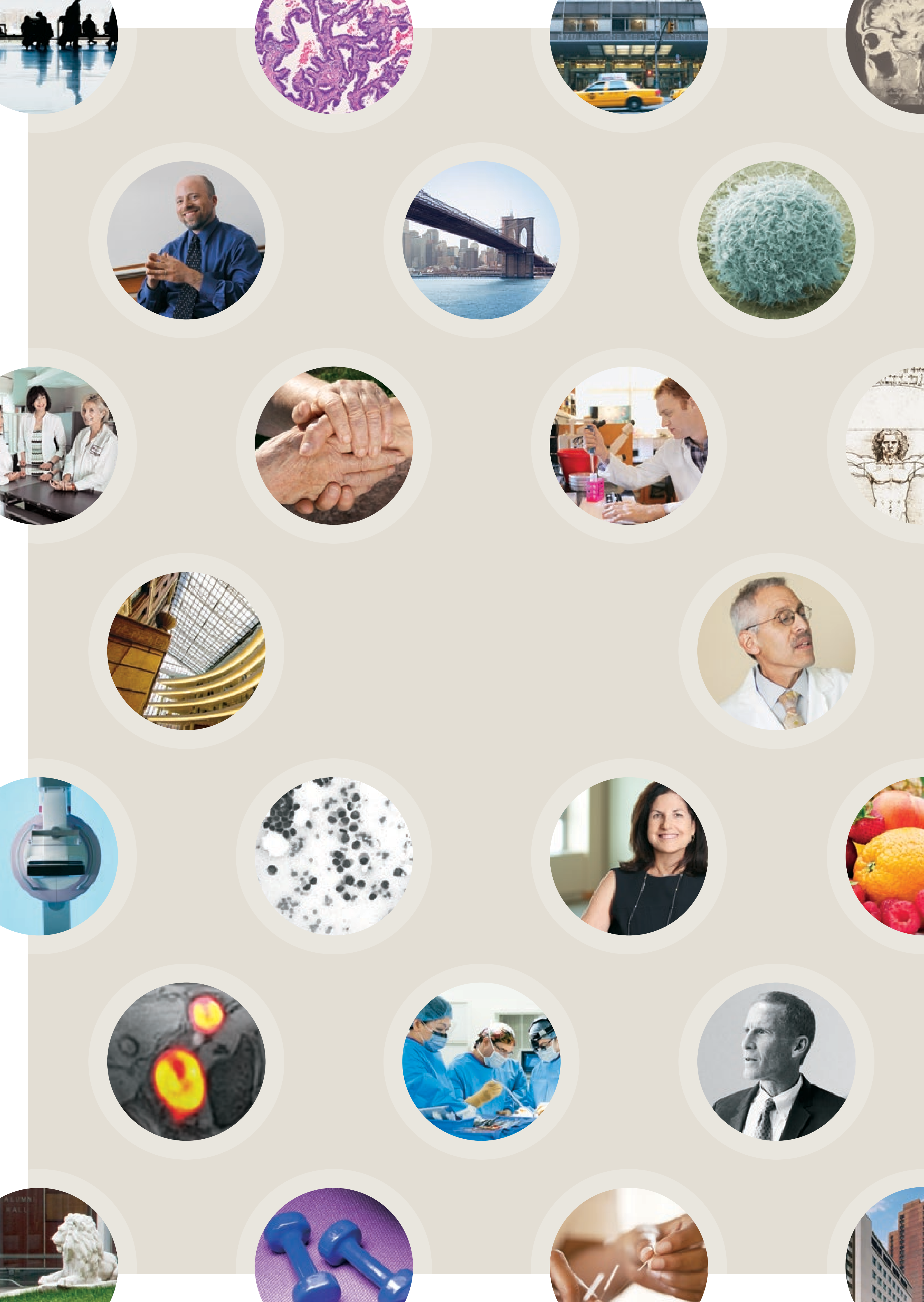
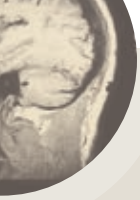
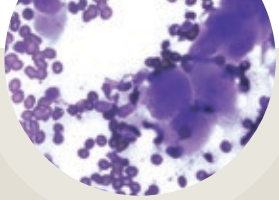
THE FOREST AND THE TREES

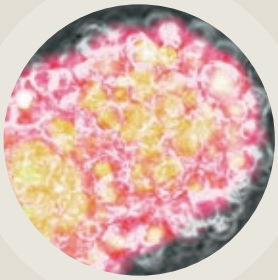
THE CANCER INSTITUTE AT NYU LANGONE

2012/2013 REPORT

NYU Langone
MEDICAL CENTER

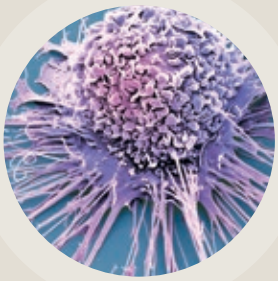


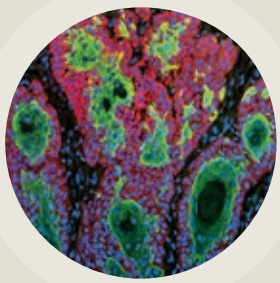



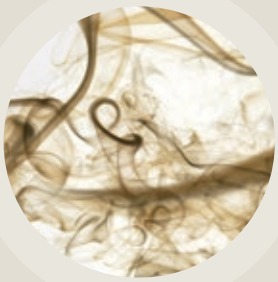




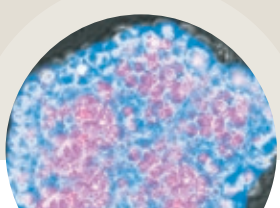






At The Cancer Institute at NYU Langone Medical Center we don't allow ourselves to become lost in a single perspective, nor in one angle of attack. It requires many avenues of research taking place at different levels, many patients' stories, and many strategies, to collaboratively map out the landscape for progress, even while closely exploring the landscape's key details. For it is in the connections between the forest and the trees that we find inspiration to make the leaps that give patients hope.



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SIX STORIES FROM THE FOREST

MISSION STATEMENT

Our mission is to discover the origins of human cancer and to use that knowledge to eradicate the personal and societal burden of cancer in our community and nation, and globally.

WHAT DIFFERENTIATES US

1 / MATRIX

Our structure as the Cancer Institute at NYU Langone Medical Center, with our ties to the larger University, enhances collaborations on all NYU campuses across scientific disciplines, and leverages, access to critical new technologies. An innovative approach to medical education, NYU School of Medicine's Curriculum for the 21st Century (C21) features a new oncology curriculum.

2 / COLLABORATION

Our culture of collaboration is reinforced throughout the Cancer Institute and translates into a true willingness for our teams to partner and conceive new methods to prevent and treat cancer.

3 / ACCESS

Our affiliation with the New York City Health and Hospitals Corporation's Bellevue Hospital Center and Woodhull Medical and Mental Health Center afford distinctive opportunities to learn and care for extraordinarily diverse groups of patients with cancer.

4 / FOCUS

Our clinical research focus has encouraged more than 18% of our patients to participate in therapeutic clinical trials (national average = 4% participation), providing patients with access to the best available therapies while defining better options to improve outcomes.

5 / PURSUIT

Our environment fosters a unique relationship between treating physicians and laboratory scientists and drives the pursuit of methods to neutralize the biological pathways that underlie the origins of human cancer. These efforts are leading to novel ways to prevent and treat this class of diseases.

6 / RECOGNITION

Our reputation as an NCI-designated Cancer Center, and recognition among the nation's top academic medical centers for cancer and as one of the top in New York City, according to US News & World Report's "2013–2014 Best Hospitals," reflect our commitment to excellence.

7 / DIVERSITY

Our location in the heart of New York City offers access to an urban laboratory with a unique global patient population. It helps us to understand variation of cancers within certain populations and to define and eradicate barriers to care.

8 / HEART

Our thoughtful approach to balancing the needs of our patients, our community and our staff remains at the heart of what we do: We care.

9 / QUALITY

NYU Langone Medical Center scored #1 for overall patient safety and quality among leading academic medical centers (AMCs) across the nation that participated in the University HealthSystem Consortium (UHC) 2013 Quality and Accountability Study.


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Multidisciplinary teams focus on the intricate details of research, early diagnosis, and treatment effectiveness without losing sight of the individual. John G. Golfinos, MD, associate professor and chair of the renowned Neurosurgery Department, is pictured, (center), along with his highly skilled colleagues.

NEW STRATEGIES AGAINST THE TOUGHEST TUMORS

The most common form of brain tumor, glioblastoma, is one of the most challenging of all tumors to treat in adults. Cure rates are disappointingly low, and even impeding the cancer's spread is challenging. Now researchers and clinicians at The Cancer Institute at NYU Langone Medical Center have realigned to form a multidisciplinary center for exploring promising new avenues to slow this aggressive type of cancer. "There's an extraordinary institutional commitment here to making an internationally renowned new Brain Tumor Center, and to providing whatever resources are needed to do it," says Brain Tumor Center director Howard A. Fine, MD, the Anne Murnick Cogan and David H. Cogan Professor of Oncology and deputy director of The Cancer Institute.

NYU Langone has long been a leading player in the fight against brain tumors, thanks in large part to its extraordinary team of clinicians, including John G. Golfinos, MD, chair of the neurosurgery department, whose team is highly respected for its extensive and growing multidisciplinary capabilities in brain tumor treatment. Now the new Brain Tumor Center will bring NYU Langone's prominent role in the brain tumor field to a new level.

Dr. Fine is the leading champion behind the new center, a distinguished clinician and researcher whom the National Brain Tumor Society called "America's neuro-oncologist." Having built pioneering brain tumor programs at the National Cancer Institute and the Dana-Farber/Harvard Cancer Center, Dr. Fine is setting a research agenda that is poised to make inroads against brain cancer, a disease that currently strikes some 23,000 Americans each year. Those inroads will go well beyond the field's standard approach of identifying and understanding the many genetic mutations behind brain tumors. "That's important work," says Dr. Fine, "but the therapeutic impact has yet to be fully realized, with median survival rates for glioblastoma patients hovering around 16 months, up from about 9 months two decades ago."

