

CENTENNIAL HISTORY 1908 | 2008

University of Hawai'i at Mānoa COLLEGE OF ENGINEERING



University of Hawai'i at Mānoa

COLLEGE OF ENGINEERING CENTENNIAL HISTORY

1908 | 2008

***"Learning from
the past, energizing
the present, and
engineering a
sustainable techno-
logical future."***

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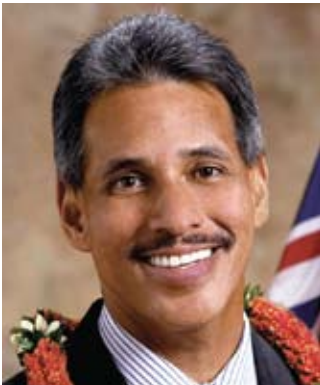
Foreword

The College of Engineering is celebrating its centennial and is very proud of its one hundred year history at the University of Hawai'i, that started with thirteen faculty and five regular students, four of whom were engineering majors. From such an auspicious beginning, over 9,000 men and women have earned engineering degrees over the last 100 years.

This is an exciting and important time for the engineering profession. Almost everything we do and touch today has been designed and built through the actions and oversight of engineers. And the challenges facing engineers today, when met, can help the planet thrive in a much more sustainable fashion. A committee formed by the National Academy of Engineering has just issued fourteen Grand Challenges for Engineering, including making solar energy affordable, providing access to clean water, engineering better medicines and securing cyberspace.

Excellence...distinction...diversity...opportunities...capacity...growth...these are all attributes that drive and inspire the College of Engineering, and all of which serve as critical components in developing and enhancing the College's vision of becoming recognized within the Pacific Rim for distinctive teaching, research and service surrounding the needs of societies in ocean and island communities.

With growing interest and support from our alumni, the community in Hawai'i, and growing support on the US mainland and Asia, this is an exciting time for the College of Engineering. New faculty, stimulating research, expanded outreach, and a host of innovative initiatives will usher in the next century of engineering at the University of Hawai'i. We invite you to learn about the College's history, and to join with the College's faculty, staff and students as they create what will be an amazing future.



Governor's & Lt. Governor's Message



*Message from Governor Linda Lingle
and
Lt. Governor James R. "Duke" Aiona, Jr.
presented to the*

UNIVERSITY OF HAWAI'I AT MĀNOA COLLEGE OF ENGINEERING 1908 - 2008

On behalf of the people of Hawai'i, we send greetings of aloha and offer our congratulations to University of Hawai'i (UH) at Mānoa's College of Engineering as it celebrates 100 years of excellence.

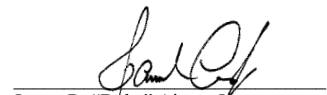
For the past 100 years, the UH College of Engineering has prepared our best and brightest students for successful careers. With a proud history of forward-looking leadership, community involvement, and rigorous training, the college and its graduates have played a direct role in the development of our islands' infrastructure, the diversification of our economy, and in improving the quality of life for all the people of Hawai'i.

Today, the UH College of Engineering continues to build a strong and local workforce of engineers while also serving as a partner in the state's Hawai'i Innovation Initiative and assisting our efforts to provide pre-college students with world-class analytical and problem-solving skills developed through science, technology, engineering and math (STEM) education. STEM-based careers are important to Hawai'i's future as we strive to transform our economy to one based on the infinite talent and intellectual capacity of our people. As the main driver behind developing FIRST (Fostering Inspiration and Relevance through Science and Technology) academies for students in grades four through eight and an active supporter of the *FIRST* Robotics programs in our high schools, the UH College of Engineering has been, and will continue to be, a major contributor to this strategic direction for Hawai'i. We are very appreciative of the support the Hawai'i Innovation Initiative has received from UH College of Engineering students, faculty, staff and leaders, including Dean and Assistant Dean, Drs. Peter Crouch and Song Choi.

As you reflect proudly on the achievements and contributions that have been made by the college and its people over the past 100 years, we send best wishes to the UH College of Engineering on the occasion of this milestone anniversary, and look forward to your next 100 years.

Aloha,


Linda Lingle
Governor, State of Hawai'i


James R. "Duke" Aiona, Jr.
Lieutenant Governor, State of Hawai'i



Mayor's Message

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CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR



MESSAGE FROM MAYOR MUFI HANNEMANN

Aloha and congratulations to everyone associated with the University of Hawaii's College of Engineering as you celebrate 100 Years of Excellence.

We live in a world driven by engineers. Virtually everything that we possess or use in our daily lives has been designed, fabricated, invented, built or tested by engineers. Hawaii is fortunate to have an outstanding College of Engineering with a distinguished faculty and a commitment to excel as a major international institution known for its superior instruction and programs.

More than 8,000 successful engineering careers have been launched locally, nationally and internationally since the first engineering degree at the University of Hawaii was conferred in 1912 – a testament to the enduring strength of your program. I commend the faculty and student body for their commitment to providing an unparalleled learning environment that inspires Hawaii's youth to realize their engineering ambitions.

On behalf of the people of the City and County of Honolulu, I extend best wishes for a memorable centennial celebration.

A handwritten signature in black ink, reading "Mufi Han".
MUFI HANNEMANN



UH President's Message

On behalf of the University of Hawai'i System, I congratulate the University of Hawai'i at Mānoa College of Engineering on the celebration of its centennial anniversary.

From its modest beginnings as the College of Agriculture and Mechanic Arts of the Territory in Hawai'i in 1908, the College of Engineering is now the home of the Hawai'i Center for Advanced Communications and the Hawai'i Space Flight Laboratory (a collaborative program with the School of Ocean and Earth Science and Technology).

Funded by the National Science Foundation, the Native Hawaiian Science and Engineering Mentorship Program graduated its first class last year.

As an integral component of a land-grant university, the College of Engineering prides itself in vigorous research and development and collaborative partnerships with governmental agencies and local and national industries.

In celebrating its first 100 years of engineering, the College of Engineering is on the threshold of becoming a nationally competitive engineering academy focused on training tomorrow's engineers and corporate leaders dedicated to innovative capabilities to be successful in a sustained global economy.

Congratulations to Dean Peter Crouch and the faculty, staff, students, and alumni of the College of Engineering on their accomplishments during the last 100 years!

As I look to the future, I envision that the College of Engineering will continue to be a major contributor in tackling the pressing challenges of the 21st century — the environment, energy, homeland security, and health care.

With best wishes and Aloha,

David McClain
President
University of Hawai'i



UHM Chancellor's Message

Aloha!

This is a special moment in the history of the University of Hawai'i at Mānoa. We mark the institution's centennial as a time when we can remind ourselves and others about how impacting this university is on people's lives in Hawai'i and throughout the world.

From the university's earliest days, the College of Engineering has been at the core of our academic and research successes – a founding member of what has become the premier American university in the Asia-Pacific region.

As you review the illustrious history and significant accomplishments of our distinguished faculty, alumni and students as compiled in this centennial publication, you will be reminded that the College contributes great value to our society in so many ways. We should all be very proud of those accomplishments.

While there is much to celebrate because of all the university has accomplished in its first century of excellence, clearly we also have aspirations to create a dynamic second century of greatness. The beginning of this new century truly is "Mānoa's Moment" and working together we will be successful in realizing our aspirations for greatness. Mahalo for being members of our Mānoa 'ohana.

With warm Aloha,

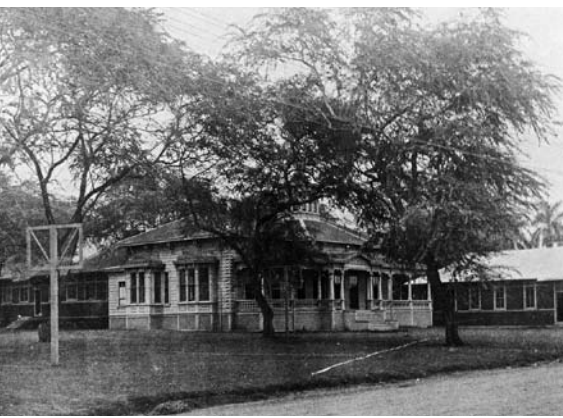
A handwritten signature in black ink that reads "Virginia S. Hinshaw". The signature is fluid and cursive, with the first name "Virginia" being the most prominent part.

Virginia S. Hinshaw
Chancellor
University of Hawai'i at Mānoa

History of the College of Engineering

1908–2008

In 2008 the College of Engineering, University of Hawai‘i at Mānoa, celebrates its centennial. When classes began in 1908, there was one engineering professor; today there are 54. Since the College issued its first engineering diploma in 1912, over 9,000 engineering majors have graduated. It is an appropriate time to look back on the events and developments that have shaped the College, to honor key individuals, and to consider the role of engineers in the high-tech world we inhabit today.



Thomas Square facilities

Engineering instruction first began in 1908 under the auspices of the newly-chartered land grant College of Agriculture and Mechanic Arts of the Territory of Hawai‘i, later to become first the College and then the University of Hawai‘i. To launch the new College, the newly-appointed president, John Gilmore, recruited the faculty, many of them from Cornell University, a New York land-grant institution. The faculty numbered thirteen, a fact of some amusement in the community since the first faculty outnumbered the first five regular students. It was soon evident that the engineering program proved more attractive than agricultural studies since the sons of immigrant workers were looking for a way out of plantation life rather than a return to that hard life. Classes began on Young Street near Thomas Square in quarters that had once been the Chinese Consulate, but in 1912 moved to the new campus in Mānoa Valley.

John Mason Young, Father of Engineering Education in Hawai‘i



John Mason Young

Among the initial thirteen faculty was John Mason Young, the new school's only engineer. Young was the son of a Tennessee Presbyterian minister. The family's finances were modest so Young worked as a mechanist and as a phosphate mine administrator until he earned enough money to attend college. He graduated from Cornell with a mechanical engineering degree. Recruited for Hawai‘i's new College of Agriculture and Mechanic Arts, Young taught approximately half of all the engineering courses. He served as dean of the College before a president was appointed and as acting president during the absences of the president. By 1909 Young had completed a plan for the new college in Mānoa. Academics today speak of "vision statements." Young's plan for the new college was indeed visionary and included provisions for future schools of law, medicine, veterinary science,

TIMELINE

1907

College of Agriculture and Mechanic Arts of the Territory of Hawai'i opens in temporary quarters near Thomas Square.

1911

College of Agriculture and Mechanic Arts becomes College of Hawai'i and moves to Mānoa campus.

