

Finally—A How-to Guide for Navigating the Postdoctoral Years

In recent years, this nation's science and engineering research has come to depend increasingly on the work of postdoctoral scholars, or postdocs—junior researchers who have a Ph.D. and who are pursuing further training in research. It is largely the postdocs who carry out the sometimes exhilarating day-to-day work of research. Many of them will go on to uncover fundamental new knowledge, chair prestigious academic departments, and form the fast-growing technology companies that power our economy. It is largely they who account for the extraordinary productivity of science and engineering research in the United States.

And yet the postdoctoral experience is not all it should be, writes the Committee on Science, Engineering, and Public Policy (COSEPUP) in its guide on *Enhancing the Postdoctoral Experience for Scientists and Engineers*. The committee heard from many postdocs who have had stimulating, well-supervised, and productive research experiences. But it also heard from postdocs who have been neglected, underpaid, and even exploited while trying to make original, creative contributions to the research enterprise; who have been poorly

matched with their research settings; and who have found little opportunity to grow toward independence or to benefit from the guidance of a mentor.

In its guide, COSEPUP provides its finding, conclusions, and recommendations based on focus groups, workshops, and responses to its survey on

the postdoc experience. This brief summary provides highlights from the guide. The full text of the report and an associated Web guide can be found at www.nationalacademies.org/postdocs.

Navigating (Continued on page 2)

Advice from Postdoc to Postdoc

Each year, medical school deans and administrators gather to discuss graduate and postdoctoral education and training at the GREAT (the Graduate Research, Education, and Training group of the Association of American Medical Colleges) meeting. This gathering of influential medical school administrators presents an excellent opportunity for postdocs to learn about issues facing academic medical centers, hear about new approaches to policy issues, and make their perspectives heard.

For the past three years, BWF has provided support for a group of postdoctoral awardees to attend the GREAT meeting. Encouraging and funding postdoctoral fellow attendance is one way BWF supports the career development of young scientists.

In October 2000, 16 postdocs gathered at the GREAT meeting in Savannah, Georgia, to discuss a variety of issues. One task before the group was to compile a list of practical advice for would-be and fellow postdocs. Reprinted below is their collective wisdom, which was published on *Science* magazine's Next Wave Web site at nextwave.sciencemag.org/cgi/content/full/2001/01/17/1

Things to do before or soon after you start your fellowship:

- Get a formal appointment letter detailing your title, pay, benefits, length of appointment, vacation/personal time, project, and future salary increases.

- Be wary of principal investigators (PIs) that "promise you the world"—they may not follow through.
- Set the tone of your mentor-mentee relationship early—Be enthusiastic; don't lie about or exaggerate your qualifications and expertise.
- Investigate institutional resources and core facilities.
- Know your rights as a fellow. See the guidelines for NIH's National Research Service Awards (grants.nih.gov/training/nrsaguidelines/nrsa_toc.htm), and you can check out the Postdoc Network Database (nextwave.sciencemag.org/cgi/content/full/2000/11/06/5) for links to examples of institutional postdoctoral guidelines and policies.
- Apply for your own funding. Not only can your own funding support travel, supplies, or other items, it allows you to start an independent project (i.e., something you can take with you) and be less constrained in dealing with your PI.

Once you are there:

- Be proactive—get involved with your home institution's postdoctoral association (or start one).
- Get out of the lab and network with your peers and others.

Advice (Continued on page 3)

The Focus of this Issue...

The Burroughs Wellcome Fund is committed to supporting the early careers of promising biomedical scientists. In this issue of *Focus* we:

- Introduce you to a postdoctoral fellow who has sniffed out a promising career in odor research. p. 4
- Highlight a new report on navigating the postdoctoral years. p. 1
- Provide postdoc-to-postdoc advice from some of our career awardees. p. 1
- Tell you about our new grant program to help young physical scientists create cross-disciplinary careers in biology. p. 3

Navigating (Continued from page 1)

Reform as a Collaborative Endeavor.