23,000 EACH YEAR

Brain cancer strikes some 23,000 Americans each year.

One of the ways Dr. Fine and the new Brain Tumor Center will go further is by focusing on the relationship between brain tumors and stem cells, which have the ability to divide and form new cells. Normal stem cells divide only so many times before they reach their final, "terminally differentiated" form. Although normal stem cells can divide an unlimited number of times, they also have the ability to terminally differentiate (which glioma stem cells do not). Dr. Fine says, "Many brain tumor cells seem to be much like stem cells that have disabled the mechanisms of that termination. Genetically and biologically, a population of glioblastoma cells within each patient's tumor has many of the same qualities of normal neuro-stem cells." One reason the field of neuro-oncology has struggled to make progress against this cancer, he adds, may be that it hasn't paid much attention to the stem-cell-like characteristics of tumor cells, focusing instead on tumor cells that are more like other cancer cells.

Applying the growing body of stem-cell research to glioblastoma cells, Dr. Fine notes, promises to yield new ways to develop drugs that could push tumor cells back on the path to normal growth. "The idea is to open new therapeutic avenues that target stem-cell pathways," he says. "The science to do that already exists, but no one has put it together with genetics and developmental biology. That's what we want to do here—connect different approaches in order to make progress against the disease."

One of the other groundbreaking approaches Dr. Fine and his colleagues at The Cancer Institute are connecting together involves exploring the ways in which glioblastomas and other tumors hijack surrounding healthy tissue, including blood vessels and the immune system, to provide support for tumor growth. The resulting dependency of tumors on their microenvironments in the body suggests a new angle of attack against cancer, and one that could foil a brain tumor's ability to resist targeted treatments by developing new mutations that protect it. Interfering with the ways in which tumor cells draw on surrounding healthy cells for support might work in much the same way that interrupting enemy supply lines proved such an effective strategy in World War II.

A third avenue that could prove important to making new headway against brain tumors is one spearheaded by Ruth Lehmann, PhD, the Laura and Isaac Perlmutter Professor of Cell Biology and Howard Hughes Medical Institute investigator. Dr. Lehmann, who is director of the Skirball Institute of Biomolecular Medicine and of The Helen L. and Martin S. Kimmel Center for Stem Biology, has focused on sperm and egg cells, which, like brain tumor stem cells, have unique cell-division characteristics, and also have a close relationship with the surrounding tissue, migrating to specific locations in ways that may be similar to how brain tumor stem cells spread. "If we can understand how germ cells use signaling pathways to keep from over-proliferating or from spreading to new sites," explains Dr. Lehmann, "we may find a way to keep glioblastoma cells under control through similar mechanisms."

Dr. Lehmann says her group has been making good progress, already gaining key insights into signaling pathways shared by both germ cells and tumor cells. Now efforts are under way to see if there might be ways to apply some of those discoveries to slowing brain tumors, as well as to see if some of the properties of tumor cells suggest yet other insights into germ cells.

Brain Tumor Center director Howard A. Fine, MD, the Anne Murnick Cogan and David H. Cogan Professor of Oncology and deputy director of The Cancer Institute.

OPENING NEW THERAPEUTIC AVENUES THAT TARGET STEM-CELL PATHWAYS

"We usually think of basic science as driving innovation in clinical work," she says. "But this is an example in which clinical discoveries may shed light on basic science."

Dr. Fine says it's this ability of researchers and clinicians at The Cancer Institute and elsewhere at NYU Langone to make these sorts of connections that should allow the new Brain Tumor Center to make progress against a disease that has so far frustrated other efforts. "What distinguishes our work here at NYU Langone is that we have in place the two bookends of translational research—strong basic research and excellent clinical care," Dr. Fine explains. Those two anchors are more solidly placed than ever, he says, noting that NYU Langone has been growing its Neuroscience Institute to bolster basic research, backed by a $100 million gift from the Druckenmiller Foundation and led by Richard W. Tsien, DPhil, the first director of the Neuroscience Institute and the Druckenmiller Professor of Neuroscience.

Not only will all these strengths bring the new Brain Tumor Center closer to discovering novel, more effective therapies for brain tumors, it will enable the center to bolster ongoing work in other Cancer Institute laboratories that are exploring cancer stem cells for other tumors, including breast cancer, melanoma, prostate cancer, and many hematological malignancies. "We need to link different research approaches together for every type of cancer," says Dr. Fine, who, as deputy director of The Cancer Institute, will be closely involved in many of these efforts.

THE BIG HEALTH IMPACT OF DAILY CHOICES

Clinicians and patients are motivated by the same goal: better outcomes. But there are many different paths for getting there, and "better outcome" often means different things to different patients. Diagnosing illness, raising cure rates, and reducing treatment side effects are among the goals that typically come to mind. But also of critical importance to improving healthcare's true bottom line—healthier patients—is helping patients to adopt lifestyles that lower the risk of developing a serious problem in the first place. NYU Langone Medical Center's Cancer Institute has taken a leading role in enhancing preventive medicine, paving the way not only for healthier patients under the Medical Center's care, but for better population health in our community and around the world.

The one cancer-related intervention that would have the most impact globally would be to reduce smoking rates, argues Cheryl G. Healton, DrPH, director of the NYU Global Institute of Public Health. Dr. Healton notes that much of the public, and even many in the medical community, mistakenly think that the United States has lowered smoking rates to the point where they no longer play a leading role in the cancer picture. "Tobacco continues to be the leading cause of cancer death in every industrialized nation in the world, including the United States," she says. "This century an estimated one billion people will die from it."

The biggest single threat to smokers is lung cancer. At The Cancer Institute, Harvey I. Pass, MD, the Stephen E. Banner Professor of Thoracic Oncology

Tobacco remains the leading cause of cancer death worldwide. For Donna Shelley, MD, MPH, and her colleagues, New York City's diverse community is a critical resource in confronting this challenge.

and chief of thoracic oncology, and William N. Rom, MD, MPH, the Sol and Judith Bergstein Professor of Medicine, have been leaders in developing predictive models for screening who is at most risk for lung cancer, and have been strong advocates for providing CT chest scans for older heavy smokers at high risk. A large clinical trial has shown that these scans can lower lung cancer mortality rates by 20 percent, they note, thanks to the fact that lung cancer has a 90 percent cure rate if it can be caught before it reaches the late stages.

Smoking is responsible for more than a third of cancer deaths in the United States. But it's often a modifiable behavior, points out Donna Shelley, MD, MPH, associate professor of population health and medicine, and smoking cessation expert. The challenge to the medical community, says Dr. Shelley, is to get the U.S. adult

90%

If a screening catches lung cancer before the late stages, there's a 90 percent cure rate.

smoking rate below the current 20 percent. It's a challenge she herself has taken up. "I'm especially focused on segments of the population with persistently high smoking rates," she says. "Seventy percent of smokers say they want to quit, but helping them do it may require more intensive approaches than we've offered so far."

Dr. Shelley has been studying ways to provide physicians and dentists with the information, tools, and incentives needed to make them an integral part of the smoker intervention process. This may involve ensuring that clinicians know what to look for and what to say when dealing with a smoker; what cessation aids to prescribe; and helping them recognize the benefits of getting smokers to talk to health coaches who specialize in encouraging and supporting behavior change. These interventions can and should be a routine part of patient exams, insists Dr. Shelley. Even genetic testing might play a role in the future. "We may be able to use genetics to target patients with the particular cessation drug that works best for them," she says. "Ultimately, we want to find whatever intervention will give those who want to quit the support they need to stick with it."

Dr. Shelley has helped start an innovative smoking cessation program at NYU Clinical Cancer Center and has spearheaded cessation-related research in a number of areas. For example, she has been studying the use of electronic cigarettes—which release a nicotine-infused vapor without the harmful smoke of cigarettes—as a cessation aid, and the risks of smokeless tobacco products, such as chewing tobacco and tobacco strips, which are becoming increasingly popular with young people.

After lung cancer, the second leading cause of cancer deaths in U.S. men is prostate cancer. Stacy Loeb, MD, assistant professor and a clinician-researcher specializing in prostate cancer, argues that better decisions about the use of prostate cancer screenings and tests can play a large role in improving patient outcomes. Dr. Loeb has studied the question of how PSA blood levels, commonly used for prostate cancer screening, should best be factored into the decision of whether or not a prostate biopsy is warranted.

Prostate biopsies can catch aggressive cancers early. But they carry a risk of complications, Dr. Loeb notes, and in some cases aren't likely to turn up an aggressive cancer that requires treatment. High PSA levels have long been seen as an indication that a biopsy may be warranted. But Dr. Loeb explains that, although there is still strong disagreement in the medical community about how PSA levels should be used, research now seems to suggest that a big jump in PSA levels, rather than a high level in and of itself, is a better factor for biopsy decisions. "A lot of biopsies could be seen as unnecessary," she says. "Watching PSA levels carefully over time can be a better option for some men than a biopsy based on a single set of high readings." Dr. Loeb has been conducting a series of studies that are intended to produce guidelines personalized to each patient's risk profile, with the goal of both lowering biopsy rates and raising the chances of catching aggressive tumors.

There are many other things patients can do to lower their risks of various forms of cancer. And that's part of

Scott Braithwaite, MD, MSc, professor of population health and medicine, and director of NYU Langone's division of comparative effectiveness and decision science in the department of population health.

