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Justine Levin awarded 2000 David Rockefeller Fellowship

Justine Levin (center) is the recipient of the 2000 David Rockefeller Fellowship. She is joined by David Rockefeller (left) and David Sabatini, a 1966 alumnus of Rockefeller University. *Photo by Paul Schneck.*

Justine Levin is the recipient of The Rockefeller University's 2000 David Rockefeller Fellowship. She received the award at the Convocation luncheon on Thurs., June 8. Levin was presented with the award by David D. Sabatini '66, chairman of the Alumni Centennial Symposium Planning Committee and professor and chairman of the Department of Cell Biology at the New York University School of Medicine.

Levin, who is completing her third year at The Rockefeller University, conducts research in the Laboratory of Biochemical Genetics and Metabolism that could lead to important insights into Alzheimer's disease. Working under the close guidance of Jonathan Smith, an associate professor in the lab that is headed by Professor Jan Breslow, Levin has already made important contributions to understanding how a gene called *apoE* affects the kind of damage to brain cells that is the hallmark of Alzheimer's.

She also is using mouse models to investigate possible protective effects of estrogen on the brain, a link suggested by epidemiological studies but not yet proven. With an increasing number of women living half their lives after menopause, the research has profound implications for the aging population in the upcoming decades; the findings could possibly lead to routine use of estrogen or estrogen-like substances to ward off the disease.

Levin came to RU in 1997 after graduating from Barnard College at Columbia University with a bachelor's degree in biology. She already was somewhat familiar with the institution, having worked in the laboratory of Professor Markus Stoffel for a month during winter break of her senior year. "That gave me confidence that the training I received at Barnard was sufficient to develop my scientific personality at a place like Rockefeller," she says.

Levin says she was drawn to Rockefeller by its flexible environment and small size. "I wanted to be in a research setting that gave me as much independence as possible but with the mentoring to keep me from getting lost both academically and scientifically," she says. "All my expectations have been fulfilled."

She says she has thrived under the tutelage of Smith, who himself has conducted much of the leading-edge research into *apoE,* because he is "an unbelievable mentor—a source of knowledge in experimentation and ideas that has brought me to this point."

Smith, in turn, commends Levin's enthusiastic approach to science. "Justine is

see **Justine Levin**, page 2

Seitz receives David Rockefeller Award for Extraordinary Service

President Emeritus Frederick Seitz (second from right) received the David Rockefeller Award for Extraordinary Service at Convocation, Thurs., June 8. Seitz was feted at a dinner later that day with honorary degree recipients Hidesaburo Hanafusa (left) and Purnell Choppin (far right), who were joined by President Arnold J. Levine. *Photo by Bruce Gilbert.*

19 receive doctoral degrees

Members of The Rockefeller University's class of 2000 posed for the traditional group picture in front of Founder's Hall last Thurs., June 8. Nineteen students received Ph.D.s at the Convocation ceremony. *Photo by John Sholtis.*

Rain threatened the university's 42nd Convocation for Conferring Degrees on Thurs., June 8, but the overcast skies held back for the traditional march into Caspary Auditorium, led by marshals Brian T. Chait and Maria Karayiorgou. Holding with tradition, there was no commencement speaker.

The graduates were presented by their faculty mentors, who introduced their students with admiration for their scientific accomplishments, related tales of adventures inside and outside the lab and wished them well in their futures as scientists. Excerpts of the presentations begin on page 3.

Kathleen Denis becomes RU's director of technology transfer

Kathleen Denis, RU's new director of technology transfer. *Photo by Jim Stallard.*

Kathleen Denis has become the university's new director of technology transfer, helping move research from the laboratory benches to the patients' bedsides using partnerships with the pharmaceutical and biotechnology industries. She will head the new Office of Technology Transfer, which will be guided by the university's Committee on Technology Transfer.

"Kathleen joins the university at an exciting time, as the possibilities of partnerships and consultations with industry have never been better," President Arnold J. Levine says. "Kathleen will develop policies to protect the interests of the university and preserve its integrity."

Denis brings a strong scientific background to her new position at Rockefeller, as well as valuable experience working in a university setting. As a director of the Center for Technology Transfer at the University of Pennsylvania from 1992 to 1995, she developed strategies for and managed the intellectual property assets of the university, with an emphasis on life sciences and biotechnology.

"Rockefeller has an incredible past and an incredible future," Denis says. "The technology developed here has been tremendous, and with the support of the new administration, the potential for new discoveries and their application for the public good is greater than ever."

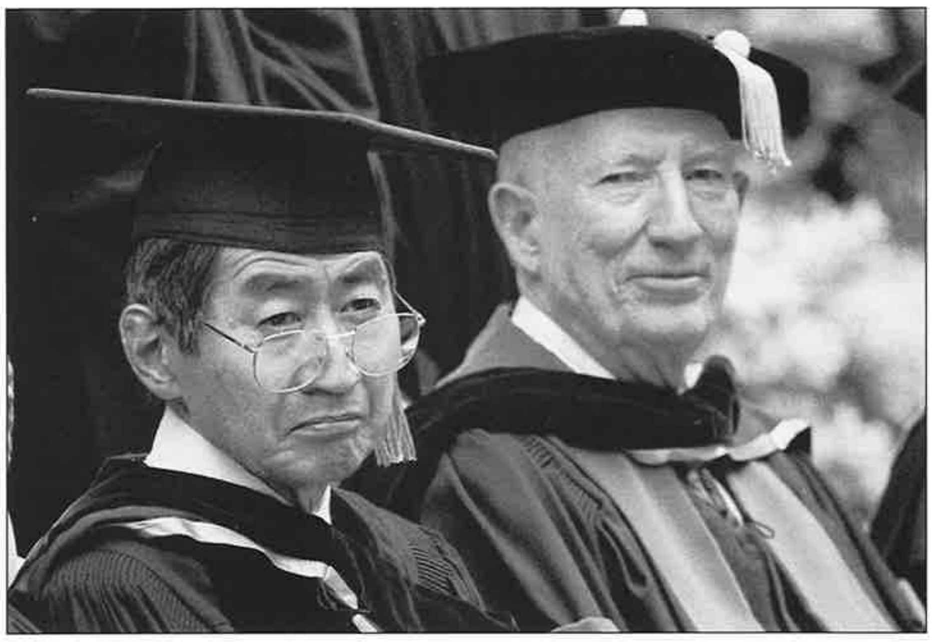
"I'm interested in the business side of science because it allows me to have contact with so many people," she says. "Success in technology transfer really depends on the relationships created between someone in my position and the administration and faculty investigators, as well as the researchers and business-development people at commercial entities."

Her scientific training sets Denis apart from most people in the business world. Denis received a B.S. in biology-genetics from Cornell University, an M.A. in human genetics and cell biology from the University of Texas Medical Branch in Galveston, Tex., and a Ph.D. in immunology from the University of Pennsylvania.

The establishment of the Committee on Technology Transfer and the hiring of Denis reflect the university's recognition that novel partnerships are forming at a rapid pace between academic research institutions and the corporate sector, and that this pace will accelerate in upcoming years. The committee will be called upon to expand opportunities for these partnerships and to advise the administration on any legal, financial and ethical issues encountered as a result of them.

Honorary degrees awarded to Hanafusa and Choppin

At Convocation (Thurs., June 8), the university awarded the degree of doctor of science, honoris causa, *to two members of the extended Rockefeller University family. Leon Hess Professor Emeritus Hidesaburo Hanafusa and Purnell Choppin, president emeritus of the Howard Hughes Medical Institute and a former Leon Hess Professor, dean and vice president of Rockefeller, received their honorary degrees to thunderous applause from the near-capacity audience in Caspary Auditorium. Below are excerpts from the introductions given by their presenters.*



The university awarded honorary doctoral degrees to Rockefeller University Professor Emeritus Hidesaburo Hanafusa (left) and Purnell Choppin, president emeritus of the Howard Hughes Medical Institute and a former professor, dean and vice president at Rockefeller. *Photo by Paul Schneck.*

Hidesaburo Hanafusa

The call to investigate the basic causes of cancer has had many respondents at Rockefeller University. Two of the earliest landmark discoveries in this field were made here early in the 1900s. Peyton Rous, in 1911, discovered the Rous sarcoma virus that was capable of causing tumors in chickens. Richard Shope discovered in 1932 a virus that caused papillomas, skin tumors in rabbits. This work came very early in the history of our understanding of viruses as packets of small numbers of genes—"infectious heredity" as the great biologist S. E. Luria called viruses. So the Rous and Shope discoveries languished for years before a molecular explanation for their effects was forthcoming.