COSEPUP developed a number of recommendations that stem from the three principles and that recognize the complexity of an experience for which several parties are responsible. It became clear that because of the diversity of postdoctoral experience by field and sector, no organization or group could enhance the experience by itself. To be effective, reforms will have to be collaborative endeavors: The *postdocs* themselves must play a role in promoting good communication with their advisers and making the best use of their opportunities. *Advisers* must invest time and effort to help make each postdoctoral experience an educational one. *Host institutions* must provide postdocs with full membership in the institutional community, help to ensure adequate stipends, and provide logistic and career-planning support. *Funding organizations* must take more responsibility in providing adequate stipend levels and creating incentives for good mentoring. *Disciplinary societies* also can play an important role in catalyzing and supporting reform, particularly because the needed changes vary from one scientific field to another.

Actions to Enhance the Postdoctoral Experience.

COSEPUP divided its explicit recommendations into five groups to address separately each of the parties to the postdoctoral experience—the postdocs, advisers, host institutions, funding organizations, and disciplinary societies—as shown throughout this summary.

These 10 Action Points constitute a brief summary of the recommendations:

- Award institutional recognition and status commensurate with the contributions of postdocs to the research enterprise.
- Develop distinct policies and standards for postdocs in their institutions—especially universities. These policies can be modeled on those already available to students and faculty.
- Develop mechanisms for frequent and regular communication between postdocs and their advisers, institutions, and funding organizations. This communication should include initial expectations on the part of both postdoc and adviser.
- Submit formal evaluations, at least annually, of the performance of postdocs. Without evaluations, some postdocs will be uncertain about their standing or progress.
- Ensure that postdocs have access to health insurance and to institutional services.
- Set limits for total time as a postdoc. It should be about five years at all institutions, with clearly described exceptions.
- Invite the participation of postdocs when creating standards, definitions, and conditions for appointments.
- Provide substantive career guidance to improve postdocs' ability to prepare for regular employment.
- Improve the quality of data in both postdoctoral working conditions and the population of postdocs in relation to employment prospects in research.
- Take steps to improve the transition of postdocs to regular career positions.

Organizations that fund postdocs either directly or through research grants should:

- Work toward a definition of a postdoc that recognizes the temporary nature of the appointment and can be flexibly adapted to fit institutional systems of nomenclature; they should distinguish between:



The full text of the report and an associated Web guide can be found at www.nationalacademies.org/postdocs.

- Ph.D.s in years 1-5 of their postdoctoral research (primarily a training phase) and
- Ph.D.s with more than 5 years of postdoctoral experience, who should be appointed as staff members in an appropriate staff category.
- Have terms and conditions that include appropriate salaries or stipends, benefits, travel to meetings, leave, performance reviews, career planning, career-skill enhancement, and tracking of postdocs after their appointment.
- Play a larger role in encouraging best practices and setting appropriate stipend levels.
- Require those seeking to support postdocs under training or research grants to demonstrate their qualifications for this responsibility.

Editor's note: BWF was a sponsor and supporter of the guide from its inception and encourages all parties who participate in postdoctoral training, from trainees to mentors to deans and provosts, to study the guide and implement its recommendations.

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VISIT OUR NEW DIRECTORY AT BWF'S WEB SITE:

www.bwfund.org

Search for BWF grant recipients by name, title, location, or keyword at www.bwfund.org/directorysearch.htm

Advice (Continued from page 1)

- Develop relationships professionally and scientifically with faculty and other postdocs. (Faculty can be useful in the future for letters of reference.)
- Keep an eye on the future; explore other career opportunities.
- Try to be open and honest in your professional relationships.
- Develop a five-year plan for your career (and review it regularly).