1912

First degree in engineering awarded in ceremonies for first graduating class, College of Hawai'i.



Hawai'i Hall, the University's first building

and architecture. There was even an observatory planned to be situated on Wa'ahila Ridge above the College. Facilities, except for the observatory, were arranged in a quadrangular design, strongly resembling Cornell where Young had studied and taught. In an era when a line between “engineer” and “architect” was not so clearly drawn, Young was instrumental in the planning of the College's first building, Hawai'i Hall, and he designed and supervised the construction of other early buildings of the University: Miller, Dean, and Crawford Halls. Young's campus structures were all in the neo-classical mode of architecture. After that, all efforts to maintain a unified campus architectural style were abandoned to the winds.

In addition to his teaching duties, Young joined the Pacific Engineering Company as chief engineer. Young's endeavors in the private sector led to what were probably the University's first conflict of interest cases. College president Gilmore recommended that Young be fired because he was spending too much time away from his teaching duties, but Young was to outlast Gilmore and continued to teach structural engineering at the College, and later the University, for over thirty years.

One of Young's contributions to the city of Honolulu was the introduction of reinforced concrete power poles impervious to termite damage, wood-rot, and heavy winds. Notable John Mason Young buildings in Honolulu include the Hawai'i Theater, Theo H. Davies building, the central YMCA, the Young Hotel annex, McInerny, the Scottish Rite Cathedral, and the Hawaiian Pineapple and Libby-McNeill-Libby canneries.

Yong Fook Tong, Hawai'i's First Engineering Graduate



Yong Fook Tong

Shortly after the move to the new campus, the College held its first graduation ceremony. Unfortunately none of the original five students managed to graduate. Other students had replaced the original five, and among these was Yong Fook Tong, the College's first engineering graduate. Tong was listed on College rolls as a resident of Maunawai, O'ahu, a coastal area of Waimea Bay. Yong Fook Tong left Hawai'i and is known to have been employed as an “office engineer” at the Armstrong Brothers in New York City until around 1920. Sometime after 1920, Yong Fook Tong moved to China and by 1928 was employed as chief engineer of the China United Engineering Corporation in Shanghai, an agent of the Truscon Steel Company of Youngstown, Ohio.

TIMELINE

1915

Engineering Materials Testing Laboratory, the second oldest building on campus (after Hawai'i Hall) erected.



1916

Engineering Professor Arthur Keller and his students oversee construction of the first paved road on campus.

1918

Mechanical and electrical engineering courses discontinued and only civil engineering courses offered.

The Keller Era



Arthur R. Keller

The legendary Arthur R. Keller joined the College in 1909 as a professor of civil engineering, and along with John Mason Young, was the mainstay of the engineering faculty until the end of the World War II days. One of Keller's first achievements was the planning and execution of a paved road, the beginning of what was to become Campus Road. To test the durability of various road materials, Keller and his students designed the road in sections, the first of plain concrete, the second of reinforced concrete, the third of Warrenite, and the last of crushed concrete. Keller also concocted a drainage system for the grounds, at that time a marshy, overgrown tangle of kiawe and weeds.

A Student Reflects on His Courses, 1917



Leslie Hicks

In the beginning, courses in mechanical, electrical, and civil engineering were offered, an ambitious program for a faculty of two professors. In 1916 a student, Leslie Hicks, recorded his impressions of courses for the school's annual Palapala, leaving a firsthand personal record of engineering education in its early days:

In the first year, he learns mechanical drawing and carpentering. In the drawing room he begins with simple exercises to learn the use of drawing instruments and to make legible lettering. By the end of the year he is making drawings of small pieces of machinery. In the wood-shop he learns the use of carpenters' tools, electrically driven saws, planes, etc., and most important of all, he learns the value of careful and accurate work.

By the second year the student finds his practical work in the foundry, in forging and surveying. If he has survived the first year with soft white hands, he soon loses them in foundry practice. He is given a blacksmith's forge, anvil, hammers and other tools and shown how to use them. By the end of the first semester, if he is not hopeless, he has learned how to weld iron and temper steel. In the second semester he studies methods of forging at first hand in the very smoke and flare of molten metal and the roar of steam hammers and riveters. In the surveying class he appears in old clothes, and armed with the instruments of the profession he sallies forth.

1920

College of Hawai'i becomes University of Hawai'i and engineering becomes a department of the newly

organized College of Applied Science with Arthur Keller named head of the latter.



1928

Engineering Quadrangle completed, four one-story concrete buildings surrounding

the Engineering Materials Testing laboratory.

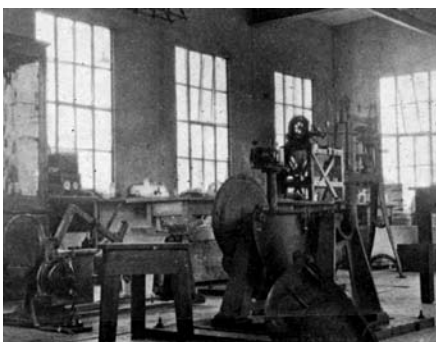
In the third year now he has arrived at the very fundamental of all structural engineering. In the materials laboratory he puts through practical tests of all materials of interest to engineers: iron, steel, sand, cement, rock, brick, wood, and the fuel, lubricating and road oils. He learns to use the electrical apparatus, calculating instruments and various power recording apparatus. On the basis of knowledge gained in the laboratory, he writes a notebook of some four hundred pages, a valuable reference book in after years. In chemistry for engineers, hydraulics, railroad surveying, and topographical surveying, the student finds work of practical application and absorbing interest.

In the fourth year comes the most interesting researches in bacteriology, electrical measurements, materials, municipal engineering, steam machinery, bridge design, structural design, contracts, and specifications.

(LESLIE HICKS, PALAPALA, 1916)

Leslie Hicks, later to become one of Hawai'i's most prominent electrical engineers, was one of the last engineering students at the College to work in the forge and machine shops. When John McTaggart, the shop instructor, died in 1908, the requirement of shop work was dropped. It was also decided that the expense of equipping the mechanical and electrical engineering facilities was not warranted by the limited demand, and thereafter engineering offerings were more realistically reduced to courses in civil engineering only.

Engineering Materials Testing Laboratory and the Engineering Quad



Engineering Materials Testing Laboratory

Hawai'i Hall, the College's first building, was completed in 1912. To house engineering laboratory equipment that could not be accommodated in Hawai'i Hall, in 1915 the Engineering Materials Testing Laboratory, the college's second permanent building, was erected. Built at a cost of \$8,146, it still stands and is in use today for publication purposes. It probably represents the Territory's best bargain in public buildings.

The pride of the engineering faculty was the Reihle Universal Testing Machine, a 150,000 pound machine purchased second-hand. It served to demonstrate to students the behavior of materials under stress but also served the community, and was used for testing concrete construction work

TIMELINE

1936

Fourteen engineering degrees awarded.

1940–41

One hundred engineering students enrolled.

1947

Wilfred Holmes becomes second dean of the College of Applied Science.



at the Pearl Harbor dry dock. The rugged machine survived many mishaps, but served for sixty years until in 1969 it was transferred to Honolulu Community College.

The Engineering Quadrangle, a complex of four rectangular single-story structures, was built between 1915 and 1928. It housed classrooms and storage for the engineering department. Arthur Keller designed the durable structures, four of which still remain in use. In 1965 the complex was officially named for John Mason Young. A plaque mounted on a moss rock originally located within the Quadrangle, but now situated in the courtyard of engineering's present quarters, bears the insignia: "Dedicated to the memory of John Mason Young, 1908–1940."

The College of Hawai'i Becomes a University

With World War I hastening change, William Kwai Fong Yap, a Honolulu bank official, led a movement in 1920 which succeeded in changing the provincial land grant college into a university with two colleges: Arts and Sciences, and Applied Sciences. Engineering studies were placed within the College of Applied Science, along with home economics, agriculture, and sugar technology. Engineering enrollments were sparse, and by the start of World War I, only seven engineering students had graduated.

By the 1930s there were six engineers on the faculty. John Mason Young taught structural design on a part-time basis. Ernest Webster was dean of student personnel for the university and also taught engineering mathematics and surveying. Carl B. Andrews, chair of the engineering department, carried a full load of courses. Russell Brinker, a young instructor, taught mechanical drawing, surveying, and mathematics. Wilfred J. Holmes, a jack-of-all-trades instructor, joined the engineering faculty in 1936 and taught physics, electrical engineering, mechanical engineering, civil engineering, and mathematics. Arthur Keller carried on his teaching assignments, but also was a vice president of the University as well as dean of the College of Applied Science. Alvin Hoy, a mathematician, taught calculus courses to engineering students and Willard Eller of the physics department, taught electrical engineering courses.

Engineering classes between the two world wars remained small, and only about seven engineers a year were graduated in this period.

Agricultural studies leaves College of Applied Science to become a separate College of Agriculture.

1950

Mae Nakatani becomes the first woman to graduate with a degree in engineering.



1953

Hawaiian Electric and Westinghouse Electric companies give University the equipment for a heat power laboratory, enabling

the University to offer courses in general engineering in addition to civil engineering.



1924: 1st engineering society (Palapala)

War Years

By the time bombs fell on Pearl Harbor engineering enrollments were up to around 100 students. University classes were suspended for about two months, and when they resumed, Keller was appointed as acting president of the University, in addition to his teaching duties. Half the student body and a large share of the faculty were drained off by the war effort. Two years earlier, the foresighted Keller had initiated a program of evening classes in naval architecture, taught by Pearl Harbor naval architects to senior engineering students and recent graduates. The design section of Pearl Harbor eagerly absorbed the graduates of this program, but the engineering department rapidly declined until there were only two engineers on the University faculty. Keller taught as many as eight classes during the war years. Nine engineering degrees were awarded during the war years, but only one in 1946.

Post War and the Enrollment Explosion

Keller retired in 1947 and Wilfred Holmes, who had returned from wartime naval service, became dean of the College of Applied Science.

GI Bill veterans flooded the campus after the war and space problems became critical. Joseph Kunesh, a Honolulu engineer, joined the University staff, first as university engineer and then, for four years, as dean of the College of Applied Science. In a bold move to deal with the space crunch, he acquired an entire army surplus field hospital for the University and transported about ninety wooden barracks to the campus, converting them to classrooms, offices, and even living quarters. Although university president Gregg Sinclair was appalled with the aesthetics of the new “temporary” buildings, they served the purpose. Some of these survive on campus today.

