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ANNUAL REPORT

The Burroughs Wellcome Fund
is an independent private foundation
dedicated to advancing the medical sciences
by supporting research and other scientific
and educational activities.



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2000 ANNUAL REPORT

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BURROUGHS WELLCOME FUND

Telephone (919) 991-5100

Fax (919) 991-5160

www.bwffund.org

Mailing Address:

Post Office Box 13901

Research Triangle Park, NC 27709-3901

Shipping Address:

21 T. W. Alexander Drive

Research Triangle Park, NC 27709

Depicted in BWF's logo, the eye of the ancient god Horus is considered a symbol of health.

ABOUT THE BURROUGHS WELLCOME FUND

The Burroughs Wellcome Fund is an independent private foundation dedicated to advancing the medical sciences by supporting research and other scientific and educational activities. Within this broad mission, we seek to accomplish two primary goals—to help scientists early in their careers develop as independent investigators, and to advance fields in the basic medical sciences that are undervalued or in need of particular encouragement.

BWF has an endowment of approximately \$700 million, and we award approximately \$35 million in grants annually in the United States and Canada. We channel our financial support primarily through competitive peer-reviewed award programs, which encompass five major categories—biomedical sciences, interfaces in science, infectious diseases, therapeutic sciences, and science education. BWF makes grants primarily to degree-granting institutions on behalf of individual researchers, who must be nominated by their institutions. To complement these competitive award programs, we also make grants to nonprofit organizations conducting activities intended to improve the general environment for science.

BURROUGHS
WELLCOME
FUND 

The Burroughs Wellcome Fund was founded in 1955 as the corporate foundation of Burroughs Wellcome Co., the U.S. branch of the Wellcome pharmaceutical enterprise, based in the United Kingdom. The Wellcome enterprise was started in 1880 by two young American pharmacists, Henry Wellcome and Silas Burroughs, who had moved to London to manufacture and sell “compressed medicines”—that is, pills—which the pair believed could replace the potions and powders of the day.

Their firm prospered. After Silas Burroughs died in 1895, Henry Wellcome directed the growth of the company into an international network with subsidiaries in numerous countries on several continents. As the business grew, Henry Wellcome held firm to his strong belief that research was fundamental to the development of excellent pharmaceutical products—a belief he put into practice by establishing the industry’s first research laboratories.

When Henry Wellcome died in 1936, his will vested all of the corporate shares in a new organization—the Wellcome Trust—devoted to supporting research in medicine and allied sciences and to maintaining museums and libraries dedicated to these fields. Over the decades, the Trust grew to become the world’s largest charitable foundation devoted exclusively to the biomedical sciences.

In 1955, leaders at the Wellcome Trust and Burroughs Wellcome Co.-USA envisioned an extension of this effort in the United States—and so was born the Burroughs Wellcome Fund. After nearly four decades as a corporate foundation, BWF in 1993 received from the Trust a \$400 million gift that enabled us to become a completely independent foundation. With this increase in assets, BWF has been able to play a larger role in funding biomedical research, including extending our support into Canada. In carrying out this work, BWF is governed by a Board of Directors composed of distinguished scientists and business leaders, and our competitive award programs are directed by advisory committees composed of leading researchers and educators.

The importance of curiosity-driven research, as endorsed by Henry Wellcome, continues as our guide. Thus, more than a century after two enterprising American pharmacists set in motion their pioneering partnership, the Burroughs Wellcome Fund remains committed to the belief that fostering research by the best and brightest scientists offers the fullest promise for improving human health.

BWF Dedicates Headquarters Building



In celebration of 45 years of grantmaking, the staff, board members, and friends of the Burroughs Wellcome Fund gathered on Thursday morning, May 25, 2000, to dedicate BWF's permanent headquarters building in Research Triangle Park, North Carolina. BWF President Enriqueta C. Bond, Ph.D., opened the ceremony attended by more than 200 guests. In her remarks, Dr. Bond said the new building, with its 43,000 square feet of offices and meeting spaces, will help BWF carry out our mission of advancing the medical sciences by giving the scientific community a neutral site to convene.

To commemorate the occasion, BWF announced two special grant initiatives:

- Eleven grants, totaling nearly \$3 million, were made to U.S. and Canadian researchers working in functional genomics, a new field of science that focuses on defining the functions of genes and how they interact within entire organisms. (See page 6.)
- A \$1 million grant was made to the Grassroots Science Museums Collaborative, a group of 15 North Carolina science museums, aquariums, and zoos that work together to coordinate science projects and activities for children, teachers, and families throughout the state. The collaborative will be headquartered at the N.C. Museum of Natural Sciences, in Raleigh.

These special grants exemplify the type of growth and expansion that the Fund hopes to achieve in our new building. David Kipnis, M.D., chair of BWF's Board of Directors and Distinguished University Professor of Medicine at the Washington University School of Medicine, said the building will provide BWF with the opportunity to expand activities related to our two major goals: helping foster the success of the early careers of biomedical scientists, and encouraging basic medical science that is undervalued.

REPORT FROM THE PRESIDENT: NEW TERRAIN FOR A NEW MILLENNIUM

By Enriqueta C. Bond, Ph.D.

**BWF recognizes
that the biomedical
research landscape
is changing.**

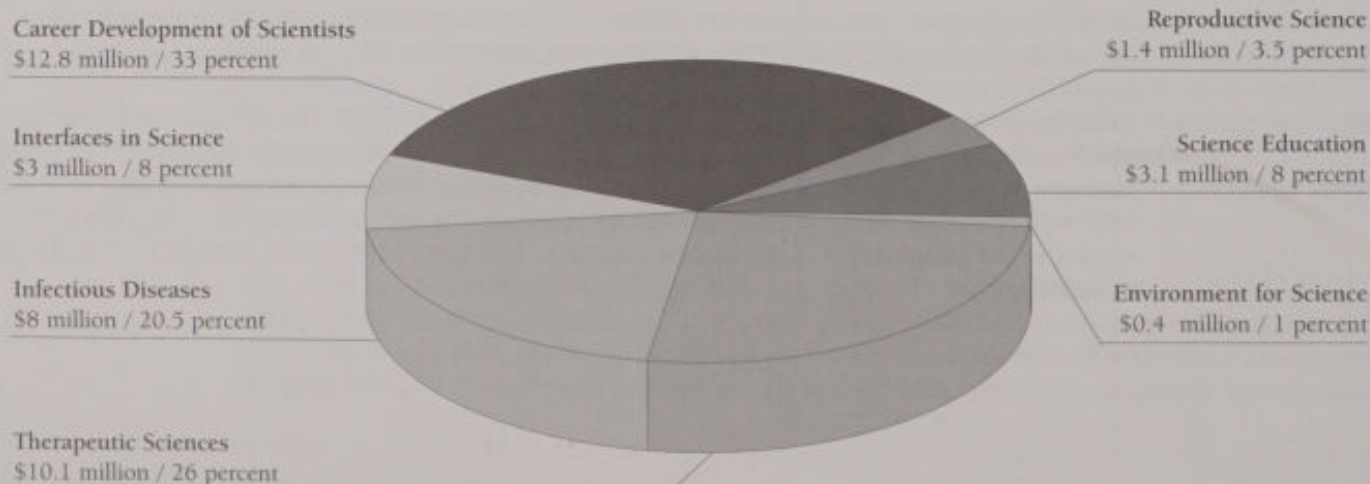
The year 2000 signaled a turning point in the maturity of the Burroughs Wellcome Fund. After a five-year period in which we had substantial growth in our award programs, due to the generous \$400 million gift from the Wellcome Trust, our sister philanthropy in the United Kingdom, BWF has now reached a steady financial state.

As we do every five years, we have been evaluating our programs in an exercise we call "terrain mapping." Through this process, we look for new opportunities where our grantmaking can help boost the careers of promising young scientists and catalyze growth in particular areas of research. This time, the exercise had an added dimension: in May 2000, BWF dedicated our permanent headquarters building in Research Triangle Park, North Carolina. (See page 3.) With the completion of our new home, which includes several meeting spaces, we were able to include in our discussion options for expanding BWF's role as a convener of scientists, policy makers, and others involved in medical research and health-related issues.

During the terrain-mapping exercise, BWF's program staff performed a comprehensive analysis of our programs—all with an eye toward consolidation and innovation. We kept in mind the role that philanthropies play in funding biomedical research. While government support for medical research in 1999 was roughly \$18 billion and industry support was more than \$23 billion, private philanthropies provided about \$1.3 billion. While modest in comparison, private funding often is more flexible and responsive to a changing research environment. Private foundations can be catalysts for change, and they can provide essential "risk capital" for new ideas and new models. BWF, which ranks among the top six health research foundations in the United States and Canada, provided nearly \$39 million for biomedical research and science education in 2000. Our funding levels by program area are shown in the chart below. The funding levels provided by the leading health/medical research foundations are shown in the table on page 5.

BWF GRANTS APPROVED IN FISCAL 2000, BY PROGRAM AREA

Total Amount Approved: \$38.8 million



(For details, see "Grants Index/Program Summary" on page 30)

FOUNDATION SUPPORT FOR HEALTH/MEDICAL RESEARCH Year: 1998

Organization	Amount (in millions)
Robert Wood Johnson Foundation	\$295.9
W. K. Kellogg Foundation	78.9
David and Lucile Packard Foundation	65.3
Whitaker Foundation	63.4
California Foundation	39.4
Burroughs Wellcome Fund	35.0
Chicago Community Trust and Affiliates	27.0
Duke Endowment	24.7
Pew Charitable Trusts	23.5
Rockefeller Foundation	22.9
TOTAL	\$676.0

Source: Foundation Giving Trends, 2000

BWF recognizes that the biomedical research landscape is changing. As a foundation, we want not only to be aware of these changes, but also to determine how we can leverage our support to effect change when and where it is needed. We must set our agenda in a way that complements, rather than duplicates, what other organizations, including the federal government, are doing. This point was amplified by the particularly prescient remarks of the featured speaker at our building dedication, Dr. Bruce Alberts, president of the National Academy of Sciences. "One challenge comes from the need to constantly stir the pot with regard to keeping science alive," he said. "As science acquires more and more knowledge, there is a grave danger in its increasing specialization. Moreover, there is a natural feedback loop in our scientific establishment. Students look at their mentors to see what kind of science is valued, go out and form their own research groups, and then do more of the same kind of research. We need to ask what kind of science we value? We need a kind of science that addresses human needs."

In one effort to respond to changing needs, BWF at our building dedication announced nearly \$3 million in awards for research in the rapidly emerging field of

functional genomics, which defines the functions of genes and shows how genes interact within the context of the whole organism. These Innovation Awards in Functional Genomics are intended to help scientists put the vast quantity of gene sequence information being generated in the world's laboratories to work in preventing and treating disease. We made awards to 11 scientists or teams of scientists in the United States and Canada for projects that either use computers to analyze genetic information or use animal models to link genomic information to physical or behavioral traits. Our hope is to encourage truly novel approaches that might not have been funded through traditional means but that have the potential for high impact. (See page 6 for a description of the research being conducted by one of these awardees, Sudhir Kumar, Ph.D.) Although these special commemorative awards will not be offered again, BWF recognizes that application of genomic data will soon permeate science, and proposals that incorporate genomic approaches will be encouraged in our ongoing award programs.

We also are playing a key role in addressing the changing needs in training the next generation of biomedical scientists. In February 2000, the American Cancer Society, the Burroughs Wellcome Fund, and the Howard Hughes Medical Institute convened a meeting on the vital role that private funders can play in ensuring that appropriate and adequate programs are available for training both basic biomedical scientists and clinical scientists. Representatives from government, academia, and nongovernmental funding agencies had the opportunity to hear presentations, discuss programs and plans of public and private funders, and consider goals for the future. Proceedings of the meeting are available on BWF's Web site (www.bwfund.org/special_reports.htm). Participants concluded that the private sector is uniquely positioned to develop and support a variety of new approaches to training both basic and clinical researchers, and that private funders can facilitate opening doors to new or emerging areas of research more easily than can public agencies.

With issues such as these as a backdrop, BWF proceeded with what would be a yearlong examination of where we have been and where we should be going in the future. In particular, we noted that the complete sequencing of the human genome (and the genomes of several model animals and human pathogens) presents research scientists with an incredibly powerful tool for discovery. Yet, to find useful information within this tremendous resource will require a shift in training that academic institutions must quickly realign themselves to handle. Mining the human genome will require not only a foundation in biology, but also fundamental skills in computational methods, chemistry, mathematics, and materials and physical sciences. Similarly, scientists from the physical sciences can advance such fields as neuroscience, systems biology, and structural biology by approaching the research in unusual and innovative ways.

**We are addressing
the changing
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of biomedical
scientists.**

Functional Genomics: Answering the Big Questions

Sudhir Kumar, Ph.D., is not content with answering the easy questions. He goes right to the heart of biology. How did life begin? How and when did mammals evolve? How do changes in genes cause disease?

With so much gene sequence data now available, Dr. Kumar, an assistant professor of biology at Arizona State University, believes that it is actually possible to ask such questions and even to expect to find some answers. He combines his knowledge of computer science, mathematics, and evolutionary biology to locate patterns in DNA sequences. These "functional footprints," as he calls them, provide insight into why related genes sometimes have different functions.

By locating these footprints, Dr. Kumar hopes to provide a database of information available for bench scientists to ask new questions about what genes do. He also hopes to learn how ancestral genes evolve to provide new functions. Dr. Kumar believes that along the way, identification of the gene footprints will bring biomedical research closer to understanding the genetic basis of disease.

A pioneer in the post-sequencing era, Dr. Kumar is a recipient of one of 11 Burroughs Wellcome Fund Innovation Awards in Functional Genomics, made to celebrate the dedication of BWF's new headquarters building.

"In choosing awardees, we were looking for scientists who are combining computational methods with laboratory experimentation to move the entire field of functional genomics forward," says Nancy Sung, Ph.D., BWF program officer. "Dr. Kumar has demonstrated that he understands a combined approach can be more powerful than doing either computation or experimentation alone."

As the number of gene sequences has grown, the sheer volume of data requires that computer-based approaches become an integral tool for the molecular biologist. Dr. Kumar's strategy already turned heads, when he used computational methods to estimate that the ancestors of modern groups of mammals diverged 30 million to 40 million years earlier than had been previously predicted. Now he is using the methods he developed to tackle the massive computational challenges of functional genomics.

Dr. Kumar and his colleagues look for functional footprints by searching for key mutations, random mistakes in the "spelling" of a gene that cells make when they copy DNA during cell division. Most such changes are of no consequence, but over millions of years of evolution, certain mutations led to changes in the role a particular gene or protein plays in the cell. These changes are the footprints that Dr. Kumar hopes to locate among the millions of gene sequences that have been spelled out in large-scale gene sequencing projects.

Traditionally, scientists studying the effects of gene mutations would take a best guess at how a mutation might change a gene function, and then conduct time-consuming experiments for every prediction to determine if they were correct. Dr. Kumar is using the power of computation to reduce guesswork and help researchers narrow the possible locations in genes that are crucial to their function.

For example, he studies a gene family called PAX, whose nine members play important regulatory roles, including development of the eye. In humans, mutations in a gene called PAX6 can lead to a malformed iris. In mice, mutations of the same gene cause the animals to be born with small eyes. Using statistical techniques, Dr. Kumar and his colleagues identified a set of functional footprints and predicted that they would be important for PAX6 action. Meanwhile, another group of researchers found that one of these footprints changes PAX6's ability to do its job, resulting in the malformed eye.

"My goal is to predict gene function and to identify mutations at the primary sequence level that may be responsible for differences in gene function," Dr. Kumar says. "We use computation to correlate mutations with the known function of a gene." When he finds a footprint in a gene whose function is unknown, he can use that sequence information to predict what the gene may do. "Then using our data," he says, "scientists can make more informed decisions about which sequences to look at in detail using laboratory experiments."

Dr. Kumar and his colleagues also are using their knowledge of the rate of mutations to estimate how long ago major groups of mammals, such as primates and rodents, and groups of eukaryotes, such as plants, animals, and fungi, became distinct species. As a member of the National Aeronautics and Space Administration's astrobiology team, Dr. Kumar is even involved in helping to understand how and when life first originated on earth.

But Dr. Kumar is really only at the starting point in his efforts. The vast majority of gene sequence is uncharted territory, and that is where he says his BWF award will really make a difference.

"This Burroughs Wellcome Fund grant allows me to hire additional scientists who will be creating the database of functional footprints," he says. "We will also create a Web site where scientists can search our results looking for information about their gene of interest. Then, we will really see the science of functional genomics accelerate."

Bringing the physical sciences and the biological sciences closer together has been the focus of BWF's Interfaces in Science program. Since 1996, this program has made six institutional development awards to colleges and universities that are creating the prototypes for a new kind of graduate and postdoctoral training, one that crosses departmental boundaries and provides a much-needed bridge among scientific disciplines.

During our terrain-mapping process, BWF reaffirmed our commitment to developing the careers of interdisciplinary researchers by creating a new program, Career Awards at the Scientific Interface. This program will provide early career support for physical scientists who are pursuing biologically relevant questions. Modeled after our Career Awards in the Biomedical Sciences program, these new awards will provide research support that bridges the late postdoctoral years and early faculty years. We will make the first awards during our 2002 award series. Initially, we plan to make awards in this program every two years, alternating with the Institutional Awards at the Scientific Interface program.

This new program exemplifies two major themes that emerged from the terrain-mapping process:

- By providing support bridging the postdoctoral and early faculty years, BWF fills an unmet need for "risk capital" at a transition point when traditional funding generally is not available. Such funding has been shown to have a tremendous impact on the career development of young scientists.
- BWF can help accelerate the development of new directions in science by providing seed capital just as a new field is beginning to emerge.

One example of such a "seed capital" project is our early support for the Malaria Genome Project at a time when malaria research was poorly funded. BWF, together with the National Institute of Allergy and Infectious Disease, the U.S. Department of Defense, and the Wellcome Trust, formed a partnership to support scientists at Stanford University, the Sanger Centre, and The Institute for Genomic Research, who are sharing the formidable task of sequencing the malaria parasite's chromosomes. Our support for this project, together with our support of special initiatives in malaria research, demonstrates how early investments in malaria can catalyze efforts and attract additional funding.

Although the field of malaria research has now become a funding priority for other grantmakers, many other infectious diseases remain underfunded. During our terrain-mapping exercise, BWF consulted with many of the leaders in infectious diseases research. Clearly, the emergence or reemergence of infectious diseases presents the world with a struggle that demands immediate attention. Infectious diseases continue to be responsible for devastating effects on human health in many developing and tropical countries. Increasingly, such diseases threaten even developed countries, as the emergence of the West Nile virus in the United States has amply demonstrated.

BWF is committed to developing the careers of interdisciplinary researchers.

BWF Names New Vice President

On September 1, 2000, the Burroughs Wellcome Fund welcomed a new vice president for programs and communications, Bernadette M. Marriott, Ph.D., following the departure of Martha Peck, who left BWF in June to fulfill a lifelong dream of becoming a physician.

Ms. Peck made enormous contributions during her career at the Fund, which she joined in 1981, when BWF was a corporate foundation of Burroughs Wellcome Co. Her legacy remains in the shape and structure of our programs and in the wisdom she bestowed upon them.



Beginning a new era, Dr. Marriott brings to the Fund a wealth of experience in scientific research and management. She comes to BWF from Northern Arizona University, where she was vice provost for research and graduate studies, dean of the Graduate College, and professor of biological sciences. Dr. Marriott previously had been the first director of the National Institutes of Health's Office of Dietary Supplements, and she served as deputy director of the Food and Nutrition Board of the Institute of Medicine, part of the National Academies, where she was responsible for planning and managing the study and development of authoritative recommendations on national issues related to nutrition, food safety, diet, and health.

"I am particularly excited by the Burroughs Wellcome Fund's approach in identifying interdisciplinary science contributions to health and by the primary emphasis on supporting undervalued areas of science, which is where private foundations can have the greatest impact," says Dr. Marriott.

**We are retooling
our programs
to better fit the
changing research
environment.**

BWF will continue our support of infectious diseases research. However, we have decided to redirect our resources to the study of pathogenesis, with a focus on the intersection of the human and pathogen biology. Examples of such research include:

- Cell-pathogen interactions, including studies of host cell responses at the cell surface, cell signaling in response to infection, and microbial persistence in host cells.
- Host-pathogen interactions, including studies of host genetics as it influences resistance and susceptibility to infectious diseases, innate and adaptive immune response to infectious agents, pathogen modulation of the immune system, and neurobehavioral consequences of infection.
- Novel routes to causation of human disease, including studies of the role of infectious agents in chronic disease and as triggers of autoimmune diseases, such as arthritis, and the effect of infection during different stages of fetal development.

We also will continue to make modest investments in the development of basic sets of molecular tools for studying parasites and pathogenic fungi.

Throughout 2001, BWF staff will be developing formal program guidelines in these areas for the award series that begins in 2002. These deliberations, it should be noted, will be aided greatly by Bernadette M. Marriott, Ph.D., BWF's new vice president for programs and communications, who joined our staff in September 2000. (See page 7.) BWF will continue to seek faculty members early in their careers to support through these programs. In addition, we are continuing our collaboration with the Wellcome Trust to support investigators in the United States, Canada, the United Kingdom, and developing nations who are partnering to study infectious diseases affecting the tropical developing world.

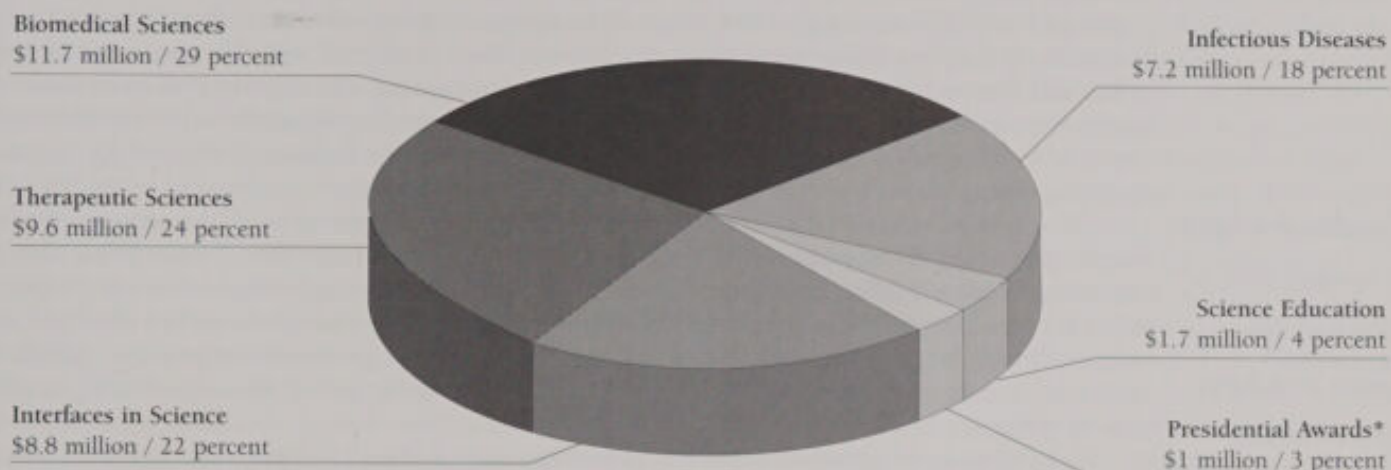
Another area of research that is at a crossroads involves the physician-scientist. Changes in the financing of medical research and health care threaten to further undermine the translation of knowledge gained from basic research into new or improved methods to treat or prevent diseases. Many physician-scientists, who play a critical role in identifying clinical questions and implementing advances in the basic sciences, have fewer financial resources and less time available for clinical studies, and they also face increased competition for access to patient populations for such studies. Support for researchers who pursue the vital link between basic and clinical research and train the next generation of investigators is more critical than ever. Therefore, BWF will continue our Clinical Scientist Awards in Translational Research, while intensifying efforts to work with other organizations to strengthen the clinical research arena.

Regardless of which direction biomedical research is headed, there will always be a demand for top-notch research scientists. Consistently, we hear that our Career Awards in the Biomedical Sciences provide young scientists with the freedom to choose their own research avenues and bolster their ability to obtain an academic appointment. Talking with our awardees, such as Bruce Lahn, Ph.D., has led the Fund's staff and board to conclude that nurturing nascent careers is extremely valuable. (See page 10 for a description of Dr. Lahn's research.) BWF's Board of Directors is united in its stance that we should not only continue, but should expand our support for outstanding young scientists throughout all of our program areas.

The board likewise felt that our support of middle school students and high school students in BWF's home state of North Carolina merits not only continuation, but expansion. If we are to have a continuing flow of bright young people who choose science as a career, then we must give young people the opportunity to experience the thrill of scientific discovery. We will continue to offer the Student Science Enrichment Program, but will also explore ways to leverage our funds to champion science and mathematics education and export successful science enrichment programs beyond our state border.

After careful reflection upon our mission and goals, BWF's program staff presented our Board of Directors with a variety of potential avenues for future activities, and the staff further recommended a scenario judged to make the best use of our resources. The board approved a scenario that brings our programs into tighter focus. There are now five core program areas:

- Biomedical sciences
- Interfaces in science
- Infectious diseases
- Therapeutic sciences
- Science education

BWF GRANTS PROPOSED FOR FISCAL 2001, BY PROGRAM AREA*Total Amount Proposed: \$40 million*

* Ad hoc grants made at the discretion of BWF's president and generally related to the Fund's program areas.

The levels of support that BWF intends to commit in 2001 to each of these core areas is shown in the chart above.

