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Roadmap Ramps Up Clinical Research

'Academic Home' To Be Created for Clinical, Translational Science

By Carla Garnett

Adding new vigor to clinical research has been a top priority for NIH director Dr. Elias Zerhouni since he arrived here in 2002. No surprise then that one of the NIH Roadmap's three main initiatives is Re-engineering the Clinical Research Enterprise. The largest component of the initiative is the Clinical and Translational Science Awards (CTSA) program that was announced in fall 2005. Its first awards will be made by the end of September 2006.

The CTSA program creates an "academic home for clinical and translational science by encouraging development of novel approaches to the discipline, enhancing informatics and technology resources and improving training and mentoring to ensure that new investigators can navigate the increasingly complex research system," according to planners. With these awards, applicants have the flexibility to determine whether they wish to establish a center, department or institute in clinical and translational science.

CTSA Program Urges Creativity

"Dr. Zerhouni drew on his experience as a clinical investigator at Johns Hopkins,"

SEE RE-ENGINEERING CLINICAL RESEARCH, PAGE 4



Fellow Victoria Bohler uses the NIH labyrinth.

Labyrinth as Holistic Healing

The Calmest Distance Between Two Ears Is Not a Straight Line

By Belle Waring

Riddle me this: What single word means a dance floor, a convoluted enclosure, an organ of balance, a turbine seal and a place to meditate?

Answer: the labyrinth.

Ancient poets sang of the labyrinth as a place where youths and maidens danced, as well as a mythical structure where heroes and monsters matched wits. The human ear contains,

SEE LABYRINTH, PAGE 6

Finding the Evolution in Medicine

By Cynthia Delgado

There is a reason we have four limbs rather than six like a centaur (head, arms and torso of a man attached to the body of a horse). There is a reason we compare our genes with those of numerous other animals, and why developing the yearly flu vaccine can be tricky. Explanations for these phenomena and other interesting facts were revealed in the Evolution in Medicine four-part lecture series held on campus recently. NIGMS and the Office of Science Education hosted the series, which was open to employees and the public.

Series planners say evolution is a timely subject for review. "Evolution unites the disciplines and is foundational to the research we do at NIH," said Dr. Irene Eckstrand, series coordinator and health scientist administrator at NIGMS.

Evolution and Development

Dr. Rudolf Raff is a professor at Indiana University and director of the Indiana Molecular Biology Institute. He is recog-

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briefs

Free Outdoor Film Festival, Aug. 11-20

Ten nights, 10 great movies and 10 years of great times at the Comcast Outdoor Film Festival begin Aug. 11. This year is the R&W 10th anniversary show and once again there is a stellar line-up of movies. Come out to the grounds of the American Speech-Language-Hearing Association and Strathmore and see movies on the huge screen. Bring your blankets, chairs (low models only) and anyone who loves movies to this event. The films are free, food will be available to purchase and there will be a raffle of items donated to help raise funds for the NIH charities (Friends of the Clinical Center, Children's Inn and Camp Fantastic/Special Love).

Friday, Aug. 11	<i>King Kong</i>
Saturday, Aug. 12	<i>Madagascar</i>
Sunday, Aug. 13	<i>Mr. & Mrs. Smith</i>
Monday, Aug. 14	<i>Curious George</i>
Tuesday, Aug. 15	<i>Maltese Falcon</i>
Wednesday, Aug. 16	<i>Batman Begins</i>
Thursday, Aug. 17	<i>Walk the Line</i>
Friday, Aug. 18	<i>Monty Python's Holy Grail</i>
Saturday, Aug. 19	<i>Harry Potter and the Goblet of Fire</i>
Sunday, Aug. 20	<i>Princess Bride</i>

Restaurants will open at 6:30 p.m. and the movies begin at 8:30. For more information, visit www.filmfestnih.org or call (301) 496-6061. If you are interested in volunteering for the event, contact Julie at the number above or email harriju@ors.od.nih.gov.

Symposium on Genomics of Critical Illness, Injury Set for November

The fourth symposium on the "Functional Genomics of Critical Illness and Injury—Surviving Stress: From Organ Systems to Molecules," will be held Nov. 13-14 at the Natcher conference center, sponsored by NIGMS and the Clinical Center's critical care medicine department. There will be five scientific sessions. Abstracts are due by Sept. 8. For more information and to register, visit www.strategicresults.com/fg4.

Research Festival Abstracts Due Aug. 8

The 2006 NIH Research Festival will be held Oct. 17-20. The organizing committee is now accepting poster abstract submissions online through Aug. 8 from NIH and Bethesda FDA/CBER investigators. Posters in any area of research conducted within the NIH intramural program will be considered for presentation, but the committee is requesting a limit of one poster submission per first author. Applicants will receive confirmation of receipt and notification of acceptance via email in early September.

