The First 75 Years of Geography and Environmental Engineering at Johns Hopkins University:

1937-2012
“EVERY ENGINEER IS AT THE INTERFACE OF SOCIAL ISSUES, SOCIAL INTERESTS, AND SERVICE.”

—M. Gordon “Reds” Wolman

The history of the Department of Geography and Environmental Engineering is one that might be likened to the flow of smaller tributaries into one mighty river: those tributaries being the confluence of several disciplines, responses to the changing needs of society, decades of collaboration, and philanthropy. A family dinner conversation is also part of the mix, but more about that later.
In the Beginning

In his 1876 inaugural address as president of Johns Hopkins University, Daniel Coit Gilman cited the need, in well-populated areas, for civic or municipal engineers. Areas wherever “15,000 or 20,000 persons are assembled should have the services of a competent scientific engineer.” That professional, among other qualities, should know how to use fundamental scientific principles in municipal affairs, “in the preparation of exact maps, in the determination of the supplies of water, and the methods of drainage, in the construction of roads, boulevards, pleasure grounds and parks, the building of wharves and docks, the supervision of gas works and fire engines, and the erection of public buildings, monuments and places of assembly.”

Indeed, in the decades that followed, the country experienced a transformation from an agrarian to an industrial society. The waves of immigrants, rise of a prosperous middle class, and mass production of the automobile taxed all components of the existing infrastructure. The need for a large cadre of college-trained engineers who could address immediately the technological requirements of a growing nation was all too evident.

By 1910, the State of Maryland was losing nearly 300 young men each year to engineering schools in other states, and it felt keenly the lack of a local training program that would supply an ongoing source of qualified engineers. That same year, perhaps fueled by public sentiment, the state offered to finance the addition of an engineering school at Johns Hopkins to coincide with establishment of the university’s Homewood campus. University trustees agreed, and the move met with hearty approval, not just in Maryland, but across the nation.

The university’s new Department of Engineering was first known briefly as the School of Technology, and the Committee on the School of Technology visited faculty at the principal engineering schools on the East Coast to discern what we now call “best practices” in instruction, curriculum, and laboratory work. As a result, the university trustees and professors charged with establishing the engineering program at Johns Hopkins saw an opportunity to create an entity that would not only be a worthy addition to an already distinguished university, but one that would improve the methods of engineering instruction.
The Early Years

The committee guiding the direction of the new engineering department elected to offer instruction in three disciplines: electrical engineering, mechanical engineering, and civil engineering.

In 1913, one of the first four students in the engineering department was Baltimore native Abel Wolman, who had just received a bachelor of arts degree from the university. Young Wolman planned to become a doctor, but “Mother Wolman” had other ideas. The family’s financial situation, plus the existence of a new engineering education program in Baltimore, prompted her to announce during a dinner conversation that her youngest child would, instead, study engineering. A job in 1913 with the U.S. Public Health Service examining water and wastewater treatment plants awakened Wolman’s interests in sanitary engineering and public health. He completed the civil engineering course of study and received his undergraduate degree in 1915.

Beginning in 1916, the civil engineering program offered instruction in sanitary engineering. By 1919, Professor Charles J. Tilden was taking students on inspection trips to municipal structures such as water filtration and purification facilities and industrial and power plants. That same year, Abel Wolman and Linn Enslow (a chemist and fellow engineering classmate) established the formula that used chlorine to make drinking water safe while working at the Maryland State Health Department. That formula is still in use around the world.

The Mechanical and Electrical Building (renamed Maryland Hall in 1931) was the first home of civil engineering and, by extension, sanitary engineering. The State of Maryland’s 1912 Technical School Bill also provided funds for the construction of a building specifically for the discipline. Sited directly across from Maryland Hall, the Civil Engineering Building opened its doors in 1916, at a cost of $150,000. The new building featured three laboratories in the basement, administrative and classroom space on the first floor (even room for a museum), three large drafting rooms on the second floor, and a single large room on the third floor.

By 1920, the Johns Hopkins School of Hygiene and Public Health offered classes in sanitary engineering as well. Other prestigious institutions, including Harvard and the Massachusetts Institute of Technology, also established graduate-level programs during this time.
The Wolman Factor and a New Graduate Program

The interdisciplinary nature of sanitary engineering meant a synergy between faculty in the now Department of Civil Engineering and the School of Hygiene and Public Health. Professor John Gregory was the civil engineering chair and held appointments in sanitary engineering in two divisions. When Professor Gregory died unexpectedly in 1937, J. Trueman Thompson took his place as chair, and university president Isaiah Bowman and engineering dean John Whitehead approached Wolman to accept a professorship of sanitary engineering.

