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BURROUGHS WELLCOME FUND



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2005 ANNUAL REPORT



BURROUGHS WELLCOME FUND HISTORICAL TIMELINE

1950'S

1955 - BWF established as a corporate foundation in Tuckahoe, New York
1955 - William N. Creasy appointed first president and board chair
1959 - First advisory committee appointed, on clinical pharmacology
1959 - First competitive award program launched—Clinical Pharmacology Scholar Award program

1970'S

1970 - BWF moves to Research Triangle Park, North Carolina (with Burroughs Wellcome Co.)
1971 - Dr. George H. Hitchings becomes president
1974 - Iris B. Evans appointed first executive director
1978 - BWF grantmaking reaches \$1 million annually
1979 - Toxicology Scholar Award program launched

1980'S

1981 - Martha Peck appointed executive director
1981 - Molecular Parasitology Scholar Award program launched
1983 - Scholar Award in Pharmacoepidemiology program launched
1985 - Immunopharmacology of Allergic Diseases Awards launched
1987 - Hitchings Awards for Innovative Methods in Drug Design and Discovery launched
1988 - First BWF newsletter (FOCUS) published
1988 - BWF President George H. Hitchings receives the Nobel Prize in Physiology or Medicine, along with Dr. Gertrude Elion and Sir James Black

1990'S

1990 - Dr. Howard J. Schaeffer appointed president
1991 - First female member appointed to the board Dr. Gertrude Elion
1991 - First non-Wellcome representative appointed to the board Dr. Samuel Katz
1993 - BWF receives \$400 million endowment from The Wellcome Trust
1993 - BWF becomes independent private foundation
1994 - Dr. Enriqueta Bond, becomes first full-time president
1994 - Dr. Schaeffer appointed board chair
1994 - Career Awards in the Biomedical Sciences program launched
1995 - BWF conducts first terrain mapping (strategic planning) exercise
1995 - Interfaces in Science program launched
1995 - Molecular Pathogenic Mycology Awards program launched
1996 - New Initiatives in Malaria Research Awards program launched
1996 - Student Science Enrichment Program launched
1996 - International Malaria Genome Project launched, with BWF support
1996 - First BWF website launched
1996 - North Carolina Institute for Education Policymakers formalized
1997 - Clinical Scientist Awards in Translational Research program launched
1997 - First directory of BWF award recipients published
1998 - BWF-Wellcome Trust Infectious Diseases Collaboration launched
1998 - Ground broken for permanent BWF headquarters building (April 17)
1999 - North Carolina Grassroots Science Museum Collaborative formalized

2000'S

2000 - Dedication ceremony for BWF's new home (May 24-25)
2000 - BWF conducts second terrain mapping exercise, which focuses core programs on five areas: basic biomedical sciences, infectious diseases, interfaces in science, translational research, and science education
2000 - Pathogenesis of Infectious Disease program launched
2001 - Career Awards at the Scientific Interface program launched
2003 - North Carolina Science, Mathematics, and Technology Education Center formalized
2005 - Health Research Alliance formalized, with BWF support
2005 - BWF conducts third terrain mapping exercise
2005 - BWF celebrates 50th anniversary



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



**Burroughs Wellcome Fund
Headquarters**

21 T.W. Alexander Drive
Research Triangle Park,
North Carolina

During its years as a corporate foundation, the Burroughs Wellcome Fund had shared space with Burroughs Wellcome Co., first in New York and then in North Carolina. After the Fund became a private independent foundation in 1994, it rented space in the Research Triangle area. In 1996, the BWF Board of Directors began discussions about building a freestanding headquarters that would firmly establish the Fund as an independent entity and provide meeting space for convening award recipients, as well as the Fund's board and advisory committees.

Perkins and Will of Charlotte, North Carolina, the selected architecture firm, designed the Fund's new headquarters.

In 1998, the Fund broke ground and a year later the staff moved into its permanent home.



HISTORY OF THE BURROUGHS WELLCOME FUND

The Burroughs Wellcome Fund is an independent private foundation dedicated to advancing the biomedical 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 biomedical sciences that are undervalued or in need of particular encouragement.

BWF has an endowment of \$700 million and awards approximately \$30 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—basic biomedical sciences, infectious diseases, interfaces in science, translational research, 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.

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. In 1993, after nearly four decades as a corporate foundation, BWF received a \$400 million grant from the Wellcome Trust to become a foundation fully independent of the Trust and the Burroughs Wellcome Co. Though we are today an independent philanthropy, our history and joint program activities allow us to maintain productive ties with the Wellcome Trust.

BWF has an endowment of \$700 million and awards \$30 million in grants annually in the United States and Canada. We channel our financial support through five competitive peer-reviewed award programs.



BWF is committed to the belief that fostering research by the best and brightest scientists offers the fullest promise for improving human health.

HISTORY

With this increase in assets resulting from the Wellcome Trust endowment, 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 guided by advisory committees composed of leading researchers and educators.

The importance of curiosity-driven research, as endorsed by Henry Wellcome, continues to be 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.

PRESIDENT'S MESSAGE

For 50 years, the Burroughs Wellcome Fund's mission—to advance the biomedical sciences through support of research and education—has remained consistent. Although the Fund has shifted priorities in response to the evolving nature of the research enterprise, our commitment to investing in the career development of young scientists and supporting investigators in underfunded and undervalued areas of science has remained steadfast.

In 2004-2005, as the stock market recovered, BWF was able to resume a full program of support. Our program activities are described in the following sections, along with profiles of representative program awardees.

