THE BRIDGE

The Magazine of Eta Kappa Nu

SPRING 2008

Changing Technology Creates Career Opportunity

HKN

www.hkn.org

FEATURES

LETTER FROM THE PRESIDENT

J. David Irwin | Xi Chapter Member

Dear HKN members,

As my term as president of HKN comes to a close, I am most pleased to acknowledge the tremendous support that I have received from so many in the HKN family. We have tried our best to accomplish many things that we believe will move the association forward, and it is only through the efforts of our volunteers and staff that we have collectively made what we hope will be significant steps in that direction.

We have now arranged to have the HKN Board of Governors' biannual meetings in conjunction with the annual meetings of the Electrical and Computer Engineering Department Heads Association (ECEDHA) and the Frontiers in Education (FIE) Conference, co-sponsored by IEEE and the American Society for Engineering Education (ASEE). Furthermore, an HKN update is a regular item on the ECEDHA business meeting agenda, and each meeting has become a venue for specific HKN annual awards. Thus, our association is closely connected with two critical constituencies. Also, by meeting in conjunction with larger groups that already have hotel discounts, we are able to save money.

We have also arranged to have, when appropriate, the Eminent Member awards presented at the IEEE Honors Ceremony each year. This is a very elegant affair, with the winners and Board in formal attire, and the presentation of the Eminent Members draws attention of the 600 attendees to the excellence of HKN.

Finally, the HKN officers and Board of Governors have worked in cooperation with IEEE officials to achieve a merger of the two organizations through a memorandum of understanding. The merger with IEEE would do the following:

- Guarantee that the HKN name will be perpetuated for all time.
- Give HKN a permanent corporate home.
- Provide a much-needed infusion of cash into HKN to enable us to permanently endow awards, increase support for chapter activities, assure that we can have a real chapter congress each year, and enable many other worthwhile projects.
- Allow HKN to apply for grants for special projects from the IEEE Foundation and from the IEEE Life Member Fund. These grants would support special projects such as a themed meeting of HKN chapters on a specific technical area or a geographical get-together of HKN members from a particular region.
- Give HKN access to the 1,500 IEEE branches worldwide so that we can globalize the HKN name in 159 countries with HKN chapters in every country. This is another value enhancement for membership in HKN because as the world increases on the path of globalization, recognition of the HKN brand to people outside the United States is imperative.
- Enhance the value of membership in HKN by an extensive worldwide public relations effort extolling the value to industry of hiring HKN members.
- Give HKN access to IEEE fundraisers to enable us to have both broad-based and targeted fundraising campaigns to further increase the HKN endowment.
- Give HKN access to IEEE's Institutional Advancement to assist us in writing proposals to foundations, governments, and NGOs.
- Allow potential synergies with the publication of *The BRIDGE*, for example, the use of IEEE–copyrighted material, technical papers, etc.
- Give HKN access to IEEE's extensive electronic database of 370,000 IEEE members, many of whom are HKN members, to allow us to improve communications with HKN members and facilitate the operations of HKN.

And the best part—all of this can be done with no increase in the induction fee (since the infusion of money from IEEE will cover permanently any extra costs), no change in chapter activities (every HKN chapter can continue to operate just as they do now), no change in the academic requirements for HKN membership, and full authority to the HKN Board of Governors for all awards, programs, and requirements.

I am most thankful for the opportunity to work with such a wonderful group of professionals during my term as president. It has been my honor and privilege to work with the Executive Committee members Karl Martersteck and Bruce Eisenstein; our Board of Governors—Stephen Goodnick, Evelyn Hirt, John Orr, Teresa Pace, Casimir Skrzypczak, and David Soldan; a superior staff composed of Roger Plummer, Kathy Ricker, Melissa Miller, and Barry Sullivan; our HKN Award chairs; and our IEEE colleagues, Dr. Moshe Kam, who adroitly and essentially single-handedly achieved the support of the IEEE for the merger, and Fern Katronetsky, our HKN/IEEE liaison. Finally, I look forward to supporting Bruce Eisenstein, a former president of IEEE, as he works to bring HKN to an even higher level of service to the members, to society, and to the profession.

Warm regards,

President

Spring 2008

Editor
Barry J. Sullivan

News Editor
Melissa A. Miller

Copy Editor
Susan M. Baker

Art Director
Graphic Design
Joseph T. Man

Advertising Sales
1-800-406-2590

HKN INTERNATIONAL HEADQUARTERS
Address editorial, subscription, and address change correspondence to:
300 West Adams Street, Suite 1210
Chicago, Illinois 60606-5114, USA
1-800-406-2590 phone | 1-800-864-2051 fax
www.hkn.org

POSTMASTER
Send address changes to:
Eta Kappa Nu Association
300 West Adams Street, Suite 1210
Chicago, Illinois 60606-5114, USA

Eta Kappa Nu (HKN) was founded by Maurice L. Carr at the University of Illinois on October 28, 1904, to encourage excellence in education for the benefit of the public. HKN fosters excellence by recognizing those students and professionals who have conferred honor upon engineering education through distinguished scholarship, activities, leadership, and exemplary character as students in electrical or computer engineering or by their professional attainments.

THE BRIDGE is the official publication of the Eta Kappa Nu Association.

Subscription Price: $15.00 (3 years)
Life Subscription: $60.00

Ideas and opinions expressed in *THE BRIDGE* are those of the individuals and do not necessarily represent the views of the Eta Kappa Nu Association, the Board of Governors, or the magazine staff.

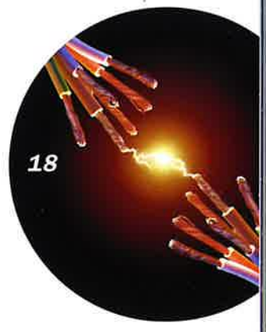
THE•BRIDGE

The Magazine of Eta Kappa Nu

features

departments

award winners



2007 Student Leadership Conferences

After months of planning, Mu chapter, University of California, Berkeley and Gamma Theta chapter, Missouri University of Science and Technology (formerly the University of Missouri, Rolla), hosted two successful student leadership conferences in October and November 2007, respectively.

Both host chapters were repeat Outstanding Chapter Award winners that organized the themes, speakers, sponsorships, and facilities for each two-day event. Student conference chairs from each chapter learned valuable lessons in leadership and project management, and the organizing committees proved that teamwork is imperative in hosting a successful event.

Chapters from five states were represented at the University of California, Berkeley for "Making a Difference: Leadership through Innovation." Guest speakers included professionals from Meltwater Group, Moto Development Group, Arizona State University, and the University of California, Berkeley. All are making significant impacts in industry, and their thought-provoking addresses gave insight into the continuous advances in technology and future opportunities for student and young professional HKN members.

At the Missouri University of Science and Technology the following weekend, students from nine chapters gathered for "Leadership for a New Century" and shared insights on chapter development, communication with alumni, and leadership skills. Guest speakers from Burns & McDonnell, Dynetics, IEEE, AdTran, and *Potentials* magazine stressed the importance of lifelong learning. Professionals must learn to adapt to the changes surrounding them, and there are many opportunities for HKN professionals to be on the leading edge of these developments.