Hanafusa, who grew up in postwar Japan, studied biochemistry on the way to his B.S. at Osaka University, publishing half a dozen papers before he was 25. Saburo then turned to animal virology for his doctoral work, also carried out at Osaka. He then made a decision that was to affect greatly the course of the oncogenic virus field. He came to the University of California at Berkeley to join Harry Rubin, who had made an important step forward during his years in Renato Dulbecco's group at Caltech. Rubin plated small numbers of the Rous sarcoma virus on sheets of chick embryo fibroblasts, and the infected cells adopted an abnormal growth pattern. They became "transformed," and only one virus particle was required to transform a cell. Such cells would grow as tumors when inoculated into animals. In a remarkable series of perspicacious studies, Hanafusa then showed that the classic transforming Rous virus required another virus for assistance in growing, but could—on its own—carry out the transformation to a cancer cell. Most chicken cells had such "passenger" viruses, which did not have the ability to transform, but could assist the Rous virus to grow. This idea of "defectiveness," meaning to a virologist a virus missing some of its genetic material, was to be of great importance. Hanafusa showed that the cancer-causing potential of the virus could be lost and then recovered by growth in a normal cell. In these cases the virus was picking up a gene or a missing part of a gene from normal cell DNA that enabled it to acquire its cancer-causing ability. Thus, normal cells contain the seeds of their own perversion to cancer cells.

This monumental discovery, completed by the mid-1970s, by no means ended Saburo's valuable contributions to the new field of molecular oncology. A parade of gifted students, in fact the greatest number of students to graduate from a single Rockefeller University laboratory, duly went to the 11th floor of the Tower Building and came away with a Rockefeller University Ph.D. and a start on a career as a tumor virologist. All of the cancer-causing molecules or "oncogenes" that Saburo and his students uncovered take part in signaling pathways that are crucial to controlling normal cell growth. These studies opened our eyes to the molecular fact there is no single cause of cancer at the molecular level—there are multiple causes.

For these truly distinguished contributions to our understanding of cancer biology Saburo has been widely recognized. For example, he received in 1991 the Japan Culture Merit Award, and one of that country's highest possible honors, the Japan Order of Culture in 1995; his students, his friends and I have always thought that this latter honor was most correctly translated to mean the recipient was anointed as a "National Treasure." Perhaps in this case we should say "International Treasure." Among his many other honors, Saburo is a foreign member of the National Academy of Sciences of the United States and received two of the most distinguished awards in this country, the Lasker Basic Medical Research Award in 1982 and the Sloan Prize from the General Motors Cancer Research Foundation in 1993.

Saburo was a quiet but extraordinarily valued colleague to a great many Rockefeller University scientists, collaborating directly with many of us and always a great source of wisdom to all of us.

No one in the long struggle to understand cancer has made as many greatly revealing discoveries of what causes our cells to escape regulation and take the mindless, heedless, destructive course that all too many of us recognize too closely. When the inevitable day arrives that our increased knowledge turns the tide to cure, not just temporary amelioration for cancer, Saburo Hanafusa will be one of the most important architects of this success.

—James Darnell

Purnell Choppin

It has been said that in all creative professions, there are explorers and colonizers. The explorers are a rare and a restless breed. They are constantly on the move and continuously reinvent themselves. They discover new paradigms and develop them into new fields. The colonizers, on the other hand, are more stationary. They settle in the newly discovered fields and enrich them with a large number of details.

Most scientists are colonizers. Only a few go on to become explorers and create new fields. Purnell Choppin is one of these very few.

Purnell was born in Baton Rouge, La. He received an M.D. from Louisiana State University and did his internship and residency in Barnes Hospital in St. Louis. In 1957, he joined The Rockefeller University as a postdoc in the Horsfall laboratory. Horsfall was the school's vice president; so Igor Tamm in Horsfall's lab became Purnell's mentor.

In 1960, Purnell was promoted to assistant professor and physician. In 1970, he became full professor and senior physician. Together with Igor Tamm he headed the Tamm/Choppin Laboratory of Virology.

The Tamm/Choppin laboratory continued Rockefeller's great tradition in virology, which began with Rous, Shope and others. Theirs became one of the leading virology laboratories in the world. One of the graduate students of this laboratory was David Baltimore, who shared the Nobel Prize with Howard Temin for the discovery of reverse transcriptase.

Purnell's work focused on the membrane that surrounds many viruses, such as the influenza virus and HIV. The viral membrane functions in fusing the virus with the host cell membrane, thereby allowing entry of the virus' genetic material into the cell. The fusion between the virus and the host cell is mediated by proteins in the viral membrane. Purnell's laboratory identified membrane proteins of several viruses, among them influenza, parainfluenza and measles.

One of Purnell's seminal findings was that fusion occurs only after a precise proteolytic cleavage of one of the viral membrane proteins by a host protease. Hence, the virus is like a Trojan horse: Its entry into Troy (the cell) requires the help of the Trojans (the host cells), who provide the proteases necessary for entry. These principles, first established by Purnell for influenza and parainfluenza, subsequently have been shown to apply to many other membrane-containing viruses and have led to the development of specific protease inhibitors, which are now among the most important drugs in the fight against AIDS. This is a beautiful example of how basic research can lead to the development of powerful drugs in the fight against disease.

In 1977, Purnell was elected to the National Academy of Sciences. He also is the recipient of the prestigious University of Chicago's Howard Taylor Ricketts Award and the Waksman Award in Microbiology from the National Academy of Sciences.

Education has always been a priority for Purnell. In 1983, he became vice president of academic programs at RU and in 1985, dean of graduate studies. In 1985, he also became vice president and chief scientific officer of the Howard Hughes Medical Institute (HHMI), becoming president in 1987. His achievements there were simply spectacular. When Purnell started at the HHMI, it had an endowment of $4.6 billion. Its endowment today is over $13 billion. During Purnell's tenure, the annual budget of the Institute grew from $77 million to over $600 million, with $5.5 billion so far expended. In addition, the number of HHMI investigators grew from 77 to 330, of which there are 11 at Rockefeller. Purnell also was the moving force behind the construction of a beautiful new campus in Chevy Chase for the HHMI. The architecture of the buildings and the surrounding landscaping attest to the great aesthetic sensitivity of Purnell.

At the end of 1999, Purnell stepped down as president of the HHMI, but his schedule is busier than ever. He serves as cochairman of the National Research Council and several other governmental advisory bodies. He has temporarily postponed his plans to write a book on the history of the HHMI and on Howard Hughes himself. We hope not for long. Purnell is known for his wonderful sense of humor.

—Günter Blobel

Justine Levin, from page 1

an extremely energetic and inquisitive person, and she has made a big impact on our research using mouse models of Alzheimer's disease," he says. "I am really fortunate to have her working with me in the lab."

Levin praises Rockefeller for its willingness to do what is necessary to bring a student up to speed in a certain skill. For example, Rockefeller Professor Bruce McEwen taught her how to do microsurgery, and the university paid for her to go to Washington University in St. Louis to learn how to take cerebrospinal fluid from mice, techniques that are essential to her work in the laboratory.

The David Rockefeller Fellowship, first awarded in 1998, consists of one year's stipend and an additional monetary prize. It is awarded to an outstanding third-year student who demonstrates exceptional promise as a student and a leader. Levin has shown these qualities by the remarkable extent to which she participates in extracurricular activities. This year she assisted in the recruitment of future graduate students, serving as student committee chairperson for the school's Open House in March, for which she organized the first student roundtable for prospective students.

She also has been teaching a weekly seminar at a New York City high school on contemporary issues in biology. "The limitation of high school biology is that you're learning mostly from a textbook, which does not change during the year. But biology is so fluid, there's always something new, so I taught from contemporary articles in publications like the *New York Times* and *Scientific American.*"

This furious pace of change is another reason Levin is glad to be where she is at the moment. "When I leave graduate school, the face of science may be completely different," she says. "With the Human Genome Project being completed, the next era will be translating structure to function. Being at Rockefeller, you feel like you're in the middle of it—you're not missing out."

