

# THE JOHNS HOPKINS UNIVERSITY

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**J**OHNS HOPKIN UNIVERSITY, John Hopkins University, John's Hopkins University, The Johns Hopkins University. Never has a university's name produced so many variations. In brief, Johns was the founder's mother's maiden name, and unfortunately for him, he inherited a last name for a first name.

Despite the frequent misspellings and confusion, The Johns Hopkins University has a long and prestigious history. Founded in 1876, Hopkins established itself as the first true American university on the European model; a graduate institution in which knowledge would be created as well as taught. As early as 1913 engineering became an integral part of this university, creating the foundation for what would later become the G.W.C. Whiting School of Engineering.

The Schools of Engineering, Continuing Studies, and Arts and Sciences, and the Space Telescope Institute are located on the Homewood campus in north Baltimore on a 140-acre wooded campus in a residential area. The campus was originally the Homewood estate, built for Charles Carroll, Jr., son of a signer of the Declaration of Independence. The university was given the estate in 1902.

In addition to the facilities at the Homewood campus, The Johns Hopkins University's academic divisions and research institutions include the world-renowned schools of medicine, public health, and nursing, all located at the East Baltimore campus; the

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**Maryland Hall**

*photo by Alan Bearden*

School of Advanced International Studies in Washington, DC, with centers for foreign studies in Bologna, Italy, and Nanjing, China; the Peabody Institute, one of the leading music schools in the United States, located in downtown Baltimore; and the Applied Physics Laboratory in Columbia, Maryland, a scientific and engineering research facility.

## **BALTIMORE**

The Hopkins community shares in the exciting, nationally recognized, urban renaissance of Baltimore. Baltimore is no longer just a place to drive around on the way to New York from Washington. The city now boasts the "Inner Harbor," a waterfront area that includes the National Aquarium, the Maryland Science Center, and shops and restaurants in two glass pavilions. The Baltimore Museum of Art, adjacent to the Hopkins campus, houses excellent permanent collections and attracts important traveling exhibitions.

The Baltimore Symphony Orchestra, which has a superb new symphony hall, the Morris Mechanic Theatre, which presents Broadway touring companies and pre-Broadway tryouts, Center Stage, and the Baltimore City Opera are just a few of the many institutions providing entertainment for Baltimoreans.

And who could pass up watching the Baltimore Orioles play at Memorial Stadium, just a short walk from the Homewood campus. A good bet for seeing a home team win would be watching the University's own championship lacrosse team, the Blue Jays. Since their first season in 1888, the Blue Jays have had 73 winning seasons and have won 41 national championships.

Festivals abound in Baltimore. Its many ethnic communities stage weekend galas throughout the spring and summer, and the city sponsors the annual City Fair and the Artscape Festival. Not to be left out, Hopkins holds its own Spring Fair, "3400 On Stage." The fair is organized and run by students, with revenues benefitting student organizations. The Hopkins Fair draws Baltimoreans from every corner of the city.

## ENGINEERING AND CHE

Perhaps it is appropriate that just about the time the Baltimore urban renaissance began in 1979 the G.W.C. Whiting School of Engineering was founded. Today a full complement of undergraduate and graduate-level programs exist, including the largest part-time graduate engineering program in the country. Along with chemical engineering, the Whiting School departments include biomedical engineering, civil engineering, electrical engineering and computer science, geography and environmental engineering, and materials science and engineering.

Renaissance is also an applicable term to use when discussing chemical engineering at The Johns Hopkins University. After existing in some form or another from the 1930s until 1967, the department was reestablished in 1979 with the rest of the engineering school. The full-time faculty now numbers seven, but plans are underway to increase the size of the department. The department also has ten part-time members, including several who are on the staff of the Applied Physics Laboratory. In 1988 the department will occupy part of a new engineering building, adding to its existing facilities. Chemical engineering's facilities now include laboratories for research in fluid mechanics, heat and mass transfer, nucleation, rheology, acoustics, phase-equilibria, electrochemical engineering, separation processes, and biochemical engineering.

The department places a great deal of emphasis on

the use of computers; both graduate and undergraduate students have access to the department's computers which include four Micro-VAX computers, a PDP 11/45, a PDP 11/40, and a PDP 11/34, several PC's and the School of Engineering's VAX 8600 and AT&T 3B20.

Despite its apparent youth, the department has a history of distinguished alumni, including several now teaching at a variety of colleges and universities in this country and abroad. These include Simon Goren (Berkeley), Robert Anderson (McMaster University), Robert Sparks (Washington University), George Frazier (University of Tennessee), Gerald Esterson

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(Hebrew University), Eric Bauer (Case-Western Reserve), Irvin Glassman (Princeton), Kenneth Keller (President, University of Minnesota), John Falconer (University of Colorado), Ralph Kummeler (Chairman, Wayne State) Stanley Middleman (University of California, San Diego), James Douglas (University of Massachusetts), Robert Edwards (Chairman, Case-Western Reserve), and Edward Fisher (Chairman, Michigan Technological University).

