

Members Engaged & Inspired:

IEEE-HKN 2019 Year in Review

Building a Stronger Future for IEEE-HKN

Asad M. Madni
Outstanding
Technical
Achievement &
Excellence Award
Honors Engineering
Pioneer

IEEE-HKN Call for Nominations

Student Leadership Conference Photo Album

Graduate School Spotlight

IEEE-Eta Kappa Nu



2020 Issue 1 // Volume 116

THE BRIDGE

The Magazine of IEEE-Eta Kappa Nu

2019 YEAR IN REVIEW

Engaged & Inspired

1,015
INDIVIDUAL
ACTIVITIES
were reported

263 CHAPTERS

85,000
HOURS GIVEN
to HKN service



MORE THAN

225

PARTICIPANTS

at the Student

Leadership Conference





IEEE-HKN AWARDS PROGRAM

As the Honor Society of IEEE, IEEE-Eta Kappa Nu provides opportunities to promote and encourage outstanding students, educators and members.

Visit our new website to view the awards programs, awards committees, list of past winners, nomination criteria and deadlines.

ALTON B. ZERBY AND CARL T. KOERNER **OUTSTANDING STUDENT AWARD (OSA)**

Presented annually to a senior who has proven outstanding scholastic excellence and high moral character, and has demonstrated exemplary service to classmates, university, community, and country.

(Deadline: 30 June)

C. HOLMES MACDONALD OUTSTANDING TEACHING AWARD (OTA)

Presented annually to electrical engineering professors who have demonstrated, early in their careers, special dedication and creativity in their teaching, as well as a balance between pressure for research and publications.

(Deadline: Monday after 30 April)

DISTINGUISHED SERVICE AWARD

Recognizes members who have devoted years of service and lifetime contributions to Eta Kappa Nu (or IEEE-HKN), resulting in significant benefits to all of the Society's members.

Jason Hui

Regions 1-2

Michael Benson

Regions 3-4

Rakesh Kumar

Regions 5-6

Lorena Garcia

Regions 7-10

(Deadline: Monday after 30 April)

OUTSTANDING CHAPTER AWARD (OCA)

Recognizes chapters for excellence in activities and service at the department, university and community levels. The award is based on the content contained in their Annual Chapter Report for the preceding academic vear.

(Deadline: Monday after 30 September)

OUTSTANDING YOUNG PROFESSIONAL AWARD (OYP)

Presented annually to an exceptional young engineer who has demonstrated significant contributions early in their professional career.

(Deadline: Monday after 30 April)

NEW! IEEE-HKN ASAD M. MADNI OUTSTANDING TECHNICAL ACHIEVEMENT AND EXCELLENCE AWARD

Presented annually to a practitioner in the IEEE technical fields of interest who has distinguished himself or herself through an invention, development or innovation that has had worldwide impact.

(Deadline: Monday after 30 April)

Katelyn Brinker

Student Governor

Sandro Sartoni

Student Governor

IEEE-Eta Kappa Nu Board of Governors

President

Edward A. Rezek

President-Elect

Ronald Jensen

Past President

Karen Panetta

Governors

James Conrad Governor At-Large

M. Ryan Bales Governor At-Large

> Preeti Bajaj Governor At-Large

Treasurer

Ron Jensen

Secretary

Bernard Sander

Director

Nancy Ostin **Program**

Manager

Stacey L. Bersani

IEEE-Eta Kappa Nu (IEEE-HKN) was founded by Maurice L. Carr at the University of Illinois at Urbana- Champaign on 28 October 1904, to encourage excellence in education for the benefit of the public. IEEE-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 IEEE-HKN. Ideas and opinions expressed in THE BRIDGE are those of the individuals and do not necessarily represent the views of IEEE-HKN, the Board of Governors, or the magazine staff.

Get in touch with Eta Kappa Nu ♥ Twitter: ieee_etakappanu () Facebook: IEEE-HKN

THE BRIDGE

The Magazine of IEEE-Eta Kappa Nu

ISSUE 1, 2020 | 2019 YEAR IN REVIEW: MEMBERS ENGAGED & INSPIRED

Features

Building a Stronger Future for IEEE-HKN

Asad M. Madni Outstanding **Technical Achievement & Excellence Award Honors Engineering Pioneer**

12

2019 YEAR IN REVIEW **Members Engaged** & Inspired

Departments

BOARD NEWS IEEE-HKN Welcomes New Members of the Board of Governors

2020 IEEE-HKN AWARDS Call for Nominations

10

DONOR PROFILES Nihal Kularatna Senior Member

Jim Look Eta Chapter Life Senior Member

16 **CONFERENCE WRAP-UP**

19 **VIC Summit**

20 IEEE-HKN

Founders Day

22

Graduate School Spotlight

27

WELCOME NEW EMINENT MEMBERS **IEEE-HKN Elevates** Three Pioneers to Eminent Member Ranks

30

PROFESSIONAL PROFILE Toshio Fukuda Member of IEEE-HKN **32**

STUDENT PROFILE Grace Brazil Zeta Chi Chapter President

<u>34</u>

ALUMNUS PROFILE Christian Femrite Former Notre Dame HKN Delta Sigma Chapter President

36

SPONSORED CONTENT 6 Engineering Fields You Probably **Never Thought About**

38

IEEE-USA Wham! Bang! Zoom! IEEE-USA E-BOOKS **Debuts New Engineering** Superheroes!

Editors-in-Chief: Sahra Sedigh Sarvestani and Steve E. Watkins

Student Leadership Conference

Editorial Board Members:

Emily Hernandez, Marcus Huggans, Emmanuel Oyekanlu

Managing Editor: Nancy Ostin **Assistant Managing Editor:** Stacey L. Bersani

Advertising Sales: Christine Cherevko

Design Company: Tumbleweeds, LLC

IEEE-HKN INTERNATIONAL HEADQUARTERS

Editorial inquiries: IEEE-Eta Kappa Nu, 445 Hoes Lane, Piscataway, NJ 08854, USA US Toll Free: +1 800 406 2590 Outside US: +1 732 465 5846 Email: info@hkn.org | www.hkn.ieee.org

Subscription address and email changes: IEEE Contact Center US Toll Free: +1 800 678 4333 | Outside US: +1 732 981 0060 | Fax: +1 732 562 6380 | Email: contactcenter@ieee.org



Scholarship: The Iota Gamma Chapter at the University of California at Los Angeles, a 2019 Outstanding Chapter Award winner, inducted 32 members in November 2019 and 29 members in May 2019.

Building a Stronger Future for IEEE-HKN

IEEE-Eta Kappa Nu is more than just an honor society—it is a lifetime designation and a connection to some of the most talented engineering minds around the world.

Every day, HKN members rise to meet the needs and challenges of our time, pushing the envelope for what is possible in the fields of electrical and electronics engineering every single day. Since 1904, our society has recognized those whose curiosity and determination know no boundaries. Students and professionals who refuse to give up until the problem is solved. Engineers who hear the calls of their communities, and answer through their willingness to serve others. Our three organizational ideals lie at the heart of all that we do—Scholarship, Character and Attitude.

For more than a century, HKN has fostered an exceptional community and grown its network across the globe. Now, we have an opportunity to make HKN membership more meaningful than ever. We are ready to be bolder, think bigger, and transform electrical and electronics engineering by empowering the next generation of leaders in our field—but we can't do it without the philanthropic support of those who believe in us most.

One of the most important components when looking at philanthropic support is ensuring the priorities that are in line with the needs of students and alumni. To ensure we got this right, we took a scientific approach.

Over the course of six months:

- Reviewed communications materials to assess HKN's current development infrastructure and fundraising potential
- Distributed a survey to more than 27,000 alumni
- Held 18 individual interviews
- Held one focus group workshop

Based on the feedback we received, the following priorities were identified to provide new opportunities for students to learn and grow; to activate an extensive alumni network through deeper engagement; and to ensure that HKN can continue to build lifelong connections with members well into the future.

Throughout the year, visibility around the following efforts will be increased. Today, we want to introduce you to the priorities:

Fueling the Success of Our Campus Chapters

For many members of HKN, campus chapters are a gateway to all that the organization has to offer and define what an HKN community can look like. Each year chapter officers plan engaging programs that enrich the college experience and often provide a home base on campus where students can collaborate and build community with their professors and peers. Our chapters accomplish so much on their campuses and beyond, exhibiting a high degree of autonomy and resourcefulness to make the HKN experience memorable for students. Many operate on few resources, and as a result can face limitations in the opportunities they can provide to students.

Connecting our Alumni Network

Our expansive global network of alumni has always been our greatest strength. HKN members have founded some of the most successful companies in the world, made discoveries that have transformed the field, and created tools that each of us use in our daily lives. When HKN alumni connect, the possibilities are endless. In order to best leverage our powerful network, we need to create a system that better facilitates these connections.



Character: Members of the IEEE-HKN Alpha Chapter at the University of Illinois at Urbana-Champaign , also a 2019 Outstanding Chapter Award winner, build circuits with students at an area middle school as part of a community outreach program.

Throughout the years, the organization has been an important venue for professionals to provide support to one another and further their careers. When a member loses touch with this powerful network of HKN peers, he or she misses out on the potential to establish important human connections that shape personal and professional lives. And while we've engaged more alumni in recent years, it is time to further systematize our work in this area.

