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# BRIDGING THE DIVIDE

## Translational research allows promising drug therapies to traverse medicine's once-impassable 'Valley of Death'

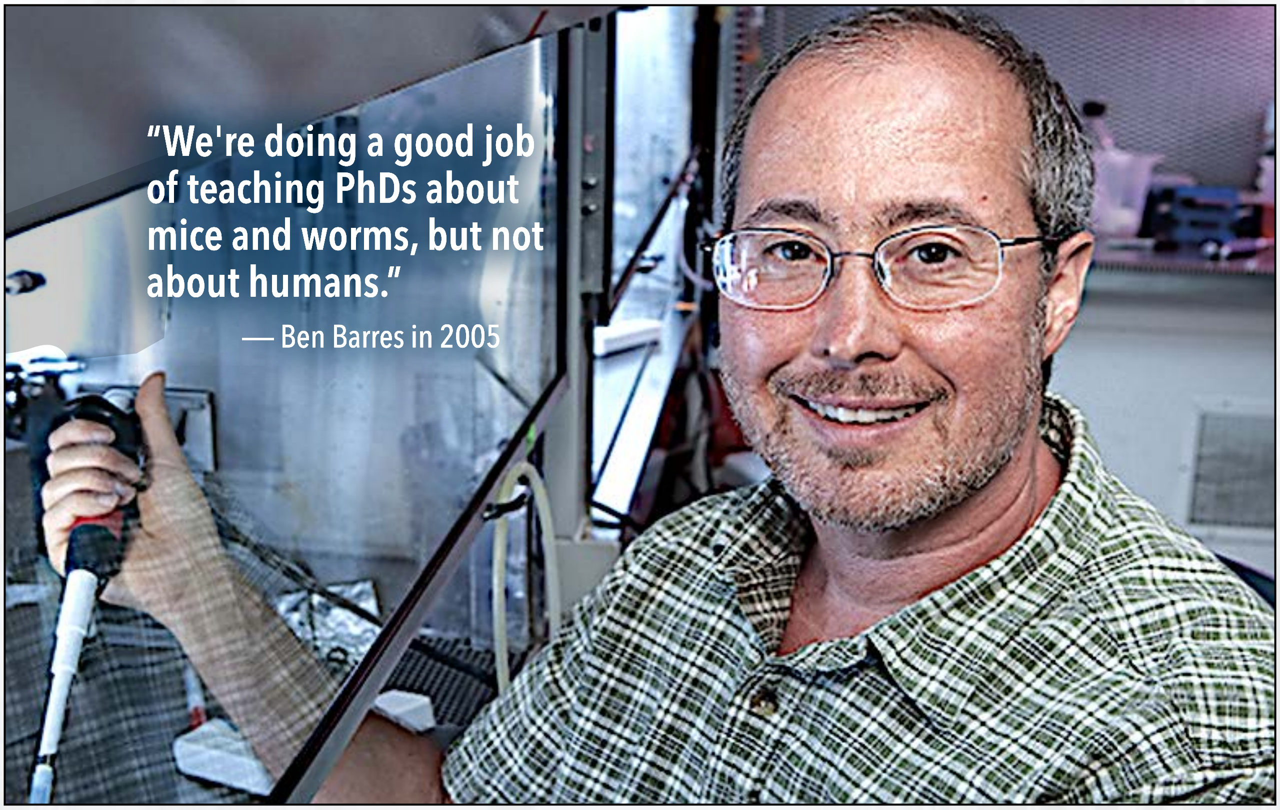
**Jeffrey G. Harris, MBA & Richard A. Skinner, PhD**

Even before he created one of the first graduate degree programs in translational research, Stanford University's Ben A. Barres had a reputation for taking roads less traveled.

The highly respected neurobiologist had pushed for gender diversity in science at a time when much of society thought women should limit their "experiments" to culinary endeavors in the kitchen. He had championed LGBTQ rights long before the now-ubiquitous abbreviation gained widespread usage. Born Barbara Barres in mid-1950s, he had transitioned to life as a man in 1997, thereby becoming the only openly transgender faculty member at the Stanford School of Medicine. He would later earn the same distinction within the National Academy of Science, owing to his groundbreaking research into the functions of non-neuronal glial cells — the least studied, least understood cells in the human brain.

The journal *Nature* called him an "unstoppable force of nature, unfazed by headwinds, managing to will all of us onwards and upwards."

Nevertheless, in 2005, when Barres asked Stanford's Academic Senate to endorse the creation of a Master of Science in Medicine (MSM) program, some colleagues no doubt thought he had missed the mark — or at least taken a premature leap. They were aware that Harvard Medical School had launched a similar program in the 1980s, only to see it wither for lack of funding. If the idea hadn't taken root at Harvard, the skeptics wondered, why would it fare any better at Stanford?




Stanford University

**Stanford University neurobiologist Ben A. Barres, who developed one of the nation's first graduate degrees in translational research, maintained that traditional instructional models failed to give basic scientists an adequate understanding of the frontline battle against human disease.**

Barres, however, was adamant about the need for a master's degree in translational research. He pointed to his own academic experience: Although he held a bachelor's degree from MIT, a medical degree from Dartmouth, and a doctorate in neuroscience from Harvard, he had never received any formal training in how to transform — or translate — basic research into life-extending (or at least life-enhancing) medical treatments.