The opening plenary session on Tuesday, Oct. 17 at 9 a.m. will feature two examples of this year's "Bench to Bedside" theme: Drs. Bill Gahl (NHGRI) and Juan Bonifacio (NICHD) will discuss disorders of lysosome-related organelles; Drs. Alan Heldman (JHMI) and Steven Sollott (NIA) will describe development of the taxol-coated stent for treatment of coronary artery disease. Other events include symposia; exhibits on resources for intramural research; a Job Fair for NIH Postdoctoral, Research and Clinical Fellows with an opening address by NIH director Dr. Elias Zerhouni; a food and music fair; and the Technical Sales Association scientific equipment tent show.

For a preliminary schedule of events and online poster registration, visit <http://researchfestival.nih.gov>. For more information, contact Paula Cohen at (301) 402-4507 or cohenp@mail.nih.gov.



APAO Hosts Annual Salute

The NIH Asian and Pacific Islander American Organization recently held its annual two-part heritage program on campus. Many attended the Asian Food Fair on May 19, and on May 26 Masur Auditorium was the site of an evening program of dance and music. The dancers above were part of a colorful and entertaining program.

nih record

High School Scientist Sangha Wins Multiple Awards

By Shannon E. Garnett

When 17-year-old Harpreet Sangha went to work in a science laboratory at the University of Alaska Fairbanks (UAF) a year ago she was hoping to gain valuable hands-on research experience. She had no idea her work would eventually lead to multiple trips to science fairs—both state and national—numerous awards and more than \$12,500 in scholarships and prizes.

Last summer, Sangha—a high school senior who has always had an interest in science, specifically neuroscience, and has always wanted to be a doctor—decided to follow her interests and contacted the UAF about opportunities for working in a neuroscience laboratory. She particularly wanted to work alongside a medical scientist on a research project.

She was put in touch with Dana Greene, a graduate student working with Dr. Abel Bult-Ito, an associate professor in the department of biology and wildlife at UAF, on construction of an animal model for obsessive-compulsive disorder. Greene soon became Sangha's mentor.

"I went into Dana's lab completely clueless," said Sangha. "The most I knew about OCD was that it stood for obsessive compulsive disorder. Little did I know that I would be involved in validating an animal model for the disorder. Dana helped me progress through various stages of the scientific research process."

Sangha's project, titled "The Role of Serotonin Pathways in Mouse Compulsive-Like Behavior: Implications for the Study of Obsessive-Compulsive Disorder," involves studying the brains of mice to learn about the neural mechanisms that may be linked to OCD.

This work is part of UAF's Alaska Basic Neuroscience Program (ABNP), which is supported by NINDS and funded through a specialized neuroscience research program (SNRP) grant. The ABNP—one of 12 SNRPs funded by NINDS—is also supported by NIMH and NCCR. SNRPs seek to promote and enhance neuroscience research at minority institutions.

"The brain is just a fascinating structure that remains the biggest mystery to everyone," said Sangha. "It will absolutely be mind-blowing if I can one day put the puzzle together for a few, maybe even just one, of the neurological disorders."

Sangha first presented her work at the Alaska State High School Science Symposium in Fairbanks, where she placed second in the preliminary round and first overall, winning scholarship money and an all-expense-paid trip to Albuquerque for the Junior Science and Humanities Symposium.

Next she competed in Anchorage in the Alaska Science and Engineering Fair—an Intel-affiliated showcase for Alaskan school students in grades K-12. She placed second and won an opportunity to present at Intel's International Science and Engineering Fair (ISEF) in Indianapolis.

From Anchorage she presented at the Albuquerque symposium, a program sponsored by the U.S. Army, Navy and Air Force that promotes original research and experimentation in science, engineering and mathematics at the high school level. Sangha won second place which, in addition to scholarship money, included being named an alternate to the London Youth Science Forum in England. At her final competition, the ISEF—the world's largest pre-college celebration of science—Sangha won a \$500 award from the American Psychological Association.

In addition to taking Advanced Placement physics next year at West Valley High School, Sangha—now a senior—will study science at UAF because she has already exhausted the biological science class offerings at West Valley. She will also keep working in Bult-Ito's lab and continue her science fair run—adding the Siemens-Westinghouse Competition and Intel Science Talent Search to her list of next year's contests.

Upon graduation next year, Sangha plans to enroll in an accelerated 6- or 7-year B.A./M.D. program where she will major in neuroscience. "Although I want to be a physician, I'd still like to keep conducting research on the side. I don't want to confine myself to just laboratory-based research, because I absolutely love interacting with people and I love being able to apply what I learn," said Sangha. "I think being a physician will allow me to get the best of both worlds." 🍌



Seventeen-year-old Harpreet Sangha went to work in a science laboratory at the University of Alaska Fairbanks (UAF) a year ago. Her work, part of UAF's Alaska Basic Neuroscience Program, which is supported by NINDS and funded through a specialized neuroscience research program, has already garnered numerous awards and more than \$12,500 in scholarships and prizes.

explains NCRR's Dr. Anthony Hayward, who leads the CTSA effort. "The idea was developed through workshops held with clinical research leaders from the extramural community and was followed by the creation of a trans-NIH team early in 2005."