Expanding Access to the Student Leadership Conference

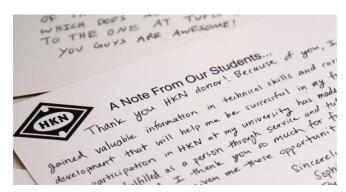
The annual Student Leadership Conference is HKN's signature opportunity for student leaders from chapters all over the world to kick-start their careers through engaging professional development, leadership, and networking activities. From dynamic keynote speakers sharing their perspectives on the workforce of today, to interactive breakout skill-building sessions, the Student Leadership Conference is the best chance for HKN delegates to build connections among the organization's membership network and to share what they've learned with other students in their home chapters.

HKN currently provides support in the form of a \$250 stipend intended to assist each chapter in sending at

least one delegate to the Conference. However, this typically cannot cover the full cost of attendance in most cases, and chapters must often use their own resources to send student delegates to the Student Leadership Conference. This means that chapters with fewer resources sometimes miss out on the dynamic programming that this event offers.

Recognizing Leaders of Today & Tomorrow

At HKN, we foster an environment that encourages and celebrates the continued success of our members and alumni. The awards program is a critical component of the Eta Kappa Nu experience, recognizing the exceptional achievements of members around the world.



Attitude: Attendees of the 2019 IEEE-HKN Student Leadership Conference write personal notes thanking individuals who contributed to the Student Leadership Conference Fund, which helps offset the costs of sending members to the conference.

Building an Endowment for Eta Kappa Nu

We want to ensure that Eta Kappa Nu can continue making an impact on the lives of talented electrical and electronics engineers for our next 100 years. By growing our endowment, we can build a perennially strong and sustainable foundation to maintain and build upon the experiences we create for HKN members. In order to grow and create programs, better serve our members, and weather future storms, we must ensure our core stability.

We want to extend a special thanks to all of those who played a part in creating these priorities. It is only through your support that HKN can influence the engineers that will follow in your footsteps.

Feeling Inspired? Make your gift today by following this link.

https://www.ieeefoundation.org/ieee hkn

THE BRIDGE

IEEE-HKN Welcomes New Members of the Board of Governors

The IEEE-HKN Board of Governors welcomed five new members, and a sixth member was elected to a second term as Student Governor. Edward Rezek will lead the society as President in 2020.



Dr. Edward Rezek, Delta Zeta Chapter, an IEEE Fellow, serves as President of the Board this year. He retired after 35 years from Northrop Grumman Space Technology. He has received 19 patents and has more

than 50 publications in refereed journals.



Ronald Jensen, Nu Chapter, an IEEE Life Senior Member, was elected President Elect for 2020. Ron served as IEEE-HKN Treasurer from 2015 to 2019, Region 3-4 Governor from 2016-2018, and

has led numerous HKN committees, including Journey Mapping, Finance, Strategic Planning, MGA Alignment, Faculty Advisor, Membership and PR & Communications.



Dr. Karen Panetta, Epsilon Delta Chapter, a Fellow of the IEEE, has assumed the position of Past President for the 2020 year. She is the Dean for Graduate Education and a Professor of Electrical and Computer

Engineering and Adjunct Professor in Computer Science at Tufts University in Massachusetts.



Dr. Jason Hui, lota Gamma Chapter, an IEEE Senior Member, was elected Region 1-2 Governor. He is a Senior Staff Program Engineering Manager at Elbit Systems of America. He has been in the aerospace and defense

industry for over 17 years with primary interests in systems engineering and technology and engineering management.



Professor Lorena Garcia, Eta Chapter, an IEEE Senior Member, was elected Region 7-10 Governor. She is Professor and Director of Laboratories and Facilities of the Faculty of Engineering and Basic Sciences

of Universidad Central, and has served as Associate Dean of Electronic Engineering and Systems and Telecommunications Engineering programs at Universidad Sergio Arboleda, and Business Director of the Center of Excellence and Adoption on Internet of Things.



Dr. M. Ryan Bales, Gamma Theta Chapter, an IEEE Senior Member, was elected as Governor At-Large. He is a Senior Research Engineer in the Sensors and Electromagnetic Applications Lab (SEAL) at the Georgia Tech Research

Institute (GTRI). He specializes in FPGA and embedded system design, and real-time signal processing for electronic warfare applications.



Katelyn Brinker, Gamma Theta Chapter, returns for a second term as Student Governor. She is pursuing her Ph.D. in electrical engineering at lowa State University with the support of a NASA Space Technology Research

Fellowship and while working as a NASA Pathways Intern at Goddard Space Flight Center. She is the recipient of the DiscoverE New Faces of Engineering 2017 IEEE-USA award and the HKN 2017 Outstanding Student Award.



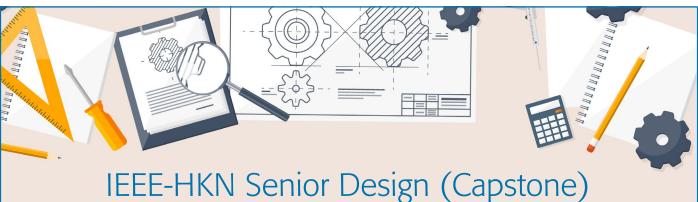
Sandro Sartoni, Mu Nu Chapter, was elected to a term as Student Governor. He is pursuing his master's degree in Electronic Engineering—Embedded Systems at the Politecnico di Torino, Italy. He received his

bachelor's Degree Electronic Engineering at the University of Florence, graduating in 2017 and scoring a 110/110 Cum Laude.



It is with the utmost gratitude that the IEEE-HKN Board of Governors and the Editorial Board of THE BRIDGE thank and commend Dr. Stephen Williams, Professor and Chair of EECS, Milwaukee School of Engineering, for his dedication to THE BRIDGE in his years of service, especially as Editor-in-Chief. He was critical to the consistent excellence of the magazine, and we are grateful for all his contributions. Thanks, Steve!





POSTER COMPETITION

Are you working on a Senior Design (Capstone) Project?

Enter a poster describing your project in the IEEE-HKN Senior Design Poster Competition. Abridged versions of selected posters will appear in an upcoming issue of *The Bridge*, with authors being recognized.

ELIGIBILITY

- The project should have been completed as part of your undergraduate coursework in a topical area of IEEE interest, and supervised by a faculty member.
- The work must have been conducted since 2018.
- Copyright must be available for all images and figures.
- Previously published work is eligible if reprint permission has been granted.

REQUIREMENTS

- Submissions should be in .PDF format.
- Your poster must include the following information:
- Project Title
- Names and affiliations of project team members (students)
- Name and affiliation of faculty supervisor
- An abstract that briefly describes the project
- Motivation
- Approach
- Conclusions
- Acknowledgments (optional)

To enter, complete the submission form on the HKN website.

Entries must be received by 20 March 2020.

> THE BRIDGE



Dr. Karen Panetta (right) 2019 IEEE-HKN President, and Eric Sarnoff, President of the lota Gamma Chapter at the University of California at Los Angeles, present Dr. Asad M. Madni (left) with a ceremonial medal that will be presented to the recipients of the Asad M. Madni Outstanding Technical Achievement and Excellence Award, IEEE-HKN's highest award.

Asad M. Madni Outstanding Technical Achievement & Excellence Award Honors Engineering Pioneer

The IEEE-HKN Board of Governors established the Asad M. Madni Outstanding Technical Achievement and Excellence Award as its highest award to be given to a practitioner who has distinguished himself or herself through an invention, development, discovery or innovation in electrical or computer sciences, engineering or technology, with worldwide impact. Factors considered in bestowing this award include the impact and scope of applicability, the impact on the public welfare, and the impact on the standard of living, sustainability and/or global stability.

The award is the first-ever endowed award for IEEE-HKN, made possible through a generous donation from the Madni family and a matching gift campaign. Each recipient will receive a custom medal, certificate and honorarium.

"The Madni Family's gift is transformative for IEEE-HKN, and we appreciate their assistance in encouraging others to fulfill the mission and vision of recognizing scholarship, attitude and character and to develop the next generation of engineers to meet the challenges of the future," said 2019 IEEE-HKN President Karen Panetta. "Asad Madni's rich legacy of technical accomplishments and philanthropy is inspiring and motivating and sets a high standard for others to strive to attain."

When evaluating nominations, judges will consider leadership, innovation, individual contributions, originality, breadth, patents/publications, other achievements, honors, duration of dominance, and quality of nomination.

Dr. Asad Madni served as President, COO & CTO of BEI Technologies Inc. from 1992 until 2006. His achievements include leading the development and commercialization of intelligent sensors, systems and instrumentation for the aerospace, military, commercial and transportation industries. His major contributions with worldwide impact include the Extremely Slow Motion Servo Control System for the Hubble Space Telescope's Star Selector System, which provided the Hubble with unprecedented accuracy



and stability, resulting in truly remarkable images that have enhanced our understanding of the universe; the revolutionary MEMS GyroChip® technology, used worldwide for Electronic Stability Control and Rollover Protection in passenger vehicles, thereby saving millions of lives every year; and RF and microwave systems

The Madni Family's gift is transformative for IEEE-HKN, and we appreciate their assistance in encouraging others to fullfill the mission and vision of recognizing scholarship, attitude and character and to develop the next generation of engineers to meet the challenges of the future.

KAREN PANETTA



and instrumentation, which significantly enhanced the combat readiness of the US Navy (and its allies) and enabled the Department of Defense to simulate more threat-representative electronic countermeasure environments for advanced warfare training.

