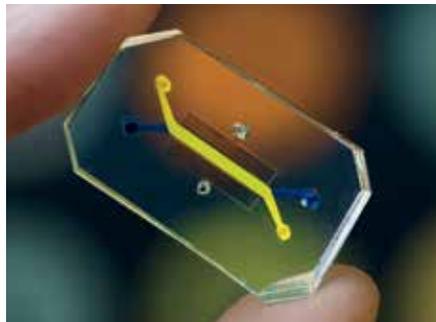
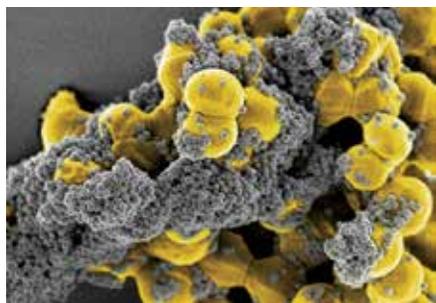


Catalyzing Bioengineering

WITH HIS \$131-million gift in support of the Wyss Institute for Biologically Inspired Engineering, announced by the University on June 7, Hansjörg Wyss, M.B.A. '65, has now made three gifts to the eponymous institute, totalling \$381 million, which bring his total philanthropic support for Harvard to more than \$400 million. The institute seeks to bridge the gap between academia and industry by drawing inspiration from nature's design principles to solve some of the world's most complex challenges in healthcare and the environment—and to commercialize those solutions to maximize their impact. It has had notable success during its first decade. Wyss's decision to continue investing in the institute, just months after the Medical School unveiled a \$200-million gift from the foundation of Len Blavatnik, M.B.A. '89, to support basic research (see "Accelerating Medical Research," January-February, page 18), indicates the University's life-sciences prowess, and leading philanthropists' willingness to underwrite it.

Wyss was CEO of Synthes, a biomedical research and device company that pioneered new techniques for healing traumatic bone breaks. In the middle of the last decade, Howard Stevenson, then a Harvard Business School professor and University vice provost, and a friend and classmate of Wyss, recalls that company's focus this way: "How do you marry materials with biology?" As Harvard sought to organize its bioengineering research



across the University and its affiliated hospitals, guided by a provostial committee co-chaired by the Medical School's Folkman professor of vascular biology Don Ingber, an affiliate of Children's Hospital Boston, and Pinkas Family professor of bioengineering David Mooney, a common interest arose. Wyss sought ways to put physicians, physicists, mathematicians, mechanical engineers—every pertinent discipline—together to work on various projects with high potential for life-changing applications. He agreed to make an initial gift of \$125 million in 2009, with the University investing as well.

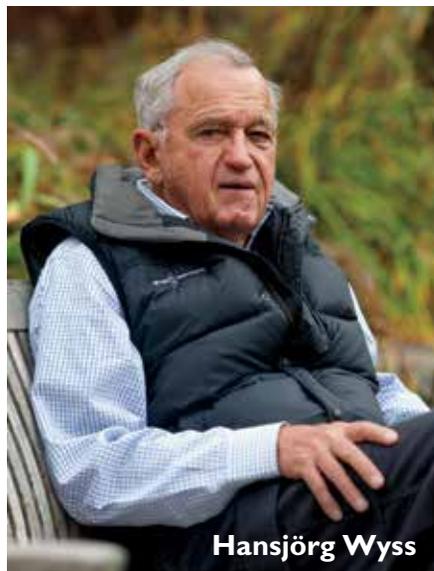
The institute that has resulted, led by Ingber in rented space in the Longwood Medical Area, now engages a rotating cast of about 375: 150 to 170 full-time staff, and 200-plus others, including 18 core and 16 associate faculty members, and numerous postdoctoral fellows and students. The exact numbers change frequently, because when a project results in a startup, members of the project team often leave to join the new company. Initially, "It was like a startup on steroids," said Ingber: since its launch, the Wyss has produced 2,085 publications, with one paper per month on average in *Science* or *Nature* (the holy grail for scientists publishing their discoveries); filed for 2,623 patents—and been issued 392; launched 29 startups; and entered 53 agreements to license technology. Since 2009, 23.8 percent of Harvard's patent applications have been linked to Wyss research.