Four of our award programs are open to scientists in the United States and Canada—Career Awards in the Biomedical Sciences, Career Awards at the Scientific Interface, Clinical Scientist Awards in Translational Research, and Investigators in Pathogenesis of Infectious Disease. Our fifth program supports creative science education activities for middle school and high school students only in North Carolina.

As we write this annual report, BWF already anticipates the 2005-2006 award cycle when we should be able to increase, at least slightly, the number of awards in each program—provided that the stock market continues to recover. We also will continue to convene our awardees for networking, training, and building the BWF family.

Charting Future Directions

Keeping stride with research encourages us to be mindful of the field and gives us the ability to determine where needs are greatest. BWF serves best as a “niche player,” and our Board of Directors has carefully selected areas of grantmaking in which we will support individual researchers rather than research projects or infrastructure. During the past award year the Fund conducted a strategic planning exercise, or terrain mapping, in which we reviewed our award programs and repositioned them for the next five years (2005-2010).

As it reviewed Fund programs, the board considered a number of ongoing changes in the scientific landscape. Notably, these changes include the federal government's increased funding for bioterrorism; the National Institutes of Health's (NIH) efforts to implement its new roadmap, which emphasizes clinical research and recognizes that the scale and complexity of biomedical research requires interdisciplinary and multidisciplinary research teams; the Food and Drug Administration's increased efforts to speed the transfer of innovative medical therapies to patients; and the ongoing national debate about the composition of the U.S. science, technology, engineering, and mathematics workforce.



Enriqueta C. Bond, Ph.D.



"It is the gifted, unorthodox,
individual, in the laboratory, or
the study, or the walk by the river
at twilight, who has always
brought to us and must continue
to bring to us, all the basic
resources by which we live."

— Caryl P. Haskins
Carnegie Institute
President

Since BWF's award programs seek to identify young scientists who will become tomorrow's leaders and to provide them with flexible long-term support, thus enabling increased risk-taking and fostering innovation, our board felt that we should continue our current direction and emphasize investing in the human capital of the research enterprise.

When BWF undertook our first terrain mapping process 10 years ago, our assets totaled \$430 million. In the ensuing years, BWF has awarded approximately \$250 million to fulfill our mission. Our assets have now grown to \$700 million, and we make between \$25 million and \$30 million in grants annually.

But what BWF can spend is dwarfed by the roughly \$60 billion in investments made by federal funders and the pharmaceutical industry. This clear "fact of life" is what drives BWF's decision to support individual researchers in areas that are not reached by the larger contributors of research dollars.

The Fund's strategy is to invest the bulk of our dollars—85 percent—in awards through competitive programs. We invest the remaining 15 percent through small ad hoc grants intended to improve the environment for our awardees and through catalytic grants that facilitate work on a problem of interest to our awardees, such as the sequencing of the malaria genome.

K-12 Science, Mathematics, and Technology Education

To help commemorate our 50th anniversary in 2005, BWF commissioned a short history emphasizing our past two decades of grantmaking—earlier grantmaking had been well covered in a similar history written in 1985 by Iris Evans, the Fund's first executive director. We also held an anniversary gala in May 2005, which celebrated the success of our awardees and spotlighted the need to champion science, mathematics, and technology (SMT) preK-12 education in North Carolina. The event featured leaders from the local scientific, business, and government communities who advocate for SMT education investments—and it also illustrated the importance of such investments by showcasing some of the enthusiasm and excellence of the young scientists-in-training whom BWF supports in North Carolina.

At the celebration, BWF presented a \$2.5 million grant to the North Carolina Science, Mathematics, and Technology Education Center (SMT Center). This is a new organization that BWF has been incubating since 2002.

BWF created the SMT Center in recognition of the fact that despite advances in preK-12 education in North Carolina, there is still much to be done if the state is to achieve its potential. The SMT Center will advocate, broker, facilitate, and communicate the urgency of advancing science and mathematics in the state's schools. Its goal is to help North Carolina achieve its vision of having the best public schools in the nation by 2010. BWF recognizes that there is no magic bullet for improving preK-12 SMT education—but we also recognize that steady, patient, creative leadership from a new institution such as the SMT Center will be critical in achieving the type and degree of educational improvement needed in our home state.

PRESIDENT'S MESSAGE

Education in the United States currently consumes 7 percent of the U.S. gross domestic product, yet the educational system remains in turmoil. This issue is of deep concern to parents, political leaders, employers, and the general public. On May 19, 2005—almost coincident with our anniversary—the Education and the Workforce's 21st Century Competitiveness Subcommittee of the U.S. House of Representatives met to examine problems in science and mathematics education that are hampering U.S. advancement. Witnesses agreed on the importance of fostering effective preK-12 science and mathematics education to help the nation maintain its technological competitiveness.

The Fund first turned major attention to science and mathematics education in 1994, when we began supporting activities through our Student Science Enrichment Program (SSEP), which enables middle school and high school students in North Carolina to fully engage in hands-on inquiry-based science learning. Many members of our board recall that it was just such experiences that "turned them on" to science and encouraged them to seek scientific careers.

Under SSEP, the Fund has awarded grants to 47 institutions spanning the state. Each year, we receive applications from universities, community colleges, public and private schools, museums, and other groups who offer science enrichment programs to middle school and high school students. Some of these are year-round programs and others are academic year or summer programs. With a total investment of \$11 million since the beginning of SSEP, we have reached more than 24,000 students across North Carolina.

