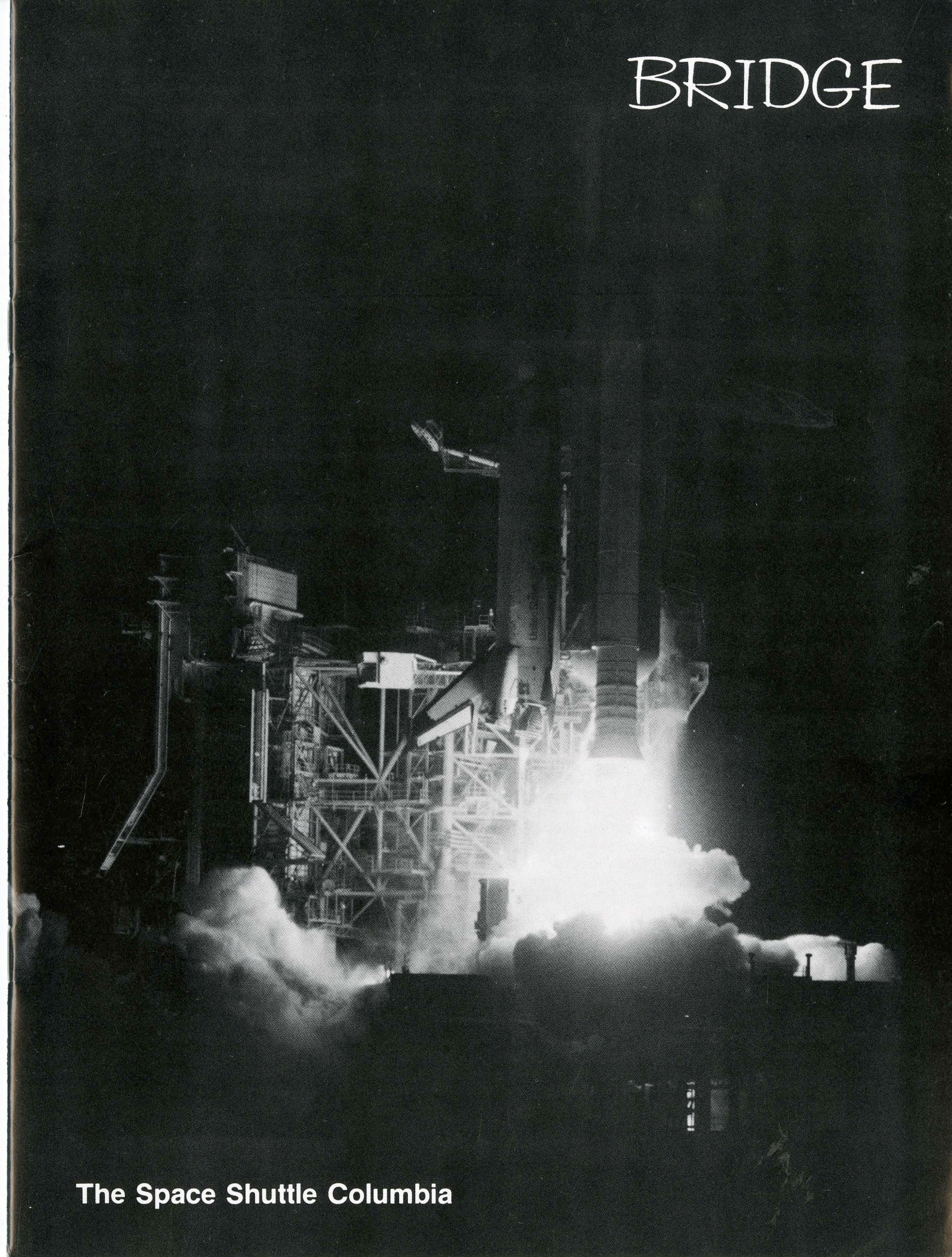
BRIDGE



The Space Shuttle Columbia

Editor and Business Manager
J. Robert Betten

AUGUST 1988
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Contributing Editors
Marc Dodson
Jim D'Arcy
Robert J. Cenker
Larry Dwon
John Farley

THE ALTON B. ZERBY OUTSTANDING ELECTRICAL ENGINEERING STUDENT AWARD 1987

Text by Marcus Dodson

THE ETA KAPPA NU ASSOCIATION
1987-88

The BRIDGE is published by the Eta Kappa Nu Association, an electrical engineering honor society. Eta Kappa Nu was founded at the University of Illinois, Urbana, October 28, 1904, that those in the profession of electrical engineering, who, by their attainments in college or in practice, have manifested a deep interest and marked ability in their chosen life work, may be brought into closer union so as to foster a spirit of liberal culture in the engineering colleges and to mark in an outstanding manner those who, as students in electrical engineering, have conferred honor on their Alma Maters by distinguished scholarship activities, leadership and exemplary character and to help these students progress by association with alumni who have attained prominence.

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HKN Bridge, P.O. Box 2107
Rolla MO 65401

THE ALTON B. ZERBY OUTSTANDING

ELECTRICAL ENGINEERING STUDENT AWARD

Background and Purposes

"The Alton B. Zerby Outstanding Electrical Engineering Student may be described as being 'outstanding by virtue of his scholastic excellence and high moral character; coupled with demonstrated exemplary service to classmates, university, community, and country'."

Among the purposes which Eta Kappa Nu expects to achieve by the operation of this program are to: annually honor the outstanding electrical engineering student by providing accepted recognition of accomplishments in this field; provide recognition to the outstanding electrical engineering student's school; provide motivation to electrical engineering students to earn membership in Eta Kappa Nu; provide recognition to the undergraduate chapter of Eta Kappa Nu from which the outstanding EE student was chosen; provide additional opportunity for publicity and recognition of the Eta Kappa Nu Association and its objectives; and provide an incentive for electrical engineering schools not having a chapter of Eta Kappa Nu to qualify and establish a chapter.

Inaugurated in 1965, as Outstanding Electrical Engineering Student Award Program of Eta Kappa Nu, it has become a traditional means of providing recognition to deserving Electrical Engineering students in the United States. In 1975 the name was changed to "The Alton B. Zerby Outstanding Electrical Engineering Student Award" to honor and perpetuate the memory of Mr. Zerby, a leader in Eta Kappa Nu and dedicated to the students. The award takes into consideration not only the scholastic achievements of the student but also pays due attention to other attributes; participation in service to classmates and university in the form of curricular and extra-curricular activities, demonstrated interest in community and fellow human beings, and regard for country. These all play a vital part in the considerations leading to being chosen. It measures the student against the traditional yardstick established by Eta Kappa Nu in its goal to achievement of the well-rounded person, one who is neither scholarly drudge nor gregarious sport, but what might be considered an appropriate combination of the best qualities of both.

Four years were spent in the development of this program by the Los Angeles Alumni Chapter of Eta Kappa Nu. Much thought and effort went into the structuring and development of the many features which are needed and the procedures which must be followed in order to be assured that a truly representative selection of the top Electrical Engineering students have been examined prior to the designation of one of these individuals as the Outstanding Student.

This program was thoroughly reviewed with the National Executive Council and Board of Directors during the primary stages of its development and is formally approved and authorized as an official program of the Eta Kappa Nu Association. The Los Angeles Alumni Chapter has been designated as the implementing organization and has been directed by the Executive Council to conduct the program.