Hailing the new gift, President Lawrence S. Bacow said, "Hansjörg Wyss has helped to expand what we know and what we can accomplish across a wide range of disciplines. The advances that his generosity has enabled will change the future for countless people. His third gift to support the work of the Wyss Institute will ensure the continued success of our extraordinarily talented faculty and staff, as well as create new oppor-

Proteins engineered to capture pathogens, to prevent sepsis (top); and an organ-on-a-chip

tunities for collaboration and growth. We are deeply grateful for his support."

University provost Alan Garber, an economist and physician who leads Harvard's life-sciences initiatives and chairs the Wyss board of trustees, added that the institute has advanced the field of bioengineering



Hansjörg Wyss

significantly. "From developing singular insights and cutting-edge approaches, to creating bioinspired materials and feats of engineering, the Wyss Institute had and will continue to have a powerful impact," he said. Elaborating in an email, he explained: "Biologically inspired engineering was an unconventional approach when the Wyss Institute was created in 2009, but it is now recognized as a

powerful approach to solving a wide range of problems. Some of the technologies that have come from the Wyss Institute are simply astounding, such as...3-D bioprinting of living tissue, and versatile ambulatory microrobots. The Wyss Institute was created to move the scientific advances of bioengineering faculty at Harvard and collaborating institutions beyond academic labs, developing real-world products that treat and diagnose human disease. Endeavors to translate research advances in this way have a long history; the Wyss Institute has demonstrated that we can do so quickly and successfully."

Among the current fields of inquiry are:

- soft, wearable robots that increase the user's balance, endurance, and strength, either during ill health or in environments that place extreme demands on the human body;
- adaptive materials that are responsive and self-optimizing, such as coatings that prevent barnacles from sticking to the hulls of ships, thereby producing huge energy savings;
- biomimetic microsystems, such as organ-on-a-chip microfluidic cell-culture devices that recapitulate the complex functions and disease states of living human organs—useful for drug testing and personalized medicine;
- materials that can modulate immune responses in order to treat cancer and in-

fections, for example;

- engineered, living, cellular devices programmed to detect pathogenic viruses, or reduce off-target drug delivery;

- programmable swarms of molecular robots that can aid in sequencing, imaging, and drug delivery;

- synthetic biology, for editing genes and proteins in applications ranging from healthcare and chemical manufacturing to information storage; and

- functional, vascularized 3-D organ replacements for implantation in the human body.

The scientific output goes hand-in-hand with the institute's organizational innovations. Research proceeds from laboratory to licensing or start-up enterprises through a changing roster of core and associated faculty members, postdoctoral fellows, and students—brought together as the problems being investigated change. The institute is

interested in funding visionary researchers and their ideas: new capabilities that will advance an entire field, yielding not single breakthroughs but entire technological *capabilities*. A significant cohort of professional engineers with product-development experience is embedded with the Wyss. "Because they sit in open spaces," Ingber explained, "when somebody says, 'I need something for a knee joint with these lubricant or material properties,' someone else might say, 'Well,

Commute Cycle

For years Mike Burke, the Faculty of Arts and Sciences' registrar, had a long and unexceptional daily commute to work from Danvers, Massachusetts. Then one day in 2014, his car broke down. He, his wife, and his two young children were, at least temporarily, now a one-car family. How would he get to his office? The wheels began to turn.

Growing up in Philadelphia, Burke had been a frequent bike rider. In college, he'd gotten used to steep hills while riding through

Syracuse, New York, and he'd become accustomed to riding with city traffic during a study-abroad program in London. He had even tried biking around Zimbabwe as a member of the Peace Corps, but after dealing with frequent flat tires, he gave up.

Though he hadn't done much cycling in decades, he decided he would bike to the local commuter rail station, ride the train to Boston, and then take two subways (or hop on another bike) for the remaining portion. It worked fine, but he was constrained by a variable schedule, stuffed into crowded cars, and subject to weather delays. "And then I decided, you know what, maybe I should just ride the bike the whole way."

