,000 to a chapter). Any chapter or member may nominate any alumnus member(s). The following brief material in digital format must arrive at Headquarters by April 1:

1) A one-page summary of achievements and/or contributions exemplifying the objective of the award.

2) Two letters of reference from persons other than the nominating party or sponsoring chapter president who are familiar with the nominee's contributions and achievements, such as a dean or supervising personnel.

EDITORIAL

International Expansion Update

Not too many members are aware of the international linkages of this international Engineering Honor Society. Here is your update. Our members are citizens of perhaps 150 nations who have studied engineering in the 237 American colleges and universities that invited Tau Beta Pi on campus to establish a chapter. Each issue of THE BENT is mailed to members in 106 nations outside U.S. borders.

A handful of members have strongly recommended that we work quickly to establish the first chapter on international sands. Recent interest in forming collegiate chapters has come from the American University of Beirut, American University in Cairo, American University of Sharjah, Kuwait University, and Pakistan's NWFP University of Engineering and Technology in Peshawar. The first four have more than the required 40 graduates per year and have strong engineering curricula accredited by ABET's engineering accreditation commission. We have carefully explained the chapter formation process to them, but it is difficult to determine whether or not any actions have been taken. Tau Beta Pi requires that a local honor society be established on a petitioning campus and to operate just like a chapter for at least two years before it may formally petition.

Taking another approach in July 2010, Seoul National University inaugurated a new collegiate honor society modeled after Tau Beta Pi and similar groups.

Tau Beta Pi is internally prepared to establish our first international chapter. The Constitution & Bylaws were amended in preparation to do so by the 2000 Convention and ratified in 2001. Among other changes, the limiting modifier *national* was removed in all locations. English was defined as the official business language of the Association by the 2001 Convention, and the change was ratified in 2002. The Executive Council has prepared a travel policy for all international inspections, installations, and all subsequent travel for any other Society business.

The Texas Delta Chapter at Texas A&M University has already started the ball rolling, and Chapter President Julia K. Roessler is coordinating the process. The institution has a branch campus at Qatar along the Persian Gulf, where the four ABET/EAC-accredited engineering curricula are under the academic control of Dr. G. Kemble Bennett, P.E., *FL Γ '62*, vice chancellor and dean of the college of engineering at College Station. Dr. Mark H. Weichold, P.E., *TX Δ '78*, dean and CEO of the Qatar campus, is Chief Advisor of the branch collegiate group, assisted by Drs. Richard B. Griffin, *PA B '64*, and Bruce R. Palmer, *CO A '68*, Advisors. A branch campus may skip the lengthy petitioning process because its engineering students meet the technical requirements for membership and can be elected as members of the home chapter.

We await our chance to review the list of eligible candidates any day and expect to celebrate the first ever initiation across international borders within a few weeks. An announcement of such will be posted at *tbp.org*. Perhaps this will spur interest in other countries after all the Middle East revolutions settle down a little. Sustainable growth in a safe location is Tau Beta Pi's goal in the international arena.

J.D.F.

Send THE BENT to Me

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

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Address _____ Email _____

City _____ State _____ Zip _____

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Because more than 60% of seniors age 65 and over will need some type of long-term care, it's wise to know your options. A Long-Term Care Outreach and Education Program for members and their families is offered through LTC Financial Partners that includes access to favorable rates on long-term care insurance from leading carriers.

Learn more at — *ltctbp*.com.

IRA ROLLOVERS REINSTATED!

You senior Tau Bates can once again make tax-free donations to TBΠ for a limited time from your IRAs if you are **age 70½ or older**. A recent law allows tax-free charitable donations from an IRA under simple conditions! You must act before December 31, 2011.

This is good news for anyone contemplating making a major gift to TBΠ or another qualified charity. Under the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010, any donor age 70½ or older may contribute up to $100,000 annually from an IRA account and avoid federal-tax consequences. The charitable gift amount can count against the donor's required minimum distribution (RMD).

When the amount withdrawn from the IRA account is paid directly to the charity, it is not counted as federally taxable income. However, because the gift would be excluded from income, it may not be included as a charitable deduction on a federal tax return. These rules will apply to gifts made through December 31, 2011.

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- **Algorithm Development**
- **Cyber Security**
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Technology in Support of National Security

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National Medalists

Steven J. Sasson, *NY Γ '72*, has received the National Medal of Technology and Innovation from President Obama. The retired Eastman Kodak Company researcher was honored for his work on the invention of the digital camera. Also honored at the White House ceremony was **Dr. Marcian E. Hoff Jr.,** *NY Γ '58*, who received the medal jointly with two Intel colleagues for their development of the microprocessor.

National Academy Prizes

Dr. Frances H. Arnold, *NJ Δ '79*, was awarded the NAE's Charles Stark Draper prize, jointly with Dr. Willem P.C. Stemmer, "for directed evolution, a method used worldwide for engineering novel enzymes and biocatalytic processes for pharmaceutical and chemical products." Dr. Arnold is a professor at the California Institute of Technology. She is the only woman to be elected to all three membership organizations of the national academies—the NAE in 2000, the Institute of Medicine in 2004, and the NAS in 2008. **Dr. Edward F. Crawley,** *MA B '76*, received the Bernard M. Gordon prize, for leadership, creativity, and energy in defining and guiding the "conceive-design-implement-operate" initiative, which has been adopted globally for engineering education. He is a professor at MIT.

IEEE Officers

Dr. Moshe Kam, P.E., *PA Z '77*, is the 2011 president and CEO of the IEEE.Chief Advisor to Pennsylvania Zeta, Dr. Kam is head and professor of electrical and computer engineering at Drexel University. His professional interests are in wireless communications, robotics and navigation, detection and estimation, and engineering education. President-elect is **Dr. Gordon W. Day,** *IL A '66*, who spent most of his career in research and management at the National Institute of Standards and Technology, where he founded and led its optoelectronics division. His personal research covered optical measurements, optical fiber, and new concepts in instrumentation.

Two Tau Bates will be honored in Washington, DC, in April among winners of the 2011 Horatio Alger awards: **Michael R. Bloomberg,** *MD A '64*, New York City mayor and founder of Bloomberg, L.P.; and **Dr. Herbert A. Wertheim,** *FL B '62*, founder of opthalmics manufacturer Brainpower, Inc.

Dr. Robert M. Metcalfe, *Massachusetts Beta '68*, inventor of the networking standard Ethernet, is to lead innovation initiatives at the University of Texas at Austin school of engineering. Named professor of innovation, fellow of the chair of free enterprise, and professor of electrical and computer engineering, Dr. Metcalfe has been a partner of Polaris Venture Partners since 2001. During the 1980s, he founded, IPOed, and grew the billion-dollar networking company, 3Com Corp.

Mary M. Barra, *Michigan Zeta '85*, has been named by GM as senior vice president, global product development, to lead the design, engineering, program management, and quality of vehicles for the company's 11 brands worldwide. She was previously vice president, global manufacturing engineering. Barra began her GM career in 1980 as a General Motors Institute (Kettering University) co-op student.

Linda P. Hudson, *Florida Alpha '72*, is president and CEO of global defense, security, and aerospace company, BAE Systems, Inc., leading 50,000 people in 130 sites. Prior to joining the firm, she spent seven years as an officer of General Dynamics Corporation and was president of its armament and technical products division.

Timothy D. Cook, *Alabama Alpha '82*, is the chief operating officer of Apple Inc., the firm he joined in March 1998. His primary responsibility is managing day-to-day operations. He previously served as Apple CEO while Steve Jobs was recovering from health issues and he serves on the board of Nike.

Courtesy of Apple

John F. Brennan Jr., *Rhode Island Beta '81*, cofounded hedge fund Sirios Capital Management and currently serves as managing director. Sirios was formed in July 1999, and reported assets of $2.4 billion as of June 30, 2010. Previously, Brennan was a senior vice president of MFS Investment Management.

Lawrence E. Page, *Michigan Gamma '95*, has taken charge of day-to-day operations of Google as chief executive officer in a top-level reorganization at the search engine giant. The computer scientist-entrepreneur co-founded Google in 1998 and was CEO until 2001.

National Academy of Engineering

The National Academy of Engineering has elected 68 new members and nine foreign associates, announced NAE President Charles M. Vest in mid-February. This brings the curent U.S. membership total to 2,335 and the number of foreign associates to 205. Election to the academy is among the highest professional distinctions accorded an engineer. Membership honors those who have made outstanding contributions to "engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature" and to the "pioneering of new and developing fields of technology." New Tau Beta Pi/NAE members are listed below.

Dr. David D. Awschalom, *IL A '78*, professor, director of the California NanoSystems Institute and director of the center for spintronics and quantum computation, University of California, Santa Barbara. For contributions to the understanding of spin coherence and spintronics.

William F. Baker Jr., P.E., *MO A '75*, structural and civil engineering partner, Skidmore, Owings, & Merrill LLP, Chicago, IL. For leadership in the development of innovative structures for high-rise buildings worldwide.

Dr. James E. Barger, *MI Γ'57*, chief scientist, BBN Technologies, Cambridge, MA. For applications of acoustic technology and engineering solutions for the benefit of national security and society.

Dr. Lawrence D. Burns, *MI Z'74*, retired vice president of research and development and strategic planning, General Motors Corp., and professor of engineering practice, University of Michigan, Ann Arbor. For leadership and technical contributions to automotive technologies.

Dr. Stuart L. Cooper, *MA B'63*, university scholar professor and chair, department of chemical and biomolecular engineering, Ohio State University, Columbus. For contributions to polymer chemistry, biomedical polyurethanes, blood compatibility, and academic administration.

Dr. Daniel C. Edelstein, *NY Δ '82*, IBM fellow and manager, BEOL technology strategy, IBM T.J. Watson Research Center, Yorktown Heights, NY. For contributions to implementation of copper/low-dielectric chip interconnects.

Dr. Linda G. Griffith, *GA A '82*, professor of biological and mechanical engineering and director, biotechnology process engineering center, MIT, Cambridge, MA. For contributions to 3D functional biomaterials, engineered hepatic tissues, and cell transplant devices.

Daniel M. Hancock, *MI Z'73*, vice president, global strategic product alliances, General Motors Corp., Pontiac, MI. For contributions to automotive engines and transmissions, and leadership in advanced powertrain technology and engineering education.

Dr. James S. Harris Jr., *CA Γ'64*, professor of electrical engineering, materials science, and applied physics, Stanford University, Stanford, CA. For contributions to epitaxial growth of compound semiconductor materials and their applications.

Dr. Chris T. Hendrickson, *CA Γ'73*, professor of engineering and co-director, green design institute, Carnegie Mellon University, Pittsburgh, PA. For leadership and contributions in transportation and green design engineering.

Dr. Mark J. Kushner, *CA E'76*, professor and director, institute for plasma science and engineering, University of Michigan, Ann Arbor. For contributions to low-temperature plasmas for semiconductors, optics, and thin-film manufacturing.

Dr. Donald Liu, *MA B'64*, retired executive vice president and chief technology officer, American Bureau of Shipping, Houston, TX. For finite-element techniques for ship structural designs and contributions to the principles for safer ships.

Dr. Asad M. Madni, *CA E'69*, retired president and chief technical officer, BEI Technologies, Inc., and independent consultant, Los Angeles, CA. For contributions to development and commercialization of sensors and systems for aerospace and automotive safety.

Joanne M. Maguire, *MI A'75*, executive vice president, Lockheed Martin Space Systems Co., Littleton, CO. For individual and team leadership of successful space programs.

Dr. Ralph D. Masiello, *MA B'68*, senior vice president and innovation director, KEMA Inc., Chalfont, PA. For online analysis, operator-training simulation, and modern market development for secure operation of electric power grids.

Dr. Amedeo R. Odoni, *MA B'65*, professor of aeronautics and astronautics and professor of civil and environmental engineering, MIT. For contributions and global leadership in air traffic control and airport systems.

Wallace R. Wade, P.E., *NY Γ'63*, consultant and retired chief engineer and technical fellow, powertrain systems technology and processes, Ford Motor Co., Novi, MI. For implementation of low-emission technologies in the automotive industry.

Dr. Gregory J. Yurek, *PA B'69*, founder, chairman of the board, president, and chief executive officer, American Superconductor Corp., Devens, MA. For engineering and leadership in development of high-temperature superconductor commercial products.

Founders Award

Dr. Robert S. Langer Jr., *NY Δ'70*, received the 2010 NAE founders award for invention and development in drug delivery and tissue engineering, mentoring, and promotion of the nation's health. He is a professor at MIT.

Thanks Tau Beta Pi

• Here's my 2010 donation. Keep up the good work in promoting engineering scholarship.

Robert H. Roth, IN A '72

• It is a pleasure to be able to provide a small amount in aiding your efforts in the education of our young engineering students.

John F. Piccolo, UT A '58

• Thanks again for all you do. I love receiving THE BENT regularly!

Baldwin B. Chiu, P.E., CA Y '98

Metric Please

• A good model for incorporating metric measures into a publication is the magazine *IEEE Spectrum*, *spectrum.ieee.org*. Some measures are presented as both English and metric, others just metric, as appropriate. Please consider following the example of *Spectrum* for THE BENT.

Dale J. Gaumer, KS A '60

•My neighbor was proud to lend me the Winter 2011 issue of THE BENT. He suggested that I read pp.16-21 and 48-49. It was indeed a pleasure to read about Immanuel Kant and to tackle the challenging Brain Ticklers. On page 11 appeared Robert H. Bushnell's letter to the editor "Metric Please" asking that you "stop using inch-pound units."

If Dr. Delagrange were to use a metric ruler that contains mm markings, he would find that measuring small segments in millimeters is easier than measuring them in fractions of an inch (no need to calculate). He needs to read NIST Special Publication 811 and ASTM E 380-79, where he will find that there are not two, but about seven kinds of calories. Besides these seven kinds of calories there are other units of energy (some metric, some English)—too many. One of them will do—the Joule. Why did SI (the modern version of the metric system) pick the Joule and not one of the calories? Because the Joule is derived from the base units in a coherent way. A system is coherent if a quantity of unit size is derived from a combination of fundamental or previously derived units, each being of unit size. All the different calories will be phased out as SI is fully implemented. The cgs systems is now only of historic interest and mks is subsumed by SI. So there is only one system. The fact that two sets of metric wrenches are needed is a regrettable failure to write and implement appropriate standards for metric practice, not the fault of the metric system itself. Computer architects have found it useful at one time or another—for the representation of numbers inside the computer—to use binary, octal, hexadecimal, and now "base 64." While well suited for the core of the computer, none of these is a candidate to replace the decimal numerals for our measurements. Matter of fact, SI is heavily invested in decimal—all of its prefixes are powers of 10. When in 1971 the United Kingdom decimalized its pound sterling (reducing the number of pence in the pound from 240 to 100), Londoners often referred to the new pound as metric money.

If there is a good reason for the engineering community or THE BENT to hold back from using SI, the modernized version of the metric system, Dr. Delagrange has not stated it.

Anton Glaser, Prof. Emeritus of Mathematics, Lansdale, PA

Lyle's Laws

• Thank you for the many "Laws" columns you have provided for THE BENT. I enjoy them immensely and hope you will continue the effort.

James J. Tyson Jr., Captain, USN (Ret.), CA Γ '58

•I have accumulated a few laws similar to Lyle Feisel over my working life and I provide them in class from time to time. Mine are not nearly as organized as those that Lyle writes. However, I am writing to ask permission to copy Lyle's Law of Jobs in THE BENT, for use in my sophomore-level digital-design class in the engineering department here at Century. The majority of these students are electrical or mechanical engineering students getting ready to transfer to the University of Minnesota in the fall. There are about 15-25 students in this class every spring.

Paul A. Vlahutin, CA Z '65

• I really enjoy the Lyle's Laws column, which is the reason I make sure to pick up each issue of THE BENT. "Lyle's Law of Locality" is no exception—well written and thought provoking as always.

About the shiny keys reflected in his computer screen, Lyle writes, "... it would be much better if these keys had a matte finish and the screen were non-reflective," as if the designers had not thought through the practical requirement. Although Lyle's complaint in the column is accurate, engineers do tend to be insufficiently mindful of how their designs will ultimately be employed, Lyle may be exhibiting a related engineers' foible, which is to assume you know more about marketing than the professionals who wrote the specs to which you're designing. It may well be that the shiny keys and reflective screens are more attractive to buyers than the more thoughtfully designed counterparts. In other words, the problem here may be with the customers' manifest preferences, rather than with the engineers' design process.

Please keep Lyle's columns coming —great stuff!

Todd E. Rockoff, Ph.D., PA Δ '85

•I was first motivated to respond to Lyle's Law of Jobs in the Winter 2011 issue about the difference between one's job and one's assignment. When I was in the Hughes Aircraft guided missile engineering division in the early 1950s, I was joined by a classmate from the 1949 Caltech M.S.E.E. class. He had previously worked for the civil aeronautics branch of the federal government. Several months later, he told me that he had initially been disturbed about his job but that

he had finally "figured out the Hughes system." He said that he was bothered at first because no one in the missile electronics department where he had been assigned was telling him what to do. He said he finally realized that his "job" was to look around, see what needed to be done, and proceed to do it, and no one would stop him. He was happy and productive thereafter. I worked for the firm until 1985 and observed that this was most often the case and the source of the firm's success and general employee satisfaction.

Later in the same edition, I perused the Math Corner article about calculating the vertical CG of an automobile. At 84 my trigonometry is too far back in my mind to check all the calculations, but I find it hard to believe that an auto with axles 20" above the ground and longitudinal CG 40" behind the front wheel would have a vertical CG 70" above the ground. Is there something I don't understand involving a virtual or equivalent or effective vertical CG? I assume the vertical CG provides a measure of how easy it would be for the car to roll over. I enjoy reading THE BENT.

Albert H.J. Mueller, CA B '47

Engineering Aspects of War

• I was discouraged by John Mizzi's support for the "truther" conspiracy theory (Letters, Winter 2011) and by Arthur Delagrange's parroting of Steve Milloy's accusation that the change from asbestos insulation to mineral-wool insulation during construction of the World Trade Center (WTC) was the proximate cause of the collapse.

When I completed my nuclear engineering degree and went to work for an architect-engineering firm, I was a bit surprised to learn that structural steel had to be insulated to prevent or delay its failure in a fire. The reason is that steel will lose roughly 50% of its strength when its temperature is 600°C (1,112°F), easily reached in a fire. Near the mid-20th century, construction practice changed from wrapping structural steel in solid insulation to spraying a glue/water/insulation slurry on the steel, a cheaper and faster approach. The spray-on insulation still had to meet standards for delay of temperature increase in the structural steel in a standardized test fire. The crashing of planes into the WTC posed a different challenge to the insulation however. As the insulation dries and ages it tends to become friable and subject to loss under mechanical stressors. In the WTC you had the combination of massive mechanical stress in the floors affected by the crash of the airliners combined with the fire from jet fuel and the resident combustibles in the office spaces. Effectively, the mechanical shock of the crash probably vibrated most of the insulation off the structural steel near the impact site. The mechanical stress also caused the failure of most of the building fire-suppression systems.

The NIST investigation that Mizzi criticizes was both high quality and comprehensive, given the challenges of establishing causes when much of the evidence is in a burning pile on the ground.

During the construction of the WTC, measurements at nearby schools found air-borne asbestos levels far above the applicable standard. The decision was made to switch the spray-on insulation from asbestos-based to mineral-wool-based. The insulation properties were equivalent,

but costs were greater since to manufacture mineral wool, rock has to be mined and melted and spun into fiber, rather than simply mined. The spray-on mineral wool was subject to the same friability and susceptibility to mechanical shock as spray-on asbestos. The idea that the switch to mineral wool caused the collapse was the creation of a right-wing activist, with a B.A. in natural science, master's in biostatistics, and law degrees from the University of Baltimore and Georgetown University. In discussions about his accusation that the switch to non-asbestos spray-on insulation caused the WTC collapse, he demonstrated no discernible expertise in engineering or physical science.

There is no need for recourse to dark conspiracy theories for an engineer to understand how the WTC buildings failed or to understand that we need to concentrate on keeping fully fueled large airplanes out of the center of tall buildings.

James S. Dukelow Jr., MO A '74

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

—James D. Froula, P.E., Editor

• The "Engineering Aspects of War" generated interesting comments in the Winter issue. I appreciate Dr. Delagrange favoring additional investigation and Ms. Lewis's comment—"*the truth about exactly how the WTC towers collapsed matters greatly….*" It does, and the most plausible explanation offered by Dr. Delagrange or Dr. Sunder fails to explain the empirical evidence. Nearly 10 years later the death and destruction continue in the name of avenging 9/11.

I concur with Mr. Mizzi and other professionals questioning the NIST investigation of the collapse of three high-rise buildings. As an engineer responsible for building design and construction for 24 years, I have a professional interest in understanding the WTC destruction. Any honest explanation must be consistent with all the evidence including extreme temperatures capable of melting structural steel[1], abundant red-gray chips identified as highly reactive pyrotechnic material in the debris[2], and numerous accounts of explosions noted in the FDNY oral histories. The principles of structural engineering are not adequate to explain these phenomena, and NIST has ignored the anomalies with arrogant indifference.

Specific reasons to question the veracity of the NIST investigation include the following:

- The NIST study of WTC 7 is incomplete and erroneous. The notion that a 47-story steel building could collapse in free fall for eight stories defies common sense. NIST acknowledges freefall, but the final reports provide no rational explanation. The collapse analysis is inconsistent with video documentation.
- WTC 7 was a modern building designed to AISC and NYC building code standards; yet it collapsed like a house of cards following an unabated office fire. Investigators claim the absence of shear studs on interior girders was a primary cause of collapse initiation. This conclusion, however, conflicts with a Canadian Steel Construction Council article that clearly shows shear studs along the interior girders[3].
- Debris from WTC 7 was destroyed prior to any investigation even though the building was evacuated hours before its collapse.
- Debris was never tested for accelerants as recommended by the national standard NFPA 921 *Guide for Fire and Explosion Investigations.* The debris should have been tested in 2001—it should now be tested in 2011, but NIST refuses to do so. *Why?*
- Clear documentation of highly reactive pyrotechnic compounds in the debris was published in April 2009. There has been no scientific rebuttal or response to this alarming discovery and publication. Although one may find iron oxide (rust) in a collapsed building, there is no natural process resulting in an intimate mixture of iron oxide with ultra-fine-grain aluminum.
- Complete documentation of the structural analysis for WTC 7 is unavailable. NIST is withholding this from the public in spite of formal FOIA requests. The analysis is shrouded in secrecy, and the record shows an indifference to empirical data that does not fit neatly into the "probable collapse sequence."

The issues at stake go beyond honesty, scientific integrity, and professional ethics because the events of 9/11/01 are still used as the primary justification for war in the Middle East. Please examine the evidence; members of ΤΒΠ cannot claim ignorance.

Ronald H. Brookman, S.E., CA Λ '84

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[1] Jonathan Barnett *et al.*, FEMA 403, World Trade Center Building Performance Study: Data Collection, Preliminary Observations, and Recommendations, May 2002, Appendix C, "Limited Metallurgical Examination."

[2] Niels H. Harrit *et al.*, "Active Thermitic Material Discovered in Dust from the 9/11 World Trade Center Catastrophe," *The Open Chemical Physics Journal*, 2009, Volume 2.

[3] John J. Salvarinas, "Seven World Trade Center, New York, Fabrication and Construction Aspects," *Canadian Structural Engineering Conference Proceedings–1986*, (Canadian Steel Construction Council, Willowdale, Ontario, 1986), pp. 11-1–11-44.

• In the Winter 2011 issue, Dr. Daniel Williams article states: *"A hypothesis is refuted when there is a large error between the observation and the result predicted by theory that cannot be reduced by slight modifications and extension of the theory. In this case it is quite likely that a radical, structural change in the theory is required to reduce the error."* I immediately thought of the *three* WTC structural-steel-framed high-rise buildings. Each collapsed vertically into a huge pile of rubble at nearly a free-fall acceleration rate in less than 12 seconds, supposedly due to fire. This fact alone (and watching the 9/11/01 WTC Building 7 collapse) will likely cause many engineers to rethink the government's 9/11 fire-caused-the-collapse theory even before referring to their fire-temperature handbooks and steel-construction manuals.

I agree with the letter to THE BENT by John Mizzi, P.E., when he states that the correct phrase should be the "alleged September 11, 2001, terrorist attack." As a rebuttal to Mr. Mizzi's letter, Dr. Delagrange stated *"An engineer warned that if a fire ever burned halfway up, the building would collapse (unverified, not refuted)."* It has in fact been refuted, not only by fire test and manuals, but also by the fact that in the 100-year-plus history of structural-steel-framed high-rise buildings (with many fires much hotter and longer lasting), not one of them collapsed. Keep in mind that the massive structural-steel framing of each of the Twin Towers was not damaged below the airplanes' impact zone. Also, the much newer 47-story WTC-7 was not hit by an airplane and apparently had only a few small areas of fire. Why did any of these three buildings collapse?

There are 1,400 (*ae911truth.org*) licensed professional architects and engineers willing to stand up to the political and societal pressures and demand a new/real investigation (with subpoena power) of the 9/11 terrorist attacks. I hope more Tau Bates will join us in this important discussion.

William A. Rice, P.E., MA Z '62

• First let me commend you in general on the publication. I find there is always something worthwhile to read, and I leave my copy in the break room at work for others to read because of my appreciation of the magazine; it always disappears!

I have to say that I virtually never write letters such as this. But once in a very rare while, I see something somewhere that is either so wonderful or so repugnant that I simply have to offer a short comment, if only for personal catharsis. The subject article in the Fall 2010 issue, alas, falls into the latter category.

With all due respect to Dr. Delagrange, this article was merely a collection of obviousness, speculation, and opinion, with little demarcation offered as to which was which. It possibly belonged in an opinion section of *Stars and Stripes*, but it did not belong in THE BENT. I'm surprised it made it past the Editor. I took the liberty of removing that article from the copy in the break room.

Martin J. Minnich, PA Z '75

Thanks Jim

• Just saw the announcement of your *early* retirement (only 29 years!). I am sure you have enjoyed your term at ΤΒΠ, but I also know that you will enjoy retirement. Last March I retired from the Boeing Company after 30 years, and I have been enjoying every minute of it. The only problem I have is that I am *busier* than when working. With thanks for your service to ΤΒΠ and wishing you the best.

Benito C. Almojuela, WA Γ '75

• Well, it's a sad day for Tau Beta Pi, but the way you describe plans that you have for the future, it looks like happy times for the Froula family. And you'll still be around, which is great.

As you describe it, "A responsible job done properly" is all-absorbing. It's interesting that Lyle's latest Law is "Your job is greater than your assignment." That certainly has applied to you. Great for a career, for you and ΤΒΠ—but there comes a time when you owe it to yourself to do a few other things, and you're not the sort to take an hour away from your multi-faceted job, so "On to the Next Event!" with the comfort of knowing that you've done a great service for all of us.

Samuel C. Florman, P.E., NY A '44

• Congratulations on your upcoming retirement, and thanks for all of your efforts over the years. I say, once again, that THE BENT is the only magazine to which I subscribe. It would be very difficult, maybe impossible, to find another magazine that provides the same high-quality, in-depth discussions of engineering topics. Your effort has made THE BENT what it is. Thanks for allowing so many readers to have a voice in the Letters section.

Steven L. Golembiewski Jr., P.E., PA B '90

• Best wishes on the Tau Beta Pi leadership transition and your search for Happy Trails. I liked your editorial and the Winter 2011 BENT. Thank you for your service.

Harold F. Hartman Jr., PA E '56

• It came to my attention that you are planning to retire from being Executive Director of TBΠ. I express my appreciation for all that you have done for the organization in the past. A tenure of 29 years is evidence of a job done well, and I am glad to have been a part of it for the last of it. I hope that you enjoy time spent with your family, playing softball, relishing the outdoors, and even with the neighbor's dog! Happy trails to you, until we meet again.

Logan S. West, OK Γ '09

• How wonderful to see that you are still so involved and committed to TBΠ. I remember you when I was fortunate enough to attend the 100 year-anniversary Convention at Lehigh University as a student officer (and I loved the recent 125th article in THE BENT). How time flies….

Richard E. Zelenka, P.E., IL A '87

Self-Regulation & Human Knowledge

•Thanks for writing the article "How Concepts of Self-Regulation Explain Human Knowledge," Winter 2011. I enjoyed your clear and succinct presentation. I am having a discussion on LinkedIn with a guy who seems to believe that with proper monetary and fiscal actions by the government, the economy can be controlled (regulated) to everyone's benefit. I will have him read your article so maybe he will understand that even with the best intentions no one has sufficient knowledge to design a controller that will have expected results.

Have you read any critiques of Kant by Ayn Rand? You might find this amusing—*rebirthofreason.com/articles/younkins/Immanuel_Kant_Ayn_Rands_intellectual_enemy.shtml.*

Benjamin I. Bachrach, NYΔ '69

• I really enjoyed reading this article. In an age when science and technology are so often misunderstood by the general public and when even those who practice science and technology often do not appreciate the underpinnings of their chosen profession, a treatise like this is immensely useful and satisfying. Keep up the good writing!

Philip W. King III, TN A '66

• Dr. Williams's exposition on control theory is interesting, but the connection to epistemology seems a bit strange. *Absolute reality* and *absolute truth* are simply the toys with which philosophers have played games for their own amusement over thousands of years. Sometimes I think they would be very disappointed if someone found an *absolute* ending to their fun.

Seems to me that, particularly for engineers, *reality* is whatever works. (Scientists might occasionally be found groping for whatever-works-a-little-better.) Feedback, in the form of successes, is also nice. And each success makes that reality likely to continue working as long as one stays in the same input region, defined neighborhood, and/or domain of effectiveness. But using continued success to suggest any special quality for that reality, or the theory (mathematics) used to define it, is presumptuous.

Edward D. Henze, IL Γ '50

• My son, Jon Allen, *MI Γ '92*, who works on the IBM supercomputer at Rochester, MN, sent your recent article, which I found very interesting! You might want to read Peter Kreeft's *Socrates Meets Kant* in this regard. Kreeft is a philosopher, not a physicist, but is an excellent philosopher and is very, very savvy.

Dennis P. Allen Jr., Ph.D.
Mathematics, Berkeley '68)

• I want to express my appreciation of this terrific article. My son is a member of TBΠ and left his periodical at home. I happened to pick it up to scan out of curiosity. I've never done this before because I am not an engineer. But the title of your article caught my eye (I majored in philosophy 42 years ago but haven't kept up with the literature). Thank you for bringing to your readers and me an insightful view of the world of science, reality, and epistemology. I mailed the magazine to my son at UCSD and told him that it is a must read. Knowing that the engineering curriculum leaves little flexibility for electives, I sense that many engineering students may not have the opportunity to take an introduction to philosophy, let alone an epistemology course.

Not being an engineer, I was not very familiar with control-theory, feedback loops, etc. I read the article twice and can truly appreciate the purpose and goal of your article. Your treatise should be on the reading list for everyone, not just engineers! I wish I could have taken my epistemology course from you. But then again, you would have been a little young. Well done!

Marston Wong, D.D.S., M.S.

•I found this article very interesting. I had never thought of the evolution of human knowledge at the societal level this way—as basically an adaptive control system—and found the concept quite fascinating.

The article reminded me of a book I read not too long ago—*On Intelligence*, by Jeff Hawkins. He is the architect of the Palm Pilot, among other things, but brain science has always been an interest of his. He presents a theory of how the brain works that is really quite understandable, and with your background in control systems you might find it interesting. According to Hawkins, the brain learns and adapts by comparing new stimuli with existing memories, and

the more similar a new stimulus is to something the brain has already seen, the easier it is to remember it and adapt to it. He posits that until we can think of the brain in this way, attempts to create artificial intelligence, or computers that can think like humans, will fail. His theory of how the brain works is a good example of a paradigm shift such as you mention in your article, which might explain why artificial intelligence hasn't really gone anywhere in the last 30 years.

In reading the article, I saw a parallel between the way you suggest that human knowledge has evolved at the societal level and the way Hawkins suggests that an individual brain acquires knowledge. I just thought you might find Hawkins' book interesting and want to recommend it.

My interests are in signal processing and high-performance computing, and as a software architect at Raytheon I can see many applications in my business for more intelligent computers, which was why I read Hawkins' book. Your ideas about macro-level knowledge evolution are of interest to me as well.

Bruce A. Kinney, IN A '78

• The article by Dr. Williams concerning people's development of knowledge is certainly erudite. However, I think that there is a simpler explanation for the way that humans acquire knowledge, based on their biological and social evolution rather than abstruse philosophical considerations of what is *knowable*, or analogy to electromechanical control systems that are a product of human intelligence and not the source of it.

As animals have evolved, we higher ones have developed the ability to form models of the real world in our brains. At the most basic level—which is apparent in most vertebrates—our brain receives sensory inputs and processes them to form a mental model of our physical surroundings. That has the obvious evolutionary advantage of allowing us to *navigate* physical space in search of food, water, or mates and then to return to a relatively safe location and nurture our offspring. Any such *model of reality* or *knowledge* is less than perfect, and, when it is stored in our brains, it tends to deteriorate over time. To compensate, we constantly use feedback from our senses to refine our *mental models*.

Some of this feedback is generated by deliberate experimentation, and some is accidental. I once observed squirrels deliberately jumping into a stream from an adjacent tree. I suspect that this started when one accidentally fell into the stream and enjoyed it, repeated the process, and was followed by others. We humans accelerate this *model-refining* process through our curiosity, which is our proclivity to deliberately test real-world surroundings to stimulate sensory feedback that enhances the accuracy and complexity of our models of reality.