Mae Nakatani, First Female Engineering Graduate

Mae Nakatani earned a place in university history by becoming the first woman to graduate with a degree in engineering. Both Nakatani’s uncle and father, she said, were interested in engineering, and this encouraged her own interest. Nakatani recalled that when she attempted to register, she was advised to go into another field. She persisted and graduated in 1950.

TIMELINE

1953

Engineering and mathematics departments separated administratively.

1958

Department of Engineering becomes College of Engineering.

1959

Keller Hall, a new home for engineering and mathematics activities, completed.



Mae Nakatani Nishioka

as the only woman in a class of 53. Soon after graduation, she married an engineering classmate, Rikio Nishioka. She went on to a successful career as an engineer. She was employed in the Highway Planning Department of the Territory, later joined the Hawai'i Irrigation Authority, and then the Public Works department of the Department of Transportation. She was a Facilities Planning officer at the University of Hawai'i and a head of that unit until her retirement in 1983. Despite her initial reception when she first registered for classes, she did not experience discrimination in her professional activities.

Record setting seems to run in her family. Her mother was the first American Japanese to graduate from Queen's Hospital School of Nursing and her daughter Susan is a Hawai'i Swimming Hall of Fame inductee.

A New Home for Engineering, Keller Hall

In 1959, Hawai'i's statehood year, Keller Hall was erected to house the engineering and mathematics departments. Named in honor of the many contributions of Arthur Keller, Keller Hall was designed by Clifford F. Young. The builder was Edwin M. Tani, a 1949 graduate in engineering. Distinguishing this four-story reinforced concrete structure are striking stained glass windows, 12 feet wide and three stories high, designed by art professor Murray Turnbull and his wife Phyllis. Concerning these works the artists wrote, "The principal purpose of the colored glass was to provide an opening of space and a life of color and light in the otherwise enclosed box-like spaces of the building. No story or symbolism was involved; the basic intention was to enrich the lighting and character of spaces which were to be primarily functional."

Agricultural studies had split off from Applied Science in 1947 to become a new College of Agriculture, leaving Applied Science with curricula in engineering, nursing, and medical technology. When Nursing and Medical Technology left the bed and board of Applied Science, only Engineering was left, and in 1959 the engineering department became the College of Engineering. Wilfred Holmes' title was now dean of the College of Engineering.



Keller Hall

1961

First group of electrical engineers graduate.

1963

First group of mechanical engineers graduate.

1963

Master's degrees in civil engineering and in electrical engineering authorized.

1965

Center for Engineering Research created from Engineering Experiment Station.

Broadening the Engineering Curriculum

In post-war years engineering enrollments rose rapidly, so much so that a broadening of engineering offerings became desirable.

In 1953 Hawaiian Electric and the Westinghouse Electric companies gave the University equipment for a heat power laboratory. It was then possible to increase offerings in mechanical engineering and to offer a degree in general engineering in addition to civil engineering. Fourteen general engineering degrees were awarded in 1959. Since 1980 degrees in general engineering were no longer awarded.



1958 engineering class visiting Fort Shafter Pumping Station (UH Archives)

When Keller Hall was occupied, space was released in the old engineering quadrangle, making room for electrical engineering laboratories. Emeritus Professor Kazutoshi Najita recalls the early days of the electrical engineering program when he and Ralph Partridge, starting from bare walls, developed a laboratory. Najita came to the University from the Sperry Corporation; Partridge was earlier involved with the US missile defense program. Both were interested in research. They acquired Navy surplus materials that students helped them assemble. Each Sunday Najita and Partridge would write out the experiments for the week. Under the direction of Ralph Partridge at first and later under Paul Yuen, the electrical engineering program developed rapidly. Najita and Yuen carried out some ground-breaking research on ionospheric characteristics. In 1962 the Engineers' Council for Professional Development accredited the electrical engineering curriculum. The first group of electrical engineers graduated in 1961.

Electrical engineer Edward Weldon was one of the first professors to encourage the concept of entrepreneurship for faculty members. Weldon, a national leader in communications, with two other UH faculty members, formed the Adtech company. Adtech was a Hawai'i success story (it was later incorporated by Spirent Communications, a large coding and network company). The formation of local firms has important implications for the electrical engineering job market. Traditionally civil engineers have no trouble finding positions in Hawai'i, but electrical engineers often necessarily leave the islands for employment opportunities. More companies mean more jobs.

A curriculum in mechanical engineering was first offered in 1960 and in 1963 the first group of mechanical engineers graduated.

1966

Dept. of Ocean Engineering established as a graduate program. James K. K. Look Laboratory of Oceanographic

Engineering transferred to the College from the US Army Corp of Engineers. Doctorate in electrical engineering authorized.

1969

Masters degree in mechanical engineering authorized.

Graduate Programs

Graduate instruction was neglected until the 1960s because of the urgent need to develop a strong undergraduate program. With this accomplished, masters' degree programs in civil engineering and in electrical engineering were authorized by the University in 1963 and for mechanical engineering in 1969.

The electrical engineering department first offered a PhD in 1966, and the first doctorate was awarded in 1969; Chin-Long Chen of Taiwan was that graduate with a dissertation titled: "Some results on algebraically structured error-correcting codes." The mechanical engineering doctorate was offered beginning in 1985. Thereafter, the Board of Regents had a strong disinclination to authorize new doctoral programs. The university's Graduate Program Review team urged engineering to consider a single-college "umbrella" doctorate rather than a doctorate in civil engineering, but in the end, concluded that such a plan was not feasible. A PhD program for civil engineers was finally approved in 1992.

Ocean Engineering

An innovative program in ocean engineering, one of the first in the country, began in 1966. The program became a department in 1968. A strong faculty, headed by Charles Bretschneider, an expert in coastal engineering, beach erosion, and tsunami wave forces, and Manley St Denis, who had done pioneering work on sea-keeping in random seas, founded the program. Later, the multi-talented marine scientist John Craven, recruited by Governor John Burns to place Hawai'i at the forefront of world maritime affairs, added additional depth and glamour to the program. Hawai'i, situated in the middle of a natural laboratory with clear, warm, deep water relatively close to shore, was a natural choice for such a program and the department thrived. During the first decade of the program, there was a concentration on hydraulic studies, coastal structures, and offshore platforms. Emphasis shifted in the second decade to research based on computer modeling and exploration of ocean resources, especially on the potential of ocean thermal energy conversion.

The James Look Laboratory of Oceanic Engineering was transferred from the federal government to the university in 1966 and served as a major applied research facility for coastal engineering. The Look Laboratory was named in honor of UH engineering graduate, James Look, who lost his life while making observations in Hilo for the U.S. Corps of Engineers during the 1960 tsunami. The Look Laboratory closed in 2004.

1972

Holmes Hall, housing all engineering activity on Mānoa campus, completed.



1974

Fujio Matsuda becomes first engineer to become UH president.

1980

Department of general engineering disbanded.

1981

Paul Yuen becomes dean of College of Engineering.

In a somewhat controversial move, in 1989 ocean engineering was transferred to the newly established School of Ocean and Earth Science and Technology (SOEST). Close ties remain between the reorganized Ocean and Resources Engineering department and the College of Engineering in the form of joint research activities and the use of background engineering courses by ocean engineering students.

Holmes Hall and the Gate of Hope



"Gate of Hope" sculpture in front of Holmes Hall

Groundbreaking for the College of Engineering's new quarters took place in 1969 and the building was occupied in 1972. Gracing the new building is an immense sculpture, a thirty-foot high work constructed of $\frac{3}{4}$ inch thick steel plates, rolled and welded together, created by the Russian-American artist, Alexander Liberman. Opinions on the piece were mixed, but noteworthy are comments from the respected artist Mamora Sato who found the work "artistically appealing, working well in terms of the space provided in terms of color, and interesting from all different angles." The bright-orange sculpture "Gate of Hope" was originally designed to be complemented by the orange trim and railings of Holmes Hall and the surrounding flame-red poinciana trees. Liberman's works are held by major museums throughout the country. A 2006 book *Them* by his daughter-in-law, the writer Francine du Plessix Gray, details some of the colorful events of his life.

Engineering Education and Socio-Economic Issues, 1970–2000

The College of Engineering, along with the rest of the University, in the last decades of the twentieth century suffered through a number of state and federal economic downturns. Engineering Dean John Shupe, successor to Wilfred Holmes, identified another problem for engineers in general. Especially in the 1970s, Shupe commented, the engineering profession was held in low esteem because the public blamed environmental ills on misdirected technology. Shupe was a vocal advocate for the development of alternative energy sources. His alternative energy campaign kept the College of Engineering in the headlines throughout the 1970s. He was acutely aware of Hawai'i's over-reliance on oil and its particular vulnerability as an island state. Shupe's successor as dean, Paul Yuen, continued a focus on alternative energy sources. Shupe was influential in the 1974 founding of the Hawai'i Natural

TIMELINE

1985

Doctoral program in mechanical engineering begins.

1989

Ocean engineering transferred to new School of Ocean and Earth Science Technology.

1992

Doctoral program in civil engineering established.

Energy Institute, a multi-disciplinary organization devoted to research and development of natural energy technologies, and both Shupe and Yuen served as directors of that Institute. As University historians, Robert M. Kamins and Robert Potter, point out however, not all residents were happy with some energy projects, most notably geothermal research.

As the century closed, budget cuts had severely hampered engineering programs. The operating budget had been cut by 30%, the faculty had decreased by 20%, and enrollment in the last five years of the 1990s dropped by 30%. Dean Wai-Fah Chen, who assumed the deanship in 1999, credits Governor Ben Cayetano with a one million dollar cash infusion to the College's base budget. Chen used the funds to retain faculty, to bring in some new faculty members, and to recruit and retain a strong student body.

The Growth of Research

Through research, Hawai'i's academic engineers can connect to the community, offer tangible benefits, and positively effect economic and social progress. Arthur Keller's 1916 experiment with road-construction materials, resulting in the first campus road, illustrates an early research contribution to the community. ("For the first time," rejoiced the Board of Regents, "the college is readily accessible by automobile in all sorts of weather and a battery of foot-scrappers is not necessary!"). Examples from the late 1960s coming from the university's Look Laboratory include erosion prevention models for the popular Kūhiō Beach and stability studies for Honolulu airport's new reef runway.

A major development in the academic research world was an administrative structure designed to deal with the critical importance of extramural funding for research activities. Issues of patents, revenue sharing, and proprietary interests arose. Professors learned to add grantsmanship to their arsenal of skills and to balance both teaching and research duties. Today external research funding provides more than half the College's total operating budget.