FINALISTS 1987

Bruce Arthur Ferguson . . . . . Purdue University
Robert Scott Hall . . . . . University of Alabama, Birmingham
Matthew John Logan . . . . . University of Dayton
John Jaroslaw Makowski, Jr. . . . . University of Texas, El Paso
Joseph Francis Sifer . . . . . University of Notre Dame
Michael James Sonnier . . . . . University of Southwestern Louisiana

THE
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OUTSTANDING ELECTRICAL
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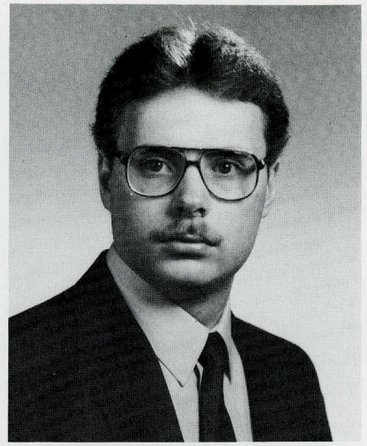
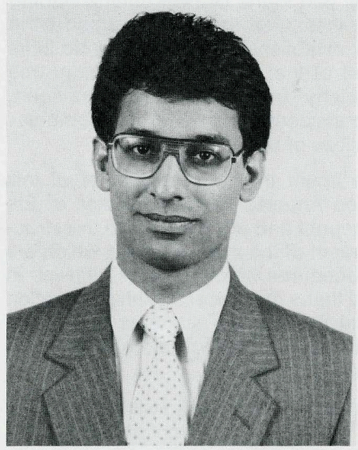
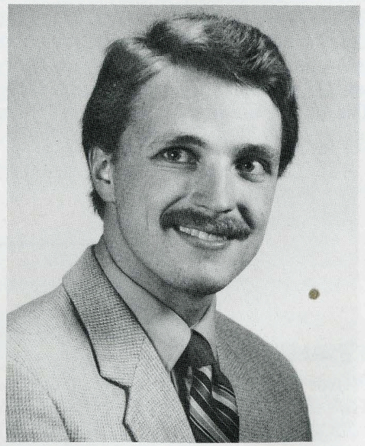
1987



Dale Joseph Kumke
Honorable Mention



Vikram Verma
Honorable Mention



Paul Francis Wysocki
Honorable Mention

MEMBER
Beta Psi Chapter, Nebraska-Lincoln

DALE JOSEPH KUMKE graduated summa cum laude with a GPA of 4.0, ranking first in a class of 204 EE's, was nominated by Beta Psi HKN Chapter at the University of Nebraska-Lincoln. He is a member of IEEE and was honored with membership in Pi Mu Epsilon and Mortar Board as well as Eta Kappa Nu.

Mr. Kumke developed the hardware and software, using Z80 micro-processors, to sychronize traffic signal controls. He interned with Delco Electronics where he developed, analyzed or modified software for testing and controls. He performed failure effect analysis of an antilock brake control system. At school he worked as a grader and tutor as well as holding responsible offices with honor, technical and social societies. He also did volunteer work for his community. He received the FIJI Successful Scholar Award, the Phi Gamma Delta Wilkinson Award and the Tau Beta Pi Scholarship Award.

He enjoyed intramural sports while an undergraduate. Hunting, fishing and camping will continue to be a part of his recreation.

MEMBER
Zeta Epsilon Chapter, Florida Tech.

VIKRAM VERMA graduated summa cum laude with a GPA of 3.97, ranking second in his EE class of 140, was nominated by Zeta Epsilon HKN Chapter at the Florida Institute of Technology. He was honored with membership in Tau Beta Pi and Blue Key as well as Eta Kappa Nu.

Mr. Verma was the leader of the Micro-mouse group and participated in a research project to investigate the Doppler shift in radar echoes from moving targets. Early in college he took part in rewriting four sophomore physics lab manuals. He headed a student team to build an FM transceiver, worked as a teaching assistant, in the security office and as a student technician for electronic repair. He plans to get a Ph.D. in electromagnetics and teach. Among his awards are Honorable Mention for the HKN Outstanding Junior, Academic All-American, Tau Beta Pi fellowship and National Collegiate Engineering Award.

He enjoyed intramural tennis and soccer as an undergraduate. Jogging and reading fit into his recreation.

MEMBER
Alpha Chapter, Illinois-Urbana

PAUL FRANCIS WYSOCKI graduated summa cum laude with a GPA of 5.0, ranking first in his EE class of 619, was nominated by Alpha (the original) HKN Chapter at the University of Illinois-Urbana. He was honored with membership in Tau Beta Pi and Phi Kappa Phi as well as Eta Kappa Nu.

As an undergraduate he studied optical electronics and he intends to continue at the graduate level. As an industrial intern in summer he held responsible positions which included producing papers, one of which was on power electronics. He was involved in the "campus community" through tutoring, discharging offices in social, honor and technical societies as well as working with children. Mr. Wysocki has received many awards, including finalist for HKN Outstanding Junior Award, the Williamson Award and the NEC-William Everitt Student Award of Excellence for a partial list.

He is an active member of the Lepidopterists Society, participated in intramural sports and bicycling.

Student Award

**THE
ALTON B. ZERBY
OUTSTANDING ELECTRICAL
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AWARD
1987**

**Penny Marie Gilbertson
Co-winner**

Wins expense-paid trip to Marriott Lincolnshire Resort and an Award Dinner in her honor, from the Alton B. Zerby Perpetual Memorial Trust established by the Eta Kappa Nu Official Family, and a gift of $1,000.00 from the Carl T. Koerner Perpetual Memorial Trust established by Edith Ann Koerner.

PENNY MARIE GILBERTSON graduated summa cum laude with a GPA of 4.0, ranking first in her class of 149 EE seniors, was nominated by Iota Kappa Chapter at Montana State University. She is a member of IEEE and the Society of Women Engineers and was honored with membership in Tau Beta Pi, Phi Kappa Phi, Phi Mu Epsilon and Eta Kappa Nu.

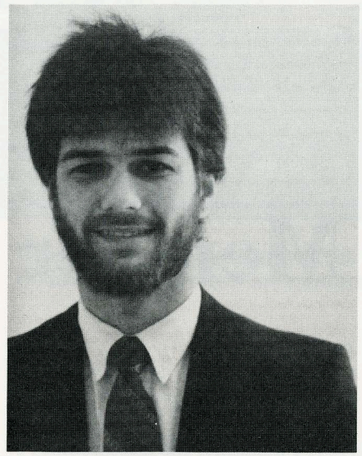
Miss Gilbertson has written papers on semi-conductors and optical computers and constructed a digital controller. During the summer of '86 she interned for a division of Hewlett-Packard where she wrote a program in assembly language for a Protocol Analyzer that included an alternative graphical display.

She served her school through committees, such as "Winter Preview Committee", "High School Residence Life Committee", "Fall Phone-a-Thon", as a tutor for HKN and as a campus tour guide. She was active on the Student Advisory Council and has a major roll in organizing the Presidential Scholarship Competition.

She was the recipient of the Alumni Chamber of Commerce Award for Excellence, the Lula M. Clay College of Engineering Scholarship and the Minnesota Mining and Manufacturing Scholarship.

Her hobbies and activities include figure skating, skiing, running, biking, reading and working with people.

. . . Winners



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1987**

**Lonnie Dale Chrisman
Co-winner**

Wins expense-paid trip to Marriott Lincolnshire Resort and an Award Dinner in his honor, from the Alton B. Zerby Perpetual Memorial Trust established by the Eta Kappa Nu Official Family, and a gift of $1,000.00 from the Carl T. Koerner Perpetual Memorial Trust established by Edith Ann Koerner.

LONNIE DALE CHRISMAN graduated summa cum laude with a GPA of 4.0, ranking first in his class of 390 EE seniors, was nominated by Mu HKN Chapter at the University of California-Berkeley. He was honored with membership in Tau Beta Pi and Eta Kappa Nu.

Mr. Chrisman, while working during school vacations at "Systems for Automatic Test" as a programmer, developed the majority of their "basic Test Manager" product and led a team in retrofitting and up-grading Hewlett-Packard equipment. He has developed programs to link ADA language to their equipment for multiple monitored failsafe work stations.

He "speaks" many computer languages and can work with several operating systems. He intends to obtain a Ph.D. in Artificial Intelligence and to apply Electrical Engineering and Computer Science to the field of designing architectures specifically for Artificial Intelligence.

He served his school as a member of the Student-Faculty Relations Committee and through the Mu HKN chapter by initiating tutorial seminars for EE students, the automation of a bar graph printout of instructor evaluations, the procurement of a copy machine for student use and established a library of UNIX and SPICE manuals.

For relaxation he enjoys writing and playing music as well as body building and the out-of-door life.

William Murray. . .