A BILLION SMOKING-RELATED CANCER DEATHS THIS CENTURY

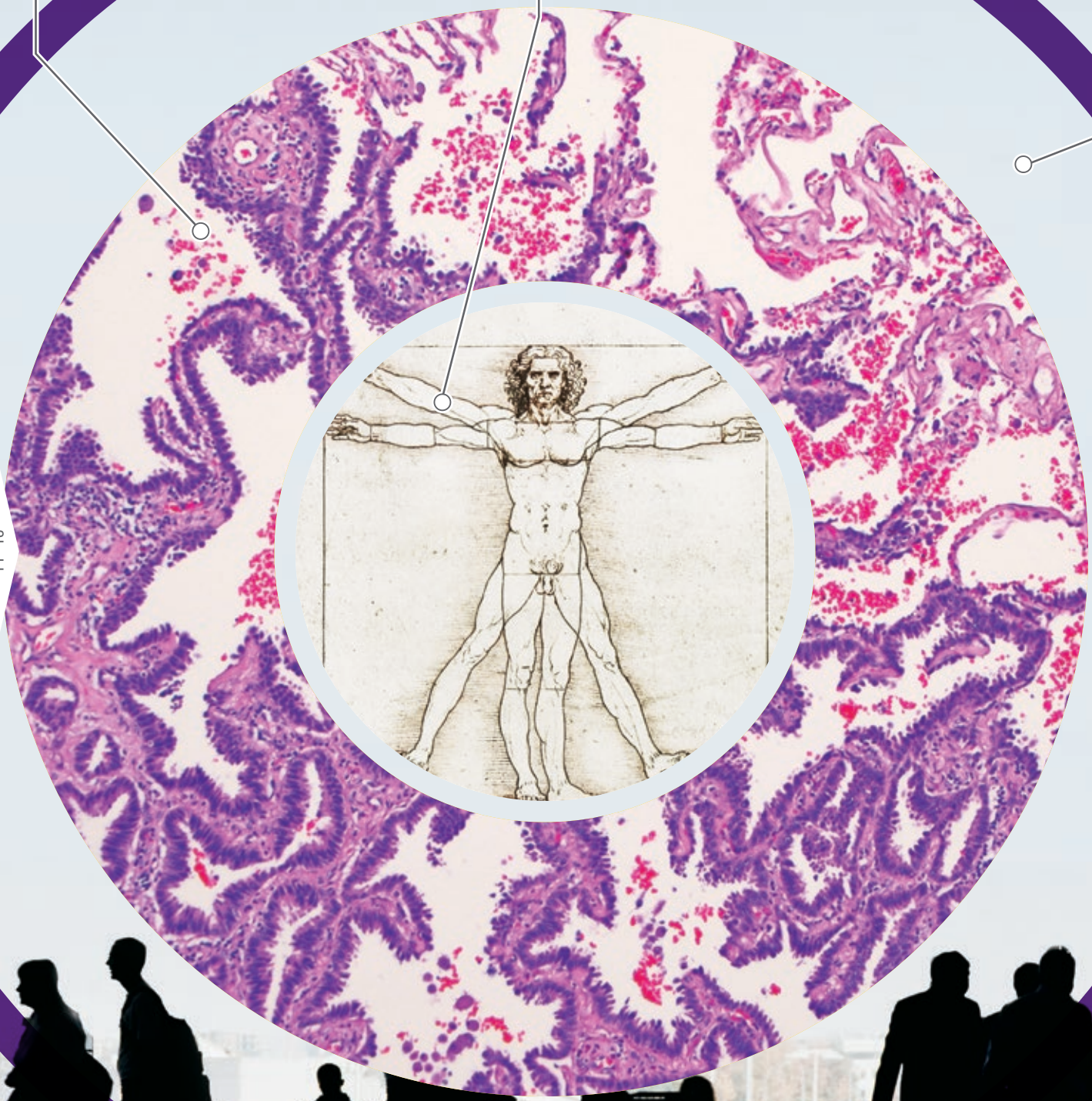
the problem, says Scott Braithwaite, MD, MSc, professor and director, division of comparative effectiveness and decision science, who specializes in analyzing which sort of medical interventions make the most sense for patients. Dr. Braithwaite notes that patients are often overwhelmed by information and advice, and aren't getting the clear, simple directions and feedback they need for making the healthiest choices. Patients frequently leave doctors' offices with suggestions to improve their diet, get exercise, visit the doctor more often, avoid too much sun, get colonoscopies, and more. "It can lead to overload," he says, "and they end up doing little of it, or the things that help them the least."

Dr. Braithwaite suspected that it might be much more helpful if doctors emphasized a few behavioral changes that could produce the biggest drops in each patient's unique set of cancer risks and constraints. For example, if a patient's genes place him or her at much higher risk for colon cancer than melanoma, and he or she is much more willing to undergo a minor medical procedure rather than slather on sunblock every day, then why not push a colonoscopy to the patient and go easier on selling skin protection? Dr. Braithwaite is now running studies to identify new metrics and decision-making models to help healthcare providers offer focused advice that can lead to better patient outcomes.

NYU Langone's longstanding, close relationship to the New York community has ensured that population health is a critical element of The Cancer Institute's strategic plan. New York's unmatched geocultural diversity, spanning both native New Yorkers and recent immigrants, provides a chance to study treatment outcomes across an enormous range of social, ethnic, genetic, economic, and environmental landscapes. The city has also been a pacesetter in health-promoting policies. That ability to represent—and in some cases lead—much of the world has become a crucial resource to Cancer Institute researchers working to improve health for all populations.

Most cancer tumors are genetically unique, and yet there are commonalities that researchers can exploit.

Human genetics must be understood and applied at multiple levels in order to find new life-saving cancer treatments.



New insights into the human genome are bringing research closer to personalized cancer treatments.

A MULTIPRONGED STRATEGY AT A MOLECULAR LEVEL

The Cancer Institute at NYU Langone Medical Center has been working to capitalize on and extend the extraordinary progress that science has made in the past few decades in cataloging the human genome. At the core of these advances is the Human Genome Project, an ambitious and groundbreaking scientific endeavor by laboratory scientists worldwide to fully sequence the human genome. The project was initiated in 1990 and completed in 2003, by which time 3.2 billion base pairs of sequences containing 20,000 to 25,000 genes were described. Today, astonishing advances in technology make it possible to sequence a genome in days instead of years. Thousands of cancer genomes have now been sequenced, affording scientists and clinicians an opportunity to discover the genetic blueprint of human cancer.

At The Cancer Institute, researchers and clinicians are taking new steps to realize the promise of these breakthroughs through an ambitious, high-tech effort to routinely examine the tumors of patients at our clinical cancer center in order to identify dozens of possible tumor-driving mutations that aren't present in normal cells. Doing so can enable clinicians at The Cancer Institute to enlist a new class of designer cancer-fighting drugs, developed by academic centers and the pharmaceutical industry, that can specifically interfere with a particular mutation. In many cases, such drugs have shown a dramatic impact on the cancer that was not achieved with conventional therapy.

Examining key aspects of each patient's genetic mutations will soon be a routine practice at NYU Langone. A 17,000-square-foot advanced molecular diagnostics lab, now being assembled by The Cancer Institute, will examine most patients' tumors for a panel of some 50 possible mutations that have been associated with cancer. Normally, genetics analysis labs are set up either for research or for clinical use, but The Cancer Institute's new lab will be certified for both. On the clinical side, that can mean better, faster predictions of which treatments are most likely to work, not only to make sure patients get the most effective treatments sooner, but also to avoid giving patients difficult therapies that aren't likely to work. At the same time, the lab will provide critical

CHROM	POSITION	GEN...	TARGET ID	TYPE	ZYGOS	GENOTYPE	REF	VARIANT	HOTSPOTID	VAR FREQ	QUAL	COV	REF...	VAR
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chr7	140453118	BRAF	CHP2_BRAF_2	SNP	Ref	C/C	C	T	COSM1137	0.00%	100	1999	1999	0
chr7	140453121	BRAF	CHP2_BRAF_2	MNP	Ref	CT/CT	CT	AA,TT	COSM1136, COSM1135	0.00%	100	1991	1991	0
chr7	140453122	BRAF	CHP2_BRAF_2	SNP	Ref	TT	T	C	COSM21542	0.00%	100	1989	1989	0
chr7	140453123	BRAF	CHP2_BRAF_2	DEL	Ref	CCAT/C...	C	C	COSM6267	0.00%	100	1990	1990	0
chr7	140453125	BRAF	CHP2_BRAF_2	SNP	Ref	A/A	A	C	COSM1134	0.00%	100	2000	2000	0
chr7	140453128	BRAF	CHP2_BRAF_2	SNP	Ref	G/G	G	A	COSM3729	0.00%	100	1999	1999	0
chr7	140453131	BRAF	CHP2_BRAF_2	DEL	Ref	ATTT/ATTT	ATTT	A	COSM30594	0.00%	100	1990	1990	0
chr7	140453132	BRAF	CHP2_BRAF_2	SNP	Ref	T/T	T	A,G	COSM1132,COSM6265	0.00%	100	1994	1994	0
chr7	140453133	BRAF	CHP2_BRAF_2	DEL	Ref	TTCA/TT...	TT	T	COSM1133	0.00%	100	1500	1500	0
chr7	140453134	BRAF	CHP2_BRAF_2	SNP	Ref	T/T	T	C	COSM478	0.00%	100	2000	2000	0
chr7	140453135	BRAF	CHP2_BRAF_2	MNP	Ref	CA/CA	CA	AT,TT	COSM475,COSM477	0.00%	100	1501	1501	0
chr7	**140453136**	**BRAF**	**CHP2_BRAF_2**	**MNP**	**Het**	**ACT/TCT**	**ACT**	**TCT,C...**	**COSM18443,COSM476,COSM6...**	**24.90%**	**100**	**1999**	**1502**	**497**
chr7	140453137	BRAF	CHP2_BRAF_2	INS	Ref	C/C	C	CTGT,...	CoSM1130,COSM219798, COS...	0.00%	100	1993	1993	0
chr7	140453138	BRAF	CHP2_BRAF_2	INS	Ref	T/T	T	TGTA	COSM30730	0.00%	100	1998	1998	0
chr7	140453139	BRAF	CHP2_BRAF_2	SNP	Ref	G/G	G	A	COSM472	0.00%	100	1998	1998	0
chr7	140453140	BRAF	CHP2_BRAF_2	INS	Ref	T/T	T	TAAC	COSM26625	0.00%	100	1994	1994	0
chr7	140453142	BRAF	CHP2_BRAF_2	SNP	Ref	G/G	G	A	COSM21549	0.00%	100	1998	1998	0
chr7	140453144	BRAF	CHP2_BRAF_2	SNP	Ref	T/T	T	C	COSM1124	0.00%	100	1997	1997	0
chr7	140453145	BRAF	CHP2_BRAF_2	MNP	Ref	AG/AG	AG	CG,GAA	COSM1125, COSM471, COSM1126	0.00%	100	1995	1995	0

(Data output courtesy of Ruliang Xu, MD, PhD, associate professor of pathology and director, Molecular Pathology Laboratory)

MAKING THE GENETIC TYPING OF INDIVIDUAL TUMORS ROUTINE FOR MOST PATIENTS

new data about mutations for researchers, and because the data come from a clinically certified lab, the resulting research insights can more quickly feed back into patient diagnostics and treatment.