HKN is pleased to offer these leadership development opportunities for student members and appreciates the support of generous alumni and corporate partners. More conference information, including the agendas, session summaries, and future conference opportunities, are available on-line (**www.hkn.org**).

2007 Student Leadership Conference Sponsors

University of California, Berkeley • Moto Development Group • Meltwater Group • Informatica • Missouri University of Science and Technology • Garmin • AdTran • Dynetics • Burns & McDonnell

2007

The Challenge of Change: Reflections of an Engineer*

by Irwin Jacobs

Based on the frequent changes experienced in my own professional life, my advice to students is to prepare for, welcome, and take advantage of change. When I graduated New Bedford (MA) High School in 1950, my counselor advised me that there was no future in science or engineering. Despite my interest in science and math, I accepted his advice. My family had a small restaurant, so I entered the school of hotel administration at Cornell University.

Changing Majors

Well, luckily I had an engineer as a roommate. After three terms of his kidding about how tough it would be to get comparable grades if I were in engineering, and given my interests, I welcomed a change and transferred to electrical engineering, entering an exciting period of rapid advances in theory and practice. In my last term at Cornell, I took a laboratory course in vacuum tubes but have been immersed in semiconductors ever since.

I was reminded of these rapid changes when I recently gave a talk at the Computer History Museum in Mountain View, CA. I saw many computers (and cell phones) that had once been important in my life but were now obsolete. One device, a commercial digital differential analyzer, brought back memories of my senior project at Cornell building such a device from a magnetic drum memory and vacuum tube logic elements salvaged from an IBM 650 computer.

I entered MIT as a graduate student planning to study electromagnetic theory and antennas. However, I joined a group of faculty and students led by Professor Claude Shannon, the father of information theory, and decided that digital communications would be my future. And I'm very pleased with that decision.

Teaching Change

After completing a thesis on network reliability, I joined the faculty at MIT. Professor Jack Wozencraft and I created a new senior course on communications focused on the theory and potential applications of probability and information theory. We edited the class notes as a textbook *Principles of Communication Engineering*, published in 1965 and still in use.

In 1964–65, while completing the book, I took a leave of absence as a NASA resident research fellow at JPL in California. Just after returning to Boston, Professor Henry Booker, from whom I learned electromagnetic theory at Cornell, called and invited me to help start electrical engineering at a new university in San Diego. The first reaction of my wife, Joan, and myself to this change was no. But after two days, we reconsidered and decided that moving to California and joining a new public university, the University of California at San Diego (UCSD), was an exciting opportunity and we accepted. I enjoyed helping shape the new curriculum. One of the undergraduate classes I started was an introduction to computers. It attracted engineering students, of course, but also students and faculty from the music and art departments who wanted to learn about changes possible with digital technology. These contacts have had a lasting impact on my own interests.

A Change in Career

The move to California led to another major change in my life. With my MIT background and background in digital communications, I had many more requests for consulting from the aerospace industry in Southern California than I had time to support. After mentioning that to a couple of UCLA faculty friends, they suggested we start a company and share the consulting. So we started a company called Linkabit. Very quickly, it began to grow. I took leave from UCSD to organize and direct the company in 1971, found it great fun, and became an "academic dropout" in 1972 after 13 rewarding years as a professor. In addition to the technical challenges, I had to master financial and marketing areas. Luckily I had taken courses in accounting and business law in the hotel school, but I also found that engineering provided an excellent preparation for most areas of business.

We made the "mistake" of selling Linkabit in 1980, and in 1985 I retired after leading the development of an exciting range of innovative products, including satellite-to-home TV and business satellite communications terminals supporting Wal-Mart, among others. Retirement was OK for three months, but I was then ready for another change. After assuring Joan that, even if things went very well, we might grow to 100 employees, I started Qualcomm with six others from Linkabit. We're now over 13,000 employees.

A Business Built on Change

Initially, we didn't have a business plan or any products, but we did know that digital and wireless would be very exciting. Shortly after starting, during a drive from Los Angeles to San Diego following a consulting meeting on mobile satellite communications, I realized the potential value for mobile communications of code-division multiple access (CDMA), a subject previously of military and theoretic interest. We had to wait until November 1988 before we could devote the resources to develop the idea. At that time, we signed a contract to install our first major product, OmniTRACS, on a fleet of 5,000 trucks, generating the needed cash flow.

Occasionally when you are in business, you have to make a bet-the-company decision. CDMA was one. Should we commit a lot of money to R&D in a technology that may or may not be accepted? Is the world going off in a different direction? Luckily at that time, I had not heard one of the projections that had been made to AT&T by a consultant a few years earlier predicting 900,000 cell phone subscribers by the year 2000 (actually, there were 109 million). We did develop the technology and demonstrated in November 1989 that we had solved the problems that led others to say that CDMA would not be commercially competitive. Then the question comes up, if you have a good product, how do you build a business model? We decided to both license the technology broadly, using an upfront license fee to support continued R&D plus royalties if successful, and supply chips, phones, and infrastructure to ensure equipment availability. We later sold the phone and infrastructure manufacturing businesses while continuing to supply chips.

Today, there are more than three billion cell phones in use around the world, with more than one billion sold per year. Qualcomm is now the largest supplier of chips for cell phones. It's quite clear that the future is not in plastics, but in mobile devices.

Changes Ahead

When we built our first CDMA cell phone, it took three chips to implement just the communications. Now, communications, including not just voice, but also high-speed data, requires about 20 percent of one chip. What do you do with the other 80 percent? You provide computing power comparable to a supercomputer of a decade ago plus camera, 3D graphics, video, and global positioning capability. What is called a phone is now a reliable, battery-powered, powerful, and versatile computer with wide-area mobile broadband data capability.

We've all heard of concerns with the digital divide, with Internet access being limited in certain regions. The phone is a low-cost device that can be used to bridge the divide worldwide. With appropriate applications, it can support education with a phone per student, provide medical assistance, assist in e-government, inform farmers and fishermen, and provide entertainment and social communications. For example, medical devices are being attached to cell phones to monitor cardiac functions and blood sugar. The cell phone has already made a major impact on the lives of almost half the world, and the changes driven by this powerful and ubiquitous device are just starting.

Conclusion

So, changes continue at an ever-increasing pace. With a strong education and an openness to new ideas, one can take advantage of and shape these changes. I wish today's students as much fun and excitement as I have had along the way.

For more on this topic, visit
www.hkn.org/bridge

ABOUT THE AUTHOR

Irwin M. Jacobs

Co-Founder and Chairman of the Board of Directors, Qualcomm Incorporated
Kappa chapter – Cornell University

Dr. Jacobs has led the commercialization of CDMA technology and its success as the world's fastest-growing, most advanced voice and data wireless communications technology. From 1959 to 1966, Dr. Jacobs was an assistant/associate professor of electrical engineering at the Massachusetts Institute of Technology (MIT). From 1966 to 1972, he served as a professor of computer science and engineering at the University of California, San Diego. At MIT, Dr. Jacobs co-authored *Principles of Communication Engineering*. First published in 1965, the book remains in use today. Dr Jacobs is an Eminent Member of Eta Kappa Nu. Dr. Jacobs received the National Medal of Technology in 1994.