Installed as

Eminent Member

William E. Murray, past President and Director, was elevated to Eminent Member status in a ceremony recognizing his contributions through engineering and service. The ceremony was conducted at the Mariott-Lincolnshire Resort in Illinois on September 19, 1987.

Mr. Murray is Principal Staff Engineer at the Douglas Aircraft Company, Long Beach California—currently assigned to the Power Systems Design Group and responsible for advanced design, research and development. A few of his Eta Kappa Nu Activities are listed below:

Initiated in Mu Chapter at University of California—Berkeley: Spring, 1947

Los Angeles Alumni Chapter:

Treasurer	1963
Secretary	1964
Vice-President	1965
President	1966

E.E. Outstanding Student Award:

Committee Member	1964-1985
Final Jury of Award	1974, 1986

Award Organization Committee 1983-1986
(Outstanding Young Electrical Engineer Award)

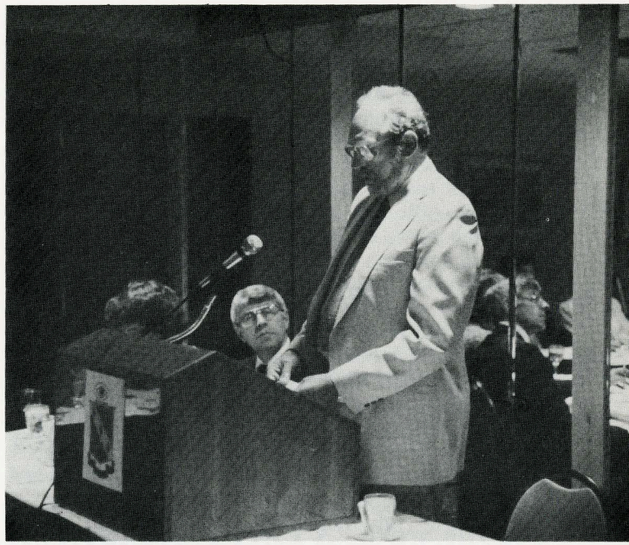
National (International) Offices:

Director	1970-72
Vice President	1973
President	1974

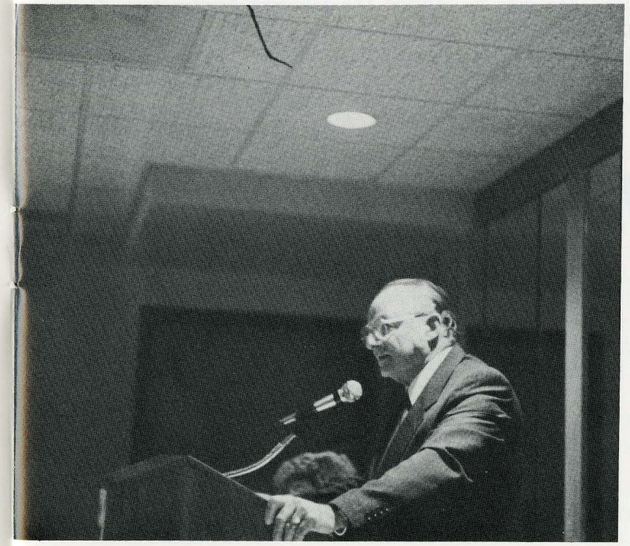
Chapter Induction Team Member: 1961-1984
including at least seven Charter Inductions

He was LA Alumni chapter secretary when the student award was first conceived, Vice-President when it was first awarded (Gene Mleczko was President then and Stu McCullough was Secretary). He presided over the second award program in California in 1966.

William Murray listens as Marcus Dodson cites Murray's contributions



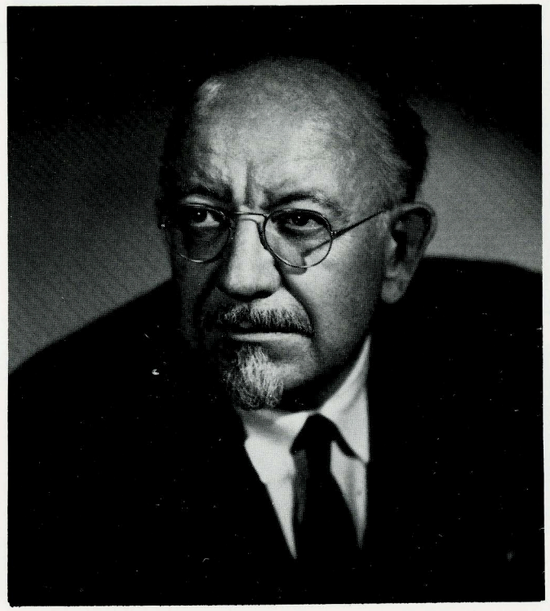
President Harold Knudsen Presents Eminent Member Citation.



Eminent Member Murray Reminisces with spontaneous remarks highlighting his enjoyable moments in HKN which span a 30 year period.

In Memorium

George H. Brown



Assistant BRIDGE Editor Dr. George H. Brown was formerly Executive Vice President for Research and Engineering of the entire RCA Corporation. He received numerous honors including Eminent Membership in Eta Kappa Nu. His article "A HAPPY WARRIOR" as published below typifies his keen mind's eye and his appreciation of human talent.

Emminent Scientist Dies

Dr. George H. Brown died at Princeton, New Jersey on Friday, December 11, 1987. He was a pioneer in the early development of radio and television broadcast antennas, and he headed the RCA technical effort leading to present-day color television. He served RCA for many years as Executive Vice-President for Research and Engineering, Executive Vice-President for Patents and Licensing, and as a member of the Board of Directors. He was also a member of the Board of Directors of RCA Global Communications and the Trane Company.

Dr. Brown, who received his Ph.D. in Electrical Engineering from the University of Wisconsin in 1933, spent his entire career with RCA. He held 80 U.S. patents and was the author of over 100 technical papers and an autobiography entitled "And Part of which I Was". He was a member of the National Academy of Engineering and a Fellow of the Institute of Electrical and Electronics Engineers, the Radio Club of America, and the Royal Television Society of Great Britain.

Various awards he received throughout his distinguished career are the Edison Medal of the Institute of Electrical and Electronics Engineers, the Armstrong Medal of the Radio Club of America, the National Association of Broadcasters (NAB) 1986 Engineering Achievement Award, the deForest Audion Award of the Veterans Wireless Operators Association, and an Honorary Doctor of Engineering Degree from the University of Rhode Island.

A HAPPY WARRIOR

by George H. Brown

Near the end of World War II, Maurice Donahue was assigned to serve as the machinist at the RCA antenna field laboratory in Princeton. He was a very colorful person with extreme opinions on most any subject. He enriched our lives and served us well. My associates and I were struck a cruel blow by the death of Maurice and his wife. Many years later, early in 1958, an article which posed as a fiction story and which was authored by a Michael J. Gahagan appeared in HARPER'S MAGAZINE. I immediately recognized that the author was using a *nom de plume* and the father which he described so vividly was our own Maurice Donahue. I immediately penned a reply which was sent to HARPER'S MAGAZINE. The rejection slip came back so quickly that I could only conclude that Harper's must have an agent in the Princeton postoffice. So my eulogy to Maurice Donahue has rested in my file for thirty years, together with a sketch of Donahue made at the time of his death forty years ago. Here is my letter to Michael J. Gahagan.

→

Dear Michael,

How I wish I could properly tell you of my experience a few nights ago when I read your *fiction* story in HARPER'S MAGAZINE. At eleven o'clock, I wandered into the kitchen for a drink of water and a display of my ironwill by opening the refrigerator for a quick peek before starting up the stairs to my bed. I had proceeded upward only a few steps when an invisible but firm hand was laid on my shoulder and I was returned to the living room, where I picked up the newest copy of HARPER'S.

In a minute, I had scanned the first page of *Gentlemen's Game* and thought, "What a lousy way to write." By the time I had finished the second page, I knew your story was not fiction and that you were writing about your father and my own unforgettable Stephen A. Gahagan. Your account of a part of his life explained to me a great deal I have not known or understood about Stephen A. Gahagan. Perhaps I can tell you a little you have not known or understood of this complex man.