Faculty mentors pay tribute to Rockefeller's 2000 grads

By Rockefeller tradition, faculty mentors present each Ph.D. candidate individually at the Convocation ceremony. The advisors describe the new graduates both as scientists and as colleagues. Below are excerpts of this year's remarks.

Members of the faculty, trustees and graduates file into Caspary Auditorium during the traditional march around campus. *Photo by Paul Schneck.*

Roy E. Crist

When Roy Crist came to my lab, he initially doubted whether he could handle the array of surgical, electrophysiological, psychophysical and analytic techniques required to record from the brain and to relate the functioning of complex neuronal circuits to visual perception. For a while, I was afraid that I had let Eeyore into the lab. Whenever I asked him how things were going, his inevitable answer was "terrible." But he persevered. Later, when I asked how things were going, he changed his answer to "Oh, reasonable." Blown away by this uncharacteristic display of optimism, I suspected that something extraordinary was afoot.

In fact, Roy had discovered something that I believe will change our view on how the brain processes information. We had found that the visual cortex in adult animals exhibits experience-dependent plasticity. Originally we saw functional changes resulting from lesions of the central nervous system, the sort of thing that would allow us to recover function after a stroke. But, suspecting that we had tapped into mechanisms that contributed to the normal functioning of the brain, Roy embarked on an ambitious effort to look for the neuronal basis of perceptual learning in the primary visual cortex.

Perceptual learning results from extended practice on a task involving recognizing or discriminating between simple shapes, or in performing some motor task like playing the violin. In the end, Roy found a functional change in the visual cortex that was specific to the kind of learning associated with the task.

The picture that emerges is that even in adults, the cerebral cortex is highly dynamic, changing its properties in the long term according to the experiences that we assimilate throughout our lives and quickly switching its properties from moment to moment to accommodate the behavioral function that we are performing. Thus there is hope, even for the senior faculty at The Rockefeller University.

Coming to this finding was not easy. The other side of the coin of Roy's premonitions of doom is that he is forever striving to apply the most rigorous standards in pursuing his scientific goal. Roy and his wife, Amy, will be moving to North Carolina in the fall, where Roy will start a postdoc at Duke.

—Charles Gilbert

László Csanády

László Csanády arrived at Rockefeller in 1995, after earning his M.D. from the prestigious Semmelweis University Medical School in Budapest. He showed a strong leaning toward neuroscience, partly as a result of a research project on neuronal synapses that he had undertaken as a medical student. That inclination led László to carry out rotations in a couple of bona fide neuroscience labs here at Rockefeller, where he began developing an interest in ion channels. After I persuaded László that the physicochemical principles of how these microscopic protein machines work was likely to be the same no matter which cell they lived in, he joined us to study the cystic fibrosis chloride ion channel. Lack of function of this channel is the single cause of cystic fibrosis, which is the most common lethal genetic disease in North America.

For his thesis research, László devised powerful new methods for examining the behavior of normal and mutated versions of cystic fibrosis chloride ion channels, either one at a time, or in small or large uniform groups. By applying those methods to unaffected channels as well as to a variety of mutants, László was able to learn important new information about the complex interactions that take place between different parts of the molecule to regulate just when a normal cystic fibrosis chloride channel will open, and when it will close. This kind of information may eventually contribute to the development of pharmaceutical treatments to ameliorate the debilitating symptoms of cystic fibrosis.

While his scholarship was impeccable, and though he worked day and night in the laboratory, László somehow also managed to find time to explore New York and its surroundings with his wife, Agota, and their two small daughters. Accomplished cyclists and lovers of the outdoors, on summer weekends they could often be seen bicycling as a family to the beaches on Long Island.

Despite the several inquiries he received from excellent labs about staying in the United States, strong family ties to the homeland encouraged László to accept a faculty position in the biochemistry department at Semmelweis Medical School, where he might even turn his attention back to neuroscience. We will be sorry to see László and his family leave, but we know they will come back to visit us often because they were the lucky winners of "green cards" in the INS lottery a couple of years ago!

—David Gadsby

José Engelmayer

At Rockefeller, José indulged in his main interest, the immunodeficiency syndromes. Working with [former RU Assistant Professor] Steve Morse, he initially developed and implemented a molecular system to quantify feline immunodeficiency virus in cats.

He joined my laboratory a few years ago to develop vaccine strategies to combat HIV infection. He focused on pox viruses, which have been distinguished by their effectiveness as smallpox vaccines in humans. José explored the ability of pox viruses to transport HIV proteins to dendritic cells. José determined that the developmental stage of dendritic cells was critical for effective presentation of HIV proteins—he discovered that pox viruses, if delivered to young dendritic cells, could subvert the dendritic cells' function, thereby uncovering a novel mechanism by which pox viruses can evade the immune system. On the other hand, if pox viruses were given to older, more mature dendritic cells, one could elicit strong immune responses. In similar studies with avian pox viruses, which have the advantage of not growing in human cells, José showed that the viruses could transport HIV proteins to dendritic cells and simultaneously elicit strong T-cell responses from HIV-infected persons. These studies have set the stage to evaluate pox viruses in clinical trials as vaccines against HIV infection.

In the lab, José impressed many of us by his dignity, quiet purpose and sunny disposition. Because of his unassuming nature, it was many months before we realized José was a multitalented individual. José speaks four languages fluently, or almost fluently—English, Spanish, Hebrew and Yiddish—fortunately not all at the same time. He is an accomplished pianist and dancer—he puts John Travolta to shame. Finally, as I was to find out a year after he'd joined the lab, he is married to a lovely young woman from Mexico.

José has decided to embellish his scientific career in the new millennium by pursuing an M.B.A. at Rice University. This is probably a good idea given the state of the market and biotech stocks at the moment.

—Nina Bhardwaj

Associate Professor Marjorie Russel (left) and graduate Jian-nong Feng, who studied how the filamentous bacterial virus, phage, exits its host. *Photo by Paul Schneck.*

Jian-nong Feng

Jian-nong Feng has successfully overcome so many obstacles that she sometimes seems to have become addicted to challenges. She grew up during the Cultural Revolution and did not go to school until she was 16. When she finally did, she did so well that she was chosen by the government to study in Japan. Later, she came to the United States and struggled through some dismal jobs before landing one in a top research lab. Ultimately, she achieved her goal of doing graduate research at Rockefeller, where she initially worked in the de Lange and the Hanafusa labs. But luckily for us, Jian was attracted to bacterial systems and to the challenge of sorting out a very mysterious process, and she joined the lab to work with Peter Model and me.

She immediately gravitated to what had been for others an intractable aspect of the problem and slowly proceeded to make it tractable. Broadly stated, the question was how our experimental organism, a filamentous virus, manages to exit its bacterial host without rupturing or otherwise compromising the integrity of the bacterium. The problem is akin to finding a way for a pencil—really hundreds of unusually long pencils—to get out of a balloon without letting the air out. Jian was determined to analyze the problem biochemically. She decided to concentrate on a critically important viral membrane protein that had previously eluded purification.

While she struggled with this problem, she pursued several related issues—she identified the type of energy that fuels virus formation and implicated the problem protein as the energy generator. She discovered that the problem protein interacts with two other viral proteins to form a virus exit structure that spans the double bacterial membrane. But she refused to give up on the purification. Ultimately her persistence and skilled analysis paid off. The purified problem protein does hydrolyze ATP, as her work had suggested it would, and it behaves as a large, multimeric complex, as she had suspected it might.

For most students, writing a thesis marks the final challenge of their graduate student days. Not so for Jian, who had the bad fortune to have finished writing hers and tried to deliver it to her thesis committee chairman, Günter Blobel, on the morning the 1999 Nobel Prizes were announced. Pushing past the TV cameras was the least of it. Günter had already become impossibly busy, and Peter and I suggested to Jian that she might have to find a new chairman to conduct her thesis defense. Not Jian. Günter, the world's expert on how proteins cross membranes, had followed her science throughout her graduate work, and she wasn't about to give up. Several months later, Günter had read her thesis from cover to cover and thought about it. One of his comments sent Jian back to the cold room for a while...and Jian was happy.