At first, Wolman refused. He was by now a world-renowned expert in sanitary engineering and lectured part-time at a number of institutions, including Harvard, Princeton, and the University of Chicago. He felt that shifting to a full-time career in academia might constrain the advances he could otherwise make in his field. President Bowman asked Wolman to name his conditions, and he submitted what he thought was an outrageous list. The president agreed to all of Wolman’s stipulations, and in 1937, Wolman joined the faculty with appointments in engineering and established programs in sanitary engineering as well as public health.

Professor Wolman’s joint appointments emphasized his belief that there is a fundamental connection between public health and the environment. To be effective, he felt, sanitary engineers and public officials needed a background in each other’s disciplines as well as an understanding of the economic, political, and social context of the times. That philosophy – put into practice each day of Professor Wolman’s distinguished career – would have a profound ripple effect in the years ahead.

Professor Wolman’s very first hire was a highly regarded scholar from the University of North Carolina, John C. Geyer. Professor Geyer joined the civil engineering department in 1937 as an assistant professor of sanitary engineering. That year, the civil engineering department offered one introductory undergraduate course and one graduate course in the subject – no instructors listed. By 1938, the course catalog featured no less than ten courses in sanitary engineering – three undergraduate, the remaining graduate – and the program was off to a flying start.

Although Professor Wolman typically lectured at the graduate level, he did create and teach one undergraduate course, *Legal and Social Aspects of Engineering*. The course, which covered the effect of engineering upon society, has been remembered by alumni as being an important part of their education.
Sanitary Engineering Becomes a Department

Under Professor Wolman’s leadership, the sanitary engineering graduate program continued to grow and exceeded the expectations of the civil engineering department. As another world conflict threatened to involve the United States, university president Isaiah Bowman and others surmised that victory would depend on technology of all types. The departments within the School of Engineering joined with the U.S. government and other institutions in a comprehensive instruction program, and sanitary engineering faculty did their part for the war effort as students enrolled in accelerated programs and quickly filled the ranks of the armed forces.

During the war years, Professor Wolman served as a consultant to the surgeon general of the U.S. Army, among numerous other roles. Professor Geyer was granted a leave of absence during the war to serve as assistant chief engineer of the Health and Sanitation Division of the Institute of Inter-American Affairs. Clarence Keefer, an instructor in the program, performed bacteriological studies associated with sewage sludge digestion. The war’s aftermath had significant consequences for the sanitary engineering program: an increased interest among students in water infrastructure and related areas and a growing demand in both public and private sectors for sanitary engineers with advanced degrees.

The sanitary engineering program achieved department status in 1946 and became one of six departments within the expanding School of Engineering. The new department incorporated professors from civil engineering and the School of Hygiene and Public Health. Charles Renn joined the department, bringing expertise in water pollution and waste management control. He was one of the very early and significant investigators on the biological aspects of water pollution, which was the beginning, in the late 1940s, of what eventually grew into the environmental movement.
The Next Phase

Another discipline, or “tributary,” that was to factor greatly in the history of the Department of Geography and Environment Engineering was geography. That component of the current Department had its beginnings in courses taught sporadically at the university from 1890 to 1943. Those very first geography courses provided instruction in physical geography, with courses in succeeding years addressing topics such as the principles of economic geology. By the early 1940s, there were 12 undergraduate courses in geography offered during the academic year.

In 1943, Johns Hopkins formally established the Department of Geography – on the humanities and sciences side of the university – in response to military needs, with instruction expanded under the auspices of the Army Specialized Training Program. From about 1945 to 1955, the department was located at 3506 Greenway, across the street from the Homewood campus and now an apartment building. In 1948, the Department’s endowment increased and it was named in honor of former president Isaiah Bowman, who had retired the previous year and himself a geographer. In the early 1950s, the Department’s primary areas of concentration were climatology, economic and political geography, and human geography.