Dr. Madni was elevated to IEEE-HKN Eminent Member in 2015 and received the IEEE-HKN Vladimir Karapaetoff Outstanding Technical Award in 2017 "for seminal contributions to the development and commercialization of intelligent sensors, systems and instrumentation for aerospace, commercial aviation and automotive safety."

Dr. Madni, is an IEEE Life Fellow, IEEE-HKN Eminent Member, Member of the National Academy of Engineering & Fellow of the National Academy of Inventors. He has received numerous awards & honors. Since 2011, he is a UCLA ECE distinguished adjunct professor and distinguished scientist, and Faculty Fellow, Institute of Transportation Studies.

2020 IEEE-HKN Awards: Call for Nominations



IEEE-Eta Kappa Nu encourages Chapters and individuals to nominate all eligible candidates for the 2020 IEEE-HKN Awards. The awards promote and encourage educational excellence in electrical and computer engineering and allied fields. These awards recognize outstanding accomplishments by students, professors and industry professionals who make significant contributions to society, and who exemplify a balance of scholarship, service, leadership and character.

Deadlines begin 4 May 2020.

For information and a description of each award, click here.

The 2020 award categories are:

- Asad M. Madni Outstanding Technical
 Achievement and Excellence Award
 (Deadline to submit applications: 04 May 2020)
- <u>C. Holmes MacDonald Outstanding Teaching Award</u> (Deadline to submit applications: 04 May 2020)
- <u>Distinguished Service Award</u>
 (Deadline to submit applications: 04 May 2020)
- Outstanding Young Professional Award
 (Deadline to submit applications: 04 May 2020)
- Alton B. Zerby and Carl T. Koerner
 Outstanding Student Award
 (Deadline to submit applications: 30 June 2020)

To submit your nominations, visit the IEEE-HKN Awards Portal.



Donor Profiles



Nihal Kularatna Senior Member

Honoring a Fellow Member and Future Generations

After meeting many global IEEE members early in his career as an engineering professional in Sri Lanka, Nihal Kularatna felt energized. "All of these encounters inspired me to work closely with IEEE and to be an active volunteer," he said. That desire only deepened as he became an Associate Professor at the University of Waikato in New Zealand and met IEEE Fellow Dr. Asad M. Madni at the IEEE Sensors Conference in 2005.

"My association with Dr. Madni as an IEEE Fellow and friend enabled me to focus my technical writing within my sixth through ninth books to help professional engineers fill the gap between

IEEE isn't only a technical organization, but *a great platform* through which to share your technical expertise and contribute your goodwill for the benefit of the pioneers of the 'knowledge economy'.

NIHAL KULARATNA

academia and the industry," Nihal shared. "When I was informed of the award established by IEEE-HKN to honor Dr. Madni—the 'IEEE-HKN Asad M. Madni Outstanding Technical Achievement and Excellence Award'—I felt immediately that completing my 10th book would be a good opportunity to support his generous gesture and set an example for other IEEE members."

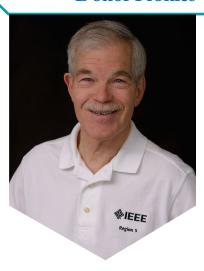
Nihal elected to donate 20 percent of his 65 percent share of the royalties from his upcoming book (Energy Storage Devices for Electrical Systems, Second Edition) to the aforementioned initiative, and his publisher was more than happy to help facilitate this arrangement. According to Nihal, "Forty percent of this book's content is based on our innovative supercapacitor-assisted (SCA) techniques, culminating in several international patents and successful commercialization, and truly supports an award recognizing 'technical excellence.'

Nihal is proud to honor his friend and mentor and to help nurture future leaders in the field. According to Nihal, "IEEE isn't only a technical organization, but a great platform through which to share your technical expertise and contribute your goodwill for the benefit of the pioneers of the 'knowledge economy."

To honor Dr. Madni by donating to the fund for the IEEE-HKN Asad M. Madni Outstanding Technical Achievement and Excellence Award fund, please follow this link.

https://www.ieeefoundation.org/Madni

Donor Profiles



Jim Look

Eta Chapter Life Senior Member

Doing Good and Feeling Good

Jim Look can't say enough about the big initiatives, key people and major world events he's experienced during his more than 50 years of IEEE membership. "Early in my career, I worked in the Middle East, and IEEE publications were my primary source of leading-edge technical information," said Jim, current 2020-21 Director of IEEE Region 5. "Now, volunteering with the IEEE has been an opportunity to do good and feel good."

Among the initiatives close to his heart, Jim recently donated to the John Meredith Memorial Fund (recognizing longtime IEEE member/leader and 2007 IEEE-USA President and IEEE Foundation Director Emeritus John Meredith, who passed in September 2018) as well as the IEEE-USA

> With IEEE's vast selection of special-interest groups, technical societies and humanitarian programs, you can find an activity to support, regardless of your passion.

> > JIM LOOK



Community Outreach Vehicle (MOVE). "I wished to memorialize John because of his tremendous personal contribution to IEEE overall and to the Region in particular, while the MOVE truck represents the physical embodiment of volunteer action supporting those in need," he said.

Jim chose to donate through Donor Advised Funds because "they can have significant U.S. Federal tax advantages, depending on your personal tax situation," he explained. "A large lump sum contribution can be made to a Donor Advised fund in one tax year, possibly qualifying for the Federal income tax deduction for charitable donations, and then those same funds can be disbursed tax-free over many years at your discretion and to your favorite charity, all the while continuing to earn investment gains."

"With IEEE's vast selection of special-interest groups, technical societies and humanitarian programs, you can find an activity to support, regardless of your passion," Jim confirmed. "In fact, it's our duty to build upon the successes of the engineers and scientists who have preceded us and support the efforts of our colleagues working to advance the state of the art for the benefit of humanity."

To support the students and mission of IEEE-HKN, please follow this link.

https://www.ieeefoundation.org/ieee hkn



IEEE-ETA KAPPA NU:

2019 Year in Review: Members Engaged and Inspired

While 2018 was a year of steady growth and systematic improvements, 2019 was the year in which IEEE-Eta Kappa Nu saw tremendous engagement and support from our students, volunteers and contributors.

And who do we have to thank? You—our students, alumni, volunteers, partners and friends in this wonderful endeavor known as IEEE-HKN. You have given of your time, talent and treasure to ensure that Eta Kappa Nu thrives now and well into the future and continues to support, inspire and educate the industry's leaders of tomorrow.

In 2019, students were inspired to dedicate 85,000 hours of service to HKN (two chapters logged 10,000 hours of service each). Records were set for the number of chapters submitting annual reports; the number of chapters casting votes in the Board of Governors election; the number of individual activities reported and attendance at the society's premier educational and professional development event: the Student Leadership Conference.



A total of 23 professional members were inducted into the Eta Chapter in 2019, including this class inducted at Region3's SoutheastCon.

Our Board of Governors worked closely with internal partners, such as various IEEE Operational Units and Societies, and external partners, such as the Electrical and Computer Engineering Department Heads Association (ECEDHA) to expand learning and networking opportunities for our students. The Board of Governors also embarked on a project to make HKN easily discoverable in the IEEE Rosters tool so that Region Directors and Sections Leaders could identify and ultimately work with HKN Chapters when conducting training and service programming to better align HKN with IEEE's processes and systems so there is improved synergy and partnership among the groups. This project is expected to debut in Q1 2020.

Our partners and benefactors contributed to a transformational year of giving. For the first time in



Hulya Kirkici

its 115-year history, Eta
Kappa Nu has an endowed
award, the Asad M. Madni
Outstanding Technical
Achievement and Excellence
Award, made possible
through a generous donation
from HKN Eminent Member
Asad M. Madni and his
family and a matching gift

campaign. It is the society's highest award. The first-ever Student Paper Award, to be presented at the Region 3 SoutheastCon, was made possible through a gift from HKN Eta Chapter member Hulya Kirkici. Both awards will be presented for the first time in 2020.

These two endowments were the jumping off point for a development study to build a strategy for philanthropic support. This support is critical to assisting our Chapters and members attain success in their academic and community service pursuits. The support is essential to enable more students to attend the Student Leadership Conference. It is critical to the strength and vibrancy of the society into the future.

2019 YEAR IN REVIEW

MEMBERS Engaged & Inspired

85,000 HOURS GIVEN to HKN service

[2 chapters reported OVER 10,000 HOURS of activities each]

1,015 INDIVIDUAL ACTIVITIES WERE REPORTED

163 CHAPTERS SUBMITTED annual reports

102 CHAPTERS VOTED in the annual IEEE-Eta Kappa Nu Board of Governors Election

62 chapters, double the 2018 number, oRDERED FOUNDERS DAY KITS to promote HKN on campus and in their communities

25% INCREASE in Chapter Officer Reporting Doubled the number of Chapters with pages on **HKN.ORG**

Record number of participants at the **Student Leadership Conference**



More than 225 PARTICIPANTS

46 SCHOOLS from 7
DIFFERENT COUNTRIES
were represented

\$40,500 in sponsorships (\$9,500 in 2018)

The student who traveled the farthest was from QUEENSLAND, AUSTRALIA

Transformative year for **FOUNDATIONAL GIVING**

FIRST EVER ENDOWED AWARD WAS ESTABLISHED

The IEEE-HKN Asad M. Madni Outstanding Technical Achievement and Excellence Award will be awarded for the first time in 2020.