In deciding on these focus areas, the board and staff had to make the difficult decision to eliminate or reshape some programs that BWF has supported for many years. This does not mean that we are abandoning particular fields of study; rather, we are simply retooling programs to better fit the changing research environment. BWF no longer will support reproductive science as a distinct focus area. However, we will continue support for reproductive science through the Career Awards in the Biomedical Sciences program and our other program areas. In addition, BWF will provide another two years of support for the Reproductive Scientist Development Program, which is funded and administered in partnership with a consortium of government, philanthropic, and professional organizations. We also will continue to support the training course titled "Frontiers in Reproduction: Molecular and Cellular Concepts and Applications," held annually at the Marine Biological Laboratory in Woods Hole, Massachusetts.

The staff also felt that BWF would be most effective if each program officer focused on a particular area, while simultaneously broadening the range of support we offer our awardees. In addition, the board felt strongly that we should spend more time evaluating the effectiveness of our grants so that, as an organization, we are making continuous improvements in our programs.

Looking forward, awardees will be offered additional opportunities to present their research and to network with colleagues at convocations sponsored by BWF, as well as additional opportunities to obtain information on career development, support for collaborative research, and mentoring. All this is part of our effort to provide not only financial support, but also a career boost. If our grant recipients consider their tenure as BWF awardees a career-enhancing experience, then we will have succeeded.

Emiquita C. Bond

CAREER DEVELOPMENT OF SCIENTISTS: WHY OR Y NOT?

"I quickly developed the comfort level to enable my lab to grow and delve into new areas."

Bruce Lahn spent seven years studying what makes a man a man. As a Ph.D. student and then a postdoctoral fellow, he studied the genes of the human Y chromosome, the tiny misunderstood partner to X that determines the essence of maleness. Once written off as a chromosome with few genes and little to inform science, the Y chromosome has enjoyed a resurgence of interest since a group of molecular biologists, including Dr. Lahn and his mentor David Page, Ph.D., of the Whitehead Institute for Biomedical Research, an affiliate of the Massachusetts Institute of Technology, began analyzing the genes on Y.

The researchers showed that four major genetic shuffling events through evolution were responsible for the generation of distinct X and Y sex chromosomes. The group also demonstrated that understanding the genetic differences between X and Y is relevant to understanding the causes of male infertility and, conversely, to the possible development of male contraception. In fact, Dr. Lahn was so successful in his graduate work that he won a national technology-transfer competition, sponsored by Merrill Lynch, for his proposal to develop a male contraceptive from a sperm-producing enzyme that he discovered.

Dr. Lahn, now an assistant professor of genetics at the University of Chicago and a 1999 recipient of a Burroughs Wellcome Fund Career Award in the Biomedical Sciences, has not been content simply to extend his Y chromosome research, although he is continuing that work. He quickly realized that the genomics revolution is opening vast unexplored territory that his training in large-scale sequencing, gene comparison, and the study of evolution would enable him to exploit. Making such a large jump, from the now relatively crowded field of Y chromosome studies to a new field of interest, neurobiology and the evolution of the brain, was a bold step, particularly since he had no reputation in the field and would likely need at least two to three years to build up enough data to submit a grant application to the National Institutes of Health (NIH), the primary federal funder of this type of research.

"I knew it was a risk, but I quickly developed the comfort level to enable my lab to grow and delve into new areas," Dr. Lahn says. "Coming in to my position with the Burroughs Wellcome Fund grant made a critical difference. I was able to hire two postdocs, two technicians, and a lab manager, and to take on three graduate students, in my first year. That first burst of growth helped me build a critical mass of personnel for my lab. I now have 15 people working in the lab."

Dr. Lahn wants to ask big questions, such as why humans developed a much larger brain than monkeys and what that means for human evolution. He wants to know why adult human brains have stem cells, which can repair and regenerate damaged tissue, when conventional wisdom says mature cells in the brain do not regenerate. These are questions he thinks he can answer, and he is building the infrastructure to do it using comparative genomics. "I recognize the need to develop databases and computational tools that will help us perform these kinds of analyses, so, for example, I have three people in my lab who do nothing but computation," Dr. Lahn says. "I believe that having people doing 'wet lab' experiments along with people using computational methods creates an incredible synergy that allows us to ask and answer questions using a combination of methods."

Dr. Lahn's work has now caught the attention of other funders, and in 2000 he was named a Howard Hughes Medical Institute assistant investigator, which carries with it a promise of research funding for years to come. Where will he go from here? Among other projects, Dr. Lahn is doing large-scale sequencing of genes expressed in the brain of the macaque monkey. He believes that the evolutionary distance between the macaque brain and human brain, about 35 million years' worth, is just right to help answer questions about how the human brain evolved from a common primate ancestor. He plans to create a library of macaque genes that can be compared to human genes for key differences. It is a leap from maleness to the macaque brain, but one that Dr. Lahn thinks will pay off.

BWF recognizes that the transition from working in a mentor's research area to making one's own stamp is not easy and is fraught with potential pitfalls. That is why we created our Career Awards in the Biomedical Sciences program—to enable awardees with a proven track record of excellence to take risks and push science in new directions. As Dr. Lahn says, "NIH is not going to give me money to do work in a field where I have no credibility. The Burroughs Wellcome Fund award allowed me to make some mistakes and learn a new field without fear of running out of money."

Program Highlights in 2000

Working across a range of disciplines, 25 U.S. and Canadian researchers received Burroughs Wellcome Fund Career Awards in the Biomedical Sciences in 2000, for a total of \$12.5 million. BWF hopes that the awards will foster the development and productivity of these promising researchers and help them make the critical transition to becoming independent investigators, as has been the case with Bruce Lahn.

The new awardees are working on projects as diverse as brain sleep rhythms that may be involved in memory, a common childhood cancer called neuroblastoma, and a new microfabrication technology to help understand how proteins in a cell's membrane control communication between cells. But they share a common goal with Dr. Lahn and all of our awardees—discovery of basic knowledge that will underpin broader efforts to improve human health and well-being.

BWF's career awards are made in honor of Dr. Gertrude B. Elion (1918-99) and Dr. George H. Hitchings (1905-98), two pioneering scientists who played major roles in the Fund's history. Dr. Elion served on our Board of Directors from 1991 to 1999, and Dr. Hitchings served as our president from 1974 to 1990. Among their numerous professional honors, Dr. Elion and Dr. Hitchings shared the 1988 Nobel Prize in Physiology or Medicine for a series of scientific breakthroughs that revolutionized the world of drug design.

We began the career awards program in 1995 and have now made a total of 126 awards—an investment of approximately \$63 million in the careers of beginning biomedical investigators. Eight of the awards, including two this year, have gone to investigators who are working in an area of reproductive science, which BWF has considered to be seriously understudied and therefore a target for support. Although we will no longer support a special focus area in reproductive science, we will continue to encourage reproductive scientists to apply to our career awards program. In addition, we will continue to sponsor the Frontiers in Reproduction training course in basic molecular and cellular research techniques, held annually at the Marine Biological Laboratory in Wood's Hole, Massachusetts.

In another program aimed at fostering career development, we awarded BWF Research Travel Grants to 46 U.S. and Canadian researchers, to enable them to visit colleagues in the United Kingdom for two weeks to six months in order to participate in collaborative research projects or learn new research techniques. These grants are intended to facilitate the rapid exchange of knowledge and to promote collaboration among scientists in the countries involved. This is the

last year BWF will offer these grants, but we will continue to support the training of postdoctoral researchers in the United Kingdom through our Career Awards in the Biomedical Sciences program.

In May, BWF issued a special report, *Investing in the Future of Science: The First Five Years of the Career Awards Program*, that highlights some of the insights and experiences of our awardees and the staff who administer the program. The report shares insights gained in administering the program, introduces the innovative work of a cross-section of our career awardees, describes some of the career issues that these scientists face, and provides a summary of career management topics selected by awardees and addressed at BWF's 1999 convocation of career awards recipients. The report is available in print or on our Web site at www.bwfund.org/The_First_Five_Years_Career_Awards.htm.

We continue to support the Career Development Center at Science's Next Wave, an on-line resource for career development information (www.nextwave.sciencemag.org). Administered by the American Association for the Advancement of Science and cofunded by the Howard Hughes Medical Institute, the center provides insight on such topics as grant writing and grant management, how to set up and maintain a laboratory, how to negotiate for space, how to select a staff, what makes a good proposal, how government agencies make funding decisions, and how to appeal a grant proposal that has been reviewed unfavorably.

BWF also supported and helped develop a new guidebook called *Enhancing the Postdoctoral Experience for Scientists and Engineers*, produced by the Committee on Science, Engineering, and Public Policy at the National Academies. We distributed the publication, which is available on-line at www.nationalacademies.org/postdocs, to our career awardees.

INTERFACES IN SCIENCE: BUILDING BRIDGES ACROSS DISCIPLINES

*Biology is changing,
calling for a new
type of training for
the next generation
of scientists.*

Modern molecular biology for the past 50 years has done an excellent job of dissecting and describing the components of living organisms. Yet, one pressing question still remains: can complex biological phenomena be measured, analyzed, and understood in their complex entirety? That question has come to the fore in recent years as volumes of gene sequence data have poured out of laboratories at a furious pace. The biological questions that can be asked using gene data now far exceed the methods available to answer them. Suddenly, biology has math problems that need to be solved.

New math problems are just the tip of the iceberg. Physical scientists are inventing new techniques to study the physical forces at work on individual molecules inside cells, using computer science and theoretical approaches to model complex biological systems, and creating molecular computing devices based on biological reactions. Successful scientists addressing these types of biological questions will need to be both originators and users of quantitative tools, methods, and approaches. Traditionally, these skills have been available more commonly to those researchers trained in the physical sciences, applied mathematics, engineering, and computer science.

Such changes in the scientific landscape will require a new type of training for the next generation of scientists, one that combines rigorous study of both the physical and biological sciences. That is the idea behind the La Jolla Interfaces in Science (LJIS) Training Program, one of six interdisciplinary training programs funded by the Burroughs Wellcome Fund since 1996. "In the next 10 years, what it means to do biological research will be completely changing," says José Onuchic, Ph.D., codirector of the LJIS program and a professor of physics at the University of California-San Diego (UCSD), which administers the BWF interfaces award. "Biology is becoming more quantitative. In the next generation, we will be asking how things work, for example, at the cellular level or brain level. To do that kind of complex work will require scientists who think in terms of quantitative theories. Through our program, we are creating scientists who view biological problems in this way."

The LJIS program cuts across not only traditional disciplinary boundaries, but also institutional boundaries. Faculty members from four institutions—the University of California-San Diego, the Scripps Research Institute, the Salk Institute for Biological Studies, and the San Diego Supercomputer Center—participate in the program. Each graduate or postdoctoral trainee has two mentors, one in the physical sciences and one in the biological sciences, and a project that bridges the two areas. The groups tie everything together with a lecture series that gives anyone interested in exploring this type of science a chance to meet others with similar interests.

It may sound like a simple concept, but putting it into practice has been quite difficult, says Elizabeth Getzoff, Ph.D., codirector of the LJIS program and a professor of molecular biology at Scripps Research Institute. "One of the challenges in coordinating this program is that different fields have different cultures," she says. "For example, graduate students in the biological sciences are expected to do rotations of several weeks in various laboratories. Well, graduate students in math have no such equivalent. We have had to work through lots of these issues."

Another challenge has been getting faculty to try something that they have never attempted before and that is outside their realm of experience. "Universities are conservative institutions," Dr. Onuchic says. "It's hard to get individuals to cross lines, even though that's what is truly needed. We need to provide a culture that encourages these types of projects so young scientists can see other people doing it. I think we've done that here. The key is to see if what is proposed is for real or if the work will just be split in half between two separate groups. We try to make sure that people are coming together to try something different from what they have been doing."

Finally, the LJIS program also provides the nucleus of a support network that trainees can take with them into a faculty position at another institution. "We want to make sure that once they move on to faculty positions, our fellows have a network of people in different fields they can call on if they have a question or want to talk over an idea," Dr. Getzoff says. "The bottom line is that the paradigm is shifting and we don't know what it's going to become. The rules of the game are not established, so it takes an extra level of energy and close monitoring to make sure our fellows have every chance to succeed."

Program Highlights in 2000

The type of cross-fertilization generated by the LJIS program exemplifies the goal of the Burroughs Wellcome Fund's Interfaces in Science program. Since 1996, BWF has funded six institutional interfaces programs, for a total of \$14.8 million. Until now, this has been a biennial program, and no awards were made in 2000. However, through BWF's terrain-mapping process, as outlined earlier in the "Report from the President," an idea emerged to create an interfaces award program for individual scientists to complement the institutional awards. The impetus for this program came from feedback BWF received that researchers who do not fit neatly into a traditional academic department often have difficulty finding faculty positions. At most universities, permanent positions are entrenched in academic departments, and competition for these tenure-track spots is fierce. Applicants with interdisciplinary backgrounds are not always fully appreciated during the faculty selection process. In addition, trainees often believe that asking for career advice is somehow "taboo."

BWF's Board of Directors approved the proposal, and in 2002 we will offer the first Career Awards at the Scientific Interface. Modeled after our Career Awards in the Biomedical Sciences, these new awards will be open to scientists who have earned a doctoral degree in one of the physical sciences and who are working on biological research problems. We believe that by offering these uniquely trained individuals independent funding during their postdoctoral training, their value will be affirmed and they will be more attractive to future employers. Indeed, many top-tier research universities are beginning to actively recruit faculty with interdisciplinary credentials.

Also in 2000, BWF cosponsored a workshop/symposium titled "Quantitative Challenges in the Post-Genomic Sequence Era," held in January in San Diego and organized by the LJIS program. The symposium brought together fellows from five of BWF's interfaces programs, along with other trainees funded by the Alfred P Sloan and Whitaker foundations. With a list of speakers that included two recent Nobel Laureates in physics, the program provided five days of exposure to the "state-of-the-art" in protein structure determination, bioinformatics, protein folding, and technology development. More significantly, perhaps, the participants also heard provocative discussions of future directions for applying quantitative science to "sequence-to-function" models in biology—how to make sense of large data sets for the purpose of predicting protein and cellular function within living organisms.

In addition to serving as a scientific forum, the meeting encouraged the students to develop peer networks and gave them the opportunity to interact with established investigators. The workshop portion of the meeting featured a panel of professors, ranging from junior faculty to department chairs, who offered their best advice on how to carve out an interdisciplinary niche in academia and responded to candid questions. These conversations continued over dinner, on such topics as strategies in interdisciplinary training, managing your own lab, and dual-career couples. There also was a breakfast discussion that focused on career-related issues unique to women.

In yet another approach to gaining insight into the various issues that face students carving out interdisciplinary careers, BWF in August 2000 surveyed the 93 trainees now in our interfaces training programs. About two-thirds of the trainees reported that they are interested in an academic research career. On the whole, they considered their experience in the laboratory to be the most valuable component of their training—which perhaps should not be surprising, given the primarily theoretical and computational backgrounds of the trainees. The importance of the trainees' mentors emerged as the next most valuable component. On average, the trainees felt that their programs had fostered a community for interdisciplinary research, and they especially valued their opportunities to network and exchange ideas with scientists from other disciplines and perspectives. Most felt that their programs are doing an excellent job of helping them understand biology and identifying important research questions in biology. With such knowledge in hand, BWF will be working with the interfaces program directors to build career-development resources tailored to the unique challenges faced by these interdisciplinary scientists of the future.

INFECTIOUS DISEASES: EVERYTHING OLD IS NEW AGAIN

Fostering new
thinking and
research approaches
in parasitology
and mycology.

It took more than 100 years, but one of the first microorganisms ever studied—by Louis Pasteur, no less—is finally getting its due again. In 1865, the south of France was in a panic over the decimation of its lucrative silkworm industry by a mystery disease. Pasteur was dispatched to find the cause, which turned out to be a parasitic organism now known to belong to a group called *Microsporidia*. It was too late to save the silkworms, but Pasteur's study did serve as a foundation for his revolutionary germ theory of disease.

Fast forward to 2000. In the intervening span, relatively little has been learned about these bizarre parasites. Scientific studies had provided descriptive information about how the organism infects cells through a spiral tube that projects from a hardy spore. But little else was known about *Microsporidia*, a mysterious group of about 1,200 organisms that had been classified as protozoa—among the most primitive cells that contain a nucleus. It was not until 1985 that physicians first reported a microsporidian species that could infect humans, particularly patients infected with the human immunodeficiency virus (HIV). It turned out that microsporidian infection was responsible for diarrhea and wasting syndromes common in patients with acquired immunodeficiency syndrome, caused by HIV. Since then, interest has grown in understanding and finding an effective treatment for these infections. But little is known about the organisms, and they are quite difficult to study.

Enter Patrick Keeling, Ph.D., an assistant professor of botany at the University of British Columbia and a scholar at the Canadian Institute for Advanced Research. Dr. Keeling, a recipient of a 2000 Burroughs Wellcome Fund New Investigator Award in Molecular Pathogenic Mycology, is beginning a study to learn how *Microsporidia* gain control of their hosts and how they usurp host cell processes to reproduce themselves. In the process, he hopes to gain a foothold into how, biochemically, to control microsporidian infections, which can be so damaging to people whose immune systems are compromised.

Dr. Keeling's interest in *Microsporidia* began when he was studying the evolutionary transition from bacteria to true eukaryotic cells that occurred more than a billion years ago. He was interested in these organisms because they seemed to be among the simplest early cells with a nucleus. As parasites, they rely heavily on their hosts for many basic functions, and they contain relatively few genes and proteins of their own. In fact, says Dr. Keeling, microsporidian genomes are closer in size to those of bacteria than to those of other eukaryotes. In the course of studying several microsporidian genes, Dr. Keeling observed that the genes closely resembled fungal genes. Further analysis revealed that, in fact, *Microsporidia* are not protozoa, as had been previously thought. Rather, they appear to have evolved from a free-living fungus to their current status as parasites.

Now that he has established more precisely where the organisms belong in the evolutionary tree, Dr. Keeling plans to use his BWF award to conduct a detailed study of the structure and organization of the *Microsporidia* genome, using as his model a member of the group that infects locusts. He wants to understand how the organisms made the leap from free-living fungus to parasite, and in the process to find some unique characteristic that can be exploited therapeutically to fight microsporidian infection.

"Right now, there is not much information available," Dr. Keeling says. "I plan to build a foundation of data and tools that can be used later on to do functional genomics. My goal is to help build our understanding of *Microsporidia* at the molecular level and to move as quickly as possible to studying their metabolism."

Program Highlights in 2000

By supporting a cadre of investigators such as Patrick Keeling, the Burroughs Wellcome Fund hopes to bring new thinking and research approaches to the areas of molecular parasitology and mycology and to open up new model systems for organisms that have been understudied. BWF's scholar awards and new investigator awards in infectious diseases have targeted parasitic and fungal pathogens, which despite advances in knowledge of their basic pathology continue to claim millions of lives annually. We believe that by providing funding for basic research, we are helping establish a foundation of knowledge that will shift the balance toward more effective treatments for endemic and epidemic infectious diseases.

In 2000, BWF made three scholar awards and three new investigator awards to scientists working in molecular parasitology, and two scholar awards and four new investigator awards to scientists working in molecular pathogenic mycology. The awards are intended to encourage scientists to use modern techniques from molecular biology, biochemistry, immunology, pharmacology, and genetics to advance fundamental knowledge of virulent disease-causing parasites and fungi. Fungal infectious diseases, in particular, pose a serious and growing health problem, in part because of the relative scarcity of safe and effective antifungal drugs, the rise in the number of people whose immune systems have been compromised by disease or drug therapy, and the relative lack of basic research on fungal pathogens.

Malaria, which annually claims more than 2 million lives worldwide, is targeted for special support through our New Initiatives in Malaria Research program. This year, eight researchers shared seven awards. The awards are intended to attract more investigators to work on malaria, to encourage them to bring novel approaches to studying the parasites and mosquitoes responsible for causing the disease, and to enhance scientific collaborations among investigators at the same or different institutions.

Beyond BWF's award programs, we teamed with the Wellcome Trust, our sister philanthropy in the United Kingdom, in sponsoring a new round of funding in a trilateral program to support collaborative programs in infectious diseases of major health importance in the developing world. The program is "trilateral" in that it aims to foster existing or new collaborations among researchers in a developing country and

researchers in North America or the United Kingdom. The "center of gravity" of these projects is in the developing world, where bacterial, viral, fungal, and parasitic diseases cause significant morbidity and mortality. During the second round of awards, completed in the fall of 2000, approximately \$9 million was awarded to groups working in a variety of countries. A full reporting of awardees will be made in 2001.

The international effort to sequence the genome of *Plasmodium falciparum*, the most dangerous form of the parasite that causes malaria, has made large strides, with completion of the genome expected by 2003. BWF was one of the first funders of the project, which is also supported by the Wellcome Trust, the National Institute of Allergy and Infectious Diseases, the Department of Defense, and the World Health Organization. The information being generated already is proving useful to the biological community in its search for new targets for drug and vaccine development, and publication of the complete sequence is only expected to accelerate those endeavors.

Using the malaria genome sequencing project as a model, BWF has helped organize projects to sequence the genomes of several pathogenic fungi. In this way, we play a catalytic role in mobilizing the community and supporting meetings that encourage collaboration among researchers interested in a particular model system.

BWF continues to support two training courses in infectious diseases. Designed for advanced graduate students, post-doctoral fellows, and independent investigators, the courses are held at the Marine Biological Laboratory in Woods Hole, Massachusetts. The courses expose students to the latest methods for molecular manipulation and analysis and provide an important means to improve networking within the research community. These courses also attract scientists into underfunded areas of research, such as the pathogenic fungi and understudied human parasites.

THERAPEUTIC SCIENCES: FIGHTING STEALTHY VIRUSES

"I always knew that I wanted to bridge the two worlds of clinical and basic research."

It might be easy to get discouraged when fighting the insidious human immunodeficiency virus (HIV). This stealthy and resourceful virus has thwarted efforts to combat its assault on the human immune system. Many promising avenues have been followed—and abandoned. But you will not hear any negativism when talking to Nina Bhardwaj, M.D., Ph.D. She is confident that the tools to successfully fight HIV are present in the body's own immune system. They just need some assistance from science to kick into the right gear.

Dr. Bhardwaj, an associate professor of cellular physiology and immunology at Rockefeller University, is trying to understand how the immune system identifies and eliminates viruses and bacteria, and then to use that information to train the immune system to eliminate, or at least control, HIV and influenza infection. A 1999 recipient of a Burroughs Wellcome Fund Clinical Scientist Award in Translational Research, Dr. Bhardwaj is using a newly discovered weapon in the arsenal of immunology: the dendritic cell. She and her former Rockefeller University mentor, Ralph M. Steinman, M.D., have been studying the dendritic cell's potential to boost the immune response to infection. "The dendritic cell is very important in its ability to initiate an immune response to pathogens such as bacteria and viruses and is essential to maintain tolerance to self," Dr. Bhardwaj says. "These properties make it a very special cell."

Using her BWF award, Dr. Bhardwaj is experimenting with using dendritic cells to "teach" the immune system how to recognize the influenza virus. This technique, called immunotherapy, attempts to activate the immune system to recognize virus-infected cells and target them for destruction. The dendritic cell does this by actually ingesting the virus, digesting it, and presenting the foreign proteins to killer T cells in the body. Once the killer T cells "learn" how to recognize the virus, they can mount a campaign to seek out the invading viruses and destroy them. The secret to this strategy is to isolate dendritic cells, mix them with the virus (or with protein fragments of the virus) under special conditions in the laboratory, and then inject the cells back into the patient.

In 1999, Dr. Bhardwaj published a paper in the *Journal of Clinical Investigation* demonstrating that a single injection of dendritic cells could generate a strong immune response to influenza and several other foreign substances, and that this response lasts for months. But this study used healthy volunteers, not people battling chronic infection. "These results were exciting," she says, "but the ultimate goal is to learn how to get these cells to boost the immune system enough to provide a protective or therapeutic effect." Her next step will be to test the therapy in HIV patients. That study, slated to begin in early 2001, will test the dendritic cell's ability to mount a strong response to HIV-infected cells.

Dr. Bhardwaj credits her BWF award with getting the clinical trial off the ground, particularly because it is very expensive to conduct trials with patients. "No one is saying we will 'cure' HIV using this therapy," she emphasizes. "But we feel there is potential to use dendritic cells to put people in the category of long-term nonprogressors."

While progress in the laboratory has been swift, Dr. Bhardwaj struggles to find medical students interested in pursuing a career in the kind of translational research she finds so fulfilling. "I always knew that I wanted to bridge the two worlds of clinical and basic research," she says. "But it hasn't been easy to attract others into pursuing this kind of career. It's my impression that translational work is not as highly regarded as bench work among students."

Dr. Bhardwaj has been pursuing various mechanisms to make translational research more attractive to students by introducing the idea earlier in their career path. She frequently lectures to medical students and encourages them to explore this type of research as a career option. "I try to help them understand that medicine doesn't progress without these types of studies," she says.

Program Highlights in 2000

Physicians, such as Nina Bhardwaj, who are equally strong and dedicated basic scientists have added immeasurably to the advancement of medicine. Yet, such individuals are finding it more and more difficult to balance the time constraints of patient care with bench research. With the Burroughs Wellcome Fund's long-standing commitment to experimental therapeutics and clinical pharmacology, we have been at the forefront in urging both public and private research funders to help shore up the ranks of the clinical researcher and help these individuals serve as mentors to the next generation of physician-scientists.