"I still remember my shock in realizing that Harvard was granting PhDs in neurobiology to people who had never seen a human brain," he said. “You can't teach neurobiology to graduate students as if there's this brain floating in space, not connected to a kidney or a heart or a liver or an immune system. Every neurological disease involves all of those things. Disease is, by its nature, interdisciplinary. You don't have a ‘brain disease’ that just affects the neurons and not the blood vessels or the immune cells. You have to know about other tissues in order to put all the pieces together to understand disease processes.”

## Bench to bedside

Some 15 years on, most members of the scientific community agree that Barres was right about the need to bridge the yawning chasm between the research laboratory and the clinic — or, in the vernacular of academic medicine, the gap between *bench and bedside*. His once-iconoclastic vision of the role that translational research should play in higher education — and vice versa — has become conventional wisdom.

Any remaining skeptics were silenced by the COVID-19 pandemic, which highlighted, as nothing had before, the essentiality of cross-functional collaboration. Simply put, had the academy, the pharmaceutical industry, and the public health sector not joined forces, COVID-19 vaccinations would likely still be months, if not years, away.

A vaccine developed by the University of Oxford in partnership with drugmaker AstraZeneca has been approved for emergency use throughout the United Kingdom and the European Union as well as in some of the world's most populous nations, including Brazil, India, and Mexico.

While the so-called Oxford vaccine might be the quintessential poster child for translational vaccinology, it is by no means the only COVID-19 vaccine to boast an academic lineage. As of January 2021, a database maintained by the World Health Organization contained 172 vaccine candidates. Of those, at least 64 — or more than one-third — had direct ties to universities or campus-based research institutes.

Even bigger than the number of universities developing antigens was the number of academic medical centers administering pivotal late-stage clinical trials, which are, by definition, massive undertakings. The first vaccine to receive emergency-use authorization from U.S. regulators, the genetic vaccine produced by Pfizer and BioNTech, was tested on more than 40,000 volunteers at 152 sites worldwide.

That the vast majority of those locations were universities is a testament to academia's visibility, credibility, and seemingly unique ability to persuade large numbers of strangers to become human guinea pigs.

Just how prevalent has translational research become?

Nowadays, one might have trouble identifying a major academic medical center that *doesn't* boast a translational research degree program, a translational research certificate, a clinical research center, an applied research institute, or a translational research partnership — if not all of the above.

Similarly, chances are most of the students now pursuing translational research degrees are blissfully unaware that such training didn't exist, at least in its current form, as recently as a generation ago. Indeed, it has become so commonplace that academics of a certain age — including, perhaps, some of Barres' contemporaries — may well have forgotten how siloed things used to be.

For both cohorts, a brief retrospective might be in order.

## Getting to the truce

Any review should start with some definitions.

"There are fundamental differences between discovery and translational research," biomedical entrepreneur Jonathan Thon, PhD, a former faculty member at Harvard Medical School, wrote in *University Affairs*. "The former aims to found new knowledge while the latter transforms that knowledge into something practical. The former succeeds if even one person (usually a highly trained scientist over the course of many years) is able to demonstrate that they can validate a theory in a well-controlled experimental study one or more times. The latter requires any technically skilled person (usually a junior research technician) to be able to successfully repeat an outcome every time.

"Both discovery and translational research are fundamental to achieving the end-goal of improving human health and wellbeing and represent book-ends between which exists a relatively broad spectrum of work."

The term "translational" was first used in the context of medical research some four decades ago, according to an analysis by Jeffrey K. Aronson, PhD, a clinical pharmacologist at the University of Oxford. Aronson's search for the term's debut turned up a 1980 paper that referred to "the translation of research to nursing practice." Another paper published that year made reference to the "translation of advances in the field of diabetes research." Aronson also unearthed a 1986 paper that examined "the role of the clinical environment in the translation of research into practice."

Notwithstanding such scattered early references, “translational research” didn’t really enter the lexicon of academic medicine until the 1990s. (Synonyms include translational medicine, preclinical research, evidence-based research, and disease-targeted research.)

“At first (translational research) was applied simply to describe cross-disciplinary research,” physician-turned-venture capitalist T. Forcht Dagi, MD, MPH, MBA, noted in a 2018 commentary in the journal *Neurosurgery*. “Soon after, it came to refer to cutting-edge investigation bridging the laboratory and the clinic, and something of an ideal.”

## Clinical trials and tribulations

Although discovery, or basic research, and applied, or clinical, research are now considered complementary, if not mutually dependent, they were largely disconnected for the bulk of the 20th century. In fact, many academicians viewed them as downright incompatible.

Harvard Medical School lampooned such sentiments in a report titled “Crossing the Valley of Death.” The cover illustration showed two rock pinnacles linked by a fraying rope footbridge. Perched on one peak were test tubes, a beaker, and a lab coat-clad scientist. Atop the other was a physician, wearing scrubs and wielding a stethoscope, leaning over a patient. At the bottom of the chasm that separated the two pinnacles lay a jumbled human skeleton.