FIRST EVER BEST STUDENT PAPER AWARD

was endowed and will be given for the first time at South East Con (Region 3) in 2020.

As HKN grows, the need for financial support from donors and friends *increases*—HKN alumni generously chose to support the mission and students we serve.

INDUCTIONS

Close to

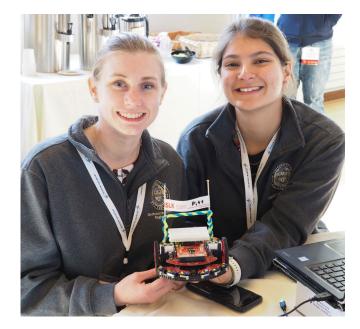
3,000 STUDENT MEMBERS

23 PROFESSIONAL MEMBERS

3 HKN MEMBERS were elevated to Eminent Member

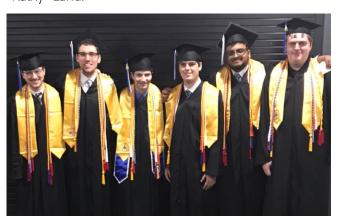
Dr. Henry Samueli, Founder of Broadcom and pioneer of Wi-Fi and Bluetooth technology Dr. G. David Forney, developed the first "modern" high-speed telephone line modem Dr. Robert Metcalfe, Inventor of the Ethernet

2nd CHAPTER in Mexico was installed at the Universidad Autonoma de Queretaro



Students from the University of Pittsburgh show off the robot they made during the robotics workshop sponsored by DigiKey Electronics and presented by Texas Instruments at the SLC.

As mentioned earlier, the largest-ever IEEE-HKN
Student Leadership Conference was held 1-3
November 2019 at Tufts University in Medford,
Massachusetts. Students from 46 schools, representing
seven countries—including one student from
Queensland, Australia, attended the conference,
which consisted of a hands-on, IoT workshop from
Cypress Semiconductors; a robotics workshop
sponsored by DigiKey Electronics and presented by
Texas Instruments; a breakfast keynote sponsored by
Lockheed Martin and the keynote at the annual awards
banquet given by 2020 IEEE President-Elect Susan
"Kathy" Land.



Members of the Kappa Lambda Chapter don their HKN honor cords and stoles at graduation.

Corporate, university and non-profit groups contributed more than \$40,000 in sponsorships to the Student Leadership Conference, which helped cover the costs underwritten by HKN.

More than numbers, HKN is about the people who have taken the pledge to live out the tenets of Scholarship, Character and Attitude that are the underpinnings of the society. HKN is fortunate to count among its ranks pioneers and giants of the industry, whose work has had worldwide impact. In 2019, three members who were inducted as students were elevated to Eminent Member, HKN's highest membership rank. They are: Dr. Henry Samueli, founder of Broadcom and pioneer of Wi-Fi and Bluetooth technology; Dr. G. David Forney, who developed the first "modern" high-speed telephone line modem; and Robert Metcalfe, inventor of the Ethernet.



Eminent Member Dr. Henry Samueli and 2019 IEEE-HKN President Dr. Karen Panetta attended the Internet 50 event in Los Angeles.

Their professional endeavors, which clearly have had global impact, stand to inspire our current and future members.

It is with the utmost gratitude that the Board of Governors thanks all our members, volunteers, department heads, faculty advisors, donors and staff for their unwavering support of IEEE-HKN. Let us move forward together into a future filled with promise and success.



The 2019 Student Leadership Conference drew a record 225 students, faculty, alumni, speakers and sponsors to Tufts University in Medford, Massachusetts. The November 1-3 conference included handson workshops and sessions on professional and career development. Susan "Kathy" Land, 2020 IEEE President-Elect, offered the keynote speech at the awards banquet. Following are her remarks.

Student Leadership Conference

Susan "Kathy" Land, 2020 IEEE President-Elect

I would like to thank IEEE Eta Kappa Nu President Dr. Karen Panetta and Conference Chair Dr. Jim Conrad for the invitation to speak to you today.

And to say 'hello' to the members of HKN here at the 2019 Student Leadership Conference, you are truly the future leaders of tomorrow and it is an honor to be able to speak to you.

I would like to share with you the warmest of congratulations as we have just this week, on October 28th, celebrated 115 years of HKN excellence as we recognized HKN Founders Day. As we celebrate, and as we are gathered here, I would like to take a moment to reflect—and to remember—that although the founding purposes of HKN...which were to create an organization to recognize the scholastic success of students and to help them find employment support in their careers, as well as the core guiding principles that, an invitation to join Eta Kappa Nu is an early recognition of success, based on Scholarship, Attitude, and Character.

That today, within IEEE, the HKN purpose is broader than that originally conceived by the HKN founders-and that is to additionally assist its members throughout their lives in becoming better professionals as well as better citizens.



















Thank you to our sponsors.

Without you, the 2019 Student Leadership Conference could not have been the success it was.





































In addition, another purpose is that members should be a constructive force, helping fellow members and non-members alike to improve the standards of the profession, the courses of instruction, and the institutions where its chapters are established.

I am proud to be a member of HKN and am inspired when I see this purpose put into action by the peer advising, exam prep, mentoring and tutoring programs, and programming activities at each one of the over 250 HKN chapters across the globe. The HKN leadership represented here today are recognized as positive and constructive forces within their educational institutions and I would like to personally thank you for your community service and dedication to the HKN guiding principles and purpose.

When we took the HKN pledge we promised to live up to the principles of IEEE-Eta Kappa Nu and to bind ourselves to the faithful observance of these promises.

I would like to encourage each of you. Remember how special you are. You are not only intelligent, but each of you are already a volunteer. You may not know how important this is now, but by helping others or by contributing your effort for free, you are building character and enhancing the meaning of your life.

I found a great quote by Jim George that I thought was very appropriate for this student leadership conference, as well as for Eta Kappa Nu, "Serving Others Prepares you to Lead Others".

As President of IEEE, please know that you will continue to have my support. Do not hesitate to contact me if you need anything or have any questions. Keep up the great work!

VIC Summit

IEEE Awards is happy to provide HKN members a **20% discount** to attend the 2020 IEEE Vision, Innovation, and Challenges Summit and Honors Ceremony Gala.

Join us on 15 May 2020 in Vancouver to hear from leading innovators, visionaries, and disruptors on what **immersive technology** means for our future. Speaker topics include:

- Virtual healthcare
- Cybersecurity
- AI/VR/MR and more!

Register before 15 April at <u>ieee-vics.org</u> and enter discount code: HKN20 to save 20% (off early-bird registration!).





The Gamma Theta Chapter at Missouri S&T held its celebration in collaboration with a university-wide event to raise the profile of the Chapter on campus.

IEEE-HKN Founders Day

Eta Kappa Nu celebrated the 115th anniversary of its founding on 28 October 2019. Chapters and individual IEEE-HKN members throughout the world marked the occasion by hosting social events, performing community service, holding technical workshops and reconnecting with alumni.









Members of the Mu Theta Chapter at Chulalongkorn University in Thailand showcase the Outstanding Chapter Award they earned.





The Gamma Rho Chapter at South Dakota State University (photo at far left) donned the IEEE-HKN sunglasses they received as part of the Founders Day kit during their get-together. The lota Epsilon Chapter at the University of Hartford in Connecticut celebrated with pizza, while the Zeta Delta Chapter at the University of Texas at El Paso feasted on barbecue.



DIGI-KEY: YOUR PARTNER FOR ACADEMIC SOLUTIONS

Your FREE Tools for Success!



INTRODUCING... DK IoT STUDIO™

The fastest and simplest way to create, deploy, and manage complete embedded-to-cloud IoT solution.



REFERENCE DESIGNS

Search and compare from manufacturer provided reference designs through Digi-Key's Reference Design Library.



EDA AND DESIGN TOOLS

Digi-Key's unparalleled design tool solutions are ready to help oring your designs to fruition quicker and easier than ever before



CONVERSION CALCULATORS

Digi-Key's conversion calculators include tools for converting temperature, pressure, capacitance, resistance codes, and more.



Scheme-it is an online schematic and diagramming tool that llows anyone to design and share electronic circuit diagrams



With the Digi-Key BOM Manager, you can import your Bill of Materials, name and save your BOMs, and share your designs.



VIDEO AND ARTICLE LIBRARY

Learn from Digi-Key's library of tutorial videos, how-to demos. n-depth design articles and how-to articles.



AND MUCH MORE!

The vast engineering resources paired with the extensive nventory makes Digi-Key a great tool for your success!

Educational Kits

As the technological world continues to explode at an unprecedented rate, individuals looking to take the first step towards learning about this fast-growing field have a tough task ahead of them. Digi-Key Electronics has made this move a little easier with educational kits and projects.

Learn more about the newest technologies from companies at the forefront of technological innovation with help from Digi-Key!



Online Conversion Calculators

A one-stop resource for many electronics industry calculations!

Ø	TEMPERATURE CONVERSION	\blacksquare	VOLUME CONVERSION	D	BATTE
也	PRESSURE CONVERSION	ATTE	RESISTOR COLOR CODE CALCULATOR	4	LENGT
dBm	DBM TO WATTS CALCULATOR	$\dashv \vdash$	CAPACITANCE CONVERSION	(1)	TIME (
J	BTU/JOULES CONVERSION	Δįδ	WEIGHT CONVERSION	A	LED SI

No One Knows Boards Like Digi-Key: DIGIKEY.COM/BOARDS

Over 10,000 Different Boards and Modules in Stock from These Suppliers and More!

