Many years ago, the manager of the shop facilities at a large electronics research laboratory near Princeton told me that he was assigning a new man to be the machinist at our antenna field laboratory. He warned me that this man appeared to be a little difficult at times but that we would find him a skilled craftsman, one of the best. So a red-headed, red-faced Irishman with a chip on each shoulder and a twinkle in his blue eyes entered our lives.

Times changed for all of us. There were always loud noises coming from the little shop at the end of the building. When there was no one else to argue with, Steve argued with himself. And he argued with all of us, individually and as a group. I always thought that he regarded himself as just about able to hold his own in an argument with us four engineers. If there had been one more against him, he would have been hard pressed. One less would have given him an unfair advantage.

After associating with us for over a year, one man of Jewish faith, another a Unitarian, the third a Methodist, and the fourth a moderate agnostic, he confided to me that in all his life he had never had so many arguments with the priest as he had since he began associating with us. The same went for Republicans. He knew they still wore horns, but they didn't show as much as he previously believed.

On his first day with us, he told us that he was a tool-and-die man. Within a few days he proved it. He attacked the metal with loving care and he didn't know how to do a rough job. When we explained that much of our work did not require the precision of which he was capable and that he could do a rough job in order to speed things up, he simply speeded things up to a point where we were amply supplied, but never a rough job.

He continually complained about the shoemakers in the main shop, not a tool-and-die man in the lot, not one that could meet a tolerance in broad daylight. But, hoo, let one of us make a derogatory remark about one of his distant colleagues and he would rush to his defense and enumerate the man's real virtues, his burdens with three sick kids or his problems with the tyrant to whom the unfortunate soul was married. He told me of his real physical illness when he saw sickness and suffering. Perhaps that is why he didn't come back to see you in the hospital.

Did you know that he had a chess piece, just a rook, in his kit of fine tools? Now I know why. I heard about the Scottish gentleman one riotous afternoon when your Dad came charging into my office, snorting fire and brimstone, wearing a rakish straw hat and a white apron. His face was flame red and his eyes were blazing. He was roaring some horrible messages concerning the idiots with whom he had to work, shouted that he was quitting on the spot and what was I going to do about it. I lost my temper and shouted back something to the effect that no Irishman could so address a Scotsman and live to see a new day dawning and get the heck out of here and come back with your hat in your hand prepared to sit down and be civilized. He was back in five minutes, hat in hand, to tell me that these guys at the field lab were pretty decent characters after all and would I like to hear about another Scotsman that he had met that was a really fine gent. That afternoon, I learned about the *Ventura* and the trip to Japan to install the silk-processing machinery. That afternoon, I saw the picture of A Japanese Gentleman Out For A Stroll. He wasn't drunk when he had the picture taken. He was living. That afternoon, I learned that here was a man who felt robbed of only one thing in life, an education. He had a family, a wife and children that suited him to a T, but he didn't have an education and he knew there was something missing in his life. He loved life and he lived it. He had a boy who wanted to be a writer. Steve didn't care, let him be a writer if only he will first get an education.

He helped us build a television antenna for the top of the Empire State Building. I still have a photograph of him, straw hat and white apron, standing in front of this antenna down by our field lab. He looks pleased, at a job well done and, I suspect, because he had secretly scratched his name on the very top. We all knew he had done this, for each of us found it there when we individually sneaked out to do the same thing.

Your Dad was the only man I ever knew who literally used an automobile as a dueling weapon. It was a black day when he took more than twelve minutes to roar down Route 1 from the house on Brunswick Avenue in Trenton to our laboratory near Princeton. A number of times, some uncharitable cop hauled him up short but each time the cop was Irish, too, and everything turned out all right. However, one day another unthinking driver passed your Dad when he was going eighty and sullied his honor. He speeded up a bit, passed his antagonist, lurched into the right lane and slammed on the brakes so the other poor soul crashed right into the back of your Dad's car. The other man was also an Irishman so the hooting and the hollering was something to behold. Soon they shook hands and parted. The day had begun successfully. For an hour, at the lab, Steve sang a wild Irish song at the top of his lungs as he

whittled out little wooden plugs to stop the new leaks in his gas tank, the only permanent wounds of this duel. Many years later, I saw two young Irishmen on wildly galloping black horses leave the coast road near Cobh to charge through the surf and then off through a rock-studded field. Then I knew that some Irish ancestor was driving Steve's car whenever he made the trip from Trenton to Princeton.

But Steve was not just an Irishman with a temper, nor was he just a tool-and-die man with skilled hands. He was an individual, with pride, pride in his skill as a workman, but above all proud of his dignity as a man. Warm-hearted and hot-tempered, with a wry humor; after ten years we miss him and we always shall. It seems like yesterday that your Dad announced that he was taking an early vacation to fly to San Francisco. A daughter there, you know. Then, as he went around to shake hands with each of us, we joshed him about living dangerously. This flight was an adventure for him and he soberly informed us that he had lived a long and a good life and, above all, he and his wife would die together as they had lived together. And they did, for as you know so well, the next morning, Friday, May 30, 1947, The New York Times carried in headlines PLANE CRASH KILLS 38, INJURES 10 IN TAKE-OFF AT LA GUARDIA FIELD; PASSENGERS TRAPPED BY FLAMES. That was the end of Stephen Gahagan in this physical world. But it was not the end in our hearts and in our memories.

So, Michael, my boy, my fine college-educated boy, I wish I could find words to tell you how I feel about Stephen A. Gahagan. But now that you are a writer, maybe you can write it for me. For sure and the first one was a fine story.

Siebert Honored

Dr. **William M. Siebert**, Ford Professor of Engineering in the Department of Electrical Engineering and Computer Science, at the Massachusetts Institute of Technology, has been named as the co-recipient, with Charles Cook, of the 1988 Pioneer Award of the Aerospace and Electronic Systems Society. The award has been given since 1949 "for the development of an aerospace system 20 or more years ago still in wide use today."
Professor Siebert is being honored for his achievements "in the development of pulse-compression radar, specifically in the origination of the phase-coding principle within the radar pulse."

Installation of Iota Lambda Chapter

by
Jeffrey Finn
Roy K. Graves

The Iota Lambda Chapter of Eta Kappa Nu was installed at the University of Illinois at Chicago on November 24, 1986. Sixty-nine new members were initiated. These new members included fifty-six undergraduate, five graduate, six faculty and two professional members.

The ceremony was held at Motorola, Inc. Galvin Center for Continuing Education at their corporate headquarters in Schaumburg, Illinois. Motorola also graciously provided refreshments before the ceremony. Keynote addresses were given by Dr. Ted Saltzberg, vice president of research at the Communications Sector of Motorola and by Dr. Wai-Kai Chen, head of the Electrical Engineering and Computer Science Department at the University of Illinois at Chicago. Dr. Chen addressed the new initiates regarding their future careers.

The Charter Member initiation was conducted by Mr. John Farley, past national president of Eta Kappa Nu. He was assisted in the installation by Mr. Eugene Mleczko, international director of Eta Kappa Nu; Dr. S.M. Shahidehpour, assistant director of the Electrical and Computer Science Department, Illinois Institute of Technology and Eta Kappa Nu Delta chapter faculty advisor; and by Dr. Barry Sullivan, assistant professor of the Electrical Engineering and Computer Science Department, Northwestern University Technical Center and Eta Kappa Nu Beta Tau chapter faculty advisor.

Iota Lambda Chapter was installed by Mr. John Farley and the charter was accepted by Dr. Paul Chung, Dean of the Engineering College at the University of Illinois at Chicago, on behalf of the University. Dr. Chung reviewed the history of the Engineering College at this young University campus and its growth including the importance of receiving an Eta Kappa Nu chapter.