BWF also was one of the first organizations to mobilize support for the physician-scientist, by establishing, in 1998, the Clinical Scientist Awards in Translational Research program. In 2000, we made 10 awards to U.S. and Canadian researchers, for a total of \$7.5 million. The awards provide \$750,000 over five years and, importantly, are unrestricted in their use. Spending is up to the discretion of the awardee and may be used to pay part of the researcher's salary, to hire new staff, or to fund patient recruitment efforts needed to help accomplish the researcher's goals. As Dr. Bhardwaj points out, research with human patients is very expensive, and there are few noncommercial sources of funding for translational studies.

We continue to evaluate the environment for translational research through awardee surveys. The goal of the 2000 survey was to find "common denominators" in the training backgrounds of successful translational researchers that will inform our programs for future investments in training. The results indicated the importance of early research training (that is, before residency) and an enthusiastic mentor as key influences in the decision to pursue a research career. They also underlined the ongoing need for debt forgiveness for physicians who would like to pursue research careers but who also carry large medical school debt loads.

Eleven basic scientists at the beginning stages of their faculty careers received BWF New Investigator Awards in the Pharmacological or Toxicological Sciences this year. The Fund has a strong tradition of support for these fields, dating back to our origins as a corporate foundation. While 2001 will be the last year BWF offers these awards, we are confident that these areas of investigation are well-positioned to capitalize on the new ideas and experimental approaches emerging from such frontiers of investigation as the computational sciences, animal models, and molecular genetics, and that investigators in pharmacology and toxicology will compete well in our other award programs. Also in 2001, BWF will convene all

of our new investigators at a meeting to be held in San Diego. We hope that this meeting will offer our awardees the opportunity to network with their peers and BWF board and advisory committee members, as well as to obtain advice on career advancement. In other activities, BWF connected to professional and scientific organizations in pharmacology and toxicology by sponsoring plenary lectures at the annual meetings of the Society of Toxicology and the American Society for Pharmacology and Experimental Therapeutics.

Besides offering individual funding, BWF also provides leadership on a national level to assist with bringing together groups concerned about the current state of clinical research. In 2000, BWF convened a group representing four private foundations and five clinical research societies to discuss ways in which groups could be mobilized to support the career development of young clinical investigators. In particular, we are helping develop innovative approaches to the recruitment and career development of clinical investigators, with a view to strengthening the entry points into the career pipeline.

As part of this process, BWF is encouraging a reversal in the recent fragmentation of societies supporting general clinical research, whose memberships have increasingly migrated to specialty societies. Three of the societies have proposed to meet jointly in 2001 in an attempt to capitalize on their combined strengths. BWF will fund this effort collaboratively with other private foundations.

BWF also has participated in the first two meetings of the newly created Clinical Research Roundtable, convened by the Institute of Medicine and the Commission on Life Sciences at the National Academies. We made a three-year, \$150,000 grant to the Institute of Medicine to help establish the roundtable, which provides a forum for discussions and sponsors workshops to address both acute and long-term issues affecting clinical research. At the roundtable's third meeting, in December 2000, participants explored models for clinical research in the future, considering particularly the potential impact of genomics and medical informatics on the practice of evidence-based medicine. The goal of this exercise is to map out a set of urgent needs of the clinical research enterprise, while keeping in mind the concerns of health care payers and other stakeholders.

SCIENCE EDUCATION: SPRINGING THE MOUSETRAP

*Providing students
with interactive,
hands-on learning
experience in
science and math.*

These days, when children hear the word "mouse," they are just as likely to think of the computerized variety as of Mickey. But for a deaf child who uses sign language to communicate, there is no sign for the ubiquitous computer rodent. And that is a problem for these children growing up in the information age.

But with the help of the Shodor Education Foundation in Durham, North Carolina, deaf students will be able to participate more fully in the digital age. Shodor is in the midst of creating a dictionary of signs for computer-related terms, such as download and hard drive, that now have no sign equivalent. This initiative, recently given a \$450,000 boost by a National Science Foundation grant, is an extension of Shodor's Stimulating Understanding of Computational Sciences through Collaboration, Exploration, Experiment, and Discovery (SUCCEED) program, which received Burroughs Wellcome Fund Student Science Enrichment Program (SSEP) awards in 1997 and 2000.

The original SUCCEED program was developed to bring computer technology from professional supercomputing laboratories to North Carolina students and teachers, providing an interactive, hands-on learning experience in science and mathematics. With BWF's awards, Shodor developed an Internet Science Club to teach basic scientific concepts to students—through workshops and classes that expose middle school students to the use of computer models that simulate real-world events, and through an apprenticeship program that partners high school students with scientists to work on real-world scientific projects.

Students in Shodor's programs learn how to create their own simulated galaxies; to model the blood flow through the human heart, and to gauge the effect of simulated air pollution on the environment. Simulations are computed using supercomputing resources usually reserved for professional scientists. The goal, says Shodor Computational Science Educator Robert Gotwals Jr., is to give students the opportunity to use the same tools professionals use and get them excited about what they can do.

These programs proved so successful that Shodor tried to expand the hands-on computer science experience for hearing-impaired students. However, the instructors quickly discovered that incorporating computational science into hearing-impaired classes raises an entire set of issues and challenges unique to deaf students. Because the sign language vocabulary lacks signs for many technological terms, everything had to be fingerspelled in the classroom, making it difficult and time consuming to integrate the subject into a hearing-impaired curriculum. The instructors discovered that it is impossible to simply translate a curriculum from a mainstream classroom to a hearing-impaired classroom, because of linguistic constraints for deaf students.

Students who have never heard or spoken English have different cultural experiences, Mr. Gotwals says, and consequently, they will have learning requirements that are different from those of other students. As a result, special curriculums must be created for the hearing-impaired classrooms. The Shodor program has three goals, he says. The first is to develop curriculum materials in computational science that are appropriate for hearing-impaired students. The second is to work with sign language interpreters to create signs for the complex technical terms associated with the computing field. Finally, Shodor will test the materials in summer school programs and summer camps for deaf students.

Program Highlights in 2000

The Burroughs Wellcome Fund created the Student Science Enrichment Program (SSEP) in 1994 to provide middle school and high school students in our home state of North Carolina with science education experiences outside the traditional classroom environment. SSEP projects enable students to participate in hands-on, inquiry-based avenues of exploration, an educational approach that has proven to be an effective way to increase students' enthusiasm for science. Museums, schools, community organizations, colleges, and universities have formed a variety of partnerships to provide students access to resources not readily available, such as the Shodor Education Foundation's programs that expose young people to the high-tech world of supercomputers.

In 2000, we made eight SSEP awards, totaling just over \$1 million. Awards went to four universities, one museum, one public school, and two community organizations that will provide such experiences as designing three-dimensional working models of biological systems and exploring freshwater and wildlife environments. In total, BWF has supported 46 SSEP projects, which have reached more than 20,000 middle school and high school students. One measure of the program's success is the response we receive from student participants. In a recent survey, 88 percent of the students who responded said they liked the program, and 81 percent said they would recommend the program to a friend. While these figures are encouraging, we are continuing to investigate ways to systematically measure the effect of the SSEP activities on students' educational choices, such as whether they choose to take science courses in high school or choose to pursue a science degree in college.

In January 2000, BWF hosted a convocation of SSEP program directors and held a poster session where awardees could network with one another and learn what others' experiences have been. In May, we published *Science Is For Kids*, a report describing the programs, the students, and the lessons we have learned along the way. Copies of the report are available from BWF in print or on our Web site at www.bwffund.org/science_is_for_kids.htm.

In celebration of BWF's 45th anniversary and the dedication of our permanent headquarters building, we made a special \$1 million grant to the Grassroots Science Museums Collaborative, a group of 15 North Carolina science museums, aquariums, and zoos. The collaborative will further the public's

understanding of science and technology by serving as a vehicle for planning and conducting cooperative projects. The group will develop programs to bring science projects to children in underserved areas of North Carolina, and will adapt existing educational programs into traveling exhibits and disseminate teaching tools and lessons across the state. In addition, the group will build closer connections with the state's educational community and extend school-centered science education into the science museums.

BWF also supported award programs that enable colleges and universities in the United States and Canada to bring in distinguished speakers from around the world. In 2000, our visiting professorship programs in the basic medical sciences and in the microbiological sciences enabled 43 schools, most of them smaller colleges, to invite scientists to teach and interact with students and faculty.

As part of our expanding commitment to science education, BWF partnered with The Science House, a learning outreach program at North Carolina State University that works with K-12 teachers, to improve communication and coordination among universities, primary and secondary schools, and the scientific community. In one effort, 70 scientists, educators, community leaders, and program directors of university science outreach programs met at a two-day conference to identify areas of success and to provide a vision for future outreach initiatives. Proceedings of the conference, held at North Carolina State University, are available on BWF's Web site at www.bwffund.org/special_reports.htm.

From our experiences, BWF has found that there is a need for a "science education champion" in North Carolina to move the state from isolated model programs to an integrated strategy that will provide high-quality education in science for all of the state's students. As a neutral party outside the education system, BWF can serve as a facilitator to bring the various parties together to discuss concerns, find consensus on what works best, and disseminate information throughout the state. In 2001, we will take initial steps toward this goal.

REPORT ON FINANCE

The Burroughs Wellcome Fund's investments totaled \$763.7 million at August 31, 2000, the end of our fiscal year. BWF's primary financial goal is to pursue an investment strategy that will support annual spending needs and maintain a constant real level of assets over the long term. To achieve this goal, substantially all of our investments are placed in U.S. and international capital markets. Hence, fluctuations in BWF's investment results will be due largely to variability in capital market returns.

BWF's investment policies are developed with the recommendations and review of the Investment Committee, which is appointed by and reports to BWF's Board of Directors. The committee, which meets three times a year, has six voting members, including four representatives from outside BWF and two representatives from our board. The board's chair, BWF's president, and BWF's vice president for finance also serve on the committee as nonvoting members.

As part of BWF's investment strategy, we have established "allocation targets"—that is, percentages of our total assets to be invested in particular asset classes. Investment managers hired by BWF pursue more focused mandates within each sector. As of the end of the fiscal year, BWF's asset mix and market values were:

- U.S. large capitalization equity assets had a market value of \$235.7 million. The sector's target allocation was 31 percent, and actual holdings stood at 30.9 percent.
- U.S. small capitalization equity assets had a market value of \$116.7 million. The sector's target allocation was 14 percent, and actual holdings stood at 15.3 percent.
- International equity assets had a market value of \$219.1 million. The sector's target allocation was 30 percent, and actual holdings stood at 28.7 percent.
- U.S. fixed income assets had a market value of \$168.3 million. The sector's target allocation was 22 percent, and actual holdings stood at 22 percent.
- Cash equivalent assets had a market value of \$11.8 million. The sector's target allocation was 3 percent, and actual holdings stood at 1.5 percent.
- Alternative assets had a market value of \$12.1 million. The sector did not have a target allocation, and actual holdings stood at 1.6 percent.

The total market value of BWF's investments increased by \$94.1 million, or 14.1 percent, from the end of the previous fiscal year. This large increase in assets was due primarily to strong returns in worldwide equity markets over the course of the fiscal year. BWF's total investment return for the fiscal year was 21.1 percent. The two sectors that drove this result were the U.S. small capitalization equity sector, which posted a 56.6 percent return, and the international equity sector, which posted a 24.8 percent return for the fiscal year.

As of August 31, 2000, BWF employed 10 investment managers. In the U.S. large capitalization equity sector, the managers were Independence Investment Associates; Westpeak Investment Advisors; and Cohen, Klingenstein and Marks. Kennedy Capital Management and Scudder Kemper Investments managed U.S. small capitalization equities. Pacific Investment Management Company and Smith Breeden Associates were the bond managers. Capital Guardian Trust Company and Hansberger Global Investors managed international equities. State Street Global Advisors managed a hedge fund. BWF also held investments in five venture capital funds: Intersouth Partners IV and V, the Spray Venture Fund, Mission Ventures II, and the North Carolina Bioscience Investment Fund.

FINANCIAL STATEMENTS AND ADDITIONAL INFORMATION

Report of Independent Accountants

To the Board of Directors of
The Burroughs Wellcome Fund

In our opinion, the accompanying statements of financial position and the related statements of activities and of cash flows present fairly, in all material respects, the financial position of The Burroughs Wellcome Fund (the "Fund") at August 31, 2000 and 1999, and the changes in its net assets and its cash flows for the years then ended in conformity with accounting principles generally accepted in the United States. These financial statements are the responsibility of the Fund's management; our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits of these statements in accordance with auditing standards generally accepted in the United States, which require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for the opinion expressed above.

Our 2000 audit was conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The information presented in Schedules I and II is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

PricewaterhouseCoopers LLP

Raleigh, North Carolina
October 6, 2000

Statements of Financial Position

August 31, 2000 and 1999

(All dollar amounts presented in thousands)

	2000	1999
ASSETS		
Cash and cash equivalents	\$ 33,473	\$ 36,833
Marketable securities	781,162	643,339
Accrued interest and dividends receivable	2,480	2,798
Other assets	31	52
Property and equipment, net	14,999	11,998
Total assets	<u>\$ 832,145</u>	<u>\$ 695,020</u>
LIABILITIES AND NET ASSETS		
Transactions payable, net	\$ 52,425	\$ 11,721
Accounts payable and other liabilities	1,064	1,155
Unpaid awards	70,028	63,395
Deferred federal excise tax liability	1,985	1,579
Total liabilities	125,502	77,850
Commitments and contingencies (Note 6)		
Unrestricted net assets	706,643	617,170
Total liabilities and net assets	<u>\$ 832,145</u>	<u>\$ 695,020</u>

The accompanying notes are an integral part of these financial statements.

Statements of Activities

Years Ended August 31, 2000 and 1999

(All dollar amounts presented in thousands)

	2000	1999
Revenues:		
Interest and dividends, less investment expenses of \$3,627 and \$3,598 in 2000 and 1999, respectively	\$ 16,423	\$ 13,126
Net realized gain on sales of marketable securities	99,422	55,328
Total revenues	115,845	68,454
Expenses:		
Program services	39,223	37,528
Management and general	6,954	5,504
Total expenses	46,177	43,032
Net unrealized appreciation of marketable securities, net of provision for deferred federal excise taxes of \$406 and \$1,260 in 2000 and 1999, respectively	19,805	89,853
Change in net assets	89,473	115,275
Net assets at beginning of year	617,170	501,895
Net assets at end of year	\$ 706,643	\$ 617,170

The accompanying notes are an integral part of these financial statements.

Statements of Cash Flows

Years Ended August 31, 2000 and 1999

(All dollar amounts presented in thousands)

	2000	1999
Cash flows from operating activities:		
Change in net assets	\$ 89,473	\$ 115,275
Adjustments to reconcile change in net assets to net cash provided by (used in) operating activities:		
Depreciation	517	-
Net realized gain on sales of marketable securities	(99,422)	(55,328)
Net unrealized appreciation of marketable securities	(20,211)	(91,113)
Provision for deferred federal excise taxes	406	1,579
Awards granted, net of cancellations and change in unamortized discount	39,453	37,588
Award payments made	(32,820)	(26,386)
Increase in transactions payable, net	40,704	4,618
Decrease (increase) in accrued interest and dividends receivable	318	(1,132)
Decrease in other assets	21	3
Decrease in accounts payable and other liabilities	(91)	(102)
Net cash provided by (used in) operating activities	18,348	(14,998)
Cash flows from investing activities:		
Purchases of marketable securities	(1,547,198)	(1,204,026)
Proceeds from sales of marketable securities	1,529,008	1,238,879
Purchase of property and equipment	(3,518)	(9,563)
Net cash (used in) provided by investing activities	(21,708)	25,290
Net (decrease) increase in cash and cash equivalents	(3,360)	10,292
Cash and cash equivalents at beginning of year	36,833	26,541
Cash and cash equivalents at end of year	<u>\$ 33,473</u>	<u>\$ 36,833</u>
Supplemental disclosure of cash flow information:		
Cash paid during the year for federal excise taxes	<u>\$ 2,155</u>	<u>\$ 1,418</u>

The accompanying notes are an integral part of these financial statements.

Notes to Financial Statements

Years Ended August 31, 2000 and 1999

(All dollar amounts presented in thousands)

1. Organization and Summary of Significant Accounting Policies

The Burroughs Wellcome Fund (the "Fund") is a private foundation established to advance the medical sciences by supporting research and other scientific and educational activities.

Cash equivalents

Cash equivalents are short-term, highly liquid investments that are readily convertible to known amounts of cash and have a maturity of three months or less at the time of purchase.

Forward currency contracts

The Fund enters into financial instruments with off-balance sheet risk in the normal course of its investment activity, primarily forward contracts, to reduce the Fund's exposure to fluctuations in foreign currency exchange rates. These contracts are for delivery or sale of a specified amount of foreign currency at a fixed future date and a fixed exchange rate. Gains or losses on these contracts occur due to fluctuations in exchange rates between the commencement date and the settlement date. Gains and losses on settled contracts are included within "net realized gains or losses on sales of marketable securities," and the changes in market value of open contracts is included within "net unrealized appreciation (depreciation) of marketable securities" in the accompanying statements of activities. It is the Fund's policy to utilize forward contracts to reduce foreign exchange rate risk when foreign-based investment purchases or sales are anticipated.

The contract amount of these forward contracts totaled \$2,676 and \$488 at August 31, 2000 and 1999, respectively. Realized losses on forward currency contracts totaled \$608 and \$143 in 2000 and 1999, respectively. The market value of open contracts at August 31, 2000 and 1999 was \$317 and \$18, respectively. The market value is recorded as an asset in the Fund's financial statements. The average market value of open contracts totaled (\$238) and (\$97) for the years ending August 31, 2000 and 1999, respectively.

Futures contracts

The Fund enters into futures contracts in the normal course of its investment activity to reduce the exposure to interest rate risk associated with bonds and mortgage backed securities. The Fund is required to pledge collateral to enter into these contracts. The amounts pledged for futures contracts at August 31, 2000 and 1999 were \$235 and \$750, respectively. It is the Fund's intention to terminate these contracts prior to final settlement. Gains and losses on the contracts are settled on a daily basis. Included in transactions payable at August 31, 2000 and 1999 is the net settlement relating to these contracts of \$0 and \$23, respectively.

Options

The Fund utilizes options to reduce the exposure to interest rate risk associated with mortgage backed securities. The market value of these options totaled \$23 and \$1,741 at August 31, 2000 and 1999, respectively, which is recorded as an asset in the Fund's financial statements. The average fair value of open contracts totaled (\$816) and \$1,201 for the years ending August 31, 2000 and 1999. Realized losses on options totaled \$2,450 and \$4,369 for the years ending August 31, 2000 and 1999, respectively.

Marketable securities

Marketable securities are carried at estimated market values based on quoted prices. Gains and losses from sales of securities are determined on an average cost basis and are recognized when realized. Changes in the estimated market value of securities are reflected as unrealized appreciation or depreciation in the accompanying statements of activities. The Fund has investment advisors which manage its portfolio of marketable securities. The Fund's management critically evaluates investment advisor performance and compliance with established diversification and investment policies.

Property and Equipment

Property and equipment is primarily comprised of a building, furniture, and computer equipment which are stated at cost less accumulated depreciation and are being depreciated over their estimated useful lives using the straight-line method. Ordinary maintenance and repair costs are expensed as incurred.

Building	40 years
Furniture and Fixtures	7 years
Computer Equipment	3 years

Transactions receivable and transactions payable, net

These amounts represent the net receivable or payable resulting from investment transactions with trade dates prior to August 31 and settlement dates subsequent to August 31.

Awards granted and unpaid awards

Grants are expensed at their fair value in the year in which the award is granted. Grants payable over several years are expensed, and carried on the statements of financial position, at the present value of their estimated future cash flows, using a risk free discount rate determined at the time the award is granted.

Functional allocation of expenses

Costs of the Fund's operations and activities have been summarized on a functional basis in the statement of activities.

Estimated fair value of financial instruments

Financial instruments include cash and cash equivalents, marketable securities, accrued interest and dividends receivable, accounts payable, and unpaid awards. All financial instruments are reported at their estimated fair value. The carrying values of accrued interest and dividends receivable, accounts payable, and unpaid awards approximate fair values based upon the timing of future expected cash flows. The estimated fair value of marketable securities is determined based upon the latest quoted sales price for such securities as of the balance sheet date. The Fund's remaining assets and liabilities are not considered financial instruments.

Use of Estimates

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Market Risk

Market risk represents the risk of changes in value of a financial instrument, derivative or non-derivative, caused by fluctuations in interest rates, foreign exchange rates and equity prices. The Fund manages these risks by using derivative financial instruments in accordance with established policies and procedures.

2. Property and Equipment

The Fund's property and equipment consisted of the following:

	2000	1999
Building	\$ 13,361	\$ -
Furniture and Fixtures	1,540	-
Computer Equipment	615	-
Construction in progress	-	11,998
	15,516	11,998
Less: accumulated depreciation	(517)	-
	<u>\$ 14,999</u>	<u>\$ 11,998</u>

3. Federal Excise Taxes

The Fund is exempt from federal income taxes under Section 501(c)(3) of the Internal Revenue Code. However, since the Fund meets the definition of a private foundation under the Internal Revenue code, it is subject to federal excise tax on its annual net investment income. Deferred federal excise taxes represent the tax liability on unrealized appreciation of marketable securities.

4. Unpaid Awards

Unpaid awards as of August 31 are scheduled for payment as follows:

	2000	1999
Payable in less than one year	\$ 28,710	\$ 28,347
Payable in one to five years	47,833	42,245
	76,543	70,592
Unamortized discount	(6,515)	(7,197)
Total	<u>\$ 70,028</u>	<u>63,395</u>

The expected future liability to the Fund has been calculated based on discount rates ranging from 4.96% to 6.70%.

5. Marketable Securities

The cost and estimated market values of marketable securities at August 31 are as follows:

	2000		1999	
	Cost	Estimated Market Value	Cost	Estimated Market Value
U.S. and foreign governmental obligations	\$ 136,483	\$ 136,430	\$ 77,092	\$ 75,453
Corporate bonds	75,516	74,840	56,184	55,019
Common and preferred stocks	288,352	345,847	284,013	335,282
Foreign stocks and foreign equity fund	174,302	217,033	142,929	173,487
Option and forward foreign currency investments	68	136	1,042	979
Venture capital investments	6,876	6,876	3,119	3,119
	<u>\$ 681,597</u>	<u>\$ 781,162</u>	<u>\$ 564,379</u>	<u>\$ 643,339</u>

6. Commitments

The Fund leased office space under an operating lease until December 1999. Rental expense for this lease was \$41 and \$161 in fiscal 2000 and 1999, respectively.

7. Employee Benefit and Retirement Plans

The Fund provides medical insurance to all employees working at least thirty hours per week. Coverage extends to each employee's spouse and dependent children, if applicable. The expense for this employee benefit was \$99 and \$88 during fiscal 2000 and 1999, respectively.

The Fund has a defined-contribution retirement plan covering all employees working at least twenty hours per week. Under the terms of the plan, the Fund matches 50% of all employees' contributions up to 6% of the employee's annual compensation. Employees are 100% vested in employee and employer contributions immediately. The Fund also has a defined-contribution retirement plan funded solely through employer contributions. Under the terms of the plan, the Fund contributes 10% of the employee's annual compensation. This plan covers all employees and vesting in contributions is immediate. The expense for these retirement plans was \$37 and \$136 in fiscal 2000 and \$38 and \$129 in fiscal 1999.

8. Classification of Expenses

	2000		1999	
	Program Services	Management and General	Program Services	Management and General
Awards granted, net of cancellations and refunds of \$6,770 and \$8,773 in 2000 and 1999, respectively	\$ 39,223	\$ -	\$ 37,528	\$ -
Federal excise taxes	-	2,155	-	1,418
Salaries and other employee expenses	-	1,960	-	1,772
Depreciation expense	-	517	-	0
Travel and entertainment	-	595	-	885
Maintenance and supplies	-	764	-	440
Honoraria	-	351	-	347
Professional fees	-	313	-	232
Printing and design costs	-	144	-	132
Rent	-	41	-	161
Miscellaneous	-	114	-	117
Total expenses	<u>\$ 39,223</u>	<u>\$ 6,954</u>	<u>\$ 37,528</u>	<u>\$ 5,504</u>

Schedule I: Statement of Award Transactions

Year Ended August 31, 2000

(All dollar amounts presented in thousands)

Unpaid awards, beginning of year	\$ 63,395
Add - Awards granted (Schedule II)	<u>45,311</u>
Less - Award payments made	(32,820)
Award cancellations (excluding refunds)	(6,541)
Net decrease in unamortized discount	<u>683</u>
Unpaid awards, end of year	<u>\$ 70,028</u>

Schedule II: Statement of Awards Granted

Year Ended August 31, 2000

Schedule II information is included in the "Grants Index" beginning on page 30. The dollar amounts listed in the schedule reflect the actual dollar amounts (not rounded to thousands) approved and paid to awardees.