To put Zerhouni's vision into practice, NIH will combine some of the National Center for Research Resource's career development programs with the General Clinical Research Center program to allow for the scale of trans-

The goal is to "establish a feeder pathway, a pipeline of people with all these different skills coming at a particular problem from several different angles. We need to cast a very broad net to advance clinical research in the next few years or so." —Dr. Robert Star

formation that will take place, Hayward says. "Academic health centers across the country are planning new paradigms for interactions between clinical and basic medical science departments and they are working to encourage more gifted young scientists into careers in clinical research." By encouraging creative redesign, the Roadmap hopes to usher scientific discoveries into medical practice more quickly.

"What's unique about CTSA is that it's moving NCRR's GCRC program forward so as to provide essential infrastructure to a larger proportion of NIH's clinical researchers," NCRR acting director Dr. Barbara Alving points out. "It will be the combination of funds from NCRR and the NIH Roadmap for Clinical Research that enables us to make these awards. Roadmap funds in this instance will be used to transform an already-existing program. We plan to have about 60 CTSA's in place around the country. It's revolutionizing the way we do translational clinical research."

Expanding the use of clinical research informatics is another way the Roadmap intends to re-engineer the field. NCRR will also oversee development of a National Electronics Clinical Trials and Research (NECTAR) network. Currently, hundreds of clinical studies are conducted around the country at any given time. Much of the information gained from these studies, however, is not easily and quickly shared among researchers doing similar work. NECTAR will be the backbone for a nationwide group of clinical researchers to collect and synthesize data from studies, reducing duplication of effort.

Two other Roadmap offshoots may also help speed up the rate of research translation:

- *NIH RAID, Rapid Access to Interventional Drugs.* RAID was set up as a bridge to get new therapies from the lab to clinical testing faster. Often these study drugs—therapies for uncommon disorders, for example—don't get developed as quickly as potential medicines that attract private-sector investment. That's where an institution like NIH can step in with extra funding or product development advice to help speed the drug along its way. Led by NIDDK's Dr. Josephine Briggs and modeled after NCI's successful Developmental Therapeutics Program, a 2-year RAID pilot began in December 2004.

- *The Patient-Reported Outcomes Measurement Information System (PROMIS)* is a way for people with chronic illnesses to report how they feel. Although blood sugar readings, cell counts and other exams can provide data about how treatments are working, results of these tests don't tell the whole story. Often they don't convey quality-of-life symptoms that mean more to patients. PROMIS is an easy-to-use questionnaire that can help document and standardize reports from patients across all disciplines. Health issues that are hard to gauge—pain, mood changes and fatigue, for instance—can be measured using PROMIS's web-based technology.

Team Concept Is Culture Change

In addition to addressing the infrastructure of clinical research, the Roadmap has planned to transform the composition of those conducting the research. Dr. Elizabeth Wilder of NIDDK, a principal leader of Roadmap's interdisciplinary research working group, says planners "had a unique challenge to change academic research culture so that interdisciplinary research is as 'normal' as discipline-specific research that academic research departments are built around."

She points to four initiatives her group designed:

- training to foster interdisciplinary thinking in investigators at all levels of their careers;
- methods-development to allow human behaviors to be quantitatively measured so that it and other disciplines can interact more effectively;
- research to foster development of scientists groups that cross departmental boundaries; and

• recommendation to change “the NIH policy most often referred to as a leading obstacle for interdisciplinary teams—the recognition of a single leader on NIH-funded projects.”

Wilder notes that response so far has been positive. “Recognizing that culture change was the goal,” she says, “I think the major advance is that the research community has a heightened awareness of interdisciplinary research, and institutions are increasingly changing their structures and reward systems to facilitate this type of research. The evaluation of our initiatives is only just getting under way, but anecdotal information leads me to believe that the stance taken by NIH—to make interdisciplinary research an area of emphasis through the Roadmap—has made research institutions take notice and adapt to accommodate groups who wish to function in teams.” Establishment of the multiple-principal investigator policy is just beginning, she says, but should allow all heads of a project to be recognized as leaders and should therefore encourage team approaches.

Finally, another early success story in transforming clinical research is in the area of training. Because the way clinical research is conducted has changed, teaching the next generation of clinical scientists must change as well, explains NIDDK’s Dr. Robert Star, cochair of the trans-NIH clinical research workforce training committee. The traditional “see one, do one, teach one” method of leading a clinical trial is essentially obsolete, he says. The “silo” mentality of single primary investigators running their own studies alone is no longer efficient or effective.

Some investigators think that “the silos are there for a reason—to keep different kinds of grains from mixing,” he notes. “But,” Star stresses, “we want the grains to work together. We want the synergy that would result from working with each other. For interdisciplinary research to work, there has to be a culture change—both inside NIH and outside.”

The goal, he says, is to “establish a feeder pathway, a pipeline of people with all these different skills coming at a particular problem from several different angles. We need to cast a very broad net to advance clinical research in the next few years or so.”

