

EXtreme Impact

Two HHMI initiatives help disadvantaged students build foundations for careers in science.

DEANNA COCHRAN, 22, IS ONLY THE third person in her large family to go to college. A biology major at Spelman College in Atlanta, Cochran brought a great deal of enthusiasm but limited laboratory experience when she traveled to Philadelphia to spend the summer of 2004 working in HHMI investigator Amita Sehgal's lab at the University of Pennsylvania.

"She came in not knowing a lot about lab work," Sehgal recalls. "She had not done any research. But that's OK," says Sehgal. "Motivation is much more important. If you really want to diversify the scientific workforce, you need to reach out to students who haven't had research opportunities."

After 10 weeks in Sehgal's lab as a participant in HHMI's Exceptional Research Opportunities Program (EXROP), Cochran knew how to design an experiment and how to collect data, analyze it, and draw conclusions. She decided that her future lay in science. And she wanted to spend another summer learning more about clinical and translational research, which she did by returning to Sehgal's lab in 2005.

EXROP pairs undergraduates with HHMI investigators and HHMI professors (a group of scientists who received \$1 million each from HHMI to make science more engaging for undergraduates). The summer research program is designed to encourage disadvantaged students, including minorities underrepresented in the sciences, to consider careers in science by involving them in research in some of the top labs in the nation. Students are selected by HHMI professors and directors of HHMI-funded undergraduate science education programs.

Over the past three summers, EXROP has matched 141 undergraduates with 115 HHMI scientists. The students included 52 African Americans, 34 of Hispanic origin, 2 Native Americans, and 36 others of non-Caucasian or multiethnic background. Nearly 80 percent of them now say they plan to study for a Ph.D.

or an M.D.-Ph.D. when they finish their bachelor's degrees, and another 13 percent want to go to medical school.

"The EX in EXROP could stand for the EXtreme impact on science that we are aiming to achieve," says HHMI President Thomas R. Cech.

"If you really want to diversify the scientific workforce, you need to reach out to students who haven't had research opportunities."

AMITA SEHGAL

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RIGHT _ SOME OF THE STUDENTS IN EXROP WHO MET IN MAY AT HHMI'S HEADQUARTERS TO SHARE IDEAS AND EXPERIENCES.

PAUL FETTERS

GILLIAM FELLOWSHIPS



BABAR



BYNOE



LEÓN



RED EAGLE



REZENDE



VAN PROOYEN

This past May, HHMI announced the recipients of its first Gilliam Fellowships, named in honor of the late James H. Gilliam, Jr., a charter Trustee of HHMI who spent a lifetime fostering diversity and opportunity in education and science. The fellowships provide support for Ph.D. studies in the life sciences to disadvantaged students, including underrepresented minorities, who participated in HHMI's Exceptional Research Opportunities (EXROP) undergraduate summer research program. These six students received the first Gilliam Fellowships:

IMRAN BABAR is a Native American/Asian who earned a degree in biology at Carleton College in Northfield, Minnesota. He did his EXROP research with HHMI investigator Tyler Jacks at the Massachusetts Institute of Technology, working to discover the role of stem cells in lung tumor formation. He will carry out graduate study in molecular, cellular, and developmental biology at Yale University.

MEISHA BYNOE was born and raised in the West Indies and earned a bachelor's degree in biology and music at MIT. She conducted research in the lab of HHMI investigator Richard Locksley at the University of California, San Francisco, where she helped develop assays to identify certain macrophages or immune system cells. She entered Yale University's graduate program in microbiology this fall.

LUIS LEÓN, who is Hispanic, supported himself while earning a bachelor's degree in biochemistry at the University of Washington. He did EXROP research in HHMI investigator Robert Siliciano's lab at the Johns Hopkins University School of Medicine, where he investigated how immune cells transcribe the HIV-1 virus, which causes AIDS, during the virus's asymptomatic latent phase. He has completed his first year of graduate studies in immunology at Harvard University.

ALEXANDER RED EAGLE, a Native American, graduated from the University of California, Los Angeles, with a bachelor's degree in biochemistry. He is currently a medical student in Stanford University's Medical Scientist Training Program and will defer his Gilliam Fellowship until 2006, when he enters the Ph.D. part of his training. He conducted EXROP research in the Yale University lab of HHMI investigator Arthur Horwich, studying a protein that, when misfolded, can lead to congestive heart failure or neurodegenerative disorders.

NAIRA REZENDE, who earned a bachelor's degree in biology from Hunter College, is from Belo Horizonte, Brazil. She did summer research in HHMI investigator David Schatz's lab at Yale University School of Medicine, where she worked to inhibit or overexpress DNA repair genes involved in developing immune system memory. This fall, she begins study for a Ph.D. in biochemistry, cell, and molecular biology at the Joan and Sanford I. Weill Medical College of Cornell University.

NANCY VAN PROOYEN, who grew up in Arkansas and Colorado, earned a bachelor's degree in biochemistry and molecular biology at Reed College in Portland, Oregon. She performed her EXROP research in the lab of HHMI investigator and Nobel laureate Eric Kandel at Columbia University College of Physicians and Surgeons, where she studied kinesin, a molecular motor protein. Van Prooyen has completed her first year as a graduate student at the Johns Hopkins University.