He attached a pannier and waterproof bags to his bike, bought some heavy-duty lights for visibility, and got on his way around sunrise. The most direct route—between 20 and 25 miles—took him through Peabody, Lynn, Revere, Everett, and Charlestown. The trip was hilly and strewn with stoplights, but biking didn't take any longer than riding a train or slogging through bumper-to-bumper traffic. After posing questions about certain tricky intersections on biking Facebook groups, he developed a less direct but more enjoyable 25- to 30-mile course through Winchester, Lynnfield, Stoneham, Medford, and Arlington—and so committed himself to a three-hour daily round-trip cycle ride.

For four years, almost nothing could spoil his morning trip. Rain was merely a nuisance, and wind and light snow (as long as it didn't accumulate) were par for the course. Cold wasn't a deterrent, but sometimes it should have been. One January morning, Burke ventured off in 25-degree weather—manageable with proper layers. By the time he left work that evening, it was dark and below zero with wind chill. "I was like, 'All right, I've ridden in weather like this, it should be okay,'" he recalled. "But I would say



Mike Burke

probably within the first four or five miles, I realized this was not going to be okay, and I might have to stop." Not wanting to call his wife for a rescue, he willed his borderline hypothermic body through about 20 more miles, refusing to warm up at the many Dunkin' Donuts en route out of fear that he would be unable to will himself back onto the bike. By the time he arrived home, he had tunnel vision. He drank hot chocolate his wife had prepared, and his kids lay on top of him, sharing their body heat. After 30 minutes, his body warmed enough to shiver.

In 2018, Burke and his family moved to Pforzheimer House's Faculty Row, and his trip to work went from 25 miles to about one. He doesn't miss the time-consuming commute, but he does miss the 50 miles daily, to which he attributes improved health and focus. Now, when his family takes a trip to New Hampshire or Maine, he often opts for a bike—meeting them at their destination later in the day.

In the summer, he gets a chance to recreate his former daily feat, biking from a Gloucester seasonal home to Cambridge on Monday and back on Thursday. At its shortest, it's about a 35-mile trip one-way, but Burke often takes the scenic route, straying far enough from traffic that he can wear headphones—and extending his pedaling by around 20 miles. "I catch myself singing as I'm riding sometimes," he said. "Sometimes it's me and the cows and the horses out there and I'm singing some lyrics from The Clash or something like that."

Of his attempts to get others to embrace a bike commute, Burke calls himself an "unsuccessful disciple" or a "failed prophet." It's hard to convey how a two-wheeled commute can brighten up a day. "The people who get it are the ones who are already doing it," he said. "I'm working on my kids, though." ~JACOB SWEET

Admissions, through the Ages

Eight years out of Yale—after stints as a U.S. Marine platoon leader and a teacher—Dwight D. Miller joined the Harvard College admissions office in July 1967. That was before the merger with Radcliffe; before the Supreme Court first ruled on affirmative action in admissions, in *Regents of University of California v. Bakke* (1978—and again in *Grutter v. Bollinger*, 2003; the multiple rounds of *Fisher v. University of Texas at Austin*, decided in 2016; and the current Students for Fair Admissions litigation against Harvard, possibly also headed to Washington on appeal); and before the global frenzy to gain a place at the nation's selective colleges led to a tsunami of applications, plummeting admissions rates—and, in turn, a parental/high-schooler arms race to gain an edge through private counselors, test-prep courses, and ever-more applications filed by each anxious student.

At Harvard, where navigating thro' this change and storm has meant attracting

Early on, he divided his time between admissions and service as senior advisor in the freshman dean's office—and he was a proctor in the Yard from 1967 to 1990, the longest tenure known. Those engagements gave him deeper insight into the College experience and how applicants might get the most from, and contribute the most to, the place. Increasingly, those admitted have represented a far wider range of minority and ethnic backgrounds, and of socioeconomic circumstances.

On the downside, today's applicants are “certainly much more uptight about the process,” Miller said, citing “the pressure on them to get into college A, B, or C—especially from the parents.” Withal, the experience accumulated within the admissions staff across the decades has enabled Harvard to winnow the applicants to find the “offbeat” ones who can thrive here, and contribute to the community in special ways. And he is grateful that “the sense of entitlement” that prevailed at mid century, when the applicants were so heavily weighted toward eastern prep schools, has dwindled away.

