by TIM DEAN

# //NEW TO GEISEL

## The Medical School's Newest Faculty Manifest its Collaborative Culture

"Our collaborative culture, the willingness of our faculty and students to ask tough questions and challenge the status quo, and the way we bring together biomedical discovery and healthcare delivery science in everything we do—always in service to patient needs—is what makes our research and our education programs stand apart," says Geisel School of Medicine Dean Duane Compton, PhD.

With such strengths, the medical school has become a leader in medical and graduate education, the creation of new knowledge, and the development of innovative models of care. It's reputation as a collegial and entrepreneurial community that encourages collaboration has attracted some of the best and brightest minds to Dartmouth.

Geisel's $250-million fundraising campaign, *Interaction*, launched in April, will generate transformative investments in several areas across the medical school. These include medical education, the Norris Cotton Cancer Center, The Dartmouth Institute for Health Policy and Clinical Practice, and leading biomedical research programs, such as immunology, genomic medicine, lung biology, and children's health and disease prevention.

Over the past year, the medical school has recruited many top physicians and scientists to Dartmouth. Highlighted on the following pages are ten new tenure track faculty with expertise across a broad spectrum of disciplines, that are helping Geisel meet its strategic goals.

Geisel's newest tenure-track faculty include, seated, L-R: Christopher Shoemaker, PhD, Steven Leach, MD, James Bliska, PhD, and Amber Barnato, MD, MPH, MS. Back row, L-R: Robert Frost, PhD, Erika Moen, PhD, MS, Daniel Schultz, PhD, Xiaofeng Wang, PhD, and Diwakar Pattabiraman, PhD. (not photographed: Alfredo Tirado-Ramos, PhD)

(all photos by Rob Strong)

## Amber Barnato, MD, MPH, MS

### Susan J. and Richard M. Levy 1960 Distinguished Professor in Healthcare Delivery
### Professor of Medicine and of Health Policy and Clinical Practice

Since joining the Dartmouth community in the summer of 2017, acclaimed physician-researcher Amber Barnato, MD, MPH, MS, has been very pleased with how her work is progressing on a number of fronts.

Barnato notes that one of the key determinants in her coming to Geisel to assume the Levy Professorship was the opportunity to do a palliative care clinical fellowship concurrently with her assuming research and teaching activities at The Dartmouth Institute for Health Policy and Clinical Practice. "And Kathy Kirkland (director of palliative medicine at Dartmouth-Hitchcock), Elliott Fischer (director of The Dartmouth Institute), and Duane Compton (dean of Geisel) were so gracious as to allow me to do that."

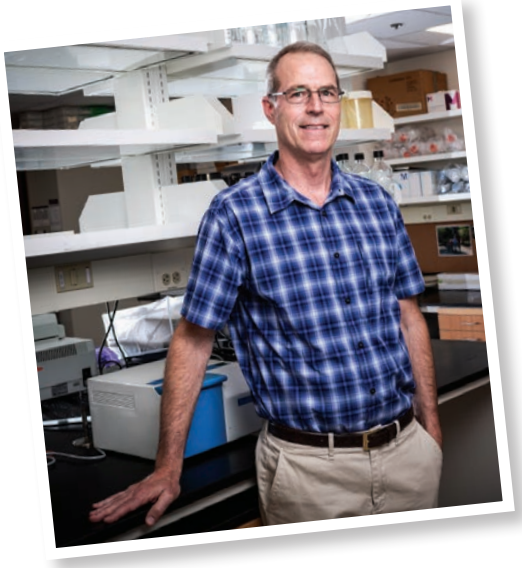
Nearly 20 years out from her original board certification in general preventive medicine and public health, she has spent a number of months "down on the wards at Dartmouth-Hitchcock (D-H), learning medicine all over again from a new perspective," says Barnato, who will soon complete her training. "I feel privileged to interact with patients and their families during such a critical time, and with other medical providers at D-H—plus it's really helped to spark a lot of new research ideas."

She has spent most of her career studying how varying provider and hospital practice patterns affect the care experiences of seriously ill, older patients who are near the end of life. "My work focuses on identifying what could be done differently to increase the health system's capacity to honor individual's values, to treat them with compassion, and to prevent or mitigate distress," explains Barnato, who has secured four grants to support her research since arriving at Geisel.