When you are established:

- Conduct informational interviews to learn about career options and get real-world advice.
- See a career counselor about your career questions and path. Consider contacting your undergraduate (or graduate) institution's career office if there are no services available to you at your postdoctoral institution.
- Consider taking a self-assessment test to help you determine your path.
- Have faith in yourself and your abilities.
- Act like a colleague—don't act like a graduate student by asking your advisor to do things for you.
- Just do it (sorry, Nike)—it is easier to beg for forgiveness than to ask for permission.
- Remember, you don't have to be a postdoc if it's not for you, there are other options.
- Always ask questions—don't be afraid.
- Have short- and long-term goals—don't just live "in the moment."
- Have a backup plan for everything—both your project and your career.
- Remember, you can always leave and go to another lab. (It's easier than you think.)
- And most important...whatever you are doing, don't give up!!!

Editor's note: Much more information is available on Science's Career Development Center for Postdocs and Junior Faculty (nextwave.sciencemag.org/feature/careercenter.shtml), which is sponsored in part by BWF.

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Interfaces in Science—the New Frontier for Young Investigators

by Nancy Sung, Ph.D., BWF program officer

It's no secret—biology is awash in an unprecedented data flood, and it is difficult to imagine a more exciting time to be involved in biomedical research. The prospect of unraveling, understanding, and predicting the design and behavior of living systems has never been more intellectually tantalizing or more possible. Not surprisingly, young scientists from the theory-rich areas of mathematics and physics are flocking to biology, believing they can make significant contributions to its advancement. Considerable cultural barriers exist, however, between biology and these other more quantitative and theoretical scientific disciplines. Recognizing the need to address these barriers, BWF began in 1996 to offer funding to institutions to develop training programs at the interface of the physical and computational sciences with biology.

Supporting institution-based training grants was a departure from BWF's primary grantmaking strategy of investing in the career development of individual scientists. This shift was fueled by the recognition that most existing training programs were tethered to specific scientific disciplines, and a distinctly different type of "ecosystem" was needed that would nurture the development of a new kind of scientist.

With 10 training programs now in place (a complete listing with web links is available at the BWF Web site www.bwfund.org/interfaces_in_science_institutional.htm), BWF has committed \$24 million to its "Interfaces in Science" program since 1996. The only structural requirement imposed by BWF is that programs are to be directed by pairs of scientists, one with a background in biology and one with a background in a physical, theoretical or computational discipline. None of the ten currently funded programs is organized in precisely the same way, but rather each capitalizes on its own unique scientific strengths, institutional capabilities, and inter-institutional connections.

Now in its fifth year, the BWF Interfaces program at last count was reaching nearly 100 trainees, including 40 postdoctoral fellows. Fully two-thirds of those trainees have expressed an intent to pursue an interdisciplinary research career in academia. If these aspirations are to become a reality, however, trainees must be provided with opportunities to develop both excellence in scientific research and in those skills needed for professional advancement.

BWF has taken a hands-on approach to the career development of young scientists in its training programs. Each year the fellows are asked to anonymously assess their experiences and suggest improvements.

Based in part on comments received from trainees in 2000, BWF has launched a new award for individual postdoctoral fellows, "Career Awards at the Scientific Interface" (CASI), application deadline May 1, 2001. When we asked postdoctoral fellows what they need the most, they replied that they most need freedom to explore their best ideas and assistance in making the transition to being independent investigators. Modeled closely on BWF's hugely successful Career Awards in the Biomedical Sciences program, the CASI program provides portable, generous funding that postdocs can use to negotiate their first independent faculty position.

BWF has also worked with the Interfaces in Science program directors to convene their trainees. These meetings build their network of contacts with like-minded young scientists, facilitate opportunities for them to present their work, and provide forums to raise and discuss important career issues. The next gathering, hosted by the Program in Mathematics and Molecular Biology (PMMB), will take place in Santa Fe, New Mexico, in January 2002. The theme of the PMMB meeting will be "Modeling across the Scales: Atoms to Organisms." Detailed information about that conference will be available on BWF's Web site in September 2001.

Profile: Dr. Leonardo Belluscio

It has happened to everyone. A scent fills the air and suddenly you are transported across memory space to another place and time. It may be the scent of new-mown hay or grandma's peach pie—the ability of smells to evoke vivid memory is a near universal experience.