SSEP gives particular attention to targeting the recruitment of underrepresented minorities and females in an effort to broaden the participation of these groups in the nation's science, technology, engineering, and mathematics workforce. Indeed, the Fund actively solicits nominations of underrepresented minorities and women for all of our awards. As Joseph Bordogna, deputy director of the National Science Foundation, said in a recent report by the Committee on Equal Opportunities in Science and Engineering: "First it is NOT about the total number of scientists and engineers the nation may or may not need. It's easy to get distracted by trends and statistics cited in the news and debates about whether the demand for science, engineering, and technological workers is greater or less than the supply. It IS about including a larger proportion of women, underrepresented minorities, and persons with disabilities in the scientific workforce, no matter the size of that workforce. Whatever the numbers turn out to be, we need a robust and varied mix and that means broadening participation...."

As complements to our investments in SSEP and the SMT Center, the Fund has worked in other ways to strengthen the infrastructure for science and mathematics education. For example, we support the North Carolina Institute for Education Policymakers, whose purpose is to provide policymakers and the media with up-to-date information about educational issues. These efforts, it is hoped, will help legislators and other leaders make informed decisions that will improve education—and ultimately the workforce—across the state.





BWF believes that we will only be as successful as the work of our awardees, and this belief provides ample incentive to be certain that our programs are living up to expectations.

The Fund also made an inaugural grant to support the N.C. Grassroots Science Museum Collaborative, whose purpose is to enhance hands-on science inquiry through programs and activities offered by more than 25 science museums across North Carolina.

Evaluating Our Work

In order to gauge the effectiveness of our programs, guide decision-making by our board, and provide data that can broadly inform policy, BWF has adopted a strategic approach to program evaluation. BWF believes that we will only be as successful as the work of our awardees, and this belief provides ample incentive to be certain that our programs are living up to expectations.

We see the success of our programs in efforts by government and other foundations to develop programs modeled on ours. For example, the NIH and the Howard Hughes Medical Institute (HHMI) recently launched programs to “cross train” investigators who have strong backgrounds in physics, chemistry, and computational sciences so that they can address important biological problems. These programs are modeled on the Fund’s Interfaces between the Physical/Chemical/Computational Sciences and the Biological Sciences program, which we began in 1995 to foster the production of scientists with quantitative and theoretical backgrounds who can use their skills to introduce new approaches and new ideas into the biological arena. Lessons learned from this BWF program, which has since been transformed into the Career Awards at the Scientific Interface program, have been reported in *Science* (12 September 2003).

A National Academy of Sciences report released in March 2005, *Bridges to Independence: Fostering the Independence of New Investigators in Biomedical Research*, called for the NIH to make awards modeled on the Fund’s Career Awards in the Biomedical Sciences, recommending that NIH award “200 five-year grants annually of \$500,000 each.” This recommendation was based, in part, on a prospective outcome study of our program awardees, published in *Academic Medicine* (February 2003), which documented how well the awards have served in helping young postdoctoral scientists make the transition to independent research careers.

The Kauffman Foundation, after learning of the success of our Student Science Enrichment Program, is developing a similar program in its home town of Kansas City, Missouri, and we are working closely with that group to help it achieve its goals. On the North Carolina front, BWF’s continued evaluation of the SSEP, which led us to restructure the program during its early years to improve educational opportunities for students, allows us to highlight successful program models that could be replicated in other areas of the nation.

In 2002, the HHMI and BWF conceived and developed a comprehensive lab management course for awardees supported by both groups. As part of this effort, we have published *Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty*, which has been widely disseminated and is available on the HHMI website. Based on our awardees’ enthusiastic

response to this course, HHMI President Thomas Cech and I published an editorial in *Science* (18 June 2004) and suggested that preparing postdoctoral fellows for the transition to a faculty position—where they are suddenly managing a lab—is the collective responsibility of universities, professional societies, and funders of science.

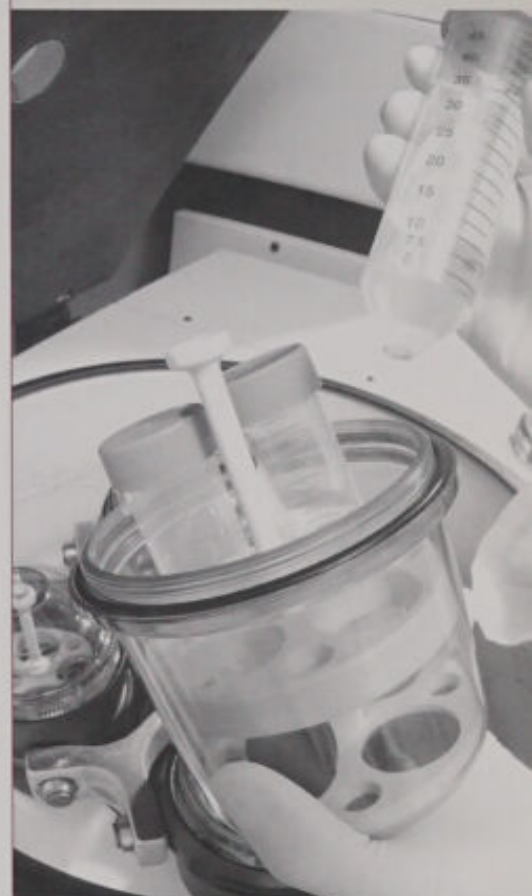
HHMI and BWF offered the lab management course again in June 2005—revised and expanded based on evaluations by the initial participants. The value of such training experiences is underscored by a recent survey carried out by Sigma Xi. Called “Doctors Without Orders,” the survey is described in the society’s publication, *The Scientist* (June 2005). The survey measured how general features of the postdoctoral experience—such as structured oversight, formal training, employment benefits, and salary—correlated with various measures of success. The results were striking. Postdocs reporting the greatest amount of structured oversight and formal training, such as in lab management, are more likely to say they are satisfied, to give their advisers high ratings, to experience relatively few conflicts with their advisers, and to be more productive in terms of numbers of publications, compared with postdocs with the least oversight and training.