Through her appointment as the first hire in the Levy Academic Cluster in Healthcare Delivery—one of 10 interdisciplinary academic groups created to extend Dartmouth's impact on major global challenges—Barnato feels strongly supported in this effort. "I'm honored to be working with Dick Levy and many other accomplished colleagues across Dartmouth to bring innovative solutions to the problems that so many people face with end-of-life care," she says.

## James Bliska, PhD

### Distinguished Professor of Microbiology and Immunology



During a late July visit to the Remsen research building on the Geisel campus, James Bliska, PhD, is excited to show visitors his newly renovated office and laboratory space. "Thanks to everyone's support, our lab is now staffed and is close to being completely functional," he says.

Bliska, a noted molecular biologist, joined the medical school faculty last winter as a Distinguished Professor of Microbiology and Immunology and senior lead faculty member of the Personalized Treatments for Cystic Fibrosis (CF) Cluster—a cross-Dartmouth group of investigators established to develop innovative, personalized medicine and treatments for CF and lung infections caused by opportunistic pathogens.

"My research has been focused on understanding how bacterial toxins interact with the immune system to trigger pathogenesis or host protection," he explains. "I'm interested in how the diseases occur and in developing therapeutics—I'd like to expand this work to investigate opportunistic bacterial pathogens that produce toxins and cause mucosal infections, such as those that occur in the lungs of CF patients."

With recent activities like guest lecturing in a graduate-level course, participating in an annual training grant retreat, and giving an in-house progress and research seminar to his department, Bliska says, "I feel really well integrated into the research community, and I've been able to start some fruitful collaborations already."

In one project, he and department colleague George O'Toole, PhD, a professor of microbiology and immunology, are investigating the possibility of engineering an immune response, using monocytes (a type of immune cell), that would lead to protection against lung infections in CF.

Another major project involves the hiring of two junior faculty members for the cluster—who will help lead research to, for example, better understand the effect of the microbiota (microbial cells in the body) on lung infections and CF, or to investigate the possibility of correcting CF mutations in patients, using their stem cells.

"The idea is to strengthen and expand on the excellent research and training going on here in CF and lung disease in general," explains Bliska. "Adding expertise in these or other key areas will complement and enhance our work going forward."

# NEW TO GEISEL

## Robert Frost, PhD

### Assistant Professor of Biomedical Data Science

The sheer volume of data that today's biomedical scientists and clinicians can access as they work to develop more effective treatments for diseases must, at times, seem a bit overwhelming. For example, consider that there are about 20,000 protein-coded genes in the human body—and that when investigators want to, say, determine how each may be expressed through mutations in diseases like autism or cancer, the number of variables to measure grows exponentially.

Conducting this kind of "high-dimensional" data analysis, is a challenge that Robert Frost, PhD, enjoys taking on.

"I'm an engineer at heart—I basically develop mathematical models and statistical methods to improve our ability to analyze and interpret large biomedical data sets," explains Frost, who earned bachelor's and master's degrees in mechanical engineering at Stanford University and did his PhD (in quantitative biomedical sciences) and postdoctoral work (biomedical informatics and biomedical data science) at Harvard University and Geisel.

Supported by a career development award from the National Library of Medicine, and some upcoming grants, Frost is applying his research in two main areas of cancer genomics. "One is focused on understanding how the function of a gene can vary within different tissue types, and the other involves developing novel methods to examine gene activity and function at the single cell level," he says.

In addition to his research activities, Frost is passionate about teaching—having served as an instructor, co-instructor, faculty advisor, or guest lecturer for a range of graduate-level biostatistics and biomedical informatics courses in the Graduate Program in Quantitative Biomedical Sciences (QBS) and Program in Experimental and Molecular Medicine at Geisel.

"It's great to see Geisel's QBS program growing and expanding, with the addition this fall of master's degree programs in health data science and epidemiology," says Frost. "One of the courses that I teach is going to go from 10 to 30 students, which I'm very excited about. One of the things I most appreciate about being in the classroom is the personalized feedback you get. Unlike with research, it's easier to know that you're having a direct impact."