Yet the sense of smell is probably the least studied and least understood of our senses. It has lagged behind studies of sight, hearing, and even touch. Part of the

reason is likely that, as humans, sight and hearing are our dominant senses and are given greater importance. Early studies in olfaction focused primarily on anatomy and physiology, showing that odors evoke signals from the olfactory sensory neurons in the nose that converge onto the olfactory bulb. Output neurons from the bulb then project directly to olfactory cortical brain regions, making the sense of smell somewhat unique in its anatomical wiring.

Our other senses are interpreted by cortical areas of the brain after more extensive neural processing.

Another reason that the sense of smell may have been neglected is that, until recently, experiments into the molecular basis of olfaction have been difficult to conduct.

Dr. Belluscio (Continued on page 5)

Questions for Leonardo Belluscio, Ph.D.



Read this profile online at BWF 24x7
www.bwfund.org/news_bwf24x7.htm

BWF award: Career Award in the Biomedical Sciences

Academic title: postdoctoral fellow

Affiliation: Duke University Medical Center, Department of Neuroscience

How did you first discover you wanted to be a scientist?

As a kid I was always interested in knowing how things work, usually by taking them apart and then trying to put them back together. I suppose to some extent I'm still trying to do that now in the laboratory.

Why did you choose to enter your particular field of study?

I would say it was my experience as a technician at Regeneron Pharmaceuticals that introduced me to the field of neuroscience and sparked my interest in brain research. Later in graduate school I came to appreciate the unique qualities of the mammalian olfactory system and its usefulness as a model system for understanding many neural processes, from system development to modifications like learning and memory to neuronal regeneration.

What has your BWF grant meant for your research?

It has given me a financial advantage in bargaining for jobs, as well as some extra confidence by helping me to establish an independent laboratory in a more timely fashion. Scientifically, the award has provided me a bit of a safety net in case I don't get another grant immediately. Also, it is allowing me to pursue some riskier projects that I would otherwise not consider.

If you had unlimited resources, what one big scientific question would you pursue?

How does the brain encode a memory?

What is the best thing about your job?

The independence. I get to choose the research that I do, the questions I ask, how to address those questions and with whom to address them.

What is your philosophy with respect to your research?

Consider ideas and concepts from other fields, you'll be surprised how often they give insight into your own research. Also, keep an open mind. Realize that the results you get are not always what you would expect and not always the most popular answer.

What kind of advice would you give a scientist just entering academic research?

Know what you are getting yourself into. A lot of time will be spent in the lab doing unsuccessful experiments that tell you very little. Your life will be much happier if you truly enjoy being in the lab doing the science and you're not solely focused on getting results.

What area of science is in most need of new researchers?

Bioinformatics. There is a wealth of data being produced through the many genome projects that needs to be analyzed and understood.

What do you do for fun?

When I have some free time I like to go flying or ride my motorcycle. For vacations I like to go camping or fishing, but mostly I end up doing projects around the house.

What do you plan to do when you retire?

Probably the same things I do now but in different proportions. I also plan to spend more time fishing and maybe even learn to sail.

What is your favorite book?

"The Fountainhead" by Ayn Rand.

Dr. Belluscio (Continued from page 4)

All that has changed over the last 10 years with the cloning of a large family of odorant receptors. Today there is a new cadre of scientists charging into the field of olfactory research. Among them is Leonardo Belluscio, who is conducting research supported by a Career Award in the Biomedical Sciences. He has helped pioneer a new method for actually watching the process of scent recognition as it happens.

Dr. Belluscio did his graduate work on the molecular basis of olfaction with Richard Axel, M.D., of Columbia University.

"I wanted a more complete understanding of the olfactory system in order to better compare it to other sensory systems, and it was clear to me that molecular biology alone would not allow me to do this," Dr. Belluscio says. "I decided to combine molecular biology with physiology and imaging to allow me to ask more sophisticated questions."

To do that, Dr. Belluscio chose to pursue postdoctoral work with Lawrence Katz, Ph.D., a Howard Hughes Investigator at Duke University Medical Center. Dr. Katz is well known for his work in visualizing the neural events of the visual cortex, and Dr. Belluscio thought he could adapt some of his techniques to studying the olfactory system.



