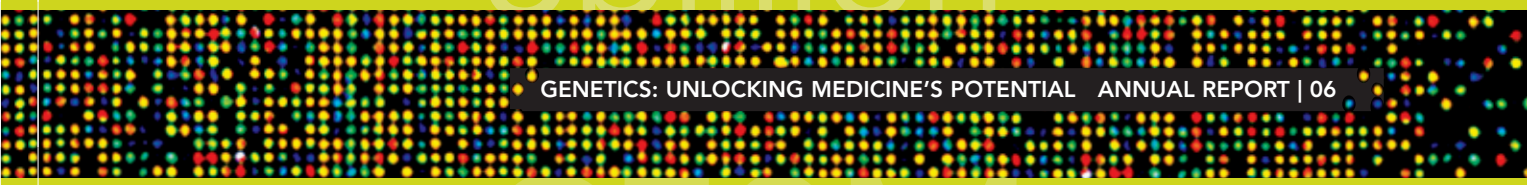
Columbia University
College of Physicians
and Surgeons

COLUMBIA UNIVERSITY COLLEGE OF PHYSICIANS & SURGEONS

22,000
genes

400,000
proteins

3 billion
chemical base pairs



GENETICS: UNLOCKING MEDICINE'S POTENTIAL ANNUAL REPORT | 06

$50M
grants received

120,000
square feet of research space

87% accuracy
detecting Down syndrome

ANNUAL REPORT 2006

Columbia University Medical Center

UNLOCKING

MEDICINE'S POTENTIAL

The potential of genetic medicine is far-reaching, but much work lies ahead to use the human genome as a base for personalized medicine. Work at Columbia is illustrated in this report by three compelling pursuits: seeking the unknown, unlocking the potential, and translating the knowledge. The image at left and on the cover is a fluorescent sequencing chip image from innovative DNA sequencing technology invented by Professor Jingyue Ju, Ph.D., Head of DNA Sequencing and Chemical Biology at the Judith P. Sulzberger, M.D., Columbia Genome Center. This new technology will have the potential of deciphering an entire human genome for just $1,000.

Human DNA has about **22,000** genes.

These genes code for about **400,000** proteins.

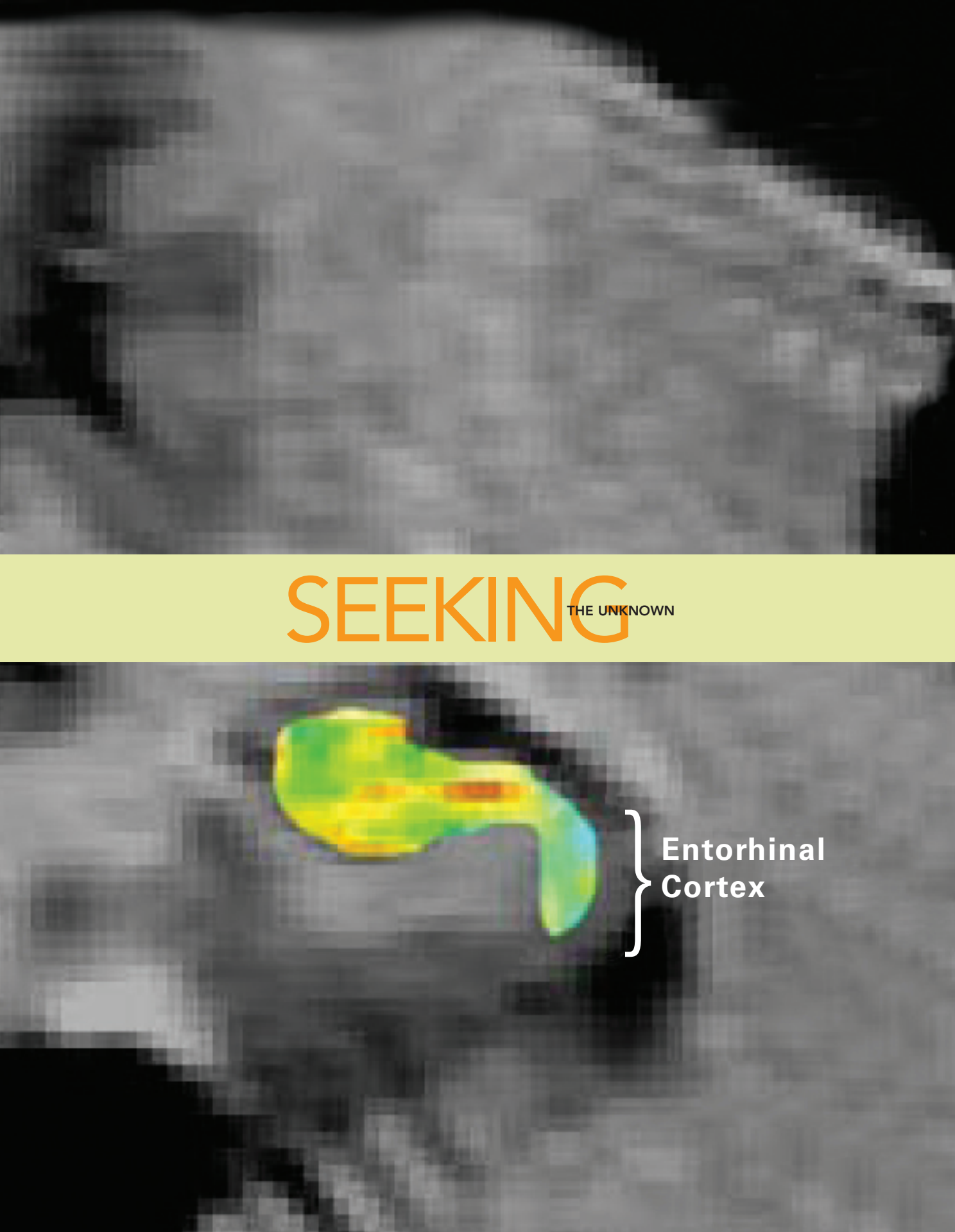
3 billion chemical base pairs make up human DNA.

Columbia received nearly **$50 million** of the $235 million in grants awarded by the NIH for Roadmap projects in 2005.

The Irving Cancer Research Center has **120,000 square feet** of research space on nine floors.

The FASTER Trial (First and Second Trimester Evaluation of Risk) involved some 38,000 women at 15 centers nationwide and found that a new prenatal screening method is **87% accurate** in detecting Down syndrome in the first trimester.

SEEKING THE UNKNOWN

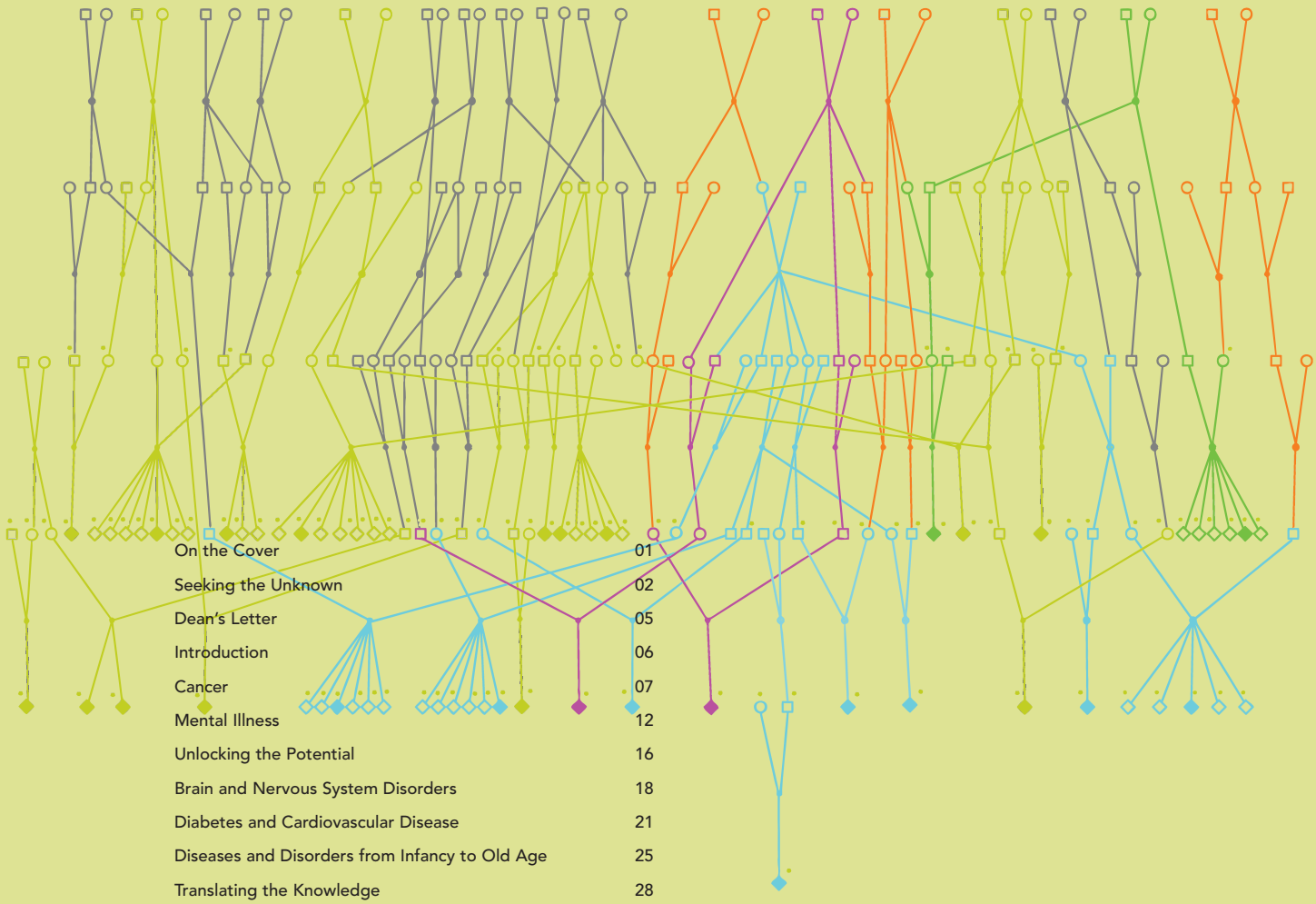


ALL TREATMENTS AND DIAGNOSTIC TOOLS BASED ON GENETICS MUST BEGIN WITH GENE DISCOVERY – A QUEST THROUGH THE RECENTLY MAPPED GENOME FOR LINKS, ASSOCIATIONS, AND PREVIOUSLY UNKNOWN FACTORS.

Researchers approach gene identification in a number of ways.

One of the more creative approaches Columbia researchers used this year was a targeted search in an area of the brain known to house the starting line for Alzheimer's disease.

By using imaging studies to look in the entorhinal cortex within the hippocampus, researchers found four genes overexpressed in people with Alzheimer's disease and zeroed in on the one they think is most likely associated with the disease.



On July 1, 2006, it was a privilege to become dean of the College of Physicians & Surgeons of Columbia University. The College's accomplishments of the 2005-2006 year, described in part in this annual report, demonstrate precisely why I feel so honored to lead such an extraordinary medical school.

Our plan for the College of Physicians & Surgeons is to create a supportive environment of the highest academic standards, to recruit the best students and faculty, and to retain the most talented people in their fields. The newest among us as well as the physicians, scientists, and educators who have long devoted their careers to P&S will thrive in such an environment. Columbia should be recognized as one of the very best academic medical centers in the world.

Our key challenge as we pursue this goal is to make what is good at Columbia even better, while investing in additional areas to achieve the breadth of the scientific, educational, and clinical mission required of the best academic medical centers. Some organizations can choose to divest from sectors in which they are not already leaders, but a great medical school needs depth across the entire range of specialties that are vital to human health. Given the multiple facets of our mission, only a limited number of medical schools in the world can aspire to greatness in all fields. Columbia must be one of them. Anything less would be to abandon the ideals to which P&S has aspired since its founding as the second medical school in the American Colonies.

This past year was a watershed for great scientific vision at Columbia, particularly in genomics and proteomics. In a year in which the National Institutes of Health awarded some $250 million for its new Roadmap research initiatives in genomics, proteomics, and related fields, Columbia received 20 percent of that funding – a testament to the extraordinary quality of the faculty here and to our commitment to the future of genetic medicine.

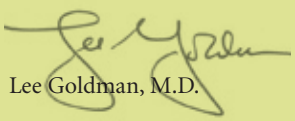
These new research efforts will play an important role as we address one of the biggest challenges shared by all leaders in academic medicine: to make the transition into "big science" and all that this transition entails, such as core facilities, advanced technology, and pre-eminence across the spectrum of disciplines. In today's world, scientists and physicians must work in institutions with 21st century facilities. The centers that successfully combine expertise and resources will be at the forefront of such fields as genomics and proteomics, computational biology, and developmental biology.

We also must reinforce our commitments to education and to clinical care. Our students are truly spectacular, and we must upgrade our educational facilities and revamp our curriculum if we are to continue to train tomorrow's leaders. Both of these initiatives have already begun under the guidance of our educational leaders.

Our new Faculty Practice Organization, formed shortly after my arrival, is dedicated to improving the systems in which our outstanding individual physicians practice. Our clinical programs are where we have our greatest impact on New York on a day-to-day basis. We take great pride in our broad clinical mission, including our partnership with NewYork-Presbyterian Hospital. We provide outstanding primary medical care and the most sophisticated specialty care, and we provide this range of care to the most vulnerable New Yorkers, who often have no other option for medical care, as well as people who could choose to get their care anywhere in the world.

To achieve our lofty goals, we will rely on a combination of vision and sweat. The vision is making Columbia an exciting place to be – a place on the cutting edge of science, education, and clinical care. This vision can flourish best when the infrastructure enables results to flow from creativity and hard work. These are self-reinforcing goals. Simply put, great opportunity will attract the best to Columbia; a satisfying work environment will keep them here.

We must all work together to set priorities that will keep Columbia in its rightful position at the pinnacle of excellence, as indisputably one of the greatest medical schools in the world. I look forward to working with all of you to realize this vision.



Lee Goldman, M.D.

When the U.S. Human Genome Project announced in 2003 that it had sequenced the entire human genome – identifying the approximately 22,000 genes found in human DNA and sequencing the 3 billion chemical base pairs that make up our DNA – headlines touted the achievement as the "book of life." But what seemed to many like the finish line of a 13-year race (the effort to sequence the genome began in 1990) was, in fact, only the starting line.

Understanding human genetics and the role our genes play in disease and wellness using the sequenced human genome is a little like planning an extended, cross-country tour of the United States using only a large wall map. You can see the major cities, what states they are in, and where they are located relative to one another. But you don't know much about many of those cities, the highways that connect them, or where you might want to go and what you might do once you get there. You know that there are oceans near Los Angeles and mountains near Denver, but what's in Dubuque, Paducah, and Grants Pass?

Now that we have the "wall map" created by sequencing the human genome, we must understand how these genes interact, how they are turned on and off or instructed to increase or decrease their activity, and how that affects the proteins for which they code. That is a vastly more daunting task – although there are just 22,000 genes, more or less, in the human genome, they code for about 400,000 proteins.

Research over some 50 years – since the day in 1953 when Francis Crick and James Watson walked into a Cambridge pub and announced that they had found "the secret of life" by determining the structure of DNA – has identified a number of single genes, their protein products, and the inheritance patterns behind single-gene disorders like Huntington's disease and hemophilia.

But understanding how multiple genes and proteins interact with our environment to cause human disease and how we can intervene in this process to treat and even cure those diseases will now be the critical challenge, and an enormous one it is. It brings together basic and translational research, chemistry, physics, biology, and computer engineering to a vast undertaking whose methods include everything from using microarrays to analyze mRNA expression patterns to using robotic instruments to streamline the determination of thousands of protein structures.

Columbia is one of the institutions at the forefront of this international effort, following a landmark year in which three major new centers have been established to advance the next generation of genomics and proteomics research. These centers – the National Center for Multi-Scale Analysis of Genetic and Cellular Networks, a Molecular Libraries Screening Center, and the New York Consortium on Membrane Protein Structure – are all funded by major grants from the National Institutes of Health and will complement the extraordinary investments being made in disease-specific gene and protein research conducted throughout Columbia.

Genomics and proteomics may sound like fields that belong primarily at the lab bench, but every day at Columbia, our growing foundation of basic science knowledge about these once-mysterious realms is being translated into new possibilities for treatment and avenues for prevention. From cancer to Alzheimer's disease, from diabetes to obesity, from cardiovascular disease to mental illness – virtually every condition we care for here at Columbia has a genetic component.

Cancer

CANCER IS GENETICS. EVERY MALIGNANT TUMOR BEGINS AS A MUTATION IN ONE OR MORE GENES, GENES THAT ORDINARILY PROMOTE NORMAL, CONTROLLED CELL GROWTH. WHEN THESE MUTATIONS – EITHER INHERITED OR ACQUIRED – ARISE AND ACCUMULATE, THEY LEAD TO CANCER. INDEED, OUR GROWING GENETIC UNDERSTANDING OF ONCOLOGY HAS LED TO THE REALIZATION THAT NO ONE CURE FOR CANCER WILL BE FOUND BECAUSE CANCER IS NOT ONE DISEASE BUT MANY DISEASES, EACH CAUSED BY DIFFERENT GENETIC CHANGES. LUNG CANCER AND BREAST CANCER, FOR EXAMPLE, COME IN SEVERAL DIFFERENT TYPES, AND DIFFERENCES IN GENETICS MEAN THAT A TREATMENT THAT WORKS WITH ONE TYPE MAY BE VIRTUALLY USELESS IN ANOTHER.