* Adapted from MIT Commencement Address, June 3, 2005.

Vladimir Karapetoff Outstanding Technical Achievement Award

This award is given annually to an electrical engineering practitioner who has distinguished himself or herself through an invention, development, or discovery in the field of electrotechnology resulting in significant benefits to humankind.

AWARD WINNER Presented March 2008

Arun G. Phadke

As modern civilization has grown more dependent on electric power, the need to maintain a reliable and secure power grid has become an imperative. Arun Phadke has helped meet this imperative by creating tools for grid-wide measurements and a methodology to act on these measurements quickly, leading to dramatically improved power reliability and security. He pioneered the development of hardware and software that led to widespread industry use of computer-based relays – the devices used to monitor and protect the power grid. Dr. Phadke spent the first thirteen years of his career working in the electric utility industry before joining Virginia Tech in 1982. He served as the American Electric Power Professor of electrical engineering and was recognized as a University Distinguished Professor. He retired in 2003 but continues as a research faculty member of the electrical and computer engineering department of Virginia Tech.

Phadke at a Glance

- University Distinguished Professor Emeritus, Virginia Polytechnic Institute and State University
- American Electric Power Professor (1985–2000)
- Founding president, International Institute for Critical Infrastructures (1985–2000)
- Fellow of the IEEE, National Academy of Engineering, IEEE Herman Halperin Award, IEEE Third Millennium Medal, IEEE Outstanding Power Engineering Educator, EEI Power Engineering Educator Award and the International Council on Large Electric Systems (CIGRE) Technical Committee Award
- B.S. from Agra University; B.T. from Indian Institute of Technology, Khargpur; MSEE from Illinois Institute of Technology; and Ph.D. from University of Wisconsin-Madison

AWARD WINNER Presented March 2008

Stanley H. Horowitz

Few people understand the relationship between knowledge and power better than Stanley Horowitz. An author, consultant, lecturer and engineer, he has guided policy and educated himself and others on safe and robust power distribution for more than 50 years. He began his career in 1950 at the American Electric Power Service Corp. (formerly American Gas and Electric) and retired in 1989, having served as head of the system protection section, assistant head of the electrical engineering division and as a consulting electrical engineer. A life fellow of the IEEE, Horowitz served as chairman of the IEEE Power and Engineering Society's (PES) Power System Relaying Committee from 1975 to 1978; was a member of the PES executive board, the Life Member Committee, the PES Fellows Committee and was chairman of the PES Constitution and Bylaws Committee.

Horowitz at a Glance

- University Distinguished Professor Emeritus, Virginia Polytechnic Institute and State University
- American Electric Power Professor (1985–2000)
- Founding president, International Institute for Critical Infrastructures (1985–2000)
- Life Fellow of the IEEE, National Academy of Engineering, IEEE Third Millennium Medal, IEEE PSRC Distinguished Service Award, International Council on Large Electric Systems (CIGRE) Attwood Associates Award
- B.S. from City College of New York; attended Brooklyn Polytechnic Institute Graduate School, and the University of Michigan Graduate School of Business

THE BRIDGE
The Magazine of Eta Kappa Nu

Key Dates, Article and Profile Submissions

- **September 15, 2008** *Deadline for submissions, Autumn 2008 issue*
- **October 1, 2008** *Notification of selections for Autumn 2008 issue*

Be a Contributor *(and It Won't Cost a Thing!)*

Got something to share? We are seeking articles from members at all levels for future issues of *THE BRIDGE*. Whether you are already a published author or you still wonder what it's like to see your words in print, we invite you to submit an article for consideration.

Topics can include—but are not limited to—technical perspectives (past, present, and future), first-person experiences, career issues, and observations on industry and the profession.

Articles for *THE BRIDGE* are 1,000–1,200 words in length and can include up to two figures (photos, graphs, or other images). Manuscripts should be sent in electronic form via e-mail to *editor@hkn.org* (MS Word .doc files preferred).

Share Your Wisdom

This issue of *THE BRIDGE* includes Member Profiles, an opportunity for members who are established in their careers to share the wisdom gained from experience with younger members.

Members interested in contributing to this feature should send a 100-word career synopsis via e-mail to *editor@hkn.org*. If selected, we will ask for your responses to a set of interview questions addressing your educational and career experience and your advice to young engineers.

Leadership for the Information Renaissance: Success for Individuals and Organizations*

by Jay E. Gillette

We labor under the requirements of the industrial economy. The industrial economy model is essentially a linear assembly line in which managers analyze a product or service, often in minute detail, and then engineers and managers design an industrial process to produce it.

We need to have "a renaissance of the renaissance" so that the smothering era of industrial thinking is leapt over to recover and rebirth new ideas from the older era. The ideas with the richest promise for individuals is the goal—dismissed by the specialization ideology of the industrial era—of becoming a renaissance man or renaissance woman.

Succeed as a Person – Become a Renaissance Man or Renaissance Woman

According to the Merriam-Webster's Dictionary, 10th edition, the phrase "renaissance man" is "a person who has wide interests and is expert in several areas." Indeed a good undergraduate education on the classic liberal arts model works to build such a person at a young age. The idea is that the graduate will continue a lifelong learning enterprise along the same lines. Yet professional specialization and the constant demands of overworked managers clearly obstruct the means to that end.

It was the European Renaissance that forwarded the concept of this multidimensional person. My hypothesis is that the demands of their Renaissance age required them to develop the type. How do we translate the European renaissance person ideal into a practical application of the information renaissance?

By way of conclusion, I put it this way: be a "T-person"—a person whose structure of personality and attributes resembles the structure of the letter "T." Be both broadly comprehensive (the T crossbar) and deeply competent (the T base) as one complete person. In essence, the information renaissance person has and displays breadth and depth: breadth of comprehension (the goal of liberal arts education) and depth of competence (the goal of professional education).

These foundational personal and educational attributes lead to professional behaviors we value in the professional world—adaptability and utility: breadth leads to adaptability to succeed in rapid change (adapt to environment); depth leads to utility to prosper by adding value (find a need and fill it).

Succeed as an Organization – Add Knowledge Value to Everything You Touch

"Add knowledge value to everything you touch." This is my paraphrase of a profound concept from Japanese theorist Taichi Sakaiya's *The Knowledge-value Revolution*, or, *A History of the Future.* Sakaiya is well known as a public policy analyst and business and cultural theorist in Japan, yet hardly known by many in this field.

Sakaiya's example of such a premium for its knowledge value is the Hermès necktie. My example, a little better known, is the value premium for high-end Mercedes-Benz vehicles. They are not essentially better than their competitors, yet like the Hermès tie, they command higher prices because they are products carrying "that which the society acknowledges to be creative wisdom."

Put simply, an organization should incorporate knowledge-value in all its products and activities. Add knowledge-value in whatever it is you do. In my work, I push for knowledge-value as a premium in the 3-Ds (design, development, deployment) of information and communications system architecture. You can focus a similar strategy incorporating a knowledge-value premium in your work and your organization's production as well.