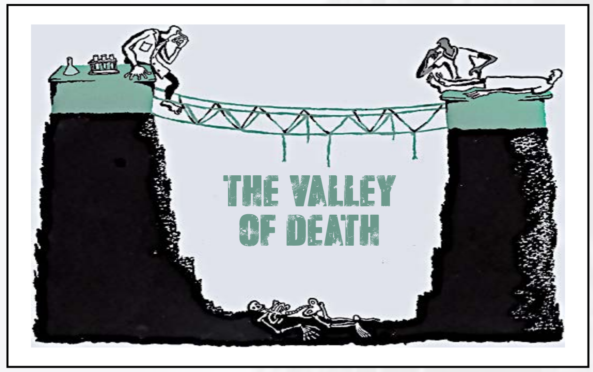
Did the pile of bones represent promising drugs that fell into a developmental abyss, never to be heard from again — or did it symbolize patients who died waiting for basic researchers and clinical researchers to erect a navigable bridge between their disparate realms?

The short answer: Yes.

The Harvard report put it this way: “Depending on the point of view, the valley divides academy and industry, basic and applied science, bench and bedside.” Underscoring the stark assessment was this comment from Adrian Ivinson, PhD, founding director of the Harvard NeuroDiscovery Center: “There are *lots* of little deserts to die in, unfortunately.”

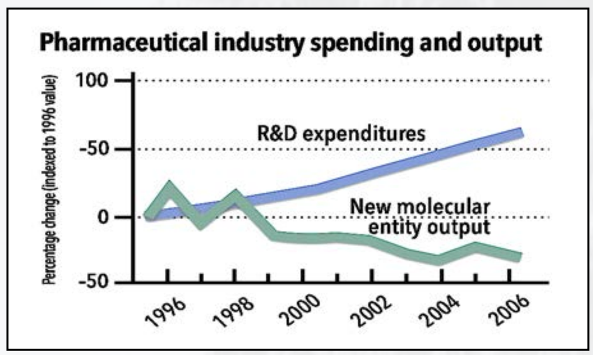
Although some researchers bemoaned the chasm’s existence, others considered it an appropriate dichotomy — something akin to the separation of church and state.

## LOST IN TRANSLATION




Harvard Medical School

**Translational medicine grew out of an environment in which basic researchers and clinicians operated on opposite sides of a scientific, philosophical, and logistical divide dubbed “the Valley of Death.”**




National Institutes of Health

**In the decade preceding the launch of the NIH’s Clinical and Translational Science Awards program in 2006, the pharmaceutical industry’s collective drug pipeline slowed to a trickle, despite a sharp increase in spending on research and development.**

“Some researchers objected to positioning translational research as an ideal,” wrote Dagi, who formerly taught in the Harvard-MIT Program in Health Sciences and Technology. “Their concerns were based on a number of historical prejudices and perhaps even anxieties. One was the historical ‘superiority’ of pure science as opposed to applied science. Another was the fear that good science would suffer from being forced into human applications before it was entirely ready. That was already a point of contention between laboratory investigators and clinicians. A third pertained to the mission of the academy.”

More specifically, Dagi wrote, some critics of translational medicine maintained that the integration of basic and translational research would "dilute" or "pervert" that mission by compelling scientists to concern themselves with tawdry factors “like competition, competitiveness, 'drugability,' or market acceptance.”

“Ethical concerns were raised about scientists moving from the laboratory to the bedside. Could a scientist act as a principle investigator in human trials, especially if his or her own patients were involved? What did that mean for surgeons? Was a surgeon precluded from developing new devices for his or her own patients and then using them? A number of translational efforts became start-up companies funded by venture capitalists and eventually as publicly traded companies. Was that a distraction? What would that mean with respect to conflicts of interest and pressure on the investigator? What were the implications of sponsored research for commercial purposes?”

## Patients’ growing impatience

Opposition to wholesale collaboration finally began to dissipate early this century — for several reasons.

First, an aging society was growing less tolerant of research projects that it saw, rightly or wrongly, as esoteric, self-indulgent, and, more often than not, utterly useless. Such frustrations were undoubtedly fueled by a spate of high-profile slaps at supposed profligate spending. Senator William Proxmire, for example, became a household name by bestowing his so-called Golden Fleece Awards. Basic research was a favorite target.

American taxpayers clamored for treatments and techniques that could be put to use immediately, not incremental advances that might benefit their great-grandchildren. That sentiment was particularly pronounced among hard-charging, instant gratification-seeking baby boomers, many of whom were starting to experience anything-but-theoretical health woes.

Another factor, no doubt related to evolving public sentiment, was one of academia’s most potent forces, for better or worse: money. The grants that had long sustained basic research were becoming scarcer and therefore tougher to obtain. More funders were demanding evidence of a tangible, quantifiable impact — a return on their investment, so to speak.