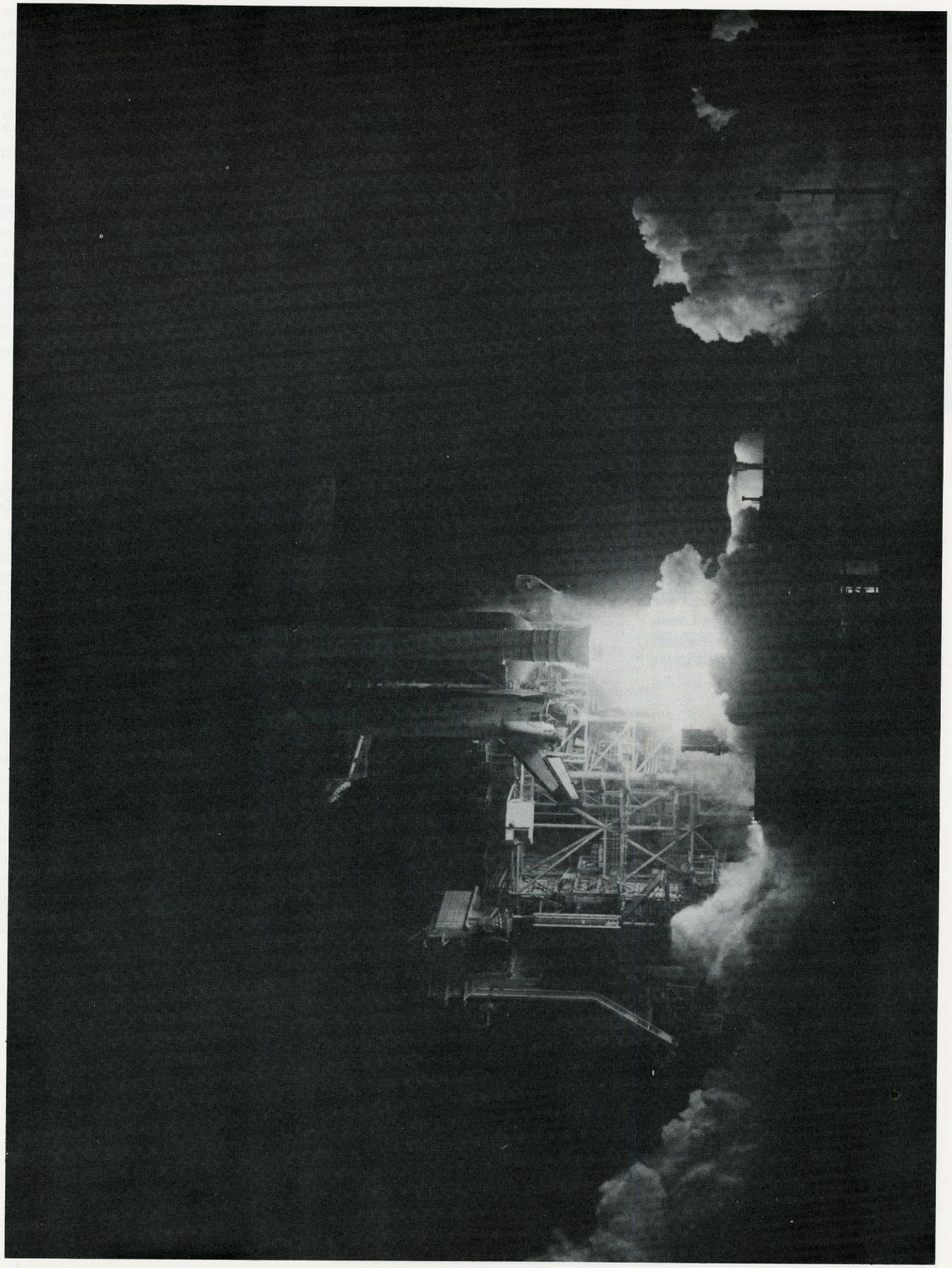
Dr. Vladimir Goncharoff, Eta Kappa Nu faculty advisor at the University of Illinois at Chicago, was the Master of Ceremonies.

The new chapter's goals include providing an atmosphere for academic excellence at the University and creating more congenial social opportunities for electrical engineering students.

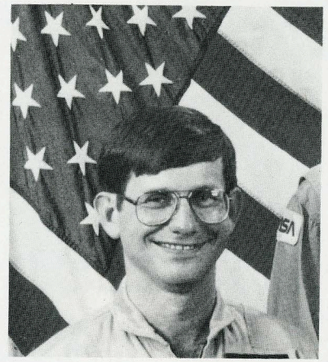
John Farley, past national president of Eta Kappa Nu, presents the Charter of the Iota Lambda chapter to Dr. Paul Chung, Dean of the Engineering College, University of Illinois at Chicago.

Charter officers and faculty advisor. First row: Steve Arendt, recording secretary; Marc Balban, officer-at-large; Roy Graves, president, with Charter; and Linda Luna, vice president. Back row: Vladimir Goncharoff, Faculty advisor; Rolando Espindola, corresponding secretary; and Hyon-Sook Kim, Treasurer.

Iota Lambda chapter. Some of the sixty-nine charter members about to be initiated and their guests.



LIFE IN SPACE



Robert J. Cenker

Editor's Note:

Robert J. Cenker is a Senior Staff Engineer at the GE/RCA Astro Space Division, East Windsor Operations, located in East Windsor, New Jersey. He was selected by RCA as a Payload Specialist; and approved by NASA to fly on the space shuttle Columbia on STS 61-C. On this six day mission, (launched on Jan. 12 and landed on Jan. 18, 1986) he performed a variety of physiological tests, observed the deployment of the RCA Satcom Ku-1 satellite, and operated his primary experiment, an infrared imaging camera.

In his 15 years with RCA, Mr. Cenker has worked in a variety of functions including satellite attitude control and in-orbit operations; spacecraft assembly, test and prelaunch operations; and satellite hardware and system design. Approximately two years of this experience were with a Navy navigation satellite program, with the remaining time spent on various communications satellite efforts. The last of these assignments was Manager of Systems Engineering on the Satcom Ku program, where he was responsible for the technical performance of the spacecraft which was deployed on his flight.

Born and raised near Uniontown, Pa., Mr. Cenker holds Bachelor's and Master's degrees in Aerospace Engineering from Penn State; and a Master's degree in Electrical Engineering from Rutgers. He is an Associate Fellow in the AIAA, a former chairman of the Princeton Section of the AIAA, a Senior Member of the IEEE, and a registered Professional Engineer in the state of New Jersey. He is also a member of Tau Beta Pi and Sigma Gamma Tau. He and his wife Barbara live in New Jersey with their children Daniel, Brian, and Laura.

The following article describes his successful voyage on the space shuttle Columbia.

Life In Space
Robert J. Cenker
Payload Specialist/Astronaut
STS 61C

Introduction

Travel in space has made great advances since the Mercury astronauts' early flights. At that time, the enormous amount of press attention assured that everyone knew as much as possible about the living conditions of these pioneers. The space shuttle has changed this situation. Prior to the Challenger tragedy, with 24 successful shuttle missions, spaceflight had fallen onto the "back page" with little more than a mention of launches and landings. Details such as lifestyles received even less attention unless problems were encountered. The purpose of this paper is to tell about "life in space" based on my limited but once-in-a-lifetime experience as a Payload Specialist on the orbiter Columbia, Space Transportation System (STS) mission 61-C.

The Mission

STS 61-C lasted from Jan. 12, 1986 to Jan. 18, 1986. It was dubbed as "Mission Impossible" by some members of the press as a result of several delays. Originally scheduled for launch on Dec. 20, 1985, a target date of Dec. 18 was established to provide margin against the Christmas holiday. Columbia was returning to the active shuttle fleet after refurbishment (61-C was "her" seventh flight), and more time was needed to prepare her; thus, the launch attempt slipped to Dec. 19. A problem with an SRB (Solid Rocket Booster) HPU (Hydraulic Power Unit) at T-14 seconds resulted in the first of 4 aborted launch attempts. These "scrubs" convinced both me and my family of the very real concern for safety maintained by the top levels of NASA management. The crew took these delays well, feeling that the situation was more difficult for the guests and families trying to witness the launch than on the crew itself.

The crew consisted of 5 full time NASA astronauts, congressman William Nelson (Florida) and myself, as shown in Photos on page 16.