As he worked with alumni volunteers who interview applicants and support their education through philanthropy devoted to financial aid, Miller set out in the 1980s to gain formal recognition for their efforts. The resulting Hiram Hunn Award, created in 1986, honors the schools-and-scholarships foot soldiers; the eponymous Hunn, A.B. 1921, who did such work for 60 years in Iowa and Vermont (where he and Miller intersected for a decade and a half); and Miller himself, for his advocacy on their behalf. He was also recognized, directly, by the James '72 and Rita Cain Scholarship fund, established by a former student in Grays Hall when he was proctor; it will be renamed upon Miller's retirement.

That moment, amazingly, is now at hand, effective September 1. His Harvard admissions service extended nearly as long as Hunn's, and accounts for more than a half-century of College classes, numbering thousands of undergraduates. No matter what changes in admissions unfold in the next five decades, no one in sight is likely to equal Miller's record. —JOHN S. ROSENBERG

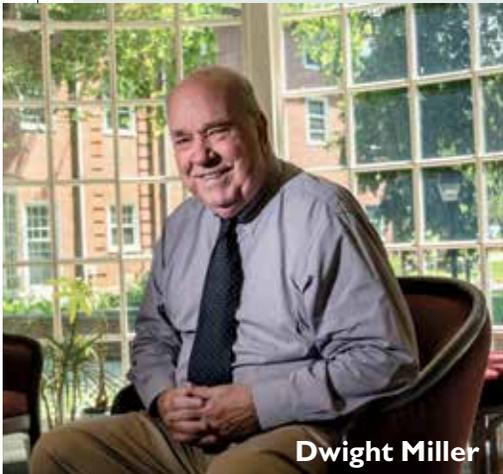
we used something that had those properties as an airplane-engine insulation....’ You don't see that at companies because they're usually focused on their [specific] expertise,” he pointed out, “and you don't ever see that in academia.” In turn, engineers and researchers are supported, as ideas evolve, by a half-dozen staff members of Harvard's Office of Technology Development, who can accelerate commercial application in the most effective way (see “Accelerating Innovation,” March-April, page 18).

Overall, said Ingber, the institute's approach might be called self-assembling interdisciplinary research. Instead of erecting buildings and placing experts from different disciplines who have “no reason to work together” in proximity to one another, he explained, “You identify problems that are so exciting, and so difficult, and you get the best people who want to solve them, but who can't do it on their own. And then, when you bring other scientists and engineers that have the right expertise to complement them nearby, you just get out of their way, and it happens.” Because faculty members commonly operate like “independent entrepreneurs, who have their own cultures,” he continued, “we created a new culture: we let our faculty keep their own labs,” but move some portion of it—generally their most entrepreneurial postdoctoral fellows, research assistants, and graduate students—to the Wyss.

“When you see the research that has been done in the first five years,” said Wyss, speaking from Paris and reflecting on his 2013 decision to double his initial support, “the intellectual property, the papers published in top scientific magazines,...the influence it had on teaching at Harvard, the influence it had on collaborative research throughout [the School of Engineering and Applied Sciences] and the Faculty of Arts and Sciences—you have to continue.”

Having recently looked at some great paintings, he added, “When Cezanne created one of his landscapes, he had to go and paint another one. He could not stop. So, when you create the Wyss and then think about the second gift, you almost have to do it.” Now he has done so again, assuring the institute's momentum and further anchoring Harvard's expanding dexterity in making fundamental life-sciences and biomedical discoveries, and translating them to the real world of application to human needs.

For a full report, see harvardmag.com/wyss-gift3-19. —JONATHAN SHAW



Dwight Miller

and reviewing an applicant pool that increased from fewer than 5,000 annually when Miller appeared on the scene to 43,330 hopefuls for the class of 2023, experience and perspective have been especially valuable. No one has personified that better than Miller, who served under admissions deans Chase N. Peterson, L. Fred Jewett, and William R. Fitzsimmons.

Now senior admissions officer, Miller, Ed.M. '71, has covered most of New England; the Atlantic seaboard; a chunk of the Midwest; four southwestern states; for a quarter-century, Long Island; and Canada.