He spent the first year learning new techniques and applying them to describe the functional organization of the olfactory bulbs of a mouse model. With the BWF Career Award, he decided to focus his interests on studying the mechanisms of learning and memory in the olfactory system.

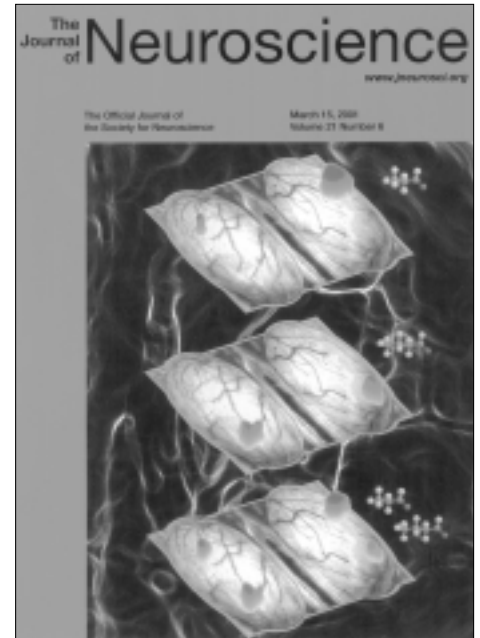
"The grant allowed me to take on a somewhat riskier project than I might have otherwise," he said. "It allowed me to gamble a little bit, hoping that it would pay off."

Dr. Belluscio began his work by creating a map of neural activity in the olfactory bulbs of mice. To do that he used a new technique that allows him to detect olfactory activity by measuring the shift in oxygen-carrying blood toward active nerve sites. Scientists know that blood flow is redirected to areas of intense activity in the brain, so they can correlate activity with blood flow. The technique is gaining acceptance in the olfactory field because it is relatively non-invasive for the animal and gives a comprehensive detailed picture of nerve impulses over the imaged area, Dr. Belluscio says.

He created maps of olfactory nerve activity when mice were presented with a series of odorous molecules called aldehydes, a class of compounds that are highly fragrant and often used in perfumes and other consumer products, and thus were a good choice as model scents for Dr. Belluscio's work.

Thus he created some of the first visual maps of how the brain processes smells, something that has been done only indirectly in the past. His work appears on the cover of the March 15, 2001, issue of the *Journal of Neuroscience*. In the paper, he describes how his visual maps correlated well with molecular studies over the last few years:

- Olfactory neurons from each nostril activate symmetrical regions within the two olfactory bulbs.
- Olfactory neurons that respond to structurally similar odorants project to similar locations or are clustered in regions of the olfactory bulbs.
- Patterns of activation within the olfactory bulbs are similar, but not identical among different individuals.



- When a combination of two odorants is presented, the odorant map produced by the bulb is essentially an overlay of the individual odorant maps.

Now that he has laid some of the groundwork for visualizing scent networks in the olfactory system, he wants to continue toward his research goals.

"We think that the experience of smell can be influenced by environment and learning," says Dr. Belluscio. "Our future studies will focus on changes in the olfactory bulb with learning."

He plans to teach the mice in his studies to associate a specific smell with a reward and see how that combination of scent and memory changes the olfactory map—a first step in understanding the link between scent and memory. Understanding that link has repercussions for more than basic research purposes. Doctors have observed that one of the first clues that a patient has Alzheimer's disease is a diminished sense of smell. The same is true of Parkinson's disease and other neural disorders. So an understanding of the neural pathways in smell may shed light on the mechanisms of neural network creation and its subsequent degeneration.

"Studying the sense of smell is a model system to look at learning and memory in one of our most ancient of neural networks," he says.