GRANTS INDEX

Program Summary

	Approved	Paid	Transferred/ Cancelled*
CAREER DEVELOPMENT OF SCIENTISTS			
Career Awards in the Biomedical Sciences	\$ 16,120,196	\$ 9,004,146	\$ 5,918,150
Hitchings-Elion Fellowships	1,902,375	914,125	98,000
Life Sciences Research Fellowships	369,000	328,000	-
BWF Research Travel Grants	369,318	354,787	-
Other Grants	81,500	128,600	-
TOTAL	\$ 18,842,389	\$ 10,729,658	\$ 6,016,150
INTERFACES IN SCIENCE			
Institutional Awards at the Scientific Interface	\$ -	\$ 3,040,813	\$ -
Innovation Awards in Functional Genomics	2,900,000	213,083	-
Other Grants	69,000	255,800	-
TOTAL	\$ 2,969,000	\$ 3,509,696	\$ -
EMERGING INFECTIOUS DISEASES			
Scholar Awards in Molecular Parasitology	\$ 1,275,000	\$ 1,057,500	\$ -
New Investigator Awards in Molecular Parasitology	630,000	765,000	-
Scholar Awards in Molecular Pathogenic Mycology	850,000	1,015,000	-
New Investigator Awards in Molecular Pathogenic Mycology	840,000	745,000	-
New Initiatives in Malaria Research	1,500,000	1,530,000	-
Other Grants	2,880,550	706,050	-
TOTAL	\$ 7,975,550	\$ 5,818,550	\$ -
THERAPEUTIC SCIENCES			
Clinical Scientist Awards in Translational Research	\$ 8,025,000	\$ 3,600,000	\$ 525,000
New Investigator Awards in the Pharmacological or Toxicological Sciences	2,310,000	2,130,000	-
Other Grants	321,000	1,191,000	-
TOTAL	\$ 10,656,000	\$ 6,921,000	\$ 525,000
REPRODUCTIVE SCIENCE			
Career Awards in the Biomedical Sciences	\$ 919,150	\$ 877,350	\$ -
Obstetrics and Gynecology Research Fellowships	183,000	181,000	-
Reproductive Scientist Development Program	240,000	240,000	-
Other Grants	22,000	111,000	-
TOTAL	\$ 1,364,150	\$ 1,409,350	\$ -

	Approved	Paid	Transferred/ Cancelled*
SCIENCE EDUCATION			
Student Science Enrichment Program	\$ 1,066,124	\$ 1,135,749	\$ -
BWF Visiting Professorships in the Basic Medical Sciences	160,000	160,000	-
BWF Visiting Professorships in the Microbiological Sciences	55,000	55,000	-
Other Grants	1,778,429	1,850,937	-
TOTAL	\$ 3,059,553	\$ 3,201,686	\$ -
ENVIRONMENT FOR SCIENCE			
General	\$ 273,765	\$ 773,765	\$ -
Communications	46,000	46,000	-
History of Medicine	7,500	167,500	-
Science Policy	117,500	242,500	-
TOTAL	\$ 444,765	\$ 1,229,765	\$ -
TOTALS	\$ 45,311,407	\$ 32,819,705	\$ 6,541,150

GRAND TOTALS[†] TOTAL APPROVED \$ 38,770,257 TOTAL PAID \$ 32,819,705

* The "Transferred/Cancelled" totals reflect grants made to awardees who changed institutions, modified the terms of their award at their current institution, or both changed institutions and modified their award. In these cases, BWF's policy has been to cancel the remaining portion of the original award and, as necessary, approve a new award. When the awardee has changed institutions, the new award is made to the new institution; when the awardee has not moved but has modified the terms, the new award is made to the current institution.

[†] To more accurately reflect the total amount that BWF approved in actual "new" dollars during this fiscal year, the "Transferred/Cancelled" total must be deducted from the "Approved" total.

Key to Grants Index—BWF makes all grants to nonprofit organizations. For most of the programs listed in the following sections, the name of the individual on whose behalf the grant is made is listed first, the title of the awardee's project is listed second, and the name of the organization that received the money is listed third. For programs that may have coawardees, the awardees and their organizations are listed first, followed by the project title. For grants made directly to organizations and not on behalf of an individual, the name of the organization is listed first, followed by the title of the project or a brief description of the activity being supported.

Career Development of Scientists

TOTAL APPROVED \$18,842,389 TOTAL PAID \$10,729,658 TOTAL TRANSFERRED/CANCELLED \$6,016,150

Career Awards in the Biomedical Sciences

Career awards are postdoctoral-faculty bridging awards. During the fiscal year, some awardees change institutions, modify the terms of their award at their current institution, or both change institutions and modify their award. In these cases, BWF's policy has been to cancel the remaining portion of the original award and, as necessary, approve a new award. When the awardee has changed institutions, the new award is made to the new institution; when the awardee has not moved but has modified the terms, the new award is made to the current institution. In the following descriptions, the name of the awardee is listed first, the title of the project is listed second, the awardee's current institution is listed third, and the amount approved or paid to the institution is listed fourth. For awardees who either changed institutions or modified their award, the portion of the award paid to the original institution, as well as any portion that was transferred or cancelled, is listed last, in parentheses. For new awardees still in the postdoctoral period, the portion of the award intended to cover a future faculty appointment is listed last, in parentheses.

Note: Eight additional career awards have been made to scientists working in reproductive science; these awards are described in the "Reproductive Science" section.

Ravi Allada, M.D.

Molecular and genetic analysis of the circadian rhythm gene, *Clock*, in *Drosophila*
Brandeis University
Paid \$29,500

Matthew P. Anderson, M.D., Ph.D.

Role of T-type calcium channels in thalamic and hippocampal rhythmic activity
Massachusetts Institute of Technology
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Oscar M. Aparicio, Ph.D.

Understanding the relationship of DNA replication to cell cycle control of cellular proliferation and chromosomal organization
University of Southern California
Paid \$193,000

Nenad Ban, Ph.D.

Determination of the high resolution structure of the large ribosomal subunit
Yale University
Paid \$65,500

Jody L. Baron, M.D., Ph.D.

Role of the innate immune system in acute and chronic hepatitis B: studies in a novel transgenic mouse model of primary HBV infection
University of California-San Francisco School of Medicine
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Greg J. Bashaw, Ph.D.

Molecular mechanisms of attractive and repulsive axon guidance at the midline of *Drosophila*
University of California-Berkeley
Approved \$59,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Gregory J. Beitel, Ph.D.

Mechanisms that control and execute the cell movements and shape changes underlying metazoan morphogenesis
Northwestern University
Approved \$313,644 Paid \$130,494
(\$304,150 of original award to the Stanford University School of Medicine was transferred/cancelled)

Leonardo Belluscio, Ph.D.

Learning and memory in the mouse olfactory bulb
Duke University Medical Center
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Guoqiang Bi, Ph.D.

Spatio-temporal specificity of synaptic plasticity at single synaptic contacts
University of California-San Diego
Approved \$59,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Mark Bix, Ph.D.

Effector CD4⁺ T-cell development: evidence for the stochastic generation and clonal distribution of a combinatorial cytokine repertoire
University of Washington School of Medicine
Approved \$357,500 Paid \$178,750
(\$357,500 of original award to the University of California-San Francisco School of Medicine was transferred/cancelled)

Azad Bonni, M.D., Ph.D.

Regulation of glial fate specification in the central nervous system
Harvard Medical School
Paid \$160,500

Edward S. Brodtkin, M.D.

Genetic analysis of anxiety-related behaviors in mice
Princeton University
Paid \$59,950

Paul S. Buckmaster, D.V.M., Ph.D.

Mechanisms of temporal lobe epilepsy
Stanford University School of Medicine
Paid \$121,000

Michael D. Bulger, Ph.D.

Relationship between organization and function at the mammalian beta-globin locus
University of Washington School of Medicine
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Walter R. Burack, M.D., Ph.D.

Analysis of the immunological synapse: a membrane-associated machine
Washington University School of Medicine
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

David C. Chan, M.D., Ph.D.

Structural and mechanistic studies of virus-mediated membrane fusion
California Institute of Technology
Approved \$357,500 Paid \$121,000
(\$386,650 of original award to the Massachusetts Institute of Technology was transferred/cancelled)

Thomas R. Clandinin, Ph.D.

Dissecting neuronal target selection in the *Drosophila* visual system
University of California-Los Angeles School of Medicine
Paid \$29,500

Michael K. Cooper, M.D.

Modulation of sonic hedgehog signal transduction by cholesterol homeostasis
Johns Hopkins University School of Medicine
Paid \$61,000

Anita H. Corbett, Ph.D.

Components of the nuclear transport system
Emory University School of Medicine
Paid \$60,500

Brendan P. Cormack, Ph.D.

Virulence determinants of *Candida glabrata*
Johns Hopkins University School of Medicine
Paid \$121,000

John D. Crispino, Ph.D.

Functional characterization of hematopoietic transcription factor complexes
University of Chicago
Approved \$386,000

George Q. Daley, M.D., Ph.D.

Probing the pathogenesis of chronic myelogenous leukemia
Massachusetts Institute of Technology
Paid \$118,250

Jeanine D'Armiento, M.D., Ph.D.

Role of matrix metalloproteinases in disease
Columbia University College of Physicians and Surgeons
Paid \$60,500

Gregory C. DeAngelis, Ph.D.

Neural mechanisms underlying perceptual feature binding
Washington University School of Medicine
Paid \$118,250

Paul De Koninck, Ph.D.

Decoding rhythms in the nervous system
Stanford University Medical Center
Paid \$61,000

Jeffrey S. Diamond, Ph.D.

Mechanisms underlying silent synapses: implications for synaptic plasticity in the hippocampus
Oregon Health Sciences University
(\$386,650 of original award to Oregon Health Sciences University was transferred/cancelled)

Aaron DiAntonio, M.D., Ph.D.

Genetic analysis of synapse formation, growth, and plasticity
Washington University School of Medicine
Approved \$357,500 Paid \$178,750
(\$386,650 of original award to the University of California-Berkeley was transferred/cancelled)

Tamara L. Doering, M.D., Ph.D.

GPI's in fungi biosynthesis and function
Washington University School of Medicine
Approved \$121,000 Paid \$121,000
(\$121,000 of original award to the Weill Medical College of Cornell University was transferred/cancelled)

Kelly S. Doran, Ph.D.

Penetration of the blood-brain barrier in GBS meningitis
University of California-San Diego
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Guowei Fang, Ph.D.

Mechanism of spindle assembly checkpoint control
Stanford University Medical Center
Approved \$357,500 Paid \$121,000
(\$386,650 of original award to Harvard Medical School
was transferred/cancelled)

Steven Fiering, Ph.D.

Mutational analysis of the beta-globulin locus control region
by homologous recombination
Dartmouth Medical School
Paid \$60,500

Elizabeth A. Finch, Ph.D.

Postsynaptic calcium signaling by inositol trisphosphate
in neuronal dendrites
Emory University School of Medicine
Approved \$386,000
(\$29,500 of original award to Duke University Medical Center
was paid; \$386,000 of original award was transferred/cancelled)

Reiko Maki Fitzsimonds, Ph.D.

Distributed properties of synaptic plasticity in neural networks
Yale University School of Medicine
Paid \$118,250

Robert C. Flaumenhaft, M.D., Ph.D.

SNARE proteins in platelet alpha-granule secretion
Harvard Medical School
Paid \$193,000

Daved H. Fremont, Ph.D.

Structural studies of antigen presentation and T-cell activation
Washington University School of Medicine
Paid \$118,250

Timothy P. Galitski, Ph.D.

Genetic networks
Massachusetts Institute of Technology
Paid \$61,000

Jeffrey S. Glenn, M.D., Ph.D.

Prenylation and viral assembly
Stanford University School of Medicine
Paid \$89,650

Patrick A. Grant, Ph.D.

Analysis of histone acetyltransferase/transcriptional adaptor
complexes in the regulation of gene expression
University of Virginia Health Sciences Center
Approved \$386,000 Paid \$131,000
(\$415,500 of original award to Pennsylvania State University
was transferred/cancelled)

Michael Graziano, Ph.D.

From eye to hand: sensory-motor integration in the primate brain
Princeton University
Paid \$90,500

Rachel Green, Ph.D.

Defining the peptidyl transferase center of the ribosome
Johns Hopkins University School of Medicine
Paid \$121,000

Matthias Gromeier, M.D.

Principles of polio neuropathies: exploiting poliovirus of brain cancer
Duke University Medical Center
Approved \$386,000 Paid \$131,000
(\$394,200 of original award to the State University
of New York-Stony Brook was transferred/cancelled)

Jay T. Groves, Ph.D.

Studies of cell recognition and signaling with micropatterned
lipid membranes
University of California-Berkeley
Approved \$59,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Gyorgy Hajnoczky, M.D., Ph.D.

Control of cellular function by calcium oscillations
Jefferson Medical College of Thomas Jefferson University
Paid \$60,500

Carrie Haskell-Luevano, Ph.D.

Determination of the physiological and pharmacological role
of the brain specific agouti-related transcript
University of Florida College of Pharmacy
Paid \$115,500

Zhigang He, M.D., Ph.D.

Signaling mechanisms mediating the repulsive effects on developing
and regenerating axons
Harvard Medical School
Paid \$127,500

Michael D. Hogarty, M.D.

BIN1: a MYCN interacting neuroblastoma suppressor
University of Pennsylvania School of Medicine
Approved \$59,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Lora V. Hooper, Ph.D.

Molecular analysis of commensal host-microbial interactions
in the intestine
Washington University School of Medicine
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Xianxin Hua, M.D., Ph.D.

Identification and characterization of novel components in the TGF-beta signaling pathway
Massachusetts Institute of Technology
Paid \$29,150

Alan J. Hunt, Ph.D.

Role of microtubule dynamics in mitotic chromosome movement
University of Michigan Health System
Paid \$118,250

Jeffrey S. Isaacson, Ph.D.

Biophysical properties of presynaptic terminals in the central nervous system
University of California-San Diego School of Medicine
Approved \$299,200 Paid \$178,750
(\$299,200 of original award to the University of Washington School of Medicine was transferred/cancelled)

Akiko Iwasaki, Ph.D.

Defining the mechanism of immune induction and effector function in the female genital mucosa
Yale University School of Medicine
Approved \$386,000 Paid \$65,500

Raymond H. Jacobson, Ph.D.

TBP-related factor and selectivity factor I: probing TBP function in alternative contexts
University of California-Berkeley
Paid \$43,000

Ursula H. Jakob, Ph.D.

Structural and functional characterization of new heat shock proteins
University of Michigan Health System
Approved \$59,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

David K. R. Karaolis, Ph.D.

Pathogenicity islands in the emergence of epidemic and pandemic cholera
University of Maryland-Baltimore School of Medicine
Paid \$118,250

Suzanne L. Kirby, M.D., Ph.D.

Proliferative advantage for therapeutic bone marrow
University of North Carolina-Chapel Hill School of Medicine
Paid \$118,250

Laura J. Knoll, Ph.D.

Molecular genetic approaches to investigate developmental regulation in *Toxoplasma gondii*
Stanford University Medical Center
Paid \$61,000

Scott C. Kogan, M.D.

Use of a transgenic mouse model of acute promyelocytic leukemia to elucidate disease pathogenesis and to improve therapy
University of California-San Francisco School of Medicine
Paid \$178,750
(\$58,300 of original award to the University of California-San Francisco School of Medicine was transferred/cancelled)

Margarethe J. Kuehn, Ph.D.

Secretory protein sorting in yeast and bacteria
Duke University Medical Center
Paid \$121,000

Peter D. Kwong, Ph.D.

Atomic-level investigation of the structure and associated biology of the HIV-envelope protein, gp120
Columbia University College of Physicians and Surgeons
Paid \$29,150

Benhur Lee, M.D.

HIV-1 coreceptors and their role in HIV-associated hematopoietic dysfunction
University of Pennsylvania School of Medicine
Approved \$59,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Hiten Madhani, M.D., Ph.D.

Specificity of signal transduction during dimorphic development of yeast
University of California-San Francisco
Approved \$357,500 Paid \$178,750
(\$357,500 of original award to the Massachusetts Institute of Technology was transferred/cancelled)

Zachary E. Mainen, Ph.D.

Optical studies of synaptic plasticity mechanisms
Cold Spring Harbor Laboratory
Paid \$178,750

Kelsey C. Martin, M.D., Ph.D.

Communication between the synapse and the nucleus during long-lasting synaptic plasticity
University of California-Los Angeles School of Medicine
Approved \$374,602 Paid \$195,852
(\$357,500 of original award to the Columbia University College of Physicians and Surgeons was transferred/cancelled)

Andrea I. McClatchey, Ph.D.

Roles of NF2 tumor suppressor gene product in embryogenesis and tumorigenesis
Harvard Medical School
Paid \$60,500

Robert Menard, M.D., Ph.D.

Genetic analysis of malaria sporozoite virulence
New York University Medical Center
Paid \$57,750

Chandra Mohan, M.D., Ph.D.

B-cell tolerance and humoral autoimmunity
University of Texas Southwestern Medical Center-Dallas
Paid \$115,500

Karen L. Mohlke, Ph.D.

Genetic analysis of type 2 diabetes susceptibility
(\$386,000 approved for future faculty appointment; postdoctoral support provided by the National Institutes of Health)

Inke S. Nathke, Ph.D.

Role of APC/catenin complexes in colon cancer
University of Dundee
Paid \$118,250

Karen M. Ottemann, Ph.D.

Chemotaxis in *Helicobacter pylori* and its role in pathogenesis
University of California-Santa Cruz
Paid \$57,750

George A. Oyler, M.D., Ph.D.

Signaling pathways of neuronal apoptosis
University of Maryland School of Medicine
Approved \$147,250 Paid \$147,250
(\$147,250 of original award to the Johns Hopkins University School of Hygiene and Public Health was transferred/cancelled)

Martin S. Pavelka Jr., Ph.D.

Biosynthesis of the mycobacterial cell wall
University of Rochester
Paid \$115,500

Thomas Perkins, Ph.D.

Measurements of single DNA-based molecular motors
Stanford University
Paid \$61,000

Samuel J. Pleasure, M.D., Ph.D.

Molecular control of cell fate in the dentate gyrus
University of California-San Francisco School of Medicine
Approved \$386,000 Paid \$65,500

Martin R. Pollak, M.D.

Mouse molecular genetic studies of the extracellular Ca^{2+} -sensing receptor
Harvard Medical School
Paid \$57,750

Jill Rafael, Ph.D.

Role of muscle proteins in synaptic structure and neuromuscular disease
Ohio State University School of Medicine
Paid \$127,500

Ilaria Rebay, Ph.D.

Investigation of yan function in Ras1-mediated signal transduction
Massachusetts Institute of Technology
Paid \$60,500

Matthew Redinbo, Ph.D.

Structural and functional characterization of human topoisomerase I and the Werner syndrome helicase
University of North Carolina-Chapel Hill
Paid \$127,500

David J. Robbins, Ph.D.

Dissecting the hedgehog signal transduction pathway
University of Cincinnati College of Medicine
Paid \$118,250

Douglas N. Robinson, Ph.D.

Studies of the mechanisms of cytokinesis using *Dictyostelium*
Stanford University School of Medicine
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Aimee K. Ryan, Ph.D.

Analysis of inductive events responsible for specification and differentiation of the anterior pituitary gland
University of California-San Diego
Paid \$29,150

Sylvia L. Sanders, Ph.D.

Analysis of cell-type differences in bud-site selection in *Saccharomyces cerevisiae*
Massachusetts Institute of Technology
Paid \$27,500

Maria A. Schumacher, Ph.D.

Structural biology of cell growth, development, and regulation
Oregon Health Sciences University
Paid \$29,500

Konstantin V. Severinov, Ph.D.

RNA polymerase and its subunits: structure and function
Rutgers, the State University of New Jersey-Piscataway
Paid \$60,500

Nirao M. Shah, Ph.D.

Genetic analysis of neural circuits mediating sexually dimorphic behaviors in mammals
Columbia University College of Physicians and Surgeons
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Krishna V. Shenoy, Ph.D.

Early reach plans in posterior parietal cortex
California Institute of Technology
Paid \$61,000

Judith A. Shizuru, M.D., Ph.D.

Transplantation of purified allogeneic hematopoietic stem cells: applications for transplantation tolerance induction and the treatment of autoimmune disease
Stanford University School of Medicine
Paid \$60,500

Elaine K. Sia, Ph.D.

Analysis of yeast mutants with altered simple repeat stability
University of Rochester
Approved \$357,500 Paid \$121,000
(\$386,650 of original award to the University of North Carolina-Chapel Hill was transferred/cancelled)

Upinder Singh, M.D.

Transcriptional control in *Entamoeba histolytica*
Stanford University School of Medicine
Paid \$59,950

Barry P. Sleckman, M.D., Ph.D.

Lineage specific regulation of T cell receptor beta rearrangement
Washington University School of Medicine
Paid \$118,250

Leonidas Stefanis, M.D.

Proteases in neuronal cell death
Columbia University College of Physicians and Surgeons
Paid \$118,250

Theodore S. Steiner, M.D.

Isolation and characterization of an interleukin 8 releasing protein from enteroaggregative *Escherichia coli*
University of Virginia Health Sciences Center
Paid \$90,500

David J. Sullivan, M.D.

Iron metabolism in *Plasmodium falciparum*
Johns Hopkins University School of Hygiene and Public Health
Paid \$121,000

Surachai Supattapone, M.D., D.Phil.

Structure and biology of a soluble prion
University of California-San Francisco School of Medicine
Paid \$29,150

Roger B. Sutton, Ph.D.

Biophysical and structural investigation of Ca^{+2} in neurotransmitter release
Stanford University
Approved \$122,000
(\$386,000 approved for future faculty appointment)

Suzanne J. Szabo, Ph.D.

T-bet, a novel t-box transcription factor that directs T-helper cell type 1 lineage commitment
Harvard School of Public Health
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

Michael J. Thirman, M.D.

Functional analyses of the MLL-ELL fusion transcript in acute leukemia
University of Chicago Medical Center
Paid \$82,500

Sarah A. Tishkoff, Ph.D.

Molecular sequence variation in G6PD and its role in malarial resistance
Pennsylvania State University
Paid \$29,150

Katharine S. Ullman, Ph.D.

Biochemical dissection of RNA export using in vitro nuclear reconstitution
University of Utah
Paid \$118,250

Peter C. VanBuren, M.D.

Assessing the role of the thin filament in the altered contractility of heart failure
University of Vermont School of Medicine
Paid \$60,500

James A. Waddle, Ph.D.

Generation of markers and methods to study asymmetric cell divisions in living *Caenorhabditis elegans* embryos
University of Texas Southwestern Medical Center-Dallas
Paid \$118,250

Johannes Walter, Ph.D.

Characterization of eukaryotic replication initiation factors using a soluble, cell-free system
Harvard Medical School
Approved \$357,500 Paid \$178,750
(\$15,000 of original award to the University of California-San Diego was paid; \$400,800 of original award was transferred/cancelled)

Michael M. Wang, M.D., Ph.D.

Estrogen receptors and neuroprotection against excitotoxic injury
Johns Hopkins University School of Medicine
Approved \$122,000 Paid \$29,500
(\$386,000 approved for future faculty appointment)

William A. Weiss, M.D., Ph.D.

Transgenic model for neuroblastoma
University of California-San Francisco School of Medicine
Paid \$118,250

Ding Xue, Ph.D.

Biochemical analysis of CED-3/ICE cysteine proteases and their roles in apoptosis

University of Colorado-Boulder

Paid \$121,000

Michael B. Yaffe, M.D., Ph.D.

Scaffolding and chaperone proteins in signal transduction:

14-3-3 regulation of mitosis and programmed cell death

Harvard Medical School

Paid \$29,500

Cassian Yee, M.D.

Adoptive immunotherapy of melanoma using T cells specific for potential tumor rejection antigens

University of Washington School of Medicine

Paid \$118,250

Deborah L. Yelon, Ph.D.

Patterning during organogenesis: genetic analysis of cardiac chamber formation

New York University School of Medicine

Approved \$386,000 Paid \$65,500

(\$29,500 of original award to the University of California-San Francisco School of Medicine was paid; \$386,000 of original award was transferred/cancelled)

Yanping Zhang, Ph.D.

ARF-MDM-p53 tumor suppression pathway

University of North Carolina-Chapel Hill School of Medicine

Approved \$122,000 Paid \$29,500

(\$386,000 approved for future faculty appointment)

SUBTOTALS: Approved \$16,120,196

Paid \$9,004,146

Transferred/Cancelled \$5,918,150

Hitchings-Elion Fellowships

During the fiscal year, some awardees change institutions, modify the terms of their award at their current institution, or both change institutions and modify their award. In these cases, BWF's policy has been to cancel the remaining portion of the original award and, as necessary, approve a new award. When the awardee has changed institutions, the new award is made to the new institution; when the awardee has not moved but has modified the terms, the new award is made to the current institution. In the following descriptions, the name of the awardee is listed first, the title of the project is listed second, the awardee's current institution is listed third, and the amount approved or paid to the institution is listed fourth. For awardees who either changed institutions or modified their award, the portion of the award paid to the original institution, as well as any portion that was transferred or cancelled, is listed last, in parentheses.

Alison L. Barth, Ph.D.

Role of CREB in plasticity within adult somatosensory cortex

Stanford University

Paid \$24,500

Michael W. Black, Ph.D.

Secretion-dependent regulation of ribosome synthesis

in *Saccharomyces cerevisiae*

Medical Research Council

Approved \$7,500 Paid \$54,500

Elena S. Casey, Ph.D.

Defining the primary targets of Xbra, a transcription factor required for mesodermal patterning in *Xenopus*

University of California-Berkeley

Approved \$2,500 Paid \$27,000

Tamara Caspary, Ph.D.

Identification and characterization of novel genes involved in mammalian sex determination

National Institute for Medical Research

Approved \$349,000 Paid \$61,000

John W. R. Copeland, Ph.D.

Activation of SRF actin remodeling proteins

Imperial Cancer Research Fund

Approved \$346,000 Paid \$31,250

Kevin S. Dingwell, Ph.D.

Role of N-cadherin in axon outgrowth

University of Cambridge

Paid \$24,500

Aaron R. Dinner, Ph.D.

Molecular mechanism of free radical oxidative DNA damage

University of Oxford

Paid \$54,500

Daniel Durocher, Ph.D.

Role of FHA domains during DNA damage signaling

University of Cambridge

Approved \$346,000 Paid \$58,000

Francine Durocher, Ph.D.