“An influx of public and private funding is invigorating a field that challenges some traditional notions of science,” the journal *Science* noted in 2007. “Budgets for biomedical research are tight and may remain so for several years. However, funding for translational research appears to be growing.”

Additionally, courtesy of the Bayh-Dole Act of 1980, the landmark federal law that cleared the way for small businesses and nonprofit institutions to derive financial benefit from federally funded research, the nation’s universities had, quite predictably, become increasingly interested in projects that could be patented, licensed, or otherwise commercialized.

This shift, both attitudinal and financial, raised an obvious question: How could the nation’s universities jumpstart translational research? To many institutions, the answer was equally apparent: They could double-down on the educational component of their multifaceted mission and teach people *how* to encourage, execute, and exploit translational research.

Thus was born the translational research degree program.

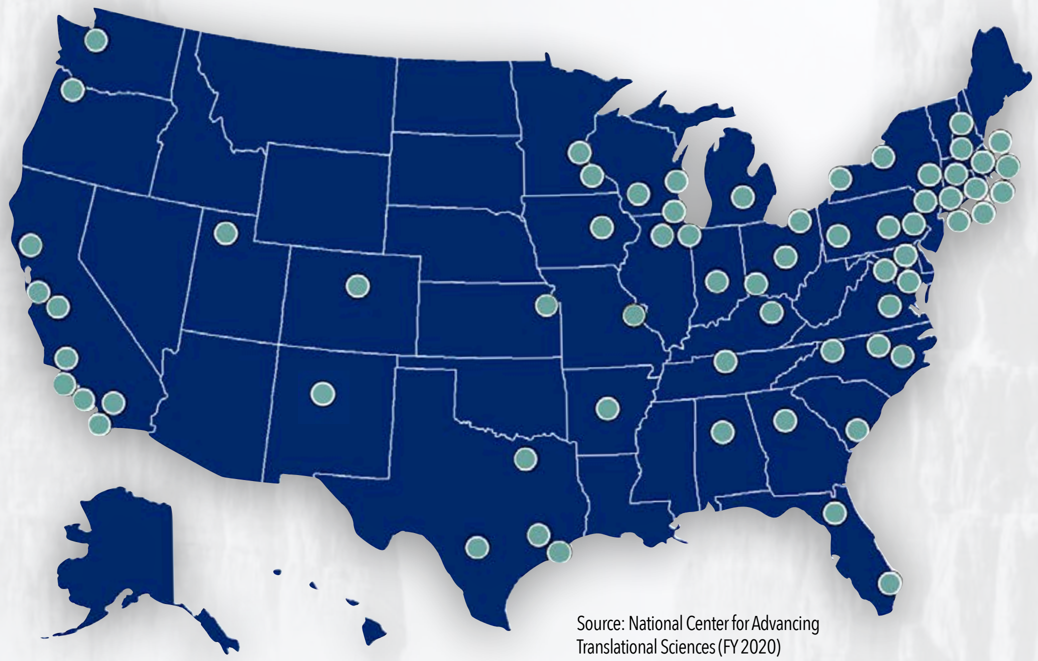
## Ecosystem or *egosystem*?

In 2002, Elias A . Zerhouni, MD, then director of the National Institutes of Health (NIH), called for an overhaul of biomedical research in the United States.

Zerhouni lamented that the nation’s once-fecund scientific ecosystem had devolved into a largely dysfunctional *egosystem,* an environment in which new treatments, diagnostic tools, and preventive measures took a back seat to peer-reviewed publishing. Although the system still yielded the occasional discovery that benefited the lives of everyday Americans, its output, he said, wasn’t commensurate with the resources it consumed — or worthy of the hopes it engendered.

# TRANSLATIONAL RESEARCH CONSORTIUM

More than **60** U.S. **research hubs** are funded through the **Clinical and Translational Science Awards** (CTSA) program, administered by the **National Center for Advancing Translational Sciences** (NCATS).



Source: National Center for Advancing Translational Sciences (FY 2020)

- Albert Einstein College of Medicine
- Boston University
- Case Western Reserve University
- Children's Research Institute, Washington, DC
- Columbia University Health Sciences
- Duke University
- Emory University
- Georgetown University
- Harvard Medical School
- Indiana University-Purdue University at Indianapolis
- Johns Hopkins University
- Mayo Clinic Rochester
- Medical College of Wisconsin
- Medical University of South Carolina
- New York University School of Medicine
- Northwestern University
- Ohio State University
- Oregon Health & Science University
- Rockefeller University
- Rutgers Biomedical/Health Sciences
- Scripps Research Institute
- Stanford University
- State University of New York at Buffalo
- Tufts University
- University of Arkansas for Medical Sciences
- University of Massachusetts Medical School
- University of North Carolina Chapel Hill
- University of Alabama at Birmingham
- University of California Davis
- UCLA
- University of California San Diego
- University of California San Francisco
- University of California Irvine
- University of Chicago
- University of Cincinnati
- University of Colorado Denver
- University of Florida
- University of Illinois at Chicago
- University of Iowa
- University of Kansas Medical Center
- University of Kentucky
- University of Miami School of Medicine
- University of Michigan at Ann Arbor
- University of Minnesota
- University of New Mexico Health Sciences Center
- University of Pennsylvania
- University of Pittsburgh
- University of Rochester
- University of Southern California
- University of Texas Health Science Center at San Antonio
- University of Texas Health Science Center at Houston
- University of Texas Medical Branch at Galveston
- University of Utah
- University of Virginia
- University of Washington
- University of Wisconsin-Madison
- Vanderbilt University Medical Center
- Virginia Commonwealth University
- Wake Forest University Health Sciences
- Washington University in St. Louis
- Weill Medical College of Cornell University
- Yale University