ERIES RESISTOR

FIND THEM ONLINE AT:

VISIT DIGI-KEY'S ACADEMIC OFFERING AT DIGIKEY.COM



Digi-Key is an authorized distributor for all supplier partners. New products added daily. Digi-Key and Digi-Key Electronics are registered trademark: of Digi-Key Electronics in the U.S. and other countries. © 2020 Digi-Key Electronics, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA

SS ECIA MEMBER

The coolest jobs are at Lockheed Martin Space.

For over 100 years, the men and women of Lockheed Martin have supported missions that push the boundaries of science, achieving the highest standards of excellence. Join our ranks and use your ambition to drive innovation that defends America and protects the world.

Lockheed Martin Space is searching for qualified candidates to join our team. Build a career with purpose that shapes the future, and join a team that values integrity, trust and diversity at all levels.

Discover the possibilities

Launch your career at www.lockheedmartinjobs.com/space







Worcester Polytechnic Institute

At WPI your graduate work will cross disciplines in a community dedicated to delivering exceptional research experiences. With engaged advisors and mentors, students pursue inquiry grounded in solving complex real-world problems. Your discoveries are supported from idea to lab to marketplace.



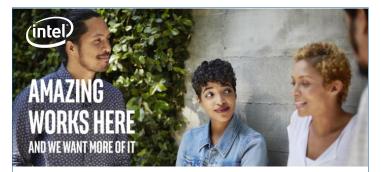
wpi.edu

Multidisciplinary **Research Areas**

CYBERSECURITY INTELLIGENT SYSTEMS AUTONOMOUS VEHICLES MACHINE LEARNING DATA SCIENCE ROBOTICS BIOMEDICAL HEALTH CARE DELIVERY







Intel's Massachusetts Design Center located in Hudson, MA is where many of Intel's leadership processor products are developed - and we're hiring. An internship or entry level job with us is your pathway to play an active role in advancing and shaping the future of technology in the world.

Come join our culture of innovation and exploration and enjoy the many experiences and perks we have to offer as you help us pioneer advances in hardware, software, energy, and many other fields.

JOIN OUR COMMUNITY OF PASSIONATE INNOVATORS!

Apply to our positions on Intel.com/jobs today!



EARN AN M.S.

in computer engineering or electrical engineering in as little as one year.

uml.edu/ECE







COMPSAC is the IEEE Computer Society Signature Conference on Computers, Software and Applications. It is a major international forum for academia, industry, and government to discuss research results and advancements, emerging challenges, and future trends in computer and software technologies and applications. The theme of COMPSAC 2020 is "Driving Intelligent Transformation of the Digital World".

Staying relevant in a constantly evolving digital landscape is a challenge faced by researchers, developers, and producers in virtually every industry and area of study. Once limited to software-enabled devices, the ubiquity of digitally-enabled systems makes this challenge a universal issue. Furthermore, as relevance fuels change, many influencers will offer solutions that benefit their own priorities. Fortunately, history has shown that the building blocks of digital change are forged by those conducting foundational research and development of digital systems and human interactions. Artificial Intelligence is not new, but is much more utilized in everyday computing now that data and processing resources are more economically viable, hence widely available. The opportunity to drive the use of this powerful tool in transforming the digital world is yours. Will your results help define the path ahead, or will you relegate those decisions to those with different priorities for utilizing intelligence in digital systems? COMPSAC has been and continues to be a highly respected venue for the dissemination of key research on computer and software systems and applications, and has influenced fundamental developments in these fields for over 40 years. COMPSAC 2020 is your opportunity to add your mark to this ongoing journey, and we highly encourage your submission!

COMPSAC 2020, organized as a tightly integrated union of symposia, will focus on technical aspects of issues relevant to intelligent transformation of the digital world. The technical program will include keynote addresses, research papers, industrial case studies, fast abstracts, a doctoral symposium, poster sessions, and workshops and tutorials on emerging and important topics related to the conference theme. Highlights of the conference will include plenary and specialized panels that will address the technical challenges facing researchers and practitioners who are driving fundamental changes in intelligent systems and applications. Panels will also address cultural and societal challenges for a society whose members must continue to learn to live, work, and play in the environments the technologies produce.

Authors are invited to submit original, unpublished research work, as well as industrial practice reports. Simultaneous submission to other publication venues is not permitted except as highlighted in the COMPSAC 2020 J1C2 & C1J2 program. All submissions must adhere to IEEE Publishing Policies, and will be vetted through the IEEE CrossCheck portal. Further info is available at www.compsac.org.

Organizers

Standing Committee Chair: Sorel Reisman (California State University, USA)
Steering Committee Chair: Sheikh Igbal Ahamed (Marquette University, USA)

General Chairs: Mohammad Zulkernine (Queen's University, Canada), Edmundo Tovar (Universidad Politécnica de Madrid, Spain), Hironori Kasahara (Waseda University, Japan)

Program Chairs in Chief: W. K. Chan (City University, Hong Kong), Bill Claycomb (Carnegie Mellon University, USA), Hiroki

Takakura (National Institute of Informatics, Japan)

Workshop Chairs: Ji-Jiang Yang (Tsinghua University, USA), Yuuichi Teranishi (National Institute of Information and Communications Technology, Japan), Dave Towey (University of Nottingham Ningbo China, China), Sergio Segura (University of Seville, Spain)

Local Chairs: Sergio Martin (UNED, Spain), Manuel Castro (UNED, Spain)

Important Dates

Workshops proposals due: 15 November 2019 Workshops acceptance notification: 15 December 2019 Main conference papers due: 20 January 2020

Main conference papers due: 20 January 2020 Paper notification: 3 April 2020

Workshop papers due: 9 April 2020 Workshop paper notifications: 1 May 2020 Camera-ready and registration due: 15 May 2020



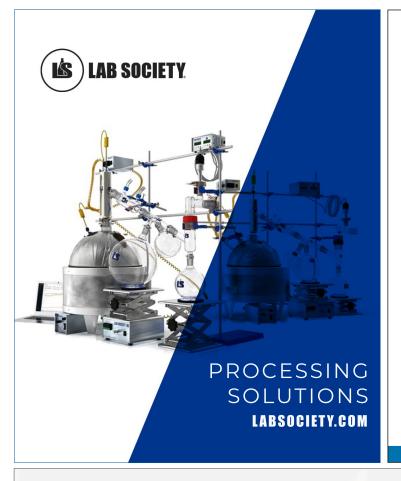


Photo: King Felipe III in Major Square, Madrid
Photo credit: Iria Castro - Photographer (Instagran

Photo credit: Iria Castro - Photographer (Instagram @iriacastrophoto)







Are You Eta Kappa Nu?



Show Your Eta Kappa Nu!

If it's not on your card, it's not in your IEEE membership record. Let us know!







800-406-2590 info@hkn.org www.hkn.org



IEEE Learning Content at Your Fingertips

Check out the IEEE Learning Network (ILN) for hundreds of hours of online learning courses from across IEEE, taught by industry experts

Benefits include:

- On-demand courses and live virtual training
- Continuing Education Units (CEUs) or Professional Development Hours (PDHs)
- Discounts on select courses for IEEE members
- Ability to search educational offerings across IEEE

Visit iln.ieee.org and start learning today!



IEEE-HKN Elevates Three Pioneers to Eminent Member Ranks

Since 1950 when the Eminent Member designation was established, only 143 Eta Kappa Nu members, out of more than 100,000 worldwide, have been elevated to this prestigious membership category.

In 2019, IEEE-HKN welcomed three industry and academic giants as Eminent Members: Dr. Henry Samueli, Dr. G. David Forney Jr. and Dr. Robert Metcalfe.

Dr. Samueli is the co-founder of Broadcom Corporation and serves as Chairman of the Board of Broadcom Inc., a global leader in providing semiconductor solutions for wired and wireless communications. He is a Professor (on leave since 1995) at UCLA, involved in teaching and research in digital signal processing and integrated circuit design. He graduated 18 Ph.D. students. He is a named inventor in 75 U.S. patents, and was elected a Fellow of the IEEE, a member of the National Academy of Engineering, a Fellow of the American Academy of Arts and Sciences and a Fellow of the



Dr. Henry Samueli, Iota Gamma Chapter

National Academy of Inventors. He has received numerous awards and honors, including the Marconi Society Prize and Fellowship, bestowed upon him for "pioneering advancements in the development and commercialization of analog and mixed signal circuits for modern communication systems, in particular the cable modem." He sits on several Boards of Directors, including the Samueli Foundation, and serves as Chairman of the Broadcom Foundation Board. He was inducted into the HKN lota Gamma Chapter at UCLA.



Dr. G. David Forney Jr., Epsilon Pi Chapter.