"This evolving knowledge allows us to identify subtypes of each cancer, with different prognoses, understand which genes are altered, and develop targeted therapies that are better suited for the particular type of cancer," says Riccardo Dalla-Favera, M.D., the Percy and Joanne Uris Professor of Genetics and Development and Pathology and director of the Herbert Irving Comprehensive Cancer Center. "We can now design drugs that essentially attack every part of the cancer cell."

That is exactly what is happening throughout the nine floors of the new Irving Cancer Research Center, a 120,000-square-foot facility dedicated solely to cancer research, which doubles the research capacity of the Herbert Irving Comprehensive Cancer Center. Columbia's leading physician-scientists in oncology have already moved into the building, and Dr. Dalla-Favera expects to recruit several more faculty members over the next five years, including five to six with expertise in translational research. "We want to have leading investigators in each key area: understanding the biology of the target organ and which genes are altered; advanced diagnostics; and translational researchers in clinical oncology," he says. "This research will be brought together with population science. Education, control, and prevention will also be a major strength of the cancer center."

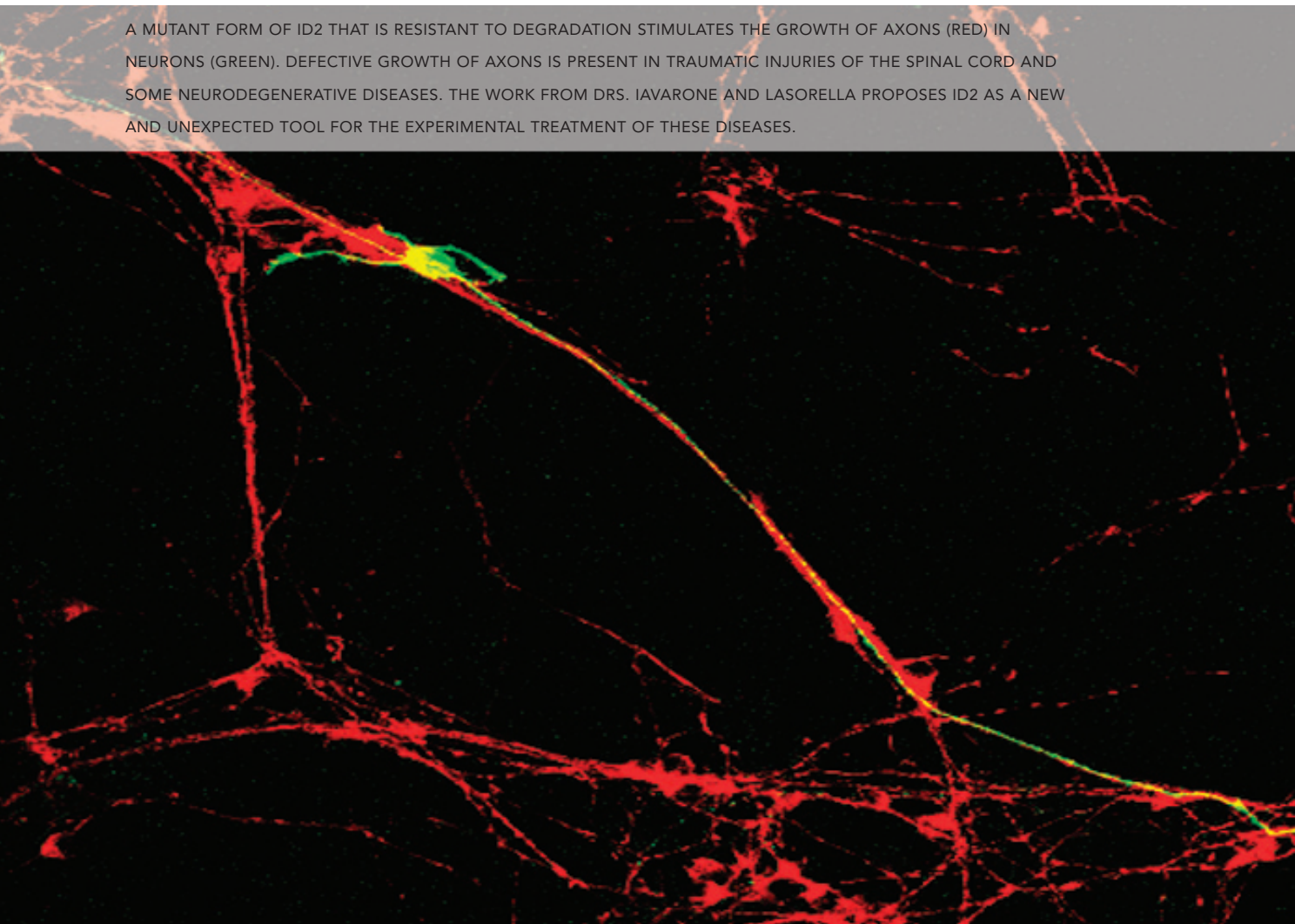
Several key discoveries in cancer genetics have been made at Columbia over the past year. Andrea Califano, Ph.D., professor of biomedical informatics, has developed the first genome-wide snapshots

of the transcriptional networks of normal and malignant human B and T cells – the two main types of white blood cells, which are key to the body's immune response. Working with Riccardo Dalla-Favera and Adolfo Ferrando in the Institute for Cancer Genetics, he was able to "reverse engineer" the transcriptional and signaling networks that govern the genetic interactions of these cells – something not previously accomplished in a human cell. Understanding these networks is essential to both defining the normal functions of these cells and to dissecting the complex array of changes that can happen when cell function goes awry.

Building on the work of his colleague, P&S microbiologist Kathryn Calame, Ph.D., Dr. Dalla-Favera has been studying an unusual tumor suppressor gene called Blimp-1 (B lymphocyte induced maturation protein). It's been called a "master regulator" of B cell differentiation – a crucial transcriptional "switch" in the generation of functionally competent plasma cells. But in B-cell lymphoma, Dr. Dalla-Favera and his colleagues found, Blimp-1 is inactivated – and the cells that should have become plasma cells become cancer cells instead.

Columbia scientists also have helped to answer a key question about the evolution of cancer: How does a tumor-initiating cell, also known as a "cancer stem cell," arise from a normal cell? These stem cells

A MUTANT FORM OF ID2 THAT IS RESISTANT TO DEGRADATION STIMULATES THE GROWTH OF AXONS (RED) IN NEURONS (GREEN). DEFECTIVE GROWTH OF AXONS IS PRESENT IN TRAUMATIC INJURIES OF THE SPINAL CORD AND SOME NEURODEGENERATIVE DISEASES. THE WORK FROM DRS. IAVARONE AND LASORELLA PROPOSES ID2 AS A NEW AND UNEXPECTED TOOL FOR THE EXPERIMENTAL TREATMENT OF THESE DISEASES.



are thought to be the engines of tumor progression, but where do they come from? A better understanding of cancer stem cells is essential if therapies are to be developed to target these critical elements of the disease.

Think of cell division as an assembly line in a factory. Just as the process of assembling a new car is monitored with stringent quality control, so is cell division. A mistake in assembling a car can lead to a deadly accident, while a mistake made when a cell divides can lead to a deadly cancer. One "checkpoint" that confirms the cell is dividing normally makes sure that chromosomes can be separated appropriately. But Columbia scientists Timothy Bestor, Ph.D., and Marc Damelin, Ph.D., have found that stem and progenitor cells are deficient in this checkpoint and will divide even if the chromosomes are entangled. If cells divide with their chromosomes still tangled, defects will almost certainly result – defects that are the hallmarks of cancer, such as too many chromosomes, too few chromosomes, or chromosomes that are rearranged.

Of course, the biology of cancer also poses important questions for the burgeoning field of stem cell research and, ultimately, stem cell therapies. Since progenitor stem cells are coaxed to divide again and again, this mistake – dividing with entangled chromosomes – could also happen over and over, increasing the risk that the new cells will be defective. It's an important area for further research.

When a pathologist looks at a cancer cell on a microscope slide, one of the worst things he or she can see is that the tumor is "anaplastic." Anaplastic cells are poorly differentiated; they have become so mutated by cancer that they no longer resemble the original cell type that they once were. "Particularly in the most aggressive tumors, cells can completely lose their ability to differentiate, sometimes so much so that you cannot even recognize the tissue of origin," says Antonio Iavarone, M.D., associate professor of neurology and pathology in the Institute for Cancer Genetics. "Only recently have we started to understand the genetic players that are, in fact, responsible for this."

The proteins that are involved in this process are called Id – for "inhibitor of differentiation" – proteins. "What they do is inhibit the function of transcription factors that normally decide a neuron is a neuron or a breast duct cell is a breast duct cell. Their useful function is to maintain the state of stem cells, but normal cells after birth lose the ability to express these Id proteins," Dr. Iavarone explains. "Somehow, however, they become reactivated in tumors cells, and an abundance of Id proteins is directly proportional to the aggressiveness of tumors."

Dr. Iavarone and his colleagues have found that every single human tumor type expresses one or more of the four members of the Id family. In breast cancer, Id1 is prominent; in neuroblastoma, Id2; and in skin cancer, Id1, 2, and 3 are all expressed. "Every tumor has one or more Id proteins that are abundantly expressed," he says. "This is a very attractive target from a therapeutic point of view, because Id proteins are essentially absent in normal adult tissues, so you could attack them without damaging normal tissue."

Until recently, no one knew what controlled the cellular abundance of Id proteins. But in a study published in Nature, Dr. Iavarone and Anna Lasorella, M.D., assistant professor of pediatrics and pathology in the Institute for Cancer Genetics, reported that an enzyme called APC (anaphase promoting complex) found inside normal cells promotes the destruction of these proteins. Could re-introducing the APC enzyme into cancer cells

shut down, or at least reduce, the activity of Id proteins? That's what Drs. Iavarone and Lasorella hope to find out in future research. "The implications are really widespread. Id proteins sustain every step of cancer growth, including angiogenesis, the ability to create new blood vessels to feed upon, and metastasis. All these steps essentially depend on Id proteins. If we can knock out Id proteins, we can knock out cancer."

That alone would make Id proteins an extraordinarily fruitful target for research. But what if physicians could take advantage of the very function that makes Id proteins so dangerous in terms of cancer – promoting growth – and harness it to coax dead or damaged cells into growing again? That's exactly what Drs. Iavarone and Lasorella think they can do for patients with spinal cord injury or Alzheimer's disease, conditions in which the brain's neurons have been injured or killed.

Instead of using the APC enzyme to put the brakes on Id proteins and stop cancer, they created a "super" Id protein, one that would resist the APC enzyme's destruction so that they could use it to stimulate the growth of axons, the structures on neurons that transmit electrical signals in the brain and spinal cord. This exciting possibility is now being studied for its potential to treat a variety of neurological conditions.

Just as genetic advances in cancer research are being harnessed for their potential benefits in neurology, discoveries in neurology are also being used to treat cancer. Two years ago, Adolfo Ferrando, M.D., Ph.D., assistant professor of pediatrics and pathology, found that a mutation in a gene called NOTCH1 plays an important role in T-cell leukemia. This particularly virulent type of acute lymphocytic leukemia (ALL) accounts for about 20 percent to 25 percent of all cases of ALL; one in five patients relapses after initial treatment, and even stem cell transplants offer little hope.

Coincidentally, some experimental drugs designed to inhibit the formation of beta amyloid, the protein that accumulates and forms plaques in the brains of people with Alzheimer's disease, also inhibit NOTCH1. Because these drugs have already gone through preliminary clinical testing, they could be rushed into clinical trials for cancer much more quickly. This year, Columbia became the only institution in the New York metropolitan area enrolling patients in a large, multicenter clinical trial of the NOTCH inhibitor drug as a treatment for T-cell leukemia.

No genetic study of human cancer can go very far without high-quality pathologic specimens of actual human cancers, with their DNA and RNA carefully sorted and extracted and good samples sifted from bad, degraded ones. That work can be tedious, but the task is now easier for Columbia breast cancer researchers with the opening of the Macromolecule Bank. DNA and RNA from about 500 breast tumors are available to any Columbia researcher along with clinical data and tissue microarrays, which hold a hundred different samples on a single slide.

IN CANCER, MANY PROTEINS THAT SHOULD NOT BE PRESENT IN MATURE CELLS BECOME ABUNDANT AND HELP THE TUMOR GROW. ANTONIO IAVARONE, M.D., AND ANNA LASORELLA, M.D., HAVE FOUND THAT ID PROTEINS, TYPICALLY PRESENT ONLY IN NORMAL STEM CELLS BEFORE BIRTH, ARE REACTIVATED IN TUMORS. ID PROTEIN RESEARCH IS FOUNDED ON THIS PREMISE: ELIMINATING ID PROTEINS WILL ELIMINATE CANCER.

Normal Rb inactivates Id2

Rb mutation leads to deregulation of Id2

Mental Illness

ABOUT ONE OF EVERY FOUR AMERICANS SUFFERS FROM A DIAGNOSABLE MENTAL DISORDER, ACCORDING TO THE NATIONAL INSTITUTE OF MENTAL HEALTH. ABOUT 6 PERCENT OF AMERICANS STRUGGLE WITH SERIOUS MENTAL ILLNESS. RESEARCH HAS SHOWN THAT MENTAL ILLNESS ACCOUNTS FOR ABOUT 15 PERCENT OF THE TOTAL BURDEN OF DISEASE ON OUR SOCIETY, MORE THAN ALL CANCERS COMBINED.

Most major psychiatric illnesses, such as schizophrenia, autism, and bipolar disorder, are multifactorial disorders that can't be traced to any single "schizophrenia gene" or "autism gene." Understanding the complex combination of genetic and environmental factors that interact to produce mental illness is the primary challenge of contemporary psychiatry and the top priority of Columbia's integrated psychiatry program, says Jeffrey Lieberman, M.D., chairman of the Department of Psychiatry at P&S, director of the New York State Psychiatric Institute, and director of the joint Columbia and NYSPI Lieber Center for Schizophrenia Research. "Unfortunately, psychiatry has so far identified very few of the genes implicated in major mental illnesses such as schizophrenia. At Columbia, we are currently using a number of innovative methods and state-of-the-art technologies to pursue promising avenues of genetic discovery."

Schizophrenia is one of the most devastating of psychiatric disorders and a major focus of research and treatment at Columbia. The delusions, hallucinations, and other debilitating symptoms of schizophrenia shatter not only the life of the person with the illness, but also the lives of family members. Some 40 percent of people with schizophrenia have substance abuse problems, and their average life expectancy is 10 to 12 years shorter than normal. In fact, schizophrenia's mortality rate is higher than that of some cardiovascular diseases and some cancers, with 15 percent to 20 percent of those whose illness is inadequately treated attempting suicide.

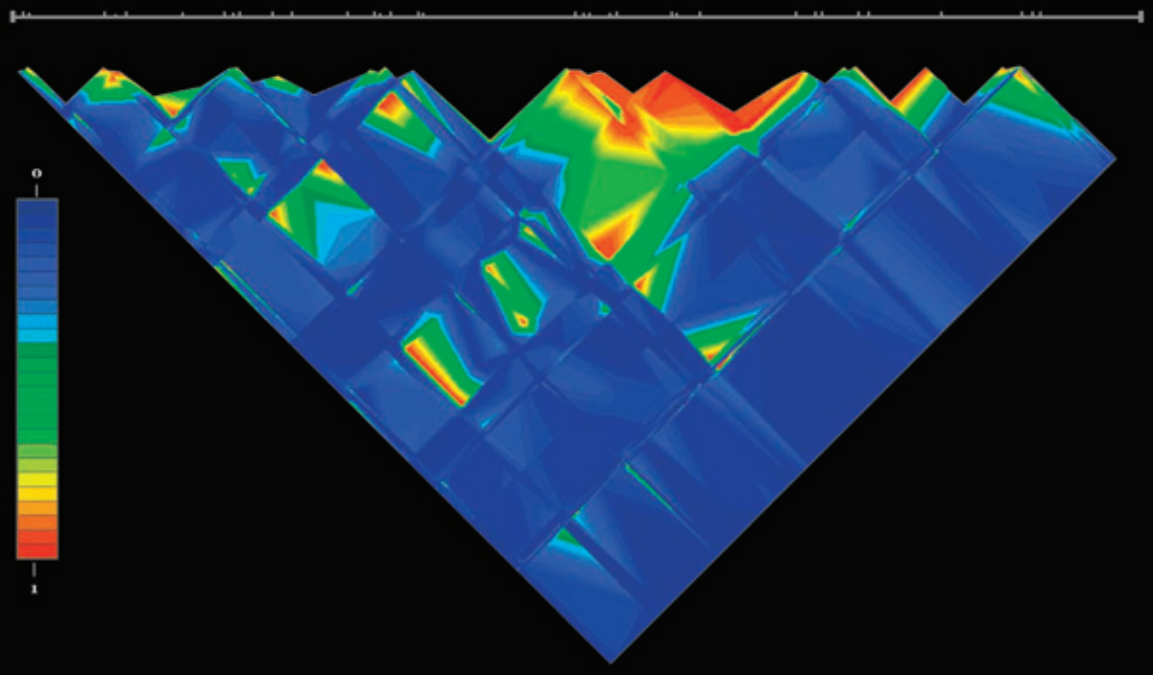
This year at Columbia, Nobel laureate Eric Kandel brought scientists one vital step closer to understanding the genetic underpinnings of schizophrenia by creating the first genetic mouse model of schizophrenia. Most scientists believe that hyperactivity in the brain's dopamine system plays a key role in the development of schizophrenia. So

Dr. Kandel and his colleagues developed genetically altered mice that overexpress dopamine in the striatum, a part of the brain that affects cognitive function in people with schizophrenia. And indeed, the mice showed difficulty in completing maze tasks and otherwise demonstrated the same kind of working-memory deficits that plague people with schizophrenia, an effect Dr. Kandel was not able to reverse merely by using an antibiotic to lower dopamine production. This finding, he says, suggests that the detrimental effects of excessive dopamine production may happen earlier on in neurodevelopment; antipsychotic drugs prescribed after the disease's symptoms set in may be too late to reverse the abnormalities at the core of schizophrenia.