JAMES GILLIAM, SR. (LEFT) AND LINDA J. GILLIAM SHARE A LIGHT MOMENT WITH GILLIAM FELLOW ALEXANDER RED EAGLE.



investing in their brains

Growing up in Mount Morris, Michigan, a city 45 minutes north of Detroit where nearly everybody works for General Motors, Cochran never even thought about being a scientist. "It's hard to want to be something you've never seen," she explains. "I had no idea until I got to Spelman that there were black people in every walk of life, including black women in math and science."

It wasn't easy for Cochran to attend Spelman. Scholarships saw her through her freshman year, and student loans financed her sophomore year. As a jun-

ior, she moved off campus, sharing an apartment with a friend because it cost too much to live in the dormitories.

Now Cochran's younger sister attends Spelman too. Their mother has always been determined that these two young women get an excellent college education. "She says her house and her BMW are invested in our brains," Cochran remarks with a grin.

Deanna Cochran spent her first EXROP summer studying how caffeine affects the sleeping behavior of *Drosophila*. Comparing the sleep cycles of fruit flies that had been fed various amounts of

caffeine with those of a caffeine-free control group, she gathered data on disruption of the normal sleep cycle and how the flies returned to normal.

"*Drosophila* are great model organisms for sleep research," she says, "and studies of sleep in flies have already been used to dispel many myths about what happens during sleep. Examining how chemicals can affect the normal sleep cycle, for instance, can help us understand the tasks that the brain performs while in its resting state."

As valuable as the EXROP learning experience is to the undergrad, it is a

two-way street. “We learned a lot from each other because we think entirely differently,” says Karen Ho, a postdoc in Sehgal’s lab who mentored Cochran. “She thinks physiologically. I think molecularly. So we read the same paper and get entirely different things out of it.”

Cochran agrees. “Now I can see the relevance of all that boring molecular biology,” she says with an infectious grin.

“Deanna is fantastic,” Ho continues. “She wonders about everything. She’s made me wonder again too.”

mentors’ legacies

Antonio Perez was another EXROP student. He spent the summer between his sophomore and junior years at Harvard University, working in HHMI investigator Louis M. Kunkel’s Harvard lab. There he studied the potential of a specialized group of cells, called muscle side population (SP) cells, to play a role in muscular-dystrophy therapy.

Kunkel, who explores the molecular and genetic basis of human neuromuscular diseases, discovered the mutation that causes Duchenne’s muscular dystrophy. Kunkel is also strongly committed to engaging young people, having mentored more than 50 undergraduates over the years. “What we’re doing here is



ABOVE _ THIRTY-TWO ADDITIONAL EXROP PARTICIPANTS—SCIENTISTS IN THE MAKING—DURING A MEETING AT HHMI HEADQUARTERS THIS PAST MAY.

PAUL FETTERS

“What we’re doing here is training the next generation of scientists.”

LOUIS KUNKEL

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training the next generation of scientists,” he says of the EXROP program. “My legacy will be the people I’ve trained.”

For Perez, a Hispanic student majoring in science and history, that summer was such an exceptional research opportunity that it turned him into a fixture in Kunkel’s lab for the rest of his undergraduate years. It also formed the basis of a paper published in the *Proceedings of the National Academy of Sciences*, on which he was second author, and of his senior thesis.

Perez continued working in Kunkel’s lab throughout the academic year after his EXROP experience, and during the

following summer he mentored a new EXROP student there. By then, Perez had turned his attention to bone marrow cells, working to see if he could cajole them into engrafting into and repairing damaged muscle cells.

Perez, who started Harvard Medical School this fall, has his eye on a career in medical research. He says he discovered the role that teaching plays in research by mentoring as well as being mentored, and he has already learned what every scientist knows—that “science isn’t a 9 to 5 job. You’re thinking about it all the time.”

onward and upward

Alexander Red Eagle, a Native American from California, spent his EXROP summer studying protein folding in the lab of HHMI investigator Arthur L. Horwich at Yale University School of Medicine. He focused on a protein that, when misfolded, can lead to con-

gestive heart failure or neurodegenerative disorders. “My HHMI experience was a real confidence booster,” Red Eagle recalls. “I learned to tackle big ideas by breaking projects down into one question at a time.”

Red Eagle’s exceptional research opportunity didn’t end with EXROP. He was one of the first EXROP alumni to receive a Gilliam Fellowship for Advanced Study from HHMI.

Starting this fall, the Institute will award up to five Gilliam Fellowships annually to outstanding EXROP students who want to pursue Ph.D.s in the biological sciences. The fellowships, which pay for up to 5 years of graduate school, are named for the late James H. Gilliam, Jr., a charter member of HHMI’s Board of Trustees. They honor his commitment to fostering diversity in the scientific community.

Red Eagle is now completing the medical school part of an M.D.-Ph.D. program in genetics at Stanford University. He deferred his Gilliam Fellowship until he starts the Ph.D. portion of his studies in 2006. ■

-Jennifer Boeth Donovan-