Further boosting the impact of the new molecular diagnostics lab will be its tight integration with conventional microscopic tumor analysis at the hands of NYU Langone pathologists, notes Joan Cangiarella, MD, associate professor of pathology, associate dean for faculty affairs, and vice chair of clinical operations. By spotting irregularities in tumor cells on slides and observing how they may change over time, explains Dr. Cangiarella, a pathologist can help establish links between the mutations identified in the molecular lab and how the cancer actually presents and progresses. Examining these links across many patients, she adds, should enable researchers at The Cancer Institute to develop new ways to more quickly determine how each patient's tumor is likely to respond to specific treatments. "There are so many things a clinician can look at in a patient and a tumor," says Dr. Cangiarella. "We need to know which of those things will give us the most useful information for treatment decisions."

Those decisions will be informed by a number of new genomic strategies that researchers and clinicians at The Cancer Institute are helping develop and carry out.

Next generation technology facilitates high-speed sequencing and data analysis.

One strategy is to find those mutations for which approved targeted therapies are available, as well as those mutations that might be addressed by new, unproven drugs being tested in clinical trials. Another approach is to examine how a mutation impacts multiple biological pathways in order to turn up opportunities to find several therapies that might address it, and to examine how pathways common to different types of cancer might lead to therapies that work across cancers.

Cancer Institute researchers are also paying special attention to the genetic profiles of cancer cells from patients who respond unexpectedly well or poorly to a therapy, since these "outlier" cases may enable researchers to pinpoint the mutations that determine how therapy works optimally. What's more, therapy options can be refined by adding information beyond the cancer cell's own DNA; that is, the molecules that attach to DNA (epigenetics) and modify its behavior, and the ways that various proteins impact pathways (proteomics).

Achieving advances that pay off in more effective personalized therapies for patients will likely be a matter of making progress on all these fronts at once, says William L. Carroll, MD, the Julie and Edward J. Minskoff Professor of Pediatrics, professor of pathology, and director of The Cancer Institute. "It won't be just one element that does it," Dr. Carroll says. "We're going to need a complete blueprint that leaves no stone unturned, and that's exactly how we're proceeding." He adds that the work will be enhanced through Cancer Institute collaborations with multi-institutional efforts, such as the extensive genomics project run by the New York Genome Center.

One example of how this work will pay off involves the efforts of Iman Osman, MD, professor and The Cancer Institute's associate director of emerging programs and education, who, along with colleagues, has been working to gain insights into how melanoma spreads to the brain. Dr. Osman believes the new advanced molecular diagnostics lab will further improve clinicians' already substantial ability to match the right treatments to particular melanoma tumor mutations. She is particularly hopeful that the platform will shed light on the question of whether the roughly one-third of melanoma patients who are more likely than others to develop brain metastases in the early stages of the disease can be quickly identified and given extra help. "If we know which patients are at higher risk, we can intervene early and may be able to prevent it from happening," she says.

The genomics effort is likely to provide similar benefits to other forms of cancer over time, predicts Dr. Carroll, adding that The Cancer Institute is moving aggressively to make that happen as quickly as possible. "We don't intend to be an institution that stands on the sidelines in the face of these opportunities to make advances," he says. "And we're focused on the advances that are most likely to bring results to patients."

17,000 SQ.FT.

The Cancer Institute is now assembling a 17,000-square-foot advanced molecular diagnostics lab.

(left to right) Medical oncologist Sylvia Adams, MD, associate professor of medicine; Sandra Demaria, MD, professor of pathology and radiation oncology; and Silvia C. Formenti, MD, the Sandra and Edward H. Meyer Professor of Radiation Oncology and chair of radiation oncology.

HELPING PATIENTS FIGHT CANCER FROM WITHIN

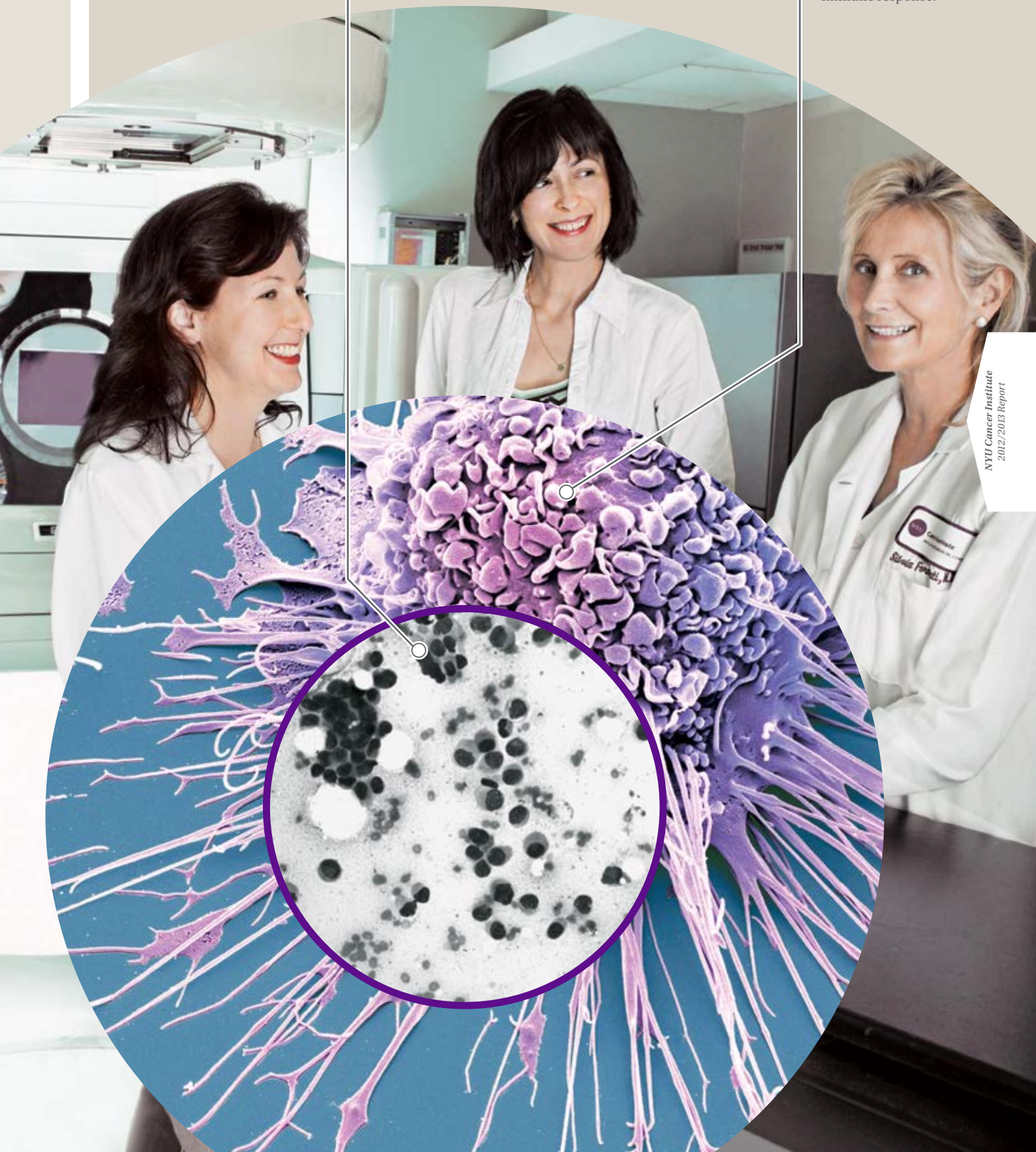
Radiation has long been an important component of cancer therapy—one that's been clearly proven to benefit many patients. The theory behind it was simple: Try to injure the tumor cells in the hopes of directly obliterating the cancer, potentially leading to long-term survival. By conventional wisdom, if there were some tumor cells that couldn't be safely reached by the radiation, the chances that the therapy would make a big difference in outcome were much smaller.

But by 2004, radiation oncologist Silvia C. Formenti, MD, had developed a strong hunch that something else was going on; namely, that radiation might not only be directly injuring tumor cells, but also somehow activating the immune system, enabling immune cells to recognize and target tumor cells wherever they were in the body, whether hit by radiation or not. "My training in internal medicine had taught me that the body has a complex network of sensors that respond to any localized effect," says Dr. Formenti. "I suspected radiotherapy had a systemic effect, too."

Dr. Formenti, the Sandra and Edward H. Meyer Professor of Radiation Oncology and chair of radiation oncology at NYU Langone Medical Center's Cancer Institute, published her theory, and formed an alliance with basic researcher and pathologist Sandra Demaria, MD, professor of pathology and radiation oncology, in

Breast cancer cells can be directly destroyed by radiation—and that process can trigger a helpful immune response.

Antigen from tumor cells uptaken by activated dendritic cells may also jumpstart an antitumor immune response.



COULD RADIATION THERAPY HAVE A SYSTEMIC EFFECT?