Of course, mice are not humans, and the neural circuitry involved in human schizophrenia is far more complex than that found in a mouse. But Dr. Kandel's schizophrenic mouse offers scientists the first opportunity to study the disease in an animal model and experimentally test theories about the development of the disease and potential treatments.

Dr. Kandel's discoveries are complemented by the recent arrival of another world-class scientist with expertise in the genetics of schizophrenia: Maria Karayiorgou, M.D., formerly of Rockefeller University, who joined the faculty in 2006. Dr. Karayiorgou studies schizophrenia using "founder

HEAT MAP ILLUSTRATING THE DISTRIBUTION OF PAIR-WISE LINKAGE DISEQUILIBRIUM — THE CHANCE THAT ANY TWO VARIANTS IN A GENE OR NEIGHBORING GENES ARE CO-INHERITED — IN THE 22Q11 SCHIZOPHRENIA SUSCEPTIBILITY LOCUS. IMAGE COURTESY OF MARIA KARAYIORGOU.



MARIA KARAYIORGOU, M.D., FOUND THAT A MISSING SECTION OF CHROMOSOME 22 GREATLY INCREASES RISK TO SCHIZOPHRENIA. HER RESEARCH BUILDING ON THAT FINDING HAS CONTRIBUTED TO RECENT EFFORTS TO IDENTIFY DISEASE GENES. DR. KARAYIORGOU ALSO STUDIES SOUTH AFRICA'S AFRIKANERS, A HOMOGENEOUS GROUP THAT GREW FROM A FEW THOUSAND DUTCH IMMIGRANTS, TO IDENTIFY ADDITIONAL SUSCEPTIBILITY GENES.

populations" – a group of people descended from a limited number of common ancestors, who have not intermarried much with outside groups whether because of geography, language, religion, or other factors. Because of their homogeneity, these founder populations are ideal for the study of genetics and inheritance. Dr. Karayiorgou is working with a founder population among the Afrikaners of South Africa to identify candidate genes that lead to vulnerability to schizophrenia, by creating one of the first genome-wide association scans ever created for a complex disease.

"Dr. Karayiorgou has already made some very important discoveries," says Dr. Lieberman. One of these discoveries explains why some people have a drastically increased risk for schizophrenia. For most of the population, the schizophrenia rate is about 1 percent. However, people born without a small section of chromosome 22, called 22q11, face nearly a one in three risk of developing schizophrenia. This deletion is the disease's greatest known risk factor, but why? Last year, while still at Rockefeller, Dr. Karayiorgou and Joseph Gogos, M.D., Ph.D., Columbia assistant professor of physiology and cellular biophysics, identified an important interaction between two genes in a section of chromosome 22 that may explain the importance of this deletion. They found that mice deficient in a particular gene called PRODH show some symptoms similar to schizophrenia, and another gene, COMT, can compensate for the lack of PRODH. It turns out that both of these genes are located in that same 22q11 region of chromosome 22, so patients with the deletion cannot compensate for low levels of PRODH with increased levels of COMT, since one copy of that gene is missing as well. Their research was reported in the journal Nature Neuroscience.

Other psychiatric disorders, such as post-traumatic stress syndrome, anxiety disorder, and phobias, also may have genetics roots – and genetic possibilities for treatment. That's the intriguing possibility suggested by new research from Dr. Kandel. "All animals, including people, have instinctive fear, a built-in response to obvious danger signals. If a ferocious dog jumps on you, you don't have to learn to jump away," he says. "It's built into the genome." But the learned fear that can impair the lives of people who have suffered great trauma is governed by a different pathway in the brain's amygdalae, areas that play a key role in the processing and memory of emotional reactions.

Using a mouse model, Dr. Kandel has found that a protein called stathmin is essential to both instinctive and learned fear. By suppressing the stathmin gene, researchers created a "fearless" mouse, one with virtually no learned or instinctive fear. They also were able to selectively modify the fear pathways in another mouse, leaving the instinctive fear behaviors unchanged while altering learned fear. These findings, published in the journal Cell, hold great promise for people with phobias, post-traumatic stress, and chronic anxiety disorders. "These are all excessive responses to learned fear," says Dr. Kandel. "This suggests potential new approaches for therapies designed to treat these conditions."

UNLOCKING THE POTENTIAL

DISCOVERING THAT A GENE IS ASSOCIATED WITH A DISEASE, WHETHER BREAST CANCER OR SCHIZOPHRENIA OR ALZHEIMER'S DISEASE, IS ONLY THE BEGINNING OF THE SCIENTIFIC QUEST.

Myriad questions follow:

How does this particular gene work to cause this particular disorder?
What other genes interact with it?
How can we interfere in the cascade of genetic events that lead to disease and set matters right?

After identifying mutations in a gene called NOTCH1 as an important contributor to T-cell leukemia, Columbia researchers started enrolling patients in a clinical trial to test the efficacy of targeting NOTCH signaling with a gamma-secretase inhibitor, a drug originally designed as treatment for Alzheimer's disease.

Brain and Nervous System Disorders

"LIKE SEARCHING FOR MOBY DICK." THAT'S HOW RICHARD MAYEUX, M.D., CO-DIRECTOR OF THE TAUB INSTITUTE FOR RESEARCH ON ALZHEIMER'S DISEASE AND THE AGING BRAIN AND DIRECTOR OF THE HUMAN GENETICS RESEARCH CORE, DESCRIBES THE QUEST FOR THE GENETIC CULPRITS IN ALZHEIMER'S DISEASE. "EVERYBODY'S BEEN LOOKING, AND WE'VE HAD LOTS OF SIGHTINGS, BUT NO ONE'S ACTUALLY IDENTIFIED ANYTHING AS THE KEY FACTOR IN ALZHEIMER'S DISEASE."

In 1993, APOE, the only gene known to be associated with the late-onset form of Alzheimer's disease, was discovered. But like such conditions as cancer and diabetes, Alzheimer's is not a "single-gene" disease; many genes are likely to be involved. More recently, Dr. Mayeux and collaborators at other universities published work on one gene variant, SORL1, known to be involved in trafficking of proteins inside cells. The researchers screened 6,000 people from four ethnic groups, including the Dominican Republic population of Washington Heights, and found that those with variant forms of SORL1 produced less of that gene's protein than usual, which may disrupt the traffic pattern and allow the amyloid precursor protein to be converted into toxic forms, contributing to the development of Alzheimer's. "We believe SORL1 is an important piece of the Alzheimer's gene puzzle," Dr. Mayeux says.

In another effort, Dr. Mayeux and his colleagues have formed a consortium of Alzheimer's centers across the country to collaborate on a nationwide study involving the identification and genetic analysis of more than 1,000 families throughout the country where two or more first-degree relatives are living with Alzheimer's disease. With Dr. Mayeux as the principal investigator, the first part of the study, which began in 2002, involved a genome-wide scan. The consortium has plans to submit another grant to the NIH for a large study of 1,000 Alzheimer's disease cases and 1,000 healthy, matched controls, in which Columbia will lead the diagnostic aspect of the study as well as submit samples.

Thanks to advanced brain imaging techniques, it's been known for some time that Alzheimer's disease begins in a small region of the brain within

the hippocampus, the area where memories are formed, called the entorhinal cortex. Columbia researchers Scott Small, M.D., and Tae-Wan Kim, Ph.D., have used that information to identify a key group of proteins that have to do with transporting molecules within the brain, including the amyloid precursor protein, which if not transported correctly begins to misfold, become insoluble, and then aggregate and evolve into plaques.

"What they did was very clever. Instead of the usual strategy, taking samples from the brains of people with Alzheimer's and samples from normal controls, they first used functional imaging to obtain high-resolution views of the hippocampus and guide them to the entorhinal cortex, to make sure that what they were looking at was a change specific to that region," says Dr. Mayeux.

Drs. Small and Kim then used DNA microarrays to study differences in gene expression in brain tissue from normal adults and adults with Alzheimer's disease, specifically in the entorhinal cortex. They found four candidate genes that were overexpressed in the entorhinal cortex in people with Alzheimer's disease. One of the genes, VPS35, appears to be the best correlated with Alzheimer's and is now being studied. "That's started a lot of excitement," says Dr. Mayeux. "It's a subtle disturbance, but one that's important and potentially modifiable."

Alzheimer's disease devastates the lives of the elderly, while another genetically linked neurological condition, spinal muscular atrophy, takes its toll on the very young. SMA, a disorder in which the nerve cells of the spinal cord waste away, is the No. 1 genetic killer of children under the age of 2. It affects one in every 6,000 children and is caused by the mutation of a single gene – SMN1, or survival motor neuron 1. The NIH has identified SMA as the neurological disease with the greatest potential for treatment or cure in the near future, and Columbia may well be where that discovery happens. Our new Motor Neuron Center, opened in November 2005, brings together some of the world's top experts in SMA and amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease, another disease of the motor neurons). More than 40 leading researchers from numerous disciplines, including neurobiology, neurology, genetics, pathology, cell biology, physiology, anatomy, chemistry, and pediatrics, have converged in this translational research program aimed at answering key questions about motor neurons: Why and how do they die in ALS and SMA? How do precursor cells develop into healthy motor neurons, and what keeps them alive?

One of the leading researchers involved in the Center, Umrao Monani, Ph.D., assistant professor of neurology, has studied SMA for more than a decade. His research has focused on creating a genetic mouse model of the disease – not an easy task, because SMA is a uniquely human disease not found in mice – and using that model to try to find targets for SMA treatment. "From these studies, we've learned that there may be a window of time during which high levels of the protein generated by the SMN gene – the SMN protein – are required for normal motor neuron development, and after you've passed through that window, the levels don't need to be so high," says Dr. Monani. "Is that time during fetal development or after birth? We don't know, although there's some suggestion that in humans the time is postnatal." Since all people have an SMN2 gene – a nearly identical backup copy of SMN1 – scientists may be able to boost the activity of that gene to produce enough of the needed protein during that critical window of motor neuron development, possibly neutralizing the disease.

One of the leading mysteries of motor neurons –

in health and disease – has been solved by Columbia scientist Thomas Jessell, Ph.D., the Claire Tow Professor of Biochemistry and Molecular Biophysics and another member of the Motor Neuron Center. He and several colleagues have unlocked a critical part of the regulatory code that tells motor neurons how to connect to specific muscles in the limbs. The code involves 21 members of a family of genes known as Hox – genes that had long been known to play a part in brain development but had not been studied much for their role in the spinal cord. Dr. Jessell reported his findings in the journal Cell.

Understanding how Hox proteins regulate the formation of the complex wiring system that the spinal cord uses to control our muscles is essential to restoring function that has been stolen by neurodegenerative diseases like SMA or ALS, as well as by spinal cord injuries. "If cell replacement therapies are to work in the future, it may not be enough to make new motor neurons," says Dr. Jessell. "We will have to understand how to connect the neurons to the right muscles in order to restore movement. The more we understand the basic workings of the entire locomotor circuit, the better chance there is of developing regenerative strategies to restore movement." The Motor Neuron Center is part of Columbia's large and growing Center for Neuroscience Initiatives, which is developing and implementing new programs and centers that will accelerate the translation of fundamental discoveries of neuroscience research into new therapies for neurological and psychiatric disorders.

This research will take a giant leap forward with the creation of the new Jerome L. Greene Science Center, soon to be the home for Columbia's growing initiative in Mind, Brain, and Behavior. To be built with a $200 million gift from Dawn M. Greene and the Jerome L. Greene Foundation – the largest bequest ever received by Columbia and the largest private gift received by any U.S. university for the creation of a single facility – the Greene Center will bring together scientists from multiple disciplines to explore the relationship among gene function, brain wiring, and behavior to probe the root causes of such neurodegenerative diseases as Parkinson's, Alzheimer's, and ALS and such psychiatric and neurodevelopmental disorders as schizophrenia and autism.

Columbia neuroscientists are already exploring the use of genetically encoded probes and sensors to monitor the activity of neural circuits deep within the brain. "For example, the ability to use genetics to express genes in neurons that are vulnerable in diseases like Alzheimer's and Parkinson's offers us a way of understanding the nature of the injury to those neurons. Is it applied solely to the neuron that dies, or is it part of a much larger circuit defect?" asks Dr. Jessell, who will lead the Greene Center with Nobel laureates Richard Axel, M.D., University Professor, and Eric Kandel, M.D., University Professor. "And in conditions like autism and neurodevelopmental disorders, we can use modern genetic experimental methods to map out the circuitry in a normal brain and then begin to examine with increasingly fine resolution what's gone wrong with those circuits in the brains of people with disorders like autism. It's an exciting challenge, bringing psychiatry together with basic neuroscience, and it's almost certain that these advances in experimental genetics will begin to have an impact on how we treat these neurodevelopmental disorders."

Diabetes and Cardiovascular Disease

ONE IN EVERY 400 TO 600 CHILDREN IN THE UNITED STATES HAS BEEN DIAGNOSED WITH DIABETES. "IMAGINE, AS A PARENT, BEING TOLD THAT YOUR 2-YEAR-OLD OR YOUR 6-YEAR-OLD HAS DIABETES," SAYS WENDY CHUNG, M.D., PH.D., DIRECTOR OF COLUMBIA'S CLINICAL GENETICS PROGRAM AND A MEMBER OF THE DIVISION OF MOLECULAR GENETICS IN THE DEPARTMENT OF PEDIATRICS. "IMAGINE THE ANXIETY ABOUT WHAT THE FUTURE HOLDS. OF COURSE, THESE PARENTS WANT TO BE AS AGGRESSIVE AS POSSIBLE ABOUT TREATMENT TO ENSURE THAT THEIR CHILD WILL BE PROTECTED."

But now, genetic research conducted by Dr. Chung is demonstrating that some children with diabetes may be spared the constant vigilance and daily insulin shots required of a chronic disease. "We've been able to use genetic testing to identify some types of diabetes that are going to be relatively mild."

It's called "maturity onset diabetes of youth," a type of diabetes that's genetically distinct from autoimmune, or type 1, diabetes. By identifying genetic mutations in families, Dr. Chung can predict which children have this particular form of the disease and can safely go off insulin therapy and stay healthy with only modest attention paid to diet and other lifestyle factors. "The diagnosis I like to be able to give is due to a mutation in a gene called glucokinase. Anyone who has mutations in that gene tends to do very well. Their sugars are mildly elevated, and they don't require daily injections of insulin," she says. "We had to assume the worst before. Now, we can offer these families and children reassurance that they don't have to go through daily finger-sticking and living life with a chronic disease if they maintain a healthy lifestyle."

While a welcome relief for some parents and children, this new genetic diagnosis doesn't help the majority of people with diabetes. In an exciting new project that brings together Columbia's Naomi Berrie Diabetes Center and a group of scientists at Harvard, researchers are using somatic cell nuclear transfer to study the molecular biology and genetics of diabetes.

"We're using cell nuclei from diabetics harvested here at Columbia by Drs. Robin Goland and Thomas Ludwig and putting them into eggs harvested in Boston," explains Rudolph Leibel, M.D., professor of pediatrics and medicine, head of the Division of Molecular Genetics, and co-director of the Berrie Center. The goal: to successfully coax stem cells to differentiate into islets, the cells that actually control the production of insulin. "If we can do that, we'll be able to study the islet cells of an individual with diabetes without doing something we really can't do – biopsy the pancreas. If successful, this will revolutionize the ways in which we study the pathogenesis of diabetes. We'll be able to look at the insulin-producing cells as they develop, figure out the mechanisms that control that development and how we might control it."

Of the 17 million Americans with diabetes, 90 percent to 95 percent have type 2 diabetes. Any solution to this enormous public health problem must tackle a growing American phenomenon: obesity, one of the single greatest risk factors for type 2 diabetes. As the population gains weight, type 2 diabetes gains momentum. Years ago, the disease was known as adult-onset diabetes because it rarely manifested in children, but as more and more children become obese, type 2 diabetes is increasingly common in young people. More than 39,000 youths age 12 to 19 now have the disease.

"If we could understand the genetics of obesity and use that understanding to help manage and prevent it, we could prevent or effectively treat a great proportion of the cases of diabetes affecting our population today," says Dr. Leibel. His laboratory is studying the pathogenesis of obesity and diabetes and how excess weight predisposes people to the disease by using a mouse model to identify some of the genes that contribute.