Identifying common low penetrance genes and gene-environment interactions in breast cancer

University of Cambridge

Paid \$52,000

Reuben S. Harris, Ph.D.

Delineation of the mechanisms of immunoglobulin gene hypermutation

Medical Research Council

Approved \$228,000 Paid \$49,000

Alan J. Herr, Ph.D.

Probing the pathway of RNA-mediated defense with viral suppressor genes

Sainsbury Laboratory

Approved \$335,500 Paid \$29,750

Susan C. Hockings, Ph.D.

Biochemical and biophysical properties of an RNA binding protein from *Drosophila*

Washington University School of Medicine

Paid \$24,500

(\$24,500 of original award to the University of Leicester was paid)

Steven L. Kazmirski, Ph.D.

Structural and dynamical characterization of the folding pathway of the oligomerization domain of p53

University of Cambridge

Paid \$55,500

Kenro Kusumi, Ph.D.

Genetic analysis of *Delta-Like 3* and *Notch* pathway regulation in vertebrate hindbrain and paraxial mesoderm segmentation

National Institute for Medical Research

Approved \$228,000 Paid \$56,750

Jonathan K. Pritchard, Ph.D.

Population structure and linkage disequilibrium in association mapping

University of Oxford

Paid \$55,500

Jill Rafael, Ph.D.

Role of utrophin and dystrophin in skeletal muscle and non-muscle tissues

University of Oxford

Approved \$2,000

(\$49,000 of original award to the University of Oxford was transferred/cancelled)

Laura Rosa Brunet, D.Sc.

Role of inflammatory cytokines in the pathogenesis of murine schistosomiasis

University of Cambridge

Paid \$49,000

David J. Rossi, Ph.D.

Mechanisms of ischemia-induced excitotoxicity

University College London

Paid \$55,500

Kristin C. Scott, Ph.D.

Ectopic silencing in fission yeast

Medical Research Council

Paid \$24,500

Steven P. Smith, Ph.D.

Interactions of granulocyte-colony-stimulating factor with its receptor at the molecular level

University of Oxford

Paid \$24,500

Dean G. Tang, M.D., Ph.D.

Role of cell cycle components in timing the oligodendrocyte precursor cell differentiation and senescence

University College London

Approved \$2,500 Paid \$27,000

Lori M. Zeltser, Ph.D.

Pattern formation in the avian diencephalon

Columbia University College of Physicians and Surgeons

Approved \$49,000 Paid \$49,000

(\$4,500 was approved as part of original award to King's College London; \$49,000 of original award was transferred/cancelled)

Michael E. Zuber, Ph.D.

Molecular and cellular interactions required for vertebrate eye field formation

University of Cambridge

Approved \$1,875 Paid \$1,875

SUBTOTALS: Approved \$1,902,375

Paid \$914,125

Transferred/Cancelled \$98,000

Life Sciences Research Fellowships

These fellowships are administered in partnership with the Life Sciences Research Foundation. BWF awards the primary grant to the foundation, which distributes the funds to the individual awardees.

John A. Berglund, Ph.D.

Structural studies on the RNA binding protein BBBp and its substrate RNA

University of Colorado-Boulder

Paid \$41,000

Ryan B. Case, Ph.D.

Biophysical analysis of 135 *Xenopus* condensin

University of California-Berkeley

Approved \$123,000 Paid \$41,000

Su L. Chiang, Ph.D.

Genetic approaches to identifying mycobacterial virulence genes

Harvard School of Public Health

Approved \$123,000 Paid \$41,000

Enrique M. De La Cruz, Ph.D.

Molecular mechanism of myosin 1

University of Pennsylvania School of Medicine

Paid \$41,000

Douglas J. Guarnieri, Ph.D.

Characterization of a *Drosophila* neuropeptide receptor involved in ethanol-induced behavior

University of California-San Francisco

Approved \$123,000 Paid \$41,000

Chau V. Huynh, Ph.D.

Intracellular interaction of *Leishmania amazonensis* with host histocompatibility complex (MHC) class II molecules

Yale University School of Medicine

Paid \$41,000

Mary Ellen Lane, Ph.D.

Analysis of posterior neural development

Massachusetts Institute of Technology

Paid \$41,000

Peri Tate, Ph.D.

Heterochromatin proteins old and new

University of California-Berkeley

Paid \$41,000

SUBTOTALS: Approved \$369,000

Paid \$328,000

BWF Research Travel Grants

* Grants are related to history of medicine.

John H. Adams, Ph.D.

Analysis of MAEBL gene expression in malaria parasites

University of Notre Dame

Approved \$15,000 Paid \$15,000

Ayotunde S. Adeagbo, Ph.D.

Fatty acid metabolites and regulation of potassium fluxes in blood vessels

University of Louisville School of Medicine

Approved \$5,356 Paid \$5,356

Don G. Bates, Ph.D.*

Nature of science: an historical perspective

McGill University Faculty of Medicine

Approved \$6,000 Paid \$6,000

Susan M. Bornstein-Forst, Ph.D.

Studies on the survival and pathogenicity of entomopathogenic nematodes

Marian College

Paid \$15,000

Robert J. Brown*

Britain and the Spanish influenza epidemic of 1918-19

Syracuse University

Approved \$6,410 Paid \$6,410

Paul Clarke, Ph.D.

In vivo electrochemical monitoring of the brain

McGill University Faculty of Medicine

Approved \$7,285 Paid \$7,285

Estelle Cohen, Ph.D.*

Reproduction and the state in Britain 1850-1930, with particular reference to the work of Frances Hoggan, M.D. (1843-1927)

Harvard University

Approved \$12,000 Paid \$15,000

Marcia L. Collaer, Ph.D.

Androgen effects on human auditory neural development

Middlebury College

Approved \$6,800 Paid \$6,800

Keith A. Crandall, Ph.D.

Using phylogenies to detect recombination: testing the old and creating the new with applications in infectious disease
Brigham Young University
Approved \$13,000 Paid \$13,000

Timothy D. Dye, Ph.D.

Development of the Rochester-Belfast perinatal research collaborative
University of Rochester Medical Center
Approved \$3,000 Paid \$3,000

Talmage D. Egan, M.D.

Identifying the neural substrate of xenon anesthesia: a brain imaging study using positron emission tomography with clinical correlation using the electroencephalogram
University of Utah School of Medicine
Approved \$13,400 Paid \$13,400

Douglas E. Eveleigh, Ph.D.*

Effects of the antibiotic industry on the fermentation industry
Rutgers University/Cook College
Approved \$13,900 Paid \$13,900

Jo-David Fine, M.D.

Relationship of genotype to clinical phenotype and the risk of major outcomes in junctional and dystrophic epidermolysis bullosa
University of North Carolina-Chapel Hill School of Medicine
Approved \$14,500 Paid \$14,500

Mark I. Friedman, Ph.D.

Assessing the liver as a potential site for the induction of emesis
Thomas Jefferson University
Approved \$9,600 Paid \$9,600

Philip J. Gatti, Ph.D.

Studies on the selectivity of vagal cardiac preganglionic neurons
Howard University School of Medicine
Approved \$9,850 Paid \$9,850

Theodore G. Goodson, Ph.D.

Nonlinear ablation of biological tissue utilizing porphyrin polymers
Wayne State University
Approved \$5,500 Paid \$5,500

Stephen L. Helfand, M.D.

Gene expression during aging
University of Connecticut Health Center
Approved \$15,000 Paid \$15,000

Graeme K. Hunter, Ph.D.*

Lawrence Bragg and the development of macromolecular crystallography
University of Western Ontario Faculty of Medicine and Dentistry
Approved \$5,225 Paid \$5,225

Sharon K. Inouye, M.D.

Cross-cultural comparison of delirium rates and outcomes in the United States and the United Kingdom
Yale University School of Medicine
Approved \$15,000 Paid \$15,000

Celeste Johnston, D.Ed.

Integration of novel techniques into assessment of pain in infants
McGill University
Approved \$3,000 Paid \$3,000

Clinton H. Joiner, M.D., Ph.D.

Modeling of pathological volume regulation in red blood cells
University of Cincinnati College of Medicine
Approved \$14,830 Paid \$14,830

Steven T. Kosak

Immuno-FISH analysis of the lineage-specific repression of the IgH locus
University of Chicago
Approved \$5,030 Paid \$5,030

Thomas R. Kozel, Ph.D.

Role of mannan binding lectin and its associated proteases in opsonization of *Candida albicans*
University of Nevada School of Medicine
Approved \$13,350 Paid \$13,350

Vicky LeGrys, Dr.A.

Assessment of testing protocols for the diagnosis of cystic fibrosis
University of North Carolina-Chapel Hill School of Medicine
Approved \$3,200 Paid \$3,200

Stephen R. Lyle, M.D., Ph.D.

Role of MLK-3 in the proliferative potential of human hair follicle stem cells
Harvard Medical School
Approved \$5,800

Richard B. Mailman, Ph.D.

Molecular and cellular mechanisms involved in use of dopamine agonists in Parkinson's disease therapy
University of North Carolina-Chapel Hill School of Medicine
Approved \$5,713 Paid \$5,713

Michael E. McGinnis, Ph.D.

Patterning of neuronal processes on silicone substrates due to the interactions of applied electric fields and substrate topography
Spelman College
Approved \$7,500 Paid \$7,500

Morton W. Miller, Ph.D.

Ultrasound-induced hyperthermic teratogenesis
University of Rochester School of Medicine and Dentistry
Approved \$3,335

Suzanne Morrissey

Development of the Rochester-Belfast perinatal research collaborative
University of Rochester Medical Center
Approved \$3,000 Paid \$3,000

Ravi Murthy, M.D.

Subintimal angioplasty: application to critical ischemia in limb salvage
in the end stage renal disease population
University of Maryland Medical Center
Approved \$2,600

Paul R. Ortiz de Montellano, Ph.D.

Protein interfaces and drug design
University of California-San Francisco School of Pharmacy
Approved \$15,000 Paid \$15,000

Stephen M. Patterson, Ph.D.

Influence of multiple risk factors for hypertension and fluid hydration
on hemorheology reactivity
Ohio University
Approved \$3,416

David H. Peyton, Ph.D.

NMR investigation of chaperone-assisted protein folding
Portland State University
Approved \$13,800 Paid \$13,800

Lawrence D. Robb-Gaspers, Ph.D.

Role of microvascular endothelium during glucose-induced
insulin secretion
University of Medicine and Dentistry of New Jersey
Approved \$3,350 Paid \$3,350

Kathryn E. Saatman, Ph.D.

Investigation of the pathogenesis of traumatic axonal damage
in a mouse model and in humans
University of Pennsylvania School of Medicine
Approved \$3,550 Paid \$3,550

Stuart R. Schwartz, M.D.

Family protective factors in schizophrenia outcome
University of Medicine and Dentistry of New Jersey
Approved \$5,600 Paid \$5,600

Thomas N. Seyfried, Ph.D.

In utero therapy for ganglioside storage disease
Boston College
Approved \$5,100

Mark E. Silverman, M.D.*

British cardiology in the 20th century
Emory University School of Medicine
Approved \$2,450 Paid \$2,450

Mark A. Simmons, Ph.D.

Cellular and molecular mechanisms of desensitization
to substance P
Marshall University School of Medicine
Approved \$6,000 Paid \$6,000

George E. Stelmach, Ed.D.

Locus of bradykinesia in Parkinson's disease
Arizona State University
Approved \$12,500 Paid \$12,500

Hirofumi Tanaka, M.D.

Small artery structure, aging, and regular physical activity
University of Colorado-Boulder
Approved \$2,950 Paid \$2,950

Donald J. Tipper, Ph.D.

Translocation of the receptor for pathogenic *Escherichia coli* to host cells
University of Massachusetts Medical School
Approved \$12,280

Nancy Van Houten, Ph.D.

Mechanisms of oral tolerance induction
University of North Carolina-Chapel Hill School of Medicine
Approved \$3,707 Paid \$3,707

Peter H. Watson

Identification of genetic markers for determination of risk of invasion
of human breast cancer
University of Manitoba Faculty of Medicine
Approved \$12,606 Paid \$12,606

Brian C. Wilson, Ph.D.

Role of circumventricular structures in mediating the cardiovascular
effects of relaxin in pregnancy
Sacred Heart University
Approved \$1,875 Paid \$1,875

Robert A. Yokel, Ph.D.

Ability of the monocarboxylate transporter to protect the brain
from chemical toxins
University of Kentucky College of Pharmacy
Approved \$15,000 Paid \$15,000

Wei Zheng, Ph.D.

Role of thyroxine at the choroid plexus in lead-induced learning defects
Columbia University School of Public Health
Approved \$5,950 Paid \$5,950

**SUBTOTALS: Approved \$369,318
Paid \$354,787**

Other Grants

In addition to making competitive awards, BWF makes noncompetitive grants for activities that are closely related to our major focus areas. These grants are intended to enhance the general environment for research in the targeted areas.

American Association for the Advancement of Science

Support for a Web-based program to help young research scientists improve their interviewing skills

Approved \$6,000 Paid \$6,000

American Association for the Advancement of Science

Support for the Career Development Resource Center, a Web site for young research scientists

Paid \$29,600

Association of American Medical Colleges

Support for a meeting of the association's Group on Graduate Research, Education, and Training

Approved \$3,000 Paid \$3,000

Association of American Medical Colleges

Support for postdoctoral scientists to attend a meeting of the association's Group on Graduate Research, Education, and Training

Approved \$11,500

Commission on Professionals in Science and Technology

Support for general activities

Approved \$5,000 Paid \$5,000

Endocrine Society

Support for postdoctoral scientists to attend the society's annual meeting

Approved \$5,000 Paid \$5,000

National Academies

Support for a practical guide for universities to use in promoting women's participation in science and engineering

Approved \$30,000 Paid \$30,000

National Academy of Sciences

Support for developing and distributing a guidebook on the postdoctoral experience

Paid \$30,000

Rockefeller University

M. C. Field, Ph.D.

Imperial College of Science, Technology, and Medicine

Reconstitution of nuclear import in vitro in a parasitic protozoan (Wellcome Trust Travel Grant)

Approved \$1,000

University of North Carolina-Chapel Hill School of Medicine

Support for the Joseph S. Pagano Award to recognize outstanding postdoctoral scientists at the Lineberger Comprehensive Cancer Center

Approved \$20,000 Paid \$20,000

SUBTOTALS: Approved \$81,500

Paid \$128,600

Interfaces in Science

TOTAL APPROVED \$2,969,000 TOTAL PAID \$3,509,696

Institutional Awards at the Scientific Interface

Listed by name of the training program, the institution or consortium conducting the program, and the researchers directing the program.

Brain Science Interfaces Program

Brown University

John P. Donoghue, Ph.D.

David Mumford, Ph.D.

Paid \$460,952

Interdisciplinary Graduate and Postdoctoral Training Program in Physics, Chemistry, and Biology

Rockefeller University

Stephen K. Burley, M.D., D.Phil.

Albert Libchaber, Ph.D.

Paid \$549,000

La Jolla Interfaces in Science Training Program

Consortium of the University of California-San Diego, the Scripps Research Institute, the Salk Institute for Biological Studies, and the San Diego Supercomputing Center; grant administered by the University of California-San Diego

Elizabeth D. Getzoff, Ph.D.

Scripps Research Institute

José N. Onuchic, Ph.D.

University of California-San Diego

Paid \$530,861

Program in Computational Biology

Johns Hopkins University

Michael Paulaitis, Ph.D.

Johns Hopkins University

George D. Rose, Ph.D.

Johns Hopkins University School of Medicine

Paid \$500,000

Program in Computational Molecular Biology

California Institute of Technology

Scott E. Fraser, Ph.D.

Michael L. Roukes, Ph.D.

Paid \$500,000

Program in Mathematics and Molecular Biology

Consortium of 17 laboratories at 12 institutions nationwide; grant administered by Florida State University

Wilma K. Olson, Ph.D.

Rutgers, the State University of New Jersey-Piscataway

DeWitt L. Sumners, Ph.D.

Florida State University

Paid \$500,000

SUBTOTALS: Paid \$3,040,813

Innovation Awards in Functional Genomics

This program was a one-time offering made in conjunction with the dedication of BWF's new headquarters building. Support for awards in this field is being incorporated into other BWF programs.

Christopher B. Burge, Ph.D.

Phillip A. Sharp, Ph.D.

Massachusetts Institute of Technology

Whole genome approaches to pre-mRNA splicing specificity and regulation

Approved \$400,000 Paid \$25,000

Wah Chiu, Ph.D.

Baylor College of Medicine

Gregor Eichele, Ph.D.

Max-Planck Institute for Experimental Endocrinology

Spatial and temporal database of gene expression patterns of mouse brain

Approved \$200,000 Paid \$16,500

R. Mark Henkelman, Ph.D.

University of Toronto Faculty of Medicine

Eugene Fiume, Ph.D.

University of Toronto

Automated image analysis of genetically modified mice

Approved \$200,000 Paid \$25,000

Terence T.-L. Hwa, Ph.D.

University of California-San Diego

Gene expression profiles based on statistical significance of clustering analysis

Approved \$200,000 Paid \$13,250

Monica J. Justice, Ph.D.

John S. Weber, Ph.D.

Baylor College of Medicine

Ian J. Jackson, Ph.D.

Western General Hospital

Mutagenesis of central mouse chromosome 4: a paradigm for functional analysis of mammalian genomes

Approved \$200,000 Paid \$25,000

Sudhir Kumar, Ph.D.

Arizona State University

Computational genomic analysis to identify and dissect functionally important mutations in protein sequences

Approved \$200,000 Paid \$12,500

Elaine A. Ostrander, Ph.D.

Leonid Kruglyak, Ph.D.

University of Washington School of Medicine

Mapping cancer susceptibility genes in dogs by linkage disequilibrium

Approved \$400,000 Paid \$25,000

Gene E. Robinson, Ph.D.

University of Illinois at Urbana-Champaign

Sociogenomics: functional genomic analyses of social behavior with microarrays

Approved \$400,000 Paid \$33,333

Eric D. Siggia, Ph.D.

Frederick R. Cross, Ph.D.

Rockefeller University

Computational and experimental analysis of promoters in the genome of budding yeast

Approved \$200,000

Oliver Smithies, D.Phil.

University of North Carolina-Chapel Hill School of Medicine

Computer simulation and animal modeling of complex genetic systems

Approved \$300,000 Paid \$25,000

Alan R. Templeton, Ph.D.

Washington University

Cladistic analyses of epistasis among candidate genes influencing common disease

Approved \$200,000 Paid \$12,500

SUBTOTALS: Approved \$2,900,000

Paid \$213,083

Other Grants

In addition to making competitive awards, BWF makes noncompetitive grants for activities that are closely related to our major focus areas. These grants are intended to enhance the general environment for research in the targeted areas.

INTERFACES IN SCIENCE

Biophysical Society

Support for a session on postdoctoral career development, held at the society's annual meeting

Approved \$2,500 Paid \$2,500

New York University

Support for an international conference titled "Methods for Macromolecular Modeling"

Approved \$10,000 Paid \$10,000

University of California-San Diego

Support for a workshop and symposium titled "Quantitative Challenges in the Post-Genomic Sequence Era"

Paid \$186,800

FUNCTIONAL GENOMICS

American Physiological Society

Support for the Physiology InFocus Program on Physiological Genomics, held at the Experimental Biology meeting

Approved \$10,000 Paid \$10,000

Jackson Laboratory

Support for the Mouse Strain Database Workshop

Approved \$15,000 Paid \$15,000

National Center for Biotechnology Information

Support in lieu of an honorarium for Dr. David Lipman, a member of BWF Innovation Awards in Functional Genomics Advisory Committee

Approved \$3,000 Paid \$3,000

Stanford in Washington

Support for the World Survey of Funding for Genomics Research

Approved \$28,500 Paid \$28,500

SUBTOTALS: Approved \$69,000

Paid \$255,800

Emerging Infectious Diseases

TOTAL APPROVED \$7,975,550 TOTAL PAID \$5,818,550

Scholar Awards in Molecular Parasitology

Alan A. Aderem, Ph.D.

Macrophage responses to *Leishmania* infection
University of Washington School of Medicine
Approved \$425,000 Paid \$42,500

Norma W. Andrews, Ph.D.

Role of lysosome exocytosis in the cell invasion mechanism
of *Trypanosoma cruzi*
Yale University School of Medicine
Paid \$80,000

Daniel E. Goldberg, M.D., Ph.D.

Hemoglobin metabolism in *Plasmodium falciparum*
Washington University School of Medicine
Paid \$80,000

Patricia J. Johnson, Ph.D.

Investigation of potential chemotherapeutic targets and the pathogenesis
of the human-infective parasite *Trichomonas vaginalis*
University of California-Los Angeles School of Medicine
Paid \$80,000

Keith A. Joiner, M.D.

Molecular analysis of secretion in *Toxoplasma gondii*
Yale University School of Medicine
Paid \$60,000

Scott M. Landfear, Ph.D.

Biology of membrane transporters in *Leishmania* parasites
Oregon Health Sciences University School of Medicine
Paid \$80,000

James H. McKerrow, M.D., Ph.D.

Parasite proteases: analysis of structure-function relationships
and structure-based drug design
University of California-San Francisco School of Medicine
Paid \$80,000

Edward J. Pearce, Ph.D.

Role of the TGF-beta superfamily in host signaling to schistosomes
Cornell University College of Veterinary Medicine
Approved \$425,000 Paid \$42,500

William Petri Jr. M.D., Ph.D.

Adherence and cytolysis by *Entamoeba histolytica*
University of Virginia Health Sciences Center
Paid \$80,000

Margaret A. Phillips, Ph.D.

Design of inhibitors for *Trypanosoma brucei* ornithine decarboxylase
using a combination of structure-based approaches and combinatorial
chemistry
University of Texas Southwestern Medical Center-Dallas
Paid \$85,000

David S. Roos, Ph.D.

Exploring the function of the apicomplexan plastid
University of Pennsylvania
Paid \$80,000

L. David Sibley, Ph.D.

Molecular pathogenesis in toxoplasmosis
Washington University School of Medicine
Approved \$425,000 Paid \$42,500

Samuel L. Stanley, M.D.

Pathways for amebic induction of inflammation and programmed
cell death
Washington University School of Medicine
Paid \$85,000

Rick L. Tarleton, Ph.D.

Immunity and disease in *Trypanosoma cruzi* infection
University of Georgia
Paid \$60,000

Elisabetta Ullu, Ph.D.

Molecular analysis of the nucleus in *Trypanosoma brucei*
Yale University School of Medicine
Paid \$80,000.00

SUBTOTALS: Approved \$1,275,000

Paid \$1,057,500

New Investigator Awards in Molecular Parasitology

John H. Adams, Ph.D.

Molecular analysis of the malaria merozoite apical complex

University of Notre Dame

Paid \$32,500

James D. Bangs, Ph.D.

Secretory and endocytic trafficking in *Trypanosoma brucei*

University of Wisconsin Medical School

Paid \$32,500

Cornelis J. Beckers, Ph.D.

Role of cytoplasmic calcium in the regulation of motility and host cell invasion by *Toxoplasma gondii*

University of Alabama-Birmingham School of Medicine

Paid \$65,000

Vivian M. Bellofatto, Ph.D.

Molecular analysis of trypanosome gene transcription

University of Medicine and Dentistry of New Jersey

Paid \$65,000

Michael Cappello, M.D.

Molecular pathogenesis of hookworm anemia

Yale University School of Medicine

Paid \$70,000

Daniel J. Eichinger, Ph.D.

Control of encystation-specific gene expression in *Entamoeba*

New York University School of Medicine

Approved \$210,000 Paid \$35,000

Theresa Gaasterland, Ph.D.

Comparative genome annotation of *Plasmodium falciparum*, *Leishmania major*, and *Trypanosoma brucei*

Rockefeller University

Approved \$210,000 Paid \$35,000

Christopher A. Hunter, Ph.D.

Role of accessory molecules in the regulation of natural killer responses during infection

University of Pennsylvania School of Veterinary Medicine

Paid \$32,500

Stuart J. Kahn, M.D.

Analysis of the naive T-cell response to the surface glycoprotein superfamily of *Trypanosoma cruzi*

University of Washington School of Medicine

Paid \$65,000

Kami Kim, M.D.

Signaling pathways and *Toxoplasma gondii* differentiation

Albert Einstein College of Medicine

Paid \$65,000

Jonathan H. LeBowitz, Ph.D.

Structure and function of the *Leishmania* paraflagellar rod

Purdue University

Paid \$32,500

Gwo-Shu M. Lee, Ph.D.

Flagellar pocket proteins of African trypanosomes

New York University Medical Center

Paid \$32,500

Silvia N. J. Moreno, Ph.D.

Pyrophosphate metabolism in *Toxoplasma gondii*

University of Illinois at Urbana-Champaign College

of Veterinary Medicine

Paid \$70,000

Martin Olivier, Ph.D.

Role of the macrophage protein tyrosine phosphatase SHP-1 in *Leishmania* pathogenesis

Laval University Faculty of Medicine

Paid \$65,000

Eric Pearlman, Ph.D.

Cell recruitment in helminth-induced allergic inflammation

Case Western Reserve University School of Medicine

Paid \$32,500

Christian Tschudi, Ph.D.

Function of cis-splicing in trypanosome RNA

Yale University School of Medicine

Approved \$210,000 Paid \$35,000

SUBTOTALS: Approved \$630,000

Paid \$765,000

Scholar Awards in Molecular Pathogenic Mycology

Martin Bard, Ph.D.

Characterization of new target sites for antifungal intervention in the *Candida albicans* ergosterol pathway
Indiana University-Purdue University at Indianapolis
Paid \$85,000

Judith Berman, Ph.D.