The great and encouraging excitement of an information renaissance is that imagination and inspiration are drivers for the exchange of value in the larger economics of value—not just monetary value, but also the attention we give in an "attention economy" exchange.

Creative Power You Can Access – Information Is a Set of Ideas You Use

If information is based on ideas—news that you use—there are two key parts to that thought. First, the obvious place to focus is on the "news." That is the "outside" part of the thought. The data comes from the outside. Yet what turns data into information is that you bring inside the "outside" news to you. You bring the data into your own head, your own mind or consciousness.

That is what makes it "information" for you. Recall that the Latin prefix "in" means "in," the same as in English. "Form" means form, or shape. So when you are informed, ideas or data take form or shape in your mind.

Information really "happens" when it happens to you or to other people. Information has power in so far as it changes minds. When ideas take shape and people act on them, information changes people, organizations, and history.

Information Networks: The Key to the Information Renaissance

Information networking is the key to the information renaissance. By this we mean information networks first, of any kind. Information moves by any means necessary. You are in a network of information networks. Second, more than that, you are in social networks that really work fundamentally as information networks. Your social networks really work by communicating information to each other.

Today, information and communication technologies are being called ICT as an acronym. The acronym "ICT" is replacing the older, more limited acronym "IT" that came from the computer industry, which stands for "information technology," essentially computers and peripheral devices such as printers, storage devices, and, later, data networking wiring together with wireless radio transmission.

The newer acronym ICT gives a broader sense of telephones, television, video cameras, multimedia, and other devices while including computers and music players and the transmission media, short range or long.

The main point, however, is that all these devices are ways to communicate information, so we will focus on information and communication, not on technologies. Think of the technologies as tools and enablers for us to better manage our information and communicate together more effectively.

Conclusions and Recommendations: Succeed and Prosper in the Information Renaissance

In summary, the following are key conclusions and recommendations:

> *Have confidence in the future*
Humans have seen and done this before. Lead with confidence from clarity of context. That is the purpose of seeing this era through the reflection of the earlier one. It is said in strategy theory that "morale is itself a strategic advantage." Let us access this strategic advantage.

> *Succeed*
Renaissance times call for renaissance men and renaissance women—a challenge we can meet. Renaissance men and women work in more than one area; they take ideas in from many people. Here is a compelling implication: today's leaders need to study the ideas and history of the European renaissance as renaissance leaders studied the ideas and history of the classics.

> *Prosper*
This is a world of knowledge value: seek knowledge; add value; add knowledge value to everything you touch. Build and lead organizations that add knowledge value to everything they touch—and in this we are already on the way.

> ***Use information networking to leverage the knowledge that we have and can discover***
Information is based on ideas—news you use—or to reinforce your position. Entertainment is essentially information based on the power of ideas. Information networking is the key to the information renaissance.

Conclusion

The key thought is that these are not mysterious new areas of human knowledge and work. Instead, these are areas we already have worked in for a long time. We must train, educate, and discipline in these areas. We need to improve these areas. Yet as I have argued, we need to look at these areas in a new way. We need to rebirth what we need to know now. We are already participants in today's information renaissance.

For more on this topic, visit
www.hkn.org/bridge

ABOUT THE AUTHOR

Jay E. Gillette
Professor of Information and Communication Sciences, Center for Information and Communication Sciences, Ball State University

Dr. Gillette serves also as senior research fellow of the Digital Policy Institute; research associate in the Applied Research Institute; and director of the Human Factors Institute of User-Centered Design, Development, and Deployment (HFI-UCD3). Dr. Gillette is a member of the Pacific Telecommunications Council, emeritus chairman of its international Advisory Council, and has covered PTC's Honolulu conferences for *Network World*. He has been a visiting professor at Oxford University. He worked at Bellcore (Bell Communications Research, now Telcordia Technologies) and served on the team that helped develop Carnegie Mellon University's graduate degree in information networking.

* Excerpt from Jay E. Gillette, "Leadership for the Information Renaissance: Clarity, Challenges, Opportunity," *Annual Review of Communications, vol. 60*, pp. 165–170, International Engineering Consortium, 2007.

Outstanding Chapter Award Winners

Outstanding Chapter Awards 2006–2007

Twenty chapters were recognized at the 2008 Annual ECEDHA and HKN Awards Banquet March 17, 2008, in San Diego, California, as 2006–2007 Outstanding Chapter Award winners. This prestigious award was presented to the department head of each chapter in a private reception with the HKN Board of Governors and special guests in attendance. Alan Lefkow, HKN Outstanding Chapter Award Committee chair, presented the plaques with Dr. Dave Irwin, HKN president.

The award is based on the person-hours of service, leveling the playing field for large and small chapters to be recognized. Other considerations for the award include recruitment and service activities to the department, university, and community. Nominations are taken from the required Annual Chapter Report, due October 15 for the previous academic year. Award details are available on the HKN Web site (**www.hkn.org**).

2006–2007 CHAPTER AWARD RECIPIENTS

Alpha	*University of Illinois – Urbana-Champaign*
Beta	*Purdue University*
Beta Epsilon	*University of Michigan*
Beta Eta	*North Carolina State University*
Beta Mu	*Georgia Institute of Technology*
Beta Omicron	*Marquette University*
Delta Omega	*University of Hawaii – Manoa*
Epsilon Beta	*Arizona State University*
Epsilon Omicron	*University of Delaware*
Gamma Chi	*New Mexico State University*
Gamma Iota	*University of Kansas*
Gamma Theta	*Missouri University of Science and Technology*
Gamma Xi	*University of Maryland – College Park*
Iota Gamma	*University of California – Los Angeles*
Mu	*University of California – Berkeley*
Rho	*University of Colorado – Boulder*
Theta Epsilon	*Kettering University*
Theta Nu	*North Carolina A&T State University*
Upsilon	*University of Southern California*
Xi	*Auburn University*

Notes from Headquarters

As we close another academic year, HQ has a few important notes:

- Don't forget to update your contact information online!
- Student members should save November 7-9, 2008 for the 2008 Student Leadership Conference at Carnegie Mellon University. Check online for details.
- Chapters are required to file either a 990 or e-postcard (990N) with the IRS starting with the fiscal year ending June 30, 2008. Please keep track of your finances carefully. Details will be provided to faculty advisors after July 1 for the proper filing procedures.
- Verify that your membership records have been sent to HQ. Inductees are NOT considered members of HKN until HQ has received the complete paperwork and dues and they will not have access to *THE BRIDGE* magazine, Experience, Inc., or other HKN member benefits.
- HKN has recently partnered with Experience, Inc., a career services and alumni networking community. Registration is free and provides many opportunities for interacting with professional HKN members, free member to member job posting, and tons of open jobs and internships both in and out of ECE.
- Annual Chapter Reports are due October 15, 2008 for the 2007-2008 academic year. Chapter officers, please work with your incoming officers to be sure this project is completed on time. The chapter report is used to determine the Outstanding Chapter Award winners so go the extra mile and include pictures and detailed descriptions of your activities.
- Nominations for the Outstanding ECE Student Award are due June 30, 2008 for a graduating senior. Chapters are encouraged to nominate their top student for national recognition and a financial award.