In some instances, single genes such as FOXO1 influence multiple aspects of the biology of diabetes and body weight regulation. This gene affects the development of the islets of the pancreas, the function of insulin-producing cells in the islets, and the function of cells in the brain that regulate food intake. Domenico Accili, M.D., professor of medicine and head of the Columbia Diabetes and Endocrinology Research Center, is leading a group in the Naomi Berrie Diabetes Center studying this critically important gene and the pathways in which it acts.

But no single gene accounts for the entire picture of diabetes. "It's not a single gene. It's a group of genes that may not be the same among all ethnic or racial groups and even may be different in the same individual depending on their age," says Dr. Leibel. "Many of these genes are members of unique, discrete pathways for the control of body weight." Studies in Dr. Leibel's lab are now examining what happens when subtle differences in a series of related genes in the same pathway could add up to a significant impact on body weight. His team and others have identified many of the suspect genes based on their work in mice and have now begun initiating studies to show exactly how these genes interact in humans to make them susceptible to obesity.

One study under way now uses data on some 18,000 New Yorkers. The study is coordinated by AMDeC Foundation, a nonprofit consortium of 35 New York medical schools, academic health centers, and research institutions. In a second study, Dr. Leibel is collaborating with a team in Alaska (Dr. Bert Boyer), examining some of the same genes within a large group of Yup'ik Eskimos. "We're studying 25 or 30 genes at a time, with multiple markers inside and around the genes," Dr. Leibel explains. "Each individual's sample DNA may have

AGGRESSIVE RESEARCH IS NEEDED FOR AN AGGRESSIVE DISEASE: DIABETES. SINCE UP TO 95 PERCENT OF AMERICANS WITH DIABETES HAVE THE TYPE FOR WHICH OBESITY IS THE SINGLE GREATEST RISK FACTOR, WENDY CHUNG, M.D., PH.D., STUDIES OBESE MICE TO TRY TO REVEAL THE MOLECULAR CONNECTIONS BETWEEN OBESITY AND DIABETES AND HOW THE CONNECTION CAN BE BROKEN.

250 or 300 genetic tests performed, and those data are used to try and estimate the role of a specific gene in determining body weight. It's quite complicated from a computational point of view, but we're convinced that these are the tools we will need to really understand obesity and type 2 diabetes in humans."

Such research couldn't be done outside an institution like Columbia, he says. "We have such a large patient population here, and ultimately we can use this resource to test across even larger numbers of individuals. We're going to need tens of thousands of human subjects to work out the genetics of complex disorders like diabetes. A medical center like this isn't just ideal, it's sine qua non; the work wouldn't be possible without access to this kind of center."

Using an exciting new genetic analysis technique called ROMA (Representational Oligonucleotide Microarray Analysis) developed at Cold Spring Harbor Laboratory, Dr. Chung is also trying to tackle the obesity question by studying individuals who have "syndromic" forms of obesity. "In about 5 percent of these people, there are contiguous gene deletions: They are missing several genes in tandem along a chromosome," she says. Before ROMA, which allows scientists to detect duplications and deletions throughout the genome, these differences couldn't have been detected. "Now we have been able to identify these small deletions and target new genes that we didn't even know had to do with obesity."

Obesity and diabetes also go hand in hand with the leading cause of death in America: heart disease. Many of the primary genes involved in cardiovascular disease have already been identified, but they don't tell the whole story. For example, what causes a condition like familial cardiomyopathy, in which seemingly healthy children or young adults – like basketball player Hank Gathers and figure skater Sergei Grinkov – die suddenly? "We know that there are genes that cause this predisposition, but not everyone has the same severity or age of onset, and not everyone responds to therapy in the same way," says Dr. Chung. "We've recently identified modifier genes that help determine who will have the more severe form of these conditions and get them earlier, and in the case of cardiomyopathy, who will progress more rapidly to the need for a heart transplant."

Just as genes interact to produce a predisposition to heart disease, genes might also be used to help heal damaged hearts. One of these genes is called cyclin A2, and Hina Chaudhry, M.D., assistant professor of medicine, thinks it may be one of the most important genes for regenerating cells in the heart. Cyclin A2 plays a key role in heart growth in fetal development, but it goes silent as soon as any mammal is born. From that point on, the heart stops developing new cells. Now, in animal research, Dr. Chaudhry has discovered that when cyclin A2 is artificially switched back on, new heart cells continue to be generated. And when heart attacks are induced in mice that have switched-on cyclin A2, their heart tissue regenerates and retains its ability to pump. Dr. Chaudhry's team has begun testing ways to deliver cyclin A2 as a drug, a potential treatment for people with heart failure or heart attacks. "Our current therapies for heart failure are limited," she says. "We have an imperative need for cellular and molecular therapies to change that picture."

Diseases and Disorders from Infancy to Old Age

ONE OF THE MOST FRIGHTENING THINGS ANY PARENT CAN HEAR IS THAT THERE MAY BE SOMETHING WRONG WITH THEIR UNBORN CHILD. AS OUR UNDERSTANDING OF GENETICS HAS ADVANCED, SO TOO HAS OUR ABILITY TO DIAGNOSE CONGENITAL CONDITIONS EARLY ON IN PREGNANCY, GIVING PARENTS THE BEST INFORMATION POSSIBLE AS SOON AS POSSIBLE. IN MANY CASES, THE TREATMENT OPTIONS FOR THESE CONDITIONS HAVE NOT KEPT PACE WITH OUR DIAGNOSTIC CAPABILITIES, BUT EVEN WHEN NOTHING CAN BE DONE TO CHANGE THE OUTCOME OF A PREGNANCY, IMPROVED PRENATAL DIAGNOSIS ENABLES PARENTS TO PREPARE THEMSELVES FOR THEIR CHILD'S CONDITION AND PLAN FOR THE OUTCOME.

Within Columbia's Center for Prenatal Pediatrics, opened just two years ago and already seeing some 400 patients every year, women who know that their pregnancy involves a congenital abnormality, or merely suspect that they may have such a problem, are seen by a multidisciplinary team that includes genetic specialists, surgeons, cardiologists, radiologists, and other experts in the care of families coping with possible birth defects. One of the leaders of this team is Ronald Wapner, M.D., a pioneer in the development of the chorionic villus sampling test for genetic defects, who joined Columbia in 2005 as director of maternal-fetal medicine. Dr. Wapner's work builds on the life's work of Dorothy Warburton, Ph.D., professor of clinical genetics and development at P&S and considered to be one of the five most influential human geneticists of contemporary times. Director of NewYork-Presbyterian's cytogenetics laboratory since 1969, Dr. Warburton uses karyotype analysis of blood samples to identify congenital anomalies, conducts prenatal diagnosis via amniocentesis or chorionic villus sampling, and, more recently, has used fluorescence in situ hybridization (FISH) as an adjunct diagnostic.

Families seeking care for high-risk pregnancies at Columbia also benefit from the latest genetic research ongoing here. Investigators at the Morgan Stanley Children's Hospital are involved in studies seeking the genetic factors involved in congenital heart disease, childhood cardiomyopathy, intrauterine growth restriction, and aneuploidy, a family of

A NEW SCREENING TOOL TO DETECT CONGENITAL CONDITIONS COMBINES BLOOD TESTS WITH AN ULTRASOUND THAT MEASURES THE THICKNESS OF THE FETUS'S NECK FOLD TO DIAGNOSE DOWN SYNDROME IN THE FIRST TRIMESTER. RONALD WAPNER, M.D., DIRECTOR OF MATERNAL-FETAL MEDICINE, USES THE NEW TOOL, WHICH WAS VALIDATED BY NATIONAL RESEARCH LED BY COLUMBIA.

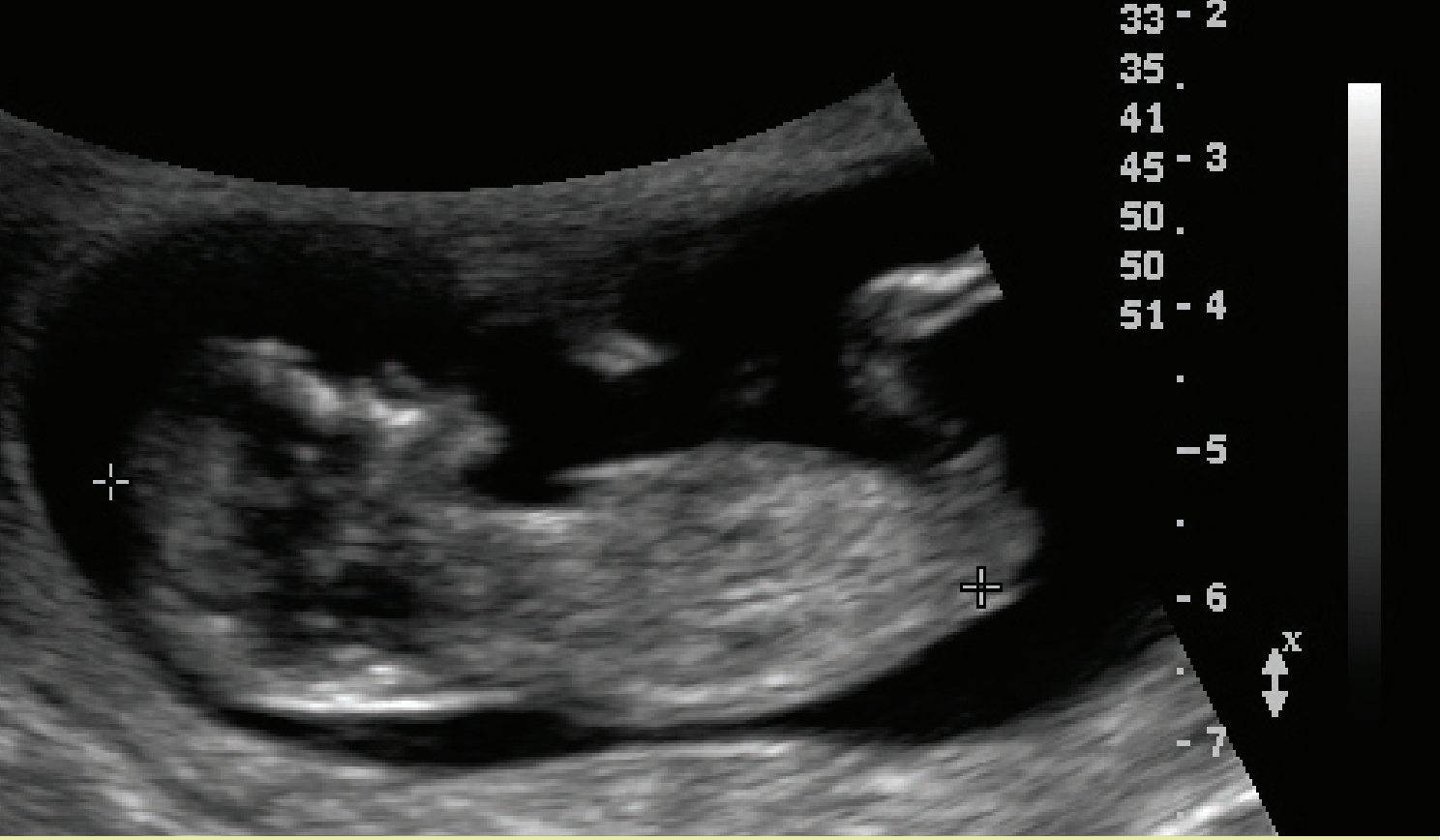
conditions involving abnormal numbers of particular chromosomes.

The most common type of aneuploidy is Trisomy 21, also known as Down syndrome. For years, women at increased risk of having a child with Down syndrome (women who became pregnant after age 35, for example) were forced to wait until their second trimester of pregnancy before their fetus could be tested. A national trial led by Mary D'Alton, M.D., chair of obstetrics and gynecology at P&S, demonstrated that a first-trimester screening test is far more accurate. The newer test, which combines a blood test for levels of a particular hormone and protein with an ultrasound that measures the thickness of the developing baby's neck fold, is 87 percent accurate, compared with only 81 percent accuracy for the best second-trimester screening methods. The study, known as the FASTER Trial (First and Second Trimester Evaluation of Risk), involved some 38,000 women at 15 centers nationwide. The results will change obstetrical practice in the United States. "Down syndrome screenings based on either maternal age alone, or an ultrasound or sonogram alone, are no longer justified protocols," Dr. D'Alton says. She and other experts working with the Society for Maternal-Fetal Medicine have formed the Maternal-Fetal Medicine Foundation to facilitate physician training and quality review for the screening.

While genetic links may be most obvious in areas like cancer, neurodegenerative disorders, and congenital anomalies, a surprising number of other conditions sometimes have genetic roots as well. Take blindness, for example. The most common cause of vision loss in older adults, a condition called age-related macular degeneration, or AMD, is at its heart a genetic disease. Columbia scientist Rando Allikmets, Ph.D., the William and Donna Acquavella Associate Professor of Ophthalmology and director of research at Harkness Eye Institute, pinpointed inflammation fed by variations in genes known as Factor B and Factor H as the cause of three out of four cases of AMD. "The two genes together explain about three-fourths of the disease," says Dr. Allikmets. "I don't know of any other complex disorder in which two genes explain so much."

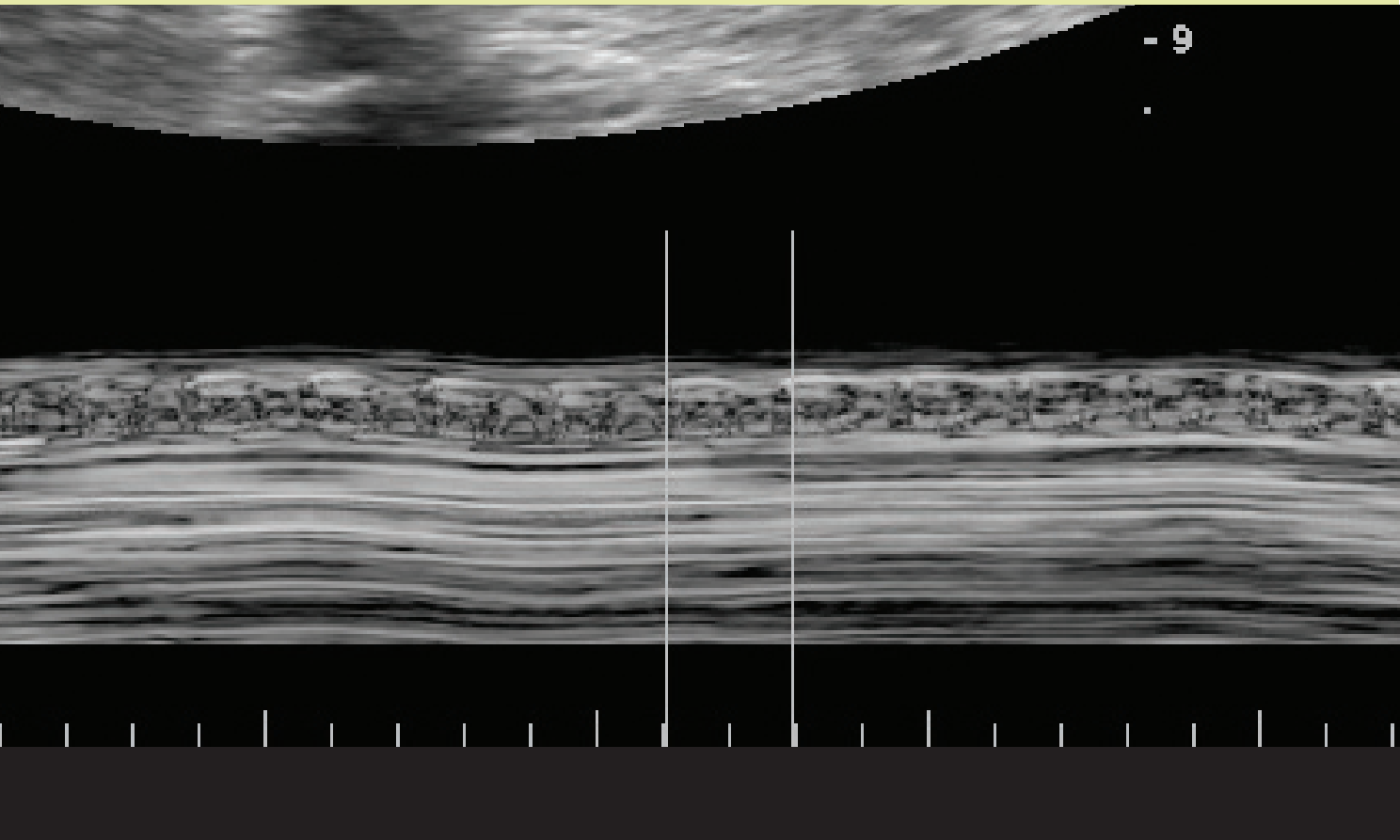
Both genes are part of a pathway that regulates the immune response, called the alternative complement cascade: Factor H turns the pathway down after inflammatory response to triggers, such as infection, while Factor B turns the pathway up to intensify the response. "These are the direct targets right now for finding therapeutic remedies for AMD," Dr. Allikmets says. Such treatments could be just around the corner, or they could take 10 years, he adds, but they are no doubt urgently needed: AMD affects about 30 percent of the over-70 population, damaging the vision of more than 12 million people in the United States alone.