Use of *Saccharomyces cerevisiae* to study molecular mechanisms of *Candida albicans* pathogenicity
University of Minnesota
Paid \$80,000

William A. Fonzi, Ph.D.

Environmental signals and virulence of *Candida albicans*
Georgetown University Medical Center
Paid \$80,000

William E. Goldman, Ph.D.

Probing the parasitic lifestyle of *Histoplasma capsulatum*
Washington University School of Medicine
Paid \$80,000

Joseph Heitman, M.D., Ph.D.

Signal transduction pathways regulating virulence of *Cryptococcus neoformans*
Duke University Medical Center
Paid \$80,000

Alexander D. Johnson, Ph.D.

Analysis of a mating-type-like locus in *Candida albicans*
University of California-San Francisco School of Medicine
Paid \$40,000

Elizabeth J. Keath, Ph.D.

Novel molecular and DNA vaccine approaches to *Histoplasma capsulatum*
Saint Louis University
Paid \$80,000

Bruce Klein, M.D.

Genetic immunization against pathogenic fungi
University of Wisconsin Medical School
Paid \$80,000

James W. Kronstad, Ph.D.

Temperature-regulated and infection-regulated gene expression in *Cryptococcus neoformans*
University of British Columbia
Paid \$85,000

Stuart M. Levitz, M.D.

Use of molecular biology to identify *Cryptococcus neoformans* antigens that stimulate cell-mediated immunity
Boston University School of Medicine
Paid \$80,000

Aaron P. Mitchell, Ph.D.

Analysis of the *Candida* CaRIM transduction pathway
Columbia University College of Physicians and Surgeons
Paid \$80,000

Peter A. B. Orlean, Ph.D.

Glycolipid anchoring of protein and wall biogenesis in fungal pathogens
University of Illinois at Urbana-Champaign
Paid \$80,000

Michael P. Snyder, Ph.D.

Analysis of morphogenic differentiation in *Candida albicans*
Yale University
Approved \$425,000 Paid \$42,500

Paula Sundstrom, Ph.D.

Global regulatory circuits and candidiasis
Ohio State University School of Medicine
Approved \$425,000 Paid \$42,500

SUBTOTALS: Approved \$850,000

Paid \$1,015,000

New Investigator Awards in Molecular Pathogenic Mycology

Kent L. Buchanan, Ph.D.

Acquired host resistance in cryptococcal meningitis

Tulane University Medical Center

Paid \$65,000

Gary M. Cox, M.D.

Antisense repression in *Cryptococcus neoformans*

Duke University Medical Center

Paid \$70,000

Tamara L. Doering, M.D., Ph.D.

Mechanisms of capsule biosynthesis in *Cryptococcus neoformans*

Washington University School of Medicine

Approved \$210,000 Paid \$35,000

Scott G. Filler, M.D.

Stimulation of endothelial cells in *Candida albicans*

University of California-Los Angeles School of Medicine

Paid \$70,000

Gary B. Huffnagle, Ph.D.

Role of melanin production by *Cryptococcus neoformans* in evasion of host defenses

University of Michigan Medical Center

Paid \$65,000

Patrick J. Keeling, Ph.D.

Early infection and adaptation to intracellular parasitism in *Microsporidia*

University of British Columbia

Approved \$210,000 Paid \$35,000

Jennifer K. Lodge, Ph.D.

Identification of virulence-related determinants in *Cryptococcus neoformans*

Saint Louis University School of Medicine

Paid \$65,000

Neal E. Lue, M.D., Ph.D.

Functional analysis of telomerase components in *Candida albicans*

Weill Medical College of Cornell University

Approved \$210,000 Paid \$35,000

Michelle C. Momany, Ph.D.

Identification of novel cell wall components in *Aspergillus fumigatus*

University of Georgia

Paid \$32,500

Anita Sil, M.D., Ph.D.

Genetic analysis of pathogenesis in *Histoplasma capsulatum*

University of California-San Francisco School of Medicine

Paid \$70,000

A. George Smulian, M.B., B.Ch.

Role of MAP kinase Mkp1 in the regulation of cell wall synthesis in *Pneumocystis carinii*

University of Cincinnati College of Medicine

Paid \$70,000

Theodore C. White, Ph.D.

Transcriptional regulation of drug resistance in *Candida albicans*

University of Washington School of Public Health

and Community Medicine

Paid \$32,500

Brian L. Wickes, Ph.D.

Identification of mating type-associated antifungal targets in *Cryptococcus neoformans*

University of Texas Health Science Center-San Antonio

Paid \$65,000

Jon Woods, M.D., Ph.D.

Antisense regulation of a protein kinase gene in *Histoplasma capsulatum*

University of Wisconsin Medical School

Approved \$210,000 Paid \$35,000

SUBTOTALS: Approved \$840,000

Paid \$745,000

New Initiatives in Malaria Research

James P. Allen, Ph.D.

Elizabeth J. Davidson, Ph.D.

Arizona State University

Structure-based design of mosquitocidal toxins

Paid \$50,000

Russ B. Altman, M.D., Ph.D.

Stanford University School of Medicine

Knowledge base of biological function for malaria

Paid \$100,000

Sailen Barik, Ph.D.

University of South Alabama College of Medicine

Signal transduction in *Plasmodium*

Paid \$50,000

Scott D. Bohle, Ph.D.

University of Wyoming

Peter W. Stephens, Ph.D.

State University of New York-Stony Brook

Interaction of the quinoline antimalarials and malaria pigment

Approved \$400,000 Paid \$50,000

Jon C. Clardy, Ph.D.

Cornell University

Inhibitors of dihydroorotate dehydrogenase for malaria treatment

Approved \$200,000 Paid \$50,000

John B. Dame, Ph.D.

University of Florida College of Veterinary Medicine

Thomas C. Rowe, Ph.D.

University of Florida College of Medicine

Discovery of a novel malarial DNA gyrase and its development as a drug target

Paid \$100,000

Roberto Docampo, M.D., Ph.D.

University of Illinois at Urbana-Champaign College of Veterinary Medicine

Acidocalcisomes in *Plasmodium*

Paid \$50,000

Jonathan A. Ellman, Ph.D.

University of California-Berkeley

Irwin D. Kuntz, Ph.D.

University of California-San Francisco School of Pharmacy

Inhibitors of plasmepsin II for malaria treatment

Paid \$75,000

Partho Ghosh, Ph.D.

University of California-San Diego

Structural studies of *Plasmodium falciparum* histidine-rich protein 2

Approved \$100,000 Paid \$25,000

Kasturi Haldar, Ph.D.

Northwestern University Medical School

Secretory targeting signals in *Plasmodia*

Paid \$75,000

Daniel L. Hartl, Ph.D.

Harvard University

Probing why there are so few synonymous single nucleotide polymorphisms (SNPs) in *Plasmodium falciparum*

Approved \$200,000 Paid \$50,000

Christopher A. Hunter, Ph.D.

University of Pennsylvania School of Veterinary Medicine

Role of NF κ B in resistance to malaria

Paid \$50,000

Anthony A. James, Ph.D.

University of California-Irvine

Genetic control of anopheline vectors

Approved \$200,000 Paid \$50,000

James W. Kazura, M.D.

Case Western Reserve University School of Medicine

Nicholas Schork, Ph.D.

Case Western Reserve University

Genetic dissection of malaria morbidity

Paid \$75,000

Walter H. Lewis, Ph.D.

Washington University

Daniel E. Goldberg, M.D., Ph.D.

Washington University School of Medicine

Optimizing the search for new antimalarial therapeutics

Paid \$100,000

Michael A. Marletta, Ph.D.

University of Michigan College of Pharmacy

Heme detoxification in *Plasmodium*

Approved \$200,000 Paid \$50,000

Thomas V. McDonald, M.D.

Albert Einstein College of Medicine

K⁺ channels as therapeutic targets in malaria

Paid \$50,000

Victor Nussenzweig, M.D., Ph.D.

Ruth Nussenzweig, M.D., Ph.D.

New York University Medical Center

Function of sporozoite membrane proteins investigated in genetically engineered malaria parasites

Paid \$75,000

Pradipsinh K. Rathod, Ph.D.

Catholic University of America

Accelerated drug resistance in *Plasmodium falciparum*

Paid \$75,000

Paul D. Roepe, Ph.D.

Georgetown University

James A. Martiney, Ph.D.

Kenneth S. Warren Laboratories

Single-cell photometric analysis of drug-resistant malaria

Paid \$80,000

Mary M. Stevenson, Ph.D.

Philippe Gros, Ph.D.

McGill University Faculty of Medicine

Genetic and functional dissection of susceptibility to malaria

Paid \$100,000

Alkhal B. Vaidya, Ph.D.

MCP Hahnemann University School of Medicine

Plasma membrane proton pumps in malaria parasites

Approved \$200,000 Paid \$50,000

Dyann F. Wirth, Ph.D.

Harvard School of Public Health

Plasmodium falciparum transcriptome: analysis of drug response

Paid \$100,000

SUBTOTALS: Approved \$1,500,000

Paid \$1,530,000

Other Grants

In addition to making competitive awards, BWF makes noncompetitive grants for activities that are closely related to our major focus areas. These grants are intended to enhance the general environment for research in the targeted areas.

GENERAL

American Society of Tropical Medicine and Hygiene

Support for a new BWF-ASTMH Fellowship in Tropical

Infectious Diseases

Approved \$156,000

CDC Foundation

Support for the International Conference on Emerging

Infectious Diseases

Approved \$10,000 Paid \$10,000

Cold Spring Harbor Laboratory

Support for speakers and travel awards associated with a meeting

titled "Microbial Pathogenesis and Host Response"

Paid \$5,000

Federation of American Societies for Experimental Biology

Support for a conference titled "Microbial Pathogenesis:

Mechanisms of Infectious Diseases"

Approved \$7,500 Paid \$7,500

Foundation for the National Institutes of Health

Support for activities of the Multilateral Initiative on Malaria

Approved \$20,000 Paid \$20,000

Keystone Symposia

Support for two meetings, titled "Genetic Manipulation of Insects"

and "Microbe Interactions with Their Environments: Genomic

Perspectives," and for the student travel fund

Approved \$20,000 Paid \$20,000

Marine Biological Laboratory

Support for the training course titled "Biology of Parasitism,"

from 1999 to 2003

Paid \$150,000

Midwest Microbial Pathogenesis Meeting

Support for the sixth annual meeting

Paid \$4,000

National Academy of Sciences

Support for the Institute of Medicine's Forum on Emerging Infections

Approved \$25,000 Paid \$25,000

North Carolina Department of Health and Human Services

Support for a project titled "Surveillance and Evaluation

of Environmental Microbiology in the Aftermath of Flooding

in Eastern North Carolina, 1999"

Approved \$100,000 Paid \$50,000

University of Wisconsin-Madison

Support for a project to optically map the genome of *Leishmania major*
Paid \$150,000

Walter and Eliza Hall Institute of Medical Research

Support for an international meeting titled "Molecular Approaches to Malaria Research"
Paid \$5,000

Wellcome Trust

Support for the Wellcome Trust/BWF Infectious Diseases Initiative
Approved \$1,000,000

MOLECULAR PARASITOLOGY

American Society of Tropical Medicine and Hygiene

Support for speakers at a symposium titled "The Past, Present, and Future of Genomic Sequence Information," at the society's annual meeting
Approved \$4,000 Paid \$4,000

Foundation for Advanced Education in the Sciences

Support for the BWF/National Institute of Allergy and Infectious Diseases Biology of Parasitic Infection Lecture Series
Approved \$5,000 Paid \$5,000

Keystone Symposia

Support for a meeting titled "Molecular Helminthology: An Integrated Approach" and for a meeting workshop titled "Threat of Drug Resistance: Strategy Session"
Approved \$12,500

Malaria Foundation

Support for activities to reach the international scientific community
Approved \$50,000 Paid \$50,000

Stanford University

Support for a project to sequence chromosome 12 of *Plasmodium falciparum*
Approved \$125,000 Paid \$25,000

University of Pennsylvania

Support for developing and operating the *Plasmodium* genome database
Approved \$1,050,000 Paid \$50,000

PATHOGENIC MYCOLOGY

Duke University Medical Center

Support for the Fifth National Institute of Allergy and Infectious Diseases Workshop in Medical Mycology: Epidemiology
Approved \$30,000 Paid \$30,000

Foundation for Advanced Education in the Sciences

Support for research on *Mucorales*
Approved \$2,750 Paid \$2,750

Marine Biological Laboratory

Support for the training course titled "Molecular Mycology: Current Approaches to Fungal Pathogenesis," from 2000 to 2002
Approved \$255,000 Paid \$85,000

Stanford University School of Medicine

Support for a researcher to present data on the *Cryptococcal* genome sequence at the 14th International Society for Human and Animal Mycology Congress
Approved \$2,800 Paid \$2,800

University of Georgia

Support for the Third International Fungal Genome Symposium
Approved \$5,000 Paid \$5,000

SUBTOTALS: Approved \$2,880,550

Paid \$706,050

Therapeutic Sciences

TOTAL APPROVED \$10,656,000 TOTAL PAID \$6,921,000 TOTAL TRANSFERRED/CANCELLED \$525,000

Clinical Scientist Awards in Translational Research

During the fiscal year, some awardees change institutions, modify the terms of their award at their current institution, or both change institutions and modify their award. In these cases, BWF's policy has been to cancel the remaining portion of the original award and, as necessary, approve a new award. When the awardee has changed institutions, the new award is made to the new institution; when the awardee has not moved but has modified the terms, the new award is made to the current institution. In the following descriptions, the name of the awardee is listed first, the title of the project is listed second, the awardee's current institution is listed third, and the amount approved or paid to the institution is listed fourth. For awardees who either changed institutions or modified their award, the portion of the award paid to the original institution, as well as any portion that was transferred or cancelled, is listed last, in parentheses.

Nina Bhardwaj, M.D., Ph.D.

Vaccination of HIV-1 positive individuals by antigen-pulsed dendritic cells

Rockefeller University

Approved \$150,000

Gilbert Chu, M.D., Ph.D.

Cancer treatment by genome-wide transcription scanning

Stanford University Medical Center

Approved \$150,000

Robert B. Darnell, M.D., Ph.D.

Detection and activation of tumor-specific killer cells in animal models and cancer patients

Rockefeller University

Approved \$750,000 Paid \$75,000

Claire M. Doerschuk, M.D.

Response of neutrophils during inflammatory lung disease

Case Western Reserve University School of Medicine

Approved \$525,000 Paid \$150,000

(\$525,000 of original award to the Harvard School of Public Health was transferred/cancelled)

Robert W. Doms, M.D., Ph.D.

Chemokine receptors as new targets for HIV-1 therapeutics

University of Pennsylvania School of Medicine

Approved \$150,000

Brian J. Druker, M.D.

Mechanism-based therapy for chronic myelogenous leukemia

Oregon Health Sciences University

Approved \$750,000 Paid \$75,000

Erol Fikrig, M.D.

Borrelia gene expression and lyme arthritis

Yale University School of Medicine

Approved \$150,000

Thomas E. Gajewski, M.D., Ph.D.

Development of a second generation melanoma vaccine

University of Chicago Pritzker School of Medicine

Approved \$750,000 Paid \$75,000

Eva Guinan, M.D.

Extending the donor pool by inducing alloantigen specific T-cell anergy ex vivo for human hematopoietic stem cell transplantation

Harvard Medical School

Approved \$150,000

Barbara Hempstead, M.D., Ph.D.

Growth factor regulation of coronary angiogenesis

Weill Medical College of Cornell University

Approved \$150,000

Daniel C. Javitt, M.D., Ph.D.

NMDA-based treatment development for schizophrenia

New York University School of Medicine

Approved \$750,000 Paid \$75,000

Alex E. MacKenzie, M.D., Ph.D.

Cytoprotective NAIP and XIAP genes: identification of activation pathways and inducing agents

University of Ottawa Faculty of Medicine

Approved \$150,000

Joseph M. McCune, M.D., Ph.D.

Regulation of human thymic function in vivo

University of California-San Francisco School of Medicine

Approved \$750,000 Paid \$75,000

M. Juliana McElrath, M.D., Ph.D.

Induction of cellular immunity in HIV-1 exposed seronegative individuals

University of Washington School of Medicine

Approved \$750,000 Paid \$75,000

Jason D. Morrow, M.D.

Isoprostanes as markers and mediators of oxidant stress in humans
Vanderbilt University Medical Center
Paid \$150,000

Mark R. Philips, M.D.

Endomembrane trafficking of Ras: novel molecular targets
for anticancer agents
New York University School of Medicine
Approved \$750,000 Paid \$75,000

Daniel J. Rader, M.D.

Novel therapeutic approach to atherosclerosis through modulation
of HDL metabolism
University of Pennsylvania School of Medicine
Approved \$750,000 Paid \$75,000

W. Edward Robinson Jr., M.D., Ph.D.

Structure-function analyses of clinically relevant HIV integrases
University of California-Irvine College of Medicine
Paid \$150,000

Don C. Rockey, M.D.

Cellular and molecular basis of portal hypertension:
an endothelialopathy in cirrhosis
Duke University Medical Center
Approved \$750,000 Paid \$75,000

Howard A. Rockman, M.D.

Novel molecular therapeutic strategies in heart failure:
role of beta-adrenergic receptor desensitization
Duke University Medical Center
Paid \$150,000

Antony Rosen, M.B., Ch.B.

Altered structure and clearance of autoantigens during apoptosis:
implications for autoimmunity
Johns Hopkins University School of Medicine
Paid \$150,000

Christian W. Schindler, M.D., Ph.D.

Intervention of IL-5 signaling: a therapeutic paradigm for asthma
Columbia University College of Physicians and Surgeons
Paid \$150,000

Ann Marie Schmidt, M.D.

Novel therapeutic strategy for the prevention and treatment
of diabetic complications: antagonism of receptor for advanced
glycation end products (RAGE)
Columbia University College of Physicians and Surgeons
Paid \$150,000

Mark H. Siegelman, M.D., Ph.D.

Functionally activated lymphocyte CD44 in the initiation
and perpetuation of autoimmune disease
University of Texas Southwestern Medical Center-Dallas
Paid \$150,000

Joyce M. Slingerland, M.D., Ph.D.

Resistance to tamoxifen: a consequence of altered p27^{Kip1} regulation
during breast cancer progression
University of Toronto Faculty of Medicine
Paid \$150,000

Dennis J. Templeton, M.D., Ph.D.

Stress signaling inhibitors potentiate genotoxin-induced apoptosis
in a human colon tumor model
Case Western Reserve University School of Medicine
Paid \$150,000

Matthew L. Warman, M.D.

Delineating the proteins and pathways that maintain human
joints and their potential for treating heritable and acquired forms
of arthritis
Case Western Reserve University School of Medicine
Approved \$750,000 Paid \$75,000

Mark J. Yeager, M.D., Ph.D.

Structure and function of cardiac gap junction membrane channels
Scripps Research Institute
Paid \$150,000

Hagop Youssoufian, M.D.

Transcellular gene therapy: application to Fanconi anemia
Baylor College of Medicine
Paid \$150,000

SUBTOTALS: Approved \$8,025,000

Paid \$3,600,000

Transferred/Cancelled \$525,000

New Investigator Awards in the Pharmacological or Toxicological Sciences

PHARMACOLOGICAL SCIENCES

Lee S. Bardwell, Ph.D.

Novel roles for protein-protein interactions in mitogen-activated protein kinase signaling

University of California-Irvine

Paid \$70,000

Carolyn R. Bertozzi, Ph.D.

Engineering novel cell surface chemistry for selective tumor cell targeting

University of California-Berkeley

Paid \$32,500

Charles M. Brenner, Ph.D.

Genomic approach to identify chemotherapeutic targets

Jefferson Medical College of Thomas Jefferson University

Paid \$65,000

Kathleen Collins, Ph.D.

Biochemical and structural characterization of recombinant *Tetrahymena* telomerase

University of California-Berkeley

Paid \$65,000

Graeme W. Davis, Ph.D.

Molecular and genetic analysis of synaptic homeostasis

University of California-San Francisco School of Medicine

Paid \$70,000

Raymond J. Deshaies, Ph.D.

Ubiquitin-dependent proteolysis

California Institute of Technology

Paid \$32,500

Pehr A. B. Harbury, Ph.D.

DNA display: in vitro evolution of small molecules

Stanford University School of Medicine

Approved \$210,000 Paid \$35,000

Bruce A. Hay, Ph.D.

Identification and characterization of regulators of caspase-dependent cell death signaling

California Institute of Technology

Paid \$65,000

Linda A. Hicke, Ph.D.

Ubiquitin-dependent internalization and degradation of signal transducing receptors

Northwestern University

Paid \$32,500

Neil L. Kelleher, Ph.D.

Genome-proteome correlations in respiratory pathogens: an experimental approach for identification of new pharmacological targets

University of Illinois at Urbana-Champaign

Approved \$210,000 Paid \$35,000

Kerry Kornfeld, M.D., Ph.D.

Sar-5, a novel negative regulator of Ras signaling

Washington University School of Medicine

Paid \$65,000

Wendell Lim, Ph.D.

Protein recognition in signal transduction: the structural and energetic basis of complex SH3 domain mediated interactions

University of California-San Francisco School of Medicine

Paid \$32,500

Andres V. Maricq, M.D., Ph.D.

Dominant activation of neurons: a genetic approach to uncover mechanisms of neuronal signaling and control of behavior

University of Utah

Paid \$70,000

Carla Mattos, Ph.D.

Surface features of the Ral GTPase obtained from the multiple solvent crystal structures and from its complex with RalBP1 and calmodulin

North Carolina State University

Approved \$210,000 Paid \$35,000

Stephen Michnick, Ph.D.

Protein-fragment complementation assays: a general strategy for identifying relationships among proteins in vivo

University of Montreal Faculty of Medicine

Paid \$32,500

Rama Ranganathan, M.D., Ph.D.

Assembly and function of multi-protein complexes in visual signaling

University of Texas Southwestern Medical Center-Dallas

Paid \$65,000

Ram Sasisekharan, Ph.D.

Heparin-like glycosaminoglycans as a target for therapeutic intervention

Massachusetts Institute of Technology

Paid \$70,000

Erik J. Sontheimer, Ph.D.

Reversible control of RNA structure with small biarsenical ligands

Northwestern University

Approved \$210,000 Paid \$35,000

Natalie C. Strynadka, Ph.D.

Antibiotic discovery targeting essential proteins on the bacterial outer membrane
University of British Columbia Faculty of Medicine
Paid \$70,000

Ronald Taussig, Ph.D.

Genetic analysis of mammalian adenylyl cyclase isoforms
University of Michigan Medical School
Paid \$32,500

Joseph Tsien, Ph.D.

Novel pharmacogenetic approach to neuronal signaling
Princeton University
Approved \$210,000 Paid \$35,000

Wilfred A. van der Donk, Ph.D.

Exploring the post-translational modifications of lantibiotics
University of Illinois at Urbana-Champaign
Paid \$65,000

Beverly R. Wendland, Ph.D.

New pathways to the cell interior: dominant negative and positive effectors of endocytosis
Johns Hopkins University
Paid \$70,000

Hongtao Yu, Ph.D.

Molecular investigation of transitions and checkpoints in mitosis
University of Texas Southwestern Medical Center-Dallas
Approved \$210,000 Paid \$35,000

TOXICOLOGICAL SCIENCES

Raffi V. Aroian, Ph.D.

Bacillus thuringiensis toxicity and resistance in nematodes
University of California-San Diego
Approved \$210,000 Paid \$35,000

Qin M. Chen, Ph.D.

Tumor suppressor mediated oxidative stress responses
University of Arizona College of Medicine
Paid \$32,500

Karlene A. Cimprich, Ph.D.

Exploring DNA damage checkpoints using a cell-free system
Stanford University School of Medicine
Paid \$70,000

Philip A. Cole, M.D., Ph.D.

Chemical cross-linking agents for identification of substrates for protein kinases
Johns Hopkins University School of Medicine
Paid \$65,000

Virginia W. Cornish, Ph.D.

In vivo screening for enzymatic activity
Columbia University
Approved \$210,000 Paid \$35,000

Bevin P. Engleward, Sc.D.

Fluorescent detection of loss heterozygosity in mammals
Massachusetts Institute of Technology
Approved \$210,000 Paid \$35,000

James M. Ford, M.D.

Transcriptional regulation of damage-inducible DNA repair genes
Stanford University School of Medicine
Approved \$210,000 Paid \$35,000

Hilary A. Godwin, Ph.D.

Biophysical approaches to lead toxicology: biochemistry, detection, and chelation of Pb(II)
Northwestern University
Paid \$65,000

Jeffrey A. Johnson, Ph.D.

Brain glutathione s-transferases and NAD(P)H:quinone oxidoreductase: a role in preventing neurotoxicity
University of Wisconsin-Madison
Paid \$32,500

Carla M. Koehler, Ph.D.

Mitochondrial biogenesis in health and disease: assembly of the mitochondrial inner membrane
University of California-Los Angeles
Approved \$210,000 Paid \$35,000

Fang Liu, Ph.D.

Role of TGF-beta-inducible gene regulation in tumorigenesis
Rutgers, the State University of New Jersey College of Pharmacy
Paid \$70,000

Thomas W. Muir, Ph.D.

Structure-activity analysis of the autoinducing peptides from *Staphylococcus aureus* responsible for virulence
Rockefeller University
Paid \$70,000

Yoichi Osawa, Ph.D.

Chemical approaches to toxicology
University of Michigan Medical School
Paid \$32,500

Jennifer A. Pietenpol, Ph.D.

Mechanism of cell cycle checkpoints following genotoxic stress
Vanderbilt University Medical Center
Paid \$32,500

Tomas A. Prolla, Ph.D.