## Steven Leach, MD

### Director, Norris Cotton Cancer Center
### Preston T. and Virginia R. Kelsey Distinguished Chair in Cancer

It's a sunny afternoon in mid-July, and Steven Leach, MD, is sitting in his office at Dartmouth's Norris Cotton Cancer Center (NCCC) reflecting on the success of the 37th Prouty, which has just raised over $2.7 million to benefit cancer research and patient supportive services at the Cancer Center.

In addition to biking 150 miles and helping to lead festivities over the final two days of the event, Leach had joined a small group the prior weekend to ride the original 100-mile route taken by four NCCC nurses (up through the White Mountains of New Hampshire) to honor the courage of their patient Audrey Prouty.

"The whole week was magical—it was truly a humbling and inspiring experience to be part of something that is such a powerful connector for the Dartmouth community," says Leach, a professor of molecular and systems biology at Geisel. After nearly a year on the job, he continues to be impressed with "how easy it is here to interact with people across diverse disciplines and campuses."

That culture of collegiality, he says, is facilitating work being done on a number of major projects—including the creation of a formal and comprehensive strategic plan for the Cancer Center and re-designation of the Cancer Center's longstanding National Cancer Institute comprehensive cancer center status, which must be renewed every five years.

In addition to his administrative duties, Leach has been able to relaunch his own research initiatives with the opening of the Leach Lab in Geisel's Williamson Translational Research Building. "We have two really cool projects coming to fruition that are focused on trying to understand how the many mutations that arise in pancreatic cancer influence the biology of the disease and provide therapeutic vulnerabilities that we can exploit," he explains.

"Overall, my goal is for us to be known as the cancer center that is most successful in solving the big problems in cancer research and cancer care that uniquely require an interdisciplinary approach," says Leach. "I think we're well on our way."

## Erika Moen, PhD, MS

### Assistant Professor of Biomedical Data Science

As a graduate student studying epigenetics and cancer biology at the University of Chicago a few years ago, Erika Moen, PhD, MS, often heard the phrase "bench to bedside" and became intrigued by some of the practical aspects of the process.

"I became interested in how all of the innovation in biomedical research gets implemented in clinical practice," explains Moen, who while at Chicago also earned a Masters in translational science through the Howard Hughes Med-into-Grad Translational Training Program.

Eager to gain expertise in biostatistics and health services research, she was delighted to have the opportunity to do her postdoctoral work at The Dartmouth Institute for Health Policy and Clinical Practice. "The Dartmouth Institute is internationally known for healthcare delivery science, and as a Rhode Island native, I wanted to come back to New England—my husband and I love living here," she says.

In July, Moen joined Geisel's Department of Biomedical Data Science, where she will build on her main area of research—using social network analysis to understand how physicians influence each other to adopt new clinical practices, particularly in cancer care.

"I'm really fortunate to be part of the Center for Molecular Epidemiology COBRE (Centers of Biomedical Research Excellence) grant, led by Principal Investigator Margaret Karagas, which funds promising projects of early career investigators," Moen says. "My project uses national Medicare data to study the diffusion of a new gene expression profiling test in patients with early-stage breast cancer—with the ultimate goal of improving patient outcomes by optimizing the spread of high-quality care."

With her first co-faculty teaching experience under her belt, in Tracy Onega's Advanced Methods for Health Services Research course for The Dartmouth Institute master's students—Moen is looking forward to future teaching opportunities that will utilize her expertise in working with big data, both in genomic medicine and health services.

"I'm excited to be a member of Biomedical Data Science at Geisel," she says. "I feel like it's the perfect academic home for me, in allowing me to grow my research program and forge new collaborations, while staying connected with the great mentors I've had in the past. It's the best of both worlds."

## Diwakar Pattabiraman, PhD

### Assistant Professor of Molecular and Systems Biology

Diwakar Pattabiraman, PhD, has long been interested in blood. "It's mind-blowing to think that one cell, a hematopoietic stem cell, can give rise to all of the cells in the blood—differentiating into over 10 different cell types, each of which has a different function," he says.

A fascination with this process, and what goes wrong in cancer (leukemia, in particular), led him to the University of Queensland in Australia, where he earned his PhD in cancer biology. Pattabiraman, who grew up in Kenya, India, and Australia, then came to the U.S. to complete his postdoctoral training at the Massachusetts Institute of Technology, shifting his focus to study how breast cancer cells progress to metastasis—the ability of cancer cells to leave a primary tumor site and spread to different parts of the body.