Discoveries like Dr. Allikmets' and others from throughout Columbia's departments, centers and institutions are being translated at the new Clinical Molecular Genetics Laboratory, opened in August of 2005. "We've taken everything from a genetic predisposition to primary pulmonary hypertension to seizure disorders and made available a CLIA-approved clinical lab where patients from around the world can be tested for rare genetic disorders," says Wendy Chung. "It's been explosive in terms of growth. Local patients can use it for diagnosis, but it's also a resource for researchers from around the world. It's very helpful for scientists who work on orphan diseases, because they can work on more samples and answer some of their most important clinical questions."



TRANSLATING

THE KNOWLEDGE



THE ESSENTIAL GOAL OF GENETIC DISCOVERY, ANALYSIS, AND MANIPULATION IS CLINICAL GENETICS: USING OUR HARD-WON KNOWLEDGE OF GENES AND THEIR IMPACT ON DISEASE TO IMPROVE DIAGNOSIS, ENHANCE TREATMENT, AND, ULTIMATELY, CURE DISEASE.

Down syndrome has long been known to be caused by a chromosomal disorder, and the medical community has long been able to identify its occurrence in women in their second trimester of pregnancy.

New research led by Columbia physicians this year demonstrated successful – and more accurate – diagnosis earlier in a woman's pregnancy.

It is an example of translational research that will change medical practice with profound results for patients.

Columbia is deeply committed to establishing the kind of institutional framework that will allow genetic discovery, analysis and manipulation, and clinical genetics to thrive in every department and every program. That goal requires a far-reaching vision and tools to make the vision reality.

Helping to provide that vision is a new Center for Human Genetics, led by Angela M. Christiano, Ph.D. The center will unite more than 40 clinicians and researchers in the hunt to identify genes involved in complex inherited diseases such as asthma, Parkinson's, and heart failure. It will integrate the work of excellent centers and programs like the Columbia Genome Center, the Institute for Cancer Genetics, the Center for Computational Biology and Bioinformatics, and the Gertrude H. Sergievsky Center. The new center will provide coordination and focus for six key areas of genetics: basic research, clinical research, genetic epidemiology and statistical and population genetics, genomics and proteomics, clinical genetics, and genetic education.

Angela M. Christiano, Ph.D.

Another important step toward a more integrated, 21st century genetics program was taken this year with the appointment of Gerard Karsenty, M.D., Ph.D., as chairman of the Department of Genetics and Development.

An endocrinologist and a geneticist who combines mouse and human genetics in his work, Dr. Karsenty is particularly interested in how the skeleton develops and how its functions are orchestrated at the genetic level. His seminal research has shown that the same hormones regulate bone metabolism and energy metabolism, proving that bone mass is regulated in part by the brain. In his current research, he is working to show that the skeleton is an endocrine organ that regulates the function of various other organs and can play a key role in the onset of degenerative diseases, such as the metabolic syndrome.

As chairman of the department, Dr. Karsenty will foster relationships with other basic science departments to strengthen graduate and postdoctoral education and forge bridges with clinical departments to foster collaborations among clinicians and basic scientists.

Gerard Karsenty, M.D., Ph.D.

The NIH has placed genomics and proteomics at the forefront of its research priorities. The first of three major themes in the NIH's "New Pathways to Discovery" explains the situation this way: "Future progress in medicine will require a quantitative understanding of the many interconnected networks of molecules that comprise our cells and tissues, their interactions, and their regulation. We need to more precisely know the combination of molecular events that lead to disease if we hope to truly revolutionize medicine."

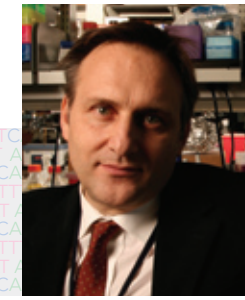
With its world-class faculty and expertise in a wide range of scientific disciplines, Columbia has become a leader in this scientific revolution, receiving nearly $50 million of the $235 million in grants awarded by the NIH for its priority Roadmap projects in 2005. These grants have established three major research centers and collaborations: the Molecular Libraries Screening Center, the National Center for Multi-Scale Analysis of Genetic and

Cellular Networks (MAGNet), and the New York Consortium on Membrane Protein Structure, part of the NIH Protein Structure Initiative.

Molecular Libraries Screening Center: Most of the organic chemical compounds, known as small molecules, that are now used in biomedical research and as targets for treatment were initially discovered serendipitously rather than by design. Columbia is one of nine institutions selected by the NIH to establish a collaborative research network to screen for promising small molecules in an efficient, high-throughput approach that will speed scientific progress. Headed by James Rothman, Ph.D., director of the Judith P. Sulzberger, M.D., Columbia Genome Center and the Clyde and Helen Wu Professor of Chemical Biology in the Department of Physiology and Cellular Biophysics, the center uses large-scale methods to identify these small molecules, which will improve our study of genes, cells, and biochemical pathways in health and disease, with the ultimate goal of discovering new drug targets and treatments. The MLSC has already established a collection of 100,000 chemically diverse small molecules, some of which have known biological activities and others that have the potential to modulate novel biological functions. The collection will grow over time, and all of its data will be made available to both public and private-sector researchers.

James Rothman, Ph.D.

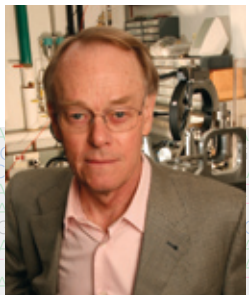
National Center for Multi-Scale Analysis of Genetic and Cellular Networks (MAGNet): The vast array of data generated by genomic and proteomic research demands innovative methods of organizing, sorting, and studying this information. "With approximately 20,000 genes in the human genome, there are trillions of possible interactions among genes and proteins within a cell. Exploring each one in the laboratory would take a very long time, even with current high-throughput methods," says Andrea Califano, Ph.D., professor of biomedical informatics. That's where computational biology and biomedical informatics come in. Columbia's new MAGNet Center, one of a network of seven centers established by the NIH, will create computational methods and tools to help solve one of the biggest challenges in biology: understanding how all the genes and proteins inside cells work together to implement specific biological processes. "We plan to use computers and new methods of systems biology to predict which proteins are interacting with each other and with DNA, and how these interactions change in disease," says Dr. Califano, who directs the new center. MAGNet is housed in Columbia's Center for Computational Biology and Bioinformatics – C2B2 – to take advantage of the resources of this interdepartmental consortium.



Andrea Califano, Ph.D.

New York Consortium on Membrane Protein Structure: The NIH's Protein Structure Initiative, a national effort aimed at determining the three-dimensional shapes of many proteins and their role in health and disease, starts where the Human Genome Project left off. "Genes are important only in that they produce proteins, which are the tiny three-dimensional machines of life," says Lawrence

Shapiro, Ph.D., associate professor of ophthalmology and biochemistry and molecular biophysics and a principal investigator in the New York Consortium on Membrane Protein Structure, one of several newly named centers in the Protein Structure Initiative. Led by Columbia's Wayne Hendrickson, Ph.D., University Professor, this specialized center will focus on developing novel methods for quickly determining the structures of proteins that attach to a cell's outer envelope, or membrane – proteins that have traditionally been difficult to study. "Drug discovery has been lagging in recent years, and many of us believe that the development of drugs based on a protein's structure is a much more efficient way to find the drugs we'd like to have," says Dr. Hendrickson.



Wayne Hendrickson, Ph.D.

Columbia researchers will also play major roles in two other centers: the New York Structural Genomics Research Consortium, led by Barry Honig, Ph.D., professor of biochemistry and molecular biophysics, which will focus on the structures of phosphatases (a type of protein particularly important in disease), and the Rutgers-led Northeast Structural Genomics Consortium.

An important resource in Columbia's genomic and proteomics research is the Center for Computational Biology and Bioinformatics – C2B2. The goal of the interdepartmental center is to catalyze research at the interface between biology and the computational and physical sciences. C2B2, co-directed by Drs. Barry Honig and Andrea Califano, supports active research programs in computational biophysics and structural biology, the modeling of regulatory, signaling, and metabolic networks, pattern recognition, machine learning, and functional genomics. Faculty from the Morningside and medical center campuses represent biochemistry and molecular biophysics, biomedical informatics, biological sciences, chemistry, computer science, applied physics and applied mathematics, electrical engineering, and computational learning systems.

Barry Honig, Ph.D.

When entering medical students first don their white coats and begin the course, "Science Basic to the Practice of Medicine and Dentistry," they immediately begin to understand the importance of genetics to medicine. The very first four-week block of their education is a genetics module, in which they meet a patient with a genetic condition, learning everything from biochemistry and molecular biology to the clinical aspects of genetics – how the genetic aspects of disease affect diagnosis, treatment, and daily life.

That's only the beginning. A program called Genetics in Medicine is threaded throughout the courses of a student's first year. Rather than separating genetics into discrete, segregated specialty courses, genetic studies are integrated holistically into the curriculum, underscoring how fundamental this field has become in medicine.

"During the first year, the curriculum has a systems approach, so as the students learn about the cardiovascular, pulmonary, and renal systems, they also learn about the genetic issues related to each of those systems," explains Wendy Chung, M.D., Ph.D., assistant professor of pediatrics and director of the clinical genetics program. The Genetics in Medicine program resulted from an assessment done by Dr. Chung and Benjamin Tycko, M.D., Ph.D., associate professor of pathology in the Institute for Cancer Genetics. Dr. Chung now oversees the genetics section of the "Science Basic to the Practice of Medicine and Dentistry" course.

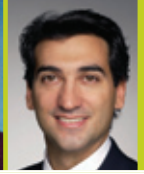
"As students are learning about electrophysiology while they study the cardiovascular system, for example, we will have a patient come in and discuss with them long QT syndrome, a particular cardiac syndrome associated with sudden death," says Dr. Chung. "They get everything from the molecular biology of the condition up to hearing what it's like to have your child die suddenly from such a disease."

Meanwhile, the human development course features lectures on the genetic control of development, including such issues as the transcription factors important to fetal development, congenital cardiac disease, and teratogenic exposure. Pathology and pathophysiology courses in the second year teach the genetic elements and modes of inheritance for various diseases, as well as the treatment implications when a disease is genetic rather than acquired.

And within the clinical practice course, in which students begin their long journey toward interacting with patients directly as full-fledged physicians, many of the patient presentations include genetic conditions. "We try to make them aware of all the aspects of genetic medicine as part of the overarching curriculum," says Dr. Chung.

This integrated exposure to genetics continues in the third year, as students in ob-gyn and pediatrics rotations learn to do prenatal diagnosis, genetic testing, and family history assessment. In the fourth year, an optional genetics elective draws about 15 students annually to study clinical and molecular genetics within Dr. Chung's program.

With the field of genetics exploding, Dr. Chung says, the difficulty is keeping the curriculum up-to-date. "There are only so many hours we have, but we definitely want to expand genetics in the curriculum. Our goal is to increase the amount of exposure and material without increasing the burden on the students, by integrating it into other courses so that it flows seamlessly."


Abbott Ahmad Al-Awqati Bakken Benson

Faculty Honors

Laurence F. Abbott, Ph.D., Physiology & Cellular Biophysics: elected to American Academy of Arts and Sciences

Anissa Abi-Dargham, M.D., Psychiatry: became vice president-elect of Brain Imaging Council of Society for Nuclear Medicine and serves as new field editor for brain imaging for the journal Neuropsychopharmacology

Christopher S. Ahmad, M.D., Orthopedic Surgery: became member of American Academy of Orthopaedic Surgeons and associate member of American Shoulder and Elbow Surgeons

Qais Al-Awqati, M.D., Medicine and Physiology & Cellular Biophysics: elected to American Academy of Arts and Sciences

Philip O. Alderson, M.D., Radiology and Radiation Oncology: installed as president of American Roentgen Ray Society and installed for two-year term as president of the American Board of Radiology

Richard Ambron, Ph.D., Anatomy & Cell Biology: named teacher of the year by P&S Class of 2009

Spencer Amory, M.D., Surgery: received NewYork-Presbyterian/Allen's physician of the year award

Jonathan Aviv, M.D., Otolaryngology/Head & Neck Surgery: elected president of American Bronchoesophagological Association and named lifetime honorary member, Israeli Society of Otolaryngology/Head & Neck Surgery

Suzanne Bakken, D.N.Sc., Biomedical Informatics and Nursing: elected to Institute of Medicine; received 21st century achievement award for education and academia, Computerworld Honors Program; and received Virginia K. Saba Informatics Award from American Medical Informatics Association

Matthew Bartels, M.D., Rehabilitation Medicine: received NewYork-Presbyterian physician of the year award

Mitchell C. Benson, M.D., Urology: received John K. Lattimer, M.D., Award for contributions to urology from the Kidney and Urology Foundation of America

Monica Bhatia, M.D., Pediatrics: received Morgan Stanley Children's Hospital's physician of the year award

Louis U. Bigliani, M.D., Orthopedic Surgery: chosen distinguished practitioner of 2006 by NewYork-Presbyterian Hospital Society of Practitioners

John Bilezikian, M.D., Medicine and Pharmacology: received first global leadership award of International Society of Clinical Densitometry (award renamed John Bilezikian Global Leadership Award) and received lifetime achievement award from Armenian American Medical Society of California

Katarzyna Bisaga, M.D., Psychiatry and Pediatrics: received young investigator manuscript award from Society for Developmental and Behavioral Pediatrics

Theodore A. Blaine, M.D., Orthopedic Surgery: elected to membership in the American Shoulder and Elbow Surgeons

Andrew Blitzer, M.D., D.D.S., Otolaryngology/Head & Neck Surgery: received Chevalier Jackson Award from American Bronchoesophagological Association

Mark Bradley, M.D., Psychiatry: received Samuel W. Perry III, M.D., Distinguished Award in Psychiatric Medicine and was named William Webb Fellow of Academy of Psychosomatic Medicine

Andrea Califano, Ph.D., Biomedical Informatics: named fellow of New York Academy of Sciences for distinguished work in computational and systems biology

Alex Carballo-Diéguez, Ph.D., Psychiatry: became research board member of American Foundation for AIDS Research (AmFAR)

Olveen Carrasquillo, M.D., Medicine: named clinician-investigator of the year by mid-Atlantic chapter of Society of General Internal Medicine

Nancy Chang, M.D., Medicine: received Ewig Award for outstanding teaching

Stanley Chang, M.D., Ophthalmology: received 2006 Hobie Award (New York State Ophthalmological Society's highest honor) and Jackson Memorial Lecture Award from American Academy of Ophthalmology

Michael F. Chiang, M.D., Ophthalmology and Biomedical Informatics: received career development award from Research to Prevent Blindness and was named to editorial board of Journal of the American Medical Informatics Association

Derek Chong, M.D., Neurology: received early career physician-scientist award from American Epilepsy Society

Bilezikian Carballo-Diéguez Carrasquillo S. Chang Chong






Cimino


Close


Cohall


Cooper


D'Alton

James J. Cimino, M.D., Biomedical Informatics and Medicine: awarded medal of honor from New York Medical College; named academy fellow of New York Academy of Medicine; and elected to American Clinical and Climatological Association

Lanny Garth Close, M.D., Otolaryngology/Head & Neck Surgery: named vice president of Triological Society and fellow of Royal Society of Medicine

Alwyn Cohall, M.D., Pediatrics: received Shirley Gordon Leadership Award from Family Planning Advocates of New York, Founders of Adolescent Health Award for community leadership from American Academy of Pediatrics section on adolescent health, and HIV leadership award and noteworthy pediatrician award from TheBody.com

Stephanie Collins, Ph.D., Psychiatry: received early career investigator travel award from College on Problems of Drug Dependency

David H. Cohen, Ph.D., Psychiatry: elected fellow of American Association for the Advancement of Science

Louis Z. Cooper, M.D., Pediatrics: received award for lifetime contribution to education in infectious diseases from American Academy of Pediatrics section on infectious diseases

Vivette D'Agati, M.D., Pathology: elected to Association of American Physicians

Mary D'Alton, M.D., Obstetrics & Gynecology: received Society for Maternal-Fetal Medicine achievement award recognizing contributions to the field and her role as a mentor

Riccardo Dalla-Favera, M.D., Pathology and Genetics & Development: awarded William Dameshek Prize (highest honor of the American Society of Hematology) and American-Italian Cancer Foundation Prize for scientific excellence in medicine

Anita Darmanian, M.D., Medicine: received Ewig Award for outstanding teaching

Gilbert Di Paolo, Ph.D., Pathology: received Charles J. Epstein Down Syndrome Research Award from National Down Syndrome Society

David L. Diuguid, M.D., Medicine and Pathology: received Ewig Award for outstanding teaching

Karen Duff, Ph.D., Pathology: shared 2006 Potamkin Prize for lifetime achievement in Alzheimer's disease research and received the 2006 Memory Walk prize from Alzheimer's Association for commitment to finding a cure for AD

Ajoy K. Dutta, M.D., Radiology: received American College of Medical Physics Award for paper, "New Fluoroscopy Systems for Pediatric Applications," published in Journal of Applied Clinical Medical Physics

Andrew Dwork, M.D., Pathology: appointed visiting professor of pathology at School of Medicine at Ss. Cyril and Methodius University in Macedonia