The most visible research project of the early 1970s was the Additive Links On-line Hawai'i Area Systems Network (ALOHA). This story begins with the faculty appointment of W. Wesley Peterson, noted for his invention of the Cyclic Redundancy Check, for which he was awarded the prestigious Japan Prize. Peterson's work Error Correcting Codes is the standard text on

1999

Wai-Fah Chen appointed as dean of College of Engineering.

2001

Hawai'i Center for Advanced Communications established. Native Hawaiian Science and Engineering Program established.

2002

Civil Engineering becomes Civil and Environmental Engineering.

2006

Peter Crouch assumes deanship.



Norman Abramson

this subject. Peterson's presence on the University campus attracted other scientists in the field. Among these was Norman Abramson. Abramson's passion was surfing, but he had other talents as well. Abramson is credited with the development of the ALOHA protocol that transmits data via radio waves, rather than by wires. Funded by IBM, the Nippon Electric Company, and NASA, the project attracted international attention, and was a stepping-stone to today's advanced wireless communication systems. A PBS program acknowledges Abramson's contributions, as does the book *Nerds 2.0*, a history of the internet.

One of the most important projects, which was headed by Frederick Munchmeyer, a professor of mechanical engineering, was the ocean thermal energy conversion program at Keahole Point on the Big Island. From that project, the NELH was founded, which contributes to the Hawai'i economy in many ways other than energy production. It was the vision and drive of John Craven that got funding for NELH.

In the 1970s, the College's research efforts were in computers, communications and electronics; alternative energy; marine environments; structures; freshwater and the environment; space and motion; and transportation. Faculty were studying errors in computer data transmission, especially for satellite communications, computer communication networks and other multi-use systems. Fundamental limits of communication caused by noise, power, static, bandwidth or other factors were also being investigated. Methods of sending voice signals by digital means, counting the number of electrons between a fixed point on earth and a geostationary satellite to lead to better satellite placement, fiber optics, artificial or machine intelligence, development of digital simulation techniques suitable for investigations of stability and performance of sound projection and funding for a solid-state device laboratory where students learn to design and construct integrated circuits were all part of the on-going research in computers, communications and electronics during this time.

Alternative energy resources were important research topics in the 1970s and 1980s, especially since Hawai'i has no fossil fuel resources. Research on understanding how heat is transferred in porous media such as the rock structure in Hawai'i's geothermal fields led to using geothermal heat to generate power. Another project, also studying heat transfer mechanisms, used refrigerants such as Freon-11 as the working fluid in alternative energy systems such as ocean thermal energy conversion. A group of researchers

Hawai'i Space Flight Laboratory
established.



Mini-OTEC experimental barge

looked at wind energy, designing wind energy generators and means to interface wind turbine generators with the utility grid. Several faculty worked on the use of hydrogen as an alternative fuel, looking at issues such as generation and storage. Others looked at solar energy to power photovoltaic cells and for solar heating. In the newly constructed Renewable Resources Research Laboratory, research was done on a pyrolysis process (the breaking apart of complex molecules into simple units by the use of heat) that uses sunlight to convert biomass to liquid hydrocarbon gases and liquids. Biomass particles included wood chips, sugar cane, and corn cobs. Ocean thermal energy conversion (OTEC), another alternative technology based on solar energy, uses the principle of a heat engine that operates between two sources that are at different temperatures to produce electricity. Wave energy was another alternative energy source, with much of the ocean energy research conducted by the Ocean Engineering Department, a part of the College of Engineering until 1989 when it was transferred to the newly-formed School of Ocean and Earth Science and Technology.

Research in the 1990s dealt with areas such as high tech applications, environmental issues, ocean-related interests and space applications. Energy continued to be a concern during this time. Computer chip designs, integrated circuit designs, chip fabrication, microelectromechanical systems (MEMS), millimeter-wave systems for wireless communications, passive sampling devices, and video compression were investigated. MEMS refers to the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology. While the electronics are fabricated using integrated circuit process sequences, the micromechanical components are fabricated using compatible 'micromachining' processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices.



Lloyd Hihara doing corrosion studies

In the environmental area, faculty looked at subjects such as the creep characterization of tropical soils, mitigating natural hazards damage, concrete durability, waste ash for geotechnical application, bioremediation of contaminated soils and monitoring the H-3 North Halawa viaduct. Studies on corrosion were also conducted. Ocean-related projects included the study of wave-induced responses of very large floating structures, a multiple autonomous vehicle imaging system, underwater robotics, development and



Magdy Iskander (right) with HCAC graduate students



Justin Akagi (left) and Wayne Shiroma, co-director of the Hawai'i Space Flight Laboratory working on a micro-satellite

testing of a wave-driven artificial upwelling device, and a large project on the development of a semi-autonomous underwater vehicle for intervention missions. Space research included the application of composite and smart materials to space structures, and error control coding techniques for space and satellite communications. Energy research included the Hawai'i electric vehicle demonstration project.

In more recent years, engineering professor Lloyd Hihara's research program addresses corrosion, an international issue but one especially problematic in Hawai'i because of the high salt-content of the air. The Pacific Rim Corrosion Research Program (PRCRP), headed by Hihara in cooperation with the US Army and other sponsors, is developing testing sites around the state, testing various protective treatments, and looking at the effect of corrosion on advanced electronics systems.

In 2000, the Board of Regents established the Hawai'i Center for Advanced Communications (HCAC) within the College of Engineering. HCAC aims to become the leading center for multi-disciplinary research in the telecommunications field. Special emphasis is on broadband wireless communications and integrated communication systems that include wireless, optical power-line, and satellite communications. Internationally-recognized Magdy Iskander, a Fellow of IEEE and a former National Science Foundation program director, was recruited from the University of Utah where he had held an endowed chair. The center has attracted extramural funding and brought two major IEEE conferences on wireless technology and antenna systems to Hawai'i. Wireless communication advances have profound implications for the technological and economic future of Hawai'i. Iskander speaks of his goal of a "Wireless Waikiki" to attract business and convention people, and a "Wireless Pearl Harbor" in support of the defense industry. The Center has also reached out to Hawai'i schools to encourage a new generation of telecommunication entrepreneurs.

In 2007 the Hawai'i Space Flight Laboratory was launched as a joint project of the College of Engineering and the School of Ocean and Earth Science and Technology. Participants will design, launch, and operate micro-satellites configured for a variety of scientific and educational tasks. Electrical Engineering Professor Wayne Shiroma is co-director of the program.



Peter Berkelman

The National Academy of Engineers identifies bioengineering as one of the waves of the future. Professor of Mechanical Engineering Peter Berkelman has designed an experimental robot that looks ahead to this future.

Berkelman's tool is designed to be attached to an endoscope (a specialized video camera attached to a long, thin rod inserted into the human body) to display images of internal tissues on a video monitor during surgery. The robotic tool allows the physician to manipulate and control the endoscope with various hands-free command interfaces such as voice recognition.

Another ongoing futuristic biomedical research project is that of electrical engineering professors Olga Boric-Lubecke, Victor Lubecke, and Anders Host-Madsen, who have developed a new technology called the Heart Sensing Radar/Life Reader. The device marries microwave Doppler radar to digital signal processing to create a means of detecting life signs. It is wireless, can see through walls, and can distinguish the signals of multiple people. Practical applications of this might include searching for signs of life at an accident scene, scanning airport security lines for signs of anxiety or hostility, or unobtrusive monitoring of at-risk medical patients.

Civil Engineering: Connecting to the Community

To a large extent, the Department of Civil and Environmental Engineering and its graduates are responsible for the infrastructure of the State of Hawai'i.



Constantinos Papacostas (center) with LTAP staff members Gail Ikeda (left) and Juli Kobayashi (right)

The Hawai'i Local Technical Assistance Program (LTAP) represents a town and gown connection for Hawai'i's civil engineers. The program, one of 58 US LTAP centers, was transferred from the Hawai'i Department of Transportation to the Department of Civil and Environmental Engineering in 1998. LTAP's mission is to deliver a broad range of quality training, technology transfer, and information sharing through cooperative relationships that promote best practices throughout the statewide transportation system. LTAP receives its basic funding from the Federal Highway Administration and the Hawai'i Department of Transportation. To strengthen its ties to the engineering community, to date the program has executed ten partnering and resource-sharing agreements with Hawai'i-based industrial and professional groups, the most of any of the 58 centers



across the nation. Civil Engineering Professor Constantinos Papacostas has directed the program since its UH inception, has organized numerous workshops and training activities, provided technical and policy assistance to local and state governments, and has edited the LTAP newsletter *Hawaiian Connections*. The newsletter covers current developments and projects and since its beginning has become a compendium of practical information on such matters as notable transportation projects (preserving the historic character of Hanalei Bridge, for example), the “building a better mousetrap” column (devices invented by local workers to improve engineering operations), and until 2002, the “Lum’s Rule of Thumb” column (advice from the late master engineer Walter Lum on ways to solve complex problems).



Peter Nicholson next to a failed levee wall in New Orleans.

The College supplies a solid team of experts who have responded to Hawai‘i’s natural disaster emergencies. Geotechnical engineer Peter Nicholson has served as a local volunteer for a number of geo-related disasters, including the rockfall at Mākaha Towers, the rockfall at Sacred Falls, and the Kaloko Dam failure on Kaua‘i in 2006. He was one of an expert faculty team that assessed damage from the 2007 Kīholo Bay and Hāwī earthquakes on the Big Island. On the national scene, in the days following Hurricane Katrina on the US Gulf Coast, he was called on to assemble a team of engineers to inspect the hurricane production system and determine causes of the catastrophic failure. His team wrote the first report on the causes of the levee failure.

A Century of Leadership

HONORS

Regents' Medal for Excellence in Research

College of Engineering Faculty Awards

2006 Albert Kim, Civil Engineering
2002 Marc Fossorier, Electrical Engineering

Regents' Medal for Excellence in Teaching

College of Engineering Faculty Awards

2003 Wayne Shiroma, Electrical Engineering
2002 Beei-Huan Chao, Mechanical Engineering
1999 Rahul Chattergy, Electrical Engineering
1994 Peter Nicholson, Civil Engineering
1991 Vinod Malhotra, Electrical Engineering
1990 Bruce Liebert, Mechanical Engineering
1982 Arthur Chiu, Civil Engineering

National Science Foundation

Presidential Young Investigator Award College of Engineering Recipients

1991 Kenneth Zeger, Electrical Engineering
1991 Junku Yuh, Mechanical Engineering
1990 Lloyd Hihara, Mechanical Engineering
1989 Galen Sasaki (awarded in Texas), Electrical Engineering
1989 Michael Smith, Electrical Engineering
1988 Anthony Kuh, Electrical Engineering

Arthur Ripont Keller (1882–1961)

Arthur Keller joined the faculty of the College of Agriculture and Mechanic Arts in 1909. When he first came to Hawai'i, he had a civil engineering degree from Cornell and a law degree from the National University Law School. In 1915, he went on a sabbatical leave and returned with two engineering masters' degrees, one from MIT and one from Harvard. By the time Keller returned from active duty in World War I, the College of Hawai'i had become the University of Hawai'i, and Keller was appointed as the first dean of the College of Applied Science, which included engineering, agriculture, home economics, and sugar technology.