*As always, the HKN Web site **(www.hkn.org)** is the best source of information, paperwork, project ideas, award information, and upcoming activities.*

HKN Chapter Highlights

In addition to their impressive scholarship abilities, HKN members are dedicated to performing service activities and having some fun too. The following is a glimpse into only some of the impressive projects going on around the country.

Pumpkin Pi *– For each ticket pledges sell, a small pumpkin with one of the digits of π is added to the ECE lobby. By Halloween numerous pumpkins line the hallways and a pumpkin pie is raffled off to the winning ticket holder. Best of all, the proceeds are donated to a local shelter for victims of domestic violence.*

Elementary After-School Programs *– HKN members volunteer at an elementary after-school program making crafty Valentine's Day cards.*

CoE Junior Expo *– HKN helps promote the College of Engineering by hosting intermediate school students in competitions for various engineering fields, including an electromagnetic fishing pole competition. HKN and IEEE chapters combine efforts in introducing basic engineering concepts and getting younger students interested in the exciting fields of ECE.*

Arb Day *– HKN members get out of the lab and get dirty in a local nature preserve. Environmentally considerate and always eager to expand their knowledge, they learn about invasive species and preserving the local ecosystem. Armed with hacksaws, they fell trees and collect seeds of the native plants to plant elsewhere.*

Scholarships *– HKN members started the Laboratory Supplies Project years ago with two goals in mind—to raise money to fund an HKN scholarship and to provide savings to students on required lab equipment purchases by purchasing in bulk. The proceeds from this project and generous alumni donations have raised enough money to establish the ECE HKN Endowed Scholarship at Georgia Tech and guarantee the scholarship in perpetuity.*

Social *– HKN members also like to have fun! Picnics, Whirley Ball, paintball, bowling, dance lessons, movie nights, pizza parties, HKN versus IEEE football and soccer tournaments, barbecues, video game tournaments, and trivia competitions are only some of the ways HKN members spend those rare study breaks.*

What Do Changes in the ECE Profession Tell Us about ECE Education?

by John Orr

Much attention has been focused on the declining interest in the United States in studying engineering in general, and electrical and computer engineering in particular. Not much attention has been directed to the question of "Just what *is* the ECE profession now, and what will it be in the future—both in the United States and around the world?" This question deserves substantial attention; otherwise we won't understand what it is that we are designing our educational programs for, and what it is that we would like to interest more students in pursuing professionally.

Looking Back

Our profession began with, and still comprises, just two fundamental aspects: generation, transmission, and use of ***electric power***; and processing, transmission, and storage of ***information***. For both of those purposes, EE began as circuit design, with circuits that compose power systems, or that process signals in some way. Of course the underlying physics was important, and that encompassed the description of electromagnetic phenomena in circuits and in free space. And of course we needed math to represent the phenomena that were occurring. For many years that was sufficient—sufficient for an analog world where, on the information side, our goal was to represent as accurately as possible some signal of interest and then transmit it, store it, and/or reproduce it. That signal might have been sound, an image, or the desired flight path of an aircraft. We pushed that approach a very long way while also developing three new branches of our profession: signal and system analysis, digital computation, and solid state devices. The synergy of these three areas, building on the incredible simplicity and elegance of systems such as the telephone, AM radio, and the power grid, have brought us to the present day, where most electrical and computer engineers could not recall when they last made use of classical circuit theory.

As we look at ECE over the past 100+ years in the United States, we see several technical, industrial, and professional cycles play out. We see these cycles in the names of corporations that have come and gone or transformed themselves: Radio Corporation of America (RCA), General Electric, Westinghouse, American Telephone and Telegraph (AT&T), Bell Telephone, International Business Machines (IBM), Digital Equipment Corporation, Novell Networks, Hewlett-Packard, etc. The profession moved from dominance on the power side to analog electronics with the growth of communications and entertainment networks, to digital computers, to the networking explosion. At the same time our profession was maturing and moving from being almost purely technology-driven to being predominantly marketing-driven.

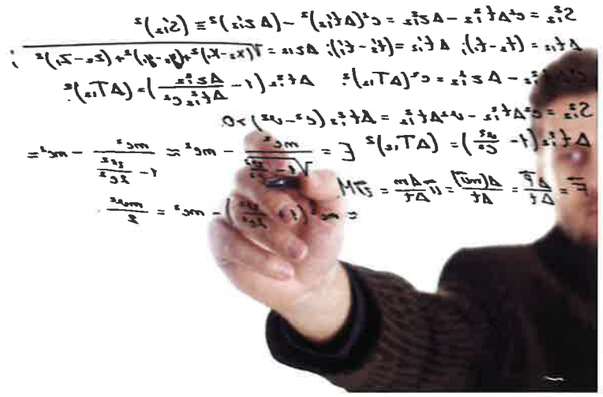
Where We Are Today

In other words, we moved from "What *can* we do technically?" to "What do people *want and need* to have done?" In fact this transformation was already under way when I began my ECE career with Bell Labs in 1969. I worked on the "Picturephone" project that represented a natural enhancement of telephone service to include a full-motion image of the person to whom you were talking. We were extremely proud of our ability to transmit and switch 1 MHz bandwidth analog video using upgraded telephone technology, but it turned out the customers did not buy the service. It simply did not have value for them. That was humbling for the Bell System!

On another front, our profession moved from being highly concentrated geographically, often around universities in the United States and a few other highly developed nations, to its current status as a truly global profession. With this maturation and broadening, the profession in the United States is vastly different than it was a generation ago, and the profession in some other nations may be quite similar to the situation in the United States 10, 20, or 30 years ago. In particular, the part of engineering that we think of as its heart, analog and digital design engineering, is completely global in scope, and probably shrinking in size as a proportion of the overall profession. Conversely, the parts of engineering that are closer to the customer are location-dependent and are growing. Because of our great technical successes and our ability to build on past work to design systems of ever-greater complexity, in ECE we can now do almost anything. The important question is "What should we do?" Only our customers can answer that, and it is the customers who drive the entire enterprise.

Looking Ahead

Hence for the United States at least, our view of ECE should be more systems-oriented, more focused on innovation and on customers. This has a substantial impact on the undergraduate ECE curriculum. We can in fact, *invert* much of the curriculum. That is, we can move much of what used to be considered basic and core concepts to the senior or graduate level. This includes such topics as circuits and networks beyond the most elementary. A particularly significant example is solid-state physics. Long ago this was considered an advanced topic, suitable only for graduate school.



When I entered college, solid-state theory was being introduced into the undergraduate curriculum because the future of electronics was clearly based on the transistor and we needed to understand the fundamentals of transistor operation. Now solid-state electronics, both analog and digital, is so highly developed that most engineers make use of functional building blocks and only a few actually design those circuits at the device level. Hence, any in-depth study of solid-state theory can once again be left for graduate school, for those relatively few engineers who will pursue that specialty.