Anke A. Ehrhardt, Ph.D., Psychiatry: was invited presenter for Frontiers of Science lecture series at American Psychiatric Association; received first Champions of Sexual Literacy Award from National Sexuality Research Center and Center for Research on Gender and Sexuality; and was re-elected to Board of Trustees of Ford Foundation

Jean Endicott, Ph.D., Psychiatry: invited to address issues related to evaluation of treatment outcomes at an NIH-sponsored think tank on "Developing a Research Agenda: New Interventions for Menopausal Symptoms"

Suzette Evans, Ph.D., Psychiatry: named president-elect of Division 28 (psychopharmacology and substance abuse) in American Psychological Association

Theresa Exner, Ph.D., Psychiatry: received John Dondero Alumni Award from La Salle University, Philadelphia

Frieda Feldman, M.D., Radiology: one of three recipients of Gold Medal for Distinguished Service to Radiology from American Roentgen Ray Society

William P. Fifer, Ph.D., Psychiatry: co-recipient of First Candle/SIDS Alliance's research award recognizing research into mechanisms underlying sudden infant death syndrome

David Figurski, Ph.D., Microbiology: received Columbia's Charles W. Bohmfalk Award for teaching in pre-clinical years

Howard F. Fine, M.D., Ophthalmology: received Ronald G. Michels Fellowship Award from American Academy of Ophthalmology

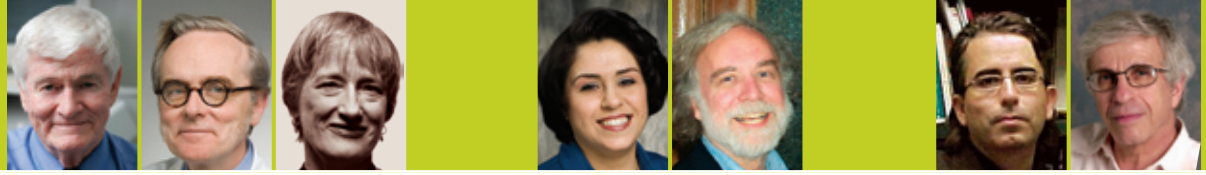

Dalla-Favera


Diuguid


Duff


Ehrhardt


Feldman



Flynn Garrett Gershon Ghossaini Goff Gogos Goldberg

John T. Flynn, M.D., Ophthalmology: received Marshall M. Parks Medal from foundation of American Association for Pediatric Ophthalmology and Strabismus

Sylvia Fogel, M.D., Psychiatry: received Lionel Ovesey Award

Max Forbes, M.D., Ophthalmology: received American Glaucoma Society's president's award for scientific achievement and service to the society

Carol Friedman, Ph.D., Biomedical Informatics: elected fellow of New York Academy of Medicine and appointed chair of scientific counselors for Lister Hill center at National Library of Medicine

Steve Frucht, M.D., Neurology: received Norman & Barbara Seiden Young Investigator Award

George Gallos, M.D., Anesthesiology: won first place award in American Society of Anesthesiologists essay contest

Thomas Garrett, M.D., Medicine: named teacher of the year by P&S Class of 2008

Anne Gershon, M.D., Pediatrics: became president-elect, Infectious Diseases Society of America

Soha Ghossaini, M.D., Otolaryngology/Head & Neck Surgery: named clinical scholar, American Academy of Otolaryngology-Head and Neck Surgery Foundation

Jay A. Gingrich, M.D., Ph.D., Psychiatry: received Roche-Nature Medicine Prize for translational medicine for research in developmental neuroscience and behavior

Stephen Goff, Ph.D., Biochemistry & Molecular Biophysics and Microbiology: elected to the National Academy of Sciences and to the Institute of Medicine

Joseph Gogos, M.D., Ph.D., Physiology & Cellular Biophysics: received NARSAD Young Investigator Award

Michael E. Goldberg, M.D., Neurology and Psychiatry: elected to American Academy of Arts and Sciences and was 2005-06 treasurer of Society for Neuroscience

Madelyn Gould, Ph.D., Psychiatry and Pediatrics: received American Foundation for Suicide Prevention's Research in Suicide Award

Peter Gouras, M.D., Ophthalmology: received honorary doctorate from University of Athens

Evelyn Granieri, M.D., Medicine: elected to three-year term to administrative board of directors of Council of Academic Societies of Association of American Medical Colleges

Lloyd A. Greene, Ph.D., Pathology: elected fellow of American Association for the Advancement of Science

Iva S. Greenwald, Ph.D., Biochemistry & Molecular Biophysics: elected to National Academy of Sciences and American Academy of Arts and Sciences

Wei Gu, Ph.D., Pathology: received Stohlman Scholar award from Leukemia and Lymphoma Society

Elisabeth Guthrie, M.D., Psychiatry and Pediatrics: selected as AACAP/Harvard Macy Teaching Scholar

Eric J. Hall, D.Sc., Radiation Oncology and Radiology: named fellow of American Society of Therapeutic Radiology and Oncology and received Distinguished Scientific Achievement Award of Health Physics Society

Ziv Haskal, M.D., Radiology: elected fellow of American College of Radiology; received Night of Honors Innovation Award from International Society of Endovascular Specialists; and was appointed editor of Cardiovascular and Interventional Radiology Journal

Wayne A. Hendrickson, Ph.D., Biochemistry & Molecular Biophysics: received New York City Mayor's Award for Excellence in Science and Technology

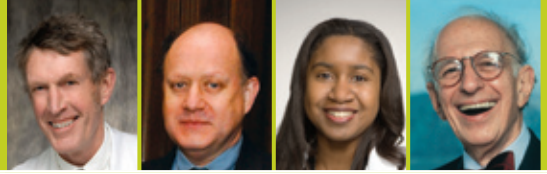
Dawn Hershman, M.D., Medicine: received Ewig Award for outstanding teaching

Barry Honig, Ph.D., Biochemistry & Molecular Biophysics: received Alexander Hollaender Award in Biophysics from National Academy of Sciences and elected fellow of American Association for the Advancement of Science

Evelyn Horn, M.D., Medicine: received Ewig Award for outstanding teaching

Joyce Hunter, D.S.W., Psychiatry: received special New York City Council proclamation as spokesperson for Coalition for Lesbian and Gay Rights on 20th anniversary of NYC gay rights bill

Gould Hall Haskal Hershman Hunter



Jacobs Jessell Joseph Kandel

Kaplan Katz Kleber

Thomas P. Jacobs, M.D., Medicine: received Ewig Award for outstanding teaching

Joseph Jaffe, M.D., Psychiatry: elected distinguished life fellow of American Psychiatric Association

Thomas M. Jessell, Ph.D., Biochemistry & Molecular Biophysics: elected fellow of American Association for the Advancement of Science

Kathie-Ann Joseph, M.D., Surgery: named one of Crain's New York Business "40 Under 40" rising stars

Eric Kandel, M.D., Physiology & Cellular Biophysics, Psychiatry, and Biochemistry & Molecular Biophysics: received Austrian Medal of Honour for Science and Art from president of Austria; received biotechnology achievement award from NYU School of Medicine; received Benjamin Franklin Medal for distinguished achievement in the sciences from American Philosophical Society, Philadelphia; received McKnight Recognition Award from McKnight Conference for Neuroscience; received Louise T. Blouin Foundation Award; received honorary doctorates from NYU and Rockefeller University

Harold Kaplan, M.D., Pathology: received first Hemphill-Jordan Leadership Award from AABB (formerly American Association of Blood Banks)

Arthur Karlin, Ph.D., Physiology & Cellular Biophysics and Biochemistry & Molecular Biophysics: invited to give 16th annual John M. Brookhart Lecture at University of Oregon

Gerard Karsenty, M.D., Ph.D., Genetics & Development: received Drieu Cholet Award from National Academy of Medicine in France

Aaron E. Katz, M.D., Urology: received Beljanski Foundation Award for excellence in integrative medicine

K. Craig Kent, M.D., Surgery: elected president of Society of Vascular Surgery

Herbert Kleber, M.D., Psychiatry: received Burlingame Award and was named to NIDA National Advisory Council and to board of directors of Partnership for a Drug Free America, College on Problems of Drug Dependence, and Phoenix House

Andreas Kraebber, M.D., Psychiatry: received Alexander Beller Award for scholarly study in psychoanalytic theory

Nathan Kravis, M.D., Psychiatry: received Howard Klar Award as outstanding teacher at Columbia Psychoanalytic Center

Jaime Landman, M.D., Urology: received Arthur Smith international lifetime achievement award at World Congress of Endourology in Amsterdam and first prize in the endourology fellows essay contest for research on ureteral physiology

Francis Y. Lee, M.D., Orthopedic Surgery: received Academy of Orthopaedic Surgeons/Orthopaedic Research and Education Foundation clinician scientist traveling fellowship award and received Orthopaedic Research Education and Foundation Career Development Award

Jay Lefkowitch, M.D., Pathology: received British Society of Authors Prize for best new edition of a medical book ("Liver Biopsy Interpretation," co-authored with Peter J. Scheuer)

Marianne J. Legato, M.D., Medicine: received inaugural Dr. Marianne J. Legato Gender-Specific Medicine Award from Ladies Home Journal

Barron H. Lerner, M.D., Ph.D., Medicine: received William H. Welch Medal from American Association for the History of Medicine for his book, "The Breast Cancer Wars"

Frances Levin, M.D., Psychiatry: appointed to board of directors, Group for the Advancement of Psychiatry

William N. Levine, M.D., Orthopedic Surgery: received Charles S. Neer, M.D., teacher of the year award for resident education and was selected for leadership fellows program of American Academy of Orthopaedic Surgeons

Howard B. Lieberman, Ph.D., Radiation Oncology: elected fellow of American Association for the Advancement of Science

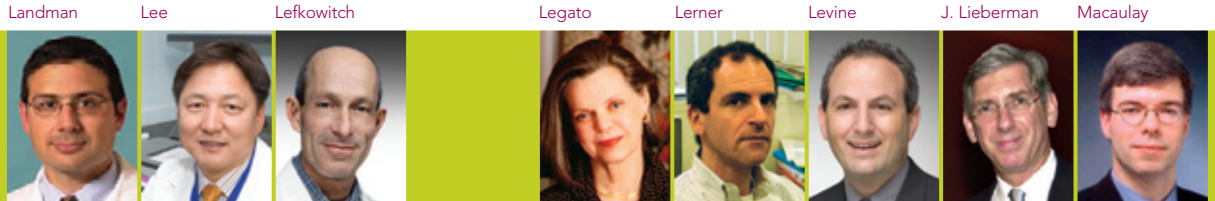
Jeffrey A. Lieberman, M.D., Psychiatry: received Lieber Prize for Schizophrenia Research from NARSAD

Elena Lister, M.D., Psychiatry: received John F. O'Connor Award for teaching of psychodynamic concepts to medical students

Zheng Feng Lu, Ph.D., Radiology: received American College of Medical Physics Award for paper, "New Fluoroscopy Systems for Pediatric Applications," published in Journal of Applied Clinical Medical Physics

William B. Macaulay, M.D., Orthopedic Surgery: became member of American Orthopaedic Association; was elected to Interurban Society and Association of Bone and Joint Surgeons; and serves as member of executive board of American Association of Hip and Knee Surgeons

Landman Lee Lefkowitch Legato Lerner Levine J. Lieberman Macaulay




Marks


McCord


Mellman


Merrill


Mitchell


Murry

Arthur Magun, M.D., Medicine: received Ewig Award for outstanding teaching

Branislav Mancevski, M.D., Neuroscience: received young investigator award from NARSAD and was selected for NARSAD Research Partners Program

John Mariani, Ph.D., Psychiatry: received College on Problems of Drug Dependency early career investigator travel award

Andrew Marks, M.D., Physiology & Cellular Biophysics and Medicine: elected to National Academy of Sciences; elected fellow of American Academy of Arts and Sciences; and received American Heart Association's Basic Research Prize

Steven Marx, M.D., Medicine: elected to American Society for Clinical Investigation

Carol A. Mason, Ph.D., Pathology and Anatomy: elected fellow of American Association for the Advancement of Science

Mary McCord, M.D., Pediatrics: received Columbia's Humanism and Community Award

Lisa A. Mellman, M.D., Psychiatry: received alumni award as outstanding graduate from the Columbia residency training program

Joseph S. Meltzer, M.D., Anesthesiology: received NewYork-Presbyterian physician of the year award

Jacqueline Merrill, D.N.Sc., Biomedical Informatics: received Pfizer Scholar Award for public health services research; elected fellow of New York Academy of Medicine; and received award from Robert Wood Johnson Foundation's Changes in Health Care Financing and Organization Initiative

Aaron Mitchell, Ph.D., Microbiology: elected fellow of American Association for the Advancement of Science

Thomas Q. Morris, M.D., Medicine: elected chairman of board of trustees of New York Academy of Medicine and received P&S Distinguished Service Award

Thomas Murry, Ph.D., Otolaryngology/Head & Neck Surgery: received presidential citation from American Laryngological Association

Philip R. Muskin, M.D., Psychiatry: received distinguished life fellow award from Association for Academic Psychiatry

Andrew Mutnick, M.D., Pediatrics: named teacher of the year by P&S Class of 2007

Michael M. Myers, Ph.D., Psychiatry: co-recipient of First Candle/SIDS Alliance's research award recognizing research into mechanisms underlying sudden infant death syndrome

Stephen Nicholas, M.D., Pediatrics: named Fulbright Scholar to Dominican Republic to research prevention of mother-to-baby HIV transmission

Edward Nickoloff, M.D., Radiology: received ribbon for scientific merit from American Association of Physicists in Medicine as co-author of a poster and received American College of Medical Physics award for paper, "New Fluoroscopy Systems for Pediatric Applications," published in Journal of Applied Clinical Medical Physics

George W. Niedt, M.D., Dermatology: named teacher of the year for 2006 by dermatology residents at St. Luke's-Roosevelt Hospital Center

Mero Nocenti, Ph.D., Physiology & Cellular Biophysics: received P&S Distinguished Service Award

Elizabeth Olson, Ph.D., Otolaryngology/Head & Neck Surgery: became associate editor of Journal of the Association for Research in Otolaryngology

Carl A. Olsson, M.D., Urology: received Ferdinand C. Valentine Essay medal

Maria A. Oquendo, M.D., Psychiatry and Neuroscience: received suicide scholar award from Eli Lilly

Marc Patterson, M.D., Neurology and Pediatrics: invited as Whitaker Visiting Professor at University of Rochester, Emery Lecturer and Professor at University of Vermont, Burlington, Sigma Xi Distinguished Lecturer at Purdue University, and Distinguished Genomics Lecturer at Mayo Clinic

Geoffrey S. Pitt, M.D., Ph.D., Medicine and Pharmacology: received inaugural Lewis Katz Cardiovascular Research Prize for a Young Investigator and Columbia's Harold and Golden Lamport Research Award in basic sciences

Roy Pizzarello, M.D., Medicine: received 2006 teacher of the year in cardiology

Richard Polin, M.D., Pediatrics: received neonatal education award in perinatal pediatrics from American Academy of Pediatrics and was named physician of the year by NewYork-Presbyterian Hospital and physician of the year by Morgan Stanley Children's Hospital

Muskin

Olsson

Patterson

Pitt

Polin


Prager


Quest


Radhakrishnan


Reiffel


Role


Rosenfield

Kenneth M. Prager, M.D., Medicine: received Leonard Tow Humanism in Medicine Award presented by Arnold P. Gold Foundation

Donald Quest, M.D., Neurological Surgery: elected president of American Association of Neurological Surgeons

LeRoy Rabbani, M.D., Medicine: received Ewig Award for outstanding teaching

Jai Radhakrishnan, M.D., Medicine: received Ewig Award for outstanding teaching

James A. Reiffel, M.D., Medicine: became one of first fellows named by Heart Rhythm Society

Noel Robin, M.D., Medicine: received Columbia's Charles W. Bohmfalk Award for teaching in clinical years

Lorna Role, Ph.D., Anatomy and Cell Biology: received Sidney R. Baer Prize for promising psychiatric research from NARSAD and McKnight Neuroscience of Brain Disorders Award

Allan Rosenfield, M.D., Obstetrics & Gynecology and dean of the Mailman School of Public Health: received Planned Parenthood Federation of America's Margaret Sanger Award, Lifetime Achievement Award from New York Academy of Medicine, Kenneth J. Ryan MD Physician Leadership Award, Health and Human Rights Leadership Award, American Legacy Foundation Public Health Leadership Award, and Coalition for School-Based Primary Care Child Health Award

Melvin P. Rosenwasser, M.D., Orthopedic Surgery: serves as president of Foundation for Orthopedic Trauma

Gorazd Rosoklija M.D., Ph.D., Neuroscience: elected to lifetime membership in Macedonian Academy of Sciences and Arts

David Rothman, Ph.D., Medicine: co-chaired national group appointed by American Board of Internal Medicine Foundation and Institute on Medicine as a Profession that issued a call to academic medical centers to reduce conflict of interest between physicians and drug companies

Rodney Rothstein, Ph.D., Genetics & Development: gave Herbert Stern Lecture at University of California, San Diego, and gave Gregor Mendel lecture in Brno, Czech Republic

David P. Roye Jr., M.D., Orthopedic Surgery: received Robert N. Hensiger Clinical Scientific Award from Pediatric Orthopaedic Society of North America

Carrie Ruzal-Shapiro, M.D., Radiology: received American College of Medical Physics Award