Speech is a form of modeling that has become particularly refined in humans. A sound such as the spoken word *food* is associated with a particular object in the minds of all members of a social group, in a way that enhances communication and, therefore, cooperation. In fact, human evolution has been a combination of two forms of evolution: (a) *conventional* biological evolution (as first described by Charles Darwin) that involves physical transformations arising from genetic mutations that have proved to have survival value; and (b) evolution of social behaviors and technologies that require the transmission of *models of reality* from one generation to the next. Most *social behaviors* have been cooperative behaviors that evolved at a *tribal level* and have proved to have survival value. Warfare between *tribes* has not been precluded in this process and has caused much human misery; however, it has not threatened the survival of humanity as a whole, and has even been of some benefit in spreading technology. The spread of nuclear weapons, however, represents a horrifying new development in that it gives modern *tribes* the capacity to mutually annihilate one another and has set the entire evolutionary process back by an unpredictable amount.

Humans have vastly supplemented their ability to preserve and share their *mental models of reality* by devising *external models*. The first of these were probably drawings on the ground or on rock faces, or sculptures made of clay, that modeled important objects such as the sun, moon, and game animals. This *external modeling* progressed to the writing of words, which enabled the preservation of increasingly complex models that represented not only physical objects, but also conditions (such as *hot* or *frightened*), actions (such as *eat* or *run*), and even complex interactions (such as cooperatively hunting, farming, and trading). And then came scaled drawings and prototype models of *inventions* and mathematical models, in which symbols and algorithms were used to quantitatively model various features of the real world and then create new ones. Perhaps this made engineering the *first profession*.

Electronic data storage and computation represent the latest advance in external modeling. Its advantage is that it allows an enormous amount of data to be stored and processed. Its downside is that many people tend to assume that complexity in a model equates to credibility and even infallibility. They overlook the reality that even the best model is a partial representation of reality, and many models contain data or algorithms that are simply false. All models that are intended to simulate reality are subject to the limiting principle of *garbage in, garbage out*, and those that contain defective algorithms, or ones that are inapplicable to the situation being analyzed, may process even accurate input into *garbage* output and proceed to disseminate it on a massive scale.

Models of reality can usually be improved by devoting additional scientifically based investigation to the modeling process. But somewhat paradoxically, no model can ever perfectly reproduce all characteristics of the real object or system being modeled. The process of creating and refining models is thus governed by balancing the cost of additional refinements versus their expected value. For example, the accuracy of census data that models a nation's population can always be improved by more frequent and thorough investigation, but the benefits of this additional information are

subject to the economic and technological principle of declining marginal utility (declining added value).

Aside from the limitations of our sensory and analytical abilities, another cause of inaccuracy in models is people's use of imagination to create fictional models, such as fictional stories and drawings. Fictional modeling has psychological value as entertainment and practical value in predicting possible future outcomes under scenarios that people have not observed previously. But its downside is, again, in people's limited ability to distinguish fictional models from models that describe reality with reasonable accuracy. This becomes particularly dangerous when different *tribes* accept religious dogmas that favor their own interests as being infallible models of reality, even though they are mutually exclusive with one another and with scientific theory.

I would hope that by understanding real-world modeling, people could benefit both as individuals and as members of society by distinguishing between reality (as close as they are capable of modeling it) and fiction. For my part, I have found both psychological gratification and practical rewards by refining my *mental model* of reality with lifelong learning.

C. Ted Stude, IN A '66

• Congratulations for publishing Dr. Williams's profoundly useful article explaining how people can come to know things, what is true, how nature works, and how to use true knowledge to advantage. He elevates and broadens the search for knowledge and truth beyond the scientific method of Bacon and Newton and the empirical engineering utility method of Kant and Kuhn, unifying them with systems modeling and feedback-control engineering into a comprehensive, interacting, adaptive, feedback human-knowledge system to confirm the truth of things that improve with time. This hallmark idea on the search and acquisition of truth belongs to the established branch of philosophy called epistemology.

So, now we can know what we are talking about and doing. The proof is in the pudding. While some may think this is nerdy and esoteric, it is essential to resolve differences and disputes for human progress. It is the intellectual framework for successful engineering, science, business, government, and civilization. Williams's article should be readily grasped by any high-school senior worth his salt; such is his gift for writing.

As a practicing chemical-process control-systems engineer like Williams (and a fellow Purdue graduate), I can attest to the soundness and utility of his epistemology. I buy it, lock, stock, and barrel. In fact, I used his intellectual foundation to guide my engineering career to computer-control oil refineries and petrochemical plants since 1966. John E. Gibson, Ph.D., wrote the book on *Nonlinear Automatic Control*, McGraw-Hill, 1963, with a concluding chapter 11 on adaptive control systems. Gibson then was professor of electrical engineering and director, control and information systems laboratory, Purdue.

I know celestial mechanics based on Newton's universal law of gravitation is right because a man landed on the moon in 1969 and the Huygens probe landed on Titan in 2005. I know the energy field mechanics of light and electromagnetic radiation described by Maxwell's equations is right because telescopes, TV, and digicams work. I know the fluid mechanics of turbulence based on Newton's laws of motion are right because many airplanes have been flying for decades. I know the structural mechanics and strength of materials sciences based on Newton are right because the Golden Gate Bridge, Hoover Dam, and Roman aqueducts work well. I know that biology is right because many successful heart surgeries were performed in the last decade. I know organic chemistry is right because oil refineries have made fuels, petrochemicals, and polymers for nearly a century. I know the second law of thermodynamics is right because no one has ever built a perpetual motion machine, and no one ever will.

I know Einstein's $E = Mc^2$ is right because the Hiroshima bomb worked in 1945 and the sun has shined for >4.6 billion years. I know calculus is right because it proved c/d = pi = 3.14159… for all circles, forever.

That is why I know Williams and I are right. His employer TRW was a competent NASA contractor when I worked on Apollo at Houston's manned spacecraft center, 1967-69. In fact their affiliate, Bunker–Ramo, inaugurated computer control of the process industries while I studied at Purdue in 1962-66. Dr. Simon Ramo, *UT A '33*, is a hero to many engineers. I use *technology* as a synonym for *engineering*, but prefer the latter noun.

As an aside, Williams might like to know that empirically generated (and theoretically verified) dynamic models are part of a commercially successful Dynamic Matrix multivariable control technology commercialized throughout the HPI since 1990. I implemented it on a commercial fluid catalytic cracker and crude-oil-distillation unit. So, contrary to Williams's assertion on page 16, column 2, paragraph 3, sentence 2, it is not possible to drive these systems to acquire data and use empirical design rules to determine optimal control. I have shown that *not* should be changed to *indeed*. But, I do not wish to quibble with his monumental article.

Jim, I note that you will retire from ΤΒΠ in 2011. Thanks for your important contributions to that honorable society and engineering ethics, integrity, and excellence. Retired engineers can still think and write.

Pierre R. Latour, Ph.D., P.E., VA B '62

Founder's Plaque

• We had a second home in Chester, VT, and would drive to a bakery in the town of Cavendish. Every time we would see a brass plaque for the home of Professor Edward Williams, founder of ΤΒΠ.

One day the plaque and house were gone, but the people who bought his house and built the new one donated the plaque to the engineering school at the University of Vermont in Burlington. I have not seen it, but hope that they take good care of it and display it on campus. We will visit Burlington, talk to the engineering dean, and send pictures. It is a very important plaque for all of us and for ΤΒΠ.

Jack S. Webb, OK A '54

As Transistors per Chip Multiply by Billions . . .

Microprocessors Face a Multicore Future

by **Alan S. Brown**

How will engineers master the billions of transistors on tomorrow's microprocessors? It's going to take a combination of divide-and-conquer and urban renewal to put them all to work.

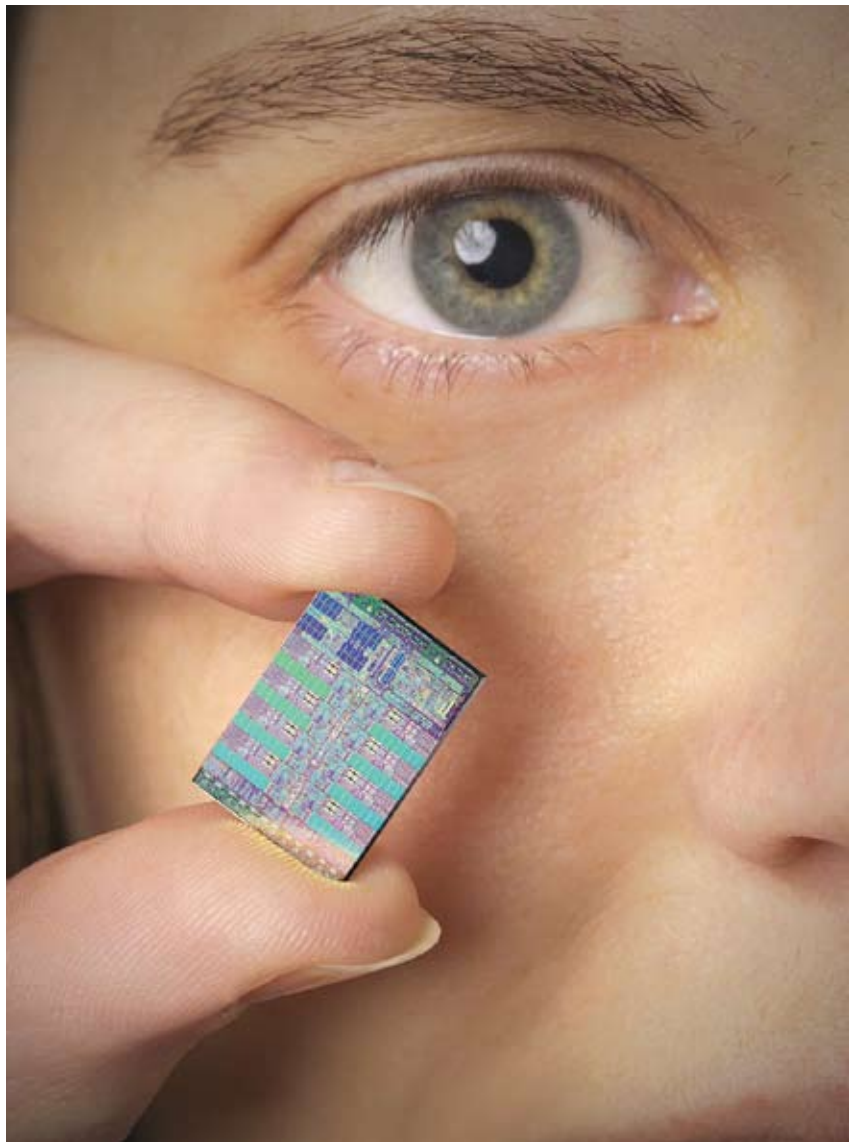
In 1965, Gordon Moore, who founded Intel Corp. three years later, noted that the number of transistors on commercial microprocessors had doubled every year for the past seven years. He estimated that the trend might continue for another ten years and that by 1975 a single processor might contain 65,000 transistors.

By 1975, Intel was producing chips with 6,500 transistors. Three years later, Intel's 8088 chip (which powered the original IBM PC) was up to 29,000 transistors. That year, Moore revised his original prediction. He now forecast that transistors would double every two years, and processor performance every 18 months.

So much for the history lesson. Fast-forward 35 years, and processors now have hundreds of millions of transistors. Intel's Core i7 processors, introduced in 2008, sports 731 million transistors. Doing the math that is now enshrined as Moore's Law, we find that commercial processors are likely to contain nearly 12 billion transistors within five years.

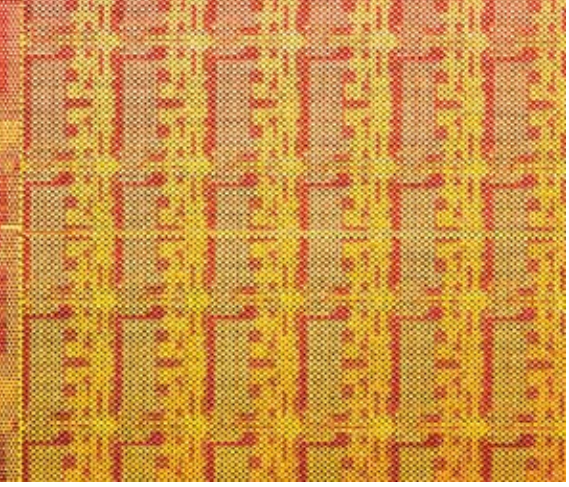
That is a lot of real estate. To appreciate what it means, consider how a city like New York, with 3.2 million housing units, functions. It is organized into five boroughs, each of which is divided into many neighborhoods. Some neighborhoods have specialized functions, such as residences, offices, stores, manufacturing, distribution, and recreation. Others mix everything together. A vast network of streets, highways, bus routes, and subways keeps people flowing from one destination to the next.

In the past, microprocessors have acted like New York's mixed-use neighborhoods. They did general-purpose calculations. If you needed, say, faster graphics for games or engineering simulations, you would buy a video card with a graphics processor optimized for the complex mathematical and geometrical calculations needed to render high-speed images.



An IBM Cell combines processor, graphics processor, and math acclerators onto a single chip, held here by an engineer.

That worked fine for many applications. Yet it involved long time lags (at least when measured against the gigahertz speed of modern chips) as data moved along a circuit board to an external processor. With so much real estate available on today's chips, hardware developers reasoned, why not use some of the processor's hundreds of millions of transistors to build a powerful graphic processor into the chip itself?



In fact, why not build in more high-speed memory, signal processing, accelerators for non-graphic processing, and chipsets to link the processor with outside devices? For processors used in mobile computing, why not include GPS systems, video processors, and sensors that enable us to use our phones as game consoles?

The Law

Those advantages are compelling, but not overriding. The real reason processor designers abandoned ever larger and more complex single processors had to do with the part of Moore's Law that involves doubling performance rather than transistors.

There are many ways to goose processor performance, but none is more important than clock speed. Every operation on a chip is synchronized with a clock. In 1975, 10 years after Moore first enunciated his law, Intel's 8080 processor had a clock frequency of 2 MHz and could perform 2 million operations per second. Today's chips run 1,000 times faster, in the 2-4 GHz range.

Faster clock speeds require higher voltages, and that generates more heat. This became painfully obvious in 2005, when Intel cancelled its single-core successor to the Pentium 4, codenamed Tejas, because it generated such high temperatures.

Instead, Intel released its first Core 2 dual-core processor. By parceling out the computing load between two cores, Intel could throttle back its clock speeds, reduce power and heat, and still improve processor performance.

In fact, hardware engineers had been working on multicore processors for many years. Yet there was no real consensus. Should they build neighborhoods where different groups of transistors have specialized functions? Or should they clone their processor into multiple mixed-use neighborhoods that can perform any task as needed? What kind of a transportation system would they need to keep data shuttling at high speeds between different cores without getting lost?

The semiconductor industry has found workable solutions to those questions as it went from two- to four- and now six- and eight-core processors.

Dividing processing-intensive tasks among several processors has yielded some impressive results. Scanning for viruses, compressing and uncompressing media streams, and juggling internet applications that would ordinarily take several dedicated servers all run significantly faster on multicore processors.

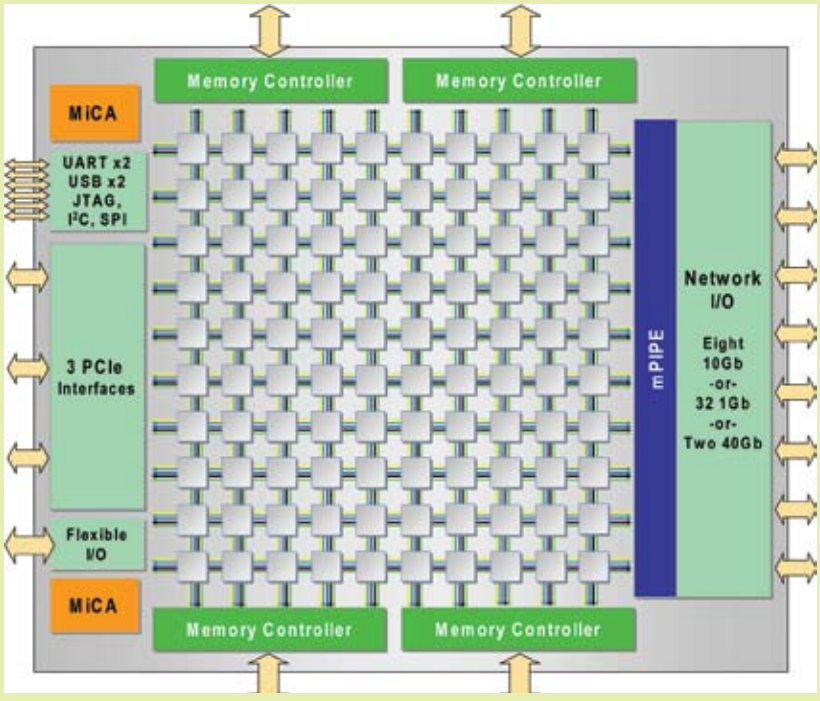
LabView software for building virtual instrumentation and controls has long embraced multicore processing. Its developer, National Instruments Coorporation of Austin, TX, routinely stuns audiences with examples of multicore PC-based instruments that run nearly as fast as the best dedicated hardware developed for the same purpose.

Such multicore designs look revolutionary, although they often build on established design principles. This will not be enough in the future when processors contain scores of cores. Intel, for example, has built experimental chips with 48 and 100 cores. Tilera Corporation, a fabless semiconductor company founded in San Jose, CA, in 2004, launched a 64-core processor in 2007.

Such core proliferation promises complete computers and even server farms on a chip, as well as smart phones with desktop capabilities. Yet getting there will not prove easy.

Power to the Groups

Tilera plans to ship this new 100-core Gx chip in 2011. While each core itself is relatively simple, the chip can partition the cores into groups to apply computing power as needed. A two-dimensional interconnect mesh moves data quickly between cores and the processor's memory controllers and I/O's.



Tiles

Tilera is one company that has taken the multicore plunge. The firm was co-founded by Anant Agarwal, an MIT professor who has studied multicore processing since the 1980s. Tilera's philosophy is simple: Instead of mixing general-purpose and specialized cores, its commercial TilePro64 chip has 64 identical cores. It plans to ship a 100-core chip, the Tile-Gx™, later in 2011.

Tilera's cores are lightweight—that is, they lack specialized hardware to run such calculations as floating-point and vector operations efficiently. They also use reduced instruction set computing (RISC), opting for simplified instructions that run much faster (but often with more iterations) than more complex instruction sets.

On the other hand, the processor is managed by a proprietary compiler. It breaks software into instructions that run in parallel on the chip's cores. The compiler also monitors the cores and can partition them into workgroups in ways that best use the processor's capacity. Since the compiler handles scheduling, the cores do not need additional hardware to manage this task.

The key to Tilera's architecture is its mesh, the high-speed interconnections that tie the cores together. The company's marketing director, Bob Doud, likens the mesh to the grout that runs between tiles (which are the cores) on a bathroom floor. It forms a tiny network that enables the cores to talk with one another and share such on-chip resources as memory, Ethernet, PC Express, and other input/output.

To appreciate how it works, consider how other multicore chips communicate. The first dual-core chips used a bus, a data highway between cores and shared resources. It could send only one message at a time and needed circuitry to decide which data segment went next.

Simple buses become inefficient as the number of cores grow. Most four-core processors switched to ring interconnects. Rings pass data two ways, clockwise and counterclockwise, but still only one message at a time. They also need hardware to register the data at each step along its journey. Each *latch* along the ring accepts the input, locks it, then moves it to output and transfers it.

Each operation takes a tick of the clock. Doud likens rings to old-fashioned bucket brigades, passing full buckets in one direction and empties in the other. Yet the need to register each message as it moves from position to position poses a problem.

"You need a large pipeline because you're filling it with information you don't need," Doud notes. "It works for four cores and it's okay for six, but what happens when you have 16 cores communicating at a time? The more cores, the more power you need to run and to move the data faster so you're not starving the cores for information."

Both rings and buses are one-dimensional pathways; that is, data can move in only two directions, right or left. Tilera's mesh, on the other hand, is a two-dimensional grid where data can travel in two dimensions, north, south, east, and west.

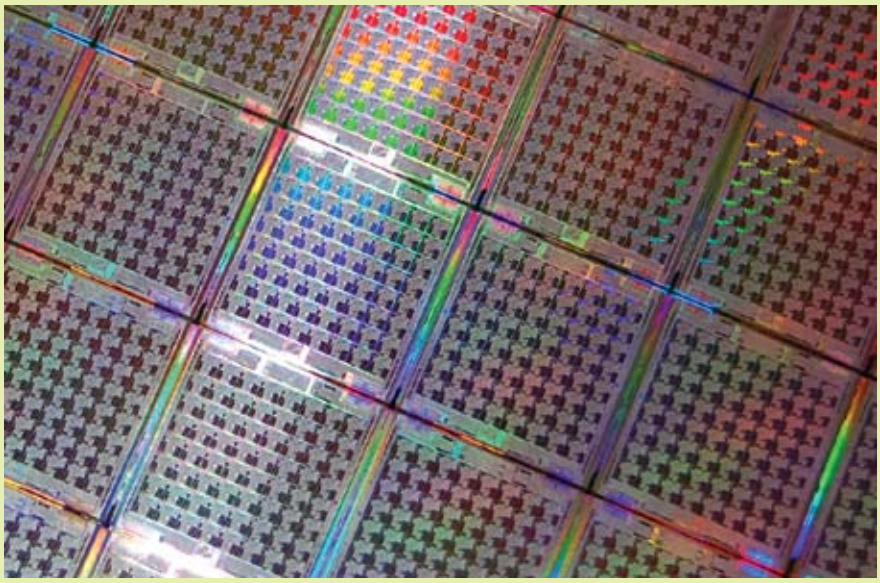
"The messages are still moving one step along the way for every clock cycle, so in that way it's not any different from a bus or a ring," Doud explains. "But now imagine 100 cores lined up in a row with a bus or ring across them. It could take as many as 100 stops to go from end to end. But on a 100-core grid, they would move sideways 10 cores and down nine, so 19 stops is the farthest you would need to go. That's why nobody is going to build a bus or ring for 32 or 64 cores."

Future is in the Clouds

This futuristic Intel single-chip cloud computer has 48 Intel cores and runs at as low as 25 watts.

Tilera's new 100-core processor will actually have separate grids for memory, input/output, cache coherency, and two that programmers can define. This will give users up to 200 terabits of mesh bandwidth, and bandwidth has been a key barrier to scaling up multicore processors. "This is more than twice the bandwidth you would need. It's like a freeway system in a busy metropolitan area," Doud states. Equally important, it achieves these high transfer rates running at only 1.5 GHz, a clock speed most processors surpassed years ago.

Cache coherency is another critical Tilera technology. It has to do with memory, which is always an issue. Today's computers have gigabytes of system memory on their motherboards and megabytes of cache memory in their processors. Single core chips check data out of memory, move it into the cache where they can access it very quickly, and then write it back to system memory.



Chips on a silicon wafer developed and manufactured by Tilera.

Two cores can negotiate who gets what on a first-come, first-served basis. It gets more complicated for four cores and more. The result is a slow and complicated scheme that involves checking data in and out of centralized caches. Tilera opts for distributing and managing memory among the tiles and enabling the tiles to look inside each other's caches.

Tilera's processors cannot do everything. They will not replace graphics chips or run high-speed, vector-based database searches. Nor are they backward-compatible with software built for Intel chips. On the other hand, putting 100 cores on a single chip and dividing them based upon workload seems a good fit for the Internet and the cloud (which provides the heavy-duty processing behind smartphone applications).

The company claims to have 100 customers, and it recently teamed with Optera Solutions to introduce a cloud server that packs 512 cores (eight TilePro64 processors) into two rack units. Each of those processors consumes only 23 watts. As a result, the server needs just a fraction of the power and cooling required for competitive units.

Mixed Use

Tilera's homogenous processors, which combine many of the same exact cores, are one way to go. Another is to mix components. If there is a poster child for that type of heterogeneous process, it could be the Sony-Toshiba-IBM Cell (for cell broadband engine architecture) chip that powers Sony's PlayStation 3 game console. Starting in 2001, the three companies spent four years and reportedly $400 million to develop the processor.

Not surprisingly, the engineers optimized the chip for graphics performance. On one hand, the chip had one mid-range, general-purpose processor base that used IBM's RISC technology. But it also included eight separate co-processing cores designed for specialized graphics tasks. A ring data bus linked together all nine processors. The chip also monitors its own temperature and can turn off unused cores to cool itself.

The eight co-processors are designed for heavy-duty mathematics, like Fourier analysis of data and floating-point vectorized processing of arrays of data. These specialized units, often called accelerators, run calculations hundreds of times faster than general-purpose cores because they contain everything needed to process information. Instead of reading and writing processing instructions from the hard drive and memory, the processors pull data, such as vectors, from memory and operate on them directly. This eliminates hundreds of redundant memory calls and thousands of valuable clock ticks.

The experimental processors introduced by Intel, the world's largest processor manufacturer, are not heterogeneous like IBM's Cell but offer more flexibility than Tilera's TilePro64. Intel introduced a simple 80-core chip in 2007 and a more serious 48-core chip, which it calls a single-chip cloud computer, at the end of 2009.

The 48-core processor consists of 27 dual-core tiles on a network mesh (which Intel calls a fabric). Each tile, which contains two separate processors, connects to the network with a router. The entire chip contains about 1.3 billion transistors, or roughly 27 million chips per core (including networking devices), yet fully supports Intel's traditional processor operations.

Like Tilera, Intel has rethought how to take advantage of all that real estate on today's processors. That means breaking down the historic barrier between hardware used to process data (processors) and hardware used to control memory, peripherals, and I/O (chipsets). More of those functions are moving onto its chips.

While the cores are all clones, each tile has its own clock. This enables Intel to manage power (and heat) by running processors at one-quarter, one-half, or full speed. As a result, Intel can scale the processor's power consumption from 25W to 125W, depending upon load.

To enable cores with different clock speeds to balance workload requires a sophisticated way to share data, and Intel has put this in place on its chip. This could enable it to add other accelerators, such as graphics processors, in the future.

Intel also has its own take on its fabric network. Tilera opted for a routed packet network, which breaks data into chunks called packets and then sends them on their often-circuitous way. This is how the Internet and corporate networks work. Intel opted for a design that hybridizes routed packs with more direct switches.

"We're trying to explore the strengths and weaknesses of these designs," explains Jim Held, an Intel fellow and the company's director of terascale computing research. "One cost of packet-routed networks is that you need control logic at each node to handle the packets as they fly between the cores. You need storage while you decide where to send it next, and this all burns energy and that means more power and heat. So with our hybrid, we redesigned the router elements and revisited the interconnect itself. We tried to create a lightweight network that set up direct-switched communications between dies with the routing done ahead of time."

Software

Held's other concern is software. Intel, he noted, has long used parallel processing. This began decades ago, when processor speeds began to increase. At that point, it became faster to break instructions into threads, or small executable tasks, and then jump from executing one thread to executing another. When the processor completed one task, instead of waiting for data to arrive, it jumped to another. It eventually returned to the original thread, which now had new data ready and waiting.

"We were presenting the core to the software as if it were several processors and sharing the processing elements," says Held. He admits that managing this trick with 48 cores presents a much greater challenge. "When you have so many cores, especially if you're using a model where the cores operate on the same memory, it's complicated to keep them from tripping over each other."

Intel has responded by designing software algorithms that identify work that can be done in parallel, such as performing the same operation on all records in a database or lightening every pixel in a digital photograph. "As we go through an increasing number of cores, it becomes harder to get the full benefit of them without specialized software tools. We can run multiple tasks on three or four cores, but it's much harder to use all four cores for the same task and make the task run faster," Held states.

This is especially true for heterogeneous processors like the Cell, which is notoriously difficult to program. "One of the barriers to heterogeneity is whether a programmer can use it. Programmers love it when everything looks the same and they just have more of it," Held continued. "That way they can apply the same code to a technology they already know, instead of trying to map their problem onto a combination of things."

Intel has tried to make programming multiple cores easier by developing an extension for the popular C++ programming language. This enables programmers to write code using a language that they have already mastered. At runtime, a compiler looks at how they defined their operations and data and divides the work among many cores.

Today, multicore processors are moving toward homogenous cores tied together with mesh-type networks and linked to input/output ports. While the software that can take full advantage of multiple cores lags far behind the hardware, it may be good enough for network and cloud servers. As the software gets better, though, it is likely that even more functions will migrate onto processors.

Think of it as a city that has begun to sprout neighborhoods. Those neighborhoods may look alike now, like developments seen through an airplane window, but they are likely to grow more diverse in the future. Because adding diversity—more I/O, specialized processors, and accelerators—is the only way that tomorrow's processors will be able to keep up with Moore's Law.

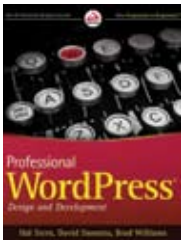
Alan S. Brown has been an editor and freelance writer for more than 25 years and lives in Dayton, NJ (*insight01@verizon.net*). A member of the National Association of Science Writers and former co-chair of the Science Writers in New York, he graduated magna cum laude from New College at Hofstra University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

AUTHORS

Clara C. Shih, *California Gamma '05,* is author of *The Facebook Era,* subtitled: *Tapping Online Social Networks to Build Better Products, Reach New Audiences, and Sell More Stuff.* Shih, a 2005 ΤΒΠ Laureate, offers best practices for overcoming obstacles to success, ranging from privacy and security issues to brand misrepresentation. She also previews social networking trends that are just beginning to emerge. The 256-page paperback is published by Prentice Hall.

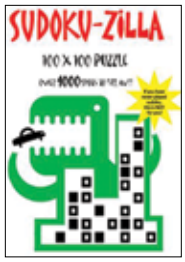
Gary M. Cokins, *New York Delta '71,* has produced his sixth book, *Performance Management: Integrating Strategy Execution, Methodologies, Risk, and Analytics.* An internationally recognized expert, Cokins is a strategist involved with performance management solutions with SAS, a provider of performance management and business analytics software. This overview of current management trends is a 272-page hardcover published by Wiley.

Hal L. Stern, *New Jersey Delta '84,* has co-authored *Professional WordPress,* an internals-out view of the widely used open source blogging and content management software. It goes beyond the basics of the system, looking at plug-in and theme development. The 408-page paperback is published by WROX/Wiley.

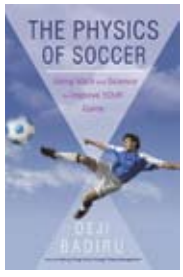


Dr. Michael E. McCormick, P.E., *District of Columbia Beta '64,* has written *Ocean Engineering Mechanics,* which provides an introduction to water waves and wave-structure interactions for fixed and floating bodies. Applications to engineering situations in the coastal zone are then presented. The introduction to the coastal engineering aspects of wave mechanics includes a section on shore protection. The book can be used for both introductory and advanced courses. Dr. McCormick is professor emeritus of ocean engineering at the U.S. Naval Academy. Publisher of the 618-page hardcover is Cambridge University Press.

William D. Eisenhauer, *Oregon Beta '94,* has produced *Sudoku-zilla: 100x100 Sudoku puzzle,* with 4,000 empty squares to be filled. The book is billed as: "Sudoku puzzle challenge for those who like BIG challenges." Eisenhauer is a professor of systems engineering at Portland State University. The 220-page paperback is published by CreateSpace.

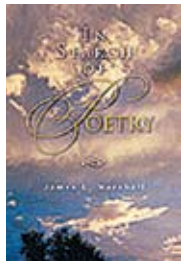


Dr. Adedeji B. Badiru, P.E., *Tennessee Gamma '79,* is professor and head, of systems and engineering management at the Air Force Institute of Technology. He has written *The Physics of Soccer: Using Math and Science to Better Your Game,* which won an editor's choice award from publisher iUniverse, Inc. The book uses an educational theme to encourage youth to pursue sports from a more intellectual standpoint beyond the stereotypical viewpoint of brawny pursuit. It has 324 pages and is available in hardcover or paperback.



Holly A. Duckworth, *Tennessee Alpha '86,* has co-authored *Social Responsibility: Failure Modes Effect and Analysis (Industrial Innovation),* about applying risk analysis and continuous improvement to corporate social responsibility. She demonstrates the use of FMEA to prioritize the mitigation of risk to organizational governance, human rights, labor practices, environmental protection, fair operating practices, consumer issues, and community participation. Duckworth advocates the use of many well-worn quality tools and techniques. She is director of six sigma for Kaiser Aluminum. Publisher of the 183-page hardcover is Taylor and Francis.

James L. Marshall, *Massachusetts Beta '49,* has penned *In Search of Poetry.* The reader is invited to regard poetry as a distillation of life's experience. The title is a metaphor for the emergence of his devotion to the expressive arts while serving as an engineering professor at Villanova University during 1957 to 2002. The book offers poems sequenced somewhat to reflect increasing maturity. The final and largest group *Narratives* has broad scope and generally longer poems. The 82-page paperback is published by Xlibris.



Your CAREER

Skills for Success in Engineering and Beyond: Getting Your Ideas Adopted

by **Dr. Peter J. Denning,** *New York Xi '64*

Have you ever felt frustrated when your good ideas do not get adopted and other people's bad ideas do? Or when you see so much of your effort to systematically generate new ideas go to waste? Do you want to improve your innovation success rate?

You can eliminate most of the frustration about getting your ideas adopted by choosing eight practices for your work and life.

Many engineers fret and fume over these questions. They are not alone. These questions bother most innovators.

Moreover, they are important questions. Many people believe innovation is the key to economic development, technological progress, competitiveness, and business survival. Policies that enhance a nation's ability to be innovative are constantly in public discussion and are hot topics among politicians and business leaders.

I have been investigating these questions for many years and have learned many things that I wish I knew when I was a younger engineer. My colleague, Robert Dunham, and I wrote a book, *The Innovator's Way* (MIT Press, 2010, *innovators-way.com*). I will share here some excerpts from the book. I think you will find them useful every time you have an idea you would like to see adopted.