Mark Boguski Presents BWF Lecture at ASPET

Mark Boguski, M.D., Ph.D., senior vice president for research and development at Rosetta Inpharmatics Inc., was selected by the American Society for Pharmacology and Experimental Therapeutics (ASPET) to deliver the Burroughs Wellcome Fund Lecture at the annual ASPET meeting of in Orlando, Florida, in April. Dr. Boguski, who trained at Washington University School of Medicine, was one of the original members of the U.S. National Center for Biotechnology Information (NCBI). He is a leading innovator at the interface between computational and experimental biology, developing tools to speed evolution of new insights from high-throughput analysis of genomes and gene expression.

His talk focused on experimental annotation of the human genome using microarrays. Gene prediction from DNA sequence is complicated and prone to

errors. Complex gene structures, large intervening non-coding DNA segments, and the high percentage of repetitive DNA in many organisms' genomes all make accurate gene prediction difficult.

Dr. Boguski's group has developed an approach for experimentally validated annotation of genomes, as described in *Nature* magazine's human genome issue earlier this year (*Nature* 409: 922-927, 2001).

Initially tested on human chromosome 22, Boguski's approach uses two methods, "exon arrays" and "tiling arrays" to examine gene expression and gene structure. Exon arrays are printed matrices of oligonucleotides complementary to predicted gene exons, which are segments of DNA that when spliced together form a complete gene. Tiling arrays are printed matrices of oligonucleotides of overlapping sequence, which together blanket the sequence of an entire region of a genome.

By probing these arrays with mRNA from cells grown under different conditions, insight can be gained into the co-expression and location of genes and exons turned on under those conditions.

The goal of this work is to produce a better "parts list" for understanding how cells work, and how those parts fit together. The work on chromosome 22 looked at 69 experimental conditions, as well as at mRNA from normal and diseased human tissue. It thus begins laying down foundational data for understanding gene expression in complex environments and diseases. The use of orderly printed arrays allows automation, providing a fast, effective method for confirming or denying predictions made by computational approaches.

Toxicology Scholars Deliver Final BWF Lectures

BWF's 1996 Toxicology Scholars, Christopher Bradfield, Ph.D., and Bennett Van Houten, Ph.D., shared the spotlight in the 15th annual Burroughs Wellcome Fund Toxicology Scholar Lectures, which were given March 27 and 28 at the Society of Toxicology's 2001 annual meeting, in San Francisco.

BWF and the Society of Toxicology first announced the Scholar Award in Toxicology program in 1980. Since that time, there have been 23 scholars in the program—a cadre of key researchers who have helped shape the landscape of the toxicological sciences. The annual lectures, which were inaugurated in 1986, commemorate the completion of each scholar's term. This year's lecture completes the scholar award series, as Drs. Bradfield and Van Houten were the last BWF toxicology scholars. Further support for toxicology will be made through other BWF programs.

In his lecture, Dr. Bradfield, of the University of Wisconsin-Madison, discussed how work in his laboratory on

the toxicity of dioxins has uncovered a model for a family of sensor elements that allow cells to adapt both to the external environment and to the shifting internal environment during development. Studying the aryl hydrocarbon receptor (AHR), Dr. Bradfield's group has taken a "reverse toxicology" approach—using poisons to focus on biology, rather than using biology to better understand the toxins. AHR regulates cell responses to polycyclic aromatic hydrocarbons and dioxins, important environmental toxins. The proteins that govern these cell responses can act as sensors, as well as bind to one another, creating a complex co-regulating system that directs cellular responses to changes in the outside world and in the organism's changing internal environment as it develops and grows.

Bennett Van Houten, gave this year's second Burroughs Wellcome Fund lecture at the Toxicology meeting. Dr. Van Houten was a professor at the University of

Texas Medical Branch in Galveston when he was selected as a scholar and has since moved to the National Institute of Environmental Health Sciences. BWF grants cannot be transferred to government institutions.

Dr. Van Houten described his strategy for using quantitative polymerase chain reaction (PCR) to detect DNA damage. The approach detects defects down to one damaged nucleotide in 100,000 bases, and can look for damage using very small quantities of DNA, down to five nanograms. The assay has allowed Dr. Van Houten's group to examine the role of mitochondrial DNA damage in toxicity. Parkinson's disease is one large-scale condition believed to result from damage to the respiratory chain of mitochondria.