Our goal should be to develop an undergraduate ECE curriculum that can be completed in four years *even if* the student enters college without having chosen ECE as his/her intended major. I believe this is essential if we are to make more progress on our long-stated goal to substantially increase participation by women and under-represented groups, as well as to make the program attractive to more of our traditional students. To accompany this, we will rely more on master's programs to supply the domain-specific knowledge that many engineers will need. At that point (rather than fresh out of high school) the engineer is in a position to make informed choices about his/her advanced education, just as the budding lawyer or doctor is able to make choices about his/her professional education.

As members of Eta Kappa Nu, we are expected to be leaders of our profession. In order to lead we must have a clear vision for what the ECE profession is, and more important, what it will be in the future. On a global basis ECE is a major player in raising the standard of living in many nations, and it is doing that in two distinct ways: first, by bringing affordable technological products to people of very modest means; second, by enabling the growth of high-tech industries that build those products locally and put people to work in relatively high-paying jobs. Within the United States the profession is evolving and maturing in the ways described above. As industry leaders many of you will play on both stages—participating in the global economy and making decisions that will determine our profession's future in the United States.

Conclusion

Three aspects are key:

1) Continue to focus on the technological breakthroughs and innovation that we do so well.
2) Pay close attention to our customers and their varied needs.
3) Help us move to an ECE educational approach for which large numbers of bright high school graduates say "That's what I want to study in college."

For more on this topic, visit **www.hkn.org/bridge**

ABOUT THE AUTHOR

John A. Orr

Provost ad interim, Dean of Undergraduate Studies, Professor of Electrical and Computer Engineering, Worcester Polytechnic Institute

Alpha chapter – University of Illinois, Urbana-Champaign

Dr. Orr joined the faculty of WPI in 1977 and served as head of the Electrical and Computer Engineering department from 1988 to 2003. In addition to B.S. and Ph.D. degrees from the University of Illinois, he received the M.S. degree in EE from Stanford University. Dr. Orr's research includes recent work in the area of positioning systems, and he maintains an interest in signal processing applied to power systems. He has also been involved in curriculum development at both the undergraduate and graduate levels as well as in assessment and accreditation activities for engineering education. Dr. Orr serves as a director-at-large of Eta Kappa Nu and is a fellow of the IEEE.

Outstanding Electrical and Computer Engineering Student Award 2007

The Alton B. Zerby and Carl T. Koerner Outstanding Electrical and Computer Engineering Student Award recognizes outstanding scholastic excellence and high moral character, coupled with demonstrated exemplary service to classmates, university, community, and country. This program is administered by the Los Angeles Area Alumni chapter. A jury of distinguished engineers selects the recipient.

For more on the award and a list of past winners, visit ***www.hkn.org/awards/oeces.html.***

2007 AWARD RECIPIENT

Priyanth Chandrasekar, *University of Maine*

At the annual meeting of the Electrical and Computer Engineering Department Heads Association (ECEDHA) March 17, 2008 in San Diego, California, Priyanth Chandrasekar accepted his 2007 Outstanding ECE Student Award plaque and financial gift from Tom Rothwell, Award Committee chair, and Dr. Dave Irwin, HKN president, in front of 200 guests at an annual HKN and ECEDHA Awards Banquet.

Priyanth double-majored in electrical engineering and economics at the University of Maine in 2007 and currently studies at the University of Cambridge in England. At UMaine, Priyanth was an officer in Eta Kappa Nu, IEEE, Golden Key Honor Society, and a member of Tau Beta Pi, Senior Skulls, and the National Society of Collegiate Scholars. For fun he played cricket with the UMaine Cricket Club and participated in the International Students Association, the Black Bear Men's Chorus, and UMaine Pep Band.

Priyanth's peers awarded him Resident Advisor of the Year, President of the UMaine Student Government, Student Leader of the Year, and Outstanding Freshman, Sophomore, Junior, and Senior. Priyanth still managed to maintain a high grade-point average and volunteer his time at the Crossroad Ministries and Manna Soup Kitchen. He was also chief organizer of successful campus-wide events such Metal Chef 2006, Rangoli 2005, International Dance Festival 2005 and 2006, and Culturefest 2004 and 2005.

Honorable Mention:

Rahil D. Jogani, *University of Illinois – Urbana-Champaign*

Monte K. Watanabe, *University of Hawaii – Manoa*

Finalist:

Ming-Jay Shiao, *University of Delaware*

Kristine Skinner, *University of Southern California*

2008 Student Leadership Conference

HKN is pleased to announce that Sigma chapter, Carnegie Mellon University, will be hosting the 2008 Student Leadership Conference in Pittsburgh, Pennsylvania, November 7–9, 2008, entitled "**Technical Leadership and Innovation.**"

Carnegie Mellon

Mark your calendars! This year's event will have the added feature of a student congress to discuss with the HKN Board of Governors the future of HKN and life after the potential merger with the IEEE.

The conference will begin Friday evening with an informal gathering for students from across the country to interact and socialize. Saturday the conference will feature world-renowned speakers, panel discussions, topical breakout sessions, and special activities, including a trolley tour of Pittsburgh. Saturday will conclude with a special keynote dinner.

Sunday morning everyone will gather again for a special congress to discuss the future of HKN. This is the ideal opportunity for chapters to provide direct feedback to the HKN Board of Governors regarding what they would like to see offered from the honor society, what they appreciate about being a member of HKN, and how to continue to serve the membership from the time they are inducted as students throughout their professional careers. The board believes that the merger with the IEEE will not affect the daily administration of HKN, but it will provide opportunities for expansion, industrial interactions, and funding that will ensure HKN's existence as the premier electrical and computer engineering honor society for many years to come. The board of governors is interested in student input and appreciates Sigma chapter offering to facilitate this special event. All chapters are invited to attend, and HKN is currently seeking financial support for chapters to attend. More details about the conference and possible travel stipends will be sent to the chapters and will be available on the HKN Web site (**www.hkn.org**).

If your company is interested in sponsorship opportunities, please contact Melissa Miller at HQ (*Melissa@hkn.org*) for more information.

We look forward to seeing you in Pittsburgh in November!

Sigma Chapter Officers >

Broadband over Power Lines

by Lee Lushbaugh and S. Rasoul Safavian

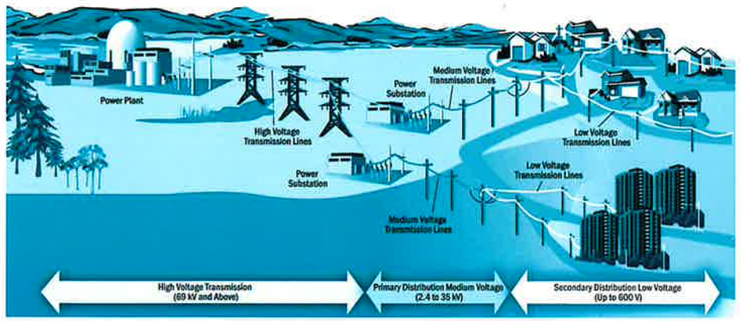


Figure 1 *Electric Power Transmission and Distribution Network*

The Internet's proliferation has focused attention on the importance of providing widespread access to broadband services. Many studies show that such access can have profound positive socioeconomic impacts. Currently, however, broadband access is available to relatively few people worldwide. Broadband access has traditionally been provided via either digital subscriber line (DSL) or cable. More recently, wireless and satellite broadband access has also gained significant momentum. Now, a third—wired—option is emerging: broadband over power line (BPL).