Ralph Sacco, M.D., Neurology: received American Stroke Association Council on Stroke's William Feinberg Award for excellence in clinical stroke

Peter Scheiffele, Ph.D., Physiology & Cellular Biophysics: received Simons Young Investigator Award to research the neural basis of autistic spectrum disorders

Ann Marie Schmidt, M.D., Surgery: elected to Association of American Physicians

David Shaffer, M.D., Psychiatry and Pediatrics: co-recipient of Ruane Prize for Child and Adolescent Psychiatric Research from NARSAD; received Catcher in the Rye award for advocacy from American Academy of Child and Adolescent Psychiatry; received Klerman Award in recognition of extraordinary research and leadership from Weill Cornell Medical College; and was made distinguished life fellow of American Psychiatric Association

Harry Shair, Ph.D., Psychiatry: served as guest editor of special edition of the journal Developmental Psychobiology in recognition of Myron A. Hofer

David N. Silvers, M.D., Dermatology: named teacher of the year for 2006 by dermatology residents at NewYork-Presbyterian Hospital

Samuel C. Silverstein, M.D., Physiology & Cellular Biophysics: received American Society for Cell Biology's Bruce Alberts Award for excellence in science and was recognized by the U.S. Geological Survey for his participation in the 1966-67 American Antarctic Mountaineering Expedition (the USGS named an Antarctic peak, Mount Silverstein, in his honor)

Ethel S. Siris, M.D., Medicine: chosen as delegate at large to White House Conference on Aging

Scott Small, M.D., Neurology: received Columbia's Harold and Golden Lamport Research Award in clinical sciences

James So, M.S., Radiology: received American College of Medical Physics Award

Robert Solomon, M.D., Neurosurgery: named chairman of American Board of Neurological Surgery; named president of New York State Neurosurgical Society; and named president-elect of Society of University Neurosurgeons


Rothman


Rothstein


Roye


Shaffer


Silverstein


Siris


Solomon


Stone


Strauss


Struhl


Van Heertum


Vitale


Walsh

Melissa Stockwell, M.D., Pediatrics: received Ambulatory Pediatric Association young investigator grant award

Brian A. Stone M.D., Urology: began two-year term as president and chair of R. Frank Jones Urological Society

Robert J. Strauch, M.D., Orthopedic Surgery: serves as president of New York Society for Surgery of the Hand and was accepted to American Orthopaedic Association

Nancy Strauss, M.D., Rehabilitation Medicine: received award from New York Society of Physical Medicine and Rehabilitation

Gary Struhl, Ph.D., Genetics & Development: elected to American Academy of Arts and Sciences

Nicole Suciu-Foca, Ph.D., Pathology: received Rose Payne Distinguished Scientist Award from American Society for Histocompatibility and Immunogenetics

Kimara Targoff, M.D., Pediatrics: received best basic research abstract award at Department of Pediatrics assistant professor pediatric research symposium

Joe Terwilliger, Ph.D., Psychiatry: named Finland Distinguished Professor by Academy of Finland

Dominique Toran-Allerand, M.D., Anatomy & Cell Biology and Obstetrics & Gynecology: received Distinguished Investigator Award from NARSAD

Stephen Tsang, M.D., Ph.D., Ophthalmology: received inaugural ARVO/Alcon early clinician scientist research award from Association for Research in Vision and Ophthalmology

Nehal Vadhan, Ph.D., Psychiatry: received early career investigator award from College on Problems of Drug Dependence and young investigator travel award from National Institute on Drug Abuse

Ronald Van Heertum, M.D., Radiology: received Holman-Kaplan Award from greater New York and New England chapters of Society of Nuclear Medicine

Michael G. Vitale, M.D., Orthopedic Surgery: received Pediatric Orthopaedic Society of North America traveling fellowship; was elected to board of trustees of Pediatric Orthopaedic Society of North America; and was elected president of Brooklyn Orthopaedic Society

B. Timothy Walsh, M.D., Psychiatry: received Price Family Award for research excellence from National Eating Disorders Association and award from Association of American Publishers for best book in clinical medicine ("Treating and Preventing Adolescent Mental Health Disorders," edited by several physicians)

Dorothy Warburton, Ph.D., Genetics & Development: received William Allan Award, most prestigious award given by American Society of Human Genetics

Marvin Wasserman, M.D., Psychiatry: received George S. Goldman Award for achievement in clinical psychoanalysis and psychoanalytic education

Nancy Sabin Wexler, Ph.D., Neurology: elected to American Academy of Arts and Sciences and governing council of Institute of Medicine

Hynek Wichterle, Ph.D., Pathology: received Basil O'Connor Starter Scholar Research Award from March of Dimes

Gail Williams, M.D., Medicine: received Ewig Award for outstanding teaching

Christopher Winfree, M.D., Neurosurgery: received Kline Award from AANS/CNS section on spinal and peripheral nerve disorders

Darrell Yamashiro, M.D., Ph.D., Pediatrics and Pathology: received Columbia's Harold and Golden Lamport Research Award in clinical sciences and physician of the year award from Morgan Stanley Children's Hospital

Chun Yip, M.D., Medicine: received Ewig Award for outstanding teaching

Ben Zalta, M.D., Radiology: received radiology's teacher of the year award

Ming Zhou, Ph.D., Physiology & Cellular Biophysics: named Pew Scholar by Pew Charitable Trusts and the University of California, San Diego; received Basil O'Connor Starter Scholar Research Award from March of Dimes; and was named Alfred P. Sloan Fellow by Alfred P. Sloan Foundation


Warburton


Wichterle


Williams


Winfree


Yamashiro


Zhou

Education

> The Glenda Garvey Teaching Academy named its director and first 12 fellows (seven shown below left). Thomas Garrett, M.D. (in center of photo), professor of clinical medicine, will guide and coordinate the activities of the new fellows.

> A comprehensive review of the medical school curriculum goals and methods began with a two-day retreat in October 2005 and accelerated under the leadership of Ron Drusin, interim senior associate dean for education, in the latter half of 2006. A task force of students and faculty has begun considering "revolutionary change," including a shortening of the pre-clerkship classroom curriculum, more team-based learning, "interludes" between clerkships to reinforce basic science and cross-cutting topics, and the introduction of "areas of concentration" in the third and fourth years.

> Columbia opened its doors and classes to five visiting third- and fourth-year medical students (two shown above far right) from Tulane University in New Orleans, who arrived at P&S for clinical rotations after being displaced by Hurricane Katrina. Four of the five students earned credit that transferred back to Tulane, while the fifth was accepted at P&S as a transfer student.

> Jeanine D'Armiento, M.D., Ph.D., (above center) was appointed associate dean for gender equity and career development. In this new position, she will guide the implementation of recommendations made by the Task Force on Women Faculty to enhance the role of women faculty and foster a climate of support and development for all faculty members.

> Thanks to a $9 million bequest from philanthropist Thelma Ewig to support clinical education, 12 Department of Medicine faculty were recognized for clinical excellence. The new honors will be awarded each year to four junior, four mid-career, and four senior faculty members.

> Minority enrollment levels have tripled at P&S since 2001, rising from 8 percent of the entering class that year to 21 percent of the fall 2006 entering class. P&S ranks among the top dozen medical schools in the nation for minority recruitment.

> "Enhancing Social and Behavioral Sciences in Medical School," a five-year, $1.35 million grant from the NIH, will train P&S faculty in social and behavioral sciences, preparing them to better instruct students in issues such as patient behavior, health policy, and professionalism. The project will be led by Rita Charon, M.D., Ph.D., professor of clinical medicine and director of the Narrative Medicine program.

> Interest in public health has increased since 9/11, and biomedical informatics graduate programs reflect the increased interest. Several students are enrolled in a new academic track in public health informatics, conducted with Mailman School of Public Health faculty.

> Six P&S graduate students spent a week in New Orleans in June 2006, volunteering with Common Ground Relief, an organization founded in the wake of Hurricane Katrina. Common Ground Relief has evolved into a collection of bioremediation projects, legal aid centers, clinics, distribution centers, and one of the largest free house gutting projects in New Orleans.

> To help fourth-year P&S students develop the teaching skills they will need to instruct medical students during their residency years, the Center for Education Research and Evaluation and the Center for Family Medicine in the Department of Medicine cosponsored a series of workshops to help students hone their teaching skills and make the transition from medical student to resident/teacher.

> P&S has added a new mobile patient encounter (MPE) system to track third-year students' experiences with their patients during core clerkships. Students enter information about their patient experiences via PDA, desktop, or laptop computer, allowing the clerkship director and the Office of Curricular Affairs to monitor

each student's activity and learning in each clerkship.

> Faculty in the Center for Education Research and Evaluation, together with faculty from the emergency medicine and from Teachers College, have been awarded a two-year $150,000 grant from the National Board of Medical Examiners' Stemmler Fund for Medical Education Research. It is the second time that CERE has received a grant from the Stemmler Fund within three grant cycles, and Columbia is one of only a few schools to have had this prestigious honor more than once.

> Richard B. Robinson, Ph.D., (below) professor of pharmacology, was appointed associate dean of graduate affairs. In overseeing graduate programs at P&S, he will take a leading role in training the next generation of scientists.

> In June 2006, TeamWoRx, a bonding event that traditionally marks the beginning of medical students' third year – their clinical year – shifted its focus from its usual team-building athletic events to working in the community through service-learning projects. The transition week brought the class together for five full days of skill building and orientation to address the responsibilities of third year, including admitting and taking care of patients, working with hospital staff, drawing blood, reading EKGs, and learning more about professionalism.

> "Casa Columbia," a new facility to house Columbia medical students and residents participating in the Columbia University International Family AIDS program in the Dominican Republic, opened its doors in the summer of 2006. It can accommodate about 11 students. The AIDS program is designed to offer insight into the medical, social, and economic challenges that global AIDS represents.

Research

> Two low-tech diagnostic tools can significantly reduce precancerous cervical lesions, overcoming traditional barriers to access of the more cumbersome and expensive Pap test for cervical cancer. In a large, randomized, controlled trial, the two screen-and-treat methods – papillomavirus (HPV) DNA testing and visual inspection with acetic acid (VIA), followed by treatment using cryotherapy for all eligible women with positive test results – performed as well as or better than the Pap smear for identifying high-grade cervical cancer precursor lesions. The methods are also cost-effective and well received by women. Thomas C. Wright Jr., M.D., principal investigator of the study and professor of pathology, predicts that they will help to reduce mortality from cervical cancer, which is highly treatable and an unnecessary cause of death in the developing world.

> A simple, noninvasive test can identify the best candidates for implantable cardioverter defibrillators (ICDs) to stop potentially fatal heart arrhythmias, according to a large, multicenter trial led by Columbia researchers. The test, known as the Microvolt T-wave Alternans (MTWA) test, can detect an electrical signal that can identify a heart likely to generate a life-threatening rhythm disturbance, a signal too slight to be detected by the traditional electrocardiogram. Using the test, physicians can identify patients most likely to benefit from ICDs and those who are unlikely to be helped.

> Almost one-third of colon cancer patients stop chemotherapy prematurely, leading to a doubling of the death rate, report Columbia researchers Alfred I. Neugut, M.D., Ph.D., and Dawn L. Hershman, M.D. Using a national Medicare database to identify stage III colon cancer patients who received one to seven months of fluorouracil (FU)-based chemotherapy treatment, the researchers found that those who

underwent five to seven months of treatment survived nearly twice as long as the 30.9 percent of patients who received only one to four months of treatment.

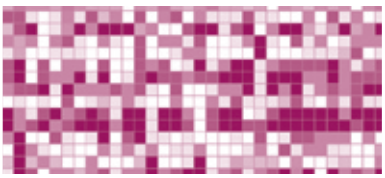
> Cognitive impairment appears to be common in people with ALS (amyotrophic lateral sclerosis), a progressive motor neuron disorder, according to a study led by Columbia scientists Yaakov Stern, Ph.D., and colleagues. ALS was previously thought to affect only the motor system, but it is becoming increasingly clear that the symptoms are much broader: In the study, one-third of ALS patients showed cognitive impairment.

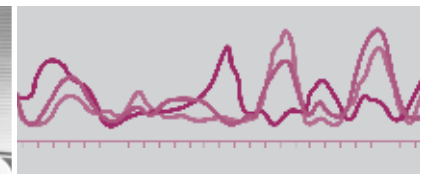
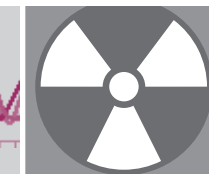
> Patients with carotid artery blockage have an increased risk of stroke, even when they show none of the usual symptoms, such as limb weakness and speech difficulties. Now, results from the largest-ever multi-center U.S. registry on the efficacy of carotid stenting show that the procedure is safe and beneficial in patients who are at high risk for standard surgical therapy. The trial, led by Columbia researchers and known as CAPTURE (Carotid ACCULINK/ACCUNET Post Approval Trial to Uncover Rare Events), is hoped to lead to re-examination, and eventual expansion, of current government coverage for this procedure for a greater number of patients in need of this promising technology.

> Despite costing roughly four times as much, four relatively new drugs show no substantial advantage over previous-generation antipsychotic medications used to treat schizophrenia. That was one of the key findings from the landmark NIMH-CATIE (Clinical Antipsychotic Trials of Intervention Effectiveness) trial, led by Columbia's chairman of psychiatry, Jeffrey Lieberman, M.D. (above left) The trial provides key insights for practitioners to use in choosing medications for patients with schizophrenia and also highlights the urgent need for new therapeutic options.

> Columbia Professor of Radiation Oncology David Brenner, Ph.D., (above right) will lead a consortium developing new technologies to rapidly screen large numbers of people for radiation exposure in the event of a terrorist attack on a nuclear facility or the detonation of a radiological "dirty bomb." The team will develop new devices that can assess, within a few days of a potentially catastrophic radiological incident, the radiation doses received by hundreds of thousands of individuals. The research, funded by a $25 million grant from the National Institute of Allergy and Infectious Diseases, capitalizes on Columbia's long history of leadership in radiation sciences.

> The osteoporosis drug raloxifene is just as effective as tamoxifen in preventing invasive breast cancer in postmenopausal women at risk for the disease, according to the Study of Tamoxifen and Raloxifene (STAR), led by Victor Grann, M.D., clinical professor of medicine and epidemiology and health policy and management. Both drugs reduced the risk of developing invasive breast cancer by about 50 percent. In addition, women who took raloxifene had 36 percent fewer uterine cancers and 29 percent fewer blood clots than the women who were assigned to take tamoxifen. Unexpectedly, raloxifene was not as effective as tamoxifen in reducing the risk of noninvasive breast cancer. The next prevention trial, which will compare raloxifene with an aromatase inhibitor, should start in late spring 2007.




> PET imaging, already used widely in the study of the brain, may be used to track diabetes progression. For years, doctors have been stymied in efforts to develop a screening method to measure insulin-producing beta cells: The pancreas, located deep within the abdomen, is largely inaccessible to biopsies. Now, a preclinical study led by Paul Harris, Ph.D., a research scientist in the Department of Medicine, shows that beta cells can be noninvasively imaged in rats using PET. A clinical trial of the technique in humans has been launched at the Naomi Berrie Diabetes Center.

> Women are less likely than men to receive recom-

mendations from their doctors for preventive therapies such as cholesterol-lowering drugs, aspirin therapy, and cardiac rehabilitation to protect against heart attacks and death, according to a study by Lori Mosca, M.D., Ph.D., associate professor of medicine and director of the Columbia Center for Heart Disease Prevention.

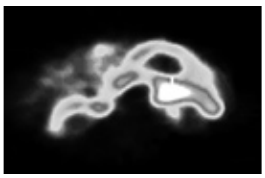
Patient Care

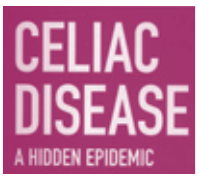
> Vagus nerve stimulation therapy for treatment-resistant depression is now available at Columbia, the first institution in the New York area to open a clinical Brain Stimulation Service offering this therapy in psychiatry. VNS – which stands for vagus nerve stimulation – is the first long-term therapy specifically approved by the Food and Drug Administration for treatment-resistant depression. Major depressive disorder affects nearly 19 million Americans every year, and approximately 4 million of those do not respond to multiple antidepressant treatments. In 2007, the FDA will convene a panel hearing on the second device-based therapy to be reviewed for the depression indication: transcranial magnetic stimulation, or TMS. The Columbia Brain Stimulation Division is a leader in TMS research for depression and other disorders and was the lead institution in the New York area for the TMS trial that generated the data the FDA will review.

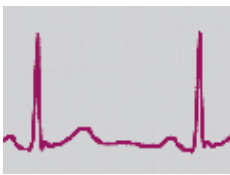
> Peter Green, M.D., published "Celiac Disease: A Hidden Epidemic" (Collins Books), raising awareness of this little-known autoimmune disease. Celiac disease is estimated to affect some 3 million Americans, but only about 3 percent currently receive treatment. Columbia's Celiac Disease Center provides comprehensive medical care, including nutrition, for adult and pediatric patients with celiac disease. The center diagnoses and treats more than 2,400 patients annually from around the world.