To extend the work of the lab management course, the Fund is working—in partnership with HHMI, the NIH’s Fogarty International Center, and the Wellcome Trust—on internationalizing the course manual in order to produce a resource for scientists in the developing world.

Next Steps and New Initiatives

The Health Research Alliance (HRA), a collaboration of 16 nonprofit organizations that support health research, is another institution that BWF is incubating in order to work more closely with other funders on common problems and challenges. The HRA’s mission is to foster collaborations among not-for-profit, nongovernmental organizations that support health research with the goal of enhancing biomedical science and speeding its translation into clinical applications. The group is currently working on a foundation awards database to consolidate information among its constituents in an online and centralized location to provide evidence for strategic planning and decision-making. It is also in the process of developing a “toolkit” of approaches that member organizations can use to evaluate their programs.

In order to create a better scientific environment in the developing world and to provide input to new program and program evaluation efforts, BWF and the Wellcome Trust, our sister philanthropy in the United Kingdom, convened awardees from our Joint Program in Infectious Diseases of the Tropical Developing World, in South Africa in November 2005. This program supported the collaborative work of a U.S. or Canadian principal investigator, a U.K. principal investigator, and a principal investigator in a developing country on problems with a center of gravity in the developing world. Our hope is that this meeting will result in new efforts in developing partnerships to address international health matters.





BWF actively solicits nominations for all our awards of underrepresented minorities and women.

PRESIDENT'S MESSAGE

Finally, BWF is deeply concerned that we represent best practices in our philanthropy and adhere to the highest ethical standards. In response to the growing media interest in charitable organizations and to Congress's perception of abuses in the nonprofit sector, a number of groups have offered proposals for new regulations and sanctions to curb any current problems. The Council on Foundations is providing leadership on these matters, and I am serving on a committee to develop a set of guiding principles for independent foundations. At the Fund's annual meeting in October 2005, our board reviewed all of our policies and procedures to ensure that BWF's practices conform to the principles, standards, and ethical codes that should guide the work of foundations.

CAREER AWARDS IN THE BIOMEDICAL SCIENCES

Twenty-two biomedical scientists representing a range of disciplines were named 2005 Burroughs Wellcome Fund Career Awardees in the Biomedical Sciences. Among the awardees were eight physician-scientists, seven women, two underrepresented minorities, and one reproductive health scientist.

The awards, which total \$11 million, are intended to foster the development and productivity of promising young postdoctoral researchers and to help them make the critical transition to becoming independent investigators.

Since launching the Career Awards in the Biomedical Sciences (CABS) program in 1994, the Fund has made 217 individual awards, investing \$110 million in the early careers of biomedical investigators. Career awards provide \$500,000 over five years to bridge advanced postdoctoral training and the early years of faculty service. During the postdoctoral period, award recipients may train at degree-granting institutions in the United States, Canada, or the United Kingdom. All faculty positions must be taken at U.S. or Canadian degree-granting institutions.

BWF has a vested interest in the careers of our awardees and we regularly conduct activities to help prepare them for the transition into faculty positions. In June 2006, the Fund will convene CABS awardees from the two most recent cohorts at our headquarters. At the meeting, awardees will interact with leading scientists, hear scientific presentations in a range of fields, gain insights about effective ways to advance their careers, and become more familiar with their awards. They will be joined by the current recipients of BWF Career Awards at the Scientific Interface. Looking beyond this meeting, BWF is making plans to convene in summer 2007 all of our career development awardees, the first meeting of all awardees since 1999.

During the past decade, the CABS program has been in the forefront of biomedical program outcome evaluation, as BWF was the only institution that had consistent evaluation data on postdoctoral-faculty bridging awards. Between 1997 and 2002, BWF annually surveyed all CABS awardees. Results from these surveys were published in *Academic Medicine* (February 2003).

This study examined the effect of early career funding on career outcomes, and though not a controlled study, it concluded that the CABS program is meeting its goal of fostering the research independence of young investigators. In a continuing commitment to evaluation, BWF has compared the success of funded applicants for CABS awards to those who did not receive an award, and we will publish the results within the next year.

The outcome data that the Fund has accumulated on its CABS awardees has provided the basis for a number of recommendations made by the National

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Academy of Sciences in a recent policy report, *Bridges to Independence: Fostering the Independence of New Investigators in Biomedical Research*, issued in 2005. Among its recommendations, the report called on the National Institutes of Health to "establish a program to promote the conduct of innovative research by scientists transitioning into their first independent positions. These research grants would provide sufficient funding and resources for promising scientists to initiate an independent research program and allow for increased risk-taking during the final phase of their mentored postdoctoral training and during the initial phase of their independent research effort. The program should make 200 grants available annually of \$500,000 each, payable over five years."

In June 2005, the Howard Hughes Medical Institute (HHMI) and the Fund held the second five-day comprehensive laboratory management course for postdoctoral fellows. Awardees from HHMI and BWF took part in the course, held at HHMI headquarters in Chevy Chase, Maryland. Initially offered in 2002, the course has been significantly revised, based on participant surveys. The surveys also revealed that 98 percent of the participants would recommend the course to their colleagues.

Based on course evaluations, new sessions on teaching, curriculum design, and strategies for success in science were added to the course and will be added to the Web site (www.hhmi.org/labmanagement). Since first published on the Web in 2002, both the lab guide and individual chapters have been downloaded more than 75,000 times each, evidencing the need for laboratory management training nationally. A second revised edition of the original laboratory management publication, *Making the Right Moves*, is under way.