—Marjorie Russel

Elliott M. Kanner

Elliott Kanner's dissertation examined how our eyes make the molecule opsin. Opsin is the primary pigment in our eye that allows us to see. Elliott's research provided—pun intended—important insight into opsin. Each cell of our body is surrounded by a barrier called a membrane. The integrity of this barrier is essential for life. All cells interact with each other, and with their environment, by sewing proteins into this barrier. It is not known how this can occur without compromising the integrity of this barrier. Opsin has to be sewn into and across the membrane seven times. Elliott's work revealed how the information is encoded in the protein as well as how the machinery of the cell decodes this information. His dissertation research revealed some of the basic processes that regulate the synthesis of all proteins while implicating some of these

processes in retinitis pigmentosa—an all-too-common genetic cause of blindness. Elliott's presentation of his work here in Caspary, and his written dissertation, stand as testaments to his scientific achievements.

Elliott is the consummate self-sacrificing individual who will do whatever is needed to help the lab. A tip to Elliott's style should have been obvious to me when he first joined the lab, for he kept referring to his former advisor at Yale as Captain Janeway. Then, in our own lab, in preparation for mastering our purification of reticulocyte-lysate—broken red blood cells—Elliott educated himself in the latest in the technology by watching every episode of "Buffy the Vampire Slayer." When Elliott started his dissertation on opsin, he had to be home each night for "Eyewitness News."

The graduates-to-be await the arrival of the final guests in Caspary Auditorium, which was filled nearly to capacity. *Photo by Ravi Rajakumar.*

With each new member who joined the lab, Elliott would go out of his way to learn something about them or their work so he could offer constructive suggestions. When Asha [Rajagopal] and Collin [Thomas], who now collaborate with Elliott, moved up to our lab from Texas, he made sure to catch every rerun of "The Beverly Hillbillies." When Denise Marciano, who is also graduating today, started growing plants for her experiments, Elliott would watch "Little Shop of Horrors." When Mark Goulian, who did his Ph.D. in string theory, joined our lab, Elliott watched "Mouse Hunt."

But now Elliott is leaving the lab. Thus, gone will be the nights watching "Friends." Instead, he's preparing for his return to the clinical wards. And I'm sure you know what show he's watching now.

Well, Elliott, today's your graduation. For this day you're "King of the Hill" and then, back to "The Practice." No need to act surprised, express concern or deny all knowledge. As you leave the ranks of that revolutionary cadre some call the Sandy-nistas, remember, we will miss you.

—*Sanford M. Simon*

Anthony John Lombardino

Tony Lombardino came to my laboratory with a great interest in philosophy. To this he soon added a passion for birds, and he became an excellent ornithologist at the university's field research center in Millbrook, where the other half of this community lives. For his thesis, Tony studied the brain circuits that control the production of learned song in birds. He made many seminal observations. The most startling one was that once a bird learns its song, which it does by a complex process of vocal imitation, the resulting song memory becomes more and more robust as the birds grow and continue to sing. Specifically, as the motor memory becomes more entrenched, it becomes less and less dependent for its maintenance on auditory feedback. This is a very intriguing observation in a very useful animal model. It should now be possible to identify the cellular molecular factors that determine memory longevity and examine, for example, whether ingrained memories interfere with new learning. In time, Tony Lombardino may be able to answer that old question: Why is it that old dogs do not learn new tricks? Maybe it is that they remember too well the tricks already known.

Tony holds, I believe, a record of this university. When he was accepted, he took all too seriously our assertion that this is a very special place. He unhitched from his undergraduate studies and came to do doctoral work. This omission was discovered some years later, and it was only last week that he did his final exam at Columbia University in a course that was part of the breadth requirements on taoism. So it has taken him a mere month to proceed from undergraduate to Ph.D. I doubt this record will be bested anytime soon.

—*Fernando Nottebohm*

Denise K. Marciano

Denise Marciano worked on a few different projects in my lab. She studied immunology: how peptides are transported into the endoplasmic reticulum for antigen presentation—an initiating step in the immune response. She studied microbiology: how *Bordetella pertussus* transports its toxins into cells to immobilize them. She studied botany: how proteins are imported into the chloroplasts of peas. These somewhat disparate-sounding pursuits in immunology, microbiology and botany were, in many ways, almost indistinguishable projects.

Our bodies are made of cells, each of which is surrounded by a membrane that serves as a barrier, similar to a seawall. In each of these projects, Denise examined: "How do our cells selectively modify this barrier to let certain molecules cross the membranes without compromising the integrity of this cellular seawall?" A second common feature, in each project Denise introduced a novel and creative biological assay. Third, the projects addressed important issues in human health. And fourth, they all showed Denise's determination and enthusiasm.

The project she wrote up for her thesis combined all these characteristics. Her dissertation examined how particular bacterial viruses called filamentous phage leave their host bacteria. This was a study in membrane transport: The phage are almost 10 times larger than anything else known to cross membranes—and thus pose a particular problem for the cell. Denise had to design new biological assays to demonstrate that the phage encode their own exit portal that functions as a tightly regulated watery escape hatch from the cell. This addressed an extremely important issue in human health: This pathway is involved in the export of various "notorious" cellular toxins such as those responsible for bubonic plague, cholera and, perhaps most terrifying, the "Jack-in-the-Box *E. coli*."

But perhaps most dramatic was Denise's determination to make the project work. When it was clear that she was bearing down on a critical question in microbiology, she went across the street to the Weill Medical College's microbiology department to co-opt the assistance of the best and the brightest of their medical scientist training program students. It is a true sign of dedication to the lab to marry someone for the sake of a project.

Denise, you and your energy, enthusiasm, intelligence, as well as our adopted lab member Michael, will all be dearly missed.

—*Sanford M. Simon*

Joseph Marcotrigiano

As an undergraduate at Rutgers University, Joe studied chemistry and did undergraduate research on the structure and function of HIV reverse transcriptase.

Following the advice of his mentor, Aaron Shatkin, a 1960s Rockefeller graduate, Joe came to my laboratory in 1995 to study the problem of translation initiation in eukaryotes. With the help of our collaborator Nahum Sonenberg at McGill University in Montreal, Canada, Joseph launched a highly successful study of eukaryotic initiation factor 4E (eIF4E), which is responsible for recognizing the cap structure found at the 5′ ends of messenger RNAs. He used X-ray crystallography to determine the three-dimensional structure of eIF4E bound to an mRNA cap. This particular initiation factor plays a critical role in gene expression. After eIF4E binds to the mRNA cap, the genetic message can be made into protein by the ribosome. Too little eIF4E and the cell cannot make enough protein to live. Too much eIF4E and the cell will divide uncontrollably, becoming malignant. His structure of eIF4E provided the first atomic resolution view of mRNA cap binding—work that earned him fame and the first David Rockefeller Graduate Fellowship. Joe's success did not stop there. He also determined the three-dimensional structures of two new multiprotein-mRNA complexes, which together explain how nature uses molecular mimicry to regulate the action of eIF4E. These structures represent significant achievements that were of great technical difficulty and of enormous importance to translation factor biologists.

Although Joe worked extremely hard in the laboratory, he did not ignore the benefits of living in the heart of New York City. He was a frequent visitor to Yankee Stadium. He also won the heart of his beautiful fiancée, Cathy, a native of New York City and a medical student at SUNY Downstate. When Joe's discoveries were described by her microbiology professor, she proudly told him of her all-important supportive role in the project.

Having succeeded brilliantly in the structural biology of translation, Joe has decided to continue working this productive vein. Next month he will become a postdoctoral fellow in my laboratory, and I look forward to another burst of important structures of eukaryotic translation factors.

—*Stephen K. Burley*

Christina Mesropian

The best way to introduce Christina Mesropian is by saying a few words about what she has accomplished.

According to our present understanding, the proton is made up of three quarks, which are held together by a force much stronger than the well-known electromagnetic force and thus appropriately called "the strong force." If one tries to knock a quark out of a proton, the force holding it to each of the other two quarks increases, just like the force between two balls held by a spring. The theory predicts precisely how the strength of the force, the so-called "strong-coupling constant," depends on the distance between quarks. Christina measured this dependence with great precision, confirming the theoretical predictions.

The measurement was performed by analyzing the results of collisions between very high energy protons and antiprotons. The scattering of colliding quarks from these "nucleons" produces collimated jets of particles along the outgoing quark directions. The jet momentum transverse to the beam is a measure of the distance between the quarks at the time of scattering. Close encounters produce large transverse momentum jets. On the other hand, the number of events obtained is proportional to the strength of the interaction. Thus, the measurement is reduced to determining the transverse momentum spectrum of jet production in high-energy proton-antiproton collisions.