"We are not seeing the breakthrough therapies that people can rightly expect," molecular biologist Alan N. Schechter, MD, senior investigator with the NIH's National Institute of Diabetes and Digestive and Kidney Diseases, observed in the journal *Nature*, in an article examining the problem's genesis and impact.

The piece's conclusion: "Over the past 30 or so years, the ecosystems of basic and clinical research have diverged. The pharmaceutical industry, which for many years was expected to carry discoveries across the divide, is now hard pushed to do so. The abyss left behind is sometimes labeled the 'valley of death' — and neither basic researchers, busy with discoveries, nor physicians, busy with patients, are keen to venture there."

To determine how the desired reform should unfold, the NIH, which had been established more than a century earlier "to extend healthy life and to reduce the burdens of illness and disability," consulted more than 300 nationally recognized leaders in industry, government, and academia.

## Mapping the future

The resulting NIH Roadmap for Medical Research, finalized in 2004, comprised more than two dozen far-reaching initiatives — all "designed to transform medical research capabilities and speed the movement of research from the laboratory to the patient's bedside."

NIH maintained that the Roadmap would enable it to tackle problems that none of its member institutes was equipped to solve on its own. Among the agency's priorities: "Foster high-risk/high-reward research, enable the development of transformative tools and methodologies, fill fundamental knowledge gaps, and/or change academic culture to foster collaboration."

The various initiatives revolved around three main themes: new pathways to discovery, research teams of the future, and re-engineering the clinical research enterprise.

The bottom line: Through targeted investment, ongoing instruction, continuous interaction, and catalytic incentivization, NIH would encourage basic researchers and clinicians to team up on novel, goal-driven projects that contribute directly — and, ideally, significantly — to the eradication of disease.

## A PATH FORWARD

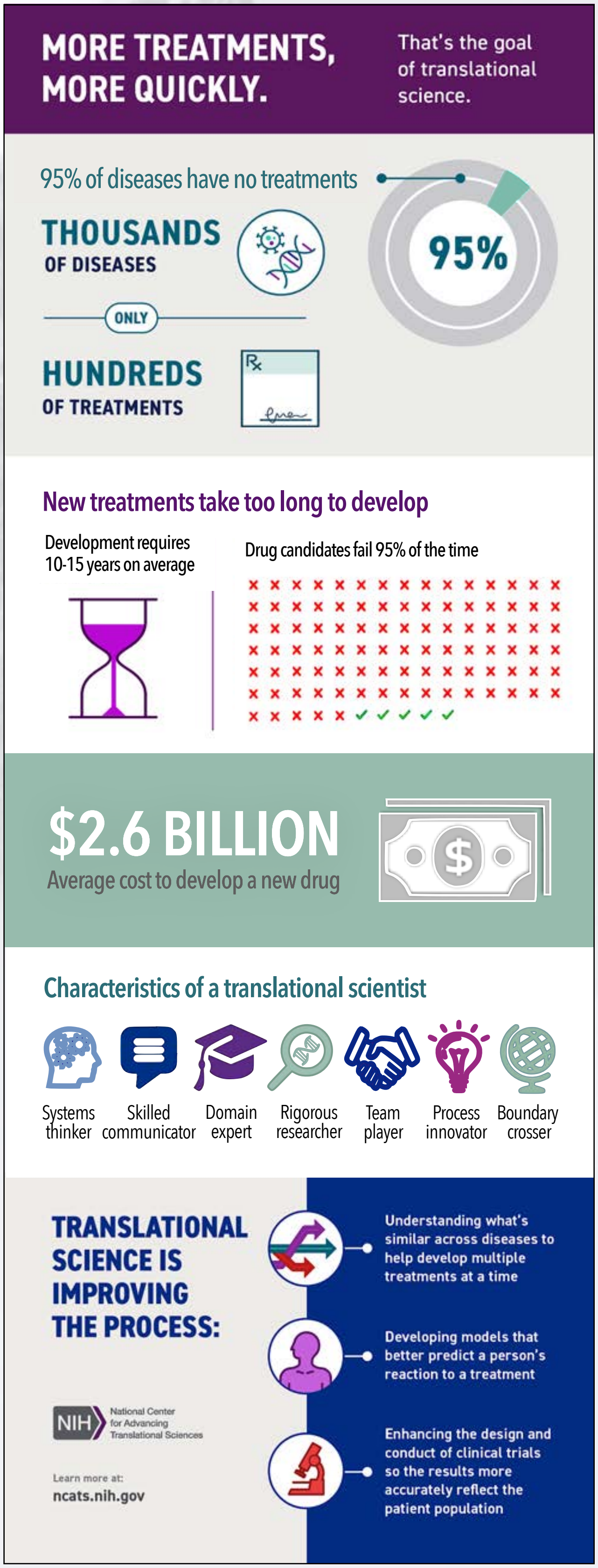
**The Roadmap for Medical Research** sought to create new pathways to discovery by realigning regulatory policies, by encouraging cross-disciplinary training, and by building a network of research hubs.