## THE FACULTY

**Marc Donohue**, chairman of the department since 1984, came to Hopkins in 1979. He saw the potential for a stimulating environment that would allow close interaction with the students. "An outstanding feature of Hopkins is the intimate atmosphere," he says. The university runs on a system much like the British system in which students receive considerable individual attention (almost comparable to private tutoring) from the faculty. This is possible because of the small student/faculty ratio in the department. It is common to find Donohue in his office with one of his advisees, hashing out a problem.

Donohue teaches a popular undergraduate course, "Ethical Questions in Engineering," and he stresses its importance. "Engineering is the discipline that translates scientific advances into products for society. As such, an engineering education must include attention to the adverse effects of that technology," he says. "We strive therefore to both provide the technical foundations necessary for students to function as engineers and to instill a sense of sensitivity to social, political, and environmental issues that the future leaders of the engineering profession will face."

He is particularly proud of the undergraduate research program, funded by a grant from the Exxon Foundation. The program enables a dozen undergraduates each year to participate in meaningful research while earning salaries competitive with industry. Last year several students published papers that resulted from their work in the program, and all of the participants continued studies in graduate schools. In fact, since the program began three years ago, only one participant has not gone on for further study.

Donohue, his wife, and his two small children like to spend their free time hiking, camping, and bicycle riding. Many weekends find them riding the trail that leads from Washington, DC, to Mt. Vernon, Virginia.

**William Schwarz** has the longest association with Hopkins. He received his BS, MS, and DrEngr degrees at Hopkins. His areas of research include non-Newtonian fluid dynamics, rheology, physical acoustics of fluids, turbulence, and biotechnology; He is currently collaborating with physicians and speech pathologists from Hopkins and Good Samaritan Hospitals on the study of dysphagia, or swallowing disorders.

The research of **Joseph Katz** involves nucleation processes (*e.g.*, condensation of supersaturated vapors, boiling of superheated liquids, condensation in flames, void formation in solids) and equations of state. He has also worked at the nearby National Bureau of Standards, studying combustion-generated ceramic materials. Katz, like Donohue, came to Hopkins in 1979 from Clarkson with the expectation of "high-quality students and shorter winters." His expectations were met. And, like Donohue, he appreciates the intimacy that "comes with a class of fifteen instead of ninety students." At Clarkson, Katz began his teaching career after a number of years in industry. "I prefer teaching students how to do research," he says. "You can't do that in industry." Katz initiated the participation of undergraduates in research projects at Clarkson. In fact, Donohue did undergraduate research there with Katz.

**Robert Kelly** specializes in separation processes (chemical absorption and stripping, in particular) and biochemical engineering. After spending some time with DuPont at Marshall Lab in Philadelphia, he returned to school at North Carolina State University



**Lower quad on a crisp winter's day.**

*photo by Carol Hyman*



where he worked with Ron Rousseau and Jim Ferrell on a project involving the removal of acid gases from coal gasification streams. Since coming to Hopkins he has returned to earlier research interests in biochemical engineering, an area particularly appropriate given Hopkins' strengths in the biological sciences. Here the primary emphasis is on engineering problems related to bacteria from extreme environments, especially extremely thermophilic archaeobacteria. "One of the great things about Hopkins is the opportunities for collaboration," he says. "Not only have we been able to work with faculty in the biology department, but with scientists at NIH, NBS, and other government laboratories."

Kelly's other interests include sports; he often can be found involved in lunchtime basketball games ("I may be slow, but I can't jump.") or on the jogging circuit around campus. He and his wife spend most of their spare time trying to keep track of their two young daughters, who are living proof of the second law of thermodynamics.

**Geoffrey Prentice** traces his interest in chemical engineering back to his early teens. "In the post-Sputnik era, do-it-yourself rocket construction was a popular activity among the junior high school set," he says. His interest in rocket fuels led naturally to an investigation of optimum mixtures (stoichiometry) as well as combustion processes (thermodynamic and kinetics). After completing his bachelor's and master's at Ohio State, Prentice went to work as a staff engineer in Sweden with Goodyear International. This was a wonderful opportunity for both professional responsibility and extensive travel throughout Europe. His second assignment took him to the Republic of Zaire (formerly the Belgian Congo). Returning to the States, Prentice completed his PhD at Berkeley, where he worked with Charles Tobias on the modeling of current distribution in electrochemical systems. Among several projects he is currently working on, he and fellow faculty member Mark McHugh are investigating the feasibility of performing electro-organic syntheses in supercritical fluids.

Prentice spends his spare time with his family, waiting for the kids to be old enough to "get away to places we haven't visited yet." He and his son just completed a scuba diving course, and they "hope to get under a few new places as well."