> Faculty at Morgan Stanley Children's Hospital and the Ambulatory Care Network of NewYork-Presbyterian Hospital run a new program called WIN for Asthma to reduce asthma-related emergency-department visits, hospitalizations, and school absences by 25 percent to 50 percent for high-risk children. The WIN for Asthma program, started through a $2 million grant, is just one of several community pediatrics programs administered by Columbia faculty.

> Columbia surgeons performed 106 heart transplants in 2006. NewYork-Presbyterian/Columbia has the largest heart transplant program in the country; more than 1,700 transplants have been performed since the inception of its heart transplant program in 1977. The 118 heart transplants performed at NewYork-Presbyterian in 2005 set a one-year record for any American hospital in the history of heart transplantation.







> P&S faculty working in NewYork-Presbyterian Hospital form one of the largest stroke centers in the nation. The hospital has received stroke center designation from the New York State Department of Health and is one of the first hospitals with a dedicated stroke center. Columbia and the hospital started offering comprehensive and coordinated care focused on stroke in 1983.

> Ground was broken (above) for NewYork-Presbyterian Hospital/Columbia's new state-of-the-art Vivian and Seymour Milstein Family Heart Center. Former President Bill Clinton, who underwent two cardiac surgeries at Columbia in 2004, attended the ceremony. The Heart Center, in a 142,000-square-foot freestanding building with six levels, will connect to the Milstein Hospital Building and the Herbert Irving Pavilion (formerly the Dana Atchley Pavilion). It is expected to be completed in 2009.

> NewYork-Presbyterian Hospital ranked sixth in the nation and first in New York City in U.S. News and World Report's 2006 listing of America's best hospitals.

In New York Magazine's annual poll of the metropolitan area's best hospitals, NewYork-Presbyterian was named the best hospital overall and best hospital in 10 areas of health care. In the annual ranking of New York City's best doctors, Columbia physicians regularly are represented more than clinicians at other facilities.

> Columbia surgeon Lloyd Ratner led New York City's first three-way kidney transplant at NewYork-Presbyterian Hospital. Dr. Ratner led 40 clinicians on six transplant teams who worked simultaneously in six operating rooms to transplant lifesaving kidneys into three patients without compatible donors.

> Columbia Professor of Social Medicine David Rothman, Ph.D., co-chaired a national group urging academic medical centers to restrict ties between drug companies and physicians. The group published its report in the Journal of the American Medical Association. Its recommendations included a ban on drug and device industry gifts, including drug samples, limits on individual relationships with industry, and firewalls insulating institutional pharmaceutical and device-related decisions from conflict. A number of medical schools have adopted the recommendations.

> Transient ischemic attacks, or "mini-strokes," should be taken just as seriously as stroke and treated the same, according to new guidelines from the American Heart Association/American Stroke Association. Columbia Associate Chairman of Neurology and Professor of Neurology and Epidemiology Ralph Sacco, M.D., chaired the committee that authored the guidelines, which found that the greatest risk a stroke survivor faces is another stroke.

> To better serve the aging population of northern Manhattan and the Bronx and create a nexus for education and clinical research in geriatric medicine, Columbia has launched a new division of geriatric medicine and aging based at NewYork-Presbyterian Hospital's Allen Pavilion in upper Manhattan. The new division, designed to prevent functional decline and promote healthy aging, will link experts from a wide spectrum of disciplines and turn the Allen Pavilion into a model of care for older adults.

> The Avon Foundation Breast Imaging Center and the Avon Foundation Breast Cancer Research Laboratory opened (below) in Columbia's Irving Cancer Research Center. The two facilities will provide access to screening and diagnostic services to underserved and uninsured women and conduct innovative basic science research focused on improved understanding of the underlying mechanisms of the disease. The imaging center offers state-of-the-art screening and diagnostic technology, including digital mammography, ultrasound-guided core biopsy, stereotactic-core needle biopsy, and a mammography reporting system to track patient history and facilitate timely follow-up.

> The Faculty Practice Organization at P&S, made up of nearly 1,200 physicians who treat patients at Columbia and NewYork-Presbyterian Hospital, is the largest multi-specialty medical group between Boston and Baltimore. The FPO this year has taken steps to become more efficient and responsive to its members and to patients, improving the experience for both provider and patient. Hard-working committees have explored technology issues, patient services, malpractice insurance, and staff training. The FPO hired its first executive director, Michael Duncan, who, along with FPO president Richard U. Levine, M.D., (left to right above) clinical professor of obstetric and gynecology, is helping the organization integrate sound business practices into clinical practice.





Columbia University's College of Physicians and Surgeons continues to benefit from generous contributions from individuals as well as philanthropic organizations. The college received gifts totaling $122 million during fiscal year 2006. The unique, close relationship that P&S shares with its greater community of friends and supporters allows it to fortify resources across a broad spectrum of disciplines. We have listed, in alphabetical order, a few of the many significant commitments that have advanced the college's mission of treating disease, understanding the causes of illness, and educating future generations of physicians and scientists. The generosity of our donors is helping P&S make great strides in defining the future of medicine.

P. Roy Vagelos (P&S'54), chairman of our *Defining the Future* capital campaign, has provided not only inspirational financial support, but also an extraordinary amount of time and energy in working with volunteers and faculty to secure record levels of philanthropic funding.

The Dr. Robert C. Atkins Foundation has established the Dr. Robert C. and Veronica Atkins Professorship for Obesity Research to support research into the causes of obesity in the hopes of developing new techniques for prevention and treatment.

The Avon Foundation has been a dedicated supporter of research and treatment of breast cancer at Columbia. This year, we celebrated the opening of Columbia University's Avon Foundation Breast Cancer Laboratory that will support innovative research in the field.

Under the leadership of Angelica Berrie, the Russell Berrie Foundation continues to be a steadfast supporter of CUMC, contributing generously to the Russell Berrie Foundation Program in Cellular Therapy for Diabetes, the Berrie Family Diabetic Retinopathy Program, and the Naomi Berrie Award for Outstanding Achievement in Diabetes Research.

Charles Brunie has provided support for the field of stem cell research; part of his philanthropy supports the Brunie Scholars Program, which sponsors young scientists working in the field. This promises to pave the way for significant developments in therapy for diseases of and injuries to the central nervous system.

Loren Eng and Dinakar Singh, whose contributions enabled the creation of the Motor Neuron Center at CUMC, continue their support of research with a special emphasis on discovering new therapies for spinal muscular atrophy (SMA).

Through a generous bequest, the estate of Thelma Ewig (below) has established the Ewig Clinical Education Endowed Fund in the Department of Medicine, recognizing our best clinical educators and providing them with financial support for the portion of their time devoted to teaching activities.

The Gatsby Charitable Foundation has provided a multi-year philanthropic grant relating to neural circuitry. This year, the foundation's support helped initiate international collaboration in this endeavor with universities in Great Britain.

Once again, Mr. and Mrs. Herbert Irving (above) have expanded their extraordinary support of CUMC with a munificent pledge for the Irving Clinical Research Center and the work of the Herbert Irving Comprehensive Cancer Center, whose mission is to combat cancer through the development of better therapies and a search for a cure.

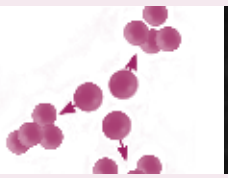
The Kavli Foundation continues to support the Kavli Institute for Brain Science at Columbia under the leadership of Nobel laureate Eric Kandel, M.D., University Professor of Psychiatry, Physiology & Cellular Biophysics, and Biochemistry & Molecular Biophysics. The Kavli Institute focuses on the development of novel experimental and computational strategies for analyzing complex neural networks.

Mr. and Mrs. Martin S. Kimmel established the Helen and Martin Kimmel Assistant Professorship in the Department of Ophthalmology to help the holder develop a career in basic science or clinical vision research.

Columbia Trustee Gerry Lenfest (Law'58) and his wife, Marguerite, have provided significant support for financial aid for students. P&S strives to offer the most talented students admission, regardless of financial status.

Longtime friends of CUMC, Stephen and Constance Lieber continue to generously support the Lieber Center for Schizophrenia Research. The Liebers have made numerous gifts to CUMC, including the establishment of the Lieber Professorship, currently held by Dr. Jeffrey Lieberman, chairman of the Department of Psychiatry (below center).

Under the leadership of Robert Bendheim, the Leon Lowenstein Foundation has provided generous support to the Robert and John M. Bendheim Clinic for Movement Disorders. The clinic offers care for patients with Parkinson's disease and other movement disorders. The Lowenstein Foundation made numerous gifts in several areas, including neurology, psychiatry, and medicine.



Through the Katz Foundation, Lewis Katz has established the Katz Prizes for Cardiovascular Research (above left), which recognizes the academic excellence of cardiologists both nationally and at Columbia.

The Mallah Family Foundation made an outstanding pledge to support cardiovascular care and research in honor of Drs. Allan Schwartz and Mehmet Oz, whose pioneering work in the fields of cardiology and cardiac surgery targets some of our most urgent health care challenges.

Marianne and Allen Mebane made a generous pledge to advance patient care, research, and education in the Division of Digestive and Liver Diseases. The Mebanes also supported research fellowships in ophthalmology and urology.

Joseph and JoAnn M. Murphy extended their support of the Naomi Berrie Diabetes Center with a generous pledge to fund the Christopher J. Murphy Professorship for Diabetes Research in memory of their son. In addition, Mr. and Mrs. Murphy committed to a leadership gift providing much-needed unrestricted support for clinical care and research in the Berrie Center.

Edward S. Reiner established the Reiner Center for Behavioral and Psychosomatic Medicine. The Reiner Center promotes excellence in exploring the influence of psychiatric, psychological, behavioral, and genetic factors in illness. It also supports the Nathaniel Wharton Professor of Behavioral and Psychosomatic Medicine, the Herbert H. and Ruth S. Reiner Fellowship Fund, and the Edward S. Reiner Fund.

Mr. and Mrs. Michael Schneeweiss created the Schneeweiss Research Fund in the Department of Ophthalmology, a current use fund to conduct research on retinal disorders, through genetic therapy and retinal stem cells.

Charlotte Schwarz endowed the Sanford and Charlotte V. Schwarz Professorship in Psychiatry, to be held by a nationally respected expert in psychosomatic psychiatry. The professorship supports teaching and research that enhances the ability of health care professionals and students to understand the emotional reactions of patients and families to illness and to improve communication between caregivers and patients.

Frank Sica has made a generous contribution to the medical center in support of the Pancreas Center. Under the leadership of Dr. John Chabot, the Pancreas Center fosters a multidisciplinary approach to the treatment of pancreatic cancer and sponsors basic and clinical research to investigate the biology of the disease.

Henry and Marilyn Taub continue to offer outstanding support to the Taub Institute for Research on Alzheimer's Disease and the Aging Brain. The institute is generating important insights into the pathogenesis of Alzheimer's disease and various related cognitive disorders.

Leonard (above right) and Claire Tow generously established the Claire Tow Professorship. The chair is occupied by Thomas Jessell, Ph.D., an internationally renowned neuroscientist, whose motor neuron research focuses on ALS.

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Beyond his distinguished career as both investor and philanthropist, William J. Ruane may have been best known among friends for his modest nature. Those who knew him and who benefited from his generosity can attest to his remarkable commitment to service. Though he shied away from public recognition, the extent of his contributions to organizations aiding the disadvantaged, and children in particular, is remarkable. The activities he championed at the College of Physicians & Surgeons and its Department of Psychiatry are too numerous to cite in entirety but include the TeenScreen program and other initiatives designed to help vulnerable youth.

His passing leaves us bereft of an extraordinary friend and benefactor, but his legacy and the causes he worked tirelessly to promote will endure.

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Mark E. Ginsberg, M.D.

Mechanical Circulatory Support Program
Yoshifumi Naka, M.D., Ph.D.

Melanoma Center
Howard L. Kaufman, M.D.

Paul Milstein Institute for Surgical Science
Ann Marie Schmidt, M.D.

Minimal Access Surgery Program
Dennis Fowler, M.D.

Minimally Invasive and Robotic Cardiac Surgery Program
Michael Argenziano, M.D.

New York Thyroid Center
William B. Inabnet, M.D.

Obesity Management and Surgery Center
Marc Bessler, M.D.

Pancreas Center
John A. Chabot, M.D.

Pancreatic Islet Cell Transplantation Program
Mark A. Hardy, M.D.

Pediatric Intestinal Rehabilitation Program
Dominique Jan, M.D.

Pediatric Minimal Access Surgery Program
Jeffrey Zitsman, M.D.

Pediatric Trauma Program
William Middlesworth, M.D.

Robotically Assisted Cardiac Surgery Program
Michael Argenziano, M.D.

Surgical Atrial Fibrillation Program
Michael Argenziano, M.D.

Transplant Center (liver, lung, heart)
Jean C. Emond, M.D.

Tumor Immunotherapy Program
Howard L. Kaufman, M.D.

Ulcer and Wound Healing Center
Nicholas Morrissey, M.D.

Vascular Institute
K. Craig Kent, M.D.

Vein Disorder Treatment Center
Roman Nowygrod, M.D.

Women at Risk
Freya R. Schnabel, M.D.

Urology

Center for Holistic Urology
Aaron Katz, M.D.

Center for Minimally Invasive Surgery
Jaime Landman, M.D.

Center for Robotic Surgery
David Samadi, M.D.

Center for Urologic Oncology
James McKiernan, M.D.

Male Reproductive Center
Harry Fisch, M.D.

New York Center for Human Sexuality
Jason Greenfield, M.D.

Center for Bladder & Prostate Health
Matthew Rutman, M.D.

Stone Center
Mantu Gupta, M.D.

Men's Health Initiative
Brian Stone, M.D.

Affiliated Hospitals

P&S affiliated hospitals:

NewYork-Presbyterian Hospital, New York, NY
Arnot Ogden Medical Center, Elmira, NY
Isabella Geriatric Center, New York, NY
Harlem Hospital, New York, NY
Mary Imogene Bassett Hospital, Cooperstown, NY
New York State Psychiatric Institute, New York, NY
St. Luke's-Roosevelt Hospital Center, New York, NY

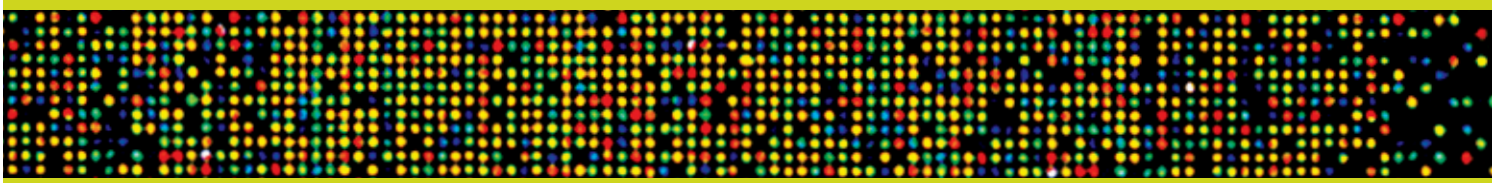
P&S/NewYork-Presbyterian Hospital affiliated hospitals:

Helen Hayes Hospital, West Haverstraw, NY
Holy Name Hospital, Teaneck, NJ
Lawrence Hospital, Bronxville, NY
New Milford Hospital, New Milford, CT
New York College of Podiatric Medicine and the Foot Clinics, New York, NY
Nyack Hospital, Nyack, NY
Orange Regional Medical Center, Middletown, NY
Palisades Hospital, Palisades, NJ
St. Mary's Hospital for Children, Bayside, NY
St. Vincent's Hospital, Bridgeport, CT
Stamford Hospital, Stamford, CT
Valley Hospital, Ridgewood, NJ
White Plains Hospital Center, White Plains, NY

College of Physicians & Surgeons 2006

Enrollment, Fall 2006	
M.D. program	624
M.D./Ph.D. program	74
Other M.D. programs	1
Graduate programs	408
Full-time faculty	**1,895**
Living M.D. alumni	**7,726**
Budget (FY06)	**$1 billion**
Endowment	**$1.192 billion (September 30, 2006)**
Endowed chairs	**158**
Research support (FY06)	**$324.23 million**

Degrees granted, July 2005 to June 2006	
M.D.	147
M.D./M.P.H.	5
M.D./Ph.D.	13
M.D./M.B.A.	4
Ph.D.	66
Doctor of physical therapy	19
M.S. in occupational therapy	42
M.S. in nutrition	19
M.S. in biomedical informatics	12
Certificate in psychoanalysis	5



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2006 Annual Report

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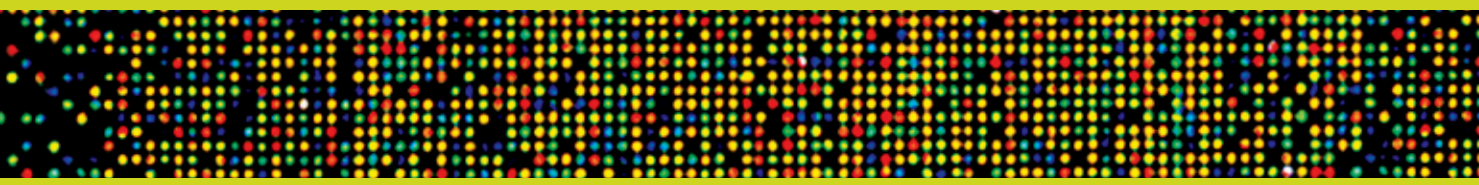

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College of Physicians and Surgeons

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