Congress soon endorsed the Roadmap with the creation of the NIH Common Fund and the Division of Program Coordination, Planning, and Strategic Initiatives within the NIH, both intended to provide stable, ongoing support and coordination for translational projects.

Congress's backing also led to the creation of a consortium of clinical and translational science centers, to be located at universities and medical centers across the country and funded through the newly established Clinical and Translational Science Awards (CTSA) program. At its inception, the consortium was to comprise 12 institution-based centers, or hubs.

Besides producing "the next generation of researchers trained in the complexities of translating research discoveries into clinical trials," the hubs would be encouraged to:

- Re-envision clinical trials to ensure that new medical therapies benefit patients with rare afflictions as well as those with common diseases.
- Develop improved research informatics tools.
- Expand outreach to minority and medically underserved communities.
- Assemble interdisciplinary teams covering "the complete spectrum of research" — i.e., biology, clinical medicine, dentistry, nursing, biomedical engineering, genomics, and population sciences.
- Forge partnerships with private and public healthcare organizations.




The consortium's original members were Columbia University Health Sciences, Duke University, Mayo Clinic College of Medicine, Oregon Health & Science University, Rockefeller University, the University of California Davis, the University of California San Francisco, the University of Pennsylvania, the University of Pittsburgh, the University of Rochester, the University of Texas Health Science Center at Houston, and Yale University.

"The development of this consortium represents the first systematic change in our approach to clinical research in 50 years," Zerhouni said. "Working together, these sites will serve as discovery engines that will improve medical care by applying new scientific advances to real world practice. We expect to see new approaches reach underserved populations, local community organizations, and health care providers to ensure that medical advances are reaching the people who need them."

By 2012, if all went according to plan, the consortium would expand to 60 centers, and annual federal funding for the program would increase to $500 million.

Translational research was taking flight.

## Premature birth?

To be clear, though, the trajectory of the burgeoning field didn't resemble that of a rocket blasting into space through cloudless skies so much as that of a turboprop that reaches its specified cruising altitude only after leveling off every few thousand feet amid severe turbulence.

The actions of the NIH prompted the launch of a journal devoted to the field: *Journal of Translational Medicine*. Others would follow, including *Translational Medicine*, *Science Translational Medicine*, *Translational Medicine Reports*, and *Annals of Translational Medicine*. As it turned out, however, the pacesetter might have been a year or two ahead of its time, as its editors acknowledged in a May 2004 editorial.

"When we launched the *Journal of Translational Medicine* a few months ago, we were interested primarily in exploring scientific consideration of this discipline," they wrote.

"However, as editors of *JTM*, we have been contacted almost daily to discuss the problems faced by scientists and clinicians around the world who are challenging the traditional boundaries of science and medicine. Through these conversations, we have learned that translational medicine is in fact 'lost in translation,' inspiring much angst, many promises and some federal appropriations. However, little has been done to substantively promote this important field."

Supporters of translational research, however, trudged onward. Before long, the crusade sparked by the NIH got an additional boost from variety of private-sector funders, including the Burroughs Wellcome Fund, the John Merck Fund, the Robert Wood Johnson Foundation, the Dana Foundation, the American Cancer Society, the Pew Charitable Trusts, and the Doris Duke Charitable Foundation.

In 2005, the Howard Hughes Medical Institute (HHMI), the largest private philanthropic funder of scientific research in the United States, rolled out its "Med-into-Grad" initiative, which sought to establish training programs that would expose graduate students to medicine and "produce a cadre of translational researchers who could conduct high-quality science and also understand and make the links necessary to eventually apply new discoveries to improve human health."

The Maryland-based organization announced that it would award $10 million to 13 graduate programs that had proposed innovative ways to introduce PhD students to clinical medicine.

"We, like many others, are concerned by how difficult it is becoming for scientists to harness the explosion of new biomedical research information and translate it into medical practice," said Thomas R. Cech, PhD, then president of HHMI. "At a time when science and medicine must work hand in hand to solve problems of human health and disease, we want to help change graduate education to increase the pool of scientists who are doing medically oriented research."

## California dreamin'

As officials at HHMI were mulling possible grantees, Ben Barres was making the case for a translational research program at Stanford.

At the time, Barres was working on treatments for multiple sclerosis, and he was frustrated that a recent explosion in knowledge about neurodegenerative disorders such multiple sclerosis, Alzheimer's disease, and Parkinson's disease had failed to yield any pharmacological agents capable of ameliorating the disorders.