Overview of Grid Structure and Topology

A power grid basically consists of power plants or generators, transmission substations, transmission lines, power substations with transformers to change voltage levels, and distribution lines that collectively generate and carry the electricity from power plants all the way to wall plugs. See *Figure 1*.

Power plants are basically spinning electricity generators. Spinning can be performed by a steam turbine, and steam can be created by burning fossil fuel or from a nuclear reactor. A generator's output is three-phase alternating current (AC) power at voltage levels in the thousands.

Transmission substations next to power plants use large transformers to step up generator output from thousands of volts to hundreds of thousands of volts (typically between 155,000 and 765,000 volts), thus allowing megawatts of power transmission over distances of 300 miles or more.

At power substations, voltages are stepped down and lines are branched out to cover larger areas. This is performed successively, transforming and branching out from extremely high voltage (EHV, typically 155 to 765 kV) to high voltage (HV, typically 45 to 155 kV), and then from HV to medium voltage (MV, typically 2 to 45 kV), and finally from MV to low voltage (LV, typically 100 to 600 V) for delivery to homes or businesses. The result is a tree-structured power distribution hierarchy. Basically, EHV and HV are used to transmit AC electric power, and MV and LV are used to distribute it.

A network of MV lines is usually referred to as the primary distribution; a network of LV lines is the secondary distribution. In the United States, at the primary distribution level, most power lines are aerial, or overhead. At the secondary distribution level, particularly in newer urban areas, most lines run underground. Overhead lines are more susceptible to producing radiation interference and picking up interference than underground lines. But underground lines are used less due to the prohibitive cost of burying cables. In the United States, MV lines typically run between 15 and 50 km.

Altering the Power Grid to Allow BPL

EHV and HV lines are usually too noisy to transmit broadband communications signals; only MV and LV lines are used for BPL. MV lines are usually less branched than LV lines, making point-to-point connections possible. MV networks allow communication over longer distances because of their weaker signal attenuation and lower noise level.

To use power lines for broadband communications, the broadband signal must be injected into and extracted from the lines through couplers. LV couplers may be capacitive or inductive, depending on distribution system topology, performance requirements, and cost. In capacitive coupling, a capacitor is responsible for the actual coupling, and the signal is modulated onto the network's voltage waveform. In inductive coupling, an inductor is used to couple the signal onto the network's current waveform. Inductive couplers are known to be rather lossy, but since they require no physical connection to the network, they are safer to install on energized lines than are capacitive couplers. MV couplers are typically inductive. It is important that couplers be easy-to-install passive devices with low failure rates that can be used outdoors and installed on energized lines.

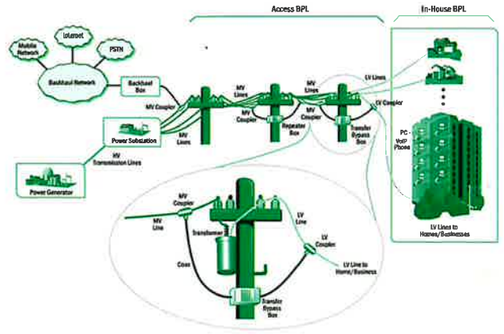


Figure 2 *Typical Broadband over Power Line Architecture*

Line noise, limitations on the amount of signal power that can be injected into power lines without causing unacceptable interference for other spectrum users, and signal attenuation as the signal traverses the line make it necessary to regenerate or repeat the signal periodically. This can be done by using MV couplers to couple the broadband signal off the MV line so that it can be regenerated if necessary and amplified before being fed back onto the MV line through another coupler. Repeaters, on the other hand, could add latency (especially if the signal is regenerated) and could also create single points of failure, because a single bad repeater can bring down an entire communications line.

The distribution transformers that change voltage levels between MV and LV lines are particularly harsh on the weak broadband signal. Transformers, which are intended to pass low frequencies near 50 or 60 Hz, appear as open circuits for the passage of higher-frequency signals and typically attenuate and distort the weak broadband signal beyond reconstruction and usability. This implies that BPL signals going between MV and LV lines need to bypass the transformers. Typically, the bypass box can also have built-in repeating functionality at a small incremental cost. The recent capability to effectively and safely bypass transformers has been instrumental to the success and deployment of BPL.

A point of presence (POP) is needed to connect the BPL network to a backhaul network such as the Internet, a public switched telephone network (PSTN), or a mobile network. The connection is made through a backhaul network box coupled to an MV distribution line, typically next to a power substation where multiple MV lines are connected. The backhaul network box is typically a bidirectional device that converts data formats, aggregates and concentrates uplink data streams, provides routing functionality, helps allocate bandwidth and resources, generates billing and charging data, and provides various backhaul Ethernet interfaces to fiber-optic or wireless connections.

Even though the importance and direct socioeconomic impact of access to broadband services are well understood, currently only 4 percent of the Earth's population has access to some type of broadband services, typically via DSL or cable modem. BPL offers a new, potentially powerful alternative means of providing high-speed Internet services, voice over Internet protocol (VoIP), and other broadband services to homes and businesses by using existing MV and LV power lines. Because roughly 60 percent of the Earth's inhabitants have access to power lines, BPL could play a significant role in bridging the existing digital divide. But the success of BPL, like that of any new technology in its infancy, depends on more than strong theoretical results or successful field testing. It also depends greatly on the appropriate business models and deployment plans.

Conclusion

As the regulatory uncertainties and interference issues surrounding BPL dissipate, and with the success of many field trials and early commercial deployments, the release of various standards, and the growing availability of reasonably priced standardized and reliable equipment, the road to BPL is becoming increasingly well paved and BPL seems to be well energized. Indeed, BPL's future looks very bright.

For more on this topic, visit
www.hkn.org/bridge

ABOUT THE AUTHORS

Lee Lushbaugh
President, Bechtel Communications, Inc.

Mr. Lushbaugh provides day-to-day direction to project directors and regional managers on all issues relating to Bechtel's performance on contracts totaling approximately $1.5 billion in revenue annually. Previously, he was the program director for the Cingular GSM Services Project, with overall responsibility for Bechtel's relationship with Cingular Wireless, LLC in Atlanta, Georgia. He is a 28-year Bechtel employee who has served both functional and operational roles in the power and telecommunications business lines.

S. Rasoul Safavian
Vice President and Chief Technology Officer – Americas, Bechtel Communications, Inc.
Beta chapter – Purdue University

Before joining Bechtel in June 2005, Dr. Safavian oversaw advanced technology research and development activities at LCC International, Wireless Facilities, and GCB Services. His roles have included responsibility for CDMA–related programs; XM satellite radio; and the design, deployment, optimization, and operation of 3G wireless networks. He has been an adjunct professor at George Washington University and a visiting faculty member at Purdue University, where he received his Ph.D. in electrical engineering.