Commander: Robert "Hoot" Gibson, Navy Commander and test pilot, 2nd flight

Pilot: Charlie Bolden, Marine Lt. Colonel and test pilot, 1st flight

Mission Specialists: Steve Hawley, Ph.D., Astronomy, 2nd flight
George "Pinky" Nelson, Ph.D., Astronomy, 2nd flight
Franklin Chang-Diaz, Ph.D., Astrophysics, 1st flight

Payload Specialists: Congressman William Nelson from Florida
Robert J. Cenker, RCA Senior Staff Engineer

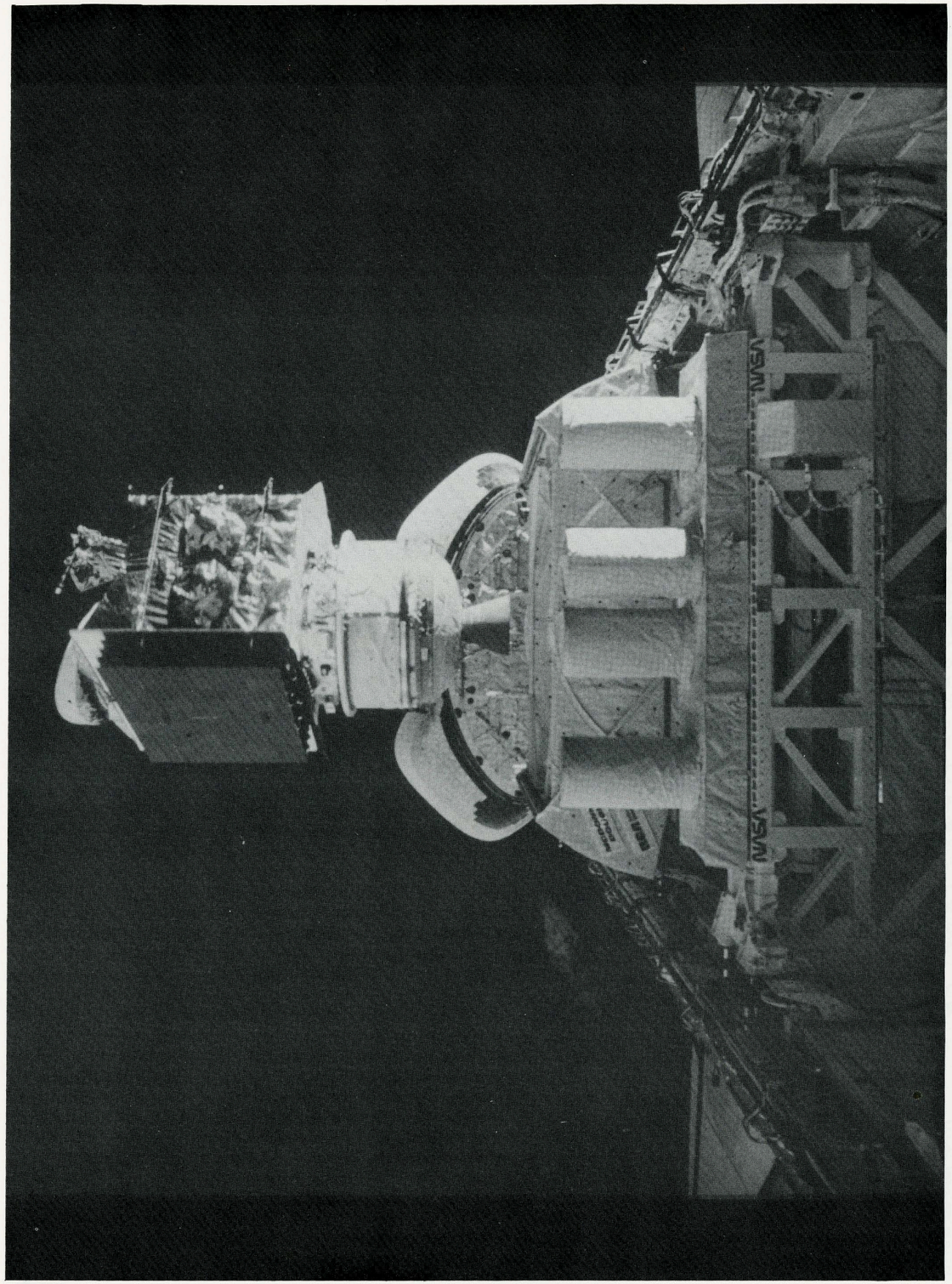
As described by our commander, our flight was a ". . . yearend clearout special!" We carried one major deployable payload, 13 GAS cans (Get Away Specials), one hitchhiker (between a GAS and a major payload), the Marshall Space Center MSL (Material Science Lab), and IRIE (InfraRed Imaging Experiment) TV camera, 3 student experiments, and several middeck experiments. The major payload was the RCA Satcom KU-1 communications satellite, shown being deployed in the Photo on P. 18, which was the basis for my presence on the flight. I had no responsibilities with respect to the deployment of the Satcom (an almost identical satellite had been deployed on the preceding shuttle mission without an RCA Payload Specialist). Rather, the presence of this major payload (deployed hardware of 10,000 lbs) qualified RCA for the Payload Specialist program. That is, there was "room" on the flight, (500 lbs is required for a crewmember) and there was an approved experiment (the IRIE) which RCA wanted tested in space. Direction of the IRIE operations were my primary responsibilities on the flight. In addition, along with all the crewmembers, I participated in a number of DSO's (Detailed Supplementary Objectives), typically life science related experiments flown on each flight.

The Ride "Uphill"

I've been strapped in my seat, which is hanging from the wall, for 1 1/2 hours. This is the fifth time I've been here, as space flight is still not routine, and safety and technical issues have resulted in 4 "scrubbed" launch attempts. With the delays and the magnitude of the opportunity, the whole situation seems unreal. Even when Columbia's main engines are ignited at T-6 seconds, I'm not sure I'm going. On two previous shuttle missions, the computer systems (established to minimize the risk in what will never be a totally safe operation) have shut down the engines after ignition. But not today. At t=0, the Solid Rocket Boosters (SRB's) are ignited. There is a noticable increase in what was already an impressive level of noise and vibration, and there is now no stopping the sequence. I am going. (See Photo, P14.)

The full time NASA crew has trained for years for this. It is their job not only to deploy payloads, operate experiments, and generally take advantage of the space environment, but also to fly the world's first reusable spacecraft. I have trained for 6 months. This doesn't mean I'm not adequately prepared. It means that I do not have any vehicle responsibilities. It means that my preparations have been to learn how to take care of my own health and safety, and how that relates to the other crewmembers; and to prepare for the work I am to perform while in space. On the ride up and back, I am a passenger. I sit (lay?? hang??) in my seat and listen over the intercom as the flight crew monitors all the events leading up to orbit insertion.

In training I have studied the routines, learned the equipment, and been told about and in some small way been exposed to the environments. But I haven't experienced this. The noise and vibration is so intense →



(while the helmet attenuates a significant portion of the sound, I can feel it) that I wasn't sure that I was moving. Some feel the motion off of the pad, but I looked out the window and watched the gantry move by to satisfy myself that I was really going. Then I settled in for "the ride uphill." As the flight progresses, I listened as the flight crew and the ground crew address the various anomolies and check off the ascent events as they occur. And the terms I've listened to many times before take on a totally new perspective as I was pressed into the seat with the force of 3 g's

"altitude __, range __, velocity __,"

"altitude __, range __, velocity __,"

The 3 g's persists for approximately the last minute of the 8 minute powered flight; and, though not painful or unduly stressful (the original astronauts experienced 8-10 g's) it is impressive. However, what is really impressive is yet to come. . . Main Engine Cutoff, or MECO. With engine acceleration gone, I was, instantly, weightless. My arms floated up in front of me; my head and helmet lifted off of the headrest slightly, and I was in space.

To assure that the vehicle had withstood this environment successfully, the NASA crew performed a number of checks; and activated orbiter subsystems as was appropriate. While I could not yet move freely about the cabin, Hoot gave permission to unbuckle, but stay close to my seat and begin to get a feel for weightlessness. I had experienced this before, for 25 second intevals in training. I had lifted up out of my seat and floated around the cabin of a cargo jet over 50 times. But as I unbuckled and gently moved away from my seat, I realized that this was not for 25 seconds; this was not momentary. As I looked "down" at the seat from the middle of the middeck, I realized that I probably would not "sit" again for 5 days. I was in space! And I will never forget that moment!