Genetic characterization of the DNA mismatch repair system
in induced mutagenesis
University of Wisconsin Medical School
Paid \$70,000

Zhigang Wang, Ph.D.

Mechanism of DNA damage-induced mutagenesis in humans
University of Kentucky
Paid \$65,000

Zhengui Xia, Ph.D.

Mechanisms of arsenite neurotoxicity
University of Washington School of Public Health
and Community Medicine
Paid \$70,000

E. Lynn Zechiedrich, Ph.D.

DNA repair and topoisomerases
Baylor College of Medicine
Paid \$65,000

SUBTOTALS: Approved \$2,310,000

Paid \$2,130,000

Other Grants

In addition to making competitive awards, BWF makes noncompetitive grants for activities that are closely related to our major focus areas. These grants are intended to enhance the general environment for research in the targeted areas.

TRANSLATIONAL RESEARCH

American Federation for Medical Research

Support for travel awards associated with the federation's
annual meeting
Approved \$10,000 Paid \$10,000

American Society for Clinical Investigation/**American Association of Physicians**

Support for a joint meeting of the society and the association
Approved \$7,500 Paid \$7,500

Association for Patient-Oriented Research

Support for the association's annual meeting
Approved \$15,000 Paid \$15,000

National Academy of Sciences/Institute of Medicine

Support for the Clinical Research Roundtable
Approved \$150,000 Paid \$50,000

New York Academy of Medicine

Support for a conference on angiogenesis
Approved \$3,500 Paid \$3,500

Royal College of Physicians and Surgeons of Canada

Support for the Henry Friesen Award and Lectureship
Approved \$55,000 Paid \$55,000

University of North Carolina-Chapel Hill School of Medicine

Support for a conference titled "Class II MHC Gene Control
and Disease Relevance"
Approved \$5,000 Paid \$5,000

PHARMACOLOGICAL OR TOXICOLOGICAL SCIENCES

American Foundation for Pharmaceutical Education

Support for the New Investigators Program in Pharmacy Faculty
Paid \$250,000

American Society for Cell Biology

Support for the society's annual meeting
Approved \$6,000 Paid \$6,000

American Society for Pharmacology and Experimental Therapeutics

Support for a symposium titled "Drug Metabolism in Animal Models
of Human Disease" and for a plenary speaker at the society's
annual meeting
Approved \$8,000 Paid \$8,000

Aspen Cancer Conference

Support for travel awards associated with a workshop titled
"Mechanism of Toxicity, Carcinogenesis, and Cancer Prevention"
Approved \$3,000 Paid \$3,000

Cornell University

Support for travel awards associated with an international symposium
titled "Management of Ambiguous Genitalia in the Newborn"
Approved \$10,000 Paid \$10,000

Gordon Research Conferences

Support for the Conference on Mechanisms of Toxicity
Approved \$7,500 Paid \$7,500

International Society of Quantum Biology and Pharmacology

Support for the society's biennial meeting
Approved \$5,000 Paid \$5,000

Society of Environmental Toxicology and Chemistry
Support for a workshop on environmental-human health
interconnections, held at the society's 20th annual meeting
Approved \$15,000 Paid \$15,000

Society of Toxicology
Support for travel awards associated with the society's annual meeting
Approved \$10,000 Paid \$10,000

Stanford University
Support for a panel/symposium titled "DNA Repair in the Nervous
System," held at the 33rd Winter Conference on Brain Research
Approved \$3,000 Paid \$3,000

Teratology Society
Support for a satellite meeting titled "Bioinformatics and
Developmental Toxicology in the 21st Century," held at the society's
annual meeting
Approved \$5,000 Paid \$5,000

Whitehead Institute for Biomedical Research
Support for a symposium titled "Genetics and Society"
Approved \$2,500 Paid \$2,500

SCHOLAR AWARDS IN EXPERIMENTAL THERAPEUTICS

*This program was superseded by the Clinical Scientist Awards
in Translational Research.*

Arturo Casadevall, M.D., Ph.D.
Development of novel antibody-based drugs against bacterial
and fungal pathogens
Albert Einstein College of Medicine
Paid \$80,000

Jonathan D. Gitlin, M.D.
Mechanisms of cellular copper homeostasis
Washington University School of Medicine
Paid \$80,000

Daniel L. Kaufman, Ph.D.
Biopharmaceuticals for the prevention of insulin-dependent
diabetes mellitus
University of California-Los Angeles School of Medicine
Paid \$80,000

Thomas Michel, M.D., Ph.D.
Nitric oxide synthases and vascular signal transduction
Harvard Medical School
Paid \$80,000

Drew M. Pardoll, M.D., Ph.D.
Molecular engineering of the antitumor immune response
Johns Hopkins University School of Medicine
Paid \$60,000

Steven E. Shoelson, M.D., Ph.D.
Targeting SH2 domains in tyrosine kinase signaling
Harvard Medical School
Paid \$60,000

SCHOLAR AWARDS IN TOXICOLOGY

*This program was superseded by the New Investigator Awards
in the Pharmacological or Toxicological Sciences.*

Christopher Bradfield, Ph.D.
Molecular genetic approaches to study dioxin toxicology
University of Wisconsin-Madison
Paid \$80,000

Titia de Lange, Ph.D.
Cell-based assays for telomerase toxicity
Rockefeller University
Paid \$80,000

Ellen Li, M.D., Ph.D.
Retinoic acid binding proteins and retinoid toxicity
Washington University School of Medicine
Paid \$60,000

Curtis J. Omiecinski, Ph.D.
Molecular biological approaches to toxicology
University of Washington School of Public Health
and Community Medicine
Paid \$60,000

**SUBTOTALS: Approved \$321,000
Paid \$1,191,000**

Reproductive Science

TOTAL APPROVED \$1,364,150 TOTAL PAID \$1,409,350

Career Awards in the Biomedical Sciences

These awards targeted at reproductive sciences are made through the Career Awards in the Biomedical Sciences program; the majority of the career awards are listed under the "Career Development of Scientists" section of the Grants Index.

Career awards are postdoctoral-faculty bridging awards. During the fiscal year, some awardees change institutions, modify the terms of their award at their current institution, or both change institutions and modify their award. In these cases, BWF's policy has been to cancel the remaining portion of the original award and, as necessary, approve a new award. When the awardee has changed institutions, the new award is made to the new institution; when the awardee has not moved but has modified the terms, the new award is made to the current institution. In the following descriptions, the name of the awardee is listed first, the title of the project is listed second, the awardee's current institution is listed third, and the amount approved or paid to the institution is listed fourth. For awardees who either changed institutions or modified their award, the portion of the award paid to the original institution, as well as any portion that was transferred or cancelled, is listed last, in parentheses. For new awardees still in the postdoctoral period, the portion of the award intended to cover a future faculty appointment is listed last, in parentheses.

Chester W. Brown, M.D., Ph.D.

Understanding the reproductive roles of the activins using an activin beta B knock-in model

Baylor College of Medicine

Approved \$59,000 Paid \$29,500

(\$386,000 approved for future faculty appointment)

David E. Cummings, M.D.

Studies of spermatogenesis and metabolism using mutant mice

University of Washington School of Medicine

Paid \$178,750

Abby F. Dernburg, Ph.D.

Chromosome architecture and the fidelity of meiotic segregation

Stanford University School of Medicine

Approved \$59,000 Paid \$29,500

(\$386,000 approved for future faculty appointment)

William L. Kraus, Ph.D.

Biochemical analysis of estrogen receptor activity

with chromatin templates

Cornell University

Paid \$115,500

Bruce T. Lahn, Ph.D.

Systematic investigation of mammalian spermatogenesis

University of Chicago

Paid \$193,000

Mala S. Mahendroo, Ph.D.

Characterization of fecundity and parturition defects in mice deficient in steroid 5 alpha-reductase type 1

University of Texas Southwestern Medical Center-Dallas

Paid \$89,650

Kelle H. Moley, M.D.

Glucose transport and apoptosis in blastocysts from diabetic mice

Washington University School of Medicine

Approved \$29,150 Paid \$150,150

Carmen J. Williams, M.D., Ph.D.

Signal transduction mechanisms during mouse egg activation

University of Pennsylvania School of Medicine

Paid \$91,300

SUBTOTALS: Approved \$919,150

Paid \$877,350

Obstetrics and Gynecology Research Fellowships

Oliver Dorigo, M.D.

University of California-Los Angeles School of Medicine

Development of a novel gene transfer system using gutless hybrid adeno-Epstein-Barr virus for prolonged transgene expression

Approved \$183,000 Paid \$61,000

Henry L. Galan, M.D.

University of Colorado Health Sciences Center

Role of endothelial nitric oxide in the fetal placental unit in an experimental model of intrauterine growth restriction

Paid \$24,000

Karen H. Lu, M.D.

Harvard Medical School

Genetic alterations in ovarian cancers associated with germ line *BRCA1* mutations

Paid \$48,000

Douglas A. Woelkers, M.D.

University of Pittsburgh School of Medicine

Oxidative stress and preeclampsia

Paid \$48,000

SUBTOTALS: Approved \$183,000

Paid \$181,000

Reproductive Scientist Development Program

Helen Kim, M.D.

Harvard Medical School

Regulation of mouse GnRH gene expression

Approved \$240,000 Paid \$80,000

Carolyn Y. Muller, M.D.

University of Texas Southwestern Medical Center-Dallas

Prospective determination of genetic alterations in cervical preneoplasia with correlation to risk exposure and behavior

Paid \$80,000

Salli I. Tazuke, M.D.

Stanford University Medical Center

Molecular analysis of early germ cell overgrowth and its function in germ line stem cell biology

Paid \$80,000

SUBTOTALS: Approved \$240,000

Paid \$240,000

Other Grants

In addition to making competitive awards, BWF makes noncompetitive grants for activities that are closely related to our major focus areas. These grants are intended to enhance the general environment for research in the targeted areas.

American Society of Andrology

Support for postdoctoral scientists to attend the society's annual meeting

Approved \$3,000 Paid \$3,000

Federation of American Societies for Experimental Biology

Support for a conference on regulation of the cardiovascular system in mothers and babies during pregnancy and after birth

Approved \$3,000 Paid \$3,000

Harvard University

Support for a meeting titled "Reproductive Endocrine"

Approved \$5,000 Paid \$5,000

Marine Biological Laboratory

Support for the training course titled "Frontiers in Reproduction"

Approved \$5,000 Paid \$100,000

Society for the Study of Reproduction

Support for postdoctoral scientists to attend the society's annual meeting

Approved \$6,000

SUBTOTALS: Approved \$22,000

Paid \$111,000

Science Education

TOTAL APPROVED \$3,059,553 TOTAL PAID \$3,201,686

Student Science Enrichment Program

American Chemical Society, North Carolina Local Section
Summer Educational Experience for the Disadvantaged
Paid \$59,310

Bennett College
Mathematics, Science, Engineering, and Technology Scholars Program
Paid \$60,000

Campbell University School of Pharmacy
Harnett Central Middle School Science and Technology
Enrichment Program
Paid \$40,555

Chowan College
Northeastern North Carolina Science Camp
Paid \$35,000

Cumberland County Schools
Cape Fear Natural Science Academy
Paid \$60,000

Duke University
Design to Learn
Approved \$70,596 Paid \$23,532

Durham Academy
Durham Public Schools Summer Institute
Paid \$60,000

Durham Public Schools
Bridging Education, Science, and Technology High School Molecular
Research Preparation Course
Paid \$50,585

Johnson C. Smith University
Intensive Summer Science Camp
Approved \$176,692 Paid \$58,898

Mountain Area Gardens in Community Inc.
Middle School Apprenticeship Program in Garden-Related Sciences
Paid \$24,403

North Carolina Museum of Life and Science
Museums and Universities for Science Enrichment of Students
Paid \$58,734

North Carolina State Museum of Natural Science
Girls in Science Statewide Project
Paid \$55,000

North Carolina State University
Science and Mathematics Colloquies at the Science House
Approved \$172,615 Paid \$56,660

Pines of Carolina Girl Scout Council
Healthy START-UP: Science and Technology around Research
Triangle Park
Approved \$179,400 Paid \$60,000

Roanoke Rapids City Schools
Summer Science Explorations in the Roanoke Valley
Paid \$20,000

Science Museums of Wilson: Imagination Station
Minorities' Interest Nurtured and Developed in Science
Paid \$43,191

Shaw University
Mentoring and Encouraging the Science Skills of Youth
Approved \$180,000 Paid \$60,000

Shodor Education Foundation
Stimulating Understanding of Computational Science through
Collaboration, Experiment, and Discovery
Approved \$178,527 Paid \$60,000

Southeastern Community College
Explorations in Science
Paid \$28,982

Swain County Schools
Students Involved and Experiencing Nature, Careers in Science,
and Environmental Awareness
Approved \$89,019 Paid \$35,673

University of North Carolina-Chapel Hill School of Medicine
Research Apprenticeship Program
Paid \$59,891

University of North Carolina-Wilmington
Oceanographic Field Support for Summer Ventures in Science
and Mathematics
Paid \$10,125

Wake Forest University School of Medicine
Linking Career Choices to Student Experiences: Mini-Fellowships
in Science Fields
Paid \$59,460

Warren Wilson College
Environmental Science Camp
Paid \$48,750

Wilmington Children's Museum
Middle School Docent Program
Approved \$19,275 Paid \$7,000

**SUBTOTALS: Approved \$1,066,124
Paid \$1,135,749**

BWF Visiting Professorships in the Basic Medical Sciences

Listed by host institution, visiting professor, and professor's affiliation. Titles of BWF Lectures cited if given in fiscal year 2000.

Albert Einstein College of Medicine
Jack L. Strominger, M.D.
Harvard University
Approved \$5,000

Baylor College of Medicine
Carl H. June, M.D.
University of Pennsylvania School of Medicine
Approved \$5,000

Case Western Reserve University School of Medicine
Robert M. Graham, M.D.
University of New South Wales (Australia)
Form and function of G-protein-coupled receptors predict promiscuity
of activation mechanisms
Paid \$5,000

Creighton University School of Medicine
William E. Paul, M.D.
National Institute of Allergy and Infectious Diseases
Approved \$5,000

Dalhousie University Faculty of Medicine
Harold L. Atwood, Ph.D., D.Sc.
University of Toronto (Canada)
How nerve cells learn from experience
Paid \$5,000

East Carolina University School of Medicine
Isaiah I. Fidler, D.V.M., Ph.D.
University of Texas M. D. Anderson Cancer Center
Therapy of cancer metastasis
Paid \$5,000

Emory University School of Medicine
Jean-Philippe Pin, Ph.D.
National Center for Scientific Research (France)
Role of Homer1 proteins in the control of localization of mGluR5
in neurons
Paid \$5,000

Idaho State University College of Pharmacy
Gerald L. Dohm, Ph.D.
East Carolina University School of Medicine
Factors that make some people prone to becoming obese
Paid \$5,000

Indiana University School of Medicine
Piers E. Emson, Ph.D.
Babraham Institute (United Kingdom)
Toward an understanding of Parkinson's disease: novel models
of disease
Paid \$5,000

Indiana University-Bloomington
Jill Bargonetti, Ph.D.
Hunter College
Approved \$5,000

Iowa State University
J. G. Sutcliffe, Ph.D.
Scripps Research Institute
Approved \$5,000

Louisiana State University Health Sciences Center
Stephen F. Heinemann, Ph.D.
Salk Institute for Biological Studies
Genetic dissection of the nicotinic receptor system and nicotine addition
brain glutamate receptors: implications for memory and stroke
Paid \$5,000

Louisiana State University Health Sciences Center
Miles D. Houslay, Ph.D.
University of Glasgow (United Kingdom)
Approved \$5,000

Loyola University of Chicago Stritch School of Medicine
Hidde L. Ploegh, Ph.D.
Harvard Medical School
Approved \$5,000

Marshall University School of Medicine

Daria Mochly-Rosen, Ph.D.

Stanford University School of Medicine

Approved \$5,000

McGill University Faculty of Medicine

Salvador Moncada, M.D., Ph.D.

University College London (United Kingdom)

Approved \$5,000

Medical College of Ohio School of Medicine

Richard J. Roberts, Ph.D.

New England BioLabs

Those flipping methylases and using bioinformatics to find restriction enzymes

Paid \$5,000

Medical University of South Carolina College of Medicine

Ivan Diamond, M.D., Ph.D.

University of California-San Francisco School of Medicine

Alcoholism in flies, mice, and men

Paid \$5,000

Morehouse School of Medicine

Stephen C. Strom, Ph.D.

University of Pittsburgh

Approved \$5,000

North Dakota State University

Adrienne Bendich, Ph.D.

SmithKline Beecham Consumer Health Care

Approved \$5,000

Ohio State University

Sidney Altman, Ph.D.

Yale University

Nature and uses of an RNA enzyme

Paid \$5,000

Pennsylvania State University College of Medicine

Alphonse E. Sirica, Ph.D.

Virginia Commonwealth University

Approved \$5,000

Rush-Presbyterian-St. Luke's Medical Center

Peter C. Bruckner, Ph.D.

University of Muenster (Germany)

Role of fibrillar assemblies in the maintenance of the cartilage phenotype of chondrocytes

Paid \$5,000

Saint Louis University School of Medicine

Steve Smale, Ph.D.

University of California-Los Angeles School of Medicine

Role of Ikaros within the centromeric heterochromatin of developing lymphocytes

Paid \$5,000

State University of New York Health Science Center-Syracuse

Winfield S. Sale, Ph.D.

Emory University School of Medicine

Signal transduction in control of the molecular motor dynein

Paid \$5,000

State University of New York Upstate Medical Center-Syracuse

Mikhail Ugryumov, M.D., Ph.D.

Russian Academy of Sciences (Russia)

Approved \$5,000

Tulane University School of Medicine

Emil R. Unanue, M.D.

Washington University School of Medicine

Symbiosis between phagocytes and lymphocytes in the response to an intracellular bacteria processing of antigen: the basis of peptide recognition

Paid \$5,000

Tulane University School of Medicine

Edward B. Ziff, Ph.D.

New York University

Approved \$5,000

University of Arizona

Eric R. Kandel, M.D.

Columbia University College of Physicians and Surgeons

Paid \$5,000

University of Arizona College of Medicine

Susan L. Lindquist, Ph.D.

University of Chicago

Approved \$5,000

University of British Columbia Faculty of Medicine

Thomas G. Spiro, Ph.D.

Princeton University

Protein dynamics from vibrational spectroscopy: the case of hemoglobin

Paid \$5,000

University of Calgary Faculty of Medicine

Edward E. Harlow, Ph.D.

Harvard Medical School

Approved \$5,000

University of California-Berkeley

James Barber, Ph.D.

Imperial College of Science, Technology, and Medicine (United Kingdom)

Approved \$5,000

University of California-Davis

Frederic M. Richards, Ph.D.

Yale University

Approved \$5,000

University of California-San Francisco School of Medicine
Shirley M. Tilghman, Ph.D.
Princeton University
Approved \$5,000

University of California-Santa Barbara
James E. Darnell Jr., M.D.
Rockefeller University
STATS in health and disease
Paid \$5,000

University of Georgia
David A. York, Ph.D.
Pennington Biomedical Research Center
Epidemic of obesity: causes, treatment, and prevention
Paid \$5,000

University of Guelph
John C. Herr, Ph.D.
University of Virginia Health Sciences Center
Approved \$5,000

University of Illinois at Urbana-Champaign
Richard L. Atkinson Jr., M.D.
University of Wisconsin-Madison
Searching for effective treatment of obesity
Paid \$5,000

University of Illinois-Chicago
Richard W. Tsien, D.Phil.
Stanford University School of Medicine
Modulation of the fundamental unit of synaptic transmission
Paid \$5,000

University of Louisville School of Medicine
Bruce Demple, Ph.D.
Harvard School of Public Health
Sensing free radical stress: biochemistry and genetics of cellular responses in bacteria and human cells
Paid \$5,000

University of Medicine and Dentistry of New Jersey
Bengt Samuelsson, M.D.
Karolinska Institute (Sweden)
Paid \$5,000

University of Miami School of Medicine
Michael J. Bevan, Ph.D.
University of Washington
T cell development
Paid \$5,000

University of Michigan Medical School
Hans-Jochem Kolb, M.D., Ph.D.
University of Munich (Germany)
Bone marrow transplantation: immunotherapy in the 21st century
Paid \$5,000

University of Minnesota College of Biological Sciences
Tony Hunter, Ph.D.
Salk Institute for Biological Studies
Approved \$5,000

University of Mississippi Medical Center
William Lederer, M.D., Ph.D.
University of Maryland-Baltimore School of Medicine
Cellular defects in heart failure
Paid \$5,000

University of Mississippi Medical Center
Charles F. Stevens, M.D., Ph.D.
Salk Institute for Biological Studies
Approved \$5,000

University of Missouri-Columbia School of Medicine
Ian A. Wilson, D. Phil.
Scripps Research Institute
Approved \$5,000

University of Missouri-Kansas City School of Medicine
Ralph Snyderman, M.D.
Duke University Medical Center
Approved \$5,000

University of Montreal Faculty of Medicine
John G. R. Jefferys, Ph.D.
University of Birmingham (United Kingdom)
Approved \$5,000

University of North Carolina-Chapel Hill School of Medicine
Alan Hall, Ph.D.
University College London (United Kingdom)
Regulation of integrin activity and actin filament assembly by Ras and Rho GTPase
Paid \$5,000

University of North Carolina-Chapel Hill School of Pharmacy
Tamar Schlick, Ph.D.
New York University
Approved \$5,000

University of Pittsburgh School of Medicine
Angela M. Gronenborn, Ph.D.
National Institute of Diabetes and Digestive and Kidney Diseases
Approved \$5,000

University of Saskatchewan College of Medicine
Paul Talalay, M.D.
Johns Hopkins University School of Medicine
Chemoprotection against cancer by induction of phase 2 enzymes
Paid \$5,000

University of South Dakota School of Medicine

John E. Hall, Ph.D.

University of Mississippi Medical Center

Approved \$5,000

University of Texas Health Science Center-San Antonio

Howard K. Schachman, Ph.D.

University of California-Berkeley

Science policy and its impact on research; and Aspartate transcarbamylase: the hemoglobin of enzymology

Paid \$5,000

University of Texas-Austin College of Pharmacy

Gerald M. Cohen, Ph.D.

University of Leicester (United Kingdom)

Role of the apoptosome: an approximately 700-kDa caspase activating complex

Paid \$5,000

University of Vermont College of Medicine

Pier M. Mannucci, M.D.

University of Milan (Italy)

Approved \$5,000

University of Western Ontario Faculty of Medicine and Dentistry

Victor J. Dzau, M.D.

Harvard Medical School

Promise of genomics in physiology and medicine

Paid \$5,000

Virginia Commonwealth University

Can Ince, M.D.

University of Amsterdam (Netherlands)

Approved \$5,000

Wake Forest University School of Medicine

Michael E. Greenberg, Ph.D.

Harvard Medical School

Signal transduction pathways that regulate differentiation and survival in the developing nervous system

Paid \$5,000

Washington State University College of Veterinary Medicine

Harris A. Lewin, Ph.D.

University of Illinois at Urbana-Champaign

Immunogenetics in the age of comparative and functional genomics

Paid \$5,000

Wayne State University School of Medicine

Anthony T. Campagnoni, Ph.D.

University of California-Los Angeles

Approved \$5,000

West Virginia University School of Pharmacy

James R. Halpert, Ph.D.

University of Texas Medical Branch-Galveston

Approved \$5,000

SUBTOTALS: Approved \$160,000**Paid \$160,000****BWF Visiting Professorships in the Microbiological Sciences***Listed by host institution, visiting professor, and professor's affiliation. Titles of BWF Lectures cited if given in fiscal year 2000.*

Arkansas Tech University

Michael S. DuBow, Ph.D.

McGill University

Blazing biosensors and orphan genes: meeting the challenges of genomics and the environment

Paid \$5,000

California State University-Fullerton

James D. Oliver, Ph.D.

University of North Carolina-Charlotte

Vibrio vulnificus: death on the half shell

Paid \$5,000

Chaminade University of Honolulu

John M. Besser, Ph.D.

Minnesota Department of Health

Approved \$5,000

Florida International University

Michael A. Zasloff, M.D., Ph.D.

Magainin Research Institute

Approved \$5,000

Georgia Southern University

Betrina Wilske, Ph.D.

Max von Pettenkofer Institute for Hygiene and Medicinal Microbiology (Germany)

Approved \$5,000

Lehman College

Roberto Docampo, M.D., Ph.D.