Meaning of Innovation

Innovation is one of the most studied subjects of all time. The number of book authors in the area is truly amazing—Amazon.com lists 9,300 books with the word innovation in their titles. Two things are remarkable about this literature:

- There is not a lot of agreement on what innovation is. The most common notions are that innovation is a mysterious talent, a disposition of some people's DNA, a process that can be managed by savvy managers, or a flash of genius. Thus, the recommendations of different authors lead in conflicting directions.

- Positive results are few and precious. Business surveys reveal that only approximately four percent of innovation initiatives meet their financial objectives. Patent office statistics show that only about 0.2 percent of patents make a return on the inventor's investment. The National Research Council reported in 1986 that the government's track record of promoting innovation through university research is not as good as is commonly believed—fewer than 25 percent of innovations are connected to published research ideas.

It appears that we collectively share a misunderstanding of innovation and, therefore, experience great difficulty in achieving it. Our methods are ineffective.

The low success rate of innovation initiatives is often explained as an inevitable consequence of the uncertainty of innovation. We are often asked to rejoice that our success rate is so high. If low success is certain, a company's best strategy is to *take many shots on goal*. However, this strategy is available to only a few companies that can afford to let 96 percent of their research and development go to waste. For the rest of us, achieving innovation looks like a crapshoot.

My co-author Bob and I do not accept this explanation. We have observed numerous people—we call them the serial innovators—who get their innovations adopted, over and over again, with success rates much higher than four percent. What can they teach us?

By studying and interacting with them, we learned that innovation is a skill. The skill consists of eight mostly conversational practices that are easy to explain and can become second nature through practice. Individuals, teams, organizations, and networks that embody these practices are regularly successful with their innovation initiatives.

Innovation Defined

Bob and I realized that if we are to teach and coach innovators, we need a clear, observable definition of the outcomes produced by skillful innovators. Proposed definitions based on notions like *DNA disposition* or *flash of genius* do not meet this requirement. We decided on a definition that is the acid test of successful innovation:

Innovation is adoption of new practice in a community.

There are three key words in this definition:

1. *Community.* The set of people who change. The community can be small such as a family, medium such as a firm's customers, and large such as a nation or the world.

2. *Practice.* Habits, routines, and processes that people embody. Embody means they engage with the practice skillfully and without conscious thought. The ability to perform is not the same as applying a mental concept.

3. *Adoption.* The members of the community make a commitment to learn and embody a new practice. They will make such a commitment only if they see sufficient value in the new practice and are willing to sacrifice the previous practice to get it.

Table 1. Structure of the Innovation Practices

The main work of invention	1	Sensing	Locate and articulate a new possibility, often in disharmonies or incongruous events
	2	Envisioning	Tell a compelling story about the world when the possibility is realized
The main work of adoption	3	Offering	Offer to produce the outcome; gain a commitment to consider it
	4	Adopting	Gain commitment to try for the first time, and overcome resistance to the change
	5	Sustaining	Gain committee to stick with the new practice over time, integrating it into the environment
The environment for the other practices	6	Executing	Create environment for effectively managing all commitments to completion
	7	Leading	Proactively mobilize people to generate the outcomes of the other practices
	8	Embodying	Instill the new practice into the practices of the community

Notice that this definition covers many types of innovation. The Internet is a set of technologies that support new practices including browsing, searching, online shopping, social networking, blogging, and texting. Mothers Against Drunk Driving inspired new practices backed by laws to take drunk drivers off the roads. Sustainable architects have introduced new construction practices that produce buildings with no carbon footprint. Heads of families have adopted small business practices to help them balance income and expense and pay off debt. The key to success is adoption of practices, not the invention of ideas.

Unfortunately, the notion that innovation comes from clever ideas is enshrined in popular mythology. It is certainly true that ideas are necessary for innovation, but, as we will discuss, ideas are never sufficient. Company or public policies aimed at stimulating creativity, producing more ideas, or encouraging inventors do a disservice by getting everyone to focus too much on ideas at the expense of adoption. We call this imbalance the invention myth—the belief that invention of new ideas is the key to innovation. The invention myth has led many people down the path to failure in their innovation initiatives.

Then, what is a balanced and holistic view of innovation? The *Eight Ways* framework is our answer.

The Eight Ways Framework

The eight ways are practices that produce eight essential outcomes for innovation. Their names are listed on the wheel of Figure 1. Taken together, these practices define what it means to be a skillful innovator.

The wheel diagram suggests that the practices are not performed sequentially in numerical order. Instead, the innovator moves constantly among them, refining the results of earlier ones after seeing their consequences. It is better to think of the practices being done in parallel. That is why they must be learned as skills. The innovator must be able to do them well without thinking about them.

Figure 1. The Eight Ways depicted as a wheel.

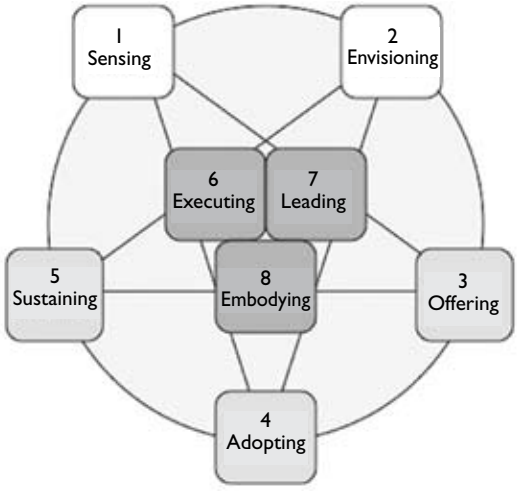


Table 1 provides more detail about the practices. The first two practices are the main work of invention, and the next three the main work of adoption. Although these five tend to be done sequentially, they are, as noted previously, not strictly sequential. Each of the final three creates an environment for effective conduct of all the other practices. The environment is important: the innovator has to execute the innovation commitments, proactively promote the innovation, and be sensitive to how other people listen and react.

The specification of each practice has two parts. The anatomy describes the structure of the practice when it goes well and produces its outcome. The characteristic breakdowns are the most common obstacles that arise in trying to complete the practice. The innovator moves toward the desired outcome and copes with breakdowns that may arise. The breakdowns are not mere annoyances. Coping with them is a normal part of the process.

Example: The World Wide Web

Tim Berners-Lee is widely known for creating the world wide web—*www*—considered one of the great innovations of the 20th century. His parents were both part of the Ferranti Atlas project in England at the University of Manchester in the 1950s. After earning a graduate degree in physics in 1976 from Queen's College, Oxford, he worked as a software engineer at Plessey Systems, a telecommunications company, and then at DG Nash, where he wrote text-processing software for intelligent printers and a multitasking operating system. Berners-Lee was fascinated by a question, first raised by his father, of whether computers could be used to link information rather than simply compute numbers. He went to CERN, the European high energy physics research laboratory, in 1980 with this question on his mind.

Berners-Lee saw a huge disharmony between the actual direction of the Internet and the information-sharing visions

of its pioneers in the 1960s. He felt a burning desire to do something about it. Given his dream about information sharing through linking, the esoteric world of hypertext was an obvious place to look for a key to an information-sharing internet.

In his spare time, he worked on a program called Enquire that could link information on any computer with any other. He began to envision CERN not as a network of separate computers, but as a single information space consolidated across many computers. In 1989 Berners-Lee wrote *Information Management: A Proposal* to create a hypertext system at CERN linking all its computers and documents into a single web from which information could be quickly retrieved from anywhere in CERN. At first his proposal was ignored, but, with help from Robert Cailliau, he gained the attention of CERN's leadership. In 1990 they gave him the go-ahead to make a prototype, which he built on a NeXT computer.

The prototype included HTML, a new markup language for documents containing hyperlinks, HTTP, a new protocol for downloading an object designated by a hyperlink, URL, an internet-compatible scheme for global names, and a graphical user interface. Berners-Lee drew on well-known ideas and practices including Gopher (University of Minnesota's file-fetching system), FRESS and ZOG (hypertext document management systems), SGML (the digital publishing markup language), TCP/IP and FTP (standard internet protocols), operating systems (the global identifier concept of capability systems, which had been on the Plessey computers), and Usenet news and discussion groups.

He posted the first web page at CERN in November 1990. Berners-Lee released and tested browser prototypes at CERN in 1991. He gave his first external demonstration at the 1991 Hypertext research conference, a natural audience for this idea. It was an immediate success and inspired others to build websites. The first non-CERN website went up at the Stanford Linear Accelerator Center in December 1991. Websites began to proliferate; there were 200 in 1993. With the universal free browser Mosaic released by Marc L. Andreesen at the University of Illinois at Urbana-Champaign in 1993, the WWW took off exponentially. During the 1990s, many new industries formed including e-commerce (selling by online stores via web interface), publishing, digital libraries, eBay, Google, Amazon.com, Yahoo, and the internet business boom (and bust).

Berners-Lee had no master plan, business plan, or any other formal document outlining a strategy for the web. Instead, he insisted that all programmers working on web software adhere to a small set of simple core principles: openness to everyone, no single controlling authority, universal identifiers, a markup language HTML, and a protocol HTTP. He steadfastly maintained that these principles were the essence of the WWW—all else would be a distraction. He analyzed all new proposals to make sure they were true to these principles.

Building political support for the web while advancing the web technology became Berners-Lee's central passion. Robert Cailliau helped him build support within CERN. In 1994, he worried that commercial companies might get into a competition over who owned the web, in violation of his core principle of openness. Michael L. Dertouzos *[Massachusetts Beta '64]* at MIT helped establish the World Wide Web Consortium, W3C, modeled after the successful MIT X Windows consortium. This consortium eventually attracted more than 400 companies, which collaborated on development of web standards and tools; it became an engine of innovation for the web. The W3C was an open-software, consensus-based organization that issued non-binding recommendations. The recommendations became *de facto* standards after consortium members adopted them.

He himself refused to set up a private company so that he could benefit financially from his technology. It belongs to the world, he said.

Here is a summary of how Berners-Lee engaged the eight practices:

Sensing

In the 1980s, he saw a disharmony between the actual direction of the Internet (email and file transfer) and its promise (semantic web of all human knowledge). This bothered him. It moved him to do something about it.

Envisioning

He envisioned a system of hypertext-linked documents; any one could link to any other. Mouse-clicking a link would cause the system to retrieve the target document. The system architecture would consist of HTTP, HTML, URLs, and a browser. Common tasks such as scheduling meetings, looking up citations, and getting mail and news would be easy in this system.

Offering

In 1989 Berners-Lee offered to build such a system at CERN. At first his offer was spurned, but with advice from colleagues he reformulated his offer around CERN document-retrieval needs and got permission to build a prototype on a NeXT machine. He demonstrated the prototype at the 1991 Hypertext research conference, got strong positive responses, and solicited implementations of web servers.

Adopting

He visited many sites and attended many conferences to tell people about his system, always soliciting new servers, software, and browsers. Marc L. Andreesen, a student at the University of Illinois at Urbana-Champaign, co-authored and made Mosaic the first universal, easy-install graphical browser in 1993. After that users adopted the web like wildfire.

Sustaining

In 1994, Berners-Lee founded the World Wide Web Consortium, hosted by MIT and CERN, to preserve the web in the public domain by creating open software and standards for the web. Over 400 organizations eventually joined W3C, and it became an engine of innovation for the web.

Executing

He put together programming teams and solicited others to do the same, so that good web software was developed and made available for anyone to use. He set clear principles for design and implementation of all web software.

Leading

At every opportunity, he recruited ever-larger numbers of followers and web supporters. Berners-Lee articulated a small set of guiding principles for web development and stuck with them. He refused to let the web "go private" or to become wealthy from his own invention. He said the cause was too important and too big for his personal considerations to influence.

Embodying

He embodied his set of core principles for the web and practiced them everywhere he went. Through well-designed software and later through tutorials in the W3C, he helped web users to embody the new practices of linking, clicking, and browsing.

Extension to Teams, Networks, and Organizations

The eight ways have been presented as personal skills. They are the skills of serial innovators who are good at all eight.

But what happens if you are strong at several but not all? For example, you could be a good inventor and storyteller, but you dislike anything having to do with offering or adopting. The obvious thing to do is team with others who are good at the practices you do poorly. With effective coordination, the team as a whole can do all eight practices and be positioned for success at its innovations.

The same is true at a larger scale for organizations. A well-designed organization can have people skilled in all the practices and, with good internal coordination, it can become very successful at innovation.

Networks can also be very good at innovation, if they have people who are good at each of the practices and use the network as a means to find each other and coordinate. Open source software communities, such as the W3C, illustrate this.

In all cases, the eight practices are embodied in the innovative individual, team, organization, or network. The eight practices must always be present in order for individuals or collectives to be successful at innovation.

Self Assessment

The eight-practices framework is not only a guide to practice, it is a useful assessment tool. With it, we can gauge our relative strengths and our chronic weaknesses in the practices. A simple version of the detailed procedure in the book is presented below. Make a list of the eight practices, and score yourself from 1 (weakest) to 5 (strongest) on each as follows:

1. *You are not aware of the necessity of this practice.*
2. *You are aware, but have taken no actions to improve your performance of this practice.*
3. *You are taking actions to improve your performance.*
4. *You are satisfied with your performance.*
5. *You are masterful at your performance.*

To have reasonable prospects of success at your innovations, you need a score of 3 or more on all eight practices. Most people with weaknesses have multiple weaknesses. Strengthening your performance in just one practice won't significantly improve your success at innovation. The book gives plenty of details.

The same assessment process can be applied to a team or organization. You just ask how effective is the team as a whole. Similar to individuals, weak teams tend to have multiple weaknesses. Getting the big picture is essential to improving your success at innovations.

Conclusions

Innovation is the adoption of new practice in a community. It is not a mysterious talent, a product of good DNA, a management process, or a flash of genius. It is the outcome of an innovator—individual or team—skillfully performing the eight practices. The eight practices share four main features:

- *They are fundamentally conversations.* Innovators perform them by engaging in the right conversations.
- *They are universal.* Every innovator, and every innovative organization, engages in all of them in some way.
- *They are essential.* If any practice fails to produce its outcome, the entire process of innovation fails.
- *They are embodied.* They manifest in bodily habits that require no thought or reflection to perform.

With these practices, you can take charge. You have the power to transform your ideas into adopted practice. The eight practices are the way.

Dr. Peter J. Denning, *New York Xi '64,* is distinguished professor of computer science and director of the Cebrowski institute for information innovation at the Naval Postgraduate School in Monterey, CA, and is a past president of the Association for Computing Machinery. After receiving his B.E.E. at Manhattan College, he went to MIT, where he earned an M.S. in 1965 and his doctorate three years later. His work at Princeton and Purdue Universities was followed by eight years at NASA Ames Research Center and 11 years at George Mason University before joining the NPS in 2002. *pjd@nps.edu*

Additional Contributors to the 2010 Quasquicentennial AGP

The names of an additional 2,467 Tau Beta Pi alumni who made donations to the Association's 2010 Quasquicentennial Alumnus Giving Program between November 16, 2010, and January 31 appear in two separate listings on the following pages. Added to the 9,162 members whose contributions were acknowledged in the Winter 2011 BENT, *the complete group of donors totaled 11,629. These loyal and generous members gave a record total of $930,258—up 15 percent—with a record average gift of $80, vs. $67.61 last year! Gifts received after February 1* and other gifts designated for the 2010 campaign *do not appear but will be published in the Winter 2012 issue.*

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

Donors' names in the special section beginning on page 28 are arranged alphabetically within their chapters. Names of members who have qualified for the Tau Beta Pi Donor Recognition Clubs are listed only in the first section below. Alumni who are club donors and made gifts of $125 or more are also cosidered members of the 125th Anniversary Club and are noted below with an asterisk. All others who made gifts of $125 or more and certain first-time donors are listed only on page 28 as members of the 125th Anniversary Club.

Names marked with a † symbol are of deceased members in whose memory donations were made either by relatives and friends or through bequests. In addition to the gifts acknowledged here, several were made anonymously through the Combined Federal Campaign or JustGive and are also deeply appreciated. Matching entities are listed on page 31.

Recognition Club Donors

The names of 1,863 Tau Beta Pi alumni appear in this first section. They made donations between November 16, 2010, and January 31, 2011, AND they have also made CUMULATIVE contributions to Tau Beta Pi through the years totaling from $125 to more than $25,000. These, plus the 6,728 names listed in the previous issue, bring the total number of 2010 recognition club donors to a record 8,591, up five percent from the previous year.

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

Matthews Club	*$500,000*	*Alpha Club*	*$25,000*	*Chi Club*	*$1,000*
Nagel Club	*250,000*	*Beta Club*	*10,000*	*Second Century Club*	*500*
Williams Club	*100,000*	*Delta Club*	*5,000*	*Founder's Club*	*250*
Heikes Club	*50,000*	*Zeta Club*	*2,500*	*125th Anniversary Club*	*125*

ALPHA CLUB

NY E *Lynnworth, Lawrence C. '58
RI A Anonymous '72

BETA CLUB

AZ B Myers, Gerald E. '70
CA B *Henigson, Robert '48
*Schlinger, Warren G. '44
CA E *Pappone, Daniel C. '77
CO B *Anonymous '78
IN A *Sarkisian, Nancy L. '77
IA A *Moyer, James H. '51
LA Γ *Kitchens, Philip H. '67
MD B *Clark, A. James '50
NJ Δ *Bezos, Jeffrey P. '86
NY K *Knox, Keith T. '70
NC A *Johnson Jr., James W. '77
TX A Yates Jr., Saint Clair P. '65
TX Δ *Rothrock, Ray A. '77

DELTA CLUB

AL B McDonald, Charles D. '40
CA A *Mleczko, Eugene L. '47
CA Z *Grigsby, David A. '84
CA O *Turhollow, Charles B. '81
CO Δ *Laughlin II, George T. '75
FL A *Bolton, Charles H. '62
*Kalter, Howard L. '66
FL B *Crews, Renard C. '70
IN A *Griffin, Abbie J. '74
LA A *Olivier, Donald A. '51
LA B *Sizer, Phillip S. '47
MA A *Keogh, Brian J. '84
MA Δ *Dranetz, Abraham '44
*Fenton, Harvey A. '58
*Lee, Richard G. '51
MA E *Prendiville, John F. '48
MS A *Scott, Charley '44
MO B *McHenry, S. Dale '81
NH A *Sherman, John L. '54
NJ Γ *Kenney, Thomas E. '70
NJ Δ *Mendelsohn, Andrew J. '77
OK A *Hall, Ralph R. '64
TN Γ *Hall, Kristofer Brian '98
TX A *Brougher Jr., John R. '50
*Knight, P.E., Graham B. '48
TX Δ *Lyon, Robert Y. '50
*Richardson, John E. '71
TX A *Beal, Barry A. '65
VA B *Breeser, Jeffrey W. '83
WV A *Baker, David W. '76

ZETA CLUB

AL B *Acree, Elaine S. '76
AZ B *Story, Franklyn H. '81
*Stout, Roger P. '77
AR A *Biggadike, Robert H. '58
CA A *Meyer, Jack A. '54
CA B *Lippey, Gerald Z. '55
CA Γ Fuller, Robert O. '51
Johnson Jr., Franklin P. '50
*Tyson Jr., USN Ret., James J. '58
Wycoff, Robert E. '52
CA Δ *Davis, John L. '60
Sekimura, Gerald T. '73
CA E *Chow, Chi-Hui Robert '85
*Chow, Hilda C. '85
*Smernoff, Kenneth B. '67
*Tozaki, Ronald Y. '74
CA Z Fisher, Dean L. '75
CA N *Caddock Jr., Richard E. '72
CA Ξ *Hickey, Robert W. '88
CO B *Harris, James R. '68
*Harris, Karen L.W. '74
CT B *Chatfield, Larry A. '71
FL A *Arnold, David Patrick '99
*Arnold, Jennifer Folmar '00
FL B *Tilles, Arno William '84
GA A *Brown III, Emil W. '82
IL A *Fue, Harold '57
*Goad, Thomas C. '55
Pfefer, Bernard L. '47
IL Γ Cook, Stanton R. '49
*White, Robert C. '56
IN A *Barker, Kenneth D. '64
*Buchholz, Richard F. '47
*Sedlacek, Warren R. '45
IN Γ *Buran Jr., Joseph E. '75
Poore, Michael F. '71
IN Δ *Stechholz, Jonathan M. '72
IA A *Faidley, Ph.D., LeVern W. '67
*Feisel, P.E., Lyle D. '61
KS A *Kleist, Robert A. '51
KS B Patton, Robert E. '70
LA A Williams, Colleen D. '82
LA B *Legendre III, Emile J. '60
ME A *Brigham, Ernest B. '53
MA A *Duris, Robert A. '74
MA B *Bardow, Alexander K. '80
*Goldstein, Andrew C. '69
*Ladd, P.E., Charles C. '55
*Poduska, John W. '59
MA Δ Carter Jr., Arthur A. '51
MA E *Sladek, P.E., John R. '77
*Stevens, Janet M. '72
MI A *Spindler, Jeffrey D. '79
MI B *Funk Jr., Clarence G. '63
MI Γ Allaben, Elizabeth A. '79
*Battel, Steven J. '79
*Luchini, P.E., John R. '71
*Padzieski, Robert J. '70
*Simmons, Charles D. '50
MI E *Frye, James H. '51
*Gomulinski, Curtis Dennis '01
Thompson, George W. '55
MS A *Goldsmith, William A. '64
*Pittman, William C. '51
MO Γ Gibbs, Kenneth P. '76
*Rossetti, David J. '74
NJ A *Post, Edwin L. '62
NJ B *Dougherty, Steven P. '64
*Mudie, Samuel H. '62
NY B *D'Avignon, Edward J. '88
NY Γ *Luckett, Larry W. '83
NY Δ *Hart, Marjorie Leigh '51
NY I Dujmich, Louis C. '78
*Judd, Robert P. '78
NY K McKeehan, John H. '46
NY Λ *Abrardo, Joseph M. '72
NC Γ *Anapol, Edward '76
Linker, Edward M. '47
OH B *Throckmorton, Dean W. '82
*Webster, Charles M. '50
OH Γ *Albery, James O. '59
*Ross, Elliot B. '69
OH H Senyk, Joseph M. '67
OH Θ *Abdoo, Richard A. '65
OK A *Morris, Jay K. '81
OR A *Eden, James D. '79
PA B Stockburger, Richard '73
PA E *Babbitt, Walter H. '77
PA H *Hettche, Leroy R. '61
RI A Pritchard, Robert L. '46
SC A Harman, J. Patrick '65
SC B *Bashore, Allen S. '51
*Gibbons, Joseph H. '56
TN A *Cook, James M. '72
*Froula, P.E., James D. '67
Massimini, Michael I. '76
Peishel, Frank L. '61
*Schwerin, Carl J. '48
TN B *Layne, Margaret E. '80
Marianelli, Walter D. '75
*Parrish Jr., Thomas F. '75
TX A *Klump, D. Craig '77
TX Δ *Plank, Michael J. '83
TX H *Schmidt, Robert W. '84
TX Θ *Barrett, Gerald G. '70
UT A *Morrison, Michael George '88
VT B Crawford, David C. '52
VA A *Brown, Lee Merry '88
VA B *Harras, Edgar D. '67
WA B Grossman, Robert J. '59
WV A *Landes II, Junior H. '64
WI A Delucca, Gregory J. '59
*Smith, Rodger F. '64
WI Γ Werner, Jeffrey A. '79

CHI CLUB

AL A Talbot, Thomas F. '52
AL B Bell III, Willis V. '78
Delorenzo, Joseph D. '57
AL Δ *Koelbl, Terry G. '84
AK A *Braun, David R. '74
Cline, John R. '81
Dombrowski, Roger A. '69
Usibelli Jr., Joseph E. '81
AZ A Bailey, Harold E. '71
Da Silva, Eduardo G. '58
*Mensch Jr., William D. '71
AZ B *Davis, John F. '93
Lanzinger, Donald J. '72
CA A Johnson, Albert W. '50
*McCune Jr., Earl W. '79
*Papay, Lawrence T. '65
Ravenscroft, Dewey S. '63
Wilhoite, W. Clinton '85
CA B *Chen, Jeff W. '81
CA Γ *Dohner, John W. '72
*Hardison, R. Logan '57
*Hetzel, Geoffrey O. '82
Marks, Stuart W. '84
Rodriguez, David A. '58
Sansbury, James D. '66
*Ullman, Marc A. '83
CA Δ Slafer, Loren I. '68
Zehrbach, Bill E. '69
CA E Auerbach, Albert '48
Gaunt, Arnold J. '86
*Goss, John R. '52
Gritton, Eugene C. '63

CHI CLUB, CONTINUED

Karagozian, Ann R. '78
Lynch, Lewis G. '54
Woo, Raymond '72
CA Z Going Jr., E. Jackson '49
CA H Burrows, Stanford '63
Herbert, Mark R. '76
*Trebaol, George O. '75
CA Θ *Koblitz, Gordon F. '66
CA Λ Cohn, Stephen G. '70
Dowdy, Mark A. '84
Hafer, Edward H. '70
*Pickles, William R. '80
*Snyder Jr., Roland C. '74
Yamamoto, Ko '84
CA M *Heitkamp, Ross S. '85
CA N Ng, Thomas Y. '71
Ruud, John E. '73
CA O Campbell, William J. '65
Mulvihill, Michael E. '60
*So, Wilson F. '68
*Treinen, James P. '85
CA Π Steinberg, Dennis P. '72
CA P *Owens, Lawrence P. '82
CO B Aerstin, Franklyn G. P. '64
*Bartlett, Paul E. '51
*Colonell, P.E., Joseph M. '58
*Eason, Ernest D. '71
*Otsuki, Steven P. '71
Waite, Joanne L. '70
Wilson, Paul L. '59
Wood, John E. '71
CT A *Fischer, Edward Michael '89
*Hawley, Chester G. '47
McLeod, Christopher K. '77
CT B Pitkin, Edward T. '52
Rinaldi, Biaggio '68
DE A *Kimpel III, Paul H. '70
Levie, Stefan Gerhard '91
*Morrow Jr., John L. '73
DC A Belcher, Wade D. '70
*Gathungu, Peter Maina '93
*Griffin, Earl H. '57
Wen, William '68
DC B Maggio, John J. '81
*Youssefmir, Paul '78
FL A Thompson Jr., John P. '77
FL B Ault, Richard H. '64
Jennings IV, Tipton D. '54
*Slavetskas, James B. '70
FL Γ *Caramalis, Nicholas '75
*Rodgers, John Charles '89
GA A Backhaus, George P. '83
Barber, Brian R. '81
Coons, Louis W. '81
Cooper Jr., Basil P. '65
Hobbs, Linder C. '48
Kaduck Jr., William W. '76
Rogers, Don E. '63
*Snare, Daniel M. '80
IL A *Hefter, Harry Oscar '51
Jones, Douglas W. '80
Kehlet, Alan B. '51
*Kitch, William A. '82
Krupka, John F. '52
Mueller, Thomas R. '85
Ostrodka, David L. '70
Schoenberg, Kurt F. '72
*Schuhrke, Donald K. '55
Zielinski, Edward L. '74
IL B Gurney Jr., P.E., Donald P. '59
McCormick, Thomas J. '60
IL Γ *Aagaard, James S. '53
Bockstahler, Alan J. '54
Cunningham, Richard G. '43
Timmerman, Nancy S. '72
IL Z *Woyna, Mark A. '87
IN A *Carlson, Richard A. '70
English, James A. '57
*Ford, Steven R. '80
*Hanover, Marilyn K. '78
Hooks, Collis C. '64
*McDonald, John D. '73
McGraw, Earle P. '50
Nelson Jr., Wallace E. '58
Peer, George J. '45
*Ricks, Stephen W. '63
Toombs, H. Dean '59
*Yackish, P.E., Thomas M. '60
IN B *Badger, Jerry D. '62
IN Γ Kukla, James A. '72
Mason, James A. '56
*Richter, Richard T. '70
IN Λ Brems, Robert R. '63
Schmalz, Peter B. '69
*Spring, Bradford H. '59
IN E *Hottel, Jerry W. '74
IA A Bookin, Marvin L. '57
Drumm, Alfred W. '64
*Johnson Jr., Aldie E. '47
Reinhardt Jr., William H. '48
KS A Harris, Albert F. '73
Johnson, Lee S. '77
*Knapp, Roy M. '63
Leamon, Richard G. '67
Shankles, Larry E. '69
Timmerman, Robert W. '38
KS B *Wilson, Bryan K. '85
KS Γ Benton, Kirk '78
KY A Dunning, William E. '61
*Feather, Gary A. '80
*Howe, P.E., Richard S. '59
LA A *Comeaux, Ph.D., Keith A. '89
*Compton, Ronald R. '72
Richardson, John D. '72
LA B *Buesinger, Robert F. '78
Mullins, Peter L. '57
Perrin III, Shepard F. '83
LA Γ *Poole, Ronald G. '69
Sigmund, John A. '75
LA Λ *Schmaltz, Joshua B. '94
ME A Atkinson III, Leland G. '78
Garfield, Henry G. '65
MD A Becker, William H. '65
MD B Bromley, Ralph W. '44
*Gold, Irwin L. '49
Kirschbaum, Alan I. '71
*Lambrechts, James R. '73
*Loger, Jaan A. '63
*Rowland, R. Wilson '51
MA A Bernacki, Stephen E. '70
MA B Brandes, Richard D. '57
Clauss Jr., John S. '54
*Dickey, Robert L. '74
Freeman, Reed H. '61
Fries Jr., John E. '48
Heatwole, Antony J. '64
*McKim, Thomas F. '75
Nobel, Sanford M. '58
Pershing Jr., John A. '75
MA Λ *Coutts, Robert B. '72
Harty Jr., Frederick R. '61
Smith, Paul R. '68
MA E Herzberg, Ernst '51
Leach, Harold H. '52
*Noymer, Arthur A. '51
MA Z Gusciora, Kenneth H. '69
Harrison, C. Brett '64
MI A Bonner, Robert C. '60
Colbry, Ph.D., Dirk J. '06
Colbry, Ph.D., Kathleen Luchini '99
*Griffin, Albert W. '80
*Houthoofd, Janet M. '76
Kupfer, Michael D. '83
Willis, George E. '42
MI B Anderson, Walter T. '43
Korpi, Mary B. '76
Sandretto Jr., Peter P. '64
Wacker, Don H. '52
Winn, Oliver H. '42
MI Γ Albrecht, Terry E. '67
Coates, Larry L. '78
Hansen, Charles '46
*Isackson, Robert M. '78
*Liepa, Mark A. '81
Pepper, Julia L. '84
Prescott, Thomas J. '69
Reines, Jose '59
Sanguinetti, John W. '70
*Seidel, David A. '81
Sheets, Alan '81
Stewart, Stephen R. '66
Warner, Caleb '44
Zuk, David M. '70
MI Λ La Bella, Salvatore A. '63
MI E Doughty, Robert E. '65
King, James B. '65
Lewizky, Jury '56
MI Z Lachele, Roger E. '75
MI Θ Garrity, Stephen D. '72
MN A Severson, John A. '72
*Tucker, Randolph L. '83
MS A *McMahan, John W. '67
MO A Crabbe, Emmanuel F. '81
*Myles, M.D., Thomas D. '82
MO B Ash Jr., Richard L. '70
Bondi, James O. '71
MO Γ Fisher, P.E., John W. '56
NE A *Criswell, Marvin E. '65
NV A Wigchert, Albert H. '74
NH A *Dycewicz, Vickie Sue '96
NJ A Schell, Robert D. '74
Schmidt, Arthur J. '68
NJ B *Carey, Mark '77
Cohen, Robert B. '77
Fletcher, Leroy S. '58
Starr, James W. '73
NJ Γ Krumins, Aivars E. '75
Kunyz Jr., Joseph J. '73
Reder, David P. '85
Sharon, Anthony P. '74
NJ Λ Lisle Jr., Thomas K. '69
NM B Gonzales, Michael A. '74
*Lindstrom, Teri L. '81
*Sevier Jr., James M. '96
NY A *McGrann, James M. '84
NY B Bickley, Thomas D. '78
*Carr, Donald J. '77
Eason, Earle D. '61
*Smolowitz, Matthew M. '80
Storrs, Edward L. '81
NY Γ *Borkowski, Norman P. '52
Bornhorst, Bernard R. '60
Cole, Marie Sayre '84
*Gray, Robin B. '46
Hanna, John P. '48
Lequar, James Kay '87
Limlamai, Manit Michael '04
Stallman, Thomas F. '59
Thal Jr., Herbert L. '53
Weinberg, Richard S. '81
Werner, Stuart L. '54
Zonis, Irwin S. '50
NY Λ Feldmann, William C. '84
Jones, Paul S. '51
*Kemp, Thomas W. '59
NY E *Hellman, Martin E. '66
Kammenzind, Henry A. '50
*Lindsey, Mason B. '38
McCaffrey, Ronald W. '52
Niebanck, Charles F. '54
Wechsler, Lawrence D. '55
NY H Levy, Jeffrey M. '74
Schattner, Bernard L. '56
Valcourt, Jean-Mary K. '85
NY Θ Broutman, Charles A. '53
Kelley, F. Douglas '78
NY I Berman, Jay I. '78
*Fischer, George A. '54
Murin, Peter A. '78
NY K Brown, George A. '48
*Moore, Duncan T. '69
NY Λ *Schmitt, Robert E. '71
NY M Czuba, John S. '78
NY Ξ *Kmetzo, P.E., John L. '63
Mathews, Joseph R. '81
Runowich, Carl J. '84
NY Π DeVoe, Charles G. '76
NY P Curran, Paul J. '83
Roldan, Mark J. '85
NC A Baer, Richard T. '63
Crotts, P.E., Marcus B. '53
Gillett, John B. '48
*Walker, Gary K. '70
NC Γ *Vadnais, Paul A. '73
NC Λ *Appel, Richard Joseph '97
OH A Faber, Tracy L. '82
Hartman, David A. '58
*Klinich, Kathleen Desartis '90
*Maxwell, Jack E. '49
Oravec, Joan M. '71
OH B Ehrnschwender, Arthur R. '48
Hamilton, Edward L. '73
Leonard, Ralph A. '59
*Stergiopoulos, James M. '61
Trippel, Omer A. '48
OH Γ *Becher, Charles D. '72
*Guins, Thomas S. '69
Hohman, Charles M. '67
Kinzel, Evelyn S. '69
Kinzel, Gary L. '68
Meyers, Frederick D. '49
Monter, George C. '60
Orkins, James E. '66
OH Λ Moore, Mathew F. '62
OH E *Basta, Edward D. '82
OH Z Frederick, Wm G. D. '58
Novak, Eugene C. '59
Tenney, P.E., Thomas H. '67
Zelms, Charles M. '73
OH H Kohlhaas, Richard L. '62
Reid, James H. '73
OH I Schaffner, Charles R. '74
OH K Krause, Leonard E. '76
Maki, Luke R. '78
OH M *Bowers, Keith Allen '91
*Kelly, Gregory Joseph '88
OK A Quigg-Young, Nancy B. '78
OK B *Hyatt Jr., Sherman E. '72
*Sloley, Andrew W. '81
OK Γ Basore, Paul A. '78
Freese, William E. '50
*Hill, Jeremy Lynn '96
OR A *Andresen, Kenneth W. '53
Geer, Edward D. '52
*Lynch, Stanley C. '73
Milton, Stuart W. '84
Niedermeyer, Rex '77
PA A Barndt, Ronald L. '58
Bechtel, Thomas F. '58
Fowler Jr., W. Beall '59
Hopkins, Richard H. '63
Sherman, William J. '60
PA B Aughenbaugh, Gregg W. '67
Best, William J. '80
Ciuca, James A. '72
*Magnus, John C. '48
*Slocum, Helene Zuber '85
Smyth, John '61
PA Γ *Kavoulakis, Alexandra M. '84
PA Λ *Sheker, Robert E. '91
Sokal, Allen M. '68
PA E Mansfield, Brian David '91
PA Z Hunt, Steven D. '80
*Pennoni, P.E., Celestino R. '63
PA H Gilman, Thomas C. '66
Hotchkiss, Jeffrey R. '69
*Swartz, William E. '54
PA Θ *Daniels Jr., Harold E. '66
*Gigliotti, Michael P. '73
*Reed, P.E., Thomas L. '69
PA Λ *Honath, Mark F. '80
RI A Fancher, H. Brainard '35
Saharian, Alexander '56
RI B Binns, George '59
Luz, James J. '80
SC A *Gratzick, George E. '78
*Roat, Ph.D., P.E., Suzanne D. '85
SC B Calvo Jr., Philip S. '48
McCaskey, Harold O. '79
SC Γ *Attanasio, Roger A. '57
Rogers, Cranston R. '49
SD A James, Karleen K. '86
TN A *Headrick, Mike R. '67
*McCaskey, Suzanne D. '80
St Clair, Edward G. '70
Trundle, Max Don '72
*Vandenbulck, Charles F. '56
TN B Heflinger, Richard S. '72
TN E *Wilcox, Leslie M. '77
TX A Godfrey, Thomas G. '63
Haschke, Chester G. '50
*Herring, David M. '55
Moorman, Charles T. '59
Sweet, Paul A. '70
White, Karen T. '84
*Wilson, Randy Wayne '97
TX B *Bowden, Ronald R. '74
*Rawls, Jerry S. '67
Rossler, Steven W. '73
Stinson, John M. '66
TX Γ Johnson, Terry R. '55
Rachford Jr., Henry H. '45
TX Λ Biard, James R. '54
Knowles, David W. '80
*Rushing, Jay A. '76
TX H *Guinn, Douglas E. '78
Hubbard, James O. '78
Totten, Dwight L. '66
UT A *Eide, Eric Norman '89
*Hull, Wade Alan '97
Reinertsen, John O. '79
VT A *Butterfield, William F. '67
Ketcham, Kenneth J. '68
Paulus, David A. '68
VA A Iachetta, F. Anthony '50
*Wadsworth, Robert M. '82
VA B Carpenter, Joseph A. '63
Doughty, Gary S. '77
Hanley, Thomas R. '67
*Hatfield, Bennett K. '79
Herrington, William A. D. '64
Hughes, Richard L. '78
Long, David A. '91
McConnell, Fred L. '64
Snidow III, Lyle C. '74
VA Γ Campbell, Dale A. '72
WA A Dracup, John A. '56
Eastman, James S. '53
Kinell, Donald K. '64
Matthaei, George L. '48
Matthews, Nancy N. '81
Moerbeek, Peter J. '69
Reichel, Jerel D. '66
WA B Hardan, David L. '65
Langley, Duane D. '55
*Oakley, Fanning T. '53
*Yates, David A. '53
WV A *Blackshaw, George L. '58
Fleischer, Charles J. '70
Mitchell, James E. '61
WV B Cavalier, Tom M. '70
Johnson, Newton E. '75
WI A Yuen, David P-K '73
WI B Grotelueschen, James H. '73
Hosteny III, Joseph N. '67
WY A Fassett, P.E., Gordon W. '74
Gallensky, Neil E. '82
*Hand, M. Maureen '94