For more information about the Roadmap for Medical Research, visit <http://nihroadmap.nih.gov/>. 🗎



Jerry Kerkhof (l) celebrates the “Big 8-0.” At right, friends toast Kerkhof at a surprise bash held at the NIH Fitness Center in Bldg. 31.

‘Jerry’s Kids’ Show Respect

Gym Personality Kerkhof Gets Birthday Surprise

Jerry Kerkhof is clearly off his rocker. And if the effervescent fitness enthusiast and former NIH’er has his say, he intends to stay that way.

For the past 22 years, Kerkhof has been opening the NIH Fitness Center four times a week for a number of early risers who have dubbed themselves “Jerry’s Kids.” On June 14 at 5 a.m., amidst a darkened room and one unsuspecting gym rat, the “kids” threw Kerkhof a surprise party marking his 80th birthday.

“I love Jerry and trust me, I’m not the only one,” remarked Diana Chambers, an NCI employee and the party’s organizer who has known her friend for some 15 years. “I don’t know what we are going to do when Jerry finally retires. His dedication to his job and to everyone he encounters is incredibly inspiring.”

A former Boston Marathon participant who has run in virtually every major city in Europe and Australia, Kerkhof worked for the National Library of Medicine from 1965 to 1985, serving as personnel officer, deputy executive officer, chief of the Office of Administrative Management Services and management analyst. Prior to that, he was employed by the Army Air Corps (where he worked as a physical training instructor and was a boxer) and also served in World War II. “What’s good is that when there’s news in the world, I can say I’ve been there and done that,” Kerkhof said. Since his federal retirement in 1985, he has been a Fitness Center employee.

At 80, he may admit to slowing down—but just a little. Many mornings find Kerkhof working out on the treadmill or one of the other exercise machines, right next to his friends. “This is my morning family. These wonderful people tease me for being old and I tease them for being young,” said Kerkhof, who admits a fondness for telling jokes and discussing politics and other issues of the day with his early morning comrades.

As for growing old successfully, his advice is “keep breathing.” More seriously, Kerkhof says it’s important to stay active, have a sense of humor, maintain a social network of friends and travel. “If you lived a good life, then you can look back at the many pleasant things you can remember and that will take you far. And don’t think of retirement as a time to fade away—on the contrary, it’s really a time to thrive,” noted Kerkhof, who has two children and two grandchildren.

His most significant personal setback was the passing of his wife Joan last year. But the Fitness Center folks helped him through it. “Like I said,” he concluded, “they are my family.” —Jan Ehrman



LABYRINTH

CONTINUED FROM PAGE 1

Bohler says it's best to form a question or intention prior to walking the labyrinth.

in its inner portion, an anatomical labyrinth of semicircular canals and a snail-shaped coil. The labyrinth seal, used in turbines, has intricate threads.

And then there's the NIH labyrinth.

The Clinical Center's Pain and Palliative Care Consult Service (PPCCS) offers a new resource for staff, patients, researchers and visitors: a 30-by-30-foot labyrinth now available for walking.

The soothing blue path, embossed on canvas, is rolled out twice monthly in the Clinical Research Center, where it serves as a respite, a place to slow down and reflect. It winds in a concentric pattern towards a midpoint and you can't get lost—no experience necessary.

"I was skeptical at first," says IRTA fellow Victoria Bohler, "but it worked for me. It made me feel calmer." Bohler helped launch the project under the direction of Dr. Ann M. Berger, founder and chief of the PPCCS, one of the CC's busiest consult services and part of the "quality of life" team. Bohler also coordinates staffing, offers orientation and instructions to labyrinth walkers and collects individual surveys after use. She is currently preparing a poster for this fall's Research Festival. Donna Pereira and Karen Baker, both nurse practitioners who are part of the PPCCS team, also collaborated closely on the project.

Working with PPCCS are the spiritual ministry and social work departments, the recreation therapy section of the rehabilitation medicine department and clinical volunteers.

The initial white paper, "Inspirational Healing of Mind, Body & Spirit: The Labyrinth," defines it as "a complementary modality designed to provide a means for therapeutic meditation [and] an ancient structure that has taken on form to cross all ethnic, religious, socio-economic and level-of-education backgrounds."

Mindful walking has for centuries served as a form of meditation and prayer in various traditions, both east and west. The Buddha was a great walker. Contemporary Zen traditions, among others, incorporate walking meditation and not just to relieve the legs after all that sitting.

The NIH labyrinth is an 11-circuit model, based on the 13th-century exemplar inlaid on the floor of Chartres Cathedral in France. Those unable to make a long and arduous overland pilgrimage could walk the indoor labyrinth for reflection and contemplation.

The NIH labyrinth is not a maze: the way in is also the way out. The path is unicursal, so there is no puzzle to solve. Since you go at your own pace, in your own manner, the design, in all its intricate simplicity, is engineered to relieve stress. The whole journey takes about half an hour.