**Mark McHugh** came to the department in 1985 from Notre Dame. His areas of expertise include high-pressure phase equilibria, polymer solution thermodynamics, and supercritical solvent extraction. While he admits he was originally interested in coming to Hopkins because of family ties, it was not long be-



*photo by Carol Hyman*

**Prof. Robert Kelly with Loy Wilkinson, Chairman of the Chemical Engineering Department Visiting Committee.**

fore he discovered the benefits of being associated with a small but well-known university. He enjoys telling a story which illustrates the camaraderie among faculty here. A short time after he arrived, Bob Kelly introduced him to a colleague in the biology department. They chatted about their work, and McHugh was impressed with his friendliness. It wasn't until some time later that he discovered that the colleague was a Nobel Laureate. "This attitude and friendliness is typical of Hopkins," says McHugh. "You rub shoulders with some of the best people in the world." McHugh believes this ability to interact with faculty in other departments makes the university much more than the sum of its parts. "Each part is strong on its own," he says, "but working together makes us formidable." McHugh is impressed with the strides the department has made in the last few years. At an AIChE meeting in Miami, all of the faculty gave papers and three faculty chaired sessions. "Our impact is being felt," he says.

McHugh likes to spend his lunch hour in the gym, shooting baskets with Bob Kelly or lifting weights. His free time away from Hopkins is spent discovering Baltimore. "We go downtown as much as we can," he says. "The geographical location is fabulous."

Chemical engineering's newest faculty member came on board last November. **Timothy Barbari's** areas of research include diffusion in polymers, membrane science, and separation processes. He was attracted to Hopkins because "there is a sense of creativity and innovation here that is hard to find at other universities. The opportunities for collaboration within the department and across departmental lines

appear limitless." Still discovering much about Baltimore, Barbari has been spending much of his free time exploring the area and "getting lost in museums in Washington."

Two more faculty members will be joining the department this year. Michael Betenbaugh, whose specialty is biochemical engineering, and Mark Saltzman, who works in transport phenomena and controlled release, are welcome additions to the department.

## THE GRADUATE PROGRAM

The program currently has about thirty graduate students, most of whom are PhD candidates. At Hopkins, the PhD degree is an individualized research de-



*photo by Carol Hyman*

**Grad student Galen Suppes injecting a sample into a high-pressure equilibrium cell.**

gree with few formal requirements. Each candidate chooses courses with the help of an adviser in an effort to obtain the depth of knowledge necessary to carry out successful research in a specific subject while obtaining the breadth and flexibility of skills needed to expand into new areas of research. The number and type of courses depend upon the student's academic background and areas of interest.

This individualized approach has attracted top students to the program. Many of the grad students agree that a drawing factor of Hopkins is the opportunity for research experience coupled with classwork related to this research. John Walsh, a PhD candidate who came to Hopkins with a master's degree, says that what attracted him to Hopkins was the size of the department. He appreciates the chance to use his initiative and to have a say in the direction of his research. Due to the small student to faculty ratio, initiative is encouraged and supported by faculty input.

The department also offers a Master of Science degree. The course requirements are more well-defined in this program, although specific programs are chosen based on consultation with the student's research adviser. In addition to coursework, the student performs research culminating in a master's thesis.

Because of the diversity of expertise of the faculty, students at Hopkins may choose from a wide variety of areas of specialization.

## THE UNDERGRADUATE PROGRAM

Undergrads in chemical engineering at Hopkins also reap benefits of individualized attention from faculty. Beside the Exxon program, many juniors and seniors participate in research with faculty members. They also have access to an array of computers, and coursework involving computer applications is introduced early in the program. The undergraduate curriculum emphasizes chemistry as well as engineering, mathematics and physics. Students with a degree from Hopkins are well-prepared to continue to an advanced degree or to go right into a professional career. And although many students pursue further studies in chemical engineering, a number of students have gone on to study business, law, and medicine.

## CONCLUSION

And so, though it has only been eight years, "The Hopkins" has returned. The chemical engineering department, beginning in 1979 with a few faculty members but with a solid history to build upon, has seen tremendous growth and change.

Since Marc Donohue has been with the department from its inception, he has a clear picture of the growth and changes that have occurred. He feels the department is over those inevitable initial struggles. "The department has finally gotten to the point where we have an identity; we have stability; we have strength."

## DEDICATION

This article is respectfully dedicated to the memory of Stanley Corrsin, Theophilus Halley Smoot Professor of Fluid Mechanics at Hopkins until his death June 2, 1986. Prof. Corrsin, at Hopkins since 1947, set an example of style and tone for his many graduate students and associates. His availability to workers in all fields was an invaluable gift to Hopkins. Though Stan Corrsin's legacy may well be his contributions to fluid mechanics, he will be remembered by his friends for his sense of humor, strength of convictions, untiring pursuit of knowledge, and love of academic life. □