SECOND CENTURY CLUB

AL A Hill, Gregory J. '74
Nolen, Bobby M. '75
*Trapane, Karen L. '82
AL B Dodson, Gene A. '57
Gachet, Thomas H. '60
Shields, Clark R. '71
AL Γ Sahawneh, Mary C. '76
AL E *Mincy, John Wayne '70
AZ A Atkinson, Dale R. '86
Berg, Jeffrey R. '93
Hays, Laura L. '87
McLaughlin, Dennis P. '80
*Sacha, Robert A. '82
AZ B *Gayle, William R. '78
AZ Γ Adler, James R. '84
Bruening, Brenda I. '82
Bruening, Gregory W. '80
AR A Hunt, Gary W. '84
*Olejniczak, Kraig J. '87
CA A *Edgar, Timothy Matthew '08
Ong, Allen '70
Woolf, I. David '61
CA B Dryden, Eugene H. '55
*Lee, Roland R. '75
*Mueller, Albert H. J. '47
*Savellano, Mark D. '93
CA Γ Dunham, James G. '73
Hakeman, Darren J. '92
Inouye, Lance M. '68
Landers, Carl F. '88
Mitchell, Donald B. '59
Roodhouse, James G. '59
Root, Steven D. '75
CA Λ *Brandow, Gregg E. '67
*Hamilton III, Edsel P. '72
Mac Millan, Archie J. '56
Shiells, David J. '78
CA E *Beguwala, Moiz '67
Ito, Roy A. '58
Masumura, Robert A. '62
CA Z Benson, Chris A. '84
Cancilla, Charles E. '59
Downey, James B. '62
CA H Battersby, Leslie Charles '98
*Pershon, James M. '79
CA Θ Bach, David P. '69
Gilman, Larry '73
Smith, John M. '70
CA I *Lee, Neil Y. '76
CA K Avetisian, Edward '91
*Sliwoski, Robert H. '75
CA Λ *Stanley, Richard L. '79
CA M *Keiser, Randy J. '73
*Rodgers, Patrick J. '80
CA N Chen, Peter W. '76
Emery, Linda R. '82
Lohman, John S. '82
Schmitt, Thomas G. '74
CA O Fiedler, James M. '78
Fitzsimons, Michael J. '79
Page, John A. '61
Ringel, David J. '71
CA Σ Frankel, Craig A. '86
CA Y Hakimi, Linda B. '86
CO A *Kranzler, Irvin '54
CO B Aronson, Haskell Harold '52
Ashwood, Edward R. '75
Knapp, Barry G. '81
*Luppens, John C. '76
Mueller, Anson G. '49
Murray, William D. '48
Potochnik, Frank S. '50
CO Γ *Hough, H. Vernon '52
Lee, Don E. '59
CO Λ *Fisher, James E. '78
Mehring, James W. '72
CT A Lehman, Jill Fain '81
Lehman, Philip L. '76
Merritt, Richard G. '50
CT B *Ezzio, Louis A. '77
Follette, Jean M. '73
*Johnson, Ethan Blake '05
Leib, David B. '61
*Tylaska, Theodore T. '85
DE A Ferron, John R. '48
DC B *Gaffney, Joseph M. '83
*Lee, Wah H. '73
DC Γ Mayo, Henry C. '60
FL A Byrum, Bruce B. '77
*Edmunds, Robert C. '68
Godwin, Owen L. '61
Hunt, James D. '78
*Passman, Alan Joseph '06
*Reed, David M. '82
Vande Vusse Jr., Gerald '65
FL B Elnaggar, Suzanne '93
FL Γ Barnes, Kathryn G. '84
Lancor, Barbara J. '79
FL H Baran, Thomas Vincent '93
GA A Brown Jr., Harry J. '65
Drawdy, Jean Elizabeth '78
Etheridge, Sara Parrish '89
Layden III, Joseph C. '87
*Negro, James E. '68
*Northington, Peyton A. '78
Parker, Jonathan E. '59
Seay II, Charles T. '63
Smith, Edwin H. '47
Sullivan, Phillip J. '55
Wetenhall, Paul D. '73
IL A Davison, Brian C. '87
Ditman, Jason Blair '91
Dooley, Charles T. '55
Dowden, Douglas C. '73
Flitman, Jeffrey E. '82
Hanus, Daniel J. '86
Kasik, Phillip M. '68
Lattner, Paul D. '55
Peithman Jr., Harlan W. '53
Peterson, Chester M. '49
Pubentz, Lawrence J. '81
Reed, Cordell '60
Reichard, Grant W. '61
Stein, Roger H. '80
Stern, Gene William '98
*Tennery, Victor J. '54
Unikel, Errol '65
Wilhelm, Dale R. '80
IL B Goldsmith, Arthur '37
*Kinast, John A. '79
Knorovsky, Gerald A. '70
Thomas Jr., Stanley R. '72
IL Γ Bryan, Jon J. '61
*Dompke, Richard K. '56
Guest, H. Brandon '81
Haase, John A. '53
Kirshner, Brian M. '82
Miner, Warren P. '59
IL Λ Klasing, Wayne G. '65
Toon, James B. '87
IL E Hopkins, Mark A. '82
IL Z *Liberatore, Matthew W. '99
IN A Bixler, Donald '49
*Boelter, Frederick W. '73
Bullions III, Robert J. '64
Cheesman, Mark W. '81
Cripe, Duane B. '82
Cundiff Jr., Bruce T. '65
Danner, David L. '70
Davis, Duane M. '55
Easto, William D. '79
Egilsrud, Richard L. '81
Fusillo, Pasquale '50
Goette, William E. '56
Golan, James R. '54
Heirman, Donald N. '62
Hendryx, Kevin S. '81
Herendeen, Robert O. '65
Hoshaw, John E. '62
Massaro, Dominic P. '76
Montgomery, Stephen T. '71
Mosier Jr., Andrew C. '78
*Novy, Ph.D., Robert A. '85
Orr, Donald J. '61
Risa, Kristen '69
Roth, Robert H. '72
Rushworth, James L. '58
Shulaker, Edward R. '72
Smith, H. Irvin '56
*Smith, James G. '50
Sosnay, Richard G. '66
Studtmann, George H. '56
Tveter, Steven E. '74
Williams, Kenneth W. '73
Yoder, Norman E. '71
IN B Bonucchi, Joe V. '49
Graham, James H. '72
Johnson, William B. '60
Klaus, R. Alan '53

SECOND CENTURY CLUB, CONTINUED

Laughlin Jr., James P. '49
Osburn, Richard K. '67
Rinker, Robert G. '51
*Waterman, Robert C. '70

IN Γ Hawes, William M. '78
Kast, Steven J. '69
Pastega, Christopher Barry '91
Quadrini, Mark L. '74
Schuster, Gregory M. '77

IN Δ Eisenbart, Thomas R. '78
Hessler, Glenn B. '61

IN E Lund, Stephen R. '80

IA A Allender, Harry L. '61
Henderson, James A. '70
Morse, David S. '52
Sellew, Roger F. '59
Zwiebel, Jeffrey L. '82

IA B Coe, Roger N. '57
Corrao, Debbie G. '93
Rathjen, Keith R. '56
West, Allison K. '81

KS A Black, Arthur G. '70
Burke, John R. '70
Calhoun, Myron A. '63
Johnson, George L. '43
Luttrell, John G. '52
Makawski, Neal E. '71
Massoth, William H. '82
Seamans, David A. '50

KS Γ McKinnis, Steve R. '74

KY A *Bauer, Arthur R. '63
Letton Jr., George C. '57
McIntosh, Rickey D. '75

KY B Hundley, John S. '87
Hundley, Theresa H. '87
Jodrie, Mary Clare '85
Raderer, Thomas K. '73
*Yee, Ngai S. '82

LA A Angelo Jr., Ernest '56
Brack, Karen Guenther '84
Franklin Jr., Duard D. '74
McLaughlin, Edward '56

LA Γ Ball Jr., John G. '61
*Bertsch, Paul J. '79
Davis Jr., John F. '50
*Schuller, Hans E. '77
Sewell, P.E., Curtis R. '69

LA Δ Garber, James D. '66

ME A Degon, Robert J. '66
Jones, Jeffrey A. '75
McKusick, James E. '82

MD A Linaweaver, F. Pierce '55
Powell, P.E., Charles A. '50
*Reynolds Jr., Joseph R. '69
Rochkind, Allen '65

MD B *McMican, Donald G. '76
*Perkins, Michael Joseph '95
Tracey, John S. '74
Whitehead, Edward R. '62

MA A Bujaucius, Gerald A. '79
Carlson, William W. '81
St Louis, Roland R. '52

MA B *Argani, Cynthia Holcroft '92
Bennett, Kenneth Harold '89
Borrmann Jr., George H. '57
Buffleben, George J. '69
Denhard, William G. '42
Dodson, John O. '68
Goldman, Barry '76
*Nelson, Percy L. '47
*Schaffer, Michael J. '63
Smoot, William N. '56
Spradlin, Louis W. '57

MA Δ Colen, Esq., Frederick H. '69
Murch, Robert E. '58
Shaer, Norman R. '58

MA E Concannon, Robert J. '60
Jurczyk, Thomas W. '71
Marini, Robert C. '54
*Travers, Harvey C. '48

MA Z Cain, John F. '61
*Grzeslak, Kazimierz T. '88
Vivaldi, Isadore L. '52

MI A Hudson, Clarence D. '58
Ruhl, Scott Alan '88
Solis, Ruben S. '78

MI B *Bohren, James F. '67
Dejonge, Michael K. '65
Mansfield, Michael G. '76
Smegal Jr., Thomas F. '57

MI Γ Anderson, Richard W. '66
*Beatty III, Howard W. '76
Berno, Jeffrey W. '63
Bloomer, Craig D. '80
Bloomer, Kristine K. '81
Caminer, Morris H. '50
Coats, Keith H. '56
Dembry, Paul E. '82
Earl, George C. '66
Friess, John G. '57
Grants, Valdis '64
Kligman, Mark D. '82
Lugten, John B. '76
Lust, Robert V. '78
Maier Jr., P.E., Edward L. '77
Maker, Pamela A. '81
*Nicols, George '85
Norquist, Warren E. '53
Poy, Alfred Lim '91
Schoenhals, Robert J. '56
Sherman, Larry G. '66
Smith, T. Murray '72
Stagner, Charles E. '86
Stuart, John K. '54
Toliver, Christopher M. '74
Trecha, Theresa M. '81
Van Zweden, John '68
Weber, Michael F. '78
*Weddle, Timothy E. '73
Ye, Eric T. '84

MI Δ Frank, John G. '50
Marino, Joseph A. '72

MI E Mertz Jr., Harold J. '61
Siepierski, Michael A. '80

MI Z Hersh, David A. '70
Morman, Kenneth F. '58
Scarlatelli, Michael G. '76
Zellner, Edward J. '75

MI H Ball, P.E., Harry R. '40

MI Θ Scott, Richard T. '78
White, Robert A. '70

MN A Chapin Jr., George G. '47
McLeod, Gary W. '70
Menne, Brian Joseph '89
Olson, Daniel J. '85
Schwantz, Gary L. '73

MS A Mills, Marvin L. '65
*Reynolds, Billy I. '58
*Wilson, Robert R. '77

MO A Brownfield, David L. '68
Caruthers, James R. '69
Henderson, Betsy A. '84
*Stiefermann, Michael C. '86
Wollschlaeger, Ursula M. '71
Young, Richard O. '62

MO B Bobnar, William B. '75
Cawns, Albert E. '59
Fennewald, Gary J. '73
Hahn, Gail L. '82
Meyer, Gene R. '84
Schmidt, Thomas E. '70
*Zimnick Jr., Harold E. '64

MO Γ Burgi, Charles E. '51
Kilert, Albert H. '63
Lum, Thomas '51
Mills, Robert A. '57
Wildermuth, Amy J. '94

MT A Cissel, Donald W. '50
MacKin, R. Peter '81
Osgard, Dennis M. '62

MT B McDonnell, Kathleen G. '83

NE A Hoffman, Ernest G. '68

NH A Charron, Ronald H. '64
Kieffer, Roger A. '61

NJ A Appuliese, Michael F. '72
Ehrhardt, William C. '68
Hughes, John J. '70
*Murphy, Kevin J. '78
Sussmann, Kenneth P. '72

NJ B Capasso, Michael A. '82
De Witt, Russell '50
Palko, John R. '69
Plant, Stephen I. '65
Wolf, David '65

NJ Γ Gagliardo, Reginald S. '70
*Moeller, Peter A. '78
Padgett, Richard J. '72

NJ Δ Prutzman, Robert A. '72
Wolff, Richard J. '72

NM B Busch, Robert D. '72
*Welter, David D. '78

NY A Bucknor, Norman K. '84
Muller, Philippe C. '83
Silbert, Glenn R. '75
White, Ralph P. '51
Zimmerman, Robert W. '77

NY B Demyanovich, Sara E. '85
Falvo, Louis '59
*Prach, Edwin F. '50

NY Γ Blakeman II, Robert Denis '89
Bruch, Charles G. '59
Butler, Charles W. '50
Fredericks, Robert J. '48
Hall, Kenneth H. '52
Loewy, Robert G. '47
Merdinger, Charles J. '45
Mohr, Wendell C. '53
Sacks, Alexei Hiram '90
*Schultz, Stephen P. '70
*Walczak, Dennis J. '76
Walter, John A. '60

NY Δ Alasti, Ali '84
Kahn, Mindy '89
Sasso, Joseph A. '70
Waring, Michael D. '65

NY E *Eisele, Donald O. '52
Fawcett, William G. '59
*Lee, John H-J '70
Lofaso, Anthony J. '44
Lombardi, Francis A. '70
Pinnes, Edward L. '71
Rosen, Fredric K. '62
*Rubin, Lowell '61

NY Z Parisse, Richard F. '61
*Sindel, Fred H. '59

NY H Bergh, Gerald K. '58
Kopp, Eugene H. '50

NY Θ Taylor, William L. '64
Wesler, Philip '48

NY I Hartmann, Hans G. '70
Hauge, Kenneth '61
*Ronan, Gregory J. '81
Telesco, John C. '69

NY K *Alcaro, Domenic J. '87
Epstein, Benjamin R. '78
Hinshaw, David J. '86
Muller-Girard, Otto T. '52

NY Λ Prono, Eric '88
Silverman, Joel S. '74

NY M Wilcox, Robert E. '73

NY N Gluszak, Timothy J. '88
Havas, Donald W. '67
Lauermann, Mark E. '92

NY Ξ *O'Keefe, Luke F. '80
Steinle, Kathleen S. '77
Storch, Florian J. '61

NY O *Hofmann, Linda '79
Jahelka, Joseph R. '76
Swidler, Susan C. '78

NY Π Drexel, Peter G. '69

NY P Kull, Philip R. '86
Loretz, Richard A. '79
Ward, Gary J. '90

NC A Capps, Dickson M. '75
Davis, John Michael '73
Doggett, William R. '86
*Fitch Jr., Johnny E. '76
*Maybee, Clarion L. '77
Minday, Richard M. '66
Skinner, James O. '73
Timmons, Michael L. '80

NC Γ *Ando, Robert R. '73
Board Jr., John A. '82
Bullard, John C. '47
Chambers, William F. '60
Farst, Douglas E. '79
Flowers III, George H. '65
Hansen, Mikkel A. '78
Moulton, Paul R. '80

NC Δ Hollar, Donna A. '88

ND A Unzelman, Louis R. '69
Vastag, Harold J. '69

ND B *Dehen Jr., James J. '80

OH A Bondor, Paul L. '63
Honious, Robert Todd '89
*May, Ronald A. '83
Michal, Gary M. '75
Thro, Stuart W. '64
Weddell, James K. '76
Zeis, John F. '62

OH B Best, Robert A. '55
*Hufstedler, Andrea Kay '97
*Spires, Richard A. '84

OH Γ Au, Ralph D. '71
Cross, Gordon G. '49
Dyer Jr., C. James '54
Frey, Mary E. '89
Hoover, Thomas E. '56
Joehlin, Stanley W. '60
Kirner-Pribe, Susan M. '85
Nodes, P.E., Scott E. '84
Steiner, William S. '63
Zeller, Hugh J. '66

OH E *Cull, Ronald C. '70
Jayjack, Edward J. '49
Kubinec, William R. '67

OH Z Allman, Susan J. '85
Johnston, David A. '79
Williams, Merrie C. '83

OH H Cole, Neil R. '75
Hagee, G. Richard '49

OH Θ Crispino, David J. '80
Kelly, P.E., John B. '67
Usleman, Robert T. '71
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Wearsch, Michael R. '85

OH I Davis, J. Paul '76
*Schilling Jr., Walter William '97
Strausbaugh, Patrick D. '86

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OK A Shick Jr., Robert L. '66
Spangler, Jon A. '90

OK B *Lambert, Donald C. '94

OK Γ Jones, James F. '84

OR A Marsa, Arnold R. '49
*Robinson, Alan H. '56
Sato, Ben '57
*Smith Jr., Clifford V. '54
Stranahan, Chapman A. '65

OR B *Buchanan, Marlowe J. '92

PA A Bradley Jr., Charles W. '51
Cahoon, Robert L. '43
Camana, Peter C. '71
Haist, Randall M. '80
Jones, Donald P. '65
Link, Roderick W. '44
Morse, Norman L. '40
Parsons Jr., Donald F. '70
Savage, Philip K. '72
*Stockham, Herbert C. '49

PA B Cohen, Bruce A. '72
Cook, William J. '54
Coombes, Bernard F. '55
Foster, Richard D. '55
Gould, James W. '68
Meckley III, Daniel G. '47
Rizzardo, David J. '82
*Thompson, A. Frederick '63

PA Γ Campbell, Ronald C. '54
Gilson, Robert D. '36
Grace, J. Nelson '49
Helfer Jr., Arleigh P. '67
Pierce, Amy M. '80
Rung, Robert D. '50

PA Δ Blecherman, Barry S. '82
*Hagist, Warren M. '48
Heath, Frank R. '51

PA E Batdorf, Harold A. '70
*Hermann, Frank V. '59
Odenwelder, Dale G. '73

PA Z Anderson, John A. '79
Hawn, Charles D. '51
Hill Jr., Albert M. '67
Howe, Howard J. '63
Jastrzembski, Joseph S. '64
Kasoff, David '55
Sarraf, Steven S. '84

PA Λ Andes, John A. '83

PR A *Blasini, Francois R. '82
*Cruz-Zeno, Elvin J. '88

RI A Campbell, Neal S. '68
Chorney, Paul '56
Newman, Gary R. '73

RI B Adamedes, Zoe '84
Fletcher, Gilbert A. '68
Tetreault, David E. '63

SC A Alexander, Samuel D. '73
Scherer, John H. '65

SC B Feldmann, Andrew Russell '89

SC Γ Edwards, Helen T. '57

SD A Stark-Kasley, Lori Ann '82

SD B Bocklund, Lori S. '83

TN A Allen, Mark L. '82
Cavender, James M. '66
*Davis Jr., Fred T. '74
Fraker, John R. '56
Jenkins, Alvin L. '61
Shoemaker, John E. '67
Tarrant, Charles H. '57
Welch, David O. '60
Williamson, James M. '79

TN B *Convery, Thomas Patrick '02
Drago, Joseph A. '65
Green Jr., Thomas B. '75
Morrison, William H. '70
Petersen, Eric S. '84

TN Γ Britton, Thomas C. '88
Crawford Jr., Walter K. '62

TX A Badgwell, Thomas Alan '92
*Baker, William E. '52
Caudle, Brian H. '77
Hugger, P.E., Bodin A. '56
*Marshall, James L. '72
Parma, George F. '85
Porcher, Calvin E. '48
Rusch, Stephen E. '84
Weirich, Robert E. '66

TX Γ Foster, Steven V. '83
Hunter, David G. '79
Smith, John T. '40

TX Δ *Alexander, James W. '49
Barrow Jr., P.E., Thomas G. '85
Bentinck, George C. '76
Crosser, Robert E. '50
Deisler, Paul F. '46
*Franke III, Henry G. '77
Garner, Scott J. '77
*Linn, William R. '81
Madeley, Hulon M. '58
Nuccio, Robert P. '51
Peurifoy Jr., Robert L. '52
Schwierzke Jr., Perry J. '60
Wolf Jr., William M. '65

TX E Badgett, James G. '81

TX H Brown, Ian W. '73
Motley, Edward M. '76
Reid, Thomas A. '65
Rivers, Larry D. '75

TX Θ Foster, Ottis C. '82

TX I Lopez, Norma J. '78

TX K *Mitchell, Fredrick L. '82

UT A Carn, Ronald M. '72
Dewey, William A. '67
Matthews, G. Morris '73

UT B *Enke, Glen G. '62

VT B Berkman, Richard L. '69
Clark, David T. '81
Henry, Thomas A. '70

VA A Anderson, Willie C. '75
Benneche, Paul E. '74
Colonna, James L. '65
Fox, William R. '71
Price, Michael G. '74
Tietjen, P.E., Jill S. '76
Wyant III, Thomas R. '71

VA B Barnes, Edgar E. '68
Dollard, Joseph S. '51
Gresham, James A. '83
Higginbotham, John B. '77
*Nowotarski, Adam A. '91
Painter, Robert A. '48
Wayne, Jennifer S. '83

WA A Chin, Ark G. '50
Follett, Mark S. '74
McHenry, John P. '62
Oiye, Martin Y. '76
Porte, Jeffrey A. '77
Rosen, Donald G. '58
Smith, Jeffrey F. '82

WV A Napier, Richard S. '71
Pellegrin, John D. '73
Tilton, Charles H. '67

WV B Janeshek, Anthony M. '74
Stevens, Ellen W. '84

WI A Christenson, Solveig Ann '86
Diedrich, Donald L. '69
Doeller, David F. '47
Fahrbach, David R. '69
Meister, James R. '78
*Page, Christopher Scott '90
Tennie, John C. '64
Wellauer, John C. '65
Wulff, Kurt H. '63

WI B Brindza, Louis B. '43
Fernandez, Rafael M. '83
Graef, P.E., Luther W. '52
*Hutton, Teresa Jean '91
Jilek, Carol B. '84
Lubinski, Paul J. '87
Mooney, Thomas J. '79
Panning, Martin H. '49
Pickett, Mark A. '72
Sobczak, Nancy L. '70
Sobczak, Robert F. '74
Sullivan, Barry J. '78
Throckmorton, Kenneth L. '45
Wick, Paula B. '81

WI Γ Scherer, Richard A. '74
Simon, Karen A. '83

WY A Lester, Roger N. '87

FOUNDER'S CLUB

AL A Jacks, Thomas E. '93

AL B McLaughlin, Douglas E. '77
Moore, Ronald A. '69

AL Γ Little, George A. '81

AZ A Kamel, Hussein A. '55
La Roche, David F. '86

AZ B Beemer, Jeffrey B. '80
Roberts, Jackson H. '69

AR A Clark, Terence B. '56
Hegeman, Louis E. '65

CA A Dawson, John T. '38
Griswold Jr., Thomas F. '72
Hall, Robert M. '70
Kaprielian, Elmer F. '42
Lee, Chilton '65
Widergren, Steven E. '75
*Yap, Grace H. '81

CA Γ Bateman, Terry S. '58
Grolle, Timothy F. '78
Madden, Christopher J. '85
Nagel, John Frederick '91
Rassieur, Robert T. '79
*Tsukamoto, Kyle S. '81

CA Δ Alting-Mees, Adrian P. '88
*Bates, John S. '65
Fee, Maurice L. '62
Gillman, Lyle '74
*Hughes, Patrick J. '80
Oslick, Harvey R. '87

CA E Brinkmeyer, William H. '60
Goodkin, Mitchell A. '68
Hollar, Ray R. '78
Hong, Phillip Robert '98
Stein, Eugene P. '68
Tamanaha, Howard S. '77

CA Z Knowles, Michael W. '86
Sabbatini, Julian '68

CA H Bahr, Alfred J. '58
Chiu, Roy K. '84
Hughes, Norman L. '74
Rossow, Terry L. '66

CA Θ Hoekstra, Gerben N. '66
Lowe, William W. '79
Mattes, Lyle T. '84
Young, Allen P. '73

CA I *Hill, Robert Charles '89
Kwong, Ray S. '65
Yoshida, Gerald T. '68

CA M *Clark, David James '99
Morrison, J. A. '84

CA N Bales, Deborah O. '77
Lansing, John Robert '79
Pitzer, Allan G. '66

CA Ξ Johnson, Edward C. '87

CA O McGuire, Phyllis A. '80

CA Σ Black, Stephen H. '85

CA T Kiyomura, Rhonda Y. '83
Montgomery, Tami A. '86

CO A *Wolfram Jr., Phillip J. '08

CO B Brueck, Robert L. '59
Gasser, David A. '77
Greene, Christopher S. '73
Grigsby, John L. '49
Hora, Keith Y. '87
Morgan, James I. '55
Walker, John S. '53

CO E *Wolfram, Elizabeth Anne '08

CT A Feinman, David M. '49
Mengwall, Martin Lennart '94
Ronalds, Hugh C. '58
Taylor, Robert W. '66

CT B Berg, Kenneth P. '73
Grossman, Richard L. '69
Pollack, Edward E. '70

DE A Bradley, Kevin Patrick '91
Kissa, Karl Martin '88

DC A Carter, Charles P. '57
Hawkes, Mavis R. '77
Sharpe, Irene W. '63

DC B O'Brien, Amy J. '87
Penafiel, Luis Miguel '76

DC Γ Evins, James B. '85
*Greenwood, Sarah Caldwell '06
Tsakos, Steven '61

FL A Charlton, John D. '72
Lovell, Gilbert H. '82
Milburn, David M. '91
Militello, Sam '61
Tinsley, William C. '77

FL B Gonzalez, Cristina M. '79
Holmes, Martin E. '82
Ross, Martin C. '76

FL Γ Meloy, Robert M. '81
Prosser III, David S. '77
Suter, Bruce W. '72

FL Δ *Curtis, Fred G. '52

FL E Hansen, Christian Michael '88

GA A Jackson, Stephen M. '80
Leathers, James C. '81
Lee, George H. '70
Smith, Stanley C. '56
*Tyber, Harold B. '74

IL A *Bullard, Marshall E. '70
Fitzgerald, Arthur G. '61
Jacobson, Jerome '50
Kareken, Ronald S. '57
Kipp, Lyle D. '86

the heritage society

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

Aagaard, Dr. James S., *IL Γ '53*
† Alford, Henry M., *MS A '27 (Dec'd.)*
† Althouse, Ernest E., *PA A '26 (Dec'd.)*
† Anderson, Marshall, *MI Γ '32 (Dec'd.)*
Anonymous Alumnus, *MA B*
† Arm, David L., *PA E '30 (Dec'd.)*
† Banner, Charles E., *OH Γ '47 (Dec'd.)*
Barnes, Raymond H., *MI Γ '40*
Basta, Edward D., *OH E '82*
Beans, Dr. E. William, *OH Γ '53*
Burns, Carlisle V., *NY A '50*
Budd Jr., Col. Roger, *IL A '62*
Campbell, P.E., Cleveland L., *IA A '47*
Cancilla, Charles E., *CA Z '59*
Colbry, Dr. Dirk J., *MI A '06*
Colbry, Dr. Kathleen Luchini, *MI A '99*
† Curtis, Dr. Richard A., *OH A '64 (Dec'd.)*
† Donoghue, Leonard W., *MA Δ '37 (Dec'd.)*
Dooley, George H., *NH A '53*
† Duenweg, Col. Louis, *IN B '36 (Dec'd.)*
† Dulles, John W. F., *AZ A '43 (Dec'd.)*
Fleming, John R., *IA B '50*
† Forge, Charles O., *CA Γ '56 (Dec'd.)*
Forslund, Donald C., *NJ A '60*
Froula, P.E., James D., *TN A '67*
Fue, Harold, *IL A '57*
Gendron, Roger J., *IL B '55*
Gomulinski, Curtis D., *MI E '01*
† Hanley, Edward P., *IL B '42 (Dec'd.)*
Herke Jr., Frederick P., *OH A '54*
† Heymann Sr., Andrew P., *FL A '39 (Dec'd.)*
Jackel Jr., Henry E., *IN B '57*
Jennings-King, Sherry D., *TN A '93*
Johnsen, Roy L, *MI B '54*
Johnson Jr., James W., *NC A '77*
† Jones, David S., *KS A '49 (Dec'd.)*
Kern, Jack C., *CA K '71*
† Kolff Van Oosterwijk, H.L.J., *CA A '50 (Dec'd.)*
† Liggett, John A., *MI A '43 (Dec'd.)*
Luce, John W., *FL Γ '50*
Luchini, P.E., Dr. John R., *MI Γ '71*
† Lucken, Ernest G., *NY I '42 (Dec'd.)*
McDonald, Capers W., *NC Γ '74*
† Nelson, Thomas A., *CA Δ '49*
Orkins, James E., *OH Γ '66*
Pierce, Russell W., *WA A '70*
† Reed, Dr. Charles E., *OH A '34 (Dec'd.)*
Regula, Dr. Donald W., *MI E '63*
Reinhardt Jr., William H., *IA A '48*
Scheffler, P.E., Paul H., *PA Z '48*
Schmoller, Ralph H., *OH Δ '61*
Schwaller, Tricia E., *SD A '98*
† Scribner, A. Clayton, *NY Γ '29 (Dec'd.)*
Siller Jr., Dr. Curtis A., *TN A '66*
Slafer, Loren I., *CA Δ '68*
Smith, Andrew L., *MS A '48*
† Stechmeyer, John P., *OH E '48 (Dec'd.)*
Stella, Damien F., *AK A '82*
† Strom Jr., George J., *CA Γ '56 (Dec'd.)*
Swanson, P.E., Hilmer S., *WA A '76*
Taber, Norma J., *MO Γ '80*
Tarwater, James P., *MO B '51*
† Taylor, Paul D., *KS A '58 (Dec'd.)*
Teti Jr., John J., *WV B '71*
Tydeman, Frederick J., *CA Δ '73*
White, Robert C., *IL Γ '56*
Widmann, Bradley H., *NY Λ '69*
† Winkler, Albert H., *AZ B '75 (Dec'd.)*
Wisner, Benjamin G., *CA Δ '49*
† Zimmerman Jr., Marlin U., *MD A '44 (Dec'd.)*

Please contact Patricia McDaniel at *tbp@tbp.org* if you wish to be included as a member of the Heritage Society.