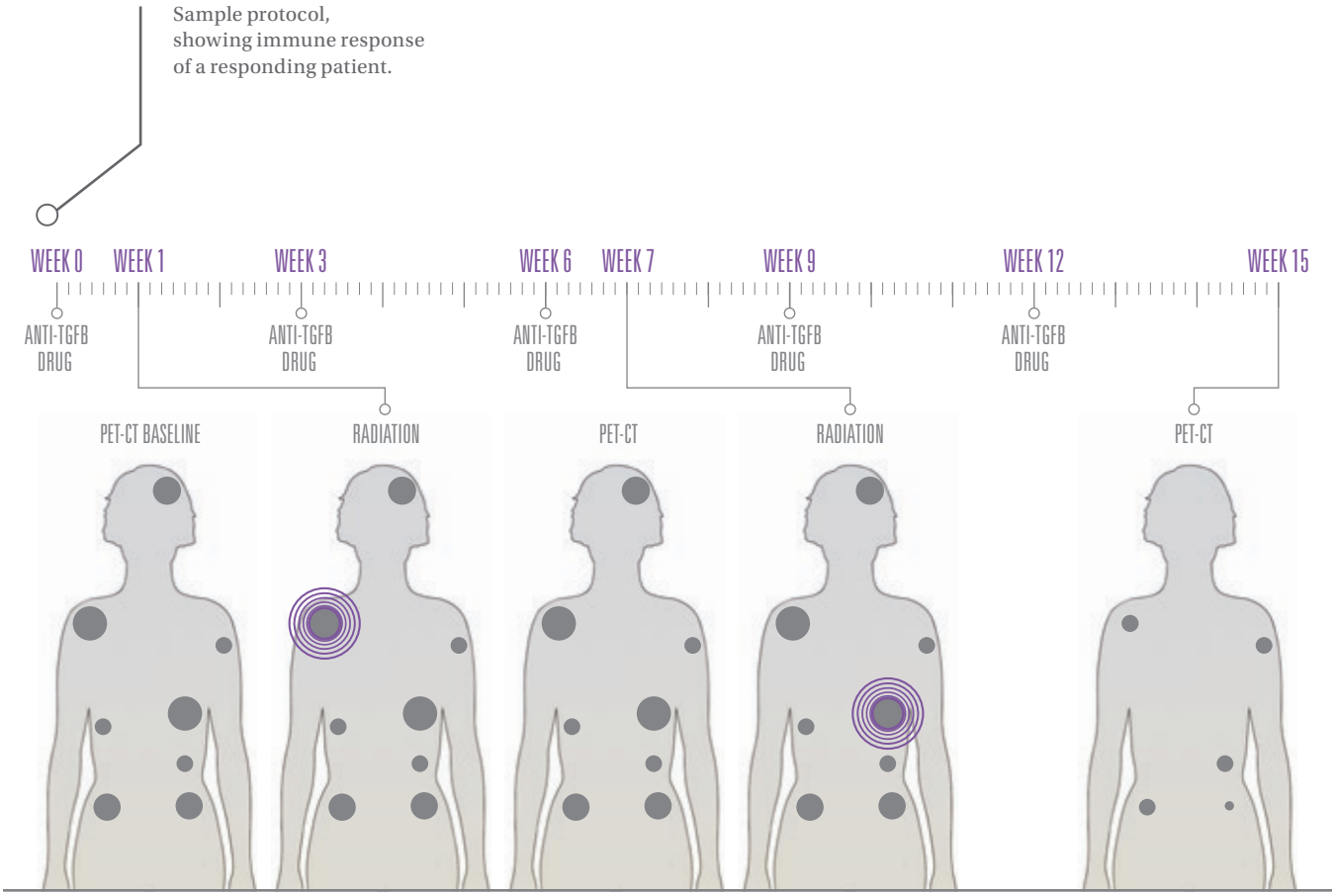
order to explore the possibility that the theory was correct.

At the time, much of the field dismissed the idea. But not only did Drs. Formenti and Demaria initially find evidence that radiation applied to the primary tumor could boost the immune system's ability to fight cancer wherever it spread, they helped kick-start what has become one of the most promising new fields of cancer research and experimental treatment. Today, some 50 teams of researchers and clinicians around the world are focused on studying how radiation can serve as a critical component of an immune-system-enhancing treatment for cancer. Meanwhile, the NYU Langone team has stayed near the forefront of the field, working to pin down the basic science, and, more important, to determine how to impart the benefits to patients.

It hasn't been easy getting to this point. Back when the team was just starting, Dr. Demaria threw herself into the lab work needed to test Dr. Formenti's theory, enlisting models of metastatic tumors to try to prove that radiation could work against them systemically, and to see if there were ways to strengthen the immune-boosting effect. "We knew that radiation by itself didn't seem sufficient to reliably trigger an effective systemic immune response in most patients," says Dr. Demaria. "We needed to know if it could be combined with another therapy to get better results."

Her lab findings suggested the best results came from combining radiation with immunotherapy drugs—those that work by either cranking up the patient's immune system or interfering with a tumor's ability to neutralize an immune response. By injuring tumor cells, says Dr. Demaria, the radiation brings the cells to the attention of the immune system, which is normally on the lookout for cell death. "The immune system in patients with advanced cancer becomes very tolerant of cancer cells," explains Dr. Demaria. "We were able to show, in the animal models, that radiation helps reawaken the immune system's awareness of the cancer so it can attack it." Once sensitized to the cancer cells, the lab experiments suggested that the immune system retains its ability to identify and attack the cells, even if the cancer re-emerges much later. "The immune response becomes a form of personal memory, similar to that generated by a vaccine, against the cancer coming back," says Dr. Demaria.

Recently, Sylvia Adams, MD, associate professor of medicine, joined the team. Her focus has been on combining radiation with a topical immunotherapy in order to treat breast-cancer-related skin metastases, which can manifest as a series of painful, visible, ulcerlike nodes on the chest and up through the arms. In collaboration with Dr. Formenti, Dr. Adams designed a trial for the treatment aimed at women with this difficult-to-treat condition, documenting clear signs that many of the patients' immune systems were rallying to combat the metastases. The two investigators were awarded a Research Project Grant (R01) from the NIH to fund this project. "Getting this sort of systemic response is an important result, because most women who have these metastases ultimately die of this widespread



disease," says Dr. Adams. "We're already able to cure the condition in mouse models with this treatment, and we think the combination therapy could make a difference for some patients." She and Dr. Demaria still sometimes hunch over microscopes looking at biopsy samples from patients undergoing the treatment, occasionally to be rewarded with clear signs that the immune system is rising to the task.

The research started by Drs. Formenti and Demaria has now resulted in five trials of radiation-enhanced immunotherapies currently enrolling patients at The Cancer Institute, and another is in the works. Among the types of advanced cancers for which the treatment approach appears particularly promising are melanoma, breast, and lung cancer. "So far the patient evidence is only observational, but we hope the trials take us to the next step," Dr. Demaria says.

Dr. Formenti gives much of the credit for the progress being made in radiation immunotherapy to the different sets of skills and viewpoints that she and Dr. Demaria have brought to the effort via their close collaboration. She notes that the collaboration with physician scientists is key to extending the program, that has now expanded to include five disease sites (breast, lymphoma, lung, melanoma, and brain). Collaborators include Dr. Adams; Anna Pavlick, DO, associate professor, Departments of Medicine and The Ronald O. Perelman Department of Dermatology; and Iman Osman, MD, professor,

50

Some 50 teams of researchers around the world have begun studying the effects of combined radiation and immunotherapy since the work began at NYU.

Departments of Medicine, Urology and The Ronald O. Perelman Department of Dermatology. Combining expertise in radiology, pathology, and oncology with extensive work, both in the lab and with patients, has been critical to recognizing the potential of the long-overlooked approach, and to advancing it to the point where it shows promise as an integral part of cancer treatment. "We've been able to coalesce around a theme that started at NYU Langone, have developed a critical mass of investigators and that's what's allowing us to make a contribution to the field," Dr. Formenti says. "But in the final analysis, what is most important is the progress we make in curing patients whose prognosis is suboptimal with traditional approaches. And there are signs of hope there."

Paired with ongoing cancer pain research efforts, supportive oncology's integrative approach to care addresses mind, body, and spirit.

SUPPORTIVE CARE FOR THE WHOLE PATIENT

The patient sitting in the office of Tanveer P. Mir, MD, MACP, had recently had cancer surgery. Though the wound was healing, he was now complaining of acute pain. His surgeon had referred him to Dr. Mir, assistant professor and director of supportive oncology and outpatient palliative care at NYU Langone Medical Center's Clinical Cancer Center. Dr. Mir spoke to the patient at length, and then had him meet with other members of her team, including a social worker and a legal adviser. It was only when the team helped the patient address deep concerns about his young son's financial security and future well-being that the man declared his pain was abating. Dr. Mir had recognized that the patient's pain wasn't just physical. He had needed help with his "total pain"—a concept introduced by hospice movement founder Dame Cicely Saunders, referring to the emotional, social, and other components of distress that can blend with physical pain.

That patient's experience illustrates the importance of the Cancer Center's groundbreaking supportive oncology program, which touches all patients at the Clinical Cancer Center with access to everything from family counseling to nutritional guidance, physical therapy, and massage. Dr. Mir is dedicated to the notion that no cancer patient should have to suffer through any form of severe discomfort. It's not enough to wait until the patient reports a problem before taking action, she insists. "Every patient expresses discomfort differently," she says. "Some are very stoic, and won't say anything—you have to try to see it in their faces. Or you have to notice that they're not eating well, or moving well, and recognize why."

Under Dr. Mir, the Clinical Cancer Center has enlisted a series of interventions to relieve all types and aspects of pain, as well as to anticipate and prevent them. Besides employing a range of new pain medications that are more effective and easier to tolerate for some patients than conventional ones, the Clinical Cancer Center provides patients who are receiving chemotherapy with massage therapy, and arranges for discharged patients facing a pain crisis to come in for immediate treatment without having to go through admission. "Managing discomfort not only helps the patient, it relieves the stress of family members who suffer from seeing a loved one in pain," she says. "And it helps the patient get back to the highest possible quality of life more quickly, including being in their own

Tanveer Mir, MD, MACP, assistant professor and director of supportive oncology and outpatient palliative care at NYU Cancer Institute.