The first laboratories of the Department of Sanitary Engineering occupied a room in the basement of Mergenthaler Hall, on temporary loan from the Department of Biology. When the biology faculty needed to reclaim their space, the university built the Aeronautics Building as a combined office and laboratory facility for sanitary engineering. (This structure was renamed Merryman Hall and was razed in 2001 to make room for Hodson Hall.) The Department of Sanitary Engineering next moved to Whitehead Hall, constructed in 1947-48 originally for the aeronautics department.

The Department of Sanitary Engineering continued to grow and prosper, building upon its interdisciplinary strengths. Professor Geyer and Professor Gordon Fair co-authored the seminal text, *Water Supply and Waste-Water Disposal*, in 1954, giving the profession its first modern textbook. In the late 1950s, the Department changed its name to the Department of Sanitary Engineering and Water Resources to acknowledge the increasing emphasis on water-related research. It also relocated offices and laboratories to Ames Hall around 1953.

In 1957, Professor Wolman handed leadership of the Department to Professor Geyer and continued research, teaching, and consultation work until his death in 1989. In 1958, another Wolman joined the Hopkins family. M. Gordon “Reds” Wolman, the only child of Abel and Anne Wolman, and a hydrologist by training, became chair of the Department of Geography. In 1964, he co-wrote *Fluvial Processes in Geomorphology*, a classic text that increased understanding of river formation and how human activities alter the landscape over time.
Changes and Mergers

In the 1950s, a number of significant changes across the engineering school signaled a shift from “practical” engineering instruction to one focused on fundamentals – or science – of the discipline. At that time and into the early 1960s, the Department of Sanitary Engineering and Water Resources maintained many ties with industry and all levels of government. Basic and applied research projects were supported by a variety of sponsors, such as the Soap and Detergent Association, the Edison Electric Institute, and the Atomic Energy Commission. The Department’s principal interests continued to focus on the use and conservation of water resources. In 1965, the Department experienced a second name change in less than ten years, this time renamed as the Department of Environmental Engineering Science. The change reflected adjustments to the curriculum, the recognition and adoption of “environmental engineering” by various professional organizations, and the desire to describe more accurately a growing field of interest and need.

In 1966, the School of Engineering merged with the Faculty of Philosophy to form the School of Arts and Sciences, diminishing the presence of engineering within the university. At the time, both Professors Wolman and also Professor Geyer supported the merger. Reds Wolman and John Geyer were friends as well as colleagues, and they soon realized that a second merger – this time of their two departments – might lead to increased strengths in both.

They submitted a proposal to the Ford Foundation in 1967 and received a grant of $858,000 over a period of five years. The grant allowed the two departments to merge into the Department of Geography and Environmental Engineering in 1968, a name that continues to this day, abbreviated (and pronounced) as DoGEE. The new Department had 11 faculty that first year and grew to 14 by the next year, with key appointments in human geography and water resource economics. The Department concentrated its activities in three broad areas that melded water resource issues with urban issues: natural processes at the surface of the earth, social processes and mechanisms of decision-making in society, and engineering or the application of engineering design to mitigate the impact of desired human activities on environmental systems. Professor Geyer chaired the newly formed department until 1971, when Professor Reds Wolman succeeded him.

Several years following the creation of the School of Arts and Sciences, engineering alumni were still displeased, the name and reputation of Johns Hopkins engineering was fading, and it was becoming difficult to recruit the highest quality faculty and students. Within a decade, it became clear to all that the merger had been a mistake.

Through the efforts of many, including engineers and university trustees Willard Hackerman ’38 (civil engineering) and F. Pierce Linaweaver ’55’65 (civil engineering and environmental engineering science), the university made the commitment to create an academic center of excellence in the new engineering school. Mr. Hackerman was instrumental in securing a gift from the estate of G.W.C. Whiting, co-founder of the Whiting-Turner Contracting Company, to fund (and name) the new school.

The engineering school was re-established in 1979, and the Department of Geography and Environmental Engineering assumed its place among the engineering disciplines at Johns Hopkins.
A Time of Growth

In the 1980s, there was a great influx of faculty across the span of Department research areas, marking a rebuilding of sorts from the constraints of faculty hiring throughout the university in the 1970s. Ames Hall received a much-needed renovation in 1987-88, adding 2,000 feet of laboratory space for environmental chemistry, microbiology, and sediment transport as well as new offices.

As the Department grew, so too did the faculty’s research efforts. In 1989, for example, active, multi-year grants awarded by corporations and government agencies totaled $2,765,986, and the faculty published 45 journal articles. By 1996, grants had increased to $5,471,289, with 55 journal articles.