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*Reeder, Thomas M. '60
Ross Jr., William C. '86
Wishner, Richard P. '56
IL B Grimm, James E. '60
Kufta, Richard W. '77
Nelson, Herman W. '45
Stocker, Danny L. '86
Xayariboun, Phouvieng '91
IL Γ Derlacki, Walter R. '45
Gosnell, John R. '61
Henze, Edward D. '50
Herman, Richard N. '55
IL Λ Kritzler, Robert W. '70
*Zeller, Sean Michael '92
IL Z Murray, Daniel A. '93
IN A Bach, Gary R. '74
Benson, Linda S. '81
Buck, Robert A. '51
Carter, Eric L. '72
*Davies, John R. '79
Dumakowski, Joe S. '76
Edelsohn, Charles R. '48
Forster, Allen V. '72
Good, Larry D. '67
Horneys, David C. '53
*Kolesar, Gary B. '75
La Duc, John T. '65
Marine, Andrew M. '74
Mills, Michael S. '69
Muzzillo, William A. '81
Noah, Max W. '58
Rayshich, Alexander '48
Russell, James Long '93
Rutz, Mark William '93
Schmertzler, Alvin L. '45
Smith, Gary R. '78
Spitler, Everett E. '53
Stall, Richard J. '63
Toby, Edward B. '77
Welch, Alan J. '71
Wolff, Jay R. '48
IN B Doenges, Peter K. '69
Jones, Philip S. '56
Raff, Barry E. '67
IN Γ Coolahan Jr., James E. '71
Fitzgerald, Edward J. '86
Foley, Dan J. '70
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Prinster Jr., P.E., Joseph C. '76
Walsh, John S. '80
IN Λ Hartman, Richard C. '63
IA A Anderson, Melvin S. '52
Hayes, John O. '66
Johnson, David C. '64
Mehrdad, Mojgan '82
Neumayer, Robert '59
Oguntimein, Gbekeloluwa B. '74
Rowe, Alvin G. '63
Sorensen, John A. '62
Wolfmeyer, Paul A. '66
IA B Braet, Ronald L. '63
Priester, Henry W. '83
Stoughton, Roger L. '59
KS A Blase, Edwin W. '44
Suelter, Leonard G. '58
Vijgen, Paul '87
Watson, Donald R. '83
KS Γ Hakimian, Hekmat '58
KY A Ogden, William R. '65
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Irwin, George M. '55
Robert, Stephen Douglas '03
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La Rocca, Anthony J. '49
Mod, William A. '42
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LA Γ Barron, Tim C. '81
Hall, Freddie R. '56
Sutton, Jerry K. '67
MD A Hanlein, Stuart L. '60
*LaBerge, Ph.D., E.F. Charles '74
Leith, Robert S. '51
Ver Valen, Henry C. '73
MD B Cuesta, Ernesto '71
Gatts, Thomas F. '62
Greville, Edgar M. '67
*Kaminski, Edward '35
Kanofsky, Hal S. '70
Klein, Marshall A. '73
Law Jr., Preston E. '60
Minnis, David A. '72
Ornett, William S. '59
*Schaefer Jr., William J. '70
Sennewald, Perry F. '53
MA A Franke, Gene L. '73
Lescoe, James Terrence '05
MA B Bangser Jr., William '48
Braisted, Paul E. '79
Ciaramaglia, Frederick J. '69
Goren, Leora Michelle '91
Hartzell, Frank C. '53
*Hilbing, James H. '86
Johnson, Timothy L. '68
Margulis, John R. '54
Morin, Gene D. '58
Post, Allen E. '66
Ross, Alexander G. '61
Shinko, Martin S. '72
Zukowski, Charles A. '81
MA Δ Iovanna, Paul R. '78
Levin, Neil '80
Orenstein, Mark A. '66
Raisler, Richard A. '72
Surtees, Robert E. '55
MA E Keys Jr., Lloyd S. '70
*Lyke, Stephen E. '75
Perry, Ronald F. '62
Soulis, Wilbur T. '72
MA Z Guros, Francis B. '75
MA H Garde, Sharon I. '86
Magoffin, Michael A. '88
Salem, Hisham M. '86
MA Θ Moran, James E. '83
*Rathbun, Rebecca '82
*Schultz, David J. '84
Vincent, Gregory F. '83
MI A Baird, Donald G. '69
Golden Jr., August '66
Hole, Kevin Michael '90
Meckler, Carrie Lynn '98
Nastas III, George '66
Su, William Perry '90
Tscharner, Christopher G. '83
Wang, Peggy P. C. '77
Woodruff, Paul H. '59
MI B Klatt, James M. '52
Kranz, Paul R. '63
Whipple, Kristina G. F. '87
Whitman, Brian Edward '92
Zollinger, Howard A. '51
MI Γ Adler, Ronald S. '77
Boettner, Donald W. '62
Byce Jr., Richard C. '51
Dalby Jr., John C. '68
Foulke, James A. '59
Frantz, John A. '75
Gross, Paul H. '83
Kisak, Robert P. '82
Lindeman, Richard J. '49
Malloch, Charles D. '57
Miller, Robert H. '52
Moon, Edward E. '47
Passman, Richard A. '44
Upham, Donald L. '58
Wille, Donald J. '58
MI Δ Trama, Louis A. '73
Youkstetter, Frederick H. '57
MI E Benci, John Edward '83
Price, P.E., David A. '66
*Yee, Jimmy '93
MI Z Long, Jerral A. '80
MI H Chute, Richard '49
Harder, Shawn J. '80
Hurst, Thomas G. '83
MN A Braaten, David L. '75
Felt, Warren A. '49
Larson, Keith A. '84
Rambosek, Thomas W. '76
Wagemaker, Thomas R. '64
MS A Bowers, Emile J. '57
Garnett III, James M. '65
George, P.E., James F. '71
Miller, Elton R. '70
MS B *Miles Jr., John H. '71
MO A Malin, Robert C. '83
Taylor, James S. '77
Van Dyne, David G. '85
MO B Bach Jr., Wilbert E. '50
Jenkins, G. Willard '59
Kopsky Jr., Raymond J. '84
Ramberg, Jeffrey R. '82
Wilreker, Victor F. '72
Wussler, Alfred J. '71
MO Γ Eddy, James D. '80
Ladewig, Scott James '90
MT A Fischer, Douglas A. '74
Petersen, James N. '76
MT B *Einhorn, Elizabeth R. '86
NE A Hofer, Diane J. '82
Langford, Susan Kathleen '90
NH A Furber, Ph.D., P.E., Mark E. '83
Johnson Jr., Carl E. '53
Russell, Earl D. '57
Zecchini, Charles R. '50
NJ A Barrese, Anthony L. '70
Berendsen, Charles G. '51
Boardman, Thaddeus J. '52
*Brigante, Joseph G. '76
Haid, David A. '57
Neill Jr., William J. '47
Ritmeester, Henry J. '45
Wolosky, Irwin S. '68
NJ B Dola, Steven '55
NJ Γ Germain, Dorothy M. '73
Meany Jr., Thomas J. '66
Poliseo, Joseph W. '50
Sutyak, William C. '75
NM B Summa, Christopher D. '90
NY A Feuerstein, Stewart F. '80
Friedman, Morton B. '48
Madia, Joseph '82
Repetti, Ronald V. '57
Richter, Stephen L. '63
Stamm, Robert C. '50
NY B Lavery, Warren T. '67
Leader, Jeffery J. '85
Leader, Margaret E. '85
Leight, David M. '75
Rubinstein, Ian Z. '69
NY Γ Covello, Joseph '63
Greaves, Charles J. '60
Howe, Harlan L. '44
Lenney, Robert V. '62
Walter, Robert W. '64
White, Andrew H. '71
Williams IV, Carter N. '66
Wrobleski, Joseph '49
NY Δ Beaubien, Robert Patrick '90
Gordon, James P. '83
Jeckovich, Stephen '47
Jureller, Steven F. '87
Lazar, Dale S. '74
NY E Goodman, Bruce J. '63
Karger, Walter '54
NY Z Levy, Cesar A. '72
Seider, Warren D. '62
NY H Lu, Peter Yong-Zeng '86
Marks, Robert '45
Shakun, Melvin F. '50
NY Θ Carley, William J. '46
Franz, John W. '70
Free, Albert P. '78
*Kaylor, James M. '88
Lester, John W. '52
Marvin, Mayne D. '80
Schwind, Daniel R. '76
Young Jr., Lloyd W. '66
NY I Ahlman, Lars T. '71
Alia, Bruno L. '71
Charleson, Carl R. '87
Drogin, Barry J. '83
*Eliasoff, Amy L. '59
Ispass, P.E., Alan B. '74
Lerner, Steven L. '75
McCutcheon, William J. '66
NY K Brusil, Paul J. '68
Isaacson, Morton S. '66
NY Λ *Conn, Robert W. '64
NY M Fredlund, John R. '83
Freed, Lisa A. '86
NY N *Arnold, Richard W. '79
Bender, David J. '64
Brady, Dennis Patrick '02
Schaub Jr., Thomas F. '93
NY Ξ Froese, Mary H. '80
Green, Gary P. '71
Haller, Marc F. '85
Mercando, Anthony D. '76
NY Π Fluker, Jon L. '88
Shakshober, Douglas J. '85
NY P Bugliarello-Wondrich, George '51
Lau, Soon '85
Ramos, Dennis J. '03
NC A Bennett Jr., C. Leonard '63
Cutchin IV, James M. '62
Keith, Alan R. '82
Nofziger, Charles L. '73
NC Γ Proctor, James F. '56
OH A Fernbacher, John M. '62
Hartsell, Debra Lynn '90
Holloway, Walter M. '67
James, Michael D. '91
Litzler, Thomas C. '53
Lund, Jeffrey W. '69
Meissner, Robert P. '53
Weber, Sheila M. '90
OH B Greene, Samuel J. '75
Harris, Neil H. '79
Keener, Sumana U. '86
Lenz, Richard R. '66
Meredith, Robert W. '68
Shields, John L. '75
OH Γ Erdman, Robert J. '62
Facer, Roger G. '85

FOUNDER'S CLUB, CONTINUED

O'Neal, Joe E. '55
Rauch, Conrad J. '52
Sattler, Frank J. '62
OH Λ Hupp, William M. '69
Kizlik, Lawrence James '90
Liles, Gary S. '83
McKittrick, Ben J. '60
Poulos, Louis G. '57
*Wuerdeman, Robert C. '69
OH E Fetzer, Monique Bahleda '87
Helmerich, Kenneth D. '83
Nock, Jeffrey E. '80
*Ponchak, George E. '83
Waid, Joseph W. '77
OH Z Gray, Charles D. '59
Mowery, Thomas T. '83
Woeller, Arthur C. '70
OH H Downey, James R. '83
OH K Kult, Milton L. '52
OH Λ *Murphy, Charles J. '77
Selak, August J. '79
OH M Kojola, Gregory Kenneth '89
OK A Brown, Leslie W. '70
OR A Chapman, James A. '58
Gibbs, Bruce F. '79
PA A Albright, Carl H. '55
Branting, Katrina L. '80
Breingan, William D. '51
Engel, Heinz '52
Frey, P. Wayne '51
Kendrick, James F. '69
Swartwout, John B. '73
PA B Martignetti, Joseph F. '78
*Ross, David S. '69
Szkudlapski, Edward H. '79
Trocchio, James T. '82
Warren, Mark L. '81
PA Γ Flaminio, Herman '62
Hall, Thomas J. '49
Lyman, Richard C. '51
PA Δ Anderson, Herbert H. '60
Berger, Bruce S. '54
Besser, Gilbert M. '49
Cavallaro, Joseph R. '81
Chun, Ping Sun '62
PA E Hartsel, James E. '62
PA Z Levonian, Puzant '49
Shaton, George '68
PA H Clarke, Charles W. '86
Coldren, Larry A. '68
Pedersen, Neil J. '74
Stiger, David L. '83
PA Θ Jain, Dilip '83
McElhenny, James E. '70
PA Λ Kaplan, Kenneth J. '84
Kvitkovich, James F. '81
Leiss, Wayne G. '76
Witkowski, Robert A. '85
RI A Clarke, Edward N. '45
Edgar, Richard B. '47
Olding, Duncan R. '55
Salmon, Edward D. '66
RI B Mitnick, Margaret H. '85
Pavia Jr., Robert J. '92
SC A Exley, Slade F. '72
Stecker, Marc K. '82
SC Γ Abbott, Byron A. '68
Fralix Jr., James T. '59
Lindsay, Craig T. '86
Roman, Ronald J. '90
Wall, John Furman '56
Wysockey, Thomas J. '53
SD A Bier, James J. '84
*Kleinschmit, Nathan Irvin '01
Stieha, John K. '80
SD B Packard, Douglas Randall '64
TN A Blazier, Stephen D. '74
Dye, Giles S. '61
Harman Jr., Francis E. '74
Harper, James R. '63
Hodgdon, Richard L. '76
Holmes, Winston H. '85
Hooker, James W. '62
Lacey III, John W. '69
Picquet, Norman E. '50
Robertson, Janet P. '85
Snyder, Kevin Lloyd '93
Utsman, Forrest Mckae '95
*Wheatley, Hubert C. '70
TN B Campbell Jr., Henry G. '59
Cook, George E. '60
Gilbert, George R. '68
Miller, Charles Alan '99
Petersen, Stephanie O. '84
TN Γ Johnson, Philip O. '79
*Patel, Suryachandra S. '74
TN E Climer, Charles E. '82
Orr, Nancy L. '77
TX A Givens, Kent B. '72
*Glasow, Brian Scott '99
Hartman, John Sinclair '64
Loring, Mark P. '87
Tedeschi, William J. '84
TX B Kiesling, Ernst W. '55
TX Γ Caddes, Donald E. '58
Flatt, Robert N. '69
Hobbs, William E. '65
*O'Dell, Stewart C. '78
Tilton, James C. '76
TX Δ Batig, Melissa Megan '98
Carta, James K. '83
Dowling Jr., Cloyd J. '51
Dyson, Norman K. '60
Hillin, Thomas A. '69
Hopper, Bruce L. '67
*Stratton Jr., Jerald J. '86
Zivney, Daniel H. '73
TX E Damoff, Howard A. '84
Smith, Kevin G. '81
Whipple, Richard B. '68
TX Z Kirkland, Robert A. '71
Meyer Jr., Frederick J. '70
TX H Shirazi, Behrooz A. '80
TX Θ Hippenstiel, Ralph D. '72
TX K *Davis, Pamela Walker '79
TX Λ *Garcia, Danny '85
Perez, Romeo R. '82
UT A Piccolo, John F. '58
UT B Hart, Robert E. '73
VT A Wilson, Adam Bertrand '89
VT B Abbott, Walter H. '53
VA A Binder, Ronald W. '74
Keel Jr., Alton G. '66
Reynolds, Albert B. '53
Stickle, Robert L. '54
VA B Cassell II, Ray V. '88
Ernest Jr., Charles L. '70
Myers, Kenneth S. '53
*Reading, Christopher R. '00
Sloan, Forrest E. '83
VA Γ Rausch, Leonard E. '80
Trotter, Vanessa H. '97
VA Δ Peay III, J. H. Binford '62
WA A Christiansen, Walter H. '84
Danielson, Donald H. '54
*Davis, Beverly Z. '80
Haug, Eric V. '76
Levin, Marc E. '80
*Ng, Kim M. '84
Rasmussen, Vernon H. '70
WA B Comstock, Lori A. '78
WA Γ *Hale, Joseph C. '95
*Moss, K. David '76
*Read, Kevin E. '83
WV A Fisher, Ervin C. '68
Kacik, Richard J. '84
Mongold Jr., Guy E. '50
WV B Farmer, Harry C. '70
Howard, Michael Ray '93
WI A Anderson, Kathryn Ann '88
Bligard, Erling J. '48
Detjen, Edson R. '46
Krumpos, John D. '72
Reynolds, Dennis A. '79
Stahl, Kenneth L. '57
Tausche, Paul E. '48
WI B Downing, Robert E. '70
Hause, Lawrence L. '66
Lenz, Marsha J. '86
Lind, Bruce A. '64
McMorrow, Daniel Patrick '98
Pelt, Thomas E. '70
Semrad, Edward V. '49
WI Γ Kestner, Wayne A. '74
Siehr, Tim M. '86

125TH ANNIVERSARY CLUB

AL A Fella, Chad A. '97
AL B Ramsey, James D. '64
AL Δ Brouillette, Chad Michael '03
CA E Farr, Roger D. '78
Green, Robert A. '72
Hou, Victor Tsin '87
CA Θ Garcia, Elias J. '67
CA Λ Bui, Tri Vu Vinh '06
CO B Heimbecher, Reed R. '85
Strange, Lynn M. '81
CO Z Ramstein, Nicole Michelle '09
DC A Karydas, Apostolos E. '62
FL Λ McCreanor, Philip Terrence '97
IL A Bond, Lynn Dierksheide '77
Goetsch, Duane A. '78
IL E Hoelscher, Joshua David '07
IN A Hammond, Joel C. '83
Simpson, Larry L. '60
IN Λ Lange, David A. '80
IA A Slater, John B. '43
IA B Biere, Frederick H. '49
KS Γ Glaze, James B. '75
LA Γ Mixon, Claude C. '79
MA A Bourget, Daniel F. '88
MA B Hong, Liang '06
Levasseur, Robert E. '68
MI B Imbault, James J. '67
Leven, Peter Johannes '93
MI K Florida, David Franklin '90
MN A Bussey, Howard E. '79
MS A Denison Jr., Oscar J. '62
MO A Kusmanoff, Antone L. '73
Sudduth, Kenneth A. '79
MO B Midden III, Henry E. '69
MT B Joyce, Helen O'Connor '90
NJ Λ Aughenbaugh, Jason M. '01
NY B Valdes, Kimberlee Marie '88
NY Γ Detora, David John '92
NY Λ Fung, Johnny T. '81
Hui, Eric C. '90
NY I Palamara, Maria L. '80
NY Z Weber, Oscar W. '61
NY M Levasseur, Amy E. Butterfield '05
NY Ξ Mohan, Anne Elizabeth '09
NY O Baxter, Scott C. '85
NC A De Haas, Cynthia R. '91
NC Λ Baker, Karen Irene '91
ND A McLaughlin, Jenny L. '84
OH A Inderhees, Bryan Paul '03
OH H Cook, Kendra L. Borglum '06
OH Θ McMorrow, Andrew D.M. '09
OH I Kuehne, James P. '77
OK B Petruska, Gregory J. '80
PA B Duca, Sharon Joyce '94
Olinick, Stephen A. '71
Yocom Jr., Harry E. '47
PA Z Michel, Joseph Stephen '03
PA I Kane, William F. '61
SC A Gachago, Njeri Muriithi '09
Lancaster, Harry L. '80
SD A Harts, Dean M. '89
TN A Edwards, Ralph C. '88
Tang, Alice W. '86
TX A Machemehl Jr., Charles A. '57
TX Λ Schultz Jr., Alvin F. '73
VT B Wilcox, Reginald B. '67
VA A Drewry, James E. '60
VA B Roberson, C. Leslie '60
WA A Allyn, Donald C. '59
Baker, Gregory G. '82
Oren, Kjell '79
Schwam, Susan E. '88
WV B Hainer, Victor Keith '00
WI A Colvin, Daniel E. '53
WI B Niggemann, Richard E. '60
Petersen, Joseph W. '86
WY A Reese, David L. '81

In Grateful Appreciation of 2010 Member-Contributors

AL A Novak, Thomas '75
Reamey, Barry Nathan '01
Roper, Daniel L. '78
Troha, John M. '65
Vickers, William K. '88
AL Γ Cato, Douglas R. '84
Ingram, Eddy L. '80
AL Δ Couey, William D. '85
AL E Brown, Michael Lynn '93
AZ A Brusch, Richard G. '65
AZ B Rasmussen, Brenda Kay '91
AR A Logsdon, Rebecca Anne '09
CA A Chew, Richard S. '85
CA Γ Fisher, Benjamin P. '74
Jones, Jesse Daniel '95
Kent, David R. '60
Richardson, John L. '56
Satterlee, Hugh M. '53
CA Δ Fung, Danny H. '87
Thorne, Douglas B. '61
CA E De Leon, Doreen R. '91
Lew, Marshall '71
CA Z Breen Jr., Robert H. '71
Vincze, Arpad '62
CA H Kovalick, Albert W. '72
Paul, Debabrata '91
CA Θ Everson, Robert C. '83
Holdmann, Dale W. '78
Nguyen, Co Trong '89
Price, Don L. '67
CA I Lu, Kenny Cuong Vu '00
Samaras, Thomas T. '59
Tanaka, Kazuro R. '68
CA K Kern, Jack C. '71
CA Λ McGrath, Timothy John '93
CA M Hume, Curtis S. '80
Imhoff, Tim A. '87
Riddiough, Todd N. '96
Taylor, Michael S. '78
CA N Baba, Steven T. '86
Evans, John David '00
Hammond, Timothy N. '74
Nadasdi, Kristof '00
Tougas, Gary F. '79
CA Ξ Hayen, Jeffrey C. '84
Kapral, Richard Everett '88
Libby, Jean M. '80
Morrow, Angela Lynn '97
Reese, Joshua Stephen '07
CA T Emori, Satoru '08
CA Y Eke, Kechy N. '02
CA Ψ Uang, Chia-Ming '77
CA ΑΑ Ferriera, Jacob Lee '05
CO A Darling, Edwin E. '68
McKee, Meghan Rae '06
Miks, Kathryn F. '87
CO B Olson, David R. '79
Roukema, Ralph W. '43
CO Λ Brady, Charles E. '86
De Crescentis, Joseph M. '92
CT A Dranoff, Joshua S. '54
CT B Daunais, Derek Edward '97
Evitts Jr., Joseph K. '80
Riek, Kerry Anne '99
DE A Tybout, Richard A. '43
DC A Pinkney Jr., Lucius '62
DC B Walsh, Brendan Michael '02
DC Γ Diehl, James M. '67
FL A Crowe, Randel A. '70
Douglas, Gavin L. '63
Grau II, Erwin F. '67
Mora Jr., Edward J. '89
O'Steen, James K. '67
Talbot, Michael T. '71
Weber, Steven E. '84
FL Γ Jones, Lawrence Edward '90
Ledford, Gary D. '75
Wieland, Karl H. '68
FL E Ungvichian, Vichate '71
FL Z Mazurek, David F. '82
FL Θ Cabrera, P.E., Mario L. '95
Thompson, Leroy Earl '56
GA A Adams, George W. '53
Andrews, Harry W. '70
Avignone, Frank T. '60
Bayone, Thomas F. '82
Daniel, John K. '70
Ethridge, Noel H. '48
Ewart, James K. '68
Gebhart, Wilford W. '67
Gokcen, Serdar Nusret '92
Hawkins, John P. '67
Hecht, Robert G. '48
Jaklitsch, P.E., James J. '80
Lecroy, Robert T. '83
McGhee, Bryan W. '67
McLain, Donald R. '53
Richmond, Brett L. '69
Simpson, Philip B. '85
Snelling, William E. '79
Sullivan, Francis J. '86
Tyler, Stephen M. '84
ID A Wiegers, Brandy Sue '02
IL A Freeburg, James R. '70
Jacobson, Paul A. '80
Kammerer, Warren L. '80
Maguire, John A. '79
Pollock, Randall J. '71
Stubenrauch, Carl F. '62
Wilton, Donald R. '64
Wynn, Brian J. '77
IL B Dober, Edward J. '53
Goldhaber, Jerome C. '50
Nair, Sudhakar '67
Thompson, William A. '74
IL Γ Borden, Roy H. '80
Dierdorff Jr., Lee H. '43
Ho, Benjamin '87
Iwasyk, John M. '56
Mok, Alvin Peter '98
Rowe, Joanne Sato '82
Stoner, Ryan Jon '03
Williams, Molly Wells '63
IL Z McPherson, Robert '00
IN A Boggus, Robert F. '50
Cutshall, Theodore W. '49
Derrick, David G. '68
Dix, Rollin C. '57
Duffner, Lee R. '57
Halley, Thomas A. '65
Heinrich, Steven J. '90
Kelly, Paul D. '59
Kruse, Alexander Sherman '08
Lafuse, Harry G. '58
Leibach, Raymond E. '51
Long, Harold T. '59
Maxfield, Daniel P. '51
McMillion, Robert A. '81
Minton, Frank A. '44
Moore, Julie Lyn '90
Ogle, Eugene H. '56
Ohlrich, Fredrick D. '70
Redding, Patricia A. '79
Riley, Daniel W. '71
Schaaf Jr., William E. '52
Shimp, Alan B. '55
Stepro, Dennis C. '71
Straus, Leo '49
Thullen, Philip '65
Wunder, Jack S. '69
IN B Dekker, Don L. '61
Pepper, Dennis J. '80
IN Γ Colleran, William T. '83
Holland, Walter B. '72
Kisting, Hilary Elizabeth '99
Longenbaker, William E. '74
Mantey, Philip M. '65
Morrissey Jr., Thomas N. '64
IN Δ Burton, Jacqueline M. '85
Kastman, Kenneth H. '66
Kretzmann, John A. '73
Venstrom, Luke Jerod '07
IA A Eybers, Lance C. '81
Romig, Bernard E. '59
Stuva, Rickie L. '72
Veenstra Jr., Henry R. '71
IA B Bailey, Bruce '65
KS A Cheshire, Paul Alexander '92
Crisler, Robert M. '56
Dyer, Kevin W. '85
Egner, Robert K. '85
Flood, Patricia S. '74
Garfinkle, Jack M. '78
Gaumer, Dale J. '60
Gormish, Michael J. '87
Horner, John M. '70
Laidig, John F. '41
Obrien, Harry G. '59
Ronnau, James F. '85
Solar, John R. '81
Tackman, Norbert E. '61
Wildin, Maurice W. '58
KS B Wentz Jr., William H. '55
KS Γ Gudenkauf, Wayne Anthony '93
Heronemus, Daryl L. '77
Seitz, Ronald J. '84
KY A Emrath, Richard M. '75
Hill, Glenn C. '65
White, Garey L. '51
KY B Miller, Damon A. '89
LA A Bergeron Jr., Sam W. '56
Blum, Joseph F. '65
Bullard, Salem C. '63
Comardelle, Jeremy Noel '01
LA B Quarve, Eric B. '94
LA Δ Easley, Kelley V. '81
Randazzo, Bert J. '92
ME A Miller, Stanley J. '49
MD A Porter, Neil C. '86
Ulanowicz, Robert E. '64
MD B Aberg, John R. '75
Cortina, Michael Ross '08
Gannon, William F. '41
Gray, Donald L. '55
Guess, Arthur L. '49
Ingling, Allen L. '63
Kirk, Kristin Anne '06
Luber, Joseph L. '49
Roberts, Victor D. '64
Silberstein, Morton S. '44
Tyler, Barbara S. '65
MD Γ Heine, Karen Marieke '94
Kolley, Chester M. '85
Obsitnik, Paul E. '86
MD Δ Mensch, Amy E. '07
MA B Anderson, Martin D. '85
Bulzacchelli, John F. '88
Chandar, Venkat Bala '06
Chiappetta, Vincent F. '73
Clark, Thomas N. '51
Harris, Marvin S. '55
Longley, Lester A. '78
Mazumdar, Anirban '07
Michel, Robert C. '50
Penn, Franklin E. '40
Thompson, Hugh A. '62
Torrielli, Luisa Kathleen '98
MA Δ Chave, Robert G. '81
Fisher, Evelyn C. '74
Fogel, Arlene Beck '77
Young, Wendell S. '45
MA E Bauer, Bruce G. '67
Bearse, Harvey S. '56
Darcy, Dennis M. '80
Galante, Pasquale E. '68
Greenleaf, Francis D. '42
Lerner, Herbert A. '50
Lockhart, Newton F. '54
Lynch, Robert T. '61
McKeon, Stephen J. '95
Nordstrom Jr., Carl H. '73
Ricketson, Ralph S. '49
Sheehan, John P. '71
Sorel, Roland L. '82
MA Z Meese, William E. '83
Tanguay, Armand R. '50
Tebo, David L. '88
MA H Diaz, Raymond '84
MA Θ Hansen, Eric Warren '93
MA I Zawacki, David Vincent '98
MI A Conklin, Daniel L. '65
Heinmiller, Wayne R. '80
Vannice, Merlin A. '64
MI B Barnhart, Kent T. '83
Dooley, William D. '81
Hauptman, Donald F. '51
Ilax, Susan B. '77
Klein, Raymond J. '84
Luttinen, Gail L. '68
Phillips, Gerald R. '70
Simpson, Stuart P. '59
MI Γ Ash, Russell A. '51
Badalament, Michael A. '91
Balachander, R. S. '87
Britton, Harold E. '41

DONORS, CONTINUED

Bulleri, Andrew A. '60
Burnham, Lewis A. '55
De Boer, Douglas F. '78
Emrick Jr., William F. '52
Fancher, Paul S. '53
Guisbert, Stephanie Anne '09
Hodges, Paul D. '51
Ipsen, Peter G. '39
Kahwati, Ghassan '64
Knepper, Mark A. '70
LeVine, David M. '63
Miekka, Richard G. '56
Plonka, Francis E. '74
Santini Jr., John Thomas '94
Schultz, Lloyd E. '49
Smedley, John H. '50

MI Δ Adamski, Gerald R. '85
Lott, Adriano P. '63

MI E Gaunt, Frederick W. '67
Gutowski, Ronald R. '76

MI Z Landis, Richard W. '69

MI Θ Dittrich, Gerald S. '86

MI I Schuster, Mike Edward '96

MI K Campbell, Curt Douglas '93

MN A Martin, Bruce Douglas '97
Roth Jr., Charles H. '55

MS A Bethay, Joseph A. '56
Middleton, Carl B. '72
Youngblood, E. Lloyd '52

MO A Amigoni Jr., Alex J. '66
Bade, Darrell D. '73
Campen, Kenneth W. '55
Carroll III, Leo T. '73
Gentry, Sarah M. '88
Sandridge, Jack R. '65

MO B Brockmann, Richard K. '62
Duderstadt, Edward C. '58
Hanser, Andrew David '92
Liescheidt, Brenda E. '78
Riley, Kenneth G. '56
Shank, Donald R. '67
Stocker, Daniel J. '44
Stuart, Robert L. '64
Weese, John R. '74

MO Γ Burns, Steven M. '81
Hironaga, Jon Kenich '90
Matheu, Amanda Lee '99
Mitzel, Kevin R. '95
Patterson, James Glen '99
Vanhouten, Robert '47
Weber, Walter H. '48
Wessling, Donald R. '60

MT A Kleinfolder, Earl O. '53
Leclair, Michelle D. '84

NE A Kaminski, Wayne A. '79

NH A Bickford, M. Dudley '59
Brucker Sr., Paul B. '83

NH B Cloyd, Joseph R. '02

NJ A Holwitt, Eric A. '70
Kottke, William C. '73
MacMillan, Robert N. '52
Maroulis, Alexandros '04

NJ B Kennedy, Robert B. '42
Vosseller, Carol A. B. '80

NJ Γ Balma, Peter M. '75
Busch, Robert E. '68
Della Rovere, Richard '09
Edwards Jr., Andrew '47
Kobylarz, Thaddeus J. '58
† Osiecki, Casimir J. '50

NJ Δ Brosens, Frank P. '79
Moore, James H. '84

NY A Laibowitz, Robert '60
Moody, J. Roger '58

NY B Ponko, Anthony Francis '89
Rzepka, William '64
White, Floyd '42

NY Γ Chow, Francis M. '96
Goldstein, Arthur L. '57
Hughes, Donald J. '50
Jennings, Robert E. '63
Kotzalas, Nick '60
Mesecher, David K. '79
Patsos, Daniel Alexander '05
Peltz, Adrienne Nicole '07
Schmidt, Richard Q. '56

NY Δ Ball Jr., Robert W. '65
Frick, Eric A. '87
Munch, William D. '76

NY E Lokenberg, John A. '69
Magilen, Robert Z. '63
Mennerich, Kenneth A. '65

NY Z Glasser, Alan '74
Keating, Kenneth B. '53

NY H Le, Phuong Dang '90
Schick, Harold P. '49
Stecher, Leonard S. '44
Sugin, P.E., Leonard '55

NY Θ Beckeman, William J. '79
Cliff, Eugene '65
Devoid, Michelle Karen '98
Godlove, Katie Ann '02
St Louis, John G. '74