Dr. Forney received a BSE in Electrical Engineering, from Princeton University where he was inducted into the Epsilon Pi Chapter of HKN. Dr. Forney earned his Master's and Doctorate of Science from the Massachusetts Institute of Technology. It was during that time, he built his thesis around information theory and solving errors in digital communication through Concatenated Codes, which remain at the basis of all modern communications systems today. Upon leaving MIT, Dr. Forney began his career at Codex, working on NASA's Pioneer

program. He designed the first coding system for deep space communication. It was at Codex that Dr. Forney re-designed the current modem with double-side band technology setting an internal standard with the first of its kind 9600 bit-per-second modem. During a sabbatical year at Stanford University, he integrated the Viterbi Algorithm as an optimum sequence decoder. The introduction of the trellis diagram that visualized the technique was published in the Proceedings of the IEEE in 1973 and is now



Dr. Robert Metcalfe, Beta Theta Chapter

used throughout technology in modems, wireless communications, speech recognition and more.

Dr. Robert Metcalfe was inducted into HKN's Beta Theta Chapter at the Massachusetts Institute of Technology, where he earned a Bachelor of Science degree in Electrical Engineering and Industrial Management. He received his Master's in Applied Mathematics from Harvard. While earning his PhD in Computer Science from Harvard, he worked on Project MAC at MIT. His efforts would detail packet switching in the ARPANET. Then while working at Xerox Palo Alto Research Center-PARC, Dr. Metcalfe would solve for challenges presented in the ALOHA network. It was at PARC in 1973 that Dr. Metcalfe invented the Ethernet, enabling computers to connect and transfer data at megabits per second. He then oversaw the development of microprocessor and communications developments at Xerox, which resulted in the Xerox Star workstation, bringing technologies that allow for personal computers and, ultimately an international computer industry standard, where the Ethernet is by far the most widely installed LAN. He founded 3Com Corporation, a digital electronics manufacturing company, providing controllers and switches, routers, IP voice systems and more. The company would create technologies with nearly 1,500 US patents.



Dr. Robert Metcalfe, inventor of Ethernet and the 143rd HKN member to be elevated to Eminent Member, addressed the audience gathered for the IEEE Educational Activities Board awards ceremony held in Boston, Massachusett on 23 November 2019. Following are his remarks.

Comments on Elevation to Eminent Member of IEEE Eta Kappa Nu (HKN)

Bob Metcalfe, #143

Thank you to HKN and IEEE for this honor. I invented Ethernet. I've been saying this for 46 years, and hope to continue saying it for 46 more years.

As inventor of Ethernet, I qualify to be a member of the Society of PC Port Inventors (SPPI). Among our venerable members are the inventors of RS-232, the printer parallel port, Ethernet RJ-45, VGA, HDMI, and USB. We meet quarterly to sustain excellence and ethics in PC port development standards. Our last quarterly meeting was very sad. One of our beloved inventors had died. The inventor of the USB port died the week before our last meeting. Turned out he had no family. And so our meeting became his funeral. The attending inventors became pallbearers. We carried the USB inventor's coffin across the street to his waiting grave. As we began to lower his coffin into the grave, it jammed. And so we had to pull the coffin back out of the grave, rotate it 180 degrees, and lower it back into its final resting place.

One of the cool things about being an engineer is having jokes that hardly anybody understands.

I encourage youngsters to be engineers. I give them three (my favorite number) reasons.

First, it's fun, like solving puzzles. Engineering offers the joy of mastery.

Second, being an engineer pays well—very few waiters or Uber drivers are engineers.

And third, engineering enables innovation, creating a virtuous circle between freedom and prosperity. Engineers solve the world's problems. We need more engineers.

When I was admitted to MIT's Beta Theta Chapter of Eta Kappa Nu in May 1968, the recognition made me think I had something new to live up to. Recognition drives aspiration, I found.

And now, 50 some years later, I am being recognized again by HKN. And now I feel that I must work harder to live up to being an Eminent Member. The way I will do this is by being a better role model. I suppose this is why IEEE-HKN gives such recognitions. Recognition drives aspiration.

I know a little about being a good role model. When a not-so-good role model gives a talk, his purpose is to convince the audience how special, how smart the role model is. This does not drive aspiration. The audience is left feeling how impossible it would be to match the accomplishments of such a special person. A better role model reveals how ordinary he is and how his accomplishments can be explained in a series of simple steps that anyone can take. I try to leave my audiences thinking that if this schlemiel can invent Ethernet and grow a multi-billion-dollar startup, then so can you.

Professional Profile Professional Profile



Toshio Fukuda Eta Chapter 2020 IEEE President

- Academic Degree: Dr. Engineering
- Professor Emeritus Nagoya University, Professor: Meijo University, Waseda University, Beijing Institute of Technology and more than 20 Universities as chaired and visiting professors in the world.
- IEEE Technical Field Award on Robotics and Automation (2010)

Toshio Fukuda received a PhD in Engineering from the University of Tokyo, Tokyo, Japan, in 1977. Currently, Dr. Fukuda is Professor Emeritus at Nagoya University, Professor at Meijo University, Professor at Waseda University, and Professor at Beijing Institute of Technology (BIT). His major is bio-robotics, especially Micro and Nano Robotics.

Dr. Fukuda is IEEE President (2020), and has served as the IEEE Director of Division X, Systems and Control (2017-2018), IEEE Region 10 Director (2013-2014) and President of IEEE Robotics and Automation Society (1998-1999), Director of the IEEE Division X, Systems and Control (2001-2002), Co-founding Editor-in-Chief of IEEE / ASME Transactions on Mechatronics (2000-2002) and Editor-in-Chief of ROBOMECH Journal, Springer (2013-). He was the Founding President of IEEE Nanotechnology Council (2002-2003, 2005). He was elected as a member of the Science Council of Japan (2008-2013). He is the recipient of the IEEE Robotics and Automation Pioneer Award (2004), IEEE Robotics and Automation Technical Field Award (2010), and the Chunichi Culture Award (2019).

He is an IEEE Fellow (1995), SICE Fellow (1995), JSME Fellow (2001), RSJ Fellow (2004), Honorary Doctor of Aalto University School of Science and Technology (2010), member of the Japan Academy of Engineering (2013), Friendship Award of State Administration of Foreign Experts Affairs of the PR China (2014), Medal of Honor on Purple Ribbon (2015), and Foreign member of Chinese Academy of Science (2017).

Why did you choose to study the engineering field?

I liked engineering matters, such as making mechanical and electric devices at home when I was young as primary school and junior high school.

What do you love about the industry?

I like creativities something new for the society such as robotic industry with IT.

What don't you like about the industry?

I do not like some selfish ways of the industry not considering the future.

Whom do you admire and why?

Thomas Edison, because of his many and wide varieties of invention.

How has the engineering field changed since vou entered it?

The soft and bio-medical engineering fields are rapidly growing and getting more popular than the heavy industry 30-50 years ago.

In what direction do you think that the engineering and other IEEE fields of interest are headed in the next 10 years?

Life long health care and Law engineering will be more popular for the next 10 years, since the society is going to be more mature.

What is the most important lesson you have learned during your time in the field?

Lesson: It is very important to imagine/think some new ideas and concept, and try to make it possible and realizable persistently with pioneer spirit.

What advice can you offer recent graduates entering the field?

It is wonderful to have intellectual curiosity for anything all the time.

If you weren't in your current field. what would you be doing?

I would be "Lawyer for engineering" and/or "Medical Doctor for basic research".

Finish this sentence. "If I had more time, I would ..."

"If I had more time, I would become a student to study different fields of "Human Science" in the more biological and social ways."



You can choose to directly support <u>IEEE-HKN</u> or any of the strategically identified IEEE initiatives that help meet the world's most pressing challenges and help us to realize the full potential of IEEE.



Student Profile

Student Profile



Grace Brazil
Zeta Chi Chapter
Chapter President

Grace Brazil, BSEE 2020 student at the University of Central Florida, is Chapter President of Eta Kappa Nu Zeta Chi Chapter. Outside of busy schoolwork, Grace had the privilege to lead the chapter to promote the HKN vision and values. She has enjoyed directing, leading and championing the best interest of the organization. Industry-wise, Grace held summer internships at Intel and Motorola Solutions, which fueled her desire to achieve and learn more in her electrical engineering journey. Her interest lies along System on a Chip (SoC) design, reconfigurable hardware and 5G communications. As a budding engineer, she enjoys employing engineering principles to solve problems and continually improving herself technically and personally. For leisure, she enjoys a nice cup of coffee and being a student of language. She currently is challenging herself to get to Advanced Conversational (B2) in both Spanish and Japanese. She says learning languages needs substantial patience and of course, open-mindedness to the culture that mainly uses it. Overall, she see this as a good way to open up her horizons.



UCF HKN Induction Ceremony.

What has it meant to you to be inducted in IEEE-HKN?

Being an inducted member of IEEE-HKN has been more beneficial than I initially thought. It gave me an opportunity to be my best self as a leader, as an engineering student, and as a friend. Being inducted into the honor society has given me the chance to be a part of something bigger, rather than just sticking to myself during my time in school. The Zeta Chi Chapter has given me community – I know I can depend on my chapter officers – whether it be organizing a networking event, working on a collaborative project, hosting tutoring sessions or just plain old "let's go get dinner and catch up!" I got the chance to meet with the wonderful people in my chapter who have seen each other grow and have supported each other. To me, being inducted into IEEE-HKN feels like belonging to a family, a family that is competitive, smart, yet very warm.

Do you have a best HKN story to share?