"I always sort of assumed that if I made a discovery that had immediate implications for new treatment for disease, big pharma would pick up on it and do the drug development step," Barres told *The New York Times*. "That's infrequently the case. Usually, things just sort of languish."

Barres, who would eventually become chair of neurobiology at the Stanford School of Medicine, attributed that disconnect in part to a dearth of experts bearing both medical degrees and PhDs. That population, he noted, had actually shrunk by about 10 percent in the preceding two decades.

"We have all these basic biomedical advances, but we're not successful in converting them into treatments for patients," he said. "I think a huge part of the problem is we haven't taught researchers about basic human diseases.

"We're doing a good job of teaching PhDs about mice and worms, but not about humans."

Barres' proposed solution was a program in which Stanford students seeking PhDs in the basic sciences could earn a supplemental master's degree by completing rigorous preclinical coursework in human biology and then spending one or two months in clinical rotations. Although the program would add 12 to 18 months to the usual or four or five years that PhD students spent at Stanford, the overall time commitment would be far less than that required by the traditional MD/PhD program.

## Prescription for success

HHMI took note. When the organization announced the 13 projects that would receive funding in the first round of Med-into-Grad grants, the list included Barres's degree program at Stanford.

The Med-into-Grad program's other inaugural grantees: Baylor College of Medicine, Case Western University, Harvard University, MIT, Rice University, the University of Alabama-Birmingham, the University of California Davis, the University of California San Diego, the University of North Carolina at Chapel Hill, the University of Pennsylvania, the University of Washington, and Yale University.

Peter J. Bruns, PhD, a geneticist who spent a decade as HHMI's vice president for grants and special programs, said Stanford's MSM program stood out as the most demanding in the emerging field of translational research.

"Stanford is way over at one end of the spectrum," Bruns said at the time. "There, graduate students are completely immersed in the medical curriculum."

Spurred by the success of Barres' translational education program, the funding sector's growing interest in translational research, and its own proximity to the biotechnology hotbed in Silicon Valley, Stanford joined many of the nation's other top universities in seeking to span the "Valley of Death" — through both the lecture hall and the laboratory.

The university's strategy focused on strengthening the Stanford School of Medicine's ties not only to other academic units on campus but also to innovators in business. At the heart of the plan was the Stanford Center for Clinical and Translational Education and Research, an independent institute — eventually dubbed Spectrum — that would operate outside traditional school boundaries.

"Translating discoveries is more than the School of Medicine," said the program's leader, Harry Greenberg, MD, the medical school's senior associate dean for research. "You need lawyers, psychologists, anthropologists, economists, environmental scientists — all of these — to figure how best to move scientific discoveries into improvements in human health and well-being.

"What's unique about Stanford is we can harness the best in those areas."

Stanford's efforts paid off when, in 2008, it gained membership in the NIH's Consortium of Clinical and Translational Science Centers, or CTSCs, courtesy of five-year grant totaling $30 million.

## The bridge takes shape

Over the next few years, Stanford's flirtation with translational research blossomed into a full-fledged marriage that reshaped key elements of the university's mission.

For example, Stanford launched the SPARK program to encourage the discovery and development of novel therapeutics and diagnostics that addressed unmet medical needs. Researchers chosen to participate in the program received annual financial support and "comprehensive weekly coaching" from more than 100 industry volunteers. Topics included intellectual property and patient law; assay development; preclinical pharmacology and proof-of-concept studies; regulatory agency expectations; clinical study design; and startup funding and business incorporation. The stated goal was ambitious: to move five to 10 biomedical research discoveries from the lab to the commercial pipeline each year.

In October 2012, the Stanford University Medical Center opened the Jill and John Freidenrich Center for Translational Research, constructed with a $25 million donation from the building's namesakes.

"The Jill and John Freidenrich Center will usher in a new era of innovation in medicine," John Hennessy, PhD, then Stanford's president, said at the dedication ceremony. "By bringing together clinical trial researchers from across the university, it will help us address one of medicine's great challenges — how to swiftly and safely bring laboratory breakthroughs to the bedside of patients."

In 2013, Stanford received another five-year grant from the NIH's CSTA program — this one worth $45 million.

Stanford's embrace of translations research reflected a much broader movement, one unfolding from coast to coast.

The translational research consortium that the NIH and Congress created in 2006 had grown, as planned, through the addition of five to 14 centers per year. The selection criteria reflected a desire to incorporate as many states as possible.

In December 2011, the NIH, with the backing of Congress, established the National Center for Advancing Translational Sciences (NCATS). Francis S. Collins, MD, PhD, who had succeeded Zerhouni as director of the NIH in 2009, labeled the move "a major milestone in mobilizing the community effort required to revolutionize the science of translation."

Among other responsibilities, NCATS would assume oversight of the CTSA-funded research consortium.

"Patients suffering from debilitating and life threatening diseases do not have the luxury to wait the 13 years it currently takes to translate new scientific discoveries into treatments that could save or improve the quality of their lives," Collins said. "The entire community must work together to forge a new paradigm, and NCATS aims to catalyze this effort."