NY I Lee, William '77
Nelson, Ivan '60
Palamara, Paul J. '81
Ronan, Anne D. '83
Sposili, Robert S. '88

NY Λ Reicher, Myron '70

NY M Johnson, John J. '74

NY N Handley, James R. '82
McHale, Brian Christopher '02
Sheriff, Jawaad Fuad '05

NY Ξ Camello, Anthony '75
Cassidy, Richard James '07
Cleary, Thomas F. '73
Conti, Anthony V. '87
Ehler IV, Frederick G. '86
Stabile, Paul J. '79
Zuccaro Jr., Richard J. '74

NY O Schuessler, Anne Murphy '87
Weiss, Robert A. '86

NY T Su, Susan Shan '01

NY Y McKenna, Dennis Brian '07

NC A Benge, G. Gregory '83
Burton, P.E., William E. '62
Corcoran, Kermit C. '04

ND A Kittock, Mark J. '85
Koch, Robert E. '95
McCormack, Fred E. '76
Mund, Douglas W. '83
Schmidt, Wayne J. '50

OH A Bauer, Wolfgang F. '59
Herman, Zelek S. '67
Ji, Niuniu '01
Marcus, Julius L. '60
Radke, Charles E. '55
Ricart, D. Glenn '71
Roth, Robert A. '42
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Hashmi, Ahsan Abbas '00
Keller, Philip S. '84
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Valins, Fred F. '69
Wilkins, Scott A. '72

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Oatman, Thomas D. '56
Shoemaker, Terry R. '83

OH E France, Chester J. '73
Harrold, James Leon '91

OH Z Randolph, Brian Walter '82
Spicer, Alvin L. '67

OH H Preuss, Carl L. '50
Spector, Marvin '73

OH I Bash, Michelle Lyn '06
Rowland, Benjamin Charles '06

OH K Indorf, Roger L. '84

OH Λ Bindel, Christopher E. '84
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Reedy, William J. '84
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Wilson, Joshua David '06

OH M Clark, D. Keith '97
Michalak, Travis Edward '03

OK A Cramer, Karen F. '80
Moran, Edward W. '61

OK B Kouba, Gene E. '86

OK Γ Flaming, Keith E. '80

OR A Bennett, Edward G. '61
Hashiro, Ryan Rikio '90
Hogue, Harry '51
Lindahl Jr., Ernest R. '73

OR Γ Castellano, Landon Joseph '04

PA A Barba, Peter M. '54
Carnali, Joseph O. '78
Carnali, Leslie G. '78
Danner, Joseph C. '59
Dreyer, Darlene Anne '97
Fertig, James H. '71
Ho, Jasper '77
Kearney, Edward R. '53
Lamparter, Robert W. '72
Minsker Jr., John H. '61
Minter Jr., Edgar F. '57
Schneiders Jr., Francis A. '50
Winter, Howard K. '77

PA B Burley, Brendon Joseph '05
Giel, Paul W. '83
Johnson, Karl B. '79
Kostelnik, Jason Mitchell '09
Okrent, Scott '00
Rindone, Guy E. '43
Rockwell, Wayne S. '49
Stodart, Brandon Patrick '06
Williams, Russell C. '75

PA Γ Bloom, Jeremy A. '73
Gass, Herbert S. '78
Lee, George K. '87
Miley II, George H. '55

PA Δ Bartusiak, R. Donald '77
Clelland, Peter J. '63
Fonseca, Arnoldo M. '00
Oppenheimer, Joel K. '79
Seguritan, Jeffrey Alan '07
Turner, Michael Bryan '89

PA E Cook, Stanley C. '03
Kressler, Durwood R. '51
Quin, James R. '66

PA Z Brown, Kathleen Ann Happ '85
Glaesser, Allan H. '60
Hrebien, Leonid '75
Katz, Joseph R. '55
Kuntz, Jason Paul '95
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Talecki, Stephen A. '76
Woerner, Stephen Joseph '91

PA H Rayeski, Thomas J. '50
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Lange, Elaine A. '76
Rossen, Richard G. '74

TX Δ Allan, David Charles '87
Baskin, Leland B. '74
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Crim, James B. '83
McIver, Jes D. '51
Redding, Billy J. '62
Ward, Jack L. '48

TX E Anderson, Jamaar B. '07
Cooke, Mike P. '76
Pechacek, Linda D. '93

TX Z Harris, Joe M. '70
Mars Jr., James F. '72
Oswald, T. Tristan '09

TX H Bhatt, Tanay Mahendra '05
Fernandez, Marcos D. '85
Read, Edgar L. '71
Scully, Robert Christopher '97
Willman, Michael Damon '90

TX I Gaddy Jr., A. Eugene '50
Hajdu, Allyson A. '86
Somes, Brian '89

UT A Humeniuk, Janice L. '85
Koshevoy, Paul A. '99

UT B Alley, Lynn D. '81
Krieger, Katherine '99

VT A Berryman, Frederick W. '54
Choquette, Jack '90

VT B Komoni, Krenar '06
Pyper, Gordon R. '48

VA A Connery, Michael Daeyang '05
Griffin Jr., Joseph H. '71
Kolodney, Matthew '71
McGrady, Joseph A. '72
Mudd, Courtney P. '65
Pettus IV, William W. '56
Rosen, Mitchel C. '82
Stansell, Thomas A. '57

VA B Bronez, Thomas P. '79
Parrish, Kristin Elaine '02
Rhodes, Marvin D. '63

VA Δ Weidner, Geoffrey Robert '96

WA A Betts, Frank Patrick '90
Blyckert, Warner A. '51
Pendleton, David E. '93
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Tanemura, Steve K. '84
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WA B Owens, William L. '53

WA Γ Renneberg, Daniel F. '82

WV A Blair, John D. '83
Frederick, Timothy S. '93
Gompers, Thomas L. '80

WI A Bell, David Jerome '94
Dillinger, James R. '68
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Melby, Anton O. '48
Nesbitt, John D. '82
Pumper, Fred J. '93
Treptow, Ethan Alan '99
Wachtl, William W. '44
Wendte, James C. '59
West, Robert P. '45

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Grosshauser, Pamela Meilicke '79
Kilker, John G. '41
Lancaster, John T. '61
Schnabl, Val J. '67
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Special Gifts

Special gifts were received in memory of Shawn R. Schwaller, SD A '95, from Edward D. Basta, OH E '82; Dr. Marvin E. Criswell, NE A '65; Edward J. D'Avignon, NY B '88; Curt D. Gomulinski, MI E '01; Wade A. Hull, UT A '97; Matthew W. Liberatore, IL Z '99; Dr. Damon A. Miller, KY B '89; South Dakota School of Mines & Technology; Elizabeth A. Wolfram, CO E '08; and Phillip J. Wolfram Jr., CO A '08. A special gift was received in memory of Edward Kaminski, MD B '35, from Joyce Kaminski Giulian, Joseph A. Kaminski, Susan Kaminski Wilson, and Kathleen Kaminski Towner. Ms. Constance W. Lindsey made a special gift in memory of her father, Mason B. Lindsey, NY E '38.

224 Companies Match Gifts to Tau Beta Pi!

The following 224 companies and foundations match gifts made by their employees to Tau Beta Pi. Their support is gratefully acknowledged by the Association. All matching gifts are allocated to the Tau Beta Pi Fellowship and Scholarship Programs to provide stipends for engineering undergraduate and graduate students. We welcome eight new firms (*).

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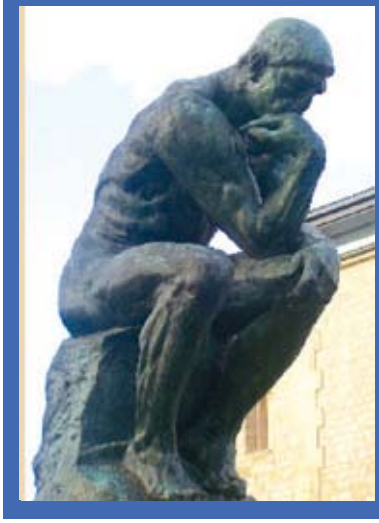
Lyle's Law of Reasons

Card playing has never been an especially popular activity for me, but over the years I have enjoyed a few games of poker, hearts, and some others whose names I don't recall. The game of hearts is fun because it is reasonably simple, involves both luck and skill, and requires a certain amount of strategy. For those unfamiliar with the game, the entire deck is dealt to four players who then play their cards and take "tricks." The object of the game is to avoid taking hearts or, especially, the queen of spades. Each heart counts one point against you; the queen of spades—which has several uncomplimentary nicknames—counts *13*.

There are other features of the game that could make taking the queen of spades a good thing, but usually, it hurts. One friend of mine, when someone stuck him with the queen, would always say, "Now why did you do that?" Why, indeed? Of course, everyone knew the answer. The sticker stuck the *stickee* to help the sticker win and the *stickee* lose. But my friend used the occasion to feign a whine and we all enjoyed a good laugh. That question, however, can provide a lot of insight and should probably be asked more often—not to analyze what we did but to guide what we should do. To this end, I will posit Lyle's Law of Reasons: *If you do things for the right reasons, you will probably do the right things.*

If you do things for the right reasons, you will probably do the right things.



So how do we decide which reasons are right? A few misanthropes might argue that it is not right to feed the hungry or to shelter the homeless, but most people would say those are pretty good motives. At the other end of the spectrum, it is hard to believe that the desire to get revenge or to punish someone could be considered to be noble reasons for doing something. Between these two extremes—feeding the hungry and exacting revenge—things can get pretty fuzzy. What constitutes a right reason or a noble motive? Philosophers have pondered and argued this question for centuries, and I won't be so bold as to try to add anything to the discussion. That's not the point of this law, anyway. We don't need to agree on what is right or on how right something is, because the only reason for doing so is that we could then apply the law to someone else. That's not what this law is for. It is for you to apply to yourself.

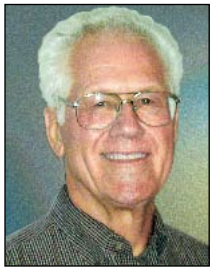
So how do you apply Lyle's Law of Reasons to yourself? It is simple, but it is not easy. We are always told to ask ourselves, "Is this the right thing to do?" This law says that it is even more helpful to ask, "Why am I doing this?" Am I doing this for the right reasons? And you have to be brutally honest. Why are you *really* doing it? And I would suggest that if the word "I" or the word "me" occurs in the statement of your reasons, you need to take another long, long look. Not that you don't have to take care of your own interests. Of course you do. But there is a difference between self-interest and selfishness, and only you can sort that out.

In our work and in our lives outside work, we are faced with many choices. Some are easy; for instance, should I obey the law? Well, of course you should. But it is remarkable how often people can convince themselves that this is a stupid law and probably doesn't apply to them or to this circumstance anyway. And you know, there are times when a law should be disobeyed. Civil disobedience was at the core of what Gandhi and Martin Luther King and, indeed, George Washington did. But those three—and many others—would have passed the test of the Law of Reasons. They had good reasons for doing what they did. The right reasons. And sure enough, what they did was the right thing to do.

Let me hasten to add that just because you are doing the right things, it doesn't mean you are necessarily doing things right. There are many paths that are paved with good intentions, and we know where those paths lead. How often I have undertaken to do the right thing—and for the right reasons—and ended up botching the job. But correcting the problem of my ham-handedness is

best left to laws authored by such luminaries as Peter Drucker and W. Edwards Deming rather than Lyle. I am comforted, though, by having tried to do the right thing for the right reasons. I would rather be criticized for not doing something well than for, well, not doing something.

If I may digress—and of course I may because I am doing the writing—I would like to suggest the application of the Law of Reasons to our criminal justice system. This system metes out various penalties, ranging from fines to public service to incarceration to death. I have often wondered what the system is designed to accomplish; *why* do we assign these penalties? If it is to remove the perpetrators from society so they cannot offend again or to teach the offender that such offenses will not be tolerated, those seem to me to be good reasons. But some penalties, it seems to me, are intended to exact revenge or just to punish because it makes us feel better. These reasons, I would suggest, are not worthy of an advanced society, which I hope we are. And if they are not the right reasons, the penalties we exact may not be the right things to do. It's worth considering.



Once again, as I write these words, I fear that I come off as preaching. That is not my intent. I am as frail as many, more frail than most, and certainly not qualified to preach. I have, however, thought at length about these things and want to share these thoughts with you. And I do believe I am doing so for the right reasons.

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

Cleve's Back!

Cleveland L. Campbell, P.E., *Iowa Alpha '47*, is once again offering to match first-time donations to Tau Beta Pi's Alumnus Giving Program. Any such gift received in 2011 (up to $2,000) will be matched dollar-for-dollar, until we reach $25,000. Past challenges of $10K, $12K, and $25K were met and matched.

Cleve's matching funds are used to create new ΤΒΠ-Campbell scholarships. If you are a first-time donor and would welcome Cleve to match your gift, please send a check (write *"Campbell match"* on it) to Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697, or use a credit card by calling us at 865/546-4578.

Thanks go to Cleve for supporting our scholars and to all loyal donors.

"Mr. and Mrs. Campbell,
Thank you for funding this scholarship. The legacy that you leave is both honorable and long-lasting; it encourages me and my fellow engineers to leave legacies of our own."
—**Joel N. Mehler,** *Kansas Beta '05*
Campbell Scholar No. 4

ANOTHER SPACE BENT

This small Bent, floating weightlessly in front of a window at the International Space Station, was photographed by **Capt. Stephen G. Bowen,** *Maryland Gamma '86*, when he was a mission specialist on space shuttle flight STS-126 during November 14-30, 2008. The Bent belongs to **Dr. Richard C. Rapson Jr.,** P.E., *Indiana Beta '63*, who works for NASA at Kennedy Space Center. Another Bent casting, polished by Dr. Rapson in 1963, traveled aboard mission STS-132 in May 2010.

SPOTLIGHT

New Engineering Degree Peak

The number of B.S. engineering (and computer-science) degrees granted in 2009-10 jumped to 79,528, up by 4,208 (5.3%) from 2008-09 and 1.7% above the previous high of 78,178 in 1985-86.

From the previous year's total (13,420), the number of female graduates climbed by 8% to 14,478, which is 18% of the total degrees and below the record of 20.6% in 1999-2000. The number of female graduates peaked at 15,282 in 2003-04. Data is furnished by the Engineering Workforce Commission.

In the TBΠ class of 2010, the portion of female members slipped to 23.5%—a figure that peaked eight classes earlier at 27.3%. Women comprise approximately one-third of the TBΠ chapter presidents.

Doctorates to Women Double

Some 21.2 percent of the 9,083 engineering doctorates awarded in 2009 went to women.

This is a 33 percent increase from the 15.9 percent mark posted in 2000. Total engineering doctorates grew by over 3,000 during this time, as well. This translates into a substantial raw growth in female Ph.D. recipients.

More than twice as many women received engineering doctorates in 2009 (1,928) than in 2000 (954).

Research Spending Up

Research and development spending by universities rose 5.8 percent in fiscal 2009, with private industry chipping in a small but growing share of the money, according to the latest National Science Foundation survey.

The survey found that industrial research spending rose 12 percent to $3.2 billion from fiscal 2008 to fiscal 2009, while the much larger category of federal spending rose 4 percent to $32.6 billion. There has been some concern from academics that a larger industrial role in funding may create pressure to alter findings.

Changing the Conversation

The Changing the Conversation website, intended to help improve the effectiveness and impact of the engineering community's efforts to communicate to the public about engineering, has been launched by the NAE committee on implementing engineering messages.

The site, *www.engineeringmessages.org*, is part of a project funded by the National Science Foundation that will also result, later this year, in publication of an action plan.

Global Survey

What skills and experiences will today's engineering students need to develop while in school and throughout their careers to compete successfully in today's global workplace?

This question is the focus for a group of corporations affiliated with the American Society for Engineering Education (ASEE) Corporate Member Council, which recently released an online survey aimed at enhancing the preparation, performance, and employability of engineering graduates living and working in an increasingly global context.

MindSET Trains Five Chapters

On December 11, 2010, at the Holiday Inn Laurel, MD, representatives from five TBΠ chapters took part in the first MindSET training and information cluster session.

Dr. Jonathan Earle, Executive Councillor, Ashish Myles, Chair of the MindSET NMC, and Dylan Lane, MindSET Coordinator, led the session. Thirteen members of DC Alpha, DC Beta, MD Beta, MD Delta, and MD Epsilon participated.

The activities included a detailed overview of the MindSET Program, a comprehensive explanation of chapter implementation, a brainstorming and feedback session, and a great opportunity for the chapters to network.

Dr. Anne Spence, MD Delta Advisor, provided useful information about engineering education in the DC/MD area.

Materials were given to all attendees, and the presentation will be updated, and become the master for future MindSET cluster training and information sessions. Tau Beta Pi appreciates the efforts and interest of the volunteers for taking time on a Saturday to learn about the program and position their chapters for implementation of MindSET projects.

2011 ACHS Meeting

Executive Director and Editor James D. Froula, P.E., was the official representative of TBΠ to the 2011 annual meeting for CEOs of the Association of College Honor Societies in Jacksonville, FL, on February 17-19. President of ACHS during 1993-95, he serves on the eligibility committee.

The conference focused on improving society operations. Tau Beta Pi is the only one of the six founding societies still active in the 69-member ACHS. Omega Chi Epsilon was represented by **Dr. Angelo J. Perna,** *NJ Γ'57*, and Omega Rho by **Dr. Yupo Chan,** P.E., *MA B'67*.

PEOPLE

Dr. Carolyn W. Meyers, *North Carolina Epsilon '68*, has been appointed president of Mississippi's Jackson State University. Dr. Meyers has 30 years of experience in higher education, serving most recently as president of Norfolk State University in Norfolk, VA. She earlier served as a program director for the NSF for two years and is a past vice president of the ASME board on minorities and women.

Presidential Early Career Awards

Eight members are recipients of 2010 presidential early career awards for scientists and engineers: **Dr. Jeremy T. Busby,** *KS Γ'95;* **Dr. Virginia A. Davis,** *LA B'93;* **Dr. Dillon D. Fong,** *IL Γ'94;* **Dr. Ryan C. Hayward,** *NJ Δ '99*; **Andrew A. Houck,** *NJ Δ '00;* **Dr. Jerome P. Lynch,** *NY I'97;* **Dr. Trent R. Northen,** *CA Σ'96;* and **Dr. Edo Waks,** *MD A'95*. This award is the highest honor bestowed by the U.S. government on engineering and science professionals in the early stages of their independent research careers.

Rhodes Scholars

Three members are among the 32 American recipients of 2011 Rhodes scholarships. **Jared A. Dunnmon,** *NC Γ '11*, mechanical engineering major; **Jennifer I. Lai,** *MA B '11*, majoring in biological engineering and music and theater arts; and **Varun Sivaram,** *CA Γ '11*, a double major in engineering physics and international relations. All three will continue their studies at the University of Oxford.

Dr. Albert Sacco Jr., *Massachusetts Epsilon '73*, has been named dean of the engineering college at Texas Tech University. The former *Columbia* astronaut had served as distinguished professor of engineering and director of the center for advanced microgravity materials processing at Northeastern University. He was a payload specialist on Space Shuttle mission STS-73 in 1995.

Dr. Bruce A. Eisenstein, *Pennsylvania Zeta '63*, has been named interim dean of the Drexel University college of engineering. He takes over from Dr. Selçuk Güçeri. Dr. Eisenstein is professor of electrical and computer engineering at Drexel and a former president of the IEEE and chair of an NSF advisory committee.

Dr. William R. Goodin, *California Epsilon '75*, director of short-course and technical-management programs for UCLA, has received a 2010 Rodney D. Chipp memorial award from the Society of Women Engineers. The award recognizes significant contributions to the acceptance and advancement of women in engineering.

Dr. Larry A. Kaye, P.E., *New York Epsilon '68*, is ABET president-elect. AIChE's representative on the board of directors for six years, Dr. Kaye retired in 2007 from ExxonMobil research and engineering.

Dr. Bassem F. Armaly, *Iowa Beta '63*, a curators' professor at the Missouri University of Science and Technology, is ABET treasurer.

FACILITIES

Johns Hopkins University's school of engineering has received $30 million for a building where researchers will work on therapies for individual patients and devise systems-based approaches to some of society's biggest problems. The gift is from alumnus **Dr. John C. Malone,** *CT A '63*, chairman of Liberty Media Corp., and is the largest ever to the engineering school. It will fund construction of a 56,000-square-foot research building on the school's Homewood campus.

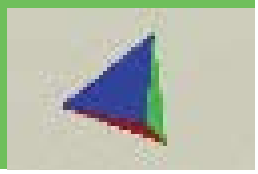
The University of Texas at El Paso has received a $2 million gift for a program that will be a model for teaching engineering. The leadership engineering program includes a broad-based curriculum of engineering design, project management, and innovation, along with an emphasis on business, communication, ethics, and social science. It is expected to launch by the fall of 2012. The combined gift came from UTEP alumnus Bob Malone, president of First National Bank of Sonora, TX, and former chairman and president of BP America, his wife Diane, and Halliburton.

The University of Minnesota announced that the engineering research center for compact and efficient fluid power, based at the Twin Cities campus, has received a four-year, $16 million renewal grant from the National Science Foundation. Industrial partners will augment NSF funding with cash and in-kind contributions, and the center's seven university partners will contribute an additional $3.2 million. More than 30 faculty, 300 undergraduate and graduate engineering students, and 57 industrial sponsors across the country have been involved in the center since its inception in 2006 through an initial NSF grant. More than 25 research projects focus on a variety of fluid-power applications.

The University of Tulsa's college of engineering and natural sciences has announced the naming of the McDougall School of Petroleum Engineering and the creation of two endowments. **Jeffrey J. McDougall,** *OK B '84*, president and founder of JMA Energy Company, announced a $7.5 million gift to underwrite a director to lead the school and engage stakeholders. It also will establish an endowment fund, named for the late **Dr. Kermit E. Brown,** *TX A '59*, to support faculty through salary supplements, research incentives, and future initiatives.

The University of Utah is receiving $5 million from the U.S. Department of Energy to study rock formations and find the best sites to store carbon dioxide underground. The grant went to college of engineering professor Dr. Brian McPherson and his team, who will be evaluating rock formations in Utah and neighboring states. Dr. McPherson says there is sufficient storage capacity in the earth's subsurface to last at least 50 years.

The University of Rochester has announced a new M.S. program in technical entrepreneurship and management for undergraduates with a background in engineering, applied sciences, or mathematics. Like many research universities, UR files dozens of patents each year. However, many of them are filed, perhaps never to be applied in the real world. Administrators created the program to put the college's intellectual property to use in medical devices, consumer electronics, and other applications. The program allows students to review the patent archives, find those that can be turned into profitable technologies, and develop businesses around them. The program is for students with a bachelor's degree in a technical field. One of its founders, vice provost for entrepreneurship **Dr. Duncan T. Moore,** *NY K '69*, believes that many academics aren't comfortable in industry, making it difficult for technologies incubated in universities to enter the marketplace.



Brain Ticklers

RESULTS FROM FALL 2010

Perfect		
*Aron, Gert	IA	B '58
*Bachmann, David E.	MO	B '72
Beaudet, Paul R.	Father of member	
*Brana-Mulero, Francisco J.	PR	A '74
*Christenson, Ryan C.	UT	B '93
*Hess, Richard I.	CA	B '62
*Mayer, Michael A.	IL	A '89
Nabutovsky, Joseph	Father of member	
*Schmidt, V. Hugo	WA	B '51
*Spong, Robert N.	UT	A '58
*Thaller, David B.	MA	B '93
Other		
Achterberg, Karl J.	WI	A '84
Alexander, Jay A.	IL	Γ '86
Bertrand, Richard M.	WI	B '73
*Couillard, J. Gregory	IL	A '89
Dohner, John W.	CA	Γ '72
Edge, Billy L.	GA	A '71
Egenriether, Brian J.	SC	Γ '10
Filippova, Olga T.	PA	Z '09
Handley, Vernon K.	GA	A '86
Harvey, Joseph M.	OH	I '04
Hasler II, H. Victor, II	IN	B '84
Jones, Donlan F.	CA	Z '52
*Jones, John F.	WI	A '59
Jones, McKray	Non-member	
Kern, Peter L.	NY	Λ '62
*Kimsey, David B.	AL	A '71
Lew, Thomas M.	TX	Δ '84
*Lott, Steven R.	MD	Δ '09
Marks, Lawrence B.	NY	I '81
Marks, Benjamin	Son of member	
Marrone, James D.	IN	A '87
Marrone, James I.	IN	A '61
Mastrocola, Naison E.	CT	B '08
Aiudi, Michael E.	Non-member	
Muksian, Robert	RI	B '59
Nishimura, Katsuyoshi	IN	A '51
*Norris, Thomas G.	OK	A '56
*Novak, Lawrence C.	IL	A '85
*Prince, Lawrence R.	CT	B '91
*Pritchard, Leroy J.	MI	Θ '69
Pyers, Dean	OH	Z '84
Quintana, Juan S.	OH	Θ '62
Rasbold, J. Charles	OH	A '83
Schleehauf, Martin W.	NY	N '79
Sigillito, Vincent G.	MD	B '58
Solt, Matthew	Son of member	
*Stribling, Jeffrey R.	CA	A '92
*Strong, Michael D.	PA	A '84
Summerfield, Steven L.	MO	Γ '85
Sutor, David C.	Son of member	
*Voellinger, Edward J.	Non-member	
White, Warren N.	LA	B '74

* Denotes correct bonus solution

BRAIN TICKLERS 60TH ANNIVERSARY!

This spring marks the 60th anniversary of the appearance of the first Brain Tickler (which concerned cutting a rug) in the April 1951 issue of The Bent. Since then, we have presented 1,535 Ticklers and received 11,098 entries from 4,529 different readers (we are indebted to Fred Tydeman and his database for these statistics). Brain Ticklers was initiated by R.H. Nagel, Editor of The Bent from 1942-82 and Secretary-Treasurer of Tau Beta Pi during 1947-82. Bob recruited a judging panel to write the column, and it's been going strong ever since. The column has been a labor of love for the judges with the pleasure expressed by our readers being our only reward. New Spring No. 1 is in honor of Bob, who died in 1997 at the age of 79.

FALL REVIEW

The most difficult regular Fall problem was No. 5 about a girl in a swing, with fewer correct answers than the Bonus about the football punter. No. 4 about four spheres was the second most difficult, with only a couple more correct answers than the Bonus.

WINTER SOLUTIONS

The Winter entries will be acknowledged in the Summer column. Meanwhile, here are the answers.

1 The smallest integer leaving remainders of 1, 2, 3, 4, 5, and 6 when divided by 2, 3, 4, 5, 6, and 7, respectively, is 419. The answer is one less than the least common multiple of 2, 3, 4, 5, 6, and 7 or $2^2 3(5)(7) - 1 = 420 - 1 = 419$.

2 The most senior pirate offers one gold coin to the least senior pirate and a second coin to the third most senior pirate and keeps 98 coins for himself. If there were only one pirate, there would be no problem; he would keep all 100 coins. With two pirates, the senior pirate keeps all the coins because his vote represents half the votes. With three pirates, the senior pirate gives one coin to the least senior pirate and keeps 99; the least senior pirate votes for this, as he gets nothing if the senior pirate is voted down and it comes down to a split between two pirates; the second most senior pirate gets nothing. With four pirates, the senior pirate needs one other vote, so he gives one coin to the next to least senior pirate and keeps 99; the pirate getting the one coin votes for this, as he gets nothing if it comes down to a split among three pirates. With five pirates, the senior pirate needs two votes, so the senior pirate offers one coin to the least senior and one coin to the third most senior pirate and keeps 98 for himself; the pirates getting the coins vote for this settlement, as they get nothing if it comes down to a split among four pirates.

3 My wife shook four hands. When asked how many hands they had shaken, nine people gave nine different answers, and since the most hands anyone could shake is eight, their answers must have been 0 through 8. Assume the person with 8 handshakes is a woman. Her spouse must have shaken 0 hands, for otherwise no one could have 0 handshakes, because she shook hands with everybody else. Next, assume the person with 7 handshakes is also a woman. Her spouse must have shaken 1 hand; otherwise, no one could have 1 handshake, because she shook hands with everyone except the person with 0 handshakes. Similar reasoning shows that the people with 6 and 2 handshakes are a married couple, as are those with 5 and 3 handshakes. Thus, in general, the sum of the handshakes of a person and the spouse is 8. The only unmatched number is 4; therefore, my wife shook 4 hands, as did I.

4 The serial numbers of the two transfers are 98,999 and 99,000. The sum of the digits of two consecutive integers cannot be an even number unless the smaller number ends in 9. Let the two numbers be A and B. Assume A ends in one 9, and let the sum of the first four digits of A be S_4. Then, the sum of the digits of B is $S_4 + 1$. Therefore, $S_4 + 9 + S_4 + 1 = 62$, so S_4

= 26, but this allows for several possibilities, so the answer to the question about the sum of the digits of one of the transfers being between 29 and 39 must have been no, and A does not end in only one 9. If A ended in two 9s, then the sum of the digits could not be even. Therefore, A must end in three 9s; let the sum of the first two digits of A be S_2. Then, $S_2 + 27 + S_2 + 1 = 62$, so $S_2 = 17$, which means the first two digits must be 98, and the two numbers must be 98,999 and 99,000.

5 The eagle is flying at a speed of 21.645 m/s. Consider an xy-coordinate system. Let a vertical line at x_0 represent the flight path of the sparrow, and let the hawk start at the origin. At time t, the sparrow is at $(x_0, v_s t)$, where v_s is the sparrow's speed, and the hawk is at (x, y). Now the slope of the tangent to the hawk's flight path at (x, y) is $dy/dx = (v_s t - y)/(x_0 - x) = p$. Solving for t gives: $t = p(x_0 - x)/v_s + y/v_s$. Also, $v_h t = S = \int_o^x \sqrt{(1+p^2)}dx$. Solving for t and equating the two values gives: $(1/v_h)\int_o^x \sqrt{(1+p^2)}dx = p(x_0 - x)/v_s + y/v_s$. Differentiating and simplifying gives: $\sqrt{(1+p^2)}/v_h = [(x_0 - x)/v_s](dp/dx)$, which upon rearranging is: $dp/\sqrt{(1+p^2)} = [(v_s/v_h)/(x_0 - x)]dx = n\,dx/(x_0 - x)$, where $n = v_s/v_h$. Integrating between 0 and p and 0 and x gives: $\ln[p+\sqrt{(1+p^2)}] = n\ln[x_0/(x_0 - x)]$ or $p + \sqrt{(1+p^2)} = [x_0/(x_0 - x)]^n$. Replacing p with dy/dx and multiplying by dx gives $dy + \sqrt{(1+p^2)}dx = dy + dS = [x_0/(x_0 - x)]^n dx$. Integrating between 0 and x_0 yields $y_c + S_c = v_s t_c + v_h t_c = x_0/(1-n)$, where the subscript c refers to capture. Solving for t_c gives $t_c = x_0/[(1-n)(v_s + v_h)] = nx_0/[v_s(1-n^2)]$. Since t_c is the same for the hawk and eagle, we have $n_e x_{0e}/(1-n_e^2) = n_h x_{0h}/(1-n_h^2)$. Therefore, $20n_e/(1-n_e^2) = 0.5(40)/(1-0.5^2) = 80/3$ and $n_e/(1-n_e^2) = 4/3$. This gives $3n_e = 4 - 4n_e^2$ or $4n_e^2 + 3n_e - 4 = 0$. Solving gives $n_e = [-3 + \sqrt{(9+64)}]/8 = 0.693$, so the eagle is flying $1/n_e = 1.443$ times as fast as the sparrow or 21.645 m/s. The problem can also be solved using numerical integration by computer.

Bonus. Ninety-six different dodecahedrons can be distinguished, with a distribution of 1, 1, 3, 5, 12, 14, 24, 14, 12, 5, 3, 1, 1 for 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 red faces, respectively. We have found no better way of determining this answer than just counting, but one needs to be very careful because of the many possible orientations. Fred Tydeman wrote a computer program which examined all 60 orientations to check for duplicates. MathWorld (*mathworld.com/wolfram.polyhedroncoloring.html*) says that the number of colorings for a dodecahedron is given by $11n^4/15 + n^6/4 + n^{12}/60$, where n is the number of colors. For $n = 2$, this equation gives 96; however, the derivation is too complex to present.

Computer Bonus. The unique solution is $549{,}386{,}721 \times 743{,}816{,}529 = 23{,}439^2 \times 27{,}273^2 = 639{,}251{,}847^2$. The equation $A \times B = C^2$, where A, B, and C are different nine-digit integers each using the digits 1 through 9 exactly once, has 620 solutions, but the solution with both A and B as perfect squares is unique. Write a computer program to look for perfect squares among the 5(8!) = 201,600 nine digit numbers that use the digits 1 to 9 exactly once and do not end in 2, 3, 7, or 8, and save the square roots of the 30 numbers that are perfect squares. Then, check the 30(29)/2 = 435 ways to multiply two of these square roots until you find a product that is a nine-digit number using the digits 1 through 9. A computer can accomplish this task in less than a minute! Email *dondechman_2000@yahoo.com* for a copy of his QBasic program.

NEW SPRING PROBLEMS

1 Solve the following cryptic multiplication, where each different letter stands for a different digit, the same letter always stands for the same digit, and there are no leading zeros. An * can stand for any digit.

```
          RNAGEL
        *******
         RNAGEL
        LRNAGE
       ELRNAG
      GELRNA
     AGELRN
    NAGELR
  RNAGEL_____
  R**N*AG**E*L
```

What is the value of RNAGEL?

—*150 Puzzles in Crypt-Arithmetic* by Maxey Brooke

2 A spider is chasing an ant. The spider is crawling counterclockwise at a speed of 701 cm/min on the circumference of a circle with a diameter of 100 cm. The ant is crawling at a speed of 700 cm/min, also counterclockwise, on a semicircle consisting of the upper half of the spider's circle plus a diameter. At the start of the chase, the ant is at the left end of the diameter and about to crawl along it, and the spider is at the other end of the diameter and ready to start crawling along the circumference of the circle (to which it is restricted). They commence crawling at the same instant. How many complete circuits of the circle must the spider make before it catches the ant? Idealize the problem by treating the spider and the ant as points.