There are so many phenomenal HKN stories to pick from. I wish I could say all of them have been the highlight of my time in college. However, I think that my experience at the 2019 Student Leadership Conference in Medford, MA, has been the most memorable. Not only was I with the other officers in my chapter, we got to meet with other chapters from around the nation. I have developed a friendship with Precious Galvez, Chapter President of Zeta Iota, and we have kept in touch ever since leaving the conference. But wait, that's not just it: We also got to meet with the chapter leaders from Italy, Taiwan and Japan. The HKN workshops, sessions, and networking have definitely helped me prepare for my career and get an insight into the industry I want to be a part of. After the conference, my chapter officers and I visited the Boston, East Boston and Cambridge area. We stopped by at the MIT museum before leaving Massachusetts, and we all thought it was fun.

Why did you choose to study the engineering field?

I chose engineering because I want to work on cutting-edge technologies that will enable the world to live smarter and safer. I wanted to be able to leverage my technical knowledge to solve problems to make things easier. I live for the excitement of a new technological revolution coming out. I thought, "That sounds cool. How can I help push boundaries?" The first step was to study engineering.

What do you love about engineering?

I have two top reasons why I love engineering. One, I love the fact that in engineering, embracing diverse ideas and team collaboration is the heart of innovation. Two, I love the fact that industrial disruption through engineering can transform the world just like that.

What is your dream job?

I want to be an engineer who helps to build an adaptable and intelligent world. I want to work in the semiconductor industry in a competitive company that has a vision for a smarter world and is one of the top technological innovators.

Whom do you admire and why?

Easy question: It's definitely 2020 IEEE President-Elect Susan "Kathy" Land. In fact, I met her during the Student Leadership Conference last year in Boston. Her impressive background, career success, charisma and confidence are truly admirable. I'm glad I was able to personally meet her during the conference, where I got an insight of her engineering journey and her work with the IEEE organization.

What is the next BIG advance in engineering?

The next big advance will be 5G or the fifth generation of cellular technology. The fact that big players such as Intel, Apple, Qualcomm and Cisco are all ready to launch 5G capable devices soon is what makes me say that. It is designed to take the 4G LTE to the next level by improving its speed,



Grace Brazil and UCF Chapter at HKN Key.

reducing its latency and expanding its capability to handle more devices. This will launch a more dense and connected network that will be able to handle products that employ data-intensive capabilities, such as machine learning algorithms. What's more is that 5G technology should not only enhance the next smartphone but also improve connectivity in underserved rural areas.

What is the most important thing you've learned in school?

The most important thing I've learned in school is to work hard. Studying engineering is not easy, but it's worth it. I say it is worth it because I was able to strengthen my work ethic and time management skills. I learned how to balance schoolwork, extracurricular and social life. I believe this will make me a strong engineer.

What advice would you give to other students entering college and considering studying your major?

If you like being intellectually challenged and can see how we can change the world through solving problems, I say choose engineering. If cool new gadgets make you wonder how it was designed and how it works, consider electrical engineering. As I mentioned before, studying engineering is hard work, but the pride you obtain from solving problems and making our lives easier makes all the challenging aspects worth it!



Alumnus Profile



Christian Femrite
Former HKN Delta Sigma
Chapter President

- Electronics Design Engineer at mHUB
- B.S. Electrical Engineering, University of Notre Dame
- Significant Career Achievements:
 Co-Founded Resonado, an audio hardware startup reinventing the speaker

Christian Femrite is a recent graduate of the University of Notre Dame, and in 2017, he co-founded audio-tech startup Resonado, which uses Flat Core Speaker technology to make speakers thinner and lighter than conventional speakers. In his studies, he earned a concentration in semiconductors and minors in engineering corporate practice and actuarial science. He has completed projects relating to solar energy, nuclear physics, RF circuits, FPGAs, and acoustic testing.

He has traveled to more than a dozen countries on five continents, most of them for study or work, during or immediately after his time at Notre Dame. These opportunities became some of his most treasured learning experiences. His passion is building integrated devices and connecting with other innovators to design exciting new technologies that make an impact in everyday life.

Christian also served as the IEEE-HKN president during his final year at Notre Dame, which was an enriching culminating experience, spending time connecting with classmates on a professional level and growing together as engineers. Christian is truly thankful to have worked with all of them and continues to be amazed by their accomplishments as they embark on their careers.

Why did you choose to study the engineering field?

As the son of an electrical engineering professor, my father taught me how to solder when I was 8 years old, so I think it's always been in my nature. However, it wasn't until I went to college and took my first electronics course that I was sure it would be something I would love as a career. At first, I liked the challenge of it, but as time went on, I realized that engineering isn't so much what you're capable of learning as what you're capable of creating, and the project work I did in Notre Dame's Nuclear Science Lab and solar energy research further built my confidence that I chose the right degree. I enjoyed every electrical engineering class I took to earn my degree, and if I had to do it over again, I would absolutely still choose electrical engineering.

What do you love about the industry?

I love the freedom to create. It's so easy to buy affordable parts these days, and being a "maker" is something financially accessible to the average person. Many other career paths are much more regimented and don't have the same learning opportunities. I also love the fact that there is still so much room for discovery; it's becoming more and more of a viable career path to start a company. As we find answers, there are more and more questions to ask, and I think it's good that it's becoming more acceptable to work for multiple companies and projects, and that there's room for originality in almost any career. Traveling the San Francisco Bay Area as a co-founder was also illuminating. Every day I met someone doing something impressive and thinking in a new way. There's never a shortage of learning opportunities in the electronics industry.

What don't you like about the industry?

Coming from the viewpoint of someone who co-founded a hardware startup, I don't like the bias toward software. Everyone seems focused on software-based solutions as we push the limits of Moore's Law, and it's from a widespread perception that software leads to a quicker profit. The term "cargo cult programmer" has come to describe the implementation of code and programming structures without understanding their underlying design and purpose, leading to inefficient solutions. For example, many of my computer science classmates lamented learning Verilog because it was a "hardware description language." However, I think the projects that value good software-hardware integration will ultimately be the most successful. Building the best product requires deep silicon and transistorlevel knowledge coupled with solid programming, manufacturing expertise, and supply chain management.

Whom do you admire and why?

It was an honor to work alongside some truly brilliant classmates and professors at Notre Dame. They are changing the world with their research and careers. HKN provided me a lot of opportunities with these amazing people when I was in school, from advising sessions to serving as a tutor to attending conferences. There's no other organization as committed to helping electrical engineering and computer engineering students excel in their studies and careers. I also really admire the people here in Chicago at mHUB. It's doubling in scale every year, and it brings together amazing people with a variety of different backgrounds who are all building and designing some remarkable products. Most of all, there have been several mentors that guided me along the way, without whom I could not have reached this point in my career.

In what direction do you think that the engineering and other IEEE fields of interest are headed in the next 10 years?

One of the big topics these days is Industry 4.0. The themes of connectivity and automation are thrown

around quite regularly. However, one major change I see is the increasing acceptance and expectation of formalized continued education, especially using online platforms. I think that in the future, more of an individual's problem-solving merit will come from independent projects than from strictly classroom learning. With this, there will come more opportunities to work in a startup or small business setting because individuals inherently move faster than corporations. The bigger themes of the new 2020 decade will also be increased accessibility, diversity, entrepreneurship, and interdisciplinary collaboration.

What is the most important lesson you have learned during your time in the field?

Although it's cliché, never give up. Starting a company required taking hundreds of "no's" before getting just one "yes." I used to joke that a good day at a startup is when you get told "no" politely. With that said, communication is also important: not just in a workplace setting, but in terms of broader ideas. Your best ideas will never come to fruition if you keep them to yourself—you need a team that will work with you and pushes to make them a reality. Patent them. I also think that it is critical to gain exposure to as many different aspects of the engineering process as possible, whether that's different products, software packages, techniques, or reading patents. It's an especially important part of early career development to be soaking in new technical ideas constantly.

Finish this sentence. "If I had more time, I would ..."

Read more and build more—it's too easy to get stuck in the minutiae of day-to-day tasks and lose sight of the bigger picture. Without active effort, we end up putting on blinders—headphones, social media, streaming platforms—and lose sight of what matters. Personal and professional growth comes through exposure to new ideas and experiences, so in a lot of ways, the issue of time and prioritization is a lifelong battle we all face. I would also spend more time outdoors. It's a bit difficult in the Chicago winter, but I still think about home in Boulder near the Rocky Mountains.

THE BRIDGE









Credit: cherryandbees/Adobe Stock

6 Engineering Fields You Probably Never Thought About

Nancy Ordman

When high school students consider career options, those looking at engineering degrees will have heard of hot fields like computer engineering and the highestpaying field for new graduates: petroleum engineering. They will also know the "big four": civil, mechanical, electrical and chemical engineering.

But what about biosystems engineering? Molecular engineering? Nanoengineering? These engineering specialties evolved from the big four in response to new technologies and new societal needs, offering today's budding professionals interesting, in-demand career opportunities.

Agricultural, biological and biosystems engineering

Biosystems and biological engineering are the 21st century versions of agricultural engineering. The American Society of Agricultural and Biological Engineering (ASABE), the body that accredits college programs in these areas, defines this broad discipline as "engineering that applies engineering principles and the fundamental concepts of biology to agricultural and biological systems and tools, ranging in scale from molecular to ecosystem level."

Careers within this discipline range from designing farm equipment, like tractors, tillers and harvesters, and structures like silos, to designing and building water control structures, to developing plant-based medicines and packaging. The U.S. Department of Labor's Occupational Outlook Handbook (OOH) projects demand growth of 5% between 2018 and 2028; median salary is \$77,100.