Newly conferred doctors of philosophy exit the auditorium, diplomas in hand, en route to the traditional class photo on the steps of Founder's Hall. *Photo by Paul Schneck.*

Christina's measurement represents a major contribution toward understanding the nature of the forces that hold matter together, which is essential to understanding the creation, evolution and eventual fate of our universe.

—*Konstantin Goulianos*

Bradley T. Messmer

Bradley Messmer graduated, when he was 19, from the Colorado School of Mines. We have it on back channel that his acceptance to RU was controversial because of concerns about his "maturity." Fortunately for science, these concerns were overruled by then-dean Norton Zinder, who himself started graduate school at 19 and has always had bigger fish to fry than worries about maturity.

The title of Brad's dissertation is "Toward Immunophenomics: The Unbiased Characterization of Antibody Recognition." We made up the word "immunophenomics," so I should explain it. Consider the question: If I give you a milliliter of my blood, can you tell me the complete set of epitopes—the molecular shapes—that are recognized by the antibodies in it? Currently there is no method to answer this question, and we believe that is an important void in our understanding.

If you have prior knowledge or guess what epitope to look for, then you can ask if a sample contains antibodies to it. But looking only for the already known is "light-under-the-lamppost science." Others have suggested an "immunomics" project, analogous to genomics and expression genomics projects. But the diversity of antibody-encoding genes is probably larger than that of all the germline encoded genes.

Even if you obtained all the sequences that encode the antibody genes, the protein-folding problem means you still would not know the shape of the antigen-binding sites. Then come problems of predicting induced fit and binding epitopes. This series of problems suggests that direct experimental methods are needed to allow the unbiased determination of the set of specific binding capacities present in many component mixtures. In the case of a mixture of antibodies, such as a milliliter of blood, that's "immunophenomics," and Bradley's work is progress toward its realization.

Bradley used and improved a technique known as biopanning with phage display. This allows one to present antibodies with a billion different molecular shapes and ask the antibody in an unbiased way to choose the ones it prefers to bind. This method owes a lot to several [researchers] from RU, including Norton Zinder, Peter Model, Marjorie Russel and George Pieczenik, all of whom experimentally and intellectually set the way for phage display; Joshua Lederberg, who was an early advocate of genetic approaches to chemistry; and Bruce Merrifield, who began working with selection from chemically synthesized peptide libraries.

Bradley has just begun postdoctoral study in immunology with particular emphasis on autoimmunity with Nicholas Chiorazzi at North Shore Hospital in Great Neck, Long Island, and NYU School of Medicine. Brad and I are also continuing to collaborate, which grows out of our mutual respect and regard.

—David S. Thaler

Davorka Messmer

When I first came to Rockefeller, I worked closely with three students, who went on to become professors at major institutions. I quickly learned from these three young ladies that our students are really daring, taking on very difficult projects. Davorka Messmer fits this standard. She chose to study HIV, using as an experimental model the simian immunodeficiency virus, or SIV.

About 10 years ago, Ron Desrosier at the New England Primate Center reported that if the *nef* gene were deleted from SIV, the virus now called delta nef was attenuated, and strikingly, the attenuated delta nef could act as a vaccine in most animals. Much to our surprise, the attenuated delta nef vaccine was able to grow well in tissue culture in the standard host cell, the T cell. Therefore, it was a mystery why in the animal the delta nef vaccine was attenuated.

Davorka has provided evidence, finally, for what is going on. In the body, viruses and vaccines can be picked up and presented to the immune system by dendritic cells. Davorka found that if she gave the virus to dendritic cells, and then added T cells, the delta nef virus was now severely compromised. In other words, when she mimicked the normal route of viral entry into the body, the vaccine was indeed attenuated, but if she bypassed this early step involving dendritic cells, the virus replicated very well.

Davorka soon begins postdoctoral work at North Shore Hospital to look at another challenging matter, immune responses to tumors. Davorka Messmer has sustained a beautiful Rockefeller tradition, tackling with courage the most demanding questions, and providing methods and answers that will have a lasting impact.

—Ralph Steinman

Susie Yvette Minor

Our laboratory has been interested in two quite common human bacterial diseases, meningococcal meningitis and gonorrhea. These diseases are caused by two very closely related bacterial species, the meningococcus and the gonococcus. In the last two decades it has become evident that the gonococcus has truly chameleon-like abilities to alter the chemical nature of the proteins and complex sugars that it carries on its surface and that come in contact with the tissues of the infected human being. For the most part, this quick-change artistry is accomplished by turning "on" or "off" the ability of about 60 genes to encode the production of their protein products. These genes have been named contingency genes, because they appear to have evolved to prepare the gonococcus to be able to cope with variations between human hosts and between different sites within human beings that this organism commonly infects.

Sue Minor became particularly interested in the variation of one of the gonococcal surface antigens called lipooligosaccharide. This molecule is composed in part by lipid and in part by short chains composed of various sugars. One of the chains referred to as the α-chain can be as long as five sugar units, and by randomly occurring changes during growth of the organism in three of the contingency genes, the sugars on this chain can vary between five different forms. Remarkably, every one of these is a perfect mimic of oligosaccharides that are present on various human cells. Why such an elegant system for producing different mimetic oligosaccharides is of advantage to the gonococcus fascinated Sue, and her studies were directed to answer this question.

With a clear understanding of the genes involved in this variation, Sue produced, by genetic means, a set of strains that could not vary spontaneously and an α-chain varying between zero and five sugars. With these mutants she was able to determine the role that lipooligosaccharides with different chain lengths play in adherence and in invasion in three different human cell lines. Her results showed that decreases in the size of the oligosaccharide had no effect on the ability of the gonococci to adhere or invade the human cells in tissue culture until the α-chain was absent. Without the α-chain, strain adherence was slightly reduced and the ability to invade the epithelial cells was 100-fold less.

While Sue returned to medical school in March, she still has her desk in the lab with her computer and a manuscript that has been favorably reviewed. To Sue I would like to say that it was wonderful to have you in the lab and to have been granted the opportunity to be a part of your vocation.

—Emil C. Gotschlich

Everything's coming up roses. Susie Minor celebrates her new doctoral degree with her family.
Photo by Bruce Gilbert.

Radha Rangarajan

When Radha arrived in the lab, we had just carried out "forward" genetic screens for mutations that affect photoreceptor axon projections and had discovered that in many cases, the projection problem was caused by abnormal development of glial cells, rather than by abnormalities in the neurons themselves, which was very unexpected. Glial cells have long been considered the "low life" of the nervous system, and although they represent the majority of its cells, relatively little is known about their function, in particular during development.

Radha decided to take a good hard look and embarked on a series of beautiful studies in which she examined the development of the glia and their role in axon guidance in the *Drosophila* visual system. She was able to show that neurons and glia suffer from a severe case of co-dependence: The photoreceptor neurons attract the glia to their appropriate positions in the developing eye, and the glia, in turn, are critical for guiding the photoreceptor axons out of the eye into the brain. Radha then took this analysis to the molecular level and found that the diffusible molecules Decapentaplegic and Hedgehog are secreted by the differentiating photoreceptors and stimulate the proliferation, migration and differentiation of the glial cells, a role that had not previously been ascribed to these molecules. With these and other studies, Radha has made important conceptual and technical inroads into glial cell biology, from which the lab and the scientific community will benefit for years to come.

Radha was a wonderful person to have in the lab. It was a pleasure to see her grow and develop into a thoughtful and creative scientist. She radiated grace and calm and a warm consideration for all fellow beings—her lab mates, fellow graduate students and even the other users of the confocal microscope. Radha's

Radha Rangarajan, who did her thesis research in the Gaul lab, waits for the signal that begins the Convocation march.
Photo by Paul Schneck.

tough side really comes to shine in matters of politics. During lunch break, Radha would forgo the flick through *Nature* or *Science* and religiously peruse the *New York Times*. At minimal prompting, she would discuss the latest political or economic events. And, unlike many of us, Radha acts on her social-political views and actively helps women in need.

Radha, we wish you all the best in your future pursuits. We know that you will make important contributions to science and the world.

—Ulrike Gaul
(presented by Stephen K. Burley)

Sidarta T. Ribeiro

At first when Sidarta Ribeiro began the graduate program at Rockefeller, he was quite divided. He was attracted to the questions we were addressing in the Nottebohm lab, on the neurobiology of birdsong, but he was also interested in brain mechanisms underlying sleep and dreams, partly because of the personal experience he had when he arrived at Rockefeller. In his own words, "I struggled to study hard and quickly engage in productive research, but all I could do was sleep…sometimes 12 hours or more a day." Quite a promising start for a graduate student!