—John H. Cook

3 Doris, the librarian, wishing to fill an empty bookshelf, asked her assistants how many books it would take to fill the shelf exactly. Al said it would take 2 catalogs, 3 dictionaries, and 3 encyclopedias; Bob said it would take 4 catalogs, 3 dictionaries, and 2 encyclopedias; and Connie said it would take 4 catalogs, 4 dictionaries, and 3 encyclopedias. As it turned out, only two of these estimates were correct. Desiring to fill the shelf with only one kind of book, Doris found that only one of the three types would exactly fill the shelf and that 15 of that type were required. Which type of book did Doris use? All the catalogs are the same width, all the dictionaries are the same width, and all the encyclopedias are the same width.

—*Logical Deduction Puzzles* by George J. Summers

4 Take the aces, kings, queens, and jacks from a deck of cards and arrange the 16 cards in a four-by-four square array such that no two cards of the same rank or same suit are in the same row, the same column, or the same major diagonal. How many such arrangements are possible, if rotations and reflections are considered to be the same arrangement?

—*A Gardner's Workout* by Martin Gardner

(Continued on page 42.)

CHAPTER ETERNAL

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

AL A '32 **Rogers, William J.;** March 26, 2009.
'35 **Green, James H.;** September 1, 1999.
'41 **Chapman, William A.;** March 23, 2010.
'49 **Kirk, Bradley S.;** September 19, 2005.
'54 **Stegall, Joseph F.;** July 23, 2006.

AL B '36 **Flanders, Wilmont B.;** May 1, 2009.
'36 **Kuhn, Edmund W.;** October 19, 2004.
'36 **Mixson, James F.;** March 15, 1997.
'42 **Lear, William E.;** January 4, 2011.
'43 **Bagdasarian, Andrew;** July 21, 2010.
'49 **Vann, Robert W.;** January 2, 2011.
'52 **Turnbull, Norman L.;** no details.
'56 **Macoy, Cecil H.;** May 21, 1994.

AL Γ '49 **Green, Paul W.;** no details.

AZ B '73 **Meadows, Joseph R.;** February 2008.
'76 **Stout III, Fred A.;** January 30, 2010.

AR A '36 **Bourland, James F.;** November 28, 2009.
'57 **Holloway, Jesse C.;** March 31, 2010.

CA A '38 **Ludwig, Harvey F.;** April 24, 2010.
'41 **Shackelford, Barton W.;** July 7, 2007.
'54 **Morizumi, Jim S.;** July 28, 2006.
'56 **Barquist Jr., William S.;** June 16, 2009.

CA B '47 **Eggenberger, Byrne;** June 3, 2004.
'48 **Kaplan, Abner;** April 2, 2010.
'48 **Platzek, Richard C.;** December 22, 1991.
'48 **Roehm, Richard M.;** no details.
'48 **Roskowski, Edward F.;** May 30, 2007.
'48 **Stix, Thomas H.;** April 16, 2001.
'48 **Whittlesey, John R. B.;** September 30, 2003.
'48 **Winchester, Robert L.;** June 1, 1997.
'48 **Woodson, William L.;** March 11, 2007.
'48 **Youtz, Byron L.;** January 23, 1992.
'49 **Alexander, Edward L.;** February 18, 1993.
'49 **Bowen Jr., George H.;** November 1, 2009.
'49 **Cohen, Alvin L.;** September 30, 2005.
'49 **Heiman, Jarvin R.;** October 9, 2004.
'49 **Hirschberg, Walter J.;** November 8, 1998.
'49 **Katz, Louis;** no details.
'49 **Morgan, Merle L.;** December 13, 1997.
'49 **Perry, Byrne;** March 17, 1996.
'49 **Stappler, Robert F.;** December 22, 2006.
'49 **Terwilliger, Kent M.;** no details.
'49 **Tryk, Donald E.;** May 28, 2008.
'49 **Turner, Thomas A.;** May 11, 2008.
'49 **Walquist, Robert L.;** July 20, 2008.
'49 **Waters, Robert R.;** July 19, 1994.
'49 **White, Jack L.;** February 20, 2002.
'50 **Cooper, Duane H.;** April 4, 1995.
'50 **Fox, Carl E.;** no details.
'50 **Gage, Boyd M.;** no details.
'50 **Gerhart, James B.;** February 20, 2007.
'50 **Goodwin, Lester K.;** November 11, 2002.
'50 **McCaldin, James O.;** November 23, 2001.
'50 **Odgers, Irving L.;** March 26, 2006.
'50 **Picciotto, Roger;** April 11, 2007.
'50 **Sellen Jr., John M.;** no details.
'50 **Soule Jr., Winsor;** May 19, 2009.
'51 **Beebe, Wayne M.;** no details.
'51 **Peck, Dallas L.;** August 15, 2005.
'51 **Sweet, Sanford S.;** January 29, 1995.
'51 **Taylor, Richard B.;** February 4, 2004.
'52 **Helmuth, James G.;** September 13, 1998.
'52 **Orville, Philip M.;** no details.
'52 **Russell, Thomas L.;** January 16, 2010.
'53 **Jacobs, Earl D.;** July 3, 2008.
'54 **Speiser, Robert C.;** July 10, 2009.
'55 **Crowther, David L.;** no details.
'55 **Grotch, Stanley L.;** October 10, 1995.
'56 **McHorney Jr., Paul E.;** July 13, 2005.
'57 **Petersen, Walter A.;** September 29, 2001.
'59 **Baicher, Vladimir V.;** September 28, 2009.
'59 **Chandos, Robert E.;** no details.
'59 **Milder, David M.;** December 12, 2009.
'60 **Munson, John H.;** no details.
'62 **Noble, Julian V.;** March 11, 2007.
'64 **Weis, Joseph H.;** no details.
'66 **Holford, Alden D.;** September 7, 2004.
'67 **Robel, Michael C.;** November 14, 2005.
'68 **Chapyak, Edward J.;** March 2, 2004.
'70 **Markert, Thomas H.;** June 19, 1996.
'77 **Lydick, Carl J.;** August 23, 1996.
'85 **Aronson, Lewis B.;** August 25, 2009.
'88 **Esquivel, Manuel S.;** December 1, 2002.
'89 **Bonenfant, Paul A.;** September 27, 2010.

CA Γ '36 **Kay, James S.;** May 4, 2003.
'36 **Russell, John D.;** February 4, 1996.
'36 **Stice, Tod E.;** January 11, 2006.
'37 **Prewett, Charles W.;** June 6, 1996.
'37 **Ward Jr., John M.;** April 29, 2009.
'38 **Lebenbaum, Matthew T.;** January 15, 2006.
'38 **Morrill, John R.;** no details.
'38 **Raffin, Bennett L.;** May 2, 2002.
'38 **Rieben, Thorburn R.;** March 14, 2009.
'39 **Bohr, Donald W.;** April 12, 1999.
'39 **Oswald, Telford W.;** July 5, 2009.
'40 **Carley, Ralph G.;** January 16, 1994.
'40 **Oakford, Robert V.;** February 11, 2008.
'40 **Prewett, Merritt M.;** August 30, 2005.
'40 **Rice Jr., Rex;** May 16, 2004.
'40 **Smith, Wayne W.;** March 4, 2001.
'40 **Soderman, Robert A.;** December 11, 2006.
'41 **Dodge, Robert L.;** May 29, 2010.
'41 **Hallingby, Paul;** June 1, 2005.
'41 **Love, Robert F.;** February 24, 2006.
'41 **Moreno, Theodore;** March 5, 2005.
'41 **Ogilvie, Hughes W.;** January 11, 2004.
'41 **Saveker, David R.;** November 4, 1999.
'42 **Bradberry, Carroll E.;** no details.
'42 **Hammett, Robert L.;** October 11, 2002.
'42 **Hoffman, DeBremond B.;** March 1, 1990.
'42 **Springmeyer, Robert L.;** no details.
'43 **MacHarg, Joseph F.;** August 9, 2008.
'43 **Pefley, Richard K.;** October 6, 2009.
'43 **Tompson, Gilbert C.;** February 8, 1996.
'44 **Ponsford, Henry T.;** May 11, 2009.
'44 **Van-Dorn, Nicholas H.;** May 15, 2006.
'46 **Woods Jr., Phineas S.;** November 2, 2000.
'47 **Alden, Daniel L.;** February 13, 1992.
'47 **Byington, Preston W.;** August 26, 1995.
'47 **Holmlund, Arthur V.;** July 12, 1990.
'47 **Kemple, Joseph N.;** July 13, 2004.
'47 **Rensch, Joseph R.;** March 21, 2003.
'48 **Bourne, William H.;** May 31, 1992.
'48 **Cornwall Jr., Edward A.;** March 31, 2003.
'48 **Huynen, J. Richard;** March 11, 2007.
'48 **King, Donald;** January 5, 1994.
'48 **Martineau Jr., Carl P.;** no details.
'48 **Nothwang, George J.;** July 3, 2009.
'48 **Paine, Samuel M.;** November 27, 2001.
'48 **Robbins, Charles H.;** May 24, 2010.

'50 **Critchlow, John B.;** May 22, 2008.
CA Δ '35 **Gish, Rollin E.;** October 25, 1997.
'50 **Sanematsu, Henry S.;** February 16, 2007.
'55 **Klumb, Fred R.;** October 30, 2010.
'58 **Alexander, Paul A.;** July 2010.
'58 **Unt, Hillar;** January 28, 2010.
CA E '72 **Cranmer, Douglas R.;** no details.
CA Z '36 **Markle, Gerald E.;** September 26, 1996.
CA I '01 **Casiano, Wendy B.;** September 2, 2010.
CO B '35 **Osborn, Robert M.;** May 16, 1995.
'40 **Harris, Robert B.;** April 27, 2003.
'43 **Krill, Arthur M.;** January 9, 2011.
'45 **Beck, Niels J.;** January 8, 2011.
'47 **Arnett, Robert W.;** November 11, 2010.
'47 **Cohn, Peter J.;** October 25, 2009.
'53 **Modeer, James R.;** January 21, 2003.
'61 **Greenbaum, Irving;** August 13, 2010.
CO Γ '59 **Liquornik, David J.;** February 2, 2008.
CT A '46 **Scarola, John A.;** June 22, 2006.
'48 **Didriksen, Caleb H.;** no details.
'71 **Williams, James M.;** no details.
DE A '49 **Clements, James B.;** January 9, 2010.
DC A '61 **Marsh Jr., Alphonso H.;** January 9, 2011.
DC Γ '63 **De Vilbiss, George E.;** January 19, 2010.
FL A '36 **Bussey, Arthur S.;** September 8, 2010.
FL B '68 **Cernautan, Nick C.;** October 27, 2010.
'69 **Faxas, Manuel;** February 4, 2009.
'92 **Alford, Gregory R.;** February 11, 2003.
FL Γ '45 **Brown, John L.;** January 16, 2011.
GA A '30 **Hall Jr., Thomas H.;** September 24, 2008.
'34 **McGraw, Alexander H.;** February 16, 2010.
'34 **Shockley, Thomas R.;** August 19, 1991.
'36 **Castles, Walter;** April 30, 1994.
'36 **Gibson, Sam T.;** September 20, 1999.
'36 **Hill, John J.;** October 26, 2000.
'36 **Li, Fon;** August 25, 1995.
'36 **Lyons, Vernon E.;** May 11, 2009.
'36 **Sachs Jr., Ward H.;** May 26, 2002.
'36 **Sams, Hansford;** August 17, 2005.
'40 **Person Jr., Charles E.;** February 8, 2010.
'44 **Ramage, William W.;** no details.
'49 **Lane, George M.;** July 15, 2010.
'53 **Blandin Jr., Sherman W.;** January 23, 2003.
'57 **Ward, Arthur B.;** December 23, 2009.
'65 **Woodward, Roger P.;** July 22, 2008.
IL A '35 **Levy, Albert M.;** December 5, 1991.
'36 **Sprengel, Herbert J.;** May 19, 2000.
'45 **Hamer, Donald W.;** no details.
'54 **Peterson, Leavitt A.;** August 2, 2010.
'61 **Waterman, William F.;** June 10, 2010.
'81 **Nitchals, David R.;** November 25, 2010.
IL B '49 **Abbott Jr., William H.;** May 29, 2010.
'50 **McKee, Keith E.;** May 1, 2010.
'52 **Garzotto, John J.;** January 9, 2011.
'59 **Mallory, Edward T.;** December 14, 2010.
IL Γ '36 **Kerr, William S.;** January 31, 1998.
'39 **Meserve, Hugh B.;** April 18, 2001.
IL Δ '47 **Abegg, Martin G.;** April 21, 2010.
IN A '29 **Riggs, Herman G.;** April 29, 2010. *[Centennarian 78]*
'31 **Sherwood, Edwin T.;** September 8, 2010. *[Centennarian 70]*
'33 **Cordier, David E.;** February 12, 1992.
'34 **Munch, Hans E.;** August 16, 2010.
'35 **Cunningham, John C.;** March 24, 2005.
'35 **Moore, Floyd R.;** March 24, 2004.
'36 **Bellows Jr., Guy;** April 7, 2003.
'36 **Keenan, Howard U.;** August 17, 2002.
'36 **Null, Robert B.;** October 27, 1996.
'37 **Petticrew, Charles R.;** April 1, 2008.
'37 **Wearly, William L.;** April 30, 2010.
'41 **Thompson, Kenworthy J.;** March 6, 2009.
'42 **King, George W.;** January 22, 2010.
'42 **Merrill IV, Harvie M.;** February 19, 2010.
'44 **Brown, Neuberne H.;** June 30, 2003.
'44 **Finlayson, John B.;** February 19, 2010.
'44 **Jeude, Oscar A.;** August 1, 2009.
'45 **Haynes, William B.;** no details.
'46 **Schmidt, Donald E.;** no details.
'46 **Suhling, Edward C.;** November 28, 2010.
'47 **Golden, Norman H.;** December 3, 2010.
'47 **Hansen, Arthur G.;** July 5, 2010.
'47 **Micklich, Frank T.;** February 27, 2010.
'48 **Gunkler, Albert A.;** January 14, 2011.
'56 **Klenke, Gerald H.;** January 5, 2011.
'56 **Mueller, Charles F.;** May 26, 2010.
'58 **Kraemer, Paul E.;** November 24, 2010.
'58 **Schramm, Harold J.;** June 28, 2004.
'58 **Van Hook, Robert D.;** October 29, 2009.
'59 **Sargis, David A.;** November 11, 2009.
'64 **Carwell Jr., Ivan L.;** May 19, 2010.
'65 **Reed, James R.;** March 13, 2008.
'73 **Gregg, Raymond D.;** August 18, 2010.
IN B '59 **Sonner, Jan R.;** December 8, 2010.
IN E '08 **Waterman, Brian G.;** December 16, 2008.
IA A '33 **Carpenter, Thomas J.;** September 20, 2010.
'35 **Baker, Marvin A.;** March 21, 2001.
'36 **Campbell, Allen R.;** June 10, 2006.
'36 **Cooper, Clayton H.;** February 10, 1998.
'36 **Gerald, Curtis F.;** September 11, 2010.
'36 **Hull, Hugh G.;** November 15, 1997.
'36 **Johnson, Cecil M.;** February 21, 2005.
'36 **Wulke, Harold W.;** November 3, 2004.
'44 **Baxter, Ward F.;** September 9, 2010.
'52 **Klinger, James B.;** April 13, 2010.
'58 **Quayle, Ronald J.;** October 28, 2010.
IA B '34 **Miller, Richard B.;** October 28, 2010.
'35 **Blecker, Vincent C.;** September 2, 2009.
'41 **Schumacher, Darrell M. R.;** August 21, 2010.
'51 **Blad, Wallace J.;** January 12, 2011.
'63 **Lee, Stanley H.;** September 28, 2010.
KS A '34 **Smith, Charles E.;** December 10, 2003.
'34 **Spahr, Charles E.;** April 7, 2009.
'38 **Means, Ralph K.;** October 20, 2010.
'41 **Barkmann, Herman G.;** July 10, 2010.
'43 **Snyder, Warren E.;** September 23, 2010.
'48 **Davis, Philip C.;** January 30, 2010.
'49 **Talley, Harry E.;** August 28, 2010.
'50 **Prosser Jr., Francis W.;** March 20, 2007.
KS B '53 **Smith, Bert L.;** no details.
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'50 **Fuchs, Robert T.;** December 11, 2010.
'50 **Robertson, Wilburn T.;** March 2010.
'71 **Peyton, Joseph V.;** November 5, 2010.
'82 **Steele, David W.;** June 2009.
KY B '41 **Caufield, James J.;** no details.
'53 **Bossler, Thomas H.;** December 31, 2010.
'79 **Horujko, Mark P.;** October 13, 2010.
LA A '36 **Fenton, Richard F.;** August 8, 2010.
'38 **Matherne, Joseph L.;** October 13, 1999.
'40 **Amuedo Jr., Arthur R.;** February 15, 2004.
'43 **De-La-Barre, Francois D.V.;** no details.
LA B '36 **Argus, Wilbert L.;** July 3, 2003.
LA Γ '47 **Justus Jr., Sherman C.;** April 9, 2010.
ME A '34 **Canders Jr., William E.;** August 20, 2010.
'35 **Gray Jr., Ira C.;** March 21, 2010.
'35 **Knight, Paul I.;** January 19, 2004.
'36 **Beal, Frederick M.;** May 19, 2003.
'57 **Hale, Gerald A.;** February 7, 2004.
'57 **Shorter, Walter W.;** March 30, 2009.
'58 **Libby, John L.;** no details.
MD A '29 **Katzoff, Samuel I.;** September 25, 2010. *[Centennarian 76]*
'36 **Gray, Edward E.;** September 11, 2007.
'48 **Kerber Jr., Wilmer;** January 1, 2011.
'49 **Sonnenfeldt, Richard W.;** no details.
'57 **Fischer, George L.;** September 6, 2010.
MD B '35 **Kaminski, Edward;** January 18, 2011.
'35 **Lozupone, Constantine E.;** September 4, 1998.

'38 **Sperry, Harold C.;** September 25, 2009.
'55 **John, James E. A.;** November 28, 2010.
MA A '48 **Shafer Jr., Wayne A.;** 2008
MA B '35 **King Jr., Arthur M.;** August 13, 1991.
'36 **Boulware, Ford M.;** October 19, 2007.
'36 **Crummey, George F.;** March 26, 1998.
'36 **Gilman, Martin A.;** February 26, 2009.
'36 **Horton, Allen W.;** March 30, 1997.
'36 **Phillips, Frank L.;** January 22, 2006.
'40 **Lawrence, Richard B.;** 2005
'41 **Gavin Jr., Joseph G.;** October 30, 2010.
'44 **Fabens, Henry B.;** December 2010.
'47 **Thompson, Alfred C.;** October 25, 2009.
'55 **Reichard, Robert W.;** December 29, 2009.
'56 **Jelinek, Frederick;** September 14, 2010.
'69 **Wendel, Joannes A.;** December 16, 2010.
MA Δ '34 **Dockstader, Ernest K.;** November 3, 2010.
'36 **Palange, Ralph C.;** September 25, 2010.
'36 **Tsutsumi, Kentaro;** March 29, 2003.
'43 **Winchell, Richard P.;** December 5, 2010.
MA E '58 **Peschel, Frederick;** April 1, 2010.
MA Z '78 **Kennedy, Kevin F.;** October 20, 2008.
MA I '81 **Ingledue, James D.;** no details.
MI A '36 **Mautz, Willard L.;** no details.
'38 **Patriarche, John;** March 18, 2007.
'40 **Conrad Jr., Harry L.;** March 26, 2004.
'58 **Downing, Charles M.;** February 1, 2008.
'82 **Bildzok Jr., Paul T.;** January 6, 2009.
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'36 **Pearson, Kenneth S.;** December 8, 2010.
'36 **Peterson, Vincent C.;** December 8, 1996.
'52 **Mulholland, Kent A.;** February 18, 2009.
'55 **Tulikangas, Robert J.;** June 19, 2010.
'58 **Hill, Vernon L.;** December 15, 1999.
MI Γ '33 **Hayes, Robert E.;** July 24, 2000.
'36 **Atherton, George H.;** no details.
'36 **Cutrona, Louis J.;** June 15, 1998.
'36 **Knudsen, Semon E.;** July 6, 1998.
'36 **Sandstrom, Roy J.;** November 8, 2004.
'36 **Witheridge, David E.;** December 20, 2008.
'37 **Thomson, Robert F.;** December 4, 2003.
'38 **Wallace, Henry W.;** January 25, 2002.
'41 **Blair, Emerson B.;** no details.
'49 **Blumenthal, Werner;** September 11, 2010.
'50 **Jacobson, Robert A.;** July 15, 2010.
'50 **Wiin-Nielsen, Aksel C.;** no details.
'56 **De Long, Richard M.;** April 26, 2008.
'57 **Sheldon, Philip H.;** August 31, 2001.
'59 **Dailey, Keith G.;** January 31, 2008.
'60 **Deimen, James M.;** November 6, 2007.
MI Δ '33 **Meyer, Robert W.;** July 14, 1999.
'49 **Loeb, Ray M.;** no details.
'49 **McManus, John E.;** September 5, 2010.
MI E '35 **Caplan, Julian;** October 31, 2001.
'59 **Groening, James A.;** December 7, 2010.
'60 **Buck, Robert G.;** May 19, 1997.
MI Z '81 **Himmelspach, Timothy A.;** no details.
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'42 **Williams, Sam B.;** June 22, 2009.
MN A '46 **Ross, Donald K.;** December 3, 2010.
'46 **Syvertson, Clarence A.;** August 13, 2010.
'69 **Nelson, Richard A.;** March 2009.
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'43 **Pritchard, Dalton H.;** April 18, 2010.
'56 **Calhoun, James D.;** November 4, 2010.
'58 **Key, Lehman E.;** February 5, 2002.
'58 **Toler, Heischel F.;** April 15, 1990.
'59 **Harding, Joe H.;** no details.
'60 **Boyd, William C.;** May 2, 2007.
MO A '36 **Johnson, Vincent O.;** September 12, 2010.
'39 **Mansur, Charles I.;** December 29, 2010.
'40 **Kemper, John T.;** February 8, 2006.
'43 **Phelan, Richard M.;** no details.
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'59 **Sloan, Roy F.;** June 11, 2010.
'61 **Alt, Leroy H.;** July 4, 2010.
'69 **Yost, Kenneth D.;** no details.
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'36 **Paley, Franklin R.;** October 6, 2007.
'36 **Schopp, Orel J.;** no details.
'56 **Koenig, Earl J.;** March 24, 2005.
'57 **Jones, Ronald A.;** January 11, 1999.
'58 **Marble, Thomas F.;** February 16, 2000.
'58 **Stueber, Alan M.;** October 24, 2009.
MT A '52 **Collins, Charles C.;** May 2008.
'60 **Bair, Donald R.;** no details.
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'36 **Bingham, Sabin H.;** no details.
'36 **Olson, Foster A.;** February 14, 2002.
'36 **Phair, Harry W.;** April 12, 2004.
'36 **Schaefer Jr., Charles V.;** November 18, 1999.
'48 **Lynch, Joseph M.;** July 9, 2009.
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'40 **Madsen, J. Robert;** December 5, 1990.
'43 **Alexander, Walter G.;** no details.
'56 **Troxel, Donald E.;** January 18, 2011.
'57 **Bartholomew, Frederick O.;** January 9, 2008.
'59 **Soule, Arthur R.;** July 10, 2004.
'75 **Dijulio, Michael J.;** May 7, 2002.
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'36 **Vecchiotti, Camillo M.;** April 24, 2005.
'39 **Ernst, Walter R.;** October 8, 2010.
'42 **Savarese, James J.;** August 13, 2009.
'44 **Weller, Richard I.;** June 17, 2010.
'49 **Bowden, Howard J.;** June 27, 2010.
'50 **Osiecki, Casimir J.;** January 23, 2007.
'55 **Makowski, Theodore E.;** July 15, 2010.
'57 **Nordman, Otto D.;** June 21, 1996.
'59 **Babcock, David H.;** June 17, 2000.
'60 **Thomas, Gary L.;** January 1, 2008.
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'42 **Holmer, Edwin C.;** September 27, 2008.
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'49 **Gere, James M.;** no details.
'50 **Donohoe, Edward R.;** no details.
'50 **Terrill, William R.;** September 19, 2010.
'54 **Chase, Kenneth H.;** February 24, 2010.
'57 **King, Thomas F.;** no details.
'58 **Carlson, A. Bruce;** 2007.
'58 **Edney, Robert N.;** July 17, 2002.
'58 **Webster, Jay E.;** April 11, 2010.
'59 **Zvaigzne, Gunars;** January 16, 2010.
NY Δ '40 **Coors Sr., Joseph;** no details.
'42 **Critchlow, George F.;** April 29, 2006.
'44 **Duboc, William T.;** January 2, 2010.
'45 **Edison, James E.;** January 14, 2010.
'45 **Miller, Irwin H.;** February 27, 2010.
'49 **Darley Jr., John W.;** January 23, 2010.
'49 **McIsaac, Paul R.;** March 15, 2010.
'49 **Sharp, Richard C.;** December 17, 2010.
'49 **Simkins, Quinton W.;** March 7, 2010.
'50 **Albertine Jr., Herman;** January 22, 2010.
'50 **Querner, Edward J.;** January 24, 2010.
'50 **Schmidt, Robert E.;** November 21, 2010.
'51 **Taylor, Stanford H.;** January 16, 2010.
'52 **Rose, Peter H.;** July 18, 2010.
'59 **Marriott, Phillip W.;** March 5, 2010.
'60 **Frueh, Bartley R.;** February 16, 2010.
'67 **McKevitt, James F.;** March 9, 2010.
NY E '36 **Adams, Ludwig;** October 29, 1995.
'36 **Beerer, Joseph G.;** May 31, 2010.
'38 **Lindsey, Mason B.;** July 4, 2010.
'38 **Swenson, Leonard K.;** May 8, 2004.

'42 **Beal Jr., Ralph R.;** February 15, 2010.
'56 **King, Matthew;** December 3, 1997.
'57 **Hung, James C.;** December 27, 2010.
'57 **Yavitz, Eric A.;** no details.
'59 **Neben, Jerry;** December 1, 2001.
'60 **Casey, Cornelius F.;** October 17, 2001.
NY Z '36 **Torda, T. Paul;** March 24, 2004.
'56 **Kabak, Irwin W.;** July 6, 2000.
'56 **Velitchko, Walter A.;** June 5, 2006.
'57 **Robbins, Lester;** January 21, 2003.
'58 **Vathke, Otto W.;** August 4, 1997.
'62 **Ciano, Peter G.;** January 11, 2009.
NY H '36 **Rizzi, Anthony V.;** March 29, 2006.
'39 **Jacobson, Leo J.;** no details.
'55 **Dorato, Peter;** September 18, 2010.
'56 **Hendrickson, John F.;** no details.
'58 **Schieber, Theodore;** November 5, 2010.
NY I '57 **Lawlor, John H.;** September 5, 2004.
NY K '71 **Witten, Alan J.;** no details.
NY N '58 **Krawczyk, Charles C.;** March 15, 2010.
NC A '63 **Malcom Jr., Herbert R.;** September 1, 2007.
NC Γ '42 **Brandon, Daniel M.;** July 11, 2010.
'47 **Pratt Jr., Edmund T.;** September 5, 2002.
ND A '57 **Horn, James N.;** January 17, 2009.
'58 **Anderson, Gerald G.;** no details.
'75 **Karhoff, James R.;** December 23, 2005.
ND B '90 **Schultz, Richard R.;** September 30, 2010.
OH A '32 **Leslie, Dana D.;** January 31, 2010. *[Centennarian 74]*
'34 **Kornhauser, Ben A.;** May 20, 2010.
'35 **Shafer, James K.;** December 9, 2005.
'36 **Bosworth, Phillips N.;** March 29, 1999.
'43 **Symes, Lester H.;** November 28, 1999.
OH B '36 **Baldwin, Bruce B.;** August 18, 2010.
'36 **Kaufman, Charles E.;** September 18, 2010.
'48 **Braun, Fredrick H.;** January 13, 2008.
'51 **Boni, Robert E.;** July 1, 2008.
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'35 **Ward, William P.;** December 16, 2004.
'40 **Isenberg, Sidney K.;** August 28, 2005.
'47 **Maxwell Jr., Daine C.;** October 20, 2010.
'49 **Bondurant, Byron L.;** January 24, 2010.
'50 **Augenstein, Edmund V.;** no details.
'64 **Kucha, Michael J.;** November 26, 2010.
'03 **Kankey, Andrew T.;** January 20, 2011.
'05 **Springer, Micah O.;** no details.
OH Δ '57 **Palmer, George W.;** August 27, 2007.
'58 **Petras, Carl H.;** January 14, 2006.
OH E '39 **Klug, Harold H.;** June 12, 1998.
'52 **Coulman, George A.;** no details.
'59 **Johnston, Weslie;** March 1, 1998.
OH Z '58 **Page, Enno H.;** November 14, 1997.
'69 **Croy Jr., Richard P.;** October 15, 2009.
OH H '56 **Egan Jr., Douglas S.;** 2001
'56 **Vetter, Arthur F.;** April 5, 2003.
'57 **Tolle, Frederick F.;** September 12, 1992.
'58 **Anderton Jr., Frank R.;** December 31, 2000.
OH Λ '74 **Pasquinelli, David M.;** August 18, 2010.
OK A '49 **Belew, George B.;** March 2, 2000.
'51 **Culvahouse, Jackie W.;** June 7, 2006.
'57 **Jones, Beauford Z.;** March 6, 2006.
'58 **Estes, Carl B.;** September 13, 2002.
'60 **Kennett, James R.;** April 27, 2009.
'60 **Maruska, Vernon J.;** December 8, 2010.
OR A '36 **Gish, Wilbur A.;** May 19, 1995.
'41 **Biasca, Frank E.;** no details.
'56 **Johnson, Fred B.;** May 24, 2009.
'59 **Morgan, Daniel H.;** no details.
PA A '36 **Waidelich, Donald L.;** July 22, 2006.
'40 **Uhl, Edward G.;** May 9, 2010.
'41 **Ojserkis, Benjamin;** August 12, 2010.
'48 **Nonemaker, Leon L.;** January 16, 2011.
'51 **Hoover Jr., Herbert C.;** no details.
'60 **Niiler, Pearn P.;** October 15, 2010.
PA B '36 **Rogers, Edward L.;** January 10, 2004.
'40 **Casselberry, Robert L.;** July 12, 2006.
'41 **Schaffer, Stanley G.;** January 28, 2011.
'43 **Richard, Paul H.;** November 25, 2009.
'55 **Francisco, Sherman G.;** no details.
'57 **Comoh, Charles W.;** no details.
'57 **Crouthamel, Marvin S.;** January 15, 1999.
'57 **Miller, David M.;** no details.
'59 **Canick, Paul M.;** June 16, 1999.
PA Γ '34 **Fenderson, Albion P.;** May 23, 2010.
'35 **Byers, Alan C.;** no details.
'36 **Coho Jr., Owen C.;** November 2, 2003.
'36 **Unger, Earle E.;** January 7, 2009.
'37 **Robey, Harry F.;** no details.
'56 **Flaugher, Lawrence L.;** November 9, 2010.
'61 **Crecine, John P.;** April 28, 2008.
PA Δ '35 **Chance, Britton;** November 16, 2010.
'44 **Gray Jr., Harry J.;** July 8, 2009.
PA E '36 **Arnold, Walter A.;** September 23, 2000.
'36 **Laudenberger, John A.;** no details.
'50 **Kudlich, Robert A.;** January 4, 2010.
'54 **Cavanaugh Sr., William J.;** August 8, 2010.
'57 **Jaeger, David;** January 17, 2004.
'61 **Bolcar, Vincent P.;** October 25, 2009.
PA Z '51 **Amand, Frank R.;** November 28, 2010.
'58 **Bauer, Carl G.;** October 10, 2003.
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'51 **Bonine Jr., William J.;** May 25, 2009.
'57 **Hoffmann, Douglas L.;** April 25, 2006.
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PA I '49 **Howard, Harvey P.;** no details.
'49 **Williams, John J.;** January 12, 2011.
'59 **Schmidt, John A.;** August 10, 2007.
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'47 **McCormick, Paul R.;** November 26, 2010.
'59 **Wise, Donald L.;** August 13, 2006.
RI A '36 **Kiesel Jr., Charles B.;** no details.
'36 **Santilli, Alcide;** June 23, 2007.
'47 **Johnson, Raymond E.;** no details.
'50 **Falls, Norton H.;** September 11, 2001.
RI B '59 **Berkowitz, Robert P.;** April 3, 2010.
'59 **Cuomo, Frank W.;** March 2, 2004.
'59 **Le Blanc, Raymond F.;** January 9, 2011.
'60 **O'Rourke, James T.;** January 14, 1998.
'63 **White, John F.;** no details.
SC A '60 **Putman, C. Evans;** November 3, 2005.
SC B '58 **Infinger, Everett N.;** March 2, 2010.
'59 **Haigler, Joe L.;** August 3, 2001.
SC Γ '36 **McCree, Donald G.;** May 11, 2005.
'75 **Wertz, Bobby G.;** June 8, 2010.
'86 **Murphy, Joel G.;** July 30, 2010.
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'35 **Hoover, Robert G.;** December 19, 2010.
'36 **Bonell, John A.;** April 26, 1998.
'56 **Keating, Donald J.;** September 29, 2001.
TN A '35 **McLain, Arnold R.;** August 2, 2001.
'35 **Nichols, Robert B.;** November 18, 2003.
'36 **Bright, Rinehart S.;** August 18, 2006.
'36 **Elliott, Drannan Z.;** November 18, 1994.
'36 **Pickell Jr., Jack;** January 23, 2001.
'39 **Hansard, Edward T.;** November 14, 2010.
'47 **Beasley, Alonzo W.;** February 27, 2010.
'58 **Keshock, Edward G.;** December 9, 2010.
'59 **Smartt Jr., Robert W.;** April 2, 2009.
'95 **Hofer Sr., Terry L.;** February 11, 2010.
TN B '40 **Horn III, Ethelred P.;** March 10, 2007.
'45 **Kaufman, Irving;** July 14, 2010.
'52 **Yount, Thomas L.;** December 2, 2010.
'71 **Fernandes, Roosevelt L. A.;** November 19, 2010.
TN Γ '50 **Shelby, Henry L.;** September 17, 2008.
TN E '47 **Turner, Tom R.;** no details.
TX A '36 **Keating, George H.;** June 17, 2009.
'36 **Lockhart, Frank J.;** December 12, 2002.
'36 **Yates, St-Clair P.;** August 2, 2008.
'40 **Michael Jr., Robert J.;** April 21, 2004.