Member Profiles

Michael A. Isnardi

Distinguished Member Technical Staff, Video, Communications, and Networking Systems
Sarnoff Corporation

Career Highlights

Being part of the team that accepted a Technical Emmy® Award for Sarnoff's Compliance Bitstreams was a highlight of my career. It was a real team effort, and it was great to get industry recognition for our work. Another highlight is the DIRECTV system, which has been called "the most successful consumer electronic product launch in U.S. history." It is heartening to see the system I helped develop become a source of entertainment and information for millions of subscribers. But believe it or not, what gives me the most satisfaction is the process of understanding how a technology or process works—not superficially, but deeply—so that improvements and optimizations become almost obvious.

Education and Career

My signal processing and information theory courses were highly relevant to my Ph.D. thesis and subsequent technical work at Sarnoff. For instance, MIT's graduate-level course on multidimensional signal processing was directly applicable to my very first project at Sarnoff, which involved designing an advanced TV system that "hid" detail information in unused portions of the 3D video spectrum.

Advice to Engineering Graduates

I was a technical manager for many years, and although I had no formal training in this area, I know that many engineering colleges and universities now offer some technical leadership training. If you feel that you have leadership qualities or have been told that you do, I recommend taking one of these technology management courses, as it will be sure to come in handy in your career.

Earl McCune

Founder, Chief Technical Officer, and Vice President of Engineering
Tropian

Career Highlights

Several highlights come immediately to mind. As the test equipment chief engineer, I inherited a project that when completed remained in production for 10 years. Successfully starting several companies is certainly a highlight, though those require a huge amount of work and sacrifice. Technically, demonstrating that several theories were incomplete (or improperly interpreted) by building hardware that performed "theoretically impossible" [tasks] was quite satisfying.

Education and Career

Beyond learning the details of engineering, education is here to teach us how to think. I have learned that all education is a good investment. My decision to go back to graduate school 17 years into my career is a good sign of that. But education must be interwoven with experience for greatest value. Having advanced degrees definitely does help in starting companies with international business goals.

Advice to Engineering Graduates

Be flexible and adaptive in your career. Above all, continuously strive to more thoroughly understand the fundamentals of your chosen specialty, as this will allow much more ease in adapting to inevitable change. I am amazed at how many people do not do this.

I am fortunate in that I knew what I wanted to do before college. I'm still doing it and still enjoying what I do. That's more important than the money or anything else—to work at what excites you. Your quality of work is noticeably higher. And management (good management, anyway) will notice. The money does come.

Sydney S. Weinstein

Chief Technical Officer
sevenEcho, LLC

Career Highlights

Starting several businesses, growing them, and then selling them to start another, and in doing so being involved in many of the major business of what became the dot-com industry. I came from a research background and took that drive for knowledge and turned it into several successful businesses.

Education and Career

Engineering education is about how to approach and solve problems in an economical and useful fashion. That education and the ability it taught me to learn, has allowed me to adapt as the world around me changed. And Lehigh made sure that engineering also included sufficient writing and communications experience so that I can relate and teach others.

Advice to Engineering Graduates

Never underestimate the value of what you learn and enjoy outside of engineering. The technology will change, the world will change, but the basics of people and business will not. Make sure your education is well rounded and that you have learned to communicate (written and oral) well. It's the people skills that will matter long after you have graduated.

Eta Kappa Nu Association Financial Report

For the year ended June 30, 2007 (Reviewed)

STATEMENT OF FINANCIAL POSITION

ASSETS

CURRENT ASSETS	
Cash and cash equivalents	$210,321
Membership receivable	4,950
Awards inventory	6,374
Prepaid Expenses	3,303
Total current assets	224,948
INVESTMENTS – at Market Value	956,042
Total assets	$1,180,990

LIABILITIES AND NET WORTH

CURRENT LIABILITIES	
Accounts payable	$11,828
Accrued Expenses	
Advanced Sponsorship	800
Administrative Expenses	227,767
Total current liabilities	240,395
LONG TERM LIABILITIES	
Unearned subscription revenue	439,698
NET ASSETS	
Unrestricted	500,897
Total liabilities & net worth	$1,180,990

STATEMENT OF ACTIVITIES

REVENUE	
Memberships	$104,785
BRIDGE magazine subscription	74,681
Merchandise sales (net of $8,260 of costs incurred)	14,823
Contributions	39,737
Total Revenue from Operations	234,026
OPERATING AND ADMINISTRATIVE EXPENSES	
Management fee	115,567
Awards	11,372
BRIDGE production	33,480
Chapter support	6,514
Directors, officers and committees expense	30,133
Office and administrative expenses	30,615
Professional fees	5,345
Total Operating and Administrative Expenses	233,026
Net gain from operations	1,000

OTHER INCOME	
Dividends and Interest	$33,721
Realized gain on the sale of investments	5,689
Market value appreciation of investments	71,707
Net Other Income	111,117
NET GAIN	112,117
NET ASSETS – BEGINNING OF YEAR	388,780
NET ASSETS – END OF YEAR	500,897

STATEMENT OF CASH FLOWS

CASH FLOWS FROM (USED FOR) OPERATING ACTIVITIES	
Cash received from memberships, contributions and program activities	$181,101
Cash paid for operations	(208,033)
Net cash used for operating activities	(26,932)
CASH FLOWS FROM (USED FOR) INVESTING ACTIVITIES	
Investment earnings	33,721
Proceeds from the sales of investments	253,655
Purchase of marketable securities	(236,709)
Net cash from investment activities	50,667
NET INCREASE IN CASH AND CASH EQUIVALENTS	23,735
CASH AND CASH EQUIVALENTS BEGINNING OF YEAR	186,586
CASH AND CASH EQUIVALENTS END OF YEAR	210,321

Reconciliation of Net Gain to Net Cash Used for Operating Activities

NET GAIN	$112,117
ADJUSTMENT TO RECONCILE NET GAIN TO NET CASH USED FOR OPERATING ACTIVITIES	
Investment activity attributable to investing activities	(111,117)
Cash received or expended to	
Decrease in accounts receivables	1,020
Increase in inventories	(5,574)
Increase in accounts payable and accrued expenses	38,827
Decrease in unearned subscription revenue	(62,205)
Net cash used for operating activities	($26,932)

Get Connected at www.hkn.org

Update Your Member Profile Today!

The HKN Web Site

HKN News Features

HKN members can stay up to date on the latest society activities and notable accomplishments of fellow members by visiting the HKN Web site. The site's home page features news headlines that link to articles and press releases.

Career and Alumni Services

Job openings, free career posts to other HKN members, resume and interview techniques, and networking opportunities are available through Experience, Inc. Free registration is available on the HKN Web site.

Chapter Administration Forms and Information

Everything needed to establish and run an HKN chapter is available in one spot on the HKN Web site.

Eta Kappa Nu Association
300 West Adams Street, Suite 1210
Chicago, Illinois 60606-5114, USA

CHANGE SERVICE REQUESTED

#BYNXRGP *****ALL FOR ADC 66340
#A2170000007# 146-3

STEVE E WATKINS
1870 MINER CIR
ROLLA, MO 65409-0001

NONPROFIT
U.S. POSTAGE
PAID
CHICAGO IL
PERMIT NO. 1131