He eventually did study both questions. The core of his thesis work relates to song auditory representation in songbirds. He tackled this question elegantly by using brain gene expression analysis and manipulating the birds' auditory environment. In large part due to Sidarta's engaging personality, a multidisciplinary study group (Canarios) was created with Guillermo Cecchi and Marcelo Magnasco from the Center for Studies in Physics and Biology. An automated mapping system and analytical tools were developed to efficiently study the brain gene expression maps. It was found that each syllable in the song of a canary elicits a unique pattern of activation in the brain. Combined, these patterns appear to form the basis for a song—syllabic representation. Importantly, these maps can be shaped by auditory experience. The principles unveiled in Sidarta's work have significantly contributed to our understanding of the brain's encoding of vocal communication signals, as well as the general mechanisms of brain representation.

In the second project, done in collaboration with Gus Pavlides, also at Rockefeller, Sidarta revealed the occurrence of a window of gene reactivation during REM sleep in rats. This reactivation occurs only in animals with a previous significant sensory motor experience, provid-

ing a possible mechanism for the cognitive role of sleep. Sidarta will now continue his studies on brain function as a postdoc in Miguel Nicolelis' lab at Duke University.

I believe Sidarta Ribeiro embodies the very qualities that have distinguished the graduate students at Rockefeller and helped make this such a unique place for biomedical research. Everyone who knows Sidarta immediately recognizes his enthusiasm for science, critical thinking, independence and autonomy, the ability to identify and address fundamental and difficult questions and to make broad and insightful generalizations. All of this coupled with experimental skill and great care for technical detail. Most of all, however, Sidarta has been a great colleague and a close friend, and it has been a lot of fun to work with him.

Some of you may know that Sidarta also has literary talents, having published a book of short stories *Entendendo as Coisas* (Understanding things). Lastly, we both have at least one big dream in common: To establish a high quality neuroscience research program in Brazil, taking advantage of the natural and human resources. I believe Sidarta has the talents needed to make this dream a reality some day.

—*Claudio Mello*

Roberto Sanchez

I have known Roberto since he was a research fellow at the International Centre for Genetic Engineering and Biotechnology (ICGEB) in Trieste, Italy. We have interacted on a daily basis since he joined my laboratory as a graduate student in August 1995.

I am extremely impressed with the volume and quality of Roberto's work. Roberto's main effort was to create, improve and assemble routines for comparative protein structure modeling into a fully automated, large-scale comparative modeling pipeline; to apply the pipeline to all known protein sequences; and to think about and explore the consequences of this unique modeling technology for structural and functional genomics. The pipeline converts multiple protein sequences to fold assignments, sequence-structure alignments, three-dimensional models and model evaluations. Roberto also constructed the ModBase database to store the results of the pipeline. Roberto designed the pipeline and the database to run on a cluster of workstations essentially automatically, which will soon result in models for all proteins that are related to at least one known protein structure. The project has been executed with the highest quality, even though it is very demanding both technically and scientifically.

Roberto has had approximately seven other projects over the last four years, which already resulted in 12 publications. He also frequently provides postdocs and other students with advice, help and computer routines.

In summary, Roberto is an extremely productive and committed scientist. He also has the knowledge, drive, creativity and independence that should enable him to contribute significantly to the area of structural bioinformatics. Roberto knows his tools very well, including computer and programming systems. He has proven that he can develop the most accurate protein structure prediction tools and apply them wisely. He is very interested in pursuing both methods development and their applications. I believe Roberto will create significant new science.

—*Andrej Šali*

Hynek Wichterle

Hynek Wichterle has amazing intuition for discovery and a remarkably creative mind, attributes he may have inherited from his grandfather, the great Czech chemist Otto Wichterle. Asking the most interesting questions, designing imaginative experiments and executing them with unmatched skills all come naturally to Hynek. He is one of the most remarkable experimentalists I have ever met. No wonder his thesis work is already considered a classic in the field.

Hats off! In the inauguration of a new Rockefeller tradition, the Class of 2000 tosses their caps into the air. *Photo by Bruce Gilbert.*

His thesis, "Brain Invaders: Widespread Neuronal Migration in the Adult and Embryonic Brain," reveals the mechanism by which cells move in chains, a novel form of cell movement discovered in the adult brain, in which young nerve cells crawl along each other. Hynek's experimental savvy allowed him to build new gadgets and write computer programs to directly visualize the cells' actions. He made remarkable movies that revealed the details of each step young neurons take. His work is the first to demonstrate this form of neuronal movement. Taking advantage of the procedures that he had developed, Hynek began exploring chain migration in the developing brain.

Investigators have been intrigued for decades by a large bulge of dividing cells at the base of the cerebral hemispheres of embryos, called the ganglionic eminence.

Hynek Wichterle (far left) enjoys a moment with his family at the reception in the President's House Wed., June 7. *Photo by Paul Schneck.*

Why so many dividing cells at this site? Hynek showed that within this bulge, there are cells endowed with an unprecedented ability—young neurons that migrate twice as fast as any young neuron previously known and, most importantly, that invade most of the developing brain. Thus, Hynek discovered that the ganglionic eminence is a factory of a type of nerve cells used in most of the cerebrum.

Hynek's trail of discovery doesn't end there. He went on to show that young neurons from the ganglionic eminence, when grafted into the adult brain, can trek deep into the already assembled brain to become functionally incorporated in mature brain circuits. He showed that these cells migrate and integrate also in the damaged brain, a discovery with considerable medical implications as this is the first primary nerve cell precursor known to integrate in this manner.

Looking back at what Hynek has done during the past four years, I am very certain that he has a very bright future. This fall, Hynek will join Tom Jessel's lab as a postdoc; we all wish him the very best of luck. We are very proud of Hynek's remarkable discoveries and the enthusiasm and creativity he brought to our lab and to Rockefeller.

—*Arturo Alvarez-Buylla*

Brian Russell Wong

The Brian Wong that I know is an aggressive, ambitious, smart scientist. He has the drive and potential to be enormously successful. Brian entered the Tri-institutional M.D./Ph.D. Program in 1993 and joined my lab in the fall of 1995 to carry out his thesis research. He was very ambitious from the start of his thesis and set up a number of cloning projects aimed at identifying new genes regulating T-cell death. During the course of these experiments, he identified a novel—at the time—member of the TNF family.

Unfortunately, this TNF family member, which he called *TRANCE,* was not involved in T-cell death. However, he was not discouraged by this fact. Having seen a mountain of evidence implicating every TNF family member as playing an important role in regulating the immune response, he proceeded to decipher the role of *TRANCE* in the immune system. He showed that *TRANCE* is in fact a survival factor rather than the death factor he originally sought.

His finding, of course, turned out to be extremely interesting in that *TRANCE* is a survival factor for dendritic cells and modulates immune responses by doing so. His findings formulated a very simple but new concept in the regulation of immune responses and laid a groundwork for clinical trials for better immunotherapy.

One of the most unique experiences I had with Brian was that he showed an extraordinary talent—as a student—for organizing collaborations through his M.D./Ph.D. program connections and other means. By coupling these fruitful collaborations with a tremendous personal effort, Brian capitalized on his luck, converting it into hard-earned success.

These days, there is a bewildering array of career options for a multitalented graduate like Brian. I can only advise him to follow his heart. I am confident that no matter which path he chooses, he will lead the way. We will miss Brian very much.

—*Yongwon Choi*

Lei Zhong

Lei grew up in the Hunan Province of China. After attending college at Nanjing, he came to the U.S.A., obtaining a master's degree in chemistry from the Southern University in Chicago, and then joined the Ph.D. program at RU. Because he was fascinated by the challenge of HIV vaccines, Lei decided to exploit the power of dendritic cells to deliver antigens from the immunodeficiency viruses to the immune system. Simian immunodeficiency virus, or SIV, infection of rhesus macaques mirrors HIV-1 in many ways, including the development of AIDS-like symptoms. So Lei decided to use this model system to test his hypothesis.