Space Adaptation Syndrome

Very few people have heard the expression "Space Adaptation Syndrome" (SAS). Certainly, more have heard it by its more common name, "space sickness!" This "common name" is an unfortunate misnomer. As spaceflight is generally considered the ultimate aircraft flight, it is a simple extension to classify space sickness as the ultimate air sickness. Thus we are left with the common perception that people who suffer from airsickness (or seasickness, or carsickness, or any type of motion sickness) are doomed to misery during the spaceflight. Not so!

The first image brought to mind by the word "weightless" is one of astronauts floating easily through the cabin. (See Bottom p.16.) This is an accurate image of the obvious. Less obvious is what the absence of weight is doing to the body and mind. Without the compressive force of weight, the spine relaxes, and stretches. Astronauts "grow" (actually, become "longer") by 1-2 inches. In many cases, this stretching of the spine results in backache, a known symptom of SAS. Also, all of the body internal organs and fluids, pulled down on earth due to gravity, migrate upward in the weightlessness of space. The feeling is similar to the feeling of hanging upside down; and when these feelings bother an individual (as they did me) "space sickness" is blamed. Note that all of these symptoms (the "stretching" and the fullness in the head and chest) are very real physiological responses to "zero g," and are manifestations of space adaptation. Individual responses to these feelings vary significantly in ways which have yet to be understood. Negative responses (backache, headache, general discomfort, and—in extreme cases—nausea and classic "sickness") are all symptoms, then, of Space Adaptation Syndrome. The good news is that it is an adaptation process. After a period of time (several hours to several days, depending on the individual) the mind and body become accustomed to this different environment, and full advantage can be taken of the unique opportunities which it affords.

Meals

A major surprise to most people is the food "enjoyed" by shuttle astronauts. Many adults remember the early reports of the astronauts eating "paste" out of toothpaste tubes, and dried food cubes. These are no longer required. Stated simply, one can eat almost anything in space that one can eat on earth, although the food may have to be prepared and/or packaged differently for space consumption.

There are basically three classes of food available to the crew, although two of these classes are similar in form. The first class is fresh food, consisting primarily of fresh fruit and also several types of bread. A limited supply of this food is carried for the simple reason that there is no refrigerator on the shuttle. Obviously such food has a limited shelf life; and, including pre-launch packing and delays, must usually be eaten in the first 2-3 days of a flight. There is no difference whatsoever between these items and those purchased at your local supermarket.

The second and third classes of food share the common characteristic that they can be stored for extended periods of time without refrigeration. The only difference between them is that the first (Menu Food) is specifically selected by each crewmember based upon a NASA baseline menu; while the second (Pantry Food) is a miscellaneous assortment of snacks, soups and beverages. While the storage requirement may seem very restrictive, in reality it is not. Canned food has an adequate shelf life, and accounts for a significant amount of the menu food. Fruit; ham, chicken or tuna salad; pudding. . . these are examples of the canned foods available. Military veterans and campers are familiar with several other types of food (thermostabilized, vacuum packed, intermediate moisture) which do not require refrigeration. These, also, constitute a number of items on the list of available selections.

A slight diversion is required here prior to completing a discussion on meals. A question often asked is, "What do you do with your garbage?" Trash and garbage is returned to the ground for appropriate disposal. The only thing that the orbiter intentionally dumps in space is, to most people's surprise, water. Electrical power is provided on the orbiter by fuel cells. These utilize hydrogen and oxygen to generate

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electricity, with water as a by-product; and this water is available for habitability purposes. In fact, in general, more water is produced than the crew either needs or can use; so excess water is periodically vented into space.

While all of the previously discussed food types are available, most of them share a characteristic (as yet unmentioned) which is still critical in spaceflight . . . weight. They all include, to an appropriate extent, moisture. Moisture (water) represents weight, and transportation of weight into space represents cost. To save weight, therefore, the majority of the items on the astronaut menu do not contain water; they are dehydrated. Advantage is taken of the water generated by the fuel cells to lessen the weight of expendables taken into space. While dehydrated food may sound only as palatable as "paste from a toothpaste tube," it is, in fact, much better than that. Once it has been rehydrated, it is very similar in consistancy and taste to earthbound food. For example, the vegetables look, feel, and taste like vegetables; because this is what they are. As stated earlier, they've only been prepared and packaged differently.

No discussion of meals in space would be complete without a discussion of eating this food; for example, how does one eat a helping of corn, green beans, and pasta in the weightlessness of space? The same way one would eat it here, albeit, a bit more carefully. It takes only a little thought to appreciate that wet food, if manipulated carefully, will adhere to its container, or a spoon, or a fork; and can indeed be eaten in a more-or-less normal fashion (if sitting on the ceiling to have dinner can be considered normal). Included in the galley is a piece of equipment for injecting controlled amounts of hot or cold water into the plastic boxes containing the prepackaged dehydrated food. Having let the food absorb the water for several minutes (it may be heated in a standard convection oven, if desired), the flexible cover may be cut off with scissors, and the food carefully consumed with standard eating utensils. Drinks are packaged in identical boxes. However, a straw is inserted where the water injection needle was removed, and the flexible cover simply collapses as the beverage is drawn from the box. A clip on the straw keeps "spills" from accidently squirting through the cabin should the box be accidently squeezed.

Bathroom

A subject about which a great many people would ". . . like to know, but didn't want to ask . . . " is the bathroom. From Alan Shephard's first Mercury flight, where no provisions were made for waste disposal (it was only to be a 15 minute flight); to early shuttle flights, where the WCS (Waste Collection System) went through evolutionary design "growing pains;" the normal body functions conjure up images of genuinely unpleasant experiences. Again, not so! As with other activities, one goes to the bathroom in space much the same as one would here (there is a "1 g" trainer at the NASA Johnson Space Center (JSC) for practice), only more carefully.

An obvious concern is that in a weightless environment there is nothing to translate the waste material away from the body. A simple and effective solution to this is moving air. Simply stated, air is drawn under the toilet seat and into the bowl, drawing the material with it; and once inside the bowl, this (damp) material adheres to the walls. Similarly, air drawn through small openings in a urine collection tube serve the same function. It is my opinion that the WCS works well, and that a similar unit on space station would be well suited to long term use.

Sleeping

Sleeping in space is the clearest example of the apparent contradictions found in a weightless life style, i.e., so many things are the same, yet different. With very little effort, one can consider the zero g environment, and reach two totally different conclusions about sleeping. Since a person can relax so completely, it can be concluded that astronauts get the best sleep imaginable. Conversely, an individual so totally relaxed is not touching anything. They are not sleeping on anything, and it can be concluded that it might be very difficult to sleep at all. Obviously, this is a personal reaction issue, with different people responding to the situation with various results. Allowing for those crewmembers who have difficulty sleeping, NASA provides on-board sleeping pills to assure that individuals can be properly rested throughout the flight. All that was required for me to sleep (after flight day 2, when I had adapted to zero g) was to relax. Unfortunately, this is not totally practical. A sleeping, floating astronaut does not simply hang motionless in the cabin; but rather is moved gently but persistantly by the airflow in the cabin. As this airflow is a continuous circulation, the individual (or any object) is always moved in the same direction. And if more than one person were to do this, they would inevitably be moved into the same area. While they would bump gently, it would not be conducive to restful sleep. And even if only one person were to sleep this way, anyone "downstream" in the cabin airflow would eventually be "bumped." Once during the mission, I found myself in this "floating" state, at sleep; and Congressman Nelson found himself downstream. Rather than disturbing my sleep, he took the simple solution of taping me to the ceiling, thus keeping me from floating freely in the cabin.