## Students on the 'flask track'

In the years since, translational research has grown exponentially, propelled by the distribution of transformative grants, the allure of commercialization, and the emergence of existential health threats such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Ebola, and, most recently, COVID-19.

Translational research degree programs now exist in all 50 states, and most states have multiple centers, institutes, fellowships, and/or partnerships devoted to the field. These days, it seems that if the laboratory bench were any closer to the bedside, it might present a trip hazard for patients.

The translational education program that Ben Barres launched at Stanford is thriving.

"The MSM program admits an elite group of highly talented people who have a serious commitment to translational research but are not interested in becoming clinicians," the program says on its homepage. "Students admitted to any of the PhD programs offered at Stanford have the opportunity to apply for MSM admission on a competitive basis."

The "flask-track" program accepts about six new students each year, and competition for the slots is intense — in part because the successful applicants pay nothing. Scholarships cover the first-year expenses of each matriculant; the second year is funded by the student's home PhD program.

Many of Stanford's other translational research initiatives also bore fruit. The university created the Stanford Predictives and Diagnostics Accelerator. It launched a data science resource portal for researchers. It also established a biobank management system capable of tracking biological samples collected in studies and linking each with associated health records and molecular data.

In 2019, the Stanford School of Medicine received yet another five-year grant renewal from the CTSA program. The amount: $53 million.

"This funding will help us strengthen our clinical and translational research infrastructure in a way that will prepare us for the remarkable transformation underway in precision health and population health research," said Mark Cullen, MD, senior associate vice provost for research at Stanford and senior associate dean for research at the School of Medicine. "Ultimately, this will accelerate the application of research discoveries into clinical care, helping people live longer, healthier lives."

## Gone too soon

Sadly, Ben Barres wasn't able to celebrate the grant — or see just how ubiquitous translational research had become.

The researcher died on December 27, 2017 — 20 months after being diagnosed with pancreatic cancer. He was 63.

Lengthy obituaries appeared in scores of high-profile publications, including *The New York Times*, *Forbes*, *Nature*, *The Atlantic*, the *Chicago Tribune*, *Newsweek*, *The Boston Globe*, *American Scientist*, and *The Boston Globe*. A headline in *The Washington Post* referred to the professor's "towering legacy of goodness."

During his career, Barres published 167 peer-reviewed papers; organized and chaired numerous meetings; and served on the editorial boards of numerous academic journals, including *Science*, *Neuron*, *Current Biology*, *The Journal of Neuroscience*, and the *Journal of Cell Biology*. Besides winning election to the National Academy of Sciences, he earned membership in the National Academy of Medicine, the American Academy of Arts and Sciences, and the American Association for the Advancement of Science.

The most poignant tributes, however, were the reminiscences shared by colleagues, peers, and former mentees. Those individuals tended not to focus on Barres' myriad professional achievements.

Instead, they extolled his kindness; his affinity for collaboration; his unwavering support for equality, diversity, and inclusion; and, of course, his difference-making advocacy of translational research. They noted that he had championed the cause long it became fashionable, knowing full well that his stance ran afoul of some of academia's foundational tenets.

Barres was unapologetic.

"Pure science is what you're rewarded for," he said in a 2011 interview with *The New York Times*. "That's what you get promoted for. That's what they give the Nobel Prizes for. And yet developing a drug is a hundred times harder than getting a Nobel Prize. We really have to have the very best scientists engaged in this.

"For a long time, this wasn't the case. Until five or 10 years ago, working on disease was kind of shunned."

Now, thanks to Barres and other pioneers who blazed trails in translational education, many of the nation's very best scientists *are* working together in the pursuit of a shared goal — namely, the elimination of humankind's cruelest diseases.

In doing so, of course, they're bridging a scientific, philosophical, and logistical chasm once thought to be impassable. ■

## About Harris Search Associates

**Harris Search Associates is a global higher education executive search firm. Established in 1997 by Jeffrey G. Harris, the firm focuses on the recruitment of senior leaders to support the growth of universities, research parks, national laboratories, hospitals, and academic healthcare enterprises. Based in Dublin, Ohio, a suburb of Columbus, Harris Search Associates maintains regional offices in Dallas and San Francisco. The firm is a shareholder member of IIC Partners, one of the world's largest executive search organizations, with 44 offices in 33 countries.**

## About Jeffrey G. Harris, MBA

**Jeffrey G. Harris is founder and managing partner of Harris Search Associates. He is an active member of CUPA-HR, the American Council on Education (ACE), the American College of Healthcare Executives (ACHE), and the Executive Search Roundtable, a group dedicated to the development of best practices in higher education talent recruitment. Mr. Harris holds a bachelor's degree from Ithaca College and an MBA from the University of Dayton.**

## About Richard A. Skinner, PHD

**Richard A. Skinner is senior consultant at Harris Search Associates. He formerly served as president of Clayton State University in Atlanta and as president and vice chancellor of Royal Roads University in Victoria, British Columbia. Dr. Skinner also was senior vice president for programs at the Association of Governing Boards of Universities and Colleges. He holds a PhD and a master's degree in government and international studies, both from the University of South Carolina.**