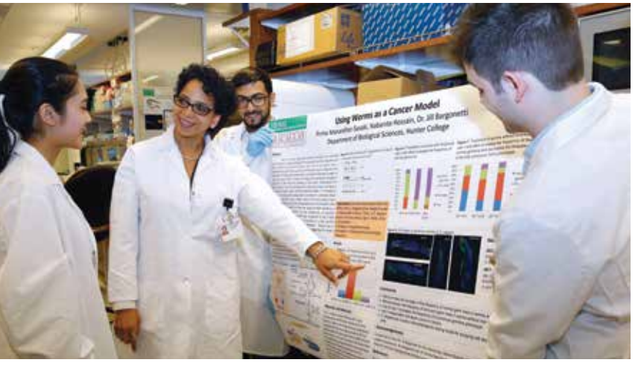
HUNTER'S LEAP FORWARD

AN UNPRECEDENTED PARTNERSHIP



▲ **Professor Bargonetti : The goal is precise, targeted medicines.**

JILL BARGONETTI: Unlocking Secrets of Proteins to Combat Breast Cancer

In her more than two decades at Hunter College, Professor Jill Bargonetti has become one of the nation's preeminent breast cancer researchers. A professor of biological sciences, she's part of Belfer's team of translational scientists, focusing on the molecular genetics of the deadly disease, specifically the roles played by two proteins—p53 and MDM2.

The laboratory work performed by Bargonetti and her team is painstaking, precise, and complicated. "Molecularly," Bargonetti says, "we study the genes and the gene products in a cancer. We genetically engineer the cancer to get rid of the genes and proteins we study, so we can see what happens when we get rid of them."

Understanding p53 and MDM2 is crucial to understanding breast cancer. In their normal state, the two proteins work together to prevent the spread of damaged cells; when cancer strikes, however, the proteins actually promote tumor growth. Mutated p53 is associated with triple negative breast cancers; MDM2 is a driver of estrogen-receptive breast cancers.

For Bargonetti, the Holy Grail of cancer treatment is precision medicine, treatment that targets the cancer and doesn't damage any other aspects of a patient's DNA.

Ideally, she says, "After patients have treatment, they're the same person they were before they had the cancer."

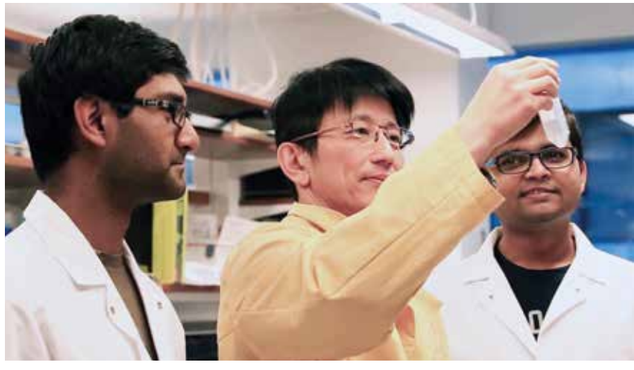
HIROSHI MATSUI: Bionanotechnology Enables Big Advances to Go Small

Professor Hiroshi Matsui takes the battle against cancer to a level so minuscule it's almost invisible. His specialty, at the intersection of biology and nanotechnology, is the relatively new—and very exciting—field of bionanotechnology, research conducted in units that are 10 to 100 times smaller than the human cell.

One goal of Professor Matsui's research at Belfer: to develop a carrier that will transport cancer-slaying drugs directly to the area in need of treatment. "There are many effective drugs," he says, "but they do not work well because they cannot target a specific area." The unintended result of current blunt-instrument treatment: Healthy tissue is attacked along with the targeted tumor.

To help pinpoint drug treatment, Matsui and his research group are working to develop a tiny case conjugated like an antibody, so it will seek out the cancerous tissue. The carrier will hold the appropriate drug. The case will also have to be MRI-sensitive, so that doctors can track its progress and watch the drug being released.

The move to the Belfer building, says Matsui, enables his group to concentrate better on this and other research. "I like the new building very much," he says. "I like the close relationships between the medical clinicians and researchers. We can exchange opinions and results with each other on a daily basis."