After trying out many ways to load dendritic cells [DCs] with viral antigens, Lei found that recombinant adenovirus was an efficient and nonperturbing genetic vector for dendritic cells. After preparing dendritic cells infected with recombinant adenoviruses, Lei would fly to Washington, where cells were injected to immunize the monkeys. As a result of Lei's work, we now know that DCs expressing SIV antigens can prime in vivo antigen-specific T cells and that this kind of immunization is not obtained by injecting vaccine vector alone.

Lei always said that only after meditation could he obtain the best cells possible. For this reason, perhaps, we sometimes could not find Lei in the lab. He is a fervid believer in the power that can be obtained by practicing meditation. On weekends, Lei traveled often with his friends to meet with their qigong masters. When he came back from these trips, he was much more relaxed and peaceful, and he resumed his dedication to the very important problem of inducing strong immunity to HIV.

Working with Lei has been full of ups and downs. Neither of us has an easy-going personality. Dealing with Lei is like touching the fire; you must have the right tool. But once you have the right tool, a lot of things are achieved.

—*Angela Granelli-Piperno*

Sidarta Ribeiro, graduate spokesperson, describes the game of science

At the luncheon hosted by President Arnold J. Levine for graduates and their families preceding last Thursday's Convocation, Sidarta Ribeiro from the Nottebohm lab was the graduate spokesperson. The following are excerpts from his remarks.

It is an honor and a pleasure to speak to you about the student experience here at Rockefeller University. This year's graduating class consists of people from nearly all continents—a testimony to the university's commitment to the universality of scientific knowledge. I am proud to have been taught to do research *pro bono humani generis*. Surely our training here will benefit not only society in the U.S. but also, directly or indirectly, in our home countries.

We have lived at RU for many years, and during this time, our ideas and habits have been deeply transformed. It is called a Ph.D. Is it possible to retrace for our parents, relatives and friends, who knew us before this transformation, what the path of change was like? While no one's experience was identical, I believe many of my recollections will apply to all.

Year one: This is probably the haziest of our memories. Imagine for a moment that you're 20-something and have signed up to play a game called "science." Your objective is to ask questions about nature and answer them in a systematic and skeptical way. The game has many rules, but there are three major ones. First, the questions asked should be completely novel. Second, the answers

"We came to Rockefeller with little more than dreams in our backpacks."

must be reproducible and convincing to the other players. Third, answers should be based on either direct experimentation or on new combinations of previously accepted answers. All questions are allowed.

Now imagine that you are accepted in an academy where some of the best players in the world play day and night. You have access to them, their playing fields and the questions they're trying to answer. Almost every day, excellent players from other academies come to tell stories of their own successful matches. This gives new players the opportunity to learn different maneuvers and strategies. As for the equipment—chemical, electronic, electromagnetic, mechanical and otherwise that you use to answer the questions with—the academy has the best, or it can be swiftly obtained upon request. Even more impressive, the academy hires professional "toymakers" that can help you invent new devices. The academy also maintains a Dean's Office for the counseling of young players, where one can go with any problem or concern, game-related as well as mildly existential, and solutions are provided!

Sounds good, doesn't it? The first year is commonly a memorable period of falling in love with science. You are told to dream, allowed to speculate, encouraged to experiment. At the same time, your social life is intense. The first-year class meets for transnational cooking clubs, picnics in Central Park, soccer matches and noisy parties. Many explore New York City for the first time. The year is characterized by the attempt to answer the first (and perhaps most difficult) question of all the years: What, among the many wonders of the world, should I investigate now?

It takes time to answer this question, often a couple of years trying different mentors, projects, labs and techniques, but no one seems to be in a rush. Why? Who is in control of my time? How should I proceed? Why do they believe I'll discover something new? Why are all the intellectual and material means so abundant?

It is usually not until the third year that one starts to understand why. The answer has to do with the type of science the university is committed to pursuing— opening the dark realms of the unknown. However, the unknown, as you can imagine, is the most difficult thing to know. Nature keeps its secrets very well. In order to discover them, one must question the oracle of experimentation.

A day in the life of a graduate student is a very humbling experience: You wake up a few minutes before the alarm clock, usually 4 a.m. or 4 p.m., have a cup of coffee and go to the lab. There you start an experiment, prepare some reagents. You read over lunch, eating quickly. You notice the results from the morning experiment are strange. What could be wrong? You go around and talk to people,

"In our backpacks we now carry a compass, a pair of wings and many more dreams for the future."

then set up the experiment again, in a slightly different manner. Maybe you fix some equipment while waiting. Then you have a snack and read. Faster! What time is it? What day is today? Get some coffee. Your results from the afternoon experiment are weird, too, but different from those of the morning. The results are hard to interpret, so you search the Web for relevant literature. Then you go to the library to read some papers, and you find something interesting that might help. After some hard thinking, you come up with a couple of

Sidarta Ribeiro, a graduate from the Nottebohm lab, delivers the Convocation luncheon address. *Photo by Paul Schneck.*

solutions. It's late. You get more coffee, prepare the experiment for tomorrow, which will be slightly different from today's. Then you go home, eat something quickly, read an interesting paper from the pile on your desk, set the alarm clock and repeat.

Irrespective of the field, we all banged our heads against the hard wall of the unknown. The glossy memories of the first year fade away with the endless repetition of feeble attacks on the unknown. Maybe the pH wasn't right. Maybe the enzyme is old. Are you sure of the concentration? Maybe you forgot something. Maybe the whole theory is wrong. Maybe, maybe, maybe, repeat, repeat, repeat. All the details matter, all the tiny things are crucial. Chase the problem. Confront it, crack it! Older players whisper words of encouragement: "Learn from your mistakes!" Repeat, fail, repeat, fail, repeat...and fail. The game of science requires a lot of patience.

And then one day, it happens. A surprising result is obtained that answers many questions in a coherent way. As Dr. Nottebohm enjoys saying, "Science is logical only after the fact." Never mind. Irrespective of what you did, you're in! You broke into some part of the unknown, and for the first time ever, somebody can see it! And let me tell you, few things feel better than that.

But then what? What would you do if you had just broken inside a dark new world? There is no guide. You might stay put and throw some light around, or run close to the wall for as long as you could, or even head toward what you believe is the center of the mystery. However, no matter where you move once inside the domain of the unknown, pretty soon you will crash into another thick wall. It's time to start all over again, and you will ponder all of the work it will take to invade the unknown one more time. However, once you've been there, you cannot help trying again. Curiosity is addictive. This is the nature of the game. Once you understand this, you become humble and grateful for the opportunity of playing on its frontier.

We came to The Rockefeller University with little more than dreams in our backpacks. Now it is obvious why the university offered us so much. Science is a very difficult game, and without the appropriate means, it would be impossible to play. Now it is clear why no one seemed to be ruling our time. To awake the game master in each of us, freedom is needed.

I wish to thank all of the mentors, colleagues, trustees, administrators and staff that made this awakening possible. It is time to part, and we will remember dearly these years of adventure. In our backpacks we now carry a compass, a pair of wings and many more dreams for the future. Thank you.

Rockefeller University graduates form immunology and marriage team

New graduates Bradley and Davorka Messmer met and married while graduate fellows at Rockefeller. *Photo by Ann-Marie Blaber.*

Among the 19 doctoral degrees awarded at this year's Convocation, two went to members of the same family. Bradley and Davorka Messmer met at a class barbecue during their first year at RU and were married in April 1999. The Messmers, who worked in different labs, say that the cohesiveness of their class and the interdisciplinary nature of Rockefeller contributed to their meeting, friendship and eventual marriage.

Deciding to attend Rockefeller was easy for Davorka. She recalls that during her interview here, "I was immediately impressed with the faculty, and I was happy that the program allowed students to begin working in the lab right away. After so many years of book study I was eager to get to work. By the end of the interview, I knew Rockefeller was the place for me." Davorka has studied the AIDS virus, focusing her studies on the simian immunodeficiency virus (SIV).

Brad came to Rockefeller to pursue studies in the biological sciences. He says he chose RU because "I knew that I would be encouraged to pursue my research interests wherever they might lead."

His choice proved to be a wise one. In his first years here, Brad studied the genetics of phage, a virus that infects bacteria, with his advisor, David Thaler, an associate professor in the Laboratory of Molecular Genetics and Informatics. Over the years, he developed an interest in immunology. In talks with Thaler, a supportive committee and the administration, Brad was able to change his research path to include his newfound interest—putting him on a research path that was closer to Davorka's.