Although HHMI and BWF do not plan to offer the lab management course again, parts of the course will be incorporated into future BWF awardee meetings. HHMI and the Fund are also working with other organizations interested in developing lab management courses. Representatives of 17 universities and professional societies worked closely with HHMI and BWF staff and course speakers in creating the various training modules. These individuals now are helping their organizations to carry out similar training programs. To aid in this effort, HHMI and BWF currently are working on a "trainers guide" intended to assist organizations in developing lab management courses; the guide will be published in spring 2006.

PROFILE

WILLIAM CLEMONS, Ph.D.

Ribosomes are responsible for the creation of all of the cell's proteins. Some ribosomes are attached to the outside of a membranous organelle called the endoplasmic reticulum (ER), one of the main manufacturing facilities of the cell. These ribosomes make proteins destined to be incorporated into the membranes of the cell. The created proteins must thread through the ER membrane by means of a protein-conducting channel and into the cell's cavity, where they are then dispatched to other locations. Like every manufacturing effort, each component is important in the process.

As a graduate student, Dr. William "Bil" Clemons, was co-first author on a number of *Nature* papers describing the structure of the small ribosomal subunit. "Because the ribosome is a target for antibiotics, pharmaceutical companies spend a lot of money targeting the ribosome," said Dr. Clemons, a recipient of a Burroughs Wellcome Fund 2005 Career Award in the Biomedical Science. "By building a 3-D picture of the ribosome, you can begin to understand, in a very detailed way, how the protein-synthesizing process works, and this improved insight holds potential applications for antibacterial design."

In January 2004, Dr. Clemons, then a postdoctoral fellow at Harvard Medical School, was co-first author on a paper published in *Nature* describing the complex atomic structure of the critical protein-conducting channel in the ER membrane. Dr. Clemons and his collaborators spent two years using X-ray crystallography to generate the vast amount of data that, when analyzed, revealed the channel's structure. When the three-dimensional electron density map on his computer monitor finally showed the familiar spiral helices of a membrane protein, his part of the project fell into place.

Dr. Clemons and his colleagues have determined that the channel has an hourglass shape forming a hole in the membrane and a ring around the protein, allowing proteins to pass across the membrane while preventing leakage of other molecules from the cell.

"This has allowed us to propose models for how the channel operates and to answer many questions about its function," Dr. Clemons said.

Dr. Clemons recalls always being interested in science. Even though his parents encouraged him to become a lawyer, when he received a National Merit Scholarship in high school, he opted to enter the biochemistry program at the Virginia Polytechnic Institute and State University. He went on to complete his Ph.D. in structural biology, working jointly at the University of Utah and the Laboratory of Molecular Biology, in Cambridge, England.

The multidisciplinary approach in structural biology appeals to Dr. Clemons. The variety of protocols, knowledge of tools, and different levels of problem solving



Dr. William "Bil" Clemons is a 2005 Career Awards in Biomedical Sciences recipient. He is an assistant professor of chemistry at the California Institute of Technology.



"Without role models, it is no surprise that few minority students who make it to the college level choose science-related career paths," Dr. Clemons said. "Direct outreach programs by universities, working in conjunction with high schools on the state level, can encourage more minority students to pursue careers in research."

keeps his interest peaked during the course of an experiment. "As a structural biologist, you have many different kinds of tools that you have to be able to use over the course of the lifetime of a project," he said. "That is what keeps it exciting for me."

Whether purifying proteins in order to grow crystals, analyzing X-ray diffraction patterns, or processing vast amounts of computer calculations required in the field, what Dr. Clemons finds most interesting is the image of the structure itself. "In the end, our data is not the most interesting thing in the world, because it's all just numbers. But in the actual visual representation of that data there is a bit of artistry," he said. "When you look at journals and see the pictures of structures, there's actually an aesthetic side of it that I think is quite beautiful."

Another aspect of the scientific endeavor that captures Dr. Clemons's interest is mentoring. He recognizes that a number of minority groups are underrepresented in science, and he plans to establish programs in order to help overcome this problem. "Without role models, it is no surprise that few minority students who make it to the college level choose science-related career paths," he said. "Direct outreach programs by universities, working in conjunction with high schools on the state level, can encourage more minority students to pursue careers in research."

In January 2006, Clemons began an assistant professorship in the Chemistry and Chemical Engineering Division at the California Institute of Technology, and he said he is looking forward to establishing his own research program. "Research skills alone do not make a successful principal investigator," he said. "Leadership, communication, management, and team work are all factors. My success is as much a consequence of the people I've had the luxury to work with—and will continue to work with in the future—as it is due to my own talents."

INTERFACES IN SCIENCE

In keeping with the Burroughs-Wellcome Fund's mission of supporting emerging scientific fields, 10 years ago our Board of Directors eyed the frontier existing between biology and the quantitative, physical, and theoretical sciences. The board's thinking was that the flood of data from research efforts such as the Human Genome Project would open up fantastic opportunities for young scientists trained in physics, mathematics, computer science, and engineering to probe critical biological questions.

At the time, a dearth of training programs specifically addressed the cultural and content gaps that existed between biologists and these other scientists. Specialized programs at universities where the careers of interdisciplinary scientists could be nurtured were few and far between. In response to this need, BWF funded 10 "experiments" in interdisciplinary training through the Institutional Awards at the Scientific Interface program.

During the 2005 award cycle, eight of these 10 programs were still receiving BWF funding. They currently are providing stipend support to approximately 125 fellows. However, the reach of these programs extends to others who participate in courses and workshops organized by the programs. The majority of these fellows are graduate students earning degrees in a variety of university departments. Some of the fellows are in traditional disciplines, such as physics, mathematics, or chemistry, while others are in intentionally interdisciplinary program areas, such as bioinformatics and biophysics.