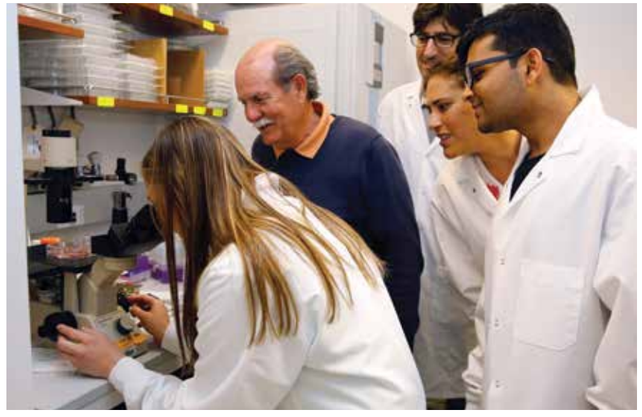
▲ **Professor Matsui (center): thinking small, aiming high.**

DAVID FOSTER: Exploring Olive Oil's Potential to Fight Cancer

On one of the shelves in David Foster's lab in the new Belfer building, nestled amid the chemicals and compounds, there's a selection of extra-virgin olive oil from various countries. It's the key ingredient in his research. Foster hopes that an antioxidant in olive oil—it's called oleocanthal—will turn out to be a cancer-killer. "It has great potential," he says. "In the lab, we found it kills cancer cells and isn't toxic to noncancerous cells."

There's already some tantalizing evidence that olive oil may have a role in preventing breast cancer. A recent study in Spain, released in *JAMA Internal Medicine*, found a Mediterranean diet supplemented with extra-virgin olive oil to be associated with a relatively lower risk of breast cancer. And Foster's research is aimed at other forms of the dreaded disease—gastric, colon, lung, pancreatic, and renal cancers.

Oleocanthal works because lymosomes, the parts of a cell where waste is stored—Foster calls them "the recycling centers"—are larger and more fragile in cancer cells than in healthy cells. They're vulnerable to anything that can penetrate, which oleocanthal does, crossing the barrier and causing necrosis—cell death. The adjacent healthy cells are unaffected—and that's a mystery that needs to be solved. "We need to understand why cancerous cells are more sensitive to oleocanthal than noncancerous cells," says Foster, who with Paul Breslin, professor of nutritional sciences in the School of Environmental and Biological Sciences at Rutgers, and Onica LeGendre, also of Hunter, published their research in the journal *Molecular and Cellular Oncology*.



▲ **Professor Foster (with students): taking aim at numerous cancers**

"The published work involved studies with cultured cancer cells in the lab," says Foster. "However, we have now begun to investigate the effect of oleocanthal on a genetically engineered mouse model for pancreatic cancers in collaboration with Dr. Nancy Du of Weill Cornell Medicine—and the initial study yielded promising results."

BRIAN ZEGLIS: Creating a Puzzle To Make Radiation Safer

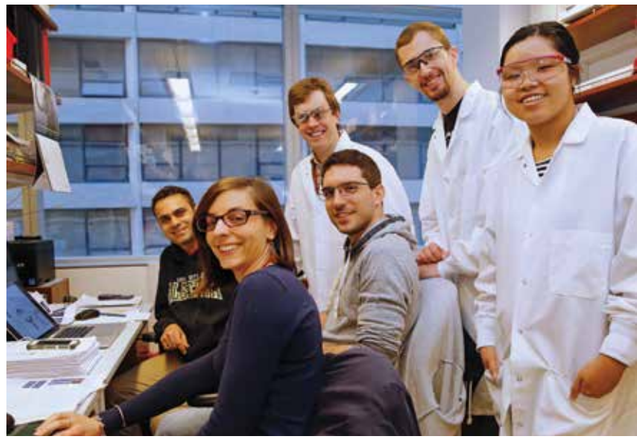
Toward the end of this year, clinicians at Memorial Sloan Kettering Cancer Center will begin testing a technique that Hunter's Brian Zeglis, assistant professor of chemistry, has been perfecting for five years.

They will first inject a cancer patient with an antibody whose task is to seek out the tumor; harnessed to the antibody will be one half of a molecular puzzle piece. A few days later—after the antibody and its tiny passenger attach to the tumor—they'll inject the second part of the puzzle piece. "It races around the body really quickly to find the other puzzle piece," says Zeglis, who has been at Belfer since January 2015. "They snap together like a jigsaw—and they make the tumor radioactive."

The goal of this microscopic molecular mating is to make Positron Emission Tomography (PET) safer for patients. Attaching radioisotopes to antibodies is one of the best ways to deliver radioactivity to cancer cells to act as a tracer for PET scans. But it can take several days for the injected isotope to degrade. During that time its radioactivity can harm healthy tissue. Zeglis's technique would cut that exposure significantly.

Zeglis came to Belfer from Sloan Kettering, where he holds a concurrent affiliate appointment in the Department of Radiology. He began his research there, as a postdoctoral fellow, then moved into the brand-new Belfer, funded by a grant from the National Institutes of Health that, he says, "allows me to keep up the pace of the research."

At Belfer, he says, "We're very much into translational science. We admire scientists who study fundamental science or fundamental biology, but I learned very early in my career that to galvanize my research I require the relation to human health and the potential for immediate impact, or at least impact on human health in a couple of years."



▲ **Professor Zeglis (standing, left): working on a PET project.**