Keller's name is associated with many phases of the young University's development. He maintained a heavy teaching schedule, helped plan the buildings and grounds of the University, served as an administrator, and was acting University president during World War II days. The city of Honolulu often drew on his expertise in matters relating to city planning, health services, and sewer design. This versatile man played on the 1911 college football team and at the age of 58 took flying lessons. Keller's depth of knowledge was legendary. Once, another professor tried to substitute for him for a course on engineering contracts. Too late, the substitute professor realized that to stand in for Keller meant lecturing on Hawaiian land law, Hawaiian laws of water rights, statute law, and the case histories of local court decisions affecting engineering. The instructor confessed that he could not teach the course

as Keller had. "Nobody else can either!" was the only sympathy the instructor received.

One of Keller's many contributions was the design of a campus drainage and flood control system. After the disastrous campus flood of 2004, his portrait fell from the wall of Keller Hall where it had hung for 44 years, confirming the belief of some that Keller's spirit haunts his namesake building.



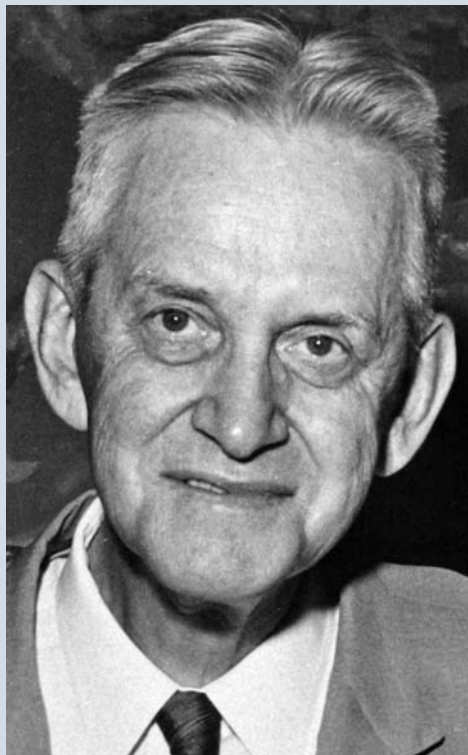
Wilfred Jay Holmes (1900–1986)

Wilfred Holmes graduated from the US Naval Academy in 1922 and thereafter was assigned to submarine duty. A disability forced his retirement from the Navy and in 1936 he joined the University of Hawai'i faculty as an assistant professor of engineering and mathematics. During World War II, he was recalled to active duty and served as an intelligence officer under Chester Nimitz. He worked in a secret room located under the Pearl Harbor headquarters building, helping to decode information from Japanese radio transmissions. Holmes returned to academia after the war to become dean of engineering. Holmes served as dean of the College of Engineering from 1947 to 1965 (there were short breaks in his deanship when he returned to teaching or was called to University administrative duties). Holmes saw many changes during his tenure. When he first came in 1936 there were only a few dozen engineering students. When he retired enrollment counts reached some 800.

Holmes led an alternative life as a successful writer. Under the pen name Alec Hudson, and drawing on his military experiences, he published a number of fictional stories on submarine warfare in the *Saturday Evening Post* as well as several fictional and non-fictional books on this subject.

One of the most notorious incidents of his writing career concerns the "second attack on Hawai'i" in March of 1942. That month bombs ripped holes in Tantalus although no one was hurt. After the war it was confirmed

that the bombs were indeed launched from a Japanese seaplane fueled by a submarine. Earlier Holmes had published a short story "Rendezvous" describing in strikingly similar terms the methodology of such an attack. Holmes dismissed any suggestion that the attack was inspired by his story. The technology was well known to the world's navies, and moreover, he said, he doubted that Japanese commanders sat around reading the *Saturday Evening Post*.



HONORS

National Science Foundation Career Awards College of Engineering Recipients

2008 Anyuan Cao, Mechanical Engineering
2006 Gurdal Arslan, Electrical Engineering
2005 Albert Kim, Civil Engineering
2002 Audra Bullock, Electrical Engineering
2000 Farzad Mashayek, Mechanical Engineering
1999 Zixiang Xiong, Electrical Engineering
1998 Marc Fosserier, Electrical Engineering
1995 Eun Sok Kim, Electrical Engineering
1995 Patrick Phelan, Mechanical Engineering
1995 Gregory Uehara, Electrical Engineering

Eta Kappa Nu Alton B. Zerby and Carl T. Koerner Outstanding Electrical or Computer Engineering Award

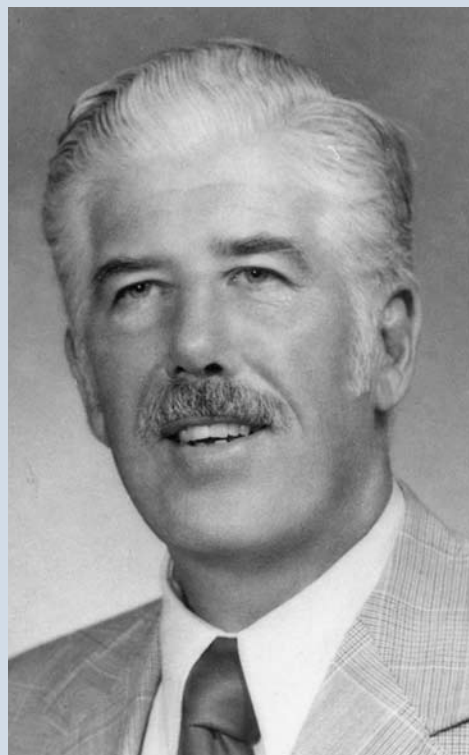
College of Engineering Student Recipients
2007 Monte Watanabe
(honorable mention)
2005 Blaine Murakami
2003 Aaron Ohta
2001 Kendall Ching

John Wallace Shupe (1924–2001)

John Shupe held a bachelor's degree in mechanical engineering from Kansas State University, a master's in civil engineering from the University of California, and a doctorate in civil engineering from Purdue. He was stationed in England during World War II and flew missions over Germany as a B-17 navigator. In a flight over Leipzig, he suffered near-fatal injuries and for that received a Purple Heart and Distinguished Flying Cross. He was associated with Hughes Aircraft and Consolidated Vultec Aircraft Corporation, and before his appointment as dean of the UH College of Engineering, he was coordinator of an Agency for International Development unit that sponsored an engineering educational program in Egypt. Shupe was dean of the UH College of Engineering from 1965–1980.

As an academic, Shupe had a mission and that was promotion of alternative energy sources. He spoke out often on the danger of Hawai'i's dependence on imported oil and was an ardent advocate for Hawai'i's rich stores of alternative sources: solar, ocean temperature differentials, wind, waves, geothermal power, and biomass.

When he left Hawai'i in 1996, he became the director of the Pacific Site Office of the US Department of Energy in San Diego.



Paul C. Yuen

Yuen was born in Hilo but moved with his family to Honolulu where he graduated from Roosevelt High School. He earned a B.S. from the University of Chicago and a PhD from Illinois Institute of Technology. He was an engineer at Standard Coil Products and Armour Research Foundation before beginning a teaching career at Illinois Institute of Technology. Yuen joined the UH faculty as an associate professor of electrical engineering in 1961 and was dean of the College of Engineering from 1981–1999.

His academic interests and writings center on atmospheric dynamics, renewable energy, and high technology. One of his notable projects was the innovative PEACESAT project that linked Hawai'i with some twenty Pacific island nations. Yuen was the engineer for the project; John Bystrom and Katase Nose participated in other capacities. As dean, Yuen pioneered a curriculum that focused on real world projects supported by strong technical skills. He was ahead of his time in developing a summer program encouraging native Hawaiians to consider engineering as a career, although ironically, he remembers, the program ran afoul of civil rights advocates. A modest man, he is not inclined to talk about his accomplishments, but he does report on his satisfaction with delivering what the people of the state wanted, a fully accredited engineering school.

He was called upon to serve as UH vice president for academic affairs, UH senior vice president, executive vice chancellor and acting UH president. To these positions he brought a rare understanding of how the state government of Hawai'i works and as a result improved communication lines between the University and "downtown."

Reginald Young was interim dean of the College of Engineering during the five-year period of Yuen's administrative leave.



FACULTY ENDOWMENTS

The Arthur N.L. Chiu Endowed Scholarship

The Arthur N.L. Chiu Endowed Scholarship, established in 2006, honors one of the College of Engineering's most respected professors. Chiu, an international authority on the effect of wind on structures, taught civil engineering classes for over 42 years. Robert Akinaka and Edward Hirata helped establish the scholarship as a means of giving back for all of Chiu's contributions. "You know how we all credit that one teacher for our success, the one teacher you remember, who took personal interest? For many of us, that's Dr. Chiu," Akinaka said.

Chiu died in 2006 after suffering a stroke at a meeting of the Structural Engineering Association of Hawai'i, "literally on the job," said Hirata.

The Dr. Hi Chang Chai Excellence in Teaching Award Endowment Fund

The Hi Chang Chai Endowment provides three teaching awards each year, one each for civil, electrical and mechanical engineering faculty. Chai established the endowment in 1998 to provide a cash award to those faculty who exemplify excellence in teaching. Chai was the advisor to all graduating seniors in mechanical engineering, ensuring that they were on track to graduating and keeping in touch with the students after they graduated.

Wai-Fah Chen

"War, war, war. Run, run, run." This is Wai-Fah Chen's description of growing up in China. With his brothers he escaped to Taiwan. His undergraduate degree was from the National Cheng-Kung University in Southern Taiwan. He studied structural engineering at Lehigh University in Pennsylvania, a fortunate choice, he says, because of Lehigh's revolutionary program in plastic design replacing an older method of allowable stress design. Chen's PhD was from Cornell with a concentration on plasticity, a branch of applied mathematics describing the inelastic behavior of materials. Chen returned to Lehigh to teach and later moved on to Purdue where he was to become the first Distinguished Professor Chair of Civil Engineering. Two of his early books brought him considerable acclaim: *Limit Analysis and Soil Plasticity* and *Theory of Beam-Columns*. Other works followed and he became a respected leader in the field of plasticity, structural stability, and structural steel design. He is a member of the US National Academy of Engineering and the Academia Sinica.