In March 1999, while on a research-related trip to New Orleans, Brad proposed to Davorka in a bistro in the French Quarter. "I was completely surprised," says Davorka. Of the event Brad says, "I thought she must have known what was coming. But when I asked the question, she nearly choked on her soup." The couple married in April 1999, first in a civil ceremony in New York surrounded by friends and then in a more elaborate ceremony in Croatia among family and friends. After a brief European vacation, the Messmers returned to New York to continue their research.

While the Messmers are happy newlyweds, they have not "settled down." In April 2000, the couple presented their theses just a week apart. They now hold postdoctoral positions in the same lab at North Shore University Hospital, where they are researching chronic lymphocytic leukemia, autoimmunity and the immune system's response to tumors.

Graduate recruitment yields results

Thirty students have accepted offers to study at Rockefeller this fall, a record recruitment year for the Dean's Office. "Fred Cross, who was our interim dean this year, did a magnificent job," President Arnold J. Levine said at the Convocation luncheon last Thursday (June 8). The incoming class is composed of 22 women and 8 men, and 13 of the 30 are from foreign countries. In addition, 15 students are joining the Tri-institutional M.D.-Ph.D. Program.

Centennial celebration in full swing in September

Every evening at 8:30, Founder's Hall becomes bathed in golden light that illuminates a proud heritage. That glorious past and a promising future is being celebrated through December 2001 as the university commemorates The Rockefeller University Centennial.

Numerous events have been planned in addition to the lectures of scientific and general interest that are published on this page. Mark the early evening of Thurs., Sept. 21, on your calendar for a campus reception for the publication of *Achievements*, a richly illustrated coffee-table history of the university that will be printed this summer. "John D. Rockefeller," an exhibit in Founder's Hall about the life and legacy of the university's founder, will also be unveiled that night.

Numerous printed materials will mark the Centennial. These include individual brochures about the university, its founding and noted landscape, which are already available in the Office of Public Affairs; a series of newsletters focusing on university history and areas of scientific strength; and newly designed university stationery bearing the Centennial logo that was unveiled last spring. The stationery is available through Media Services and should be considered when filling new orders. The academic year 2000-2001 promises to be an exciting time that will peak on June 14, 2001, the day of Convocation and the 100th anniversary of The Rockefeller University.

The following is a list of upcoming Centennial Lectures.

Scientific Lectures

Fri., Oct. 20, 2000
10:30 a.m.
Chemists in Their Element at The Rockefeller University
Bruce Merrifield, Nobel laureate in Chemistry
The Rockefeller University
Dedication of The Rockefeller University campus as an Historical Chemical Landmark
Sponsored by the American Chemical Society

3:45 p.m.
The Rotary Mechanism of ATP Synthase
John Walker, Nobel laureate in Chemistry
University of Cambridge
Sponsored by the Pels Family Center for Biochemistry and Structural Biology
Jerry A. Weisbach Lecture

Thurs., Nov. 9, 2000
9 a.m.-5 p.m.
Infectious Disease in the Post-genomic Era: Lessons from HIV, Hepatitis C and Tuberculosis
Arnold J. Levine, Stephen K. Burley, David D. Ho, Vincent Fischetti, Charles Rice, Alexander Tomasz, Theresa Gaasterland, John McKinney and Tom Muir
The Rockefeller University
Scientific Symposium

Lectures of General Interest

Tuesdays, Sept. 26, Oct. 10 and Oct. 17, 2000 at 7 p.m.
Genes, DNA and You: The Impact of the Human Genome Project
Sept 26: Arnold J. Levine, President
"A Primer on the Human Genome"

Oct. 10: Jeffrey Friedman, Director of the Starr Center for Human Genetics
"Food Intake and Obesity"

Oct. 17: Günter Blobel, Nobel laureate in Medicine
"The Inner Life of Cells"

All speakers are from The Rockefeller University
Sponsored at RU with 92nd Street Y (for discounted tickets: (212) 996-1100, use discount code ROC)

Wed., Nov. 8, 2000
6 p.m.
Outbreak: Familiar Diseases Reemerge
Ruth Berkelman, *Centers for Disease Control*
Centennial Lecture on Science & Society

Mon., Dec. 18, 2000
5:30 p.m.
When Good Cells Go Bad: Genomewide Gene Expression in Cancer
David Botstein, *Stanford University*
Zanvil A. Cohn Forum on Health Affairs

All lectures will take place in Caspary Auditorium.

All lectures are free and open to the public, unless otherwise noted. Seating is available on a first come, first-served basis.

Visit our Web site: http://www.rockefeller.edu/lectures.html

Potpourri

Fellowship and scholarship winners

The Faculty Committee on Nominations met on Thurs., May 18, to select the recipients of the 2000-2001 Charles H. Revson and Norman and Rosita Winston Fellowships in Biomedical Research, the C. H. Li Memorial Scholarship and the King of Thailand Biomedical Fellowship. This year, there were 12 fellowships available: six Revson, four Winston, one C. H. Li, and one King of Thailand. Candidates were chosen from an outstanding cross-section of applicants from the Rockefeller community.

The Revson Foundation fellowships were awarded to Helene Courvoisier of the Gaul lab, Kai Ge of the Roeder lab, Ehab M. Khalil of the Muir lab, Martin Mense of the Gadsby lab, Mary E. Miller of the F. Cross lab and Waldemar Vollmer of the Tomasz lab. The recipients of the Winston Foundation fellowships are William W. S. Kim of the Ravetch lab, Hui Liu of the Karayiorgou lab, Katsuhiko Murakami of the Darst lab and Yuhong Shen of the J. Darnell lab. The C. H. Li award recipient is Niangui Wang of the Nottebohm lab, and the King of Thailand fellowship winner is Preeya Puangsomlee of the Chua lab.

In memoriam

Charles Baird, an employee who retired from Rockefeller after nearly 37 years of service, died on Sun., May 21, at the age of 66. Baird began working in the RU Paint Shop in 1956, under Herman Richter Sr. In 1982, he became foreman of the Paint Shop. He retired on July 1, 1993.

Baird's colleagues said he was a gentleman, always polite and ready to help whoever needed his expertise. Born and raised in Harlem, Baird knew a lot of the history of the area and had many stories that he shared with colleagues.

Abby Aldrich Rockefeller Dining Room summer hours

The Abby Aldrich Rockefeller Dining Room will close today (June 16), but not for long. Beginning Wed., July 5, the dining room will offer summer grill service on the patio. Featured selections will include BBQ and a variety of other foods from a café on wheels. The grill will be open weekdays from noon to 2 p.m.

AwardsCorner

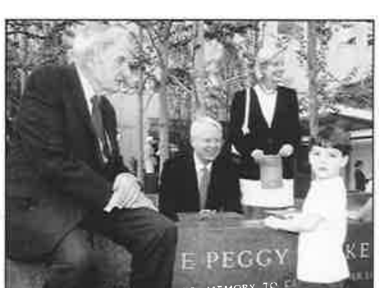
While 19 RU graduate students were awarded their doctoral degrees at Convocation this year, several RU faculty have been awarded honorary degrees as well. Below is a list of faculty members who have received an honorary degree and the conferring institutions.

- Professor Emeritus Maclyn McCarty—Harvard University
- Professor Günter Blobel—Yeshiva University
- Professor James Darnell—Albany Medical College
- Professor David D. Ho—Columbia University
- Professor Mary Jeanne Kreek—University of Uppsala, Sweden
- President Arnold J. Levine—Rider University and Bard College
- Professor Bruce McEwen—Oberlin College

Professor A. James Hudspeth, head of the Laboratory of Sensory Neuroscience and an HHMI investigator, received this year's Hugh Knowles Prize from Northwestern University. This award is presented to scientists who have contributed the most to advances in hearing science.

"Peggy Plaza" delights RU community

The newly renovated plaza at the south end of campus was dedicated in memory of the late Peggy Rockefeller Thurs., May 25. Among those attending were (at right, from left to right): Honorary Chairman and Life Trustee David Rockefeller, husband of the late Peggy Rockefeller; the plaza's benefactors, RU Trustee Robert Bass and his wife, RU Council member Anne Bass; the plaza's architect, Thomas Balsley; and RU President Emeritus Torsten Wiesel.



Above left: A young member of the Rockefeller community joined David Rockefeller and Robert and Anne Bass by the fountain. Above right: President Arnold J. Levine spoke at the dedication ceremony, which was attended by many from the campus community. *Photos by Paul Schneck.*

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