"What I'm trying to do now, in fact, is to bring both of those areas of study into my current research, which is aimed at understanding the mechanisms of tumor progression and metastasis using breast cancer as a model," says Pattabiraman, who joined the Geisel faculty last October.

One of the main challenges in effectively treating many cancers today, he says, stems from the fact that almost 90 percent of deaths that result from cancer come from metastasis. "If we can understand how cancer cells are able to acquire these properties that enable them to initiate this complex process—the idea then would be to design drugs that can prevent that first step, so they never leave the primary site."

To this end, Pattabiraman has started collaborations with Dartmouth Chemistry Professor Dale Mierke, PhD, and Geisel's Scott Gerber, PhD, professor of molecular and systems biology and of biochemistry and cell biology. "I also get to interact almost daily with senior colleagues like Dr. Todd Miller, who is identifying novel ways to target breast cancer cells, who are eager to collaborate and offer support," he says. "That's what makes this place special—Dartmouth is a fantastic place to do science."

# NEW TO GEISEL

## Daniel Schultz, PhD

### Assistant Professor of Microbiology and Immunology

The way in which bacteria have been increasingly successful at developing resistance to antibiotics, presents a daunting challenge to today's medical and scientific communities.

"It's getting harder to find new drugs, and bacteria are showing more and more resistance to the drugs we have," explains Daniel Schultz, PhD, who joined Geisel's faculty last November. "There's a growing understanding that, in addition to trying to find new drugs, we need to know how to better use our existing drugs."

Schultz—who got an undergraduate degree in electrical engineering in his native Brazil before coming to the U.S. to earn a PhD in theoretical biological physics at the University of California San Diego and do his postdoctoral training in systems biology at Harvard Medical School—is bringing both theoretical and experimental approaches to bear on the problem.

"I'm studying how bacterial cells evolve the regulation of antibiotic resistance mechanisms that allows them to 'turn on' resistance when they're exposed to a drug," explains Schultz, who is part of Dartmouth's Neukom Cluster in Computational Science and also works with colleagues at the Thayer School of Engineering. His closest collaborators include Deborah Hogan, PhD (microbiology and immunology), Carey Nadell, PhD (biological sciences), and Rahul Sarpeshkar, PhD (computational sciences).

"For example, on the experimental side, we just built a device that allows us to evolve bacteria under different dynamic conditions to see if they can develop this regulation," he says. "In another project from the theoretical or computational side, we're searching microbial genome databases to study how bacteria change their resistance mechanisms depending on their natural environment."

By uncovering the selective pressures that shape the evolution of antibiotic resistance, Schultz hopes to advance the work being done on both fronts, while helping to guide innovations in clinical therapies.

When asked what drew him to Hanover, Schultz says, "Dartmouth has a really solid reputation, and the quality of the people is outstanding. I like the size of the school—there's definitely a critical mass of excellent people to do great things, but it's small enough to give you that strong sense of community."

## Christopher Shoemaker, PhD

### Assistant Professor of Biochemistry and Cell Biology

With his broad interest in science, Chris Shoemaker, PhD, could easily have ended up specializing in any number of areas within biomedical research. "A lot of the grad students I went to school with seemed to know exactly what they wanted to focus on; by contrast, every time I'd hear about the science someone was doing I'd think, 'I want to do that,'" recalls Shoemaker, with a laugh.

That all changed during his postdoctoral training experience at Harvard University, when he began studying autophagy—a complex process by which cells, in a controlled manner, degrade and recycle components that are damaged, toxic, or no longer needed.

"The idea that something could be studied for decades (mostly in yeast) and still be so poorly understood just fascinated me and suggested that there was more than a career's worth of work to do, so I jumped in with both feet," says Shoemaker, who earned his PhD in molecular biology and genetics at the Johns Hopkins University School of Medicine. While at Harvard, he shifted his research model from yeast to mammals—opening up a new realm of possibilities for better understanding disease processes like neurodegeneration.

Shoemaker joined the Geisel faculty in August. From his lab in the Vail research building, he and his team are focused on shedding new light on the molecular underpinnings of autophagy in mammalian cells—using a broad array of techniques such as CRISPR-based genetic screening, quantitative microscopy, and in-vitro biochemistry.