Report prepared by Victoria McGovern, Ph.D., program officer

More Than \$1 Million Awarded for Science Education

Thousands of middle school and high school students across North Carolina are learning firsthand about the excitement of scientific research and discovery through the latest series of \$1.1 million in grants from the Burroughs Wellcome Fund.

The Student Science Enrichment Program (SSEP) awards each provide up to \$180,000 over three years. The SSEP program is the only BWF grant program that is specifically directed to North Carolina. These grants will allow students to design three-dimensional working models of biological systems, explore freshwater and wildlife environments, and work alongside computer experts to sharpen their understanding of computational science, among other projects.

"The BWF science-enrichment projects enable students to participate in a variety of hands-on, inquiry-based avenues of exploration—an educational approach that we believe to be an effective way to increase students' understanding of science," says BWF President Enriqueta C. Bond, Ph.D. "We hope the projects will nurture students' enthusiasm about science, expose them to the excitement of scientific discovery, and interest them in pursuing careers in research or other science-related areas."

The new awards bring to nearly \$7 million the total that BWF has invested through its science-enrichment program. The Fund has supported more than 50 projects, which have reached more than 22,000 middle school and high school students statewide.

"Our goal is to see the lessons learned from these projects incorporated into efforts to improve science, mathematics, and technology education—at K-12 levels, in all schools, and beyond classroom doors," says Carr Agyapong, BWF senior program and communications officer.

Following are 2001 SSEP grantees. For a complete listing of current and previous SSEP awards, visit our Web site at ssep.bwfund.org:

American Chemical Society, North Carolina Section

SEED: Summer Educational Experience for the Disadvantaged

Campbell University School of Pharmacy
Harnett Central Middle School Science and Technology Enrichment Program

Catawba Science Center
STEP: Science Technology Enrichment Program

Duke University
Techtronics: Hands-on exploration of technology in everyday life

Duke University Nicholas School of the Environment
Connecting Coastal Communities: A partnership between Duke Marine Lab and local middle school students

Jacksonville—Onslow Community Ministries
Sturgeon City Student Science Series

Lenoir-Rhyne College
Carolina Institute for the Multicultural Approach to Science

North Carolina State University
Performing Inquiry Based Exploration: An example in using agricultural waste and wastepaper to produce new products

University of North Carolina-Chapel Hill School of Medicine
Scientific Enrichment Opportunities for High School Students

Physician-Scientists Receive \$7.5 Million in Awards

The Burroughs Wellcome Fund has announced Clinical Scientist Awards in Translational Research to 10 institutions on behalf of researchers who will help bridge the gap between the laboratory bench and patient care.

Made as part of BWF's 2001 award series, the grants each provide \$750,000 over a period of five years and will begin on July 1.

The grants are intended to foster the development and productivity of mid career physician-scientists who will strengthen translational research—the two-way transfer between basic research and the treatment of patients—through their own studies as well as their mentoring of the next generation of physician-scientists.

"Public and private organizations support a significant amount of basic biomedical research, while industry supports the commercial development of medicines, yet the vital bridge between these areas remains underserved," says BWF President Enriqueta Bond, Ph.D. "These awards bridge the gap and encourage investigators to provide the vital link between the patient and the laboratory bench."

BWF's translational research grants are designed to enable physician-scientists

to explore important scientific questions, to apply the resulting knowledge at the bedside, and to bring insights from the clinical setting back to the laboratory for further exploration. These efforts, it is hoped, will lead to a better understanding of the mechanisms of disease, as well as to new methods of diagnosing, treating, and preventing disease.