Acoustical engineering

Acoustical engineering, a small specialty within the larger field of mechanical engineering, deals with sound and vibration, typically with analysis and control of sound. Some schools offer bachelor's degrees in acoustical engineering; more common are master's degree programs in mechanical engineering that specialize in acoustics.

Acoustical engineers tackle noise pollution, which is a serious environmental problem. These engineers also design audio equipment for the recording industry, television and movies, among other specialties.

The OOH does not provide information about acoustical engineering separately from mechanical engineering. However, Glassdoor.com estimates that acoustical engineers earn an annual salary of \$82,567.

Materials engineering

Materials engineers study the properties of existing materials and develop new ones that meet specific requirements for products from airplane wings to computer chips. They also develop materials testing protocols and analyze material failures. Specialty materials engineering disciplines include ceramic, composites, metallurgical and plastics engineering.

Demand for materials engineers should be steady at about 5% growth between 2018 and 2028, according to the OOH, due to expanding interest in developing materials for products like medical devices and aerospace composites. Median annual salary in 2018 was \$92,390.

Molecular engineering

Molecular engineering combines aspects of multiple engineering and science fields, including chemical, electrical, mechanical and materials engineers, and chemistry and physics. Molecular engineers apply engineering fundamentals to design molecules for new products and applications, working at nanoscale to solve problems. A molecular engineer could specialize in developing new ways to diagnose diseases or produce less-expensive solar cells.

Because the field is relatively new, few specific academic programs exist to train practitioners. As such, interested students or graduate engineers could have the opportunity to help shape the field. No information is yet available on demand or salaries.

Nanoengineering

Nanoengineering has applications across multiple engineering fields. The Nanowerk website describes this as an enabling technology, one that designs devices at the scale of atoms and molecules. At this sub-microscopic level of matter, quantum effects, rather than Newtonian physics, can dominate its behavior.

Current work in nanoengineering focuses on development of new materials for applications ranging from medical devices to automotive materials to sports equipment. Carbon nanotubes, introduced in 1991, have received much publicity in both technical and popular science outlets. Jobs currently available for nanoengineers include researching new materials and developing manufacturing processes.

Although nanoengineering is a relatively new discipline, undergraduate and graduate programs are available, sometimes as standalone departments, sometimes as specialties within mechanical, materials or chemical engineering. The U.S. government's National Nanotechnology Initiative is investing billions of dollars in nanotechnology projects, which bodes well for job opportunities.

Mining engineering

Mining engineers can choose from a range of specialties, from ameliorating the effects of mining operations to mineral discovery, feasibility studies, mineral separation techniques and mining health and safety. Some mining engineers work at mine sites; others work for mining engineering services and for government agencies.

The OOH reports that demand for mining engineers is growing more slowly than other engineering specialties (3% per year). The median annual salary is \$92,250.

MORE INFORMATION

In addition to the OOH, professional associations for different engineering specialties, such as the Society for Mining, Metallurgy and Exploration and ASM International (materials science and engineering) offer more information. Universities that offer degree programs in specific engineering disciplines are also excellent resources.

THE BRIDGE

Wham! Bang! Zoom! IEEE-USA E-BOOKS **Debuts New Engineering** Superheroes!

Georgia C. Stelluto

On March 1, IEEE-USA E-BOOKS will debut its first-ever comic book for members—with engineering superheroes, The Slate Twins!

For all ages, **The Slate Twins—Caught in** the Currents, features twins, Nick and Tess Slate. Since tragically losing their parents,



the twins have lived with their grandfather, Dane Slate. Coming from a long line of inventors, Grandpa Dane pushes their creativity and their curiosity daily with all kinds of inventions and experiments.

This first comic book begins the twins' origin story—and is complete with an electrical engineering adventure and an evil villain!

IEEE-USA E-BOOKS will release this exciting new publication for IEEE members on March 1, for the discounted member price of \$2.99. Non-members pay \$4.99 at https://ieeeusa.org/shop/.

Get your copy as soon as it is released! You'll want to collect this first edition comic book of the Slate Twins' adventures, with more future adventure to come!

OTHER OFFERINGS

IEEE-USA Free Audio Book for Members Targets Career Asset Management, Teamwork, Empowerment; eBook Encourages All Technical Professionals To Enhance Their Careers by Publishing Their Work(s); Download All IEEE-USA Free Audio Books

IEEE-USA is now offering its new Audio Book, Developing Your People — Commonsense Leadership in the Workplace – Vol. 3: Career Asset Management, Teamwork and Empowerment free to members.

In the third and final volume of author Harry T. Roman's trilogy covering common-sense leadership in the workplace, the author explores how managers and leaders can put the right people in the right places within an organization, achieve a teambased approach to problem solving, and empower employees to meet the future challenges of their jobs.

In addition, Roman discusses how managers can put together successful teams—by balancing team members' professional development. He advises letting them take time for formal professional courses and activities, both in the skills they will need on the team, and in the areas that keep them current in the field they came from.

Exploring employee teams, Roman warns that managers "sometimes tend to average down highachievers, restraining their immense energy and tremendous momentum." He notes that highperformers' can-do spirits often re-energize evolving companies. Roman recommends putting these "race horses" in charge of the teams, and letting them set a fast pace.

"Professionals want to be involved in a learning environment, Roman says. "They expect mentoring, with the opportunity to grow in new directions."

IEEE members can get their free MP3 download of this new audio book, by going to: https://ieeeusa.org/shop/audiobooks/

The companion eBook is available at: https://ieeeusa.org/shop/careers/managementresources/developing-vour-people-commonsenseleadership-in-the-workplace-vol-3/

The Member price for the eBook is \$7.99. Non-members pay \$9.99.

Get both versions for your personal reference library today!

IEEE-USA's New eBook Encourages All Technical Professionals To Enhance Their Careers by Publishing Their Work(s)

"Publish or perish" is a familiar saying among academics. More often than not, their advancement depends on publishing new research in their fields. In IEEE-USA's new eBook, Publish Your Work, author Harry T. Roman encourages all technical professionals to publish their work(s), for greater recognition along their career paths.

Veteran engineer and educator Harry T. Roman believes that technical professionals who are not college or university professors also can enhance their careers when they publish their work(s). What's more, he says it doesn't matter whether it's a technical paper, or an article in an industry publication: Both get noticed.

Drawing on his own, personal experiences, the author offers valuable insights into publishing both formal papers and industry articles. This book is a helpful resource for almost any engineer, especially those beginning their careers, or those with just a few years of professional experience.

"My original corporate mentors—all eventual IEEE Fellows-liked to remind us young engineers that if you worked hard to develop something, you should sign your name to it, and present it," Roman says. "Be proud of your work!"

Get IEEE-USA's eBook at:

https://ieeeusa.org/shop/careers/career-resources/ publish-vour-work/

It's \$1.99 for members. Non-members pay \$3.99.

Download All of IEEE-USA's Free Audio Books

IEEE-USA has many free audio books on various career topics, available in mp3 format, for your listening pleasure.

To download all of the free IEEE-USA Audio Books. go to: https://ieeeusa.org/shop/audiobooks/

Follow the instructions to download the audio books of your choice in MP3 format. Take one—or take them all—for your personal listening library.

You can purchase a companion eBook of each Audio Book, to add to your personal reference library, at low, discounted prices for members. The member price for most companion eBooks is only \$2.99.

Go to: http://shop.ieeeusa.org. Type the book title in the search engine; and it will guide you to the page to purchase the companion eBook.

CALL FOR AUTHORS

IEEE-USA eBOOKS seeks authors to write an individual eBook, or a series, on career guidance and development topics, and practical skills engineers at all levels can use to do their jobs better. If you have an idea you think will benefit members in a particular area of expertise, please email your proposal to IEEE-USA Publishing Manager, Georgia C. Stelluto, at g.stelluto@ieee.org.

IEEE-USA serves the public good and promotes the careers and public policy interests of nearly 190,000 engineering, computing and technology professionals who are U.S. members of IEEE.

Georgia C. Stelluto is IEEE-USA's Publishing Manager; Manager/Editor of IEEE-USA E-BOOKS; InFocus Department Editor for IEEE-USA InSight; and Co-Editor of the IEEE-USA



IEEE Eta Kappa Nu Launches IEEE-HKN Career Center



IEEE Eta Kappa Nu is proud to announce its new IEEE-HKN Career Center - the premier resource to connect career opportunities with highly qualified Engineering talent.



LOG ON TODAY!

IEEE-HKN Career Center will allow you to:

Manage Your Career:

- Search and apply to more Engineering jobs than in any other job bank.
- Upload your anonymous resume and allow employers to contact you through IEEE-HKN Career Center's messaging system.
- Set up Job Alerts specifying your skills, interests, and preferred location(s) to receive email notifications when a job is posted that matches your criteria.
- · Access career resources and job searching tips and tools.
- Have your resume critiqued by a resume-writing expert.

Recruit for Open Positions:

- Post your job in front of the most qualified group of Engineering talent in the industry.
- Promote your jobs directly to candidates via the exclusive Job Flash email.
- Search the anonymous resume database to find qualified candidates.
- Manage your posted jobs and applicant activity easily on this user-friendly site.

ieee-hkn.careerwebsite.com

THE BRIDGE