To date, the programs boast more than 200 alumni, half of whom are still in training either finishing their doctorates or working in postdoctoral positions. Of those who have completed training, 57 percent hold academic faculty positions and 33 percent are staff scientists or group leaders in industry.

A number of these fellows have gone on to compete successfully for BWF's Career Awards at the Scientific Interface (CASI), which was launched in 2001. Closely modeled on BWF's Career Awards in the Biomedical Sciences, the program has made 26 grants to date, with 11 new awards made in 2005. Demand for the program has steadily increased, rising from 75 applications in the first award cycle to more than 100 reviewed in 2005. The number of institutions submitting candidates also has increased from 52, in the first cycle, to 67 in 2005. Notably, the representation of women has increased as well, from 23 percent to 34 percent of the applicant pool, and they currently hold eight of the 26 awards.

A distinctive focus of all BWF award programs is not just on providing funding resources, but also on providing "intangible" resources that can have a huge impact on the career development of young scientists. In 2005, for example, 14 CASI awardees attended the Burroughs Wellcome Fund/Howard Hughes Medical Institute Laboratory Management Course, which covered topics such as negotiating salary, research collaboration, obtaining funding, teaching, and gender issues, and

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also enabled participants to explore their own personal leadership styles. For many participants, this was much needed information as they were in the early stages of a faculty position and were having to adjust, in short order, from being a trainee to being a supervisor and mentor.

For CASI awardees, there is the added pressure, as interdisciplinary scientists, of amassing an acceptable body of work for the tenure process of academic departments, which traditionally expect scholarship to be confined to one scientific discipline. The awardees' participation in the course provided not only immediately relevant information for creating a body of work, but also extended their network of colleagues to whom they could turn for collaboration, career advice, and perspective.

Of the 26 individuals who have received CASI awards, 15 have accepted tenure-track faculty positions at research universities, some in physical science departments and some in biological science departments or medical schools. Many of them entertained multiple job offers, providing early indication that their "interdisciplinarity" will not be an obstacle to their career success.

BWF is confident that this group of awardees will push at the barriers to creativity that remain between disciplines, and distinguish themselves as thoughtful leaders in emerging fields of science.

PROFILE

LINDSAY COWELL, Ph.D.

Dr. Lindsay Cowell is one of an emerging new breed of scientists working in physical or computational sciences and answering biological questions. The question she is determined to answer is how do the two main parts of the body's immune system communicate with each other in order to ward off harmful biological invaders. Armed with such understanding, scientists will be better able to produce vaccines against a range of threatening agents.

When a virus, bacteria, or parasite enters the body, the immune system detects this "antigen" and sets up a line of defense. Two parts of the immune system, the innate system and the adaptive system, spring into action. Generally, the innate system reacts first, usually on the order of minutes or hours. The system kicks into action when it recognizes the specific molecular code carried by a biological invader, and it then triggers a cascade of effects that slow or stop the agent's reproduction. The innate immune system has no immunologic memory, meaning that on subsequent exposures to the same pathogen, the response is no more effective than it was the first time.

But all is not lost: as part of its standard operating procedure, the innate system also triggers the adaptive immune system into responding. The adaptive system marshals the forces of specific cells, including T cells (produced in the thymus gland) and B cells (produced in bone marrow). Working together, these cells are able to recognize the molecular codes of a wide diversity of biological invaders and take action to disable them from causing harm. After contraction of an immune response, specific B and T lymphocytes remain in the body so that on subsequent exposure to the same pathogen, the response is much more rapid and vigorous.

While B cells and T cells are developing, they build a wide range of different protein molecules into their plasma membrane, using a process called V(D)J recombination. These molecules, which stick out from the cells' surfaces, are known as antigen receptors and are capable of binding to single specific antigens.

By developing the computer software and the algorithms, Dr. Cowell, an assistant professor of biostatistics and bioinformatics and immunology at Duke University and a co-director of the Duke University Laboratory of Computational Immunology, has modeled the molecular codes directing V(D)J recombination and developed new statistical approaches to understanding how the cells create the diversity of protein arrangements for the antigen receptors by rearranging the codes.

Dr. Cowell, who received a Burroughs Wellcome Fund Career Award at the Scientific Interfaces in 2002, has taken a circuitous route to her current interest in the immune system. As she recalls, she always loved mathematics, but her early academic choices took her in other directions.



Dr. Lindsay Grey Cowell is a Burroughs Wellcome Fund 2002 Career Award at the Scientific Interface recipient. She is an assistant professor of biostatistics and bioinformatics and immunology at Duke University.



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During high school, she worked as a volunteer at a preschool for severely handicapped children, and this experience led her to the University of North Carolina-Chapel Hill as a major in early childhood education. But by the time she graduated, she already was feeling pulled elsewhere. "I loved the kids, but the system was frustrating," she said. "I also felt like I wasn't making any long-term difference. I began to feel like I couldn't do this for the rest of my life. I had to find something else."

As an undergraduate, Dr. Cowell had worked as a teacher's aide in a school for emotionally and behaviorally disturbed children—and trained her dogs as a hobby. Working with her dogs got Dr. Cowell interested in how dogs could be taught to be companions to individuals with mobility and hearing impairments. "It was a way to stay involved with the special needs community and transition out of teaching," she said. "It was something that would have a huge positive influence on the quality of life for people, something I didn't feel like I was doing as a teacher."

She spent two summer internships at Canine Companions for Independence in Santa Rosa, California, before deciding to go back to graduate school to study zoology. Her goal was to gain practical knowledge to help in breeding service dogs.