Chen served as dean of the College of Engineering from 1999–2006. His goal for the College, he stated, was simple and clear: "to elevate the College to the level of the nation's top-tier engineering schools by building academic excellence." When he retired as dean he was able to cite tremendous progress. He had added faculty, strengthened research programs, improved facilities, and increased enrollment.



Peter E. Crouch

Crouch holds BS (Engineering Science) and MS (Control Theory) degrees from Warwick University in England and a PhD in applied science from Harvard. He assumed the deanship of the UH College of Engineering in 2006 following a distinguished career as administrator, educator, and scholar at Arizona State University. Previously, Crouch taught at Warwick University, served as vice provost for global engineering at Arizona State University, and led that University's Ira A. Fulton School of Engineering. As dean at ASU for more than a decade, Crouch was responsible for elevating the school to one of the top 50 engineering programs in the nation. He has authored some 120 scientific articles and two books.

His research interests center on control theory, nonlinear system theory and dynamical systems. Crouch is well-traveled and especially interested in China. He takes as a goal better connections of the College with Asia and Europe.



On The Job

An Engineer In The Corporate World: Leslie Asa Hicks (CLASS OF 1916–17)



The University of Hawai'i has been an invaluable source of very talented engineers. It has been the UH College of Engineering's integration into the professional community that has facilitated their graduates' understanding of the industry's needs. Working closely with local and national Architect/Engineer firms, the College has been able to supply local and cultural insight to the curriculum of science and engineering that has produced highly qualified engineering students.

The Hawai'i Council of Engineering Societies is proud to have the UH College of Engineering as a member.

TODD C. BARNES, P.E.
Chair 2006–2007
Hawai'i Council of Engineering Societies

Born on Presque Isle, Maine, Hicks moved to Hawai'i in 1908. He graduated from McKinley High School, entered the College of Hawai'i, and was the only engineer to graduate in the 1916–17 class. Hicks enlisted in the World War I armed forces and was trained in France as a balloon specialist. The work of a balloon operator, he wrote back to his Hawai'i classmates, was to observe and adjust the artillery fire below.

Hicks joined the Hawaiian Electric Company as a technician in 1919. He moved up rapidly and by 1943 was president of the company. He guided the company through momentous years in Hawai'i. The power plant at Pearl Harbor's West Loch was strafed on December 7, 1941, but power to the island was only briefly shut down. Hicks can be credited for effective leadership of wartime electric power operations, giving priority to the heavy demands of the military on O'ahu. After the war, Hicks led the company in fulfilling the electrical demands of an unprecedented building boom. Providing power to the Ala Moana Center, the largest shopping center in the nation at that time, posed particular challenges. The size of the new center was bigger than downtown Honolulu. A power distribution system had to be installed from Kona Street to the shopping center. Since the center was built on reclaimed lands, underground vaults for submersible transformers that could withstand flooding had to be built.

Hicks advocated a concept of "good corporate citizenship" as company policy. He set a good example and served on many boards, including the University's Board of Regents from 1957–1961. After an acrimonious labor dispute in 1943, some union officials tried to have Hawaiian Electric taken over by the city, but Hicks was able to fend off that move. Hicks was with Hawaiian Electric for 40 years. The power plant on Ala Moana Boulevard is named in his honor.

An Engineer in Public Service: Edward Y. Hirata (CLASS OF 1956)



The 100 year history of the College of Engineering is something all students, alumni, and faculty can be proud to have been a part of. I am truly grateful for the education I received as a student, and I have continued to learn more about what it means to be an engineer by volunteering and supporting the college after graduating. The future of the college will be even brighter if I and my fellow alumni continue to do our part to support the college that has given us the foundation to build successful careers.

MATTHEW K. FUJIOKA
President 2007–2008
Engineering Alumni Association of the
University of Hawai'i

Edward Hirata graduated from the University of Hawai'i in 1956 with a degree in civil engineering with honors. His career was varied: he was project engineer for a number of Honolulu engineering firms, head of his own consulting firm, and an executive with Hawaiian Electric Company. Hirata spent thirty-three years as a US Army Reserve officer and retired with the rank of Brigadier General.

"I have been privileged to serve seventeen years as a public servant," Hirata notes. "I've said many times that public service is the highest calling to which one can aspire. The two most challenging appointed positions that I held were, first, as Director of the Hawai'i State Department of Transportation (HDOT) and second, Managing Director of the City and County of Honolulu. I consider the position of Director of the HDOT as the most challenging position that an engineer can hold in the State of Hawai'i. The department is responsible for all the major highways, harbors, and airports in the State.

"As director of HDOT, I played a role in the designing and building of the controversial H-3 freeway. Despite much opposition, the project was completed and has been successful in reducing traffic congestion in the morning and afternoon commutes of the windward O'ahu citizens.

"One little known project that I was especially proud of was making improvement to the roadways, harbor, and airport at the Kalaupapa Hansen's Disease Settlement on Moloka'i. We repaved the roadways, renovated the one and only harbor that receives supplies once a year, and realigned and smoothed out the runway.

"The other challenging position I held was that of Managing Director of the City and County of Honolulu. My job, as the deputy to the mayor, was to coordinate the various interdepartmental activities of the city, resolve any differences, and assist the mayor in working with the City Council to get the job done. Some of the many initiatives of the Fasi administration still in existence today are The Bus system, satellite city halls, the open markets, and the staggering of vehicle licensing throughout the year. Although the managing director's position is not an engineering position, the training that I received at the College of Engineering was instrumental in giving me the ability and tools to get the jobs done."



The UH College of Engineering serves as a vital resource for Hawai'i's engineering community, developing our best and brightest young people into the professional problem solvers of tomorrow.

JON NISHIMURA, P.E.
President 2007–2008
American Council of Engineering Companies
of Hawai'i

Starting Out: Troy Ching (CLASS OF 2007)

Troy Ching graduated from Kamehameha Schools in 2002 and after enrolling in the College of Engineering was one of the first participants in the Native Hawaiian Mentoring Program. During his last two years at the College, he interned at Community Planning and Engineering Inc., a Native Hawaiian owned firm for the past 50 years. The firm specializes in land development and related consulting work. While at Community Planning and Engineering, Ching worked on two Department of Hawaiian Homelands subdivisions: Kēōkea in uplands Maui, and East Kapolei on O'ahu. He also worked on the Waiawa Ridge Development

For a year in 2003–04, Ching was a research assistant under Kaeo Duarte, a hydrologist in the University's botany department. He assisted in the set-up and measurement taking of He'eia fishpond in order to map out the hydrology of a Native Hawaiian fishpond. He also had the experience of setting up an evapo-transpiration station in the lo'i (irrigated terrace) at the Hawaiian Studies building. The goal of the project was to measure the water consumption rate of a typical lo'i.

After graduation, Ching joined HDR Inc., an award-winning, large, employee-owned architectural engineering and consulting firm founded in 1917. HDR has projects in all 50 states and in 60 countries. The firm specializes in coastal engineering and restoration, community planning and urban design, design engineering, master planning, transportation planning, wastewater collection systems, wastewater treatment, and water supply and treatment. HDR had expanded its operations to Hawai'i in 2007 by acquiring Hawai'i Pacific Engineers Inc., a local consulting civil engineering firm established in 1985. At HDR, Ching has worked on several projects, including the proposed Kapolei Costco Warehouse and Gas Station, Kalihi-Nu'uanu Sewer Rehabilitation and a Navy project located on Guam.

"The classes that I feel have helped me the most in my current position are CEE 421 Engineering Hydraulics, CEE 431 Water and Wastewater Engineering, and CEE 490 Senior Design Project," Ching notes.

A Diverse Student Body

The Native Hawaiian Mentoring Program

In step with national initiatives to increase the overall number of underrepresented groups in the areas of science, technology, engineering and math, in 2001 the College of Engineering joined the Alliances for Minority Participation, funded by the National Science Foundation. The Hawai'i program, called Native Hawaiian Science and Engineering Program, is headed by College of Engineering Director of Academic Affairs Tep Dobry, in cooperation with Lilikala Kame'eleihiwa, director of the Center for Hawaiian Studies. Kame'eleihiwa's intent was not only to increase enrollment of Native Hawaiians in Hawaiian studies and language, but also in the science and health fields. Joshua Kaakua came on board as Minority Engineering Program Coordinator. The program has been a success story. Native Hawaiians now constitute ten per cent of the engineering enrollment. The seventy per cent retention rate is considered extraordinary. Measures proven effective in accomplishing this success include: a summer bridge program which gives students an extra semester to prepare for classes; mentoring in math; "engineering learning communities" with weekly problem-solving sessions in calculus and chemistry; individual assistance with homework assignments; and involvement with engineering projects important to native Hawaiians. Beginning in 2007, the College of Engineering joined the Islands of Opportunity Alliance, in cooperation with the University of Hawai'i at Hilo, UH West O'ahu, Hawai'i Pacific University, American Samoa Community College, Guam Community College, the College of Micronesia, the College of the Marshall Islands, Northern Marianas College, and Palau Community College. The new alliance extends opportunities for underrepresented groups of students throughout the state of Hawai'i and the islands of the Pacific.



CEE graduate Kristopher Maile and CEE sophomore Kahaleali'i Muhlestein measure and control water flow at Kohala, Hawai'i Island. The taro patch was newly refurbished in 2006 with assistance from UH Mānoa engineering students.

Female Representation in the College Of Engineering

Since Mae Nakatani graduated in 1950 as the only women in a class of fifty three students, female percentages have risen steadily. In 2006/07 the College of Engineering percentage of women is approximately twenty per cent, a number that tracks with national figures. A discernable trend is the rise in the number of female electrical engineering majors.

ENGINEERING FAMILIES

Here is one of those only-in-Hawai'i stories.