"Utilizing these genome-wide CRISPR screens, we've recently been able to identify a new protein, as well as a whole new pathway, that are giving us fresh glimpses into this process in mammalian cells," he says. "It's a perfect place to be working right now—having made these cool discoveries, but still needing to dissect things out mechanistically to figure out what's going on."

During his interview process, Shoemaker was "blown away by the people at Dartmouth—as independent scientists, potential collaborators, and future colleagues," he says. "There was no question that this was absolutely where I wanted to be."

## Alfredo Tirado-Ramos, PhD

### Associate Professor of Biomedical Data Science

Opportunity and challenge—those were the two main motivating factors for Alfredo Tirado-Ramos, PhD, in deciding to join the Dartmouth community in May to head up biomedical and translational informatics programs for Geisel and the Dartmouth-Hitchcock Health System.

"It's been wonderful so far—the Dartmouth community has welcomed me with open arms and I feel strongly supported," says Tirado-Ramos, who was formerly the chief and founder of the Clinical Informatics Division at the University of Texas Health Science Center at San Antonio, and a senior scientist and associate director of biomedical informatics at Emory University's Center for AIDS Research in Atlanta, Georgia.

A distinguished computational scientist and expert in informatics (which he describes as "applying computational science to the handling of data at all levels—from molecular medicine to population health"), Tirado-Ramos's leadership responsibilities include directing biomedical informatics at SYNERGY Clinical and Translational Science Institute (Dartmouth's CTSA—Clinical and Translational Science Award—funded by the National Institutes of Health).

He is also serving as director of the Biomedical Data Science Research Software Laboratory, associate professor in the Department of Biomedical Data Science at Geisel, and scientific director of biomedical informatics for Dartmouth-Hitchcock.

"I was drawn to Dartmouth by the opportunity to work with Dr. Alan Green, who through the SYNERGY program has worked tirelessly to advance translational science and clinical care," he says, "and also by the challenge of bridging the discoveries made by Dartmouth's world-class scientists—who are achieving breakthroughs in all kinds of basic science and also outcomes research—and the clinical domain of its expansive health system."

Tirado-Ramos foresees advancing biomedical and translational informatics at Dartmouth in two phases. "In the next year, we'll be focusing on bringing the SYNERGY program up to speed in terms of establishing the infrastructure and resources we need to ensure that our CTSA is refunded and we can continue to build on the great work that has been done here," he explains. "Then, within five years, I'd like to see Dartmouth connect with national and international networks and become one of the lead centers for biomedical and translational informatics."

## Xiaofeng Wang, PhD

### Assistant Professor of Molecular and Systems Biology

First impressions, as Xiaofeng Wang, PhD, knows, can sometimes be misleading.

"On my first visit to Dartmouth, it felt a bit small and isolated to me, and the winter weather wasn't the best," recalls Wang, who earned his PhD from Tsinghua University in Beijing, China, and did his postdoctoral training at Dana-Farber Cancer Institute and Harvard Medical School in Boston.

"But by my third visit, after having the chance to talk with people and interact with the faculty, I could see it was the right fit for me," he says. "Dartmouth is a special place—one that has a highly collaborative and inclusive culture and attracts amazing students and faculty."

Wang joined the Geisel faculty in February, opening his lab (which conducts both basic science and translational research) on the sixth floor of Dartmouth's Norris Cotton Cancer Center. "Our work focuses on cancer epigenetics," he explains. "We're trying to understand the molecular mechanisms behind certain mutations that occur in gene expression and how they lead to different forms of cancer—such as ovarian, lung, and kidney cancer. We're also using genetic and chemical screens to identify potential therapeutic targets for these cancers."

One upcoming collaboration with Scott Gerber, PhD, a professor of molecular and systems biology and of biochemistry and cell biology, will help advance these efforts. "We're looking forward to working with Scott, who specializes in mass spectrometry, which will allow us to identify the partners of key proteins that are lost in cancers, compared to those in normal cells," says Wang.

Like immunotherapy, says Wang, epigenetics is one of the most promising fields in cancer research to emerge in recent years. "I'm excited to be working in this kind of environment," he says.

"I think Geisel is doing a great job of recruiting new people from different backgrounds with different perspectives and skills—who can synergize with the current research here," adds Wang. "Hopefully, this can lead to many more collaborations and breakthroughs in our research in the future."