Enrolling at North Carolina State University (NCSU), Dr. Cowell had to prepare herself for her new major by taking basic science courses. One of these courses was a population biology course. She loved it. "The course got me back in touch with math and specifically mathematical biology," she said. She received her Ph.D. in biomathematics from NCSU's Department of Statistics.

While at NCSU, Dr. Cowell was introduced to immunology—the study of the immune system—and the subject proved to be the icing on the cake. "After trying out all these different careers, I finally found something that I knew could keep me interested for a lifetime and where I knew I could make a difference in the world," she said. "As convoluted as my path may seem, each experience put me in the place I needed to be in order to discover the next thing."

TRANSLATIONAL RESEARCH

As part of the Burroughs Wellcome Fund's 2005 terrain mapping process, our Board of Directors recommitted its support for the Clinical Scientist Awards in Translational Research, which foster the productivity and creativity of physician-scientists whose work translates basic science discovery into clinical knowledge and ultimately patient care. With a historical award rate of 8 percent, demand for the awards, as measured by numbers of qualified applicants, remains strong.

The flattening of the National Institutes of Health's budget also has underscored the importance of the award program as one of only a few that selectively target M.D. investigators from across all subspecialties. BWF is pleased to be "back in business" after a one-year break in the translational program, made necessary by the falling stock market. We made seven new awards in 2005. To date, BWF has made 59 awards, for a total financial commitment of more than \$44 million.

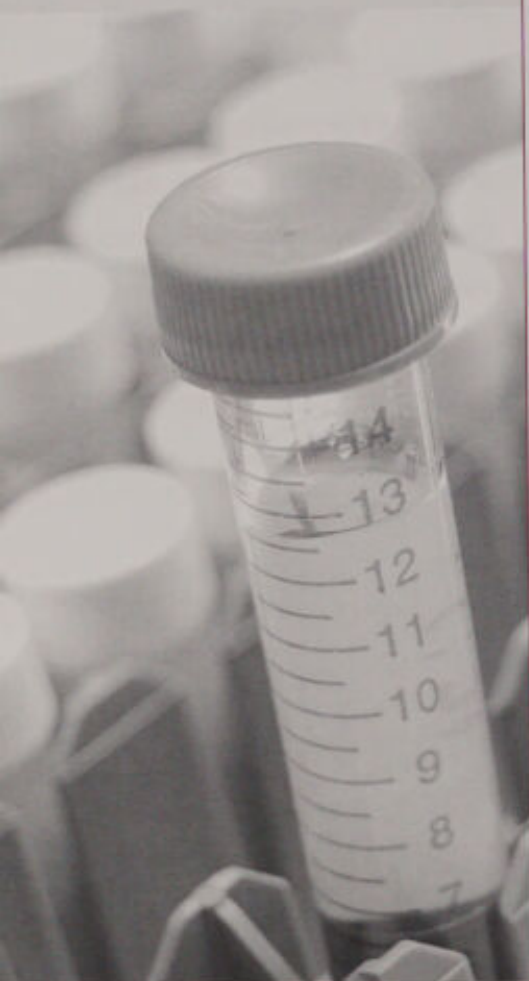
Roughly a quarter of the awards have gone to oncologists, 12 percent to physician-scientists working in neurology, and 11 percent to researchers in cardiovascular areas. Other awardees are distributed across a broad range of clinical disciplines. What these awardees have in common is that they all are conducting first-rate science and they all intend to initiate studies using human subjects before the end of the five-year award.

In today's scientific environment, successfully translating basic research into clinical application typically requires academic investigators to become team leaders and to become more savvy at identifying and collaborating with industry sponsors. It also requires them to climb a steep learning curve of regulations governing the use of human subjects. None of these new skills is traditionally part of scientific or clinical training, and thus each presents a barrier that can discourage trainees from embarking on careers in translational research. For this reason, BWF complements our competitive award program with modest investments in activities that seek to address some of these career disincentives.

One such activity is the Institute of Medicine's (IOM) Forum on Drug Discovery, Development, and Translation, which brings together stakeholders from academic health centers, the pharmaceutical industry, federal regulatory agencies, patient advocacy groups, and funding agencies.

Forum members are working to facilitate interactions of academic investigators with companies. One early step is to raise investigators' level of understanding of the drug development process so that they can envision how their ideas and skills might be best applied. The Forum grew out of the IOM's Clinical Research Roundtable, which brought together a diverse group of stakeholders to consider systemwide solutions to the central challenges facing the clinical research enterprise.

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In a related activity, BWF supports the American Association of Medical Colleges's Task Force II on Clinical Research. Convened in 2004, the Task Force will evaluate the adequacy of the clinical research infrastructure and milieu within academic institutions and recommend ways to strengthen them.

Although BWF's translational research focus area is intentionally broad and not intended to target any particular clinical discipline or disease area, our Board of Directors has identified preterm birth as an area that has enormous health and economic consequences and is in urgent need of talented investigators to address critical scientific questions. The researchers traditionally best equipped to address such questions are specialists in obstetrics and gynecology. Changes in health care financing and liability in recent years, however, have severely diminished the pool of physician investigators in this area, and thus very few OB/GYN doctors are being trained to do research. To help find ways to bridge this gap, BWF is providing support for an IOM study entitled "Understanding premature birth and assuring healthy outcomes."

In all of these efforts to address systemic issues, BWF has adopted a strategy of collaborating with likeminded private funders. For example, the March of Dimes also is supporting the IOM study on premature births, and the group shares our interest in promoting the career development of clinical investigators in this area. BWF's collaborative opportunities are likely to become even more numerous in the near future with the formal organization of the Health Research Alliance, which we have helped to incubate and continue to lead. This is a consortium of foundations and voluntary health agencies that fosters collaboration among not-for-profit, non-governmental funders to support the continuum of health research and training from biomedical science to applications that advance health.