The 2001 physician-scientists, along with their institutions and research projects, are:

Sunil K. Ahuja, M.D.
University of Texas Health Science Center-San Antonio
HIV-1 AIDS pathogenesis: bridging the gap between host genotype and HIV transmission/disease phenotype

Cameron S. Carter, M.D.
University of Pittsburgh School of Medicine
Multimodal brain imaging and the pharmacotherapy of cognitive disability in schizophrenia

Jeffrey A. Drebin, M.D., Ph.D.
Washington University School of Medicine
Targeted suppression of beta-catenin in colorectal cancer

Physician-Scientists (Continued on page 8)

\$2.1 Million Awarded in Pharmacology and Toxicology

BWF has made New Investigator Awards in the Pharmacological or Toxicological Sciences to 10 institutions on behalf of scientists who are bringing new ways of thinking and new experimental approaches to their fields.

Made as part of BWF's 2001 award series, each grant provides \$210,000 over a period of three years and will begin on July 1, 2001.

New Investigator Awards are intended to foster the development and productivity of scientists who are at the beginning stages of their faculty careers, and to enable them to pursue research projects that have higher-risk but also the potential for moving their fields in significant new directions.

"As in many other areas of biomedical research, the fields of pharmacology and toxicology are poised to take advantage of the wealth of new tools for scientific discovery now available to bench scientists," said BWF President Enriqueta Bond, Ph.D. "This year's New Investigators are leading the way with new model organisms, chemical and genetic libraries, and a variety of inventive methods to move their fields forward."

This is the last time that BWF will offer these grants. Future support for the fields of pharmacology and toxicology will be made through other BWF programs.

The new investigators, along with their institutions and research projects, are:

PHARMACOLOGICAL SCIENCES

Peter J. Belshaw, Ph.D.

University of Wisconsin-Madison
Combinatorial synthesis of non-ribosomal peptide-based electrophilic libraries

Anton M. Bennett, Ph.D.

Yale University School of Medicine
p21Ras signaling by protein tyrosine dephosphorylation

Calvin J. Kuo, M.D., Ph.D.

Stanford University School of Medicine
Physiologic and pathologic roles of VEGF

David P. Siderovski, Ph.D.

University of North Carolina-Chapel Hill
GoLoco motif-derived peptides as selective G-protein "perturbagens"

Scott K. Silverman, Ph.D.

University of Illinois-Urbana-Champaign
Phototriggered folding approaches to RNA structural motifs and RNA-protein interactions

Lu-Yang Wang, Ph.D.

University of Toronto
Regulation of synaptic strength by subtype-specific coupling between Ca^{2+} channels and metatropic receptors

TOXICOLOGICAL SCIENCES

Mohanish P. Deshmukh, Ph.D.

University of North Carolina-Chapel Hill
School of Medicine
Caspase activation during apoptosis: a novel mechanism of regulation in neurons

Su Guo, Ph.D.

University of California-San Francisco
School of Pharmacy
The mechanism of action of neurotoxins that induce parkinsonism a molecular genetic study in zebrafish

Anna K. Mapp, Ph.D.

University of Michigan College of Pharmacy
Small molecules for reprogramming gene expression

Terry L. Sheppard, Ph.D.

Northwestern University
Chemical toxicology of oxidative DNA damage lesions

Physician-Scientists (Continued from page 7)

Glenn I. Fishman, M.D.

Mount Sinai School of Medicine
Gap junction channels as novel anti-arrhythmic targets

Lisa M. Guay-Woodford, M.D.

University of Alabama-Birmingham
School of Medicine
Genetic modifiers in recessive polycystic kidney disease: implications for pathogenesis and therapeutics

Marshall S. Horwitz, M.D., Ph.D.

University of Washington School of Medicine
Therapeutic inhibition of aberrant protease activity in inherited neutropenias

Elizabeth M. McNally, M.D., Ph.D.

University of Chicago
Microvascular spasm in the progression of cardiomyopathy

Anthony J. Muslin, M.D.

Washington University School of Medicine
Signaling mechanisms in cardiovascular disease

Steven A. Porcelli, M.D.

Albert Einstein College of Medicine
Defining the protective human CD8+ T-cell response against *Mycobacterium tuberculosis*

Marc E. Rothenberg, M.D., Ph.D.

University of Cincinnati College of Medicine
Experimental analysis of eosinophil-associated gastrointestinal inflammation

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