THREE MONTHS

Receiving more supportive care not only reduces suffering, research has shown it extends the lives of patients with cancer an average of three months.

homes, being productive at work, and enjoying everything their lives have to offer."

It's a theme echoed in the cluttered office of Abraham Chachoua, MD, the Jay and Isabel Fine Associate Professor of Oncology, associate director of cancer services at The Cancer Institute at NYU Langone, and medical director of NYU Clinical Cancer Center. Dr. Chachoua's office was once sparse, he explains, until years ago when a patient placed a small elephant statuette on his desk, assuring him it would bring good luck. Another patient showed up later with an elephant to put next to the first. A third patient who noticed the first two brought one back from a trip. Patients kept bringing more elephants, crowding Dr. Chachoua's desk and shelves so that he had to build a new set of shelves to contain the spillover, followed by yet another set. Today, Dr. Chachoua explains, the elephants are an element of the care his patients receive, however small. "It gives them a chance to talk about something other than cancer for a few minutes," he says.

The message of Dr. Chachoua's elephant tale is that oncology is not just about treating cancer. "We have to meet all of the patient's needs," he says, "and help patients achieve what they consider to be the highest possible quality of life." Finding more ways to do so has been a priority for Dr. Chachoua and the Cancer Institute.

The idea that cancer patients may need many types of help during what can be a demanding journey is not new. Dr. Chachoua notes that research has shown patients thrive in many ways when they receive supportive services, citing a 2010 Harvard study published in *The New England Journal of Medicine* that found that palliative care could extend survival time. Yet the model for these sorts of interventions in cancer care has long been an effort to merely make services available for those who ask for them, as well as for those experiencing a serious crisis. Unfortunately, many patients who could benefit from these services (and perhaps most) don't always request them, either not recognizing their own need for support, or in some cases, feeling uncomfortable admitting it. And waiting for a crisis—often one that occurs near the end of life—to provide that support isn't a reasonable plan, says Dr. Chachoua. "We can preempt that sort of trauma for the patient and family by emphasizing wellness early on," he says.

The key to getting patients involved in supportive services, Dr. Chachoua explains, is to do it shortly after the patient first receives a diagnosis. "You want to introduce the idea when the patient has time to sit and talk about the issues, instead of waiting for problems to become acute," he says. Among the first appointments scheduled for new patients are those involving evaluations of psychological, social, nutritional, and

PROVIDING THE HELP PATIENTS NEED TO MORE QUICKLY GET BACK TO THE HIGHEST POSSIBLE QUALITY OF LIFE

physical needs. Nurses play a central role throughout the process, and are often the ones who become aware that a patient is silently suffering or troubled, and who recognize which underlying problem may be the key to relieving an entire cluster of symptoms.

Another key member of the supportive oncology team prepared to go beyond the ordinary standard of care is psychiatrist James P. Fraiman, MD, clinical assistant professor and medical director of psychosocial services at the Clinical Cancer Center. "Cancer isn't just a medical problem—it affects the whole person," says Dr. Fraiman. "It can impact their work, relationships, sexual functioning, finances, and other aspects of their lives. Our mission here is help their lives go well during their cancer journey." That help begins by meeting with one of a team of social workers who can listen to the patient's concerns, provide counseling, and help a patient with any of their existing needs. If the concerns suggest there may be signs of significant depression or anxiety—something that nearly a third of cancer patients experience at some point—the patient is then encouraged to meet with Dr. Fraiman, who along with his team offers support groups, one-on-one psychotherapy, medications, and more.

Patients who arrive for appointments get an electronic tablet with questions that help identify stress and other problems. The tablet then flags any difficulties to alert the support team to a possible need to intervene.

Changes in the pattern of answers over time become part of the patient's medical record. "Many people today are more comfortable expressing their feelings in an electronic medium rather than face to face," notes Dr. Fraiman. "However feelings are expressed, there is always someone here willing to help them."

Having a dedicated support team to concentrate on the patient's wellness and quality of life also means that those clinicians dedicated to treatment can focus on the medical side, notes Dr. Chachoua. With research—much of it taking place at NYU Cancer Institute—continually opening new doors for treatment, he says, specialists want to make sure they leave no stone unturned. "We're able to offer promising treatments to some patients we didn't know what to do with just a few years ago," he says.

Still, that doesn't mean Dr. Chachoua's meetings with patients are all about medical details. "The one thing patients always remember about my meetings with them is all these elephants," he says. "And I think that's a good thing."

Biochemist Dafna Bar-Sagi, PhD, senior vice president and vice dean for science, and chief scientific officer of NYU Langone Medical Center; and surgical oncologist George Miller, MD, assistant professor.

PANCREATIC ADENOCARCINOMA

TEAMING UP TO OUTWIT A TOUGH DISEASE

In most cancers, about 10 to 40 percent of tumors exhibit a Ras oncogene mutation—a mutation that gives these cancer cells a growth advantage over normal, noncancer cells. "But in human pancreatic adenocarcinoma, the Ras oncogene is mutated in greater than 95 percent of cases," says biochemist Dafna Bar-Sagi, PhD, professor and internationally known expert in Ras biology. "It may be one reason," she notes, "that pancreatic cancer tends to be so difficult to cure," and it's why Dr. Bar-Sagi, senior vice president and vice dean for science, and chief scientific officer of NYU Langone Medical Center, focused in on trying to understand the role in pancreatic cancer. Dr. Bar-Sagi leads a team that has helped forge a number of breakthroughs related to Ras that could point to new, more effective treatments.

Pancreatic cancer cells use certain processes to acquire the energy they need to survive—and researchers are learning how to shut them down.

Because symptoms from pancreatic cancer usually occur when the tumor is advanced, pancreatic adenocarcinoma can be among the most challenging cancers to cure. But Dr. Bar-Sagi is among a number of researchers at NYU Langone's Cancer Institute who have been steadily gaining new insights into this formidable disease, thanks to highly collaborative efforts that draw on The Cancer Institute's strong links to basic science, translational research, and clinical care.

Dr. Bar-Sagi's group, for example, discovered some years ago that Ras facilitates "immune evasion"; that is, Ras helps turn off the immune system's ability to recognize and attack the tumor by increasing the cell's production of proteins that interfere with the immune response. Since then, the search has been on for compounds that could turn the production of these proteins off, countering Ras's effect. "The best weapon against pancreatic tumors would be our own immune system," says Dr. Bar-Sagi.

Now, Dr. Bar-Sagi's team, working with colleagues from other institutions, has published the details of a major breakthrough that may prove even more fruitful in terms of developing new drugs to combat Ras's role in the growth of pancreatic cancer. In a series of experiments described in the prestigious journal *Nature* in 2013, Dr. Bar-Sagi and her colleagues document another way that Ras promotes tumor cell growth: by boosting these cells' ability to drink in amino acids from surrounding tissue and use them as building material for new cancer cells, a process known as macropinocytosis. "We believe that macropinocytosis could be targeted," says Dr. Bar-Sagi. "If we could turn off the way Ras helps cancer cells take

A focus on a particular gene within a particular type of cell can open up new angles of attack on pancreatic cancer.

in the amino acids, we might be able to choke tumor cells by keeping them from the nutrients and building blocks they need to grow and survive."

The macropinocytosis process could even open up an opportunity to use the Ras-mutated cell against itself. Some potentially effective cancer drugs don't get to deliver their full punch because too little of the drug makes it inside the cells. In theory, a new drug could be designed to take advantage of oncogenic Ras to get cells to drink it via *macropinocytosis*.

Dr. Bar-Sagi's clinical colleagues in the NYU Langone GI Cancer Program have noted that the new insight may help explain why the new protein-bound cancer drug nab-paclitaxel (Abraxane® from Celgene Corporation) has shown promise for patients with pancreatic cancer. "We believe that among the chief reasons for its efficacy is the increased uptake of the drug by Ras-mutated pancreas cancer cells," says Lawrence P. Leichman, MD, director of the NYU Langone GI Cancer Program.

The macropinocytosis theory is new to most clinical specialists, notes Dr. Leichman, and NYU Langone is trying to bring potential benefits to patients as quickly as possible. For starters, the GI Cancer team has begun a new program that enlists nab-paclitaxel in combination with another agent, gemcitabine, prior to radiation therapy and surgery. "We medical oncologists are working with NYU Langone basic scientists, surgical oncologists, radiation oncologists, radiologists, and pathologists to define which patients will benefit most from this new treatment," says Dr. Leichman. "This type of broad and innovative collaboration is translational cancer therapy at its best, and the Cancer Institute's multidisciplinary yet close-knit environment positions us perfectly for it."

95%+

The Ras gene is mutated in over 95 percent of patients with the most common form of pancreatic cancer.

Any new target is potentially critical when it comes to pancreatic cancer. That's because pancreatic cancer isn't like other cancers, notes NYU Langone surgical oncologist George Miller, MD, assistant professor and an NIH-funded researcher. For one thing, Dr. Miller says, much of a pancreatic cancer tumor consists not only of mutated cancer cells, but of inflammatory cells. "More than with other cancers, in pancreatic cancer there is a constant back-and-forth interplay between the cancer cells and their inflammatory environment," he explains.

The tumor cells appear to rely on this interaction for growth and to avoid immune system attack, notes Dr. Miller. But he adds that knowing so also opens up the possibility of slowing tumor growth by finding a way to interrupt that cellular partnership. "It's a potential opportunity to turn that strength to our advantage," he says. That's one direction that Dr. Miller's research is taking, via work on mouse models of pancreatic cancer and inflammation.

Another NYU Langone researcher exploring inflammation is pathologist and microbiologist Dan Littman, MD, PhD. Dr. Littman, the Helen L. and Martin S. Kimmel Professor of Molecular Immunology and a Howard Hughes Medical Institute investigator, doesn't just focus on cancer; his basic science research into the relationship between inflammation and gut bacteria in animal models is yielding surprising potential links to disease, including possible connections to pancreatic cancer, as well as colorectal tumors.

Lawrence P. Leichman, MD, director of the NYU Langone GI Cancer Program.