Patriarch of the Endo family, Wallace, graduated from UH with a degree in civil engineering in 1954. Wallace Endo became a senior partner of SEY Engineers. Wallace Endo had three children, all three graduates of the UH College of Engineering: Howard (1978, presently with SEY Engineers), Sheryl (1980, presently with Gray, Hong, Nojima & Assoc., Inc.), and Carolyn (1992, presently with Belt Collins Hawai'i). Sheryl Endo married Michael Nojima, UH civil engineering, 1981, also with Gray, Hong, Nojima & Assoc., Inc. Carolyn Endo married Peter Len, a UH mechanical engineering graduate, class of 1991, now with NAVFAC Pacific. Peter Len's father Raymond, also a mechanical engineer, graduated from UH in 1962 and is now retired.

There is more. Howard Endo married Linda Hihara (a 1978 UH engineering graduate, now with the US Army Corps of Engineers). Linda's brother Lloyd (UH mechanical engineering, 1983) is presently a College of Engineering professor. Lloyd's sister Shirley is a College of Engineering graduate, class of 1980, presently with NAVFAC Pacific.

All in all, there are 10 engineers in the Endo/Nojima/Hihara/Len clan.

Student Honor Societies

Three engineering honor societies are active on campus. Chi Epsilon, the civil engineering society, is the oldest and in 2007 celebrated its half-century mark. Generations of students remember an early supporter of Chi Epsilon, Professor Arthur Chiu who seldom missed a meeting of the society. Eta Kappa Nu (HKN), Delta Omega Chapter is the electrical and computer honor society founded by Professor Kazutoshi Najita in 1962. The Hawai'i Sigma Pi chapter of Pi Tau Sigma, the national mechanical engineering honor society, was chartered in 1969.

Student Activities and Support Staff

A strength of the College has traditionally been the wide range of activities offered to the student body. There are numerous open houses, career days when companies come to recruit, and competitions. Many students have lasting memories of competing in the concrete canoe, micro-mouse, human-powered vehicle, mini-Baja, Formula SAE, and nano-satellite projects. Open houses and school visits acquaint high school students with College of Engineering opportunities. Some 1,000 alumni maintain ties with the College by attending the annual banquet.

Planning and execution of these events through the years has been overseen by a loyal support staff and student volunteers. It is noteworthy that from World War II through the 1980s, there were only two secretaries of the College, Hazel Hee and Matsue Miyamoto. Fay Horie took over in 1986 and remained until her retirement in 2006.

Our Future

A Message from Dean Peter Crouch: *Envisioning the future of engineering, internationally and at the University of Hawai'i*



As we end our brief look into the history of the College, we see that society today faces many serious challenges. These include the provision of housing and civil infrastructure for the world's population, mitigation of natural disasters, provision of sufficient renewable energy to diminish the build up of carbon dioxide in the atmosphere, delivery of drinking water to the people of the world, developing techniques to counter the degradation of the natural environment, health care diagnosis and delivery to the world's inhabitants, mitigation of human disabilities, and providing a security environment for all. Engineering professionals have the capacity to provide many solutions to these challenges.

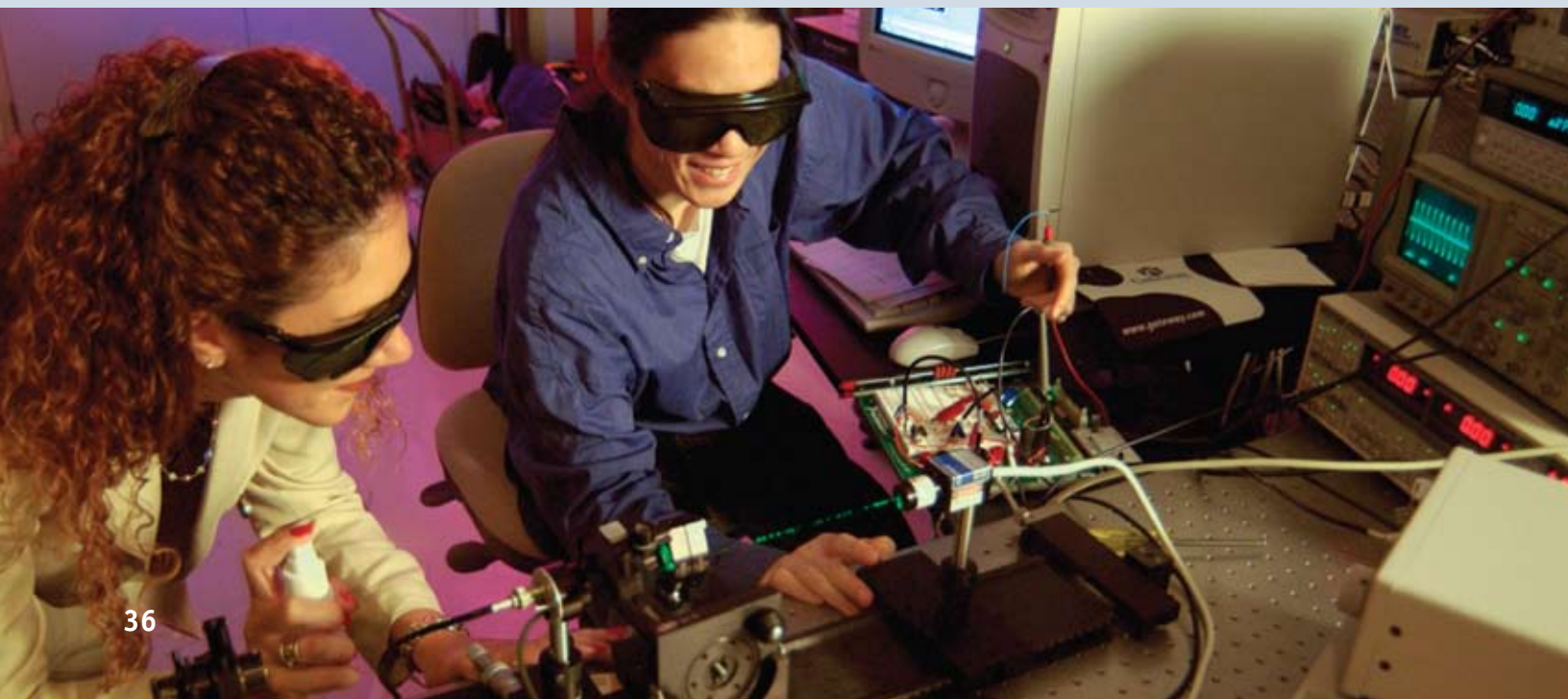
However, in comparison with other professions, the engineering profession is generally not understood or valued by many in the US or those in other societies. Moreover, society is in general increasingly technologically illiterate and with the continued acceleration of scientific and technological knowledge the increasing gap between the technologically literate and illiterate is creating societal tensions. The engineering workforce is growing faster in many parts of Asia than in Europe, Japan, and the US, which is creating economic tensions in a once economically secure US, Japan and Europe. The engineering community is beginning to understand the critical role it must play in the concurrent evolution of public policy related to the solutions or potential solutions it provides.

More and more fundamental research is taking place at intersections of scientific and technological disciplines. The most recognized intersections are occurring at the boundaries of nanotechnology, computer science, and biology. The evolution of some branches of engineering is becoming increasingly linked with a concurrent evolution in the sciences, especially the life sciences, and computer and information sciences, creating new areas such as biomedical engineering and embedded systems. US industry performs significantly less research and development (R & D) than in the past, potentially leaving the higher education system in the US with an enhanced role to play. But, US federal support of R & D is decreasing while in many Asian countries it is increasing.

The US higher education system has shown a tendency to become more isolationist in an increasingly “flattening” world. The events of 9/11 played a major role in an even more pronounced period of isolation from which the US is only now recovering. In contrast, many European, Asian, and Australasian communities have worked hard to internationalize education and research.

As pathways through higher education, Science, Technology, Engineering and Mathematics (STEM) curricula are in general no more attractive now than they have ever been for the K-12 population, despite much recent effort to popularize STEM in K-12. There are particular problems in attracting under-represented segments of the population and women to STEM careers. New K-12 educators are typically not exposed to STEM subjects in their higher education pathways, creating an ever increasing need for K-12 STEM educators. To combat some of these trends many countries, including the US, are putting much more emphasis on innovation in STEM teaching methods in higher education and developing many after school programs for K-12 students aimed at attracting students to STEM careers.

Faced with these many challenges and opportunities to contribute toward society’s needs, it is not at all clear what areas of inquiry and research will have the greatest payoff. This is especially challenging in a relatively small island state like Hawai’i with limited resources. However, despite the risks, it is important to make some choices for the future research directions for the College as it heads into the 21st Century. Tentative decisions on these directions have been made and are summarized here.