The Department revised its part-time master’s degree program in Environmental Engineering, Science, and Management designed specifically for working professionals in the Maryland and Washington, D.C., regions. This program, part of the Engineering for Professionals component of the Whiting School, has grown in popularity and reach through the years and is now considered one of the most comprehensive and rigorous programs of its kind in the nation.

In 2002, the Department established its first undergraduate major in environmental engineering, in part a response to increased interest of students in the discipline as well as the desire to build the pipeline of future engineers and scholars. The Department also participates in the interdisciplinary Global Environmental Change and Sustainability, which offers a major and minor to undergraduate students.

When not hard at work in the classroom and laboratory, students have combined their expertise in other areas to represent the Department in extracurricular activities. The Department has fielded a softball team for many years (at one time known as the DoGEE Reds) as well as soccer and volleyball teams. A Student Advisory Committee holds a variety of activities to enrich the social and academic experience. Since 2005, the Department has hosted a prom, an evening of entertainment attended by many students and a number of faculty. In 2012, students established a Johns Hopkins chapter of the American Academy of Environmental Engineers and Scientists to promote networking and career opportunities.

Through the years, Department faculty have received national and international acclaim for their achievements in the field. To select only one example from the many awards that have been conferred, five faculty have been elected to membership in the prestigious National Academy of Engineering: Professor Abel Wolman (1965), Professor John Geyer (1970), Professor Charles Renn (1976), Professor Charles O’Melia (1989), and Professor Reds Wolman (2002).
Geography and Environmental Engineering at Johns Hopkins: 2012-2013

Today, the Department of Geography and Environmental Engineering is the only department so named in the country – with one exception. West Point has a department of the same name, based on the structure of the Johns Hopkins department. Its graduate and undergraduate programs are ranked consistently among the very top programs throughout the country.

A dynamic group of 14 faculty call the Department their academic home, and a number of them have been at Johns Hopkins for the majority of their professional careers. Their research interests fall into these primary areas:

• Pollutant fate and transport
• Water resources engineering
• Environmental chemistry
• Geomorphology
• Treatment processes
• Environmental management
• Systems Analysis
• Ecosystem dynamics
• The interplay between technology, society, and environmental changes

Currently, there are 40 master’s degree students, 35 doctoral students, and 80 undergraduates. The 2013 senior class of 22 students is the Department’s largest to date.

The Department has continued its emphasis on collaboration among research areas and disciplines. For example, faculty actively participate in the following university centers, programs, and institutes: Center for Environmental and Applied Fluid Mechanics; Center for a Livable Future; Center for Water and Health; Environment, Energy, Sustainability, and Health Institute (E2SHI); Global Water Program; IGERT: Water, Climate, and Health; Institute for NanoBioTechnology; and the Systems Institute.

Community outreach, particularly to elementary school students, has become an important Department activity. In 2010, Department faculty began visiting the City Spring Elementary School in East Baltimore, where they conducted experiments with fifth-grade students that demonstrated basic scientific principles. The students were invited to the Homewood campus to see working laboratories, talk with faculty and students, and tour the campus. Current research facilities include laboratories in Krieger Hall and field operation space, including a flume and rainmaker, in the Stieff Building (located in Baltimore’s Remington neighborhood).

The Department is thriving and is well represented by the more than 1,695 living alumni, who lead successful and distinguished careers in numerous areas of geography and environmental engineering. The alumni have used their Johns Hopkins education to influence and inform environmental policy and practice around the world. They remain the Department’s best ambassadors and continue the rich legacy of those who have preceded them.
The civic engineer as described by Daniel Coit Gilman; the high standards set by John Whitehead, Abel Wolman, and Reds Wolman; and the work of many dedicated faculty have defined the Department’s mission and accomplishments. Social responsibility remains a strong undercurrent in many of the Department’s activities, and through their efforts, faculty and students bring practical and novel applications of their work to the community-at-large.

Building on its achievements and the lessons learned during the past 75 years, the Department of Geography and Environmental Engineering looks forward to the next 75 years of innovation and advances in teaching, research, and service.

This brief history of the Department of Geography and Environmental Engineering is far from complete. We hope that those who know the Department best – its students, alumni, and faculty – will share their insights and memories to expand upon this beginning effort. To be part of the living history of the Department of Geography and Environmental Engineering, please send submissions to dogee@jhu.edu.