CHOKING TUMOR CELLS OFF FROM THE NUTRIENTS THEY NEED

Dr. Littman recalls how a key break in his research came when his group discovered that the level of certain immune cells, called T helper 17 cells, appeared to vary wildly in newly purchased batches of mice in his lab, even though all the mice were genetically identical. One of the team researchers eventually realized that the determining factor appeared to be whether or not the mice carried a gut bacterium called segmented filamentous bacterium (SFB). Sure enough, tests eventually confirmed that adding SFB to the mice guts strongly drove up the numbers of T helper 17 cells.

It was an important discovery, because high levels of T helper 17 cells are linked to some autoimmune disorders, including arthritis and multiple sclerosis, as well as to speeding the growth of some types of tumors. Dr. Littman's group is now studying the relationship of SFB and T helper 17 cells in patients, and whether the link to disease holds as it does in mice. "We're a long way from being able to say conclusively that SFB is a causative bacterium in humans for autoimmune disease and tumor growth," says Dr. Littman. "But we think there may be a connection."

If so, it will be yet another promising new potential path to treating some of the toughest tumors.

NEW WAYS TO BRING THE BIG PICTURE INTO FOCUS

How best to approach the enigmatic puzzle that is cancer? Knowing that a single breakthrough is unlikely to cure this set of complex diseases, the Cancer Institute at NYU Langone is mounting a multifaceted attack with an aggressive focus on the most promising approaches.

Consider the approach of genetically profiling tumors in order to identify the drugs most likely to be effective for a particular patient. That's a critical part of the puzzle, and one in which we at the Cancer Institute are playing a leading role. And we are expanding scientific understanding of genetic information beyond DNA structure to the molecules that surround genes and influence them, in order to discover yet new opportunities to beat cancer.

We are confronting the genetic roots of cancer on multiple levels, helping move the state of the art beyond conventional classification of tumors. That means finding those biological pathways that drive tumor growth in ways that may be common to different tumors, so that we can identify treatments that may work on more patients with a particular type of cancer, or even across different cancers.

We are also playing a critical role in pioneering impressive advances in treatments that combine radiation therapy and drugs in order to enable patients' own immune systems to effectively fight tumors. We're improving the ability to image and track tumors to determine more quickly what works and what doesn't in individual patients, so that we can more quickly zero in on the right treatments. And we are finding new ways to combine all these approaches and more, in order to get the best possible results.

This strategy of enlisting a better understanding of the big picture as well as the critical details—that is, paying attention to both the forest and the trees, a notion we explore throughout this report—is one the Cancer

Institute is uniquely poised to follow. It's a strategy that's anchored in the tremendous depth of expertise we maintain across a range of domains critical to addressing cancer, from neurosurgery to radiology, pathology, and environmental biology, and from basic science to bedside care, outpatient services, and community health.

All this is enabled by an intensely collaborative environment that allows a free back-and-forth flow among these domains. Laboratory experiments here are informed by what's happening today with patients, and clinicians make treatment decisions with an eye to what's happening today in our basic science labs. We're prepared to selectively combine the tried and true with tomorrow's discoveries. The results continue to reinforce our belief that this is a battle we are on the way to winning, one small victory at a time.

We are committed at the same time to being at the forefront of addressing the patient's total experience. That may involve providing help with the pain, emotional trauma, financial difficulties, family stress, work pressures, and more, that can all go along with facing down cancer.

That we do all this in the great city of New York is not an accident of geography. Drawing on the vast, amazingly diverse community around us gives us insight, inspiration, and a range of unique resources. And we aim to give back to this remarkable community, not only through patient care, but also by helping to reduce the risks of cancer on a population level. The resulting lessons in what works enable us to contribute even more to reducing the cancer burden for people everywhere.

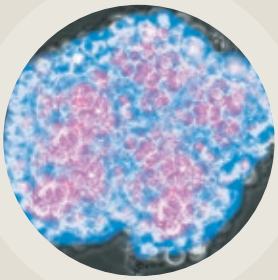
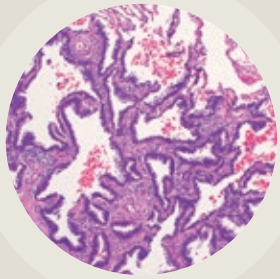
All of us at the Cancer Institute are grateful for the opportunity we have to serve in this enormously empowering environment. We intend to continue to make that opportunity pay off in improving the outlook for everyone who is touched in some way by the challenge of cancer. I'm proud we're able to report that our strategy is proving effective, and that our progress is substantial.

Bill

WILLIAM L. CARROLL, MD

The Julie and Edward J. Minskoff Professor of Pediatrics
Professor of Pathology, NYU Langone Medical Center
Director, NYU Cancer Institute



RESEARCH HIGHLIGHTS

The momentum continues as our investigators strive "to discover the origins of human cancer and to use that knowledge to eradicate the personal and societal burden of cancer in our community and the nation, and globally." Here's a glimpse into just a few of their accomplishments:

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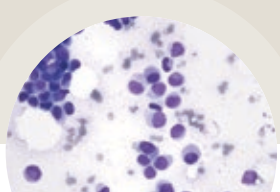





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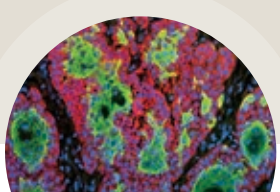
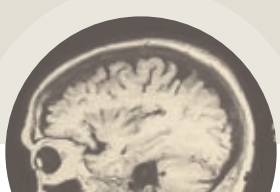

PHILANTHROPY

The Cancer Institute at NYU Langone Medical Center is especially grateful to the many individuals, foundations, corporations, and organizations that have aided our effort in the fight against cancer. The generous donors listed here made gifts, commitments, and/or event payments of $10,000 or more in fiscal year 2012 (Sept. 1, 2011–Aug. 31, 2012).

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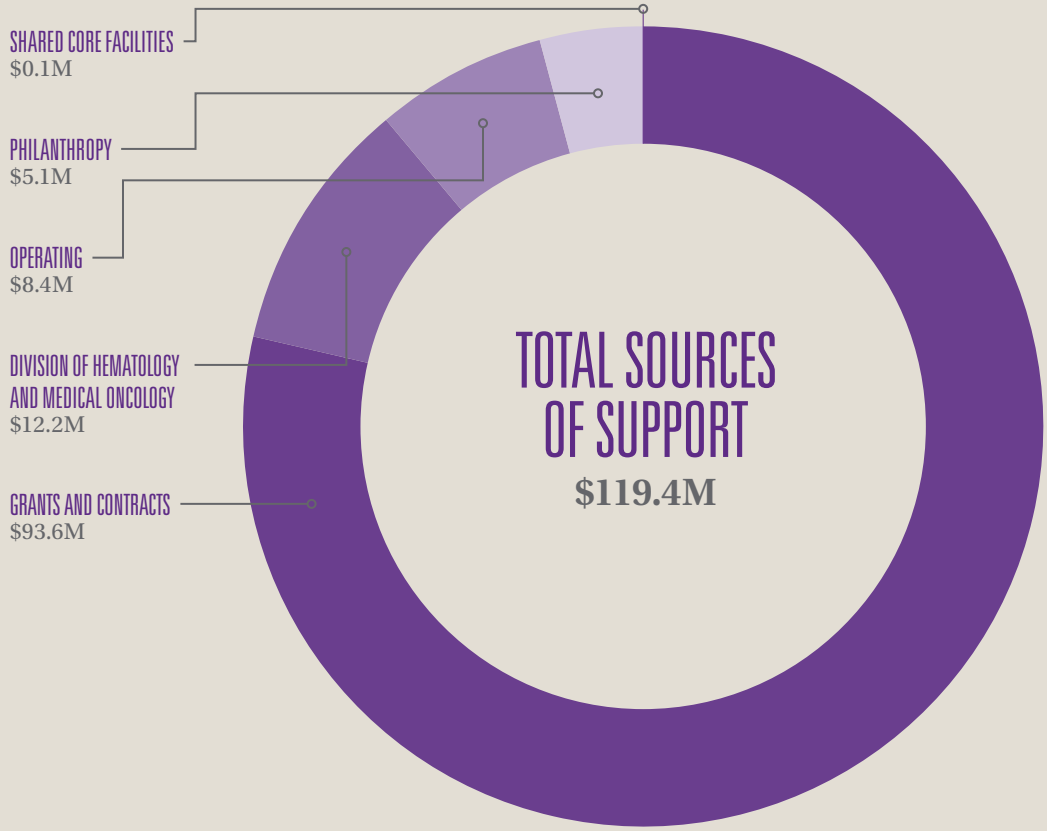