Bohler says she's found sources describing the labyrinth in a 4th-century Algerian church.

A search on the Internet—itself a sort of labyrinth—also reveals that they were carved into stones, or petroglyphs, dating back thousands of years, spread across the Mediterranean basin and as far north as Ireland. These were much



Mindful walking can be restful to labyrinth users.

smaller than the ones made for walking and in size, if not conceptually, they are somewhat like the “finger labyrinths” offered as tabletop versions for individuals who are not ambulatory.

All have built-in curves that bear some schematic resemblance to the grooves of the brain. These turns, known as clews, offer a place to pause. “You can stop there awhile,” Bohler suggests, “and use it as a place to say a word, phrase, meditate or reflect.”

Clew originally meant a ball of yarn or thread, and Bohler cites it as the root of our word clue. In Greek myth, Ariadne offered Theseus a ball of string so he could find his way back out of the Labyrinth after killing the Minotaur.

“There are no hard and fast rules for using the labyrinth,” she explains, “but it helps before you enter to sit down for a moment and form an intention or question. Then walk to slow down and concentrate on that.” In addition to the labyrinth’s clews, the center, shaped like a blossom, can also be used as a resting point. “You can pause there in the middle, or in each of the six petals,” says Bohler. “You can sit down and take the time you need to reflect on where you are in your life. When you come out, reflect on your experience.”

“We put it in place to hopefully help reduce stress in patients, families and health care professionals,” says Berger. “Our hope for the future is to do research.”

The labyrinth is available on the 1 SE corridor, off the main lobby of the CRC, on the first and third Tuesdays of each month from 8 a.m. to 3 p.m. Call the Pain and Palliative Care Consult Service at (301) 594-9767 for more information. ●

NIAMS at 20



“In a successful partnership, each partner brings unique resources and strengths to the table.”

—Dr. Gayle Lester,
Osteoarthritis Initiative
coordinator

The Power of Partnership

By Dr. Stephen Katz, NIAMS director

The cost, complexity and other facets of research today make collaboration an essential ingredient for scientific achievement. As NIAMS enters its third decade, some of its most notable successes have come through the partnerships it has formed with other institutes, academia, industry, private foundations and patient advocacy groups. Such collaborations include:

- The Osteoarthritis Initiative, a public-private partnership with several pharmaceutical companies to help find biological markers for the progression of osteoarthritis. It provides funds to research centers to establish and maintain a natural history database for the disease that will include clinical evaluation data, radiological images and a repository of biospecimens.
- The North American Rheumatoid Arthritis Consortium, a partnership between NIAMS, the National Institute of Allergy and Infectious Diseases and the Arthritis Foundation to support a national collaboration of 12 research centers in the search for genes that determine susceptibility to rheumatoid arthritis.
- Upcoming Individual Postdoctoral NRSA Fellowships in Epidemiology, Clinical Trials Research and Outcomes Research in skin diseases and in orthopaedic surgery, to be collaboratively supported by the American Skin Association and the Orthopaedic Research and Education Foundation, respectively.
- The Health Partnership Program, a community-based medical research program operating as a collaborative effort between NIAMS and Washington, D.C.-area community leaders and representatives. The program is aimed at reducing the morbidity and mortality associated with arthritis and other rheumatic diseases, primarily in the African-American and Hispanic/Latino communities in the metropolitan area.

To paraphrase an old saying, “a rope of many strands is stronger than a single thread.” At NIAMS, collaborative efforts will always remain an essential part of our success in efforts to conquer human disease.

EVOLUTION

CONTINUED FROM PAGE 1



Above, l:
Dr. Brian Alters is an international leader in education and author of the best-selling book *Defending Evolution in the Classroom*.

Top, r:
Dr. Rudolf Raff discussed some of the misconceptions society has about evolution and highlighted research findings in evolutionary developmental (evo-devo) biology.

nized as a pioneer in the field that merges evolutionary and developmental biology called “evo-devo,” described in his book, *The Shape of Life: Genes, Development, and the Evolution of Animal Form*. Raff wants people to “understand that evolution is the underlying principal that organizes biology. Humans, their food and their pathogens are all products of evolution,” he said.

Evo-devo scientists study body plans (actual body architecture) in plants and animals over developmental and geological time spans. Raff’s research involves a pair of related Australian sea urchins (diverged 4 million years ago) that have similar body plans as adults but follow markedly different pathways to maturity. His data show that rapid morphological changes are linked to underlying genetic mechanisms such as the timing and regulation of expression of specific genes during early development.

Phylogenetic information—graphical representations of evolutionary relationships between organisms—is vital to evo-devo, said Raff. With it, you can learn about common ancestors, evolutionary trends in many biological processes and can make comparisons between divergent and related species. “In evolution, history matters. We have four limbs because our fish ancestors developed that way,” he said.