The preferred method of sleeping is to neither float freely in the cabin, nor to be taped to the ceiling. NASA provides a "Sleep Restraint" for each crewmember. (See Photo on p.20.) This is simply a sleeping bag, unpadded (you're not sleeping "on" anything), with a tether at each end. The tethers can be and are tied almost anywhere (ceiling, floor, walls) to restrain the sleeping crewmember, who is zipped comfortably inside.

Bathing

The only part of the shuttle space flight experience which was less than pleasant was bathing. To call it bathing is probably stretching the definition. One can

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wash easily enough in space. Water directed into a wash cloth will be absorbed. The wet washcloth can be soaped, exactly the same as in a one g environment. Moreover, the body can be washed in basically the same fashion (discounting the fact that you may be floating between the ceiling and the floor) as "here." After washing, however, the divergence is significant. How does one rinse off the soap? Skylab had a zero g "shower," which used airflow to move rinse water past the astronaut. However, this was a rather large piece of hardware; for a one week shuttle flight, this type of investment is not judged to be essential. Rather, crewmembers must simply wet a "bath" towel, and try to rub the soap off of their bodies with the wet towel. "Try" is the operative word here, because the towel is soon as soapy as the astronaut, who is not really removing any soap, but rather re-distributing it evenly over his body. After several days in this environment, the skin begins to feel "sticky," and the hair "thick," because the soap from bathing can never be completely removed. While it may not be a pleasant feeling, it's certainly tolerable, especially when compared to the lifestyles of the early astronauts.

Coming Home

The trip home was the only part of the flight during which I was nervous. Preparation began approximately 4-5 hours before the scheduled landing time, with the full time NASA crew confirming the vehicle's readiness for the de-orbit/re-entry/landing process. My only responsibilities during this interval were minor housekeeping items, and personal preparation. At actual initiation of de-orbit (an Orbital Maneuvering System—OMS—burn), I was strapped to my seat on the mid-deck. I remained here, a "passenger," until the "wheels stopped" at the end of the runway.

Coming home is divided into 3 phases; Free Fall, Re-Entry, and Terminal Approach and Energy Management. Free Fall is exactly what the name states. After being slowed down slightly by the OMS burn, the vehicle begins to fall towards the earth. It took approximately 30 minutes to fall 100 miles, from our nominal mission altitude of 175 miles, to 400,000 feet, arbitrarily defined as the Entry Interface. During this 30 minutes, the crew is still "weightless," and we were kept in our seats by the seat belts. At 400,000 feet, the orbiter's computers are reconfigured for re-entry dynamics, i.e., the Re-Entry phase. Within an additional 5 to 10 minutes, the vehicle will begin to feel the effects of the outer fringes of the atmosphere. Physically, the crew very gradually begins to feel weight, as the orbiter begins to be decelerated by the earth's atmosphere. A pen floating in front of me moved slowly downward, with an acceleration that grew as the descent continued deeper and deeper into the thicker air of the lower atmosphere. Looking out the hatch window, there was an orange/yellow glow, and communications with the ground was lost. This was, for me, the most nervous period during the flight. The vehicle flies at an approximate 45 degree pitch "up" attitude, and is stabilized by the computers. And after 6 days of weightlessness, every motion seemed exaggerated. While never doubting that the orbiter was under control (all flight crew dialogue could be heard over the intercom), the certainty of the final outcome if that control were lost was a very real presence. Re-acquisition of communications and ground contact marks the transition to the Terminal Approach and Energy Management (TAEM) phase of the flight. With no propulsive means of adding energy, the shuttle is flown along a very carefully defined, slightly high energy incoming trajectory. Computers and personnel (both flight and ground) monitor this situation continually and maneuver the vehicle to dissipate this excess energy as the final approach and landing nears. All of this effort culminated in the commander and pilot (they ARE flying the vehicle) executing the smoothest landing that I have ever experienced.

After a long rollout (no engines, no thrust reversers, only brakes) I unbuckled my seat belt and stood up. While one does not weaken appreciably during 6 days in space, it is difficult to stand and move about. . . the mind has adapted to being weightless. As we move around in a "normal" situation, the mind automatically adjusts and balances muscle tension and action to maintain upright stability in the presence of the earth's gravitational field. After six days in space, the mind has adapted to the concept that there is no up or down; there is no continuous force pulling one way or the other. Thus, the mind must work at re-learning the processing of inner ear, visual, and tactile data, enabling an individual to move about freely again. Due to the fact that this one g environment is the norm from which we have departed, re-adaptation is very fast; and within 10-20 minutes the crew is ready to leave ("egress") the vehicle. A short physical to confirm no ill effects is followed by a much enjoyed shower, and the mission is basically over. There are medical tests associated with the flight experiments, and "de-briefings" for the various support groups involved. But within 1-2 weeks I had returned to my home and regular engineering position. What could only be described as an incredible experience of a lifetime had ended.

Eta Kappa Nu
Headquarters
Has Moved
See p. 24
(Back Cover)

HKN Member Distinguishes HKN

by Larry Dwon, P.E.

GEORGE J. TAYLOR, P.E.

INTRODUCTION—

George J. Taylor really does not need any further recognition, nor does he seek it, for what he has achieved in his career as an outstanding Illuminating Engineer.

I just felt that a record of his unique accomplishments and the honors he received as a consequence thereof, would be inspiring to our members. In my mind he exemplifies what the Eta Kappa Nu Ritual states that is required of a successful engineer, namely, quality performance, continuing education, hard work, reasonable goals, involvement in his profession, determination to reach the defined goals, and perserverance against all obstacles.

This article is an example of career success and peer recognition, for achievements in an engineering area which is no longer recognized by engineering educators to be worthy of inclusion in an engineering curriculum. Illuminating engineering like electric power engineering are ignored fields by modern day educators. But where would we be without electric energy and good electric illumination? You are all correct; in the dark age.

UNIQUE AWARDEE—

George Taylor is the only illuminating engineer who has received all the major awards of the Illuminating Engineering Society:

- Louis B. Marks Award—The highest Award for service which he received in 1987.
- Gold Medal for technical contributions to the lighting community, 1971.
- Distinguished Service Award, 1969.
- Fellow in IES, 1953.

George received these honors because, like no other person, he has dedicated himself to the lighting field; first as an engineer, later as a manager and Vice President of Emerson Electric Company, but especially because of his continuous involvement and substantial contributions to improving the quality of life through good lighting practices.

ACHIEVEMENTS—

Evidence of the foregoing is substantial—a twenty page resume. A summary of that document follows:

- He wrote three books, seven technical papers and over twenty more general articles in the lighting area.
- He has served and was chairman of over 100 committees, sub-committees, task forces councils and boards.
- He worked for four major companies in seven distinctly different areas.
- For a period he was a consultant.
- He has been active (not just a member) in ten technical industrial and other societies.
- He is a registered professional engineer in two states.
- He pioneered the development of combined use of mercury and incandescent lamps to produce "synthetic daylight".
- He was co-inventor of cross baffles for commercial and industrial luminaires to improve lighting quality.

And these are just random samplings from George's resume.

Along the way he became President of IES in 1958-59 and Chairman of the Council Executive Committee. He is also a Fellow in IEEE since 1958. He is a life member of IEEE, IES-North America, IES-England, Commission Internationale De L'Eclairage and N.S.P.E. He has more lives than a cat.

But above all George is my friend and a member of Eta Kappa Nu. He served on the Jury for OYEE Award in 1958. Recently he wrote an article for the Bridge titled, "A Close Look At The Eye" (Volume 83, No. 4). A reader responded to that article for more help with a case of his own.

George received his BSEE degree from Armour Institute of Technology (now Illinois Institute of Technology) in 1925. He received an MSEE from Massachusetts Institute of Technology, 1926. In 1933, he returned to Armour to receive his EE degree.

IN CONCLUSION—

George J. Taylor has achieved substantially through:

- Individual Contributions of new technology in the lighting field.
- Science, research and development of products and application of quality illumination and aesthetics.
- Voluntary service on technical committees, leading to better standards and practices which improved the quality of life in industrial and commercial environments.
- Management and administrative contributions helping to improve the illuminating engineering profession.

It is a pleasure to recognize a member of Eta Kappa Nu who performed as the ritual he heard 63 years ago recommended.

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