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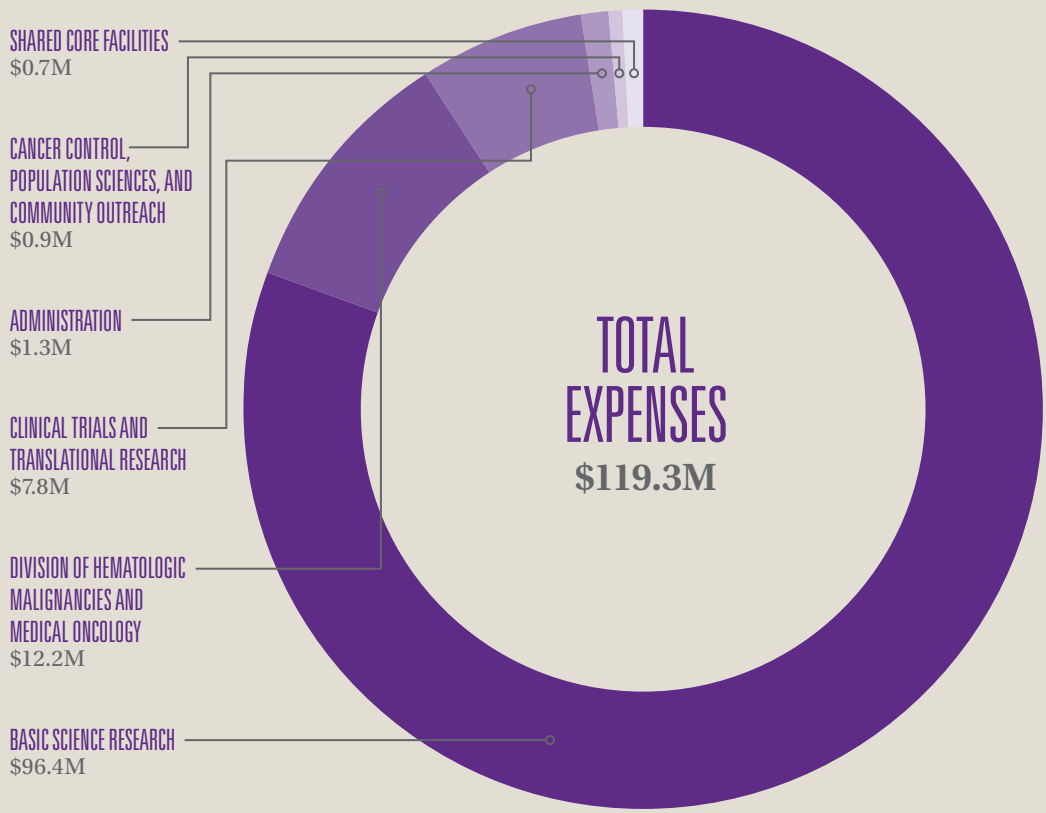
(For Fiscal Year 2013)



*The Cancer Institute sets the scientific, clinical, and educational agenda for oncology across the NYU Langone Medical Center. Resources and institutional support are allocated to various departments and institutes to fund cancer-focused basic and clinical research initiatives, faculty recruitment, programs in various disease areas, the Division of Hematology and Medical Oncology, and new technologies.

NYU CANCER INSTITUTE FACTS AND FIGURES

209,000+
patient visits in FY2013 (total among our major sites).

$93.6
million in research funding inclusive of $20.4 million from the National Cancer Institute.

180+
oncology clinical trials available (132 interventional).

7,000+
community members, patients, and healthcare professionals benefit from our community outreach and education programs.

208,170 SQ. FT.
of dedicated space, a 550% increase since 2002.

232
investigators working on cancer initiatives.

18.2%
patient participation in clinical trials, compared to 4% national average.

∞
commitment to eliminating the burden of cancer.

IMPORTANT PHONE NUMBERS

New Patient Physician Referral Line:
212.731.5000

Clinical Trials Information:
212.263.4432

Mammography and/or Related Procedures:
212.731.5002

Lung Cancer Screening Program:
855.698.5864

Smoking Cessation:
212.731.5767

Lynne Cohen and Caring Together Project for Women with Increased Risk for Cancer Clinical Cancer Center:
212.731.5452

Lynne Cohen and Caring Together Project for Women with Increased Risk for Cancer Bellevue Hospital Center:
212.263.3198

Stephen D. Hassenfeld Children's Center for Cancer and Blood Disorders:
212.263.8400

100 Women in Hedge Funds National Ovarian Cancer Early Detection Program:
212.731.5345

NYU Clinical Cancer Center Support Group Information Line:
212.731.5480

Speakers Bureau & Community Outreach Programs:
212.263.6342

Media Inquiries:
212.404.3555

Office of Development:
212.404.3640

NYUCI Office of the Director:
212.263.3276

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THE CANCER INSTITUTE AT NYU LANGONE MEDICAL CENTER

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1 / MAIN CAMPUS:
Tisch Hospital, including the Rita J. and Stanley H. Kaplan Stem Cell/Bone Marrow Transplant Center
NYU School of Medicine
Rusk Rehabilitation
Sackler Institute of Graduate Biomedical Sciences
Cancer Research Center at Joan and Joel Smilow Research Center
The Helen L. and Martin S. Kimmel Center for Stem Cell Biology at the Skirball Institute of Biomolecular Medicine
550 First Ave.
New York, NY 10016

2 / Department of Environmental Medicine: Division of Biostatistics
650 First Ave.
New York, NY 10016

3 / Hospital for Joint Diseases
301 East 17th St.
New York, NY 10003

4 / NYU Cancer Institute Office of the Director
522 First Ave.
Smilow 1201
New York, NY 10016

5 / NYU Cancer Institute Administrative Offices
215 Lexington Ave.
New York, NY 10016

6 / Molecular oncology/cancer genomics laboratory
240 East 38th St.
(22nd Floor)
New York, NY 10016

7 / Clinical and Translational Science Institute
227 East 30th St., 8th Floor
New York, NY 10016

8 / New York University College of Dentistry David B. Kriser Dental Center
345 E. 24th St.
New York, NY 10010

9 / Nelson Institute of Environmental Medicine
57 Old Forge Road
Tuxedo, NY 10987

10 / New York University College of Nursing
726 Broadway, 10th Floor
New York, NY 10003

11 / Alexandria Center for Life Science
450 East 29th St.
New York, NY 10016

12 / Center for Women's Imaging
221 Lexington Ave.
New York, NY 10016

13 / Ronald O. Perelman Department of Dermatology, Charles C. Harris Skin & Cancer Unit
240 East 38th St.
New York, NY 10016

14 / Smilow Comprehensive Prostate Cancer Center
135 East 31st St., 2nd floor
New York, NY 10016

15 / The Stephen D. Hassenfeld Children's Center for Cancer and Blood Disorders: Hassenfeld Children's Hospital
160 East 32nd Street
New York, NY 10016

16 / CLINICAL CANCER CENTERS:

16A / *160 East 34th Street*
New York, NY 10016

16B / *240 East 38th Street*
18th Floor/19th Floor
New York, NY 10016

16C / *97-77 Queens Boulevard*
Rego Park, NY 11374

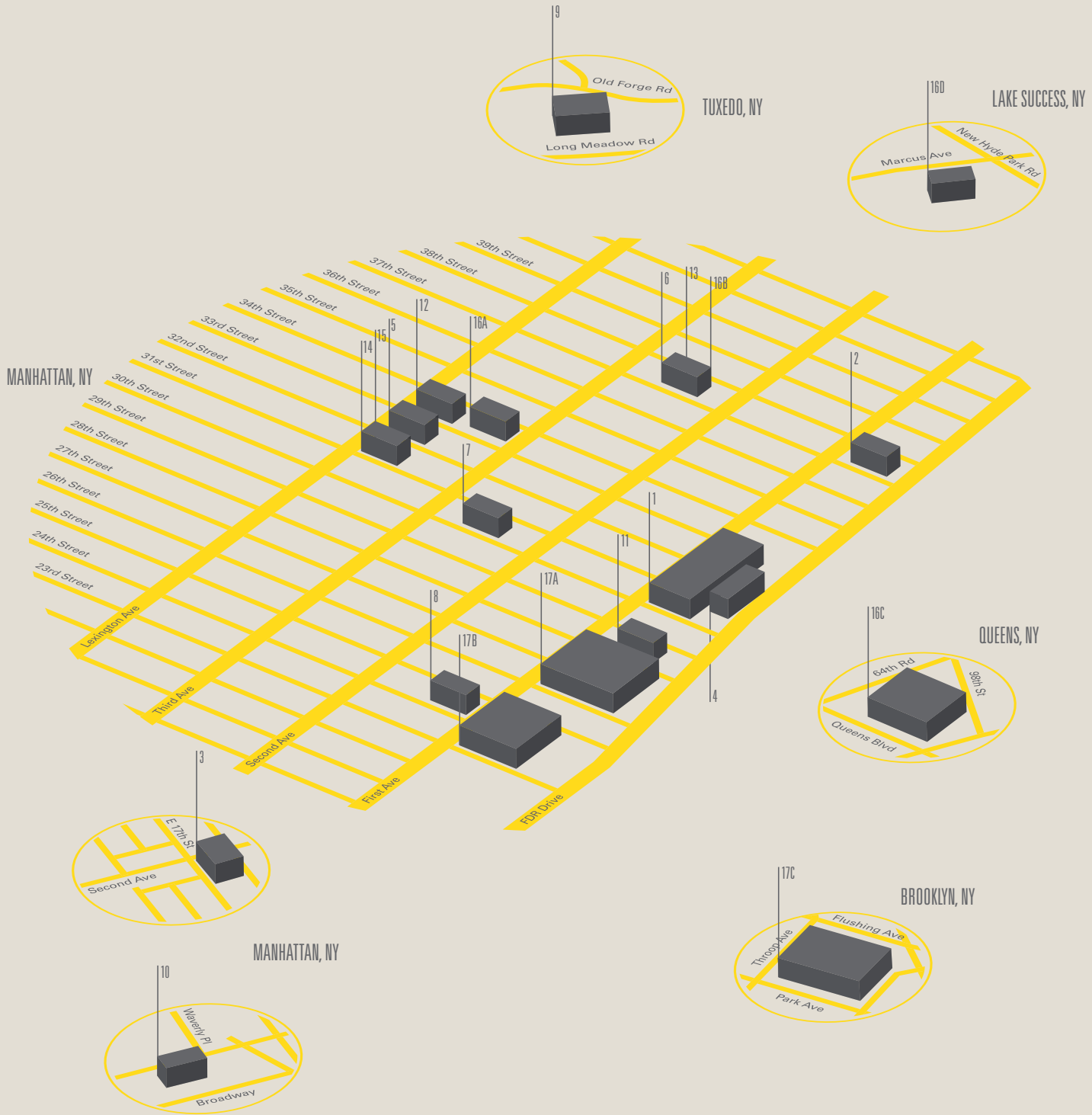
16D / *1999 Marcus Avenue*
Lake Success, NY 11042

17 / AFFILIATIONS:

17A / Bellevue Hospital Center
462 First Ave.
(at 27th Street)
New York, NY 10016

17B / United States Department of Veterans Affairs VA NY Harbor Healthcare System
423 East 23rd St.
New York, NY 10010

17C / Woodhull Medical and Mental Health Center
760 Broadway
Brooklyn, NY 11206



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