		'49	**Schneider, Gene W.;** August 21, 2009.
		'52	**Schulz, Edward R.;** November 22, 2010.
		'58	**Raney, Charles N.;** December 15, 1987.
		'59	**Reynolds, James D.;** April 11, 2010.
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		'58	**Bruton Jr., John D.;** January 14, 2011.
		'58	**Dixon, Floyd A.;** no details.
		'59	**Comiskey, Eugene A.;** August 15, 2002.
TX	Γ	'36	**Bentz, Irvin C.;** March 7, 2004.
		'38	**Sinclair, James A.;** March 2, 1994.
		'57	**Bull, John S.;** August 11, 2008.
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		'57	**Wende, Harvey O.;** no details.
		'78	**Groves, Alvin B.;** November 22, 2010.
TX	E	'47	**Graff, William J.;** August 19, 2009.
		'75	**Schrader, Monroe A.;** November 18, 2010.
TX	Λ	'56	**Rai, Charanjit;** March 26, 2003.
UT	A	'49	**Noorda, Raymond J.;** October 9, 2006.
UT	Γ	'96	**Taylor, Troy L.;** July 11, 2010.
VT	A	'56	**Weber, Robert;** January 2, 2008.
		'68	**Beliveau, Jean-Guy L.;** July 17, 2009.
VA	A	'54	**Barton, Furman W.;** June 1, 2010.
VA	B	'36	**Bailey, Ralph R.;** April 19, 2007.
		'36	**Maher, Francis J.;** August 10, 1995.
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		'48	**Harrison, Edwin D.;** October 23, 2001.
		'57	**Bryson, Bobby L.;** no details.
		'58	**Carter, Everett C.;** August 10, 2005.
		'60	**Moses, Hal L.;** May 15, 1994.
VA	Δ	'40	**Hardy Jr., Marshall B.;** November 2, 2010.
WA	A	'43	**Huey, Donald R.;** November 21, 1998.
		'49	**Crossfield, Albert S.;** April 19, 2006.
		'50	**Kumasaka, Kazuo;** November 18, 2010.
		'57	**Schaak, John C.;** June 10, 2000.
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		'70	**Henshaw, Boyd J.;** January 1, 2003.
WA	B	'35	**Garrett, John C.;** no details.
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		'44	**Schurman, Glenn A.;** December 30, 2010.
		'49	**Bills, Daniel G.;** September 30, 2010.
		'54	**Muir, Earl L.;** November 28, 2009.
		'56	**Pettibone, Robert E.;** March 29, 2003.
WV	A	'47	**Elkins, Rush E.;** February 27, 2006.
		'59	**Szczyrbak, Jackson;** no details.
		'65	**Rotruck, James L.;** January 24, 2011.
WI	A	'36	**Cole, Allan W.;** March 13, 1999.
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		'36	**Wagner, Eldon C.;** May 16, 2001.
		'44	**Wollering, Walter R.;** February 9, 2009.
		'58	**Stafford, Thomas S.;** December 15, 2000.
WI	B	'35	**Wellauer, Edward J.;** January 22, 1998.
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		'49	**Karas, George P.;** March 27, 2010.
		'52	**Sackett, Robert W.;** October 31, 2010.
		'57	**Schliesmann, Raymond G.;** May 22, 2006.
		'66	**Hause, Lawrence L.;** no details.
WI	Δ	'97	**Nelson, Thomas C.;** January 10, 2011
ΣT	A	'49	**Cuckler, Virgil A.;** March 21, 2007.
ΣT	A	'50	**Blume, Myron M.;** April 24, 2010.
ΣT	A	'50	**Hunt, Wilmer A.;** June 12, 1995.
ΣT	E	'53	**Kaul, Kenneth E.;** August 31, 1999.
ΣT	E	'56	**Gabrielson, Harold W.;** April 18, 1990.
ΣT	H	'52	**Slehofer, Otto J.;** no details.
ΣT	H	'53	**Desposato, Richard D.;** April 27, 2009.
ΣT	Ξ	'48	**Rubin, Sherwin;** no details.
ΣT	Ξ	'56	**Oelke, Harlan;** August 30, 2009.
ΣT	P	'50	**Abbott, Charles T.;** October 17, 2010.
ΣT	P	'53	**Coombs, Wendell P.;** January 1, 2007.
ΣT	P	'55	**Mortensen, Glen A.;** September 26, 2003.
ΣT	Σ	'51	**Grigsby, Robert A.;** October 14, 2002.
ΣT	Σ	'52	**Day, Winthrop J.;** April 29, 2003.
ΣT	T	'49	**Socolowski, Norbert J.;** February 15, 2008.
ΣT	T	'55	**Pavlat, John R.;** August 11, 2008.
ΣT	T	'50	**Burge Jr., Furman H.;** February 7, 2008.
ΣT	Ψ	'48	**Monito, Gregory A.;** May 19, 2006.
ΣT	Ω	'50	**Carlson, Eugene E.;** May 19, 1995.
ΣT	AB	'49	**Gerrity, John W.;** March 14, 2005.
ΣT	AΔ	'57	**Hansen, Keith A.;** August 16, 1990.

Correction

Steven G. Jenks, *OR* A *'73*, was incorrectly added to Chapter Eternal in the Spring 2007 issue of The Bent. He is alive and well.

BRAIN TICKLERS

(Continued from page 37.)

5 In the town of Isobar, every rainy day is followed by a sunny day. Every sunny day is followed by either a rainy day or a sunny day with equal probability. To the nearest day, what is the expected number of sunny days in a 365-day year? On a rainy day, it rains all day; on a sunny day, it is sunny all day.

—*The Surprise Attack in Mathematical Problems* by L.A. Graham

Bonus. Suppose that, instead of being a sphere, the Earth were a right circular cylinder (with a diameter equal to its height) of the same total volume and mass. What would be the gravitational acceleration on a person standing in the center of one of the circular faces? Assume the earth is a perfect sphere with a radius of 6,370 km and a uniform specific gravity of 5.518. Use a value of 6.674×10^{-11} m^3/s^2 kg for G, the universal gravitational constant.

—Howard G. McIlvried III, *PA Γ '53*

Computer Bonus. Within the set of prime numbers is a subset of primes, the sums of whose digits are also primes; we will call such numbers double primes. For example, 23 is a double prime because it is a prime number whose digits sum to 5, which is also prime; while 13 is not a double prime since it is a prime whose digits sum to 4, which is not prime. Let P_N be the Nth smallest prime, and let D_N equal the number of double primes less than or equal to P_N. For $N = 1, 2, 3, 4,$ and 5, $D_N/N = 1$. However, as more primes are considered, D_N/N generally (although not continuously) decreases. For example, when $N = 9$, $D_N/N = 2/3$. Determine the value of N such that $D_N/N < 1/e$ for the first time, where e is the base for the natural logarithms.

—Samuel L. SanGregory, *OH M '88*

Send your answers to any or all of the Spring Brain Ticklers to Jim Froula, **Tau Beta Pi, P.O. Box 2697, Knoxville, TN 37901-2697** or only as plain text by email to *BrainTicklers@tbp.org*. The cutoff date for entries to the Spring column is the appearance of the Summer Bent in late June. It is not necessary to include the method of solution. The Computer Bonus is not graded. The judges welcome any interesting problems that might be suitable for the column. Jim will forward your entries to the judges: **F.J. Tydeman,** *CA Δ '73;* **D.A. Dechman,** *TX A '57;* **J.L. Bradshaw,** *PA A '82;* and the columnist for this issue, **H.G. McIlvried,** III, *PA Γ '53*.

EXECUTIVE COUNCIL MEETING

The Executive Council met in Knoxville, TN, on December 4, 2010.

The Council enthusiastically voted one ΤΒΠ Superior Service Award to a retiring advisor of the collegiate chapters. The Council voted a ΤΒΠ Distinguished Service Award to retiring District 5 Director Curt G. Campbell, *TX B '03*. Richard Della Rovere, *NJ Γ '09*, was appointed as Engineering Futures Facilitator to a term ending June 2013.

The 2010 Convention held in October in King of Prussia, PA, and Lehigh University celebrating the Society's Quasquicentennial was reviewed and judged to have been successful, and the Council reviewed a recommendation presented during the annual meeting and revised plans for the 2011 Convention. The Council reaffirmed its policy to limit either on-site or full reimbursement of advisors attending a Convention to one per chapter in 2011. In compliance with a recommendation from the 2010 Convention, the invitation of the Iowa Alpha Chapter to host the 2013 meeting in Ames was accepted.

Vice President Solange C. Dao, P.E., was appointed Installing Deputy for the Florida Iota installation on March 12.

Dr. Cheryl B. Schrader, *IN Δ '84*, was appointed Chair of and Drs. Robert J. Marley, *MT A '83*, and Marc S. Ingber, *LA B '72*, were appointed to the National Outstanding Advisor Selection Committee. District Directors J.A. Hester, C.D. Gomulinski, and L.C. Gascoigne were appointed to the Laureate Selection Committee.

Councillor J.F.K. Earle reported on recent progress in the ΤΒΠ K-12 MindSET Program and on the Society's successful participation in the inaugural USA Science & Engineering festival on the Capitol Mall in Washington, DC, October 23-24. A grant of $50,000 was received in November 2010 for MindSET from the Stephen Bechtel Fund, and plans were being made for a training meeting for five-to-seven chapters in Laurel, MD, December 11-12. Ashish Myles, *FL A '02*, was appointed as Chair of the MindSET National Management Committee and Dr. Edward P. Gorzkowski III, *PA A '99*, to the Region 1 Management Committee for terms ending June 2013.

A schedule of Spring District Conferences was reviewed, and assignments were made for national-official representation at all 16 Districts. The Council reviewed arrangements for the June 11, 2011, meeting of national officials to be held in Knoxville. The Council established a policy allocating $1,000 for each District and allowing District Directors to recognize chapters for implementing or completing projects relating to the ICE Chapter Growth Cycle in order to impact leadership, membership, projects, or image.

Executive Director J.D. Froula reported on the status of the 2010 Alumnus Giving Program and on the various information-technology improvements; his first-quarter financial report of the fiscal year had been sent to the Council and was accepted; the Michigan Gamma Chapter received 501(c)(4) tax-exempt status in July; and an additional $11,000 distribution from the bequest from the estate of Charles O. Forge, *CA Γ'56*, was received. The Council allocated this distribution to the General Fund and designated $9,000 that could be reimbursed to the California Gamma Chapter during 2010-11 upon submission of four special-project reports with documented expenses.

Mr. Froula reviewed his response to the auditor's management letter with respect to segregation of duties and the small size of the Headquarters staff. He reported that the Texas Delta Chapter planned to elect and initiate members at the Texas A&M University-Qatar branch campus, and the Council modified the ΤΒΠ International Official Travel Policy.

The Council approved a new ΤΒΠ Trust Investment Policy and revised the trust-spending guide to five percent of trust market value based on a 48-month rolling average.

President L.A. Simonson reported on his planned visits with alumni on behalf of the Association. The Council established an Executive Advisory Committee to assist the Association with its capital fund-raising campaign.

The Council appointed four members of the Executive Director Search and Screen Committee, chaired by Russell W. Pierce, *WA A '70*, and made plans to prepare a review and interview process to be used by the committee after applications and nominations were received on December 31, 2010.

ΤΒΠ Directory

Executive Council

President Larry A. Simonson, Ph.D., P.E., *SD A '69*, SDSM&T Foundation, 501 E. St. Joseph St., Rapid City, SD 57701. *(larry@tbp.org)*

Vice President Solange C. Dao, P.E., *FL A '95*, 1110 E. Marks St., Orlando, FL 32803. *(solange@tbp.org)*

Councillor Jonathan F.K. Earle, Ph.D., P.E., *FL A '65*, 8516 SW 20th Lane, Gainesville, FL 32607. *(jonathan@tbp.org)*

Councillor Jason A. Huggins, P.E., *FL A '96*, 4701 Hickory Shores Blvd., Gulf Breeze, FL 32563. *(jason@tbp.org)*

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

International Headquarters

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

"THE BEST PEOPLE" ENGINEERING JOB BOARD

Through a partnership with JobTarget, Tau Beta Pi has a state-of-the-art job board. Members can post resumes, browse nearly 600 engineering jobs, faculty positions, and internships, and employers may browse resumes.

Job postings are updated weekly— visit *tbp.org/pages/ForMembers*.

Centenarians

Seventy-five members have previously reached their second century and been identified by The Bent. The full list is available at *www.tbp.org* under *Who we are/Distinguished members*. We identified four more gentlemen:

Clifton H. Ewing, *NY Z '47*
b. November 2, 1905
d. September 15, 2007

Isadore E. Millstone, *MO Γ '27*
b. January 6, 1907
d. June 2, 2009

Benjamin Labaree, *MI Γ '33*
b. April 6, 1909
d. November 9, 2009

Dana D. Leslie, *OH A '32*
b. July 17, 1909
d. January 31, 2010

Centenarian **Albert E. O'Neall,** *FL A '35*, center, with President Simonson, Councillors Pih and Earle, Vice President Dao, Councillor Huggins, and Executive Director Froula in Gainesville, FL, September 11, 2010.

Mother-Daughter

Here is a rare category in The Bent. We happily welcome two more for a total of 13.

The Fites Family
Robin J., *IN A '80*
Kateri E., *IN A '12*

The Catudal Family
(See Multi-Generation)
Joanne B., *PA E '80*
Christine L., *NY Δ '11*

Bi-Spousal

The names of 723 Tau Beta Pi couples have appeared in The Bent. To this most popular category, we welcome 22 additional families.

Jennifer E. Blanchard, *IN Γ '04*
Michael J. Blanchard, *IN Γ '03*

Kathy J. Caldwell, *TN A '85*
Ronald A. Cook, *TX A '89*

Janet H. Carpenter, *MI Z '82*
Robert D. Carpenter, *MI Z '82*

Jill S. Craven, *AZ A '07*
Devin T. Wiley, *AZ A '07*

Florence D. Dungan, *AZ A '92*
Michael R. Dungan, *VA B '92*

Sarah T. Hansen, *IA A '03*
Joseph D. Hansen, *IA A '02*

Christy M. Gearheart, *KY B '04*
Jason A. Gearheart, *KY B '04*

Christine C. Irelan, *CO B '90*
William R. Irelan, *CO B '90*

Louise N. Leighton, *IN Γ '90*
David T. Leighton, *NJ Δ '80*

Maria L. Palamara, *NY I '80*
Paul J. Palamara, *NY I '81*

Anneliese M. Pasadyn, *CA M '95*
Alexander J. Pasadyn, *TX Γ '97*

Aubrey H. Pratt, *UT B '05*
Brian H. Pratt, *UT B '05*

Julie L. Read, *WY A '07*
Timothy D. Read, *WY A '08*

Virginia W. Ross, *CA Θ '82*
David O. Ross, *CA Θ '83*

Tricia E. Schwaller, *SD A '98*
Curtis D. Gomulinski, *MI E '01*

Kathryn K. Sneed, *NE A '80*
Elbert L. Sneed Jr., *OK Γ '79*

Zohar M. Strinka, *IN A '10*
Stephen J. Strinka, *IN A '10*

Virginia C. Sulzberger, *NJ Γ '62*
Carl L. Sluzberger, *NJ Γ '62*

Marcia H. Turner, *KS A '72*
Kenneth R. Turner, *WV A '67*

Libby J. Goyco-De-Vera, *PR A '99*
Joel A. Martinez-Vega, *PR A '99*

Nancy G. Woodbridge, *KS B '85*
Donald A. Woodbridge, *KS B '86*

Wendelin J. Wright, *CA Γ '98*
John C. Bravman, *CA Γ '79*

ONE CHAPTER PETITION

One petition for a new collegiate chapter of Tau Beta Pi has been received and will be presented in October to the 2011 Convention in Indianapolis, IN.

The Tau Alpha Zeta Engineering Honor Society has operated at the **University of San Diego** since 2008, when its first members joined. This group submitted a preliminary petition for a new chapter in May 2010. It was approved by the Executive Council for an inspection visit, and a committee of two national officials and student and faculty representatives of five neighboring chapters visited in September 2010. The committee recommended granting a charter to the petitioning group after the implementation of improvements in operations.

The institution was established in 1949 as Roman Catholic, coeducational institution and independent California not-for-profit university. With five colleges and schools, USD was reclassified in 2006 as a doctoral and research university.

The 182-acre campus has 5,100 undergraduates (4,900 full time), 57 percent of whom are women. Ninety-six percent of the freshmen live on campus. Honor societies include Alpha Pi Mu, Eta Kappa Nu, Mortar Board, and Phi Beta Kappa.

The engineering department, established in 1987, has 275 undergraduates in three programs. Electrical, mechanical, and industrial and systems engineering are ABET/EAC accredited, and all degrees are unique, dual B.S./B.A. degrees and include a strong laboratory and design emphasis. Currently located in the school of business administration, the department has grown steadily for six years and provides strong support to student organizations. In 2009-10, the school awarded 41 engineering degrees.

USD engineering's goals include becoming a school of engineering and establishing a chapter of Tau Beta Pi. The administration is committed to supporting Tau Alpha Zeta.

This petition has the support of the administrative officials and faculty of the institution and will go to the 2011 Convention with Executive Council approval.

Multi-Generation

The names of 95 families with at least three generations of members have appeared here. We add five more.

The Boorujy Family
Robert H., *PA E'52*
Joanne B. Catudal, *PA E'80*
James R., *MD Γ'83*
William R., *NY Δ'83*
Christine L. Catudal, *NY Δ'11*

The Goodenow Family
Willis G., *PA B'13 (dec.)*
Robert H., *PA B'51 (dec.)*
Rene D. Gabbai, *FL B'97 (fourth)*

The Hustrulid Family
Andrew, *MN A'31 (dec.)*
William A., *MN A'62*
Andrew I., *CO A'97*
Todd R., *ID A'97 (cousin)*

The Ralph Family
Walter M., *NY Δ'13 (dec.)*
Pierson M., *CO A'48*
Jake M., *TX A'11 (fourth)*

The Rollinger Family
Charles N., *MI Δ'57*
Martin G., *MI Γ'82*
Jillian R., *IL A'10*

Twins

The Bent has previously published the names of 237 sets of twins. Listed are 16 more matched pairs:

The Adams Family
Imani N., *NC E'11*
Shauna N., *NC E'11*

The Bartling Family
Brett L., *MT A'11*
Ryan A., *MT A'11*

The Browning Family
Adam P., *TX A'11*
Jason M., *TX A'11*

The Cleveland Family
Daniel M., *TN A'11*
Michael M., *TN A'11*

The Haan Family
Dylan C., *MI A'10*
Tyler A., *MI A'10*

The Itagaki Family
Leah H., *CT A'11*
Sarai J., *CT A'11*

The Khuu Family
Hieu Minh, *CA X'12*
Hieu Ngoc, *CA X'12*

The Krebs Family
Aaron C., *AZ Γ'11*
Benjamin M., *AZ Γ'11*

The Lohkamp Family
James E., *KS Γ'12*
Joseph A., *KS Γ'12*

The Lumley Family
Joshua M., *MI Γ'12*
Ryan M., *MI Γ'12*

The McGuirk Family
Christian P., *VA B'11*
John S., *VA B'11*

The Meenaghan Family
Ashley M., *NY Γ'11*
Kelly A., *NY Γ'11*

The Naeger Family
Rachael A., *MO B'12*
Robert J., *MO B'12*

The Rougeau Family
Mary A., *MS A'12*
Ryan W., *MS A'12*

The Trettel Family
Andrew J., *MD B'11*
Benjamin M., *MD B'11*

The Winnike Family
Caitlin A., *NC A'11*
Kristen L., *NC A'11*

Alabama Beta

Dr. John D. Winter, '77, has joined Synthesis Energy Systems, Inc., as senior vice president, engineering and project operations. In this newly created position, Dr. Winter will be responsible for overseeing the Zao Zhuang and Yima joint ventures, along with the company's engineering and equipment sourcing activities. Synthesis is an alternative energy technology company that provides advanced technology products and solutions to the energy and chemical industries.

Alabama Gamma

Penny M. Manuel, '85, has been appointed executive vice president, engineering and construction services at Southern Company Generation. She began her career with the firm in 1982, and has also completed the advanced-management program at Harvard Business School.

California Beta

Albert H.J. Mueller, '47, is enjoying travel, tennis, and downhill skiing since taking early retirement in 1985 from Hughes Missile Systems Group in Tucson, AZ, where he was vice president for manufacturing.

Florida Delta

Donald D. Jacobovitz, P.E., **'98,** is public works director for Putnam County, FL. The Florida professional engineers in government, a practice section of the Florida Engineering Society, named him the government engineer of the year for 2010.

Illinois Alpha

Richard E. Zelenka, P.E., **'87,** is now a patent attorney with Sheridan Ross P.C., based in Denver, CO. He formerly was a Boeing executive responsible for 24/7 contractor support of USAF observatories atop Haleakala, Maui, HI. Before that, he was a NASA engineer who developed aircraft collision-avoidance systems and airline information systems.

Illinois Beta

Robert B. Johnson, P.E., **'69,** has received a Robert Cornforth award from the National Council of Structural Engineers Associations for outstanding service to the profession. He is a senior engineer for Bowman, Barrett & Associates Inc., consulting engineers, in Chicago.

Illinois Zeta

George M. Reed, '84, is vice president, marketing and product management, for wireless test and channel emulation experts Azimuth Systems.

Iowa Alpha

Meredith R. Gibson, '12, was a guest speaker at the *Fortune* Most Powerful Women Summit in Washington, DC. She was chosen for her involvement in engineering at Iowa State and participation in the National Math and Science Young Leaders Program. Gibson was the only collegiate student guest speaker.

Loren J. Rittle, '90, is a principal staff engineer at the applied research center of Motorola Mobility. He first joined the firm in 1988 as a summer intern. Rittle's eighth U.S. patent, regarding aspects of group-based dynamic programming in wireless sensor networks, was awarded recently.

Kentucky Alpha

Linda C. Bridwell, P.E., **'88,** Kentucky American Water's director of water quality and environmental compliance, has received the 2010 professional recognition award presented by the Kentucky section of ASCE. She is the first woman to receive the honor, which has been awarded annually since 1966. Bridwell joined her firm in 1989 and was promoted to lead the company's engineering department in 1995.

Michigan Eta

Richard L. Fertell, '87, is director of corporate quality and laboratory for flow sensing and control instruments makers Proteus Industries Inc. of Mountain View, CA. He serves as the National Conference of Standards Laboratories international region 1410 coordinator for Central California and Nevada.

Mississippi Alpha

Dr. Dennis D. Truax, P.E., **'79,** has been appointed to the Mississippi State Board of Licensure for Professional Engineers and Surveyors. He is head of the civil and environmental engineering department at Mississippi State University.

Nebraska Alpha

Jayne E. (Bigley) Kessler, '95, along with husband Scott and son Jude, welcomed a baby girl, Neve Amanda, on June 15, 2010.

New Jersey Alpha

Zachary W. Carr, '11, senior goalkeeper of the Stevens Institute of Technology men's soccer team, was named the top ESPN Academic All-American in the college division. Carr is a two-time first-team Academic All-American and held a cumula-

tive grade-point average of 3.92 as a biomedical engineering major. In 2010, he was the top-ranked soccer goalkeeper in the nation in terms of save percentage with a 0.927 rate.

Lisa R. Taylor, '90, is principal horn player in the Park Ridge Orchestra and a member of the Chicago Chamber Orchestra. After earning her engineering degree, she completed a bachelor of music at New England Conservatory and a master's at Peabody Conservatory. She is also a member of the Sapphire Woodwind Quintet, whose website observes: "Lisa also has degrees in mechanical engineering, and colleagues learn not to leave any instrument with moving parts unguarded."

New York Alpha

Yiannis Constantinou, '92, is area manager for Dubai/Qatar/corporate with Al Habtoor-Specon, LLC, a contracting company specializing in building services and electromechanical construction.

New York Iota

Zhi Zhong Qiu, '83, has been appointed vice chairman for Asia-Pacific and chairman of Greater China for Barclays Capital, the investment banking division of Barclays Bank PLC. He was previously chairman of ABN Amro China and vice chairman, ABN Amro Asia, and Greater China chairman for Credit Suisse First Boston.

North Dakota Alpha

Capt. Warren P. Lundblad (Ret.), P.E., **'85,** is now vice president of engineering at naval architecture and marine engineering firm Gibbs & Cox, Inc., where he will manage and support all areas of platform and systems engineering. Capt. Lundblad served 25 years in the U.S. Navy, most recently as director of supervisors of shipbuilding at Naval Sea Systems Command (NAVSEA).

Oklahoma Gammta

Dr. Kimberly D. Douglas-Mankin, P.E., **'87,** is an associate professor of industrial and manufacturing systems engineering at Kansas State University. The former TBΠ Fellow is director of K-State's women in engineering and science program, which received the national women in engineering program award. The program is a collaborative effort between the colleges of engineering and arts and sciences.

Rhode Island Beta

William G. Boardman, P.E., **'87,** town engineer of South Kingstown, RI, since 2000, has received the humanitarian of the year award from Providence Engineering Society. He is also a reserve Seabee lieutenant commander in the U.S. Navy's civil engineer corps. He recently returned from a yearlong tour in Iraq where he commanded personnel in the distribution of construction materials.

Tennessee Alpha

J. Matthew Froula, '94, has been selected as a regional finance manager for computer storage manufacturer EMC Corporation, supporting the southeastern division. He is based in Atlanta and joined EMC as an area finance manager in 2005.

Kevin R. Stooksbury, '01, is now economic practices coordinator with ExxonMobil Qatar Inc., based in Doha, Qatar.

Tennessee Gamma

Randal L. Petty, P.E., **'89,** a senior project manager at the Tennessee Valley Authority, has been honored as TVA's engineer of the year. Petty, a TVA employee for 12 years, was nominated for directing a transmission-infrastructure project that included a 500-kilovolt substation and construction of more than 60 miles of lines. The project incorporated environment friendly concepts and saved TVA ratepayers about $15 million.

Texas Alpha

Dr. Victor M. Ugaz, '91, has been named chair of Texas A&M University's professional program in biotechnology, an interdisciplinary effort that draws on the skills of more than 60 faculty members from five colleges within the university. Dr. Ugaz, associate professor of chemical engineering and holder of a development professorship, has been a faculty member of the program and served on its executive committee.

Texas Eta

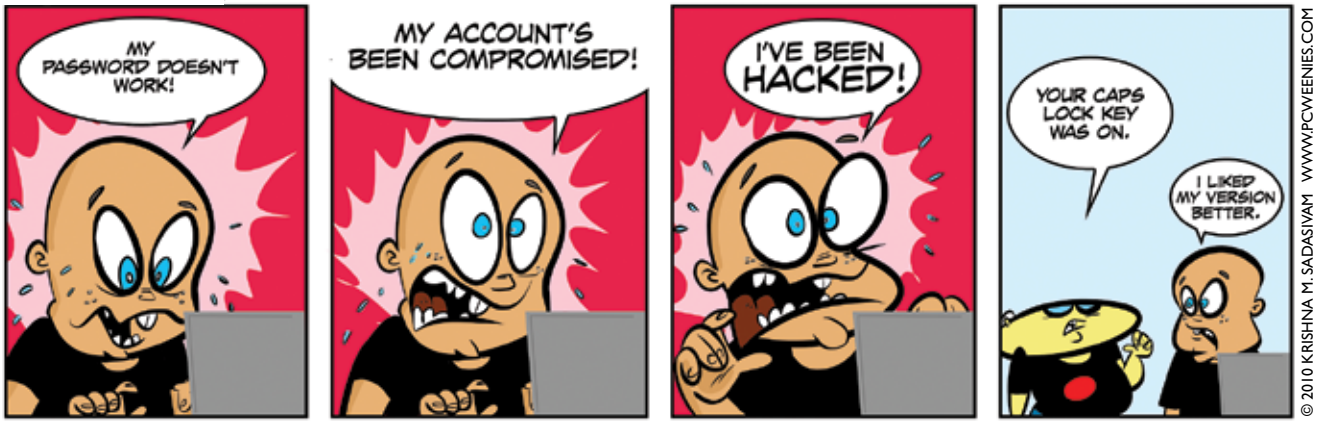
Dr. Walter H. Delashmit Jr., P.E., **'03,** has retired. He worked for 39 years in the aerospace industry, including 25 years at Lockheed Martin Missiles and Fire Control, and for two years on the adjunct faculty of the University of North Texas.

Write Your Own Alumnus Note!

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

The PC Weenies

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



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	A. OFFICIAL BENT (FULL SIZE) FOR MEMBERS ENGRAVED AT NO CHARGE WITH NAME, CHAPTER, AND CLASS:	
____	•10K YELLOW GOLD	126.00
____	•10K WHITE GOLD	126.00
____	•GOLD FINISH, SATIN BACK	29.00
	B.1(p) OFFICIAL (FULL SIZE) BENT (PIN) FOR MEMBERS IS ENGRAVED WITH NAME, CHAPTER, & CLASS AT NO CHARGE, AND A PIVOTING PIN TO SECURE THE BENT TO A LAPEL IS SOLDERED ONLY ON NEW BENT:	
____	•10K YELLOW GOLD	133.00
____	•10K WHITE GOLD	133.00
____	•GOLD FINISH, SATIN BACK	28.00
____	***B.2(p)** SMALL BENT (PIN): •10K YELLOW GOLD	72.00
____	•GOLD FINISH, SATIN BACK	27.00
____	***B.2(c)** SMALL BENT (CHARM): •10K YELLOW GOLD	90.00
____	•GOLD FINISH, SATIN BACK..... **SALE PRICE**	14.00
____	***B.3(p)** MINIATURE BENT (PIN): •10K YELLOW GOLD	70.00
____	•GOLD FINISH, SATIN BACK	26.00
____	***B.3(c)** MINIATURE BENT (CHARM): •10K YELLOW GOLD	69.00
____	•GOLD FINISH, SATIN BACK	25.00
	C. MINIATURE BENT, TO BE WORN AS A TIE TACK; CLUTCH AND CHAIN ASSEMBLY INCLUDED:	
____	•10K YELLOW GOLD	89.00
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QTY.	DESCRIPTION & QUALITY	PRICE
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____	**I.** TIE BAR, 50mm SOLID BAR WITH ALLIGATOR CLASP, GOLD FINISH (BENT NOT INCLUDED)	49.00
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____	**N.** MAN'S NECKTIE, 100% SILK, 95mm WIDE; NAVY & WINE STRIPES, WITH GOLD BENT	35.00
____	**O.** STOLE: WHITE SATIN GRADUATION COLLAR EMBROIDERED WITH BENT	20.00
____	**P.** CERAMIC MUG: 12-OZ., WHITE WITH 125th MOTIF	14.00
____	**R1.** T-SHIRT: 100% PRESHRUNK COTTON, BLACK WITH RADIANT BENT, (XXL: 18.00) S-M-L-XL	16.00
____	**S.** T-SHIRT: 100% PRESHRUNK COTTON, WHITE WITH BLUE LOGO ON BOTH SIDES, S-M-L-XL-XXL	13.00
____	**T.** GOLF SHIRT,100% WHT. COT. PIQUE, BLACK TRIM COLLAR & CUFFS, S-M-L-XL	35.00
____	**U.1** UNSTRUCTURED, LOW-PROFILE, WHITE CAP WITH BLUE LOGO, TAU BETA PI ON SIDE	14.00
____	**U.2** UNSTRUCTURED, LOW-PROFILE, KHAKI CAP WITH BLACK LOGO, TAU BETA PI ON SIDE	14.00
____	**V.** TIE TACK, STERLING OVAL, w/ PIN & CLUTCH, NOT SHOWN (SEE WEB)	45.00
____	**W.** UNSTRUCTURED, LOW-PROFILE CAP, WHITE CROWN WITH BLUE LOGO,BLACK VISOR (SEE WEB) **SALE PRICE**	8.00
____	**X.** HONOR CORD: WHITE & ORANGE GRADUATION CORD, NOT SHOWN (SEE WEB)	15.00

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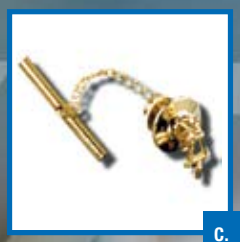
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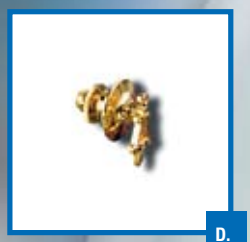
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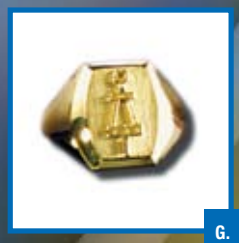
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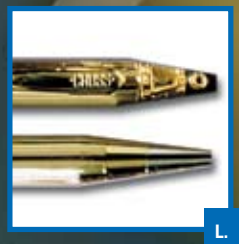
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