Raff described some common misconceptions about evolution. Claims that there are no intermediates between major body plans in the fossil record are incorrect, he said. He cited some well-documented transitions such as those from fish to amphibian, dinosaur to bird and ape to human. We’ve all seen evolution presented as the sequential morphing of ape to human over time. Raff says this can be “effective, but misleading.” He stressed that in reality, “evolution happens one generation at a time, during development.”

Evolution and Education

Dr. Brian Alters is an international leader in education and the author of the best-selling book *Defending Evolution in the Classroom*. He holds dual appointments with McGill University in Montreal and Harvard University. He is also founder and director of the Evolution Education Research Center at McGill.

“Overall, the nation has a big problem,” said Alters. “Approximately half of the U.S. population thinks evolution does (or did) not occur.



While 99.9 percent of scientists accept evolution, 40 to 50 percent of college students do not accept evolution and believe it to be ‘just’ a theory,” he reported.

Many university students have misconceptions about evolution that are amazingly ubiquitous, noted Alters. They believe that evolution is not pertinent to medical research or practice and has no relevance to AIDS, for example, or to antibiotic resistance in microbes.

Part of the problem is in effective teaching, he said. An instructional technique known as constructivism works best in the classroom, he suggested. Essential elements of constructivism include asking questions that require students to act based on what they think is accurate and presenting challenges so that misconceptions can be exposed and alternatives explored.

In the classroom, there is a tendency to separate science and religion as unique categories without overlap, Alters added. The separation results in an evolution-versus-creationism (or evolution-versus-intelligent design) struggle that is being waged in courtrooms and classrooms across the nation. “The key issue revolves around misunderstanding the nature of science, particularly that modern science does not entertain supernatural causation. Modern creationism involves the belief that a supernatural power intervened in the natural processes of the development of life on Earth. Proponents want this taught in science classrooms as science and oppose parts or all of biological evolution,” he said.

Evolution and Genomics

Dr. Eric Green is scientific director of NHGRI and a distinguished scientist in the field of genomics. Genetics and genomics provide “a wealth of examples of how evolutionary principles can be used to gain a better fundamental understanding of basic biological processes and an understanding of the molecular underpinnings of human health and disease,” he said.

“The Human Genome Project’s name may be a misnomer,” Green noted. From the outset, the project intended to make evolutionary compari-



sons of other genomes, including those of the yeast, a fly, a worm and a mouse. The other species were chosen, in part, because “they were at distinct evolutionary time points, separated from humans roughly 80 million to 1,000 million years ago,” he said. Evolutionary comparisons are illuminating details about the human genome and its function.

Evolutionary comparisons also aid in the study of genetic diseases. For many human diseases, there is a counterpart in animals. In some cases, the gene mutations responsible for a disease are identical and may occur in the same gene, Green explained.

“Our ability to interpret the human genome sequence is remarkably underdeveloped at this time,” he admitted. Toward that end, an important goal is to identify all the sequence elements in the genome of functional importance, he said. They include sequences known to code for proteins as well as non-coding regions, sequences that do not code for proteins but still have a functional role. Establishing a catalog of functional sequences in the human genome will help efforts to identify the genetic changes that lead to complex genetic ailments such as diabetes and cardiovascular disease.

Green credited the work of Charles Darwin, described in *The Origin of the Species*, as laying the foundation for one of the most powerful tools available for interpreting the human genome sequence. Darwin wrote that it’s not the strongest or most intelligent that survives, but “the one that is the most adaptable to change.” Evolutionary changes that allow a species to adapt and survive now help scientists identify functional sequences in the genome. Nonfunctional sequences tend to undergo change more readily than functional areas, said Green.

Evolution and Infectious Diseases

Dr. Robin Bush is a professor of evolution-

ary biology at the University of California at Irvine. She collaborates with scientists at the Centers for Disease Control and Prevention using computational techniques and phylogenetic methods to study the evolution of influenza viruses.

Bush said the simplest type of phylogenetic tree has three taxa (divergent groups) that evolved from a common ancestor. “Think of it as a parent with three children,”

she explained. The length of the branches indicates genetic distance or the number of nucleotide changes that have occurred. A phylogenetic tree of the Orthomyxoviridae family of influenza viruses shows that strains A, B and C have all come from a common ancestor. All three infect humans. Strain A also infects pigs, horses and birds.

Her research focuses on the genes that code for surface proteins of the viral coat and how they evolve in response to the host’s immune system. Hemagglutinin (HA) is needed for host receptor binding and host cell membrane fusion. Neuraminidase is needed for viral release from the host cell. There are a number of genetic variants for each of these proteins (H and N lead to such designations as H5N1). In humans, these proteins are constantly under attack by the immune system; in response, they have evolved very rapidly within humans, said Bush.

Bush uses phylogenetic trees to study changes in HA and to look for patterns between strains. She hopes to predict which strains may be responsible for the next year’s flu and design more effective and better-targeted vaccines.