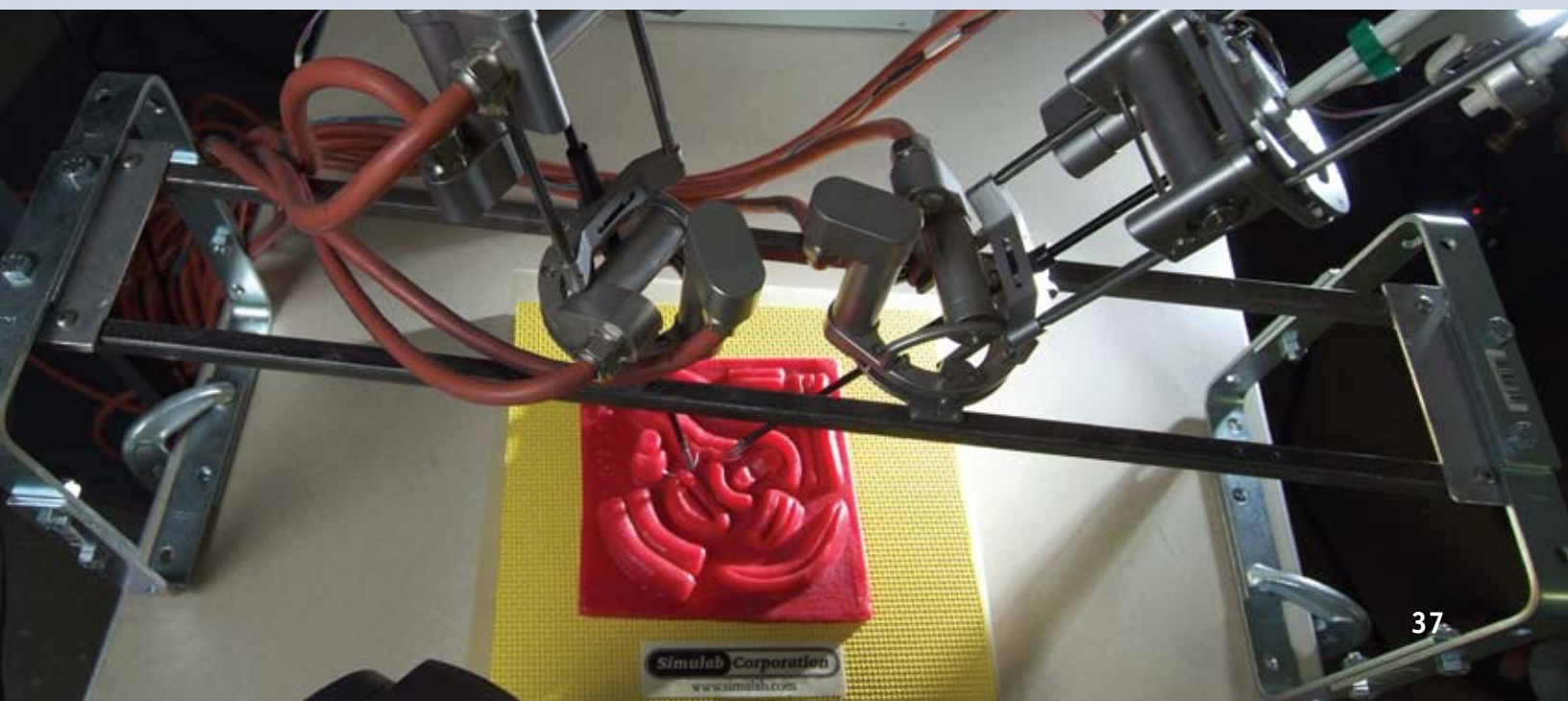


ENGINEERING FOR A SUSTAINABLE HAWAII

Hawaii has a special interest in sustainability and mitigating the effects of global warming because of its isolation and dependence on imports for so much of its current existence. Engineering to support a sustainable Hawaii can take many forms: photovoltaic devices, deep ocean water heat exchange, fuel cells, environmental engineering, water treatment and supply, dams and watersheds, solid and liquid waste disposal, food production, supplying the infrastructure for biotechnology in both land-based and ocean-based agriculture, transportation and mass transit, alternative fuels, pavements and roads, and affordable and sustainable housing. The College should develop capabilities and expertise that reinforces the development of the technologies related to some, if not all, of these needs.

EXPLORATION ENGINEERING

The University of Hawaii at Mānoa has significant “big-science” strengths, those involving the School of Ocean and Earth Science and Technology (SOEST) and those involving the Institute for Astronomy (IfA). Both of these big-science strengths involve significant engineering efforts. These big-science endeavors embody a developing discipline of “exploration engineering”, whether that is at the bottom of the oceans, on the surface of the oceans, in near space or deep space. This is made possible because of the existence of some unique facilities in Hawaii, many of which are being developed in association with the programs at UH. Examples include the telescopes operated by IfA, the ships and underwater exploration vehicles



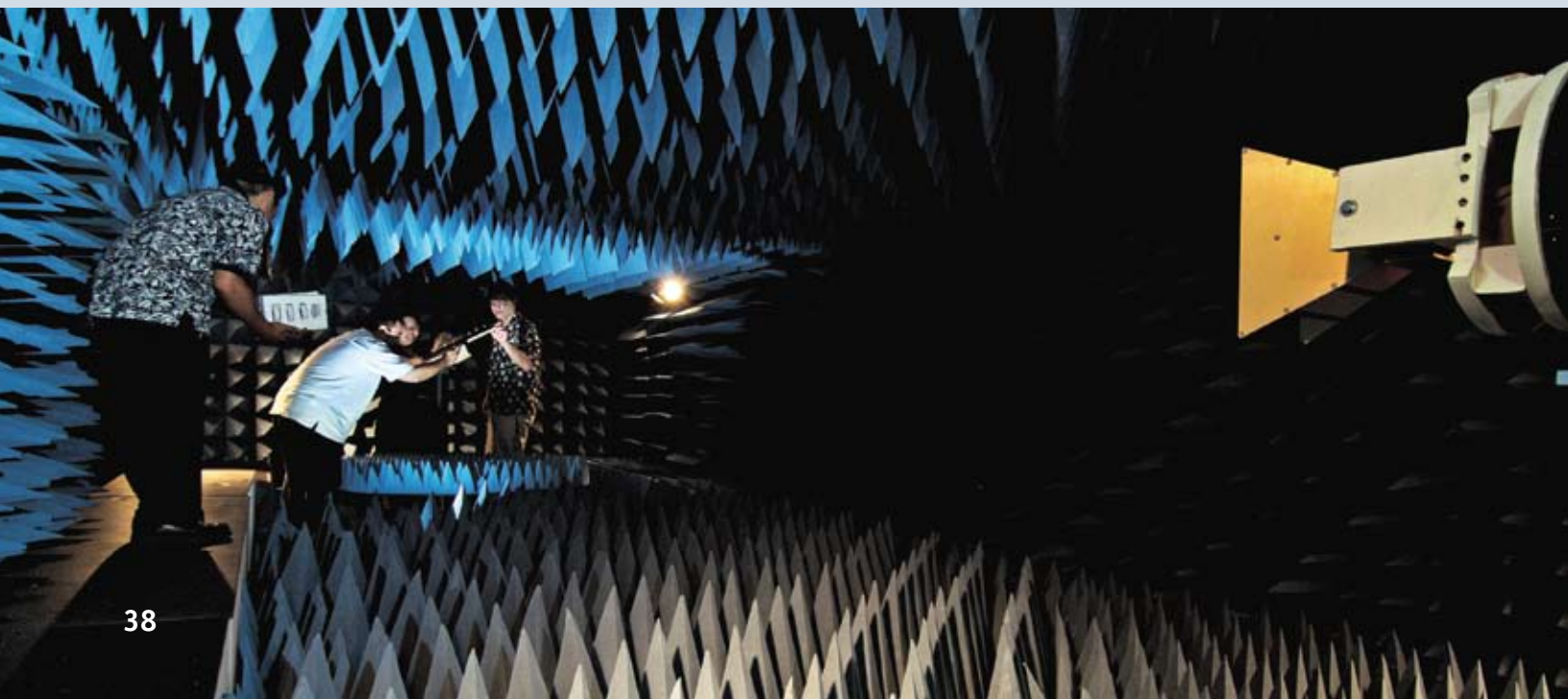
operated by SOEST and the Pacific missile range on Kaua'i. The College should leverage these areas of national and international prominence and develop capabilities and expertise that complement the science and facilitate the corresponding growth of the associated technologies, especially with companies in Hawai'i.

ENGINEERING FOR A SECURE HAWAI'I AND THE UNITED STATES

Hawai'i's geographic position ensures that it is representative of the many natural hazards and potential disasters that can befall the US. Its geographic position in the middle of the Pacific ensures that it also plays a major role in the national security of the entire US as far as threats from Asia are concerned. These threats range from those posed by unfriendly nations to the spread of disease. UH and the College of Engineering currently have some expertise in many of these areas. The College can work with existing UH resources to build nationally competitive areas of expertise that provide local and national capability in the analysis, mitigation, and response to hazards and potential disasters.

DUAL USE HIGH TECHNOLOGIES

The military presence in Hawai'i provides for a large component of the current technologically-based economic opportunities available in Hawai'i.



The most natural place for the development of Hawai'i's future economic diversification therefore surrounds the harnessing of underlying technologies that are being developed for military applications, and developing them for use in the civil sector. These areas include computation, modeling and simulation capability, software/hardware co-development, communication and information technologies, wireless and radar platforms, sensors, optics, and materials research including nano-electronics, mechanics and corrosion. The College should develop areas of expertise that reflect the natural capabilities of local companies and national defense contractors in these areas that have a significant presence in Hawai'i.

BIOMEDICAL ENGINEERING

The State of Hawai'i has recently made a large investment in the John A. Burns School of Medicine (JABSOM) and other medical units associated with UH. Perhaps the greatest expansion of new knowledge in any discipline is occurring at the fusion of the life sciences, physical sciences and information sciences. The College needs to be a part of this very exciting scientific and technological revolution, and leverage the State investments in the medical arena. There are several areas of technological interest where the College is already strong including imaging and sensor design, among others. The College should continue to develop these areas of expertise with an ever increasing dialog with JABSOM.



ENGINEERING FAMILIES

Another prolific UH engineering family is that of Reginald Young, UH emeritus professor of civil engineering, and a former interim dean of the College from 1989–1993. Young’s uncle Quan Yuen Ching (class of 1932) got the family started in engineering. Four Young brothers are graduates of UH in engineering: Reginald and Leonard in 1959, Thomas in 1950, and Hung Joong in 1941. First cousin Walter Hee is a 1961 civil engineering graduate. Four Young nephews are graduates of the College: Jeffrey (class of 1976), Jon (class of 1979), George (class of 1978) and Bruce (class of 1980). Further, Jon married Linda Katsura, class of 1979. Ethan Young, a grandson of Reginald Young, is currently a freshman at UH Mānoa, majoring in civil engineering.

A Brief Hawaiian Language Glossary for Engineers

Once thought virtually extinct, the Hawaiian language today is alive and well. It has adapted to the needs of the modern world. Some engineering terms are merely substitutions of the Hawaiian alphabet for English spellings. More interestingly, many engineering terms are deeply rooted in the native Hawaiian cognitive system.

building	Hale	irrigated terrace	Lo’i
building permit	Palapala ‘ae e kūkulu	laboratory	Ke’ena hana
cement	Kamiki (Hawaiianized English)	laser	Wana’ā
computer	Lolo uila (Lit.: electric brain)	plastic	‘Ūlina (malleable)
corrosion	Popopo	satellite	Ukali
contract	‘Aeliki	sewer	‘Auwai lawe mea ‘ino (ditch carrying rotten things)
EI	Palapala Hō’ike Hopena Kaiapuni	soil	Lepo
earthquake	‘Ōla’i	stone	Pōhaku
electric	Uila	street	Alanui
electric light	Kukuī uila	survey	Ana
energy	‘Eleu	steel	Kila (Hawaiianized English)
engineer	Wilikī (Lit. “turn key”)	tunnel	Ana puka
ferry	Moku halihali	wave	Nalu
geothermal	Uila māhu Pele	wind	Makani
groundwater	Wai honua	wood	Lā’au
heat	Wela	SOURCE Pukui, Mary Kawena and Samuel Elbert. <i>Hawaiian Dictionary</i> and Kōmike Hua’ōlelo, Hale Kuamo’o, ‘Aha Pūnana Leo Māmaka Kaiao: <i>A Modern Hawaiian Vocabulary</i>	
high rise building	Haleku’i (Lit. “added house”)		

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