University of Illinois at Urbana-Champaign

Approved \$5,000

McGill University
Robert Kadner, Ph.D.
University of Virginia School of Medicine
Structure meets function: a view of TonB-dependent active transport
Paid \$5,000

McMaster University
Jens Boman, M.D.
University Hospital of Umea (Sweden)
Approved \$5,000

North Carolina State University
Claire M. Fraser, Ph.D.
The Institute for Genomic Research
Microbial genome sequencing: implications for understanding
microbial diversity, evolution, and infectious disease
Paid \$5,000

Northern Arizona University
Erik de Clercq, M.D., Ph.D.
University of Leuven Medical School (Belgium)
Approved \$5,000

Oklahoma State University
James M. Tiedje, Ph.D.
Michigan State University
Approved \$5,000

Prairie View A&M University
Debra Murray, Ph.D.
Veterans Administration Medical Center-Dallas
Titin: the biggest player in cytokinesis
Paid \$5,000

University of Arkansas-Monticello
John Iandolo, Ph.D.
University of Oklahoma Health Sciences Center
Virulence mechanisms of *Staphylococcus aureus*
Paid \$5,000

University of Central Arkansas
Thomas M. Terry, Ph.D.
University of Connecticut
Approved \$5,000

University of Guam
Hans W. Paerl, Ph.D.
University of North Carolina-Chapel Hill
Cyanobacterial-bacterial consortia: a microbial life support strategy
in extreme environments
Paid \$5,000

University of Kentucky School of Medicine
Andrew D. Steele, Ph.D.
Medical University of Southern Africa (South Africa)
Emergence of retroviruses in Africa
Paid \$5,000

University of Massachusetts Medical School
Jorge E. Galan, D.V.M., Ph.D.
Yale University School of Medicine
Interaction of *Salmonella* with host cells: encounters
of the closest kind
Paid \$5,000

University of Missouri-Rolla
Kenneth H. Nealson, Ph.D.
California Institute of Technology
Approved \$5,000

University of New Mexico School of Medicine
Michael J. Buchmeier, Ph.D.
Scripps Research Institute
Pathogenesis of virus-induced demyelination
Paid \$5,000

University of Puerto Rico-Humacao University College
Mindy Brashears, Ph.D.
University of Nebraska-Lincoln
Approved \$5,000

University of Tennessee-Knoxville
Harald von Boehmer, M.D., Ph.D., D.Sc.
Harvard Medical School
Approved \$5,000

University of Wisconsin-Madison
Rudolf K. Thauer, Ph.D.
University of Marburg (Germany)
Methanogenic archaea: from the greenhouse effect
to the fire-breathing dragon
Paid \$5,000

SUBTOTALS: Approved \$55,000
Paid \$55,000

Other Grants

In addition to making competitive awards, BWF makes noncompetitive grants for activities that are closely related to our major focus areas. These grants are intended to enhance the general environment for research in the targeted areas.

Alzheimer's Association

Support in lieu of an honorarium for Dr. Elmima Johnson, a member of BWF Science Education Advisory Committee
Approved \$1,250 Paid \$1,250

American Heart Association

Support in lieu of an honorarium for Dr. Elmima Johnson, a member of BWF Science Education Advisory Committee
Approved \$1,250 Paid \$1,250

American Society for Microbiology

Support for administering the BWF Visiting Professorships in the Microbiological Sciences
Approved \$2,500 Paid \$5,000

Canadian Federation of Biological Societies

Support for administering the BWF Visiting Professorships in the Basic Medical Sciences
Approved \$2,500

Carnegie Institution of Washington

Support for the Capital Science Lectures
Approved \$10,000 Paid \$10,000

Federation of American Societies for Experimental Biology

Support for administering the BWF Visiting Professorships in the Basic Medical Sciences
Approved \$11,354 Paid \$20,954

Grantmakers for Education

Support for general activities
Approved \$1,000 Paid \$1,000

Medical Research Council of Canada

Support for the BWF Student Research Award Program
Approved \$1,000,000 Paid \$500,000

National Academy of Sciences

Support for a workshop on issues and opportunities for Ph.D. scientists who are interested in becoming high school teachers
Paid \$100,000

National Association of Academies of Science

Support for a session at the annual meeting of the American Association for the Advancement of Science to provide high school students an opportunity to interact with scientists
Approved \$2,500 Paid \$2,500

National Institutes of Health

Support for a clinical research symposium and a career awareness fair at the Student National Medical Association annual meeting
Approved \$2,500 Paid \$2,500

North Carolina Association for Biomedical Research

Support for general activities
Approved \$25,000 Paid \$25,000

North Carolina Association for Biomedical Research

Support for the association's 10th anniversary celebration
Approved \$2,500 Paid \$2,500

North Carolina Central University

Support for planning and coordinating the Minority and At-Risk Youth Academic Skills Preparedness Outreach and Technical Support Initiative
Approved \$43,983 Paid \$43,983

North Carolina Museum of Life and Science

Support for the Grassroots Science Museums Collaborative
Paid \$1,000,000

North Carolina Science Olympiad

Support for the tournament
Approved \$5,000 Paid \$10,000

North Carolina State University

Support for a conference of representatives from university science departments to discuss K-12 outreach
Approved \$271,292

Public School Forum of North Carolina

Support for developing an international study program for educational policymakers
Approved \$145,800 Paid \$50,000

Public School Forum of North Carolina

Support for the Institute for Educational Policymakers
Approved \$225,000 Paid \$50,000

Shodor Education Foundation

Support for developing and maintaining the Student Science Enrichment Program Web site
Approved \$20,000 Paid \$20,000

University of Alabama-Birmingham

Support for the Graduate Student Endowment
Approved \$5,000 Paid \$5,000

**SUBTOTALS: Approved \$1,778,429
Paid \$1,850,937**

Environment for Science

TOTAL APPROVED \$444,765 TOTAL PAID \$1,229,765

General

Council on Foundations

Support for general activities

Approved \$39,600 Paid \$39,600

Duke University Medical Center

Support for general activities of the Children's Health Center

Approved \$17,500 Paid \$17,500

Foundation Center

Support for general activities

Approved \$7,500 Paid \$7,500

Grantmakers in Health

Support for general activities

Approved \$5,000 Paid \$5,000

Institute for Science Philanthropy

Support for general activities

Approved \$50,000 Paid \$50,000

Johns Hopkins University

Support for the Daniel Nathans Fund for Basic Medical Sciences, named in honor of the late BWF board member

Approved \$50,000 Paid \$50,000

Keystone Symposia

Support for general activities

Approved \$25,000 Paid \$25,000

Medical Research Council of Canada

Support for producing a video commemorating the council

as it is incorporated into the Canadian Institutes of Health Research

Approved \$20,000 Paid \$20,000

National Institute of Diabetes and Digestive and Kidney Diseases

Support for a conference titled "Challenges in Health Disparity in the New Millennium"

Approved \$20,000 Paid \$20,000

National Library of Medicine

Support for general activities

Approved \$7,500 Paid \$7,500

North Carolina Center for Nonprofits

Support for a conference titled "Celebrating North Carolina's Nonprofit Sector: Growing Strong Together"

Approved \$3,000 Paid \$3,000

North Carolina Center for Nonprofits

Support for general activities

Approved \$1,000 Paid \$1,000

North Carolina Sickle Cell Foundation

Support for the foundation's annual conference

Approved \$2,500 Paid \$2,500

Research!America

Support for general activities

Approved \$5,000 Paid \$5,000

Society for the Advancement of Women's Health Research

Support for general activities

Approved \$5,000 Paid \$5,000

Southeastern Council of Foundations

Support for general activities

Approved \$5,000 Paid \$5,000

Triangle Community Foundation

Support for the Gertrude B. Elion Fund, named in honor of the late BWF board member

Approved \$5,165 Paid \$505,165

University of North Carolina-Chapel Hill School of Medicine

Support for producing a biography of Dr. Reece Berryhill, former dean of the medical school, and for compiling all of the Norma Berryhill Lectures

Approved \$5,000 Paid \$5,000

SUBTOTALS: Approved \$273,765

Paid \$773,765

Communications

American Association for the Advancement of Science
 Support for the Mass Media Science and Engineering Fellows Program
 Approved \$16,000 Paid \$16,000

Council for the Advancement of Science Writing
 Support for the New Horizons in Science Briefing and the Traveling
 Fellowship Program
 Approved \$30,000 Paid \$30,000

SUBTOTALS: Approved \$46,000
Paid \$46,000

History of Medicine

National Humanities Center
 Support for the BWF History of 20th Century Medicine Fellowship
 Paid \$160,000

University of Michigan Health System
 Support for a symposium on the history of pediatrics
 Approved \$5,000 Paid \$5,000

Stanford University Medical Center
 Support for a symposium on the history of women in medicine
 Approved \$2,500 Paid \$2,500

SUBTOTALS: Approved \$7,500
Paid \$167,500

Science Policy

American Association for the Advancement of Science
 Support for the Center for Science, Technology, and Congress
 Paid \$100,000

Institute of Medicine
 Support for general activities
 Approved \$5,000 Paid \$5,000

American Enterprise Institute for Public Policy Research
 Support for research activities on biomedical policy
 Approved \$5,000 Paid \$5,000

Jackson Heart Study
 Support for a meeting titled "Capacity Building for Research
 and Training in Minority Health"
 Approved \$5,000 Paid \$5,000

Association of Academic Health Centers
 Support for the association's annual meeting, titled "Global
 Dimensions of Domestic Health Issues"
 Approved \$7,500 Paid \$7,500

Research!America
 Support for continuation of the 435 Project advocating for increased
 funding for medical research
 Approved \$50,000 Paid \$25,000

Center for the Advancement of Health
 Support for an initiative to build scientific capacity for conducting
 behavioral research and translating research into policy and practice
 Paid \$50,000

Sigma Xi, the Scientific Research Society
 Support for a conference titled "New Ethical Challenges in Science
 and Technology"
 Approved \$25,000 Paid \$25,000

Harvard Medical School
 Support for studying the evolving status of research faculty
 at academic health centers
 Approved \$20,000 Paid \$20,000

SUBTOTALS: Approved \$117,500
Paid \$242,500

INFORMATION FOR APPLICANTS

The Burroughs Wellcome Fund makes approximately 90 percent of our grants through competitive award programs, which support investigators in targeted areas of basic scientific research that have relevance to human health. Most of BWF's award programs are open only to citizens or permanent residents of the United States and Canada. (Programs with different requirements are noted in the descriptions that follow.) Awards are made with the advice of our advisory committees, which comprise scientists and educators selected for their expertise in the program areas. Program application deadlines for the 2002 award series are listed in the "Program Application Deadlines" section.

Most awards are made only to degree-granting institutions on behalf of individual researchers, who must be nominated by their institution. Institutions receiving awards must be tax-exempt 501(c)(3) organizations. Government agencies, such as the National Institutes of Health and the Centers for Disease Control and Prevention, generally are not eligible for awards.

Throughout the following program descriptions, references to M.D. and Ph.D. degrees include all types of medical and scientific doctoral degrees.

BWF believes that diversity within the scientific community enhances the well-being of the research enterprise; therefore, we encourage applications from women and from members of underrepresented minority groups.

BWF does not support activities that are primarily clinical in nature (such as disease diagnosis and treatment) or primarily related to health care and health care policy. We generally do not provide support for research projects or other activities outside our competitive programs, nor do we generally support endowments, development campaigns, ordinary operating expenses, capital facilities and equipment, or publications.

BURROUGHS WELLCOME FUND

Telephone (919) 991-5100

Fax (919) 991-5160

www.bwfund.org

Mailing Address:

Post Office Box 13901

Research Triangle Park, NC 27709-3901

Shipping Address:

21 T. W. Alexander Drive

Research Triangle Park, NC 27709

Award Programs

Biomedical Sciences

Career Awards in the Biomedical Sciences

These awards are made in honor of Gertrude B. Elion, D.Sc., and George H. Hitchings, Ph.D., who shared the 1988 Nobel Prize in Physiology or Medicine and were long associated with the Burroughs Wellcome Fund. The awards are intended to foster the development and productivity of biomedical researchers who are early in their careers and to help them make the critical transition to becoming independent investigators. The awards provide support ranging from \$445,000 over four years to \$574,000 over six years to bridge advanced postdoctoral training and the first three years of faculty service. Recipients may spend part of the award period at institutions in the United Kingdom or the Republic of Ireland. BWF expects to make at least 20 awards annually, with some of them specifically targeted at reproductive science. Approximately half of the awards will go to researchers with a Ph.D. degree and half to those with an M.D. or M.D.-Ph.D. degree. Candidates must have completed at least 12 months but not more than 48 months of postdoctoral research training by the application deadline. For candidates with M.D. degrees, postdoctoral training excludes clinically oriented residencies that do not contain a major research component. Researchers who hold a faculty appointment as an assistant professor or the equivalent, or who know they will hold such an appointment within a year of the application deadline, are not eligible.

Interfaces in Science

Career Awards at the Scientific Interface

This new program will begin with the 2002 award series. These awards are intended to foster the early career development of researchers with backgrounds in the physical/computational sciences whose work addresses biological questions and who are dedicated to pursuing a career in academic research. Candidates are expected to draw from their training in a scientific field other than biology to propose innovative approaches to answer important questions in the biological sciences. The awards provide up to \$538,000 over five years to support up to two years of advanced postdoctoral training and the first three years of a faculty appointment. BWF expects to make up to 10 awards. Candidates must have a Ph.D. degree in physics, chemistry (physical, theoretical, or computational), mathematics, computer science, statistics, or engineering. Exceptions will be made only if the candidate can demonstrate significant expertise in one of these areas, evidenced by publications or advanced course work. In addition to being open to U.S. and Canadian citizens and permanent residents, this program is open

to temporary residents whose lawful immigration status has been granted and will extend for the duration of the award. BWF will make awards in this program every two years, alternating with the Institutional Awards at the Scientific Interface program, which is targeted at fostering interdisciplinary training at institutions.

Institutional Awards at the Scientific Interface

These awards, which are made to degree-granting institutions, are intended to encourage the interdisciplinary training of graduate and postdoctoral students from the physical, chemical, and computational sciences so they can better apply their unique knowledge and talents to biological problems. BWF will make awards in this program every two years, alternating with the Career Awards at the Scientific Interface program, which is intended to foster the career development of individual researchers. The next institutional awards will be made during the 2003 award series. We expect to commit up to \$10 million for these awards each year they are offered, and the awards will provide from \$150,000 to \$500,000 per year for five years. Emphasis will be placed on supporting new programs or existing programs that will change graduate and postdoctoral training in a meaningful way, as opposed to programs seeking more funding for activities already under way.

Infectious Diseases

Pathogenesis of Infectious Diseases

This award program, now under development, will promote the study of human-pathogen interactions. The program will encourage investigators early in their careers to pursue new avenues of research. The goal will be not only understanding individual pathogens, but also shedding light on the overarching issues of how the human host handles infectious challenges.

Therapeutic Sciences

Clinical Scientist Awards in Translational Research

These awards are intended to foster the development and productivity of established independent physician-scientists who will strengthen translational research, the two-way transfer between work at the laboratory bench and clinical medicine. The awards provide \$750,000 over five years (\$150,000 per year). BWF expects to make up to 10 awards annually. We are interested particularly in supporting investigators who will bring novel ideas and new approaches to translational research and who will mentor the next generation of physician-scientists. Proposed activities may draw on the many recent advances in the basic biomedical sciences—including such fields as biochemistry, cell biology, genetics, immunology, molecular biology, and pharmacology—that provide a wealth of opportunities for studying and alleviating human disease. Candidates generally must be affiliated with a medical school; candidates at other types of degree-granting institutions (including schools of veterinary medicine, public health, and pharmacy) will be considered only if they can demonstrate a plan for coordinating with institutions that provide the patient connection essential for translational research. Candidates must have an M.D. or M.D.-Ph.D. degree and hold an appointment or joint appointment in a subspecialty of clinical medicine. In exceptional circumstances, non-M.D. candidates will be considered if their work is likely to contribute significantly to the clinical enterprise; these candidates should hold an appointment or joint appointment in a clinical department. Candidates must be tenure-track investigators at the late assistant professor level or the associate professor level, or hold an equivalent tenure-track position, at the time of application. Candidates must present evidence of already having established an independent research career, as this is not a “new investigator” award. Individuals holding the rank of professor are ineligible.

Reproductive Science

At least one of the Career Awards in the Biomedical Sciences is targeted to reproductive science annually. Qualifications for this award are outlined in the “Biomedical Sciences” section. In addition, BWF provides partial support for one award annually to help obstetrician-gynecologists working in the basic reproductive sciences bridge the postdoctoral years and initial faculty years. The award is made through the Reproductive Scientist Development Program (RSDP), a consortium supported by the National Institute of Child Health and Human Development, professional societies, and foundations. BWF provides \$240,000 over the first three faculty years, and RSDP supports the postdoctoral years. This award is open only to citizens and permanent residents of the United States. Contact RSDP for information (415/476-9047).

Science Education

Student Science Enrichment Program

These awards are limited to nonprofit organizations in BWF’s home state of North Carolina. BWF provides \$1 million annually for this program, and awards provide up to \$60,000 per year for three years. The program’s goals include improving students’ competence in science, nurturing their enthusiasm for science, and interesting them in pursuing careers in research or other science-related areas. The awards are intended to support projects that provide creative science enrichment activities for students in the sixth through twelfth grades who have shown exceptional skills and interest in science, as well as those who may not have had an opportunity to demonstrate conventional “giftedness” in science but are perceived to have high potential. The projects must enable students to participate in hands-on scientific activities and pursue inquiry-based avenues of exploration—an educational approach that has proven to be an effective way to increase students’ understanding and appreciation of the scientific process. Project activities must take place outside of the usual school environment, such as after school, on weekends, or during vacation periods. Projects may be conducted all year, during the school year, or during the summer. Eligible organizations include colleges and universities, community groups, museums and zoos, public and private schools, scientific groups, and others that can provide experiential activities for middle school and high school students. We encourage partnerships—for example, between scientific groups and school systems or between universities and community groups. Industries may participate in collaboration with nonprofit organizations that assume the lead role.

Environment for Science

BWF makes noncompetitive grants for activities that fall outside of our competitive award programs but are closely related to our targeted areas, such as career development of scientists or the pathogenesis of infectious diseases. We place special priority on working with nonprofit organizations, including government agencies, to leverage financial support for our targeted areas of research, and on encouraging other foundations to support biomedical research. Proposals should be submitted to BWF in the form of a letter, which should be no more than five pages. Applicants should describe the focus of the activity, the expected outcomes, and the qualifications of the organization or individuals involved; provide certification of the sponsor’s Internal Revenue Service tax-exempt status; and give the total budget for the activity, including any financial support obtained or promised. Proposals are given careful preliminary review, and those deemed appropriate are presented for consideration by BWF’s Board of Directors during one of its quarterly meetings.

PROGRAM APPLICATION DEADLINES

2002 Award Series

BIOMEDICAL SCIENCES

Career Awards in the Biomedical Sciences

October 1, 2001

INTERFACES IN SCIENCE

Career Awards at the Scientific Interface

May 1, 2001

Institutional Awards at the Scientific Interface

See note below*

INFECTIOUS DISEASES

Pathogenesis of Infectious Diseases

November 1, 2001

THERAPEUTIC SCIENCES

Clinical Scientist Awards in Translational Research

August 30, 2001

REPRODUCTIVE SCIENCE

Career Awards in the Biomedical Sciences

October 1, 2001

Reproductive Scientist Development Program

October 1, 2001

SCIENCE EDUCATION

Student Science Enrichment Program

October 15, 2001

ENVIRONMENT FOR SCIENCE

Received all year

** These institutional awards are offered every other year. The next awards will be made in the 2003 award series, and the application deadline will be in the spring of 2002.*

ADVISORY COMMITTEES

The Burroughs Wellcome Fund uses advisory committees for each competitive award program to review grant applications and make recommendations to BWF's Board of Directors, which makes the final decisions. We select members of these committees for their scientific and educational expertise in the program areas. In addition, BWF uses a financial advisory committee to help in developing and reviewing the Fund's investment policies. This committee is appointed by and reports to the Board of Directors.

Career Awards in the Biomedical Sciences

Mina J. Bissell, Ph.D.

Ernest Orlando Lawrence Berkeley National Laboratory

Pamela J. Bjorkman, Ph.D.

Howard Hughes Medical Institute
California Institute of Technology

William Chin, M.D.

Eli Lilly and Company

Patricia K. Donahoe, M.D.

Massachusetts General Hospital
Harvard Medical School

Uta Francke, M.D.

Howard Hughes Medical Institute
Stanford University School of Medicine

Elaine Fuchs, Ph.D.

Howard Hughes Medical Institute
University of Chicago

Phil Gold, M.D., Ph.D. (Cochair)

Montreal General Hospital
McGill University Faculty of Medicine

Lawrence C. Katz, Ph.D.

Howard Hughes Medical Institute
Duke University Medical Center

Stanley J. Korsmeyer, M.D.

Howard Hughes Medical Institute
Dana-Farber Cancer Institute
Harvard Medical School

George M. Langford, Ph.D.

Dartmouth College

Martin M. Matzuk, M.D., Ph.D.

Baylor College of Medicine

Donald W. Pfaff, Ph.D.

Rockefeller University

Suzanne R. Pfeffer, Ph.D.

Stanford University School of Medicine

Jerome F. Strauss III, M.D., Ph.D. (Cochair)

University of Pennsylvania Health System

Ian A. Wilson, D.Phil.

Scripps Research Institute

James M. Wilson, M.D., Ph.D.

Institute for Human Gene Therapy
University of Pennsylvania Health System

Christopher Wylie, Ph.D.

University of Cincinnati College of Medicine

Interfaces in Science

Robert H. Austin, Ph.D.
Princeton University

Robert L. Baldwin, Ph.D.
Stanford University School of Medicine

Jeremy M. Berg, Ph.D.
Johns Hopkins University School of Medicine
Until July 2000

Carlos Bustamante, Ph.D.
Howard Hughes Medical Institute
University of California-Berkeley
Appointed November 2000

Jeffrey I. Gordon, M.D.
Washington University School of Medicine

James Hudspeth, M.D., Ph.D. (Chair)
Howard Hughes Medical Institute
Rockefeller University

Douglas A. Lauffenburger, Ph.D.
Massachusetts Institute of Technology

Paul C. Lauterbur, Ph.D.
University of Illinois at Urbana-Champaign

Tamar Schlick, Ph.D.
Howard Hughes Medical Institute
Courant Institute of Mathematical Sciences
New York University

Susan S. Taylor, Ph.D.
Howard Hughes Medical Institute
University of California-San Diego School of Medicine
Appointed November 2000

Michael S. Waterman, Ph.D.
University of Southern California

Molecular Parasitology/Malaria

These programs are being incorporated into BWF's new program in infectious diseases.

John C. Boothroyd, Ph.D. (Chair)
Stanford University School of Medicine

Daniel G. Colley, Ph.D.
Centers for Disease Control and Prevention

Stephanie L. James, Ph.D.
National Institute of Allergy and Infectious Diseases
National Institutes of Health

Chris Newbold, Ph.D.
Institute of Molecular Medicine
University of Oxford (United Kingdom)

Kenneth D. Stuart, Ph.D.
Seattle Biomedical Research Institute

Thomas E. Wellems, M.D., Ph.D.
National Institute of Allergy and Infectious Diseases
National Institutes of Health

Molecular Pathogenic Mycology

This program is being incorporated into BWF's new program in infectious diseases.

John E. Edwards Jr., M.D.
Harbor-UCLA Medical Center
University of California-Los Angeles School of Medicine

Gerald R. Fink, Ph.D.
Whitehead Institute for Biomedical Research
Massachusetts Institute of Technology

June Kwon-Chung, Ph.D.
National Institute of Allergy and Infectious Diseases
National Institutes of Health

P. T. Magee, Ph.D. (Chair)
University of Minnesota

Juneann W. Murphy, Ph.D.
University of Oklahoma Health Sciences Center

Clinical Scientist Awards in Translational Research

Martin J. Blaser, M.D. (Cochair)
New York University Medical Center

Bruce A. Chabner, M.D. (Cochair)
Massachusetts General Hospital

Susan George, M.D.
University of Toronto Faculty of Medicine

John W. Griffin, M.D.
Johns Hopkins University School of Medicine

Judith G. Hall, M.D.
University of British Columbia Faculty of Medicine

Charles A. Janeway Jr., M.D.
Howard Hughes Medical Institute
Yale University School of Medicine

Barton A. Kamen, M.D., Ph.D.
Robert Wood Johnson Medical School
University of Medicine and Dentistry of New Jersey

John E. Niederhuber, M.D.
University of Wisconsin Medical School

Jennifer M. Puck, M.D.
National Human Genome Research Institute
National Institutes of Health

Judith L. Swain, M.D.
Stanford University Medical Center

Craig B. Thompson, M.D.
Leonard and Madlyn Abramson Family Cancer Research Institute
University of Pennsylvania Medical Center

Michael J. Welsh, M.D.
Howard Hughes Medical Institute
University of Iowa College of Medicine

Wayne M. Yokoyama, M.D.
Howard Hughes Medical Institute
Washington University School of Medicine

New Investigator Awards in the Pharmacological or Toxicological Sciences

This program is being discontinued after the 2001 award series.

PHARMACOLOGICAL SCIENCES SUBCOMMITTEE

Lorraine J. Gudas, Ph.D.
Weill Medical College of Cornell University

T. Kendall Harden, Ph.D.
University of North Carolina-Chapel Hill School of Medicine

Lee E. Limbird, Ph.D. (Chair)
Vanderbilt University Medical Center

Victor Ling, Ph.D.
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CONTACT INFORMATION FOR MAJOR PROGRAMS

Staff E-mail Addresses and Program Areas

D. Carr Agyapong, cagyapong@bwfund.org
Science education

Martin Ionescu-Pioggia, Ph.D., mionescu@bwfund.org
Biomedical sciences, reproductive science

Victoria P. McGovern, Ph.D., vmcgovern@bwfund.org
Infectious diseases

Nancy S. Sung, Ph.D., nsung@bwfund.org
Interfaces in science, therapeutic sciences

Jean A. Kramarik, jkramarik@bwfund.org
Infectious diseases

Debra A. Linkous, dlinkous@bwfund.org
Interfaces in science, therapeutic sciences

Melanie B. Scott, mscott@bwfund.org
Science education

Rolly L. Simpson Jr., rsimpson@bwfund.org
Biomedical sciences, reproductive science

BURROUGHS WELLCOME FUND

Telephone (919) 991-5100
Fax (919) 991-5160

www.bwfund.org

Mailing Address:
Post Office Box 13901
Research Triangle Park, NC 27709-3901

Shipping Address:
21 T. W. Alexander Drive
Research Triangle Park, NC 27709

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Telephone (919) 991-5100

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