Videocasts of the lecture series can be found at <http://videocast.nih.gov/> and at <http://www.nigms.nih.gov/News/Meetings/EvolutionSeries/>. ●

Left:

Dr. Robin Bush, a professor of evolutionary biology at the University of California at Irvine, collaborates with scientists at the Centers for Disease Control and Prevention using computational techniques and phylogenetic methods to study the evolution of influenza viruses.

NIH Training Center Classes

The Training Center supports the development of NIH human resources through consultation and provides training, career development programs and other services designed to enhance organizational performance. For more information call (301) 496-6211 or visit <http://LearningSource.od.nih.gov>.

Review, Update on EEO Policies & Processing Laws	9/11
NIH Domestic Travel (NBS Travel System)	9/11-13
Basic Time & Attendance Using ITAS	9/12-13
Writing Statements of Work	9/12-14
NIH Foreign Travel	9/25-26

Computer Training Summer Term Now in Session

The CIT Training Program summer term of computer classes is now open for registration. With over 100 different topics, more than 25 of them new, there is sure to be something to help everyone become more productive in their work. Classes, as always, are available free to NIH staff.

Is Adobe Acrobat becoming a more prevalent application in your environment? Are you part of the new trend of employees periodically working from home? Does your group need to collaborate with colleagues in remote locations? If so, Inside Adobe Acrobat; Home Networking Fundamentals; Working from Home—Understand the Technologies; Breeze 5 and Podcasting at NIH may be of interest to you.

Are you a Macintosh user? CIT is offering 3 seminars presented by Apple, including OS X Productivity Tips and Tricks; iLife for Scientific Collaboration and Scientific Digital Asset Management on a Mac.

For IT professionals there are two new classes, NIH Network Design (an overview of the structure of the NIH Network) and Rights Management Services (RMS) Across Multiple Platforms.

Is your group thinking about creating or upgrading a web site? Summer term offers web development training for many levels of experience. New classes include a newly expanded Dreamweaver 8 Introduction and Intermediate along with Adobe Flex 2—Foundations; AJAX Programming Techniques—Introduction; and Advanced XML.

Scientific seminars make up nearly 40 percent of CIT courses; most are designed to deliver valuable information in less than a day. New classes include NCBI's Microbial Genomes Quick Start and BRB-ArrayTools Data Analysis Workshop, both developed within NIH. New scientific computing classes include such tools as the JMP Scripting Language; MYSQL for Biologists; MATLAB Scripts in Octave (along with a variety of other MATLAB offerings). Other classes include AlleleID: Introduction; Array Designer: Introduction; Introduction to Labmatrix; Labmatrix Advanced Query Builder; and PathwayExpert.

You can obtain full course information, register for summer classes, join the CIT training mail list and check out your transcript or current application status at <http://training.cit.nih.gov>. For more information call (301) 594-6248 ext. 2 or write to CITTraining@mail.nih.gov.

Take a Tour of the Bartók String Quartets

Music lovers can take a guided tour of the Bela Bartók string quartets with Dr. Joel Berman and members of the Beethoven/Bartók Cycle Quartet, well-known for similar performance-lectures featuring Beethoven string quartets. For the second time, the quartet will present all six Bartók string quartets in the same format. The series is being offered by the FAES Graduate School (course GENL 158) on Mondays, beginning Sept. 11 from 7 to 9 p.m.

Bartók has been called the “Hungarian Beethoven.” While well-loved, his complex quartets are not always easy to understand. The series is designed for people who love music, regardless of musical training.

All the quartets are performed live. Each is featured for two of the 12 sessions, which include multiple performances, musical excerpts and a lecture outlining structural features unique to the work. A detailed outline of each quartet—designed to be followed as the music is being performed—provides a guided tour through the inner workings of Bartók's music.

For more information call Berman at (301) 946-2311 or email BBCQuartet@aol.com. For registration information, call (301) 496-7976 or visit www.faes.org. Register by mail through Aug. 18, or in person Aug. 30-Sept. 1.

Principles of Clinical Pharmacology Course

The Principles of Clinical Pharmacology course, sponsored by the Clinical Center, will begin in Lipsett Amphitheater, Bldg. 10 on Sept. 7. The course will be held Thursday evenings from 6:30 to approximately 7:45 and will run through Apr. 26, 2007.

The course covers topics such as pharmacokinetics, drug metabolism and transport, assessment of drug effects, drug therapy in special populations and drug discovery and development. An outstanding faculty has been assembled to present the lectures. The faculty has also prepared a textbook, *Principles of Clinical Pharmacology, Second Edition*, which will be available in the Foundation for Advanced Education in the Sciences, Inc. bookstore located in Bldg. 10. The textbook is also available from Amazon.com.

This is the ninth year that the course is being offered. Registration is open to all interested persons free of charge. Certificates will be awarded at the end of the course to students who attend 75 percent of the lectures. More information about the course, including online registration, is available at <http://www.cc.nih.gov/researchers/training/principles.shtml> or by calling (301) 435-6618.



Study of Fibroids Needs Women

Women ages 33-50 suffering with fibroids are invited to participate in an NIH study. Compensation is provided. Call 1-866-444-2214 (TTY 1-866-411-1010) for information. Refer to study 06-CH-0090.

Have Enlarged Gums?

Do you have enlarged gums and are you taking dilantin, cyclosporine or calcium-channel blockers? If so, take part in an NIH study. Call 1-866-444-2214 (TTY 1-866-411-1010).

HIV-Positive Volunteers

HIV+ volunteers who are off anti-HIV medications and who have a CD4+ count of 300 or greater are needed for a research study. Compensation is provided. For more information call 1-800-444-2214 (TTY 1-866-411-1010).

Kidney Transplant Offered

Do you have kidney failure and need a kidney transplant? NIH has kidney transplant studies designed to reduce need for anti-rejection drugs. Call 1-800-411-1222 (TTY 1-866-411-1010).

Volunteers Needed for Anthrax Vaccine Study

NICHD is seeking healthy men and women, ages 18-30, to participate in an anthrax vaccine study. Compensation will be provided. Call 1-866-444-2214 (TTY 1-866-411-1010). Refer to study 04-CH-0283.

Study of Ovarian Function

Healthy women ages 18 through 25 are needed for an ovarian function study. Compensation is provided. Call 1-866-444-2214 (TTY 1-866-411-1010). Refer to study 00-CH-0189.

Thyroid Research Study

For volunteers 18 or older with thyroid gland removed or hypothyroidism. Compensation is provided. Call 1-866-444-2214 (TTY 1-866-411-1010).

Healthy Volunteers Needed

NICHD is seeking healthy volunteers, ages 18-45, to participate in a typhoid fever vaccine study (06-CH-0070) conducted at the Clinical Center. Compensation is provided. Call 1-866-444-2214 (TTY 1-866-411-1010).



Sohraby Is New NEI Deputy SD

Dr. Sarah Sohraby recently joined NEI's Division of Intramural Research as deputy scientific director. She will monitor, coordinate and evaluate all aspects of NEI's intramural research

efforts. She received her M.D. (magna cum laude) from Belgium's Université Libre de Bruxelles (ULB) Medical School in 1977. In Brussels, she completed her clinical fellowship training in internal medicine in 1980. From 1980 until 1983, she served as a Fogarty postdoctoral fellow at NIH in Dr. Maurice Burg's lab and, subsequently, at Harvard Medical School from 1984 to 1987 in Dr. Barry Brenner's lab. She received her Ph.D. in physiological sciences at ULB concurrent with her board certification in internal medicine. For the last 18 years, she has held research and teaching positions in Belgium both at the Medical and the Engineering School (ULB), and in the Congo at the Université de Lubumbashi's medical school. Sohraby has published in many scientific journals. She was the first to describe the direct measurement of single, amiloride-sensitive Na⁺ channels, after incorporation of purified kidney epithelial cell apical membranes in planar lipid bilayers. Her studies also indicated that the effect of aldosterone on kidney Na⁺ transport was related to methylation at the membrane level.

Barn Swallows Find Niche at NIH When the Swallows Come Back to the Garage-O

“When the Swallows Come Back to Capistrano” (recorded by the Ink Spots in 1940) laments a missing sweetheart who’s promised to return in spring along with the swallows—in this case, the ones migrating between North and South America, a round trip of 10,000 to 15,000 miles.

The MLP-10 garage may not be as picturesque as Capistrano, Calif.—and it’s usually not as romantic—but it is home to a nest of barn swallow chicks, well tended by both parents. Hirundo rustica, known for its long, deeply forked tail, lives on every continent but Australia. American barn swallows, subspecies H.r. erythrogaster, are distinguished by their ruddy underfeathers—at least the adults are. The babies are distinguished by their egg-yolk yellow open mouths.

Adults feed on insects in flight, so are renowned for their aerodynamic prowess. To catch their prey, they execute acrobatic turns and swoops. They nest under bridges and wharves, and in barns, stables and caves. While we rush through the garage towards home, they are home, so if you are lucky enough to locate the nest, don’t get too close. If you do, the parent bird on duty will swoop in and make an in-flight U-turn without stopping to feed those hungry mouths.

The family resides in a mud nest near two open passageways, allowing the parents to fly in and out at speed. In typical swallow fashion, when feeding young they rest little. Lynn Mueller, chief of grounds maintenance and landscaping, Office of Research Facilities, explains: “We’ve had a nice colony of barn swallows in the MLP-7 garage for years. This past winter the garage began an extensive renovation and totally disturbed the returning birds. None nested, thank goodness. Maybe the ones in MLP-10 were returning MLP-7 birds that took up residency there instead of flying further on.

“There were 11 nests last year within the middle two parking levels. The [renovation] contract was designed to begin last fall after the nesting season. However, the extent of the renovation was such that it was impossible to complete the work before this spring. Work is now nearly over and the garage will be open and ready for any returning birds next May.”—Belle Waring



PHOTOS: BELLE WARING