PROFILE

LISA GUAY-WOODFORD, M.D.

The baby came to Children's Hospital in Boston with complex renal tubular disorder, and the house officer called for a series of tests to be run overnight. "He left me in charge to collect the data and samples and send them off to the labs to collect more data," Dr. Lisa Guay-Woodford remembered.

At the time, she was in her third year at Harvard Medical School and was serving a pediatric rotation at the hospital. "It was an amazing experience. I hadn't had a lot of research experience prior to that time, so I lacked the experience of seeing new information and puzzling out what might be wrong with this adorable little baby."

In the middle of the night, after the testing was complete, Dr. Guay-Woodford sat down with the baby in the quiet of the night and fed her.

"I thought, this is exactly why I went to medical school," she said. "It had elements of the intellectual snap, crackle, and pop; elements of the personal connection; and elements of trying to use a knowledge base to figure out someone's problem and come up with a completely new insight. I was sold."

In September 2005, Dr. Guay-Woodford, professor of medicine at the University of Alabama-Birmingham (UAB), was named director of the newly formed UAB Recessive Polycystic Kidney Disease Core Center, a multidisciplinary center that will enhance understanding of autosomal recessive polycystic kidney disease (ARPKD), a genetic kidney disorder.

The disease occurs in one in 6,000 to 40,000 people, with a higher incidence in Finlanders and Afrikaners. The disease is characterized by cyst formation in the kidney and bile duct abnormalities and is chronic and progressive and causes liver abnormalities and eventual kidney failure. Approximately 50 percent of people with the disease are diagnosed prenatally. There is no cure and up to half of newborns diagnosed with the disease die soon after birth.

"This is a rare disorder, and there are not a lot of patients," she said. "We're trying to figure out how the disrupted gene causes this disease. From there, we can determine specific therapies."

By using a mouse model to locate the pathways of the gene mutation Dr. Guay-Woodford hopes to provide insights that can be used to understand and perhaps treat the disease in humans.

UAB maintains a registry for ARPKD patients and has one of four participating laboratories in an international ARPKD Consortium that identified the single gene that causes the disease. In related work, Dr. Guay-Woodford's group has characterized two distinct mouse models, in which the clinical disease closely resembles human ARPKD. Her laboratory has identified the genes for both models and recently, her group has identified a candidate modifier gene for one of the models.



Dr. Lisa Guay-Woodford is a Burroughs Wellcome Fund 2001 Clinical Scientist Award in Translational Research recipient. She is the director of genetic and translational medicine and professor of medicine, pediatrics, and genetics at the University of Alabama-Birmingham.



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TRANSLATIONAL RESEARCH

Other genetic diseases, such as sickle cell disease and cystic fibrosis (CF), are caused by a mutation on one gene. Though 70 percent of CF patients have the same mutation, there is a wide range of clinical disease expression.

"It was logical to look at the disease process in the mouse model and ask, is this same process happening in human kidney disease?" Dr. Guay-Woodford says. "In the mouse model that we study all affected mice share two copies of the same mutation, but they have very different levels of disease expression. So we are not only interested in characterizing the gene disrupted in the disease, we are also looking to identify other genetic factors that could be affecting the disease in the mouse."

UAB's center will serve as a unique resource to design and develop studies involving mechanisms of the disease, to enhance diagnostic specificity, and to expand therapeutic approaches.

"One nice thing is that so much of biomedical research is involved in building a foundation," Dr. Guay-Woodford says. "Following the logical steps—seed money, grants from organization like the Burroughs Wellcome Fund, and support from the National Institutes of Health—all of these things can be put together on a platform from which you can build a superstructure that can have increasing impact and importance in terms of scientific insight and translation to meaningful clinical impact."

CATALYTIC PROGRAMS

HEALTH RESEARCH ALLIANCE

Catalytic programs and grants, or Innovative Catalyst Grants, are large grants designed to significantly advance an emerging field, build infrastructure in an area, create venues to grow more young scientists, or participate in innovations to advance biomedical sciences and provide important and worthwhile opportunities for the Burroughs Wellcome Fund and for science. Past grants of this type have ranged from \$250,000 to \$3 million.

The Health Research Alliance's roots can be traced to 1998, when a group of private health research funders convened at a meeting jointly organized by the American Cancer Society, the Burroughs Wellcome Fund, the Howard Hughes Medical Institute, and the Pew Charitable Trusts. The meeting, "Strengthening Health Research in America: Philanthropy's Role," considered the future of biomedical research in light of major changes in funding streams for research within academic health centers. The group met again in 2000 to consider the role of private funders in training the next generation of biomedical scientists and in 2002 to share best practices with respect to basic operational processes, such as electronic grantmaking.

A subset of this initial group, consisting of a mix of private foundations and voluntary health agencies, began to meet periodically, informally calling itself the Clinical Research Alliance (CRA). Over the years, the CRA contributed to several developments in health research. One of the most significant was the cosponsorship of a national meeting, "Partnering to Advance Health Research: Philanthropy's Role," in 2004. Attended by representatives of more than 70 biomedical research foundations and voluntary health agencies, the meeting focused on building partnerships among like-minded nongovernmental funders as well as with governmental funders and for-profit entities. The meeting agenda was built around the concept of the two "translational blocks" that affect the speed and probability of translating basic biomedical science discoveries into applications that improve health.

The positive response to the 2004 meeting underscored the need for nongovernmental funders of health research to forge collaborations around common interests and to share best practices. With the consensus of its members and the support of BWF, the Clinical Research Alliance became the Health Research Alliance in 2005, reflecting the group's concern for research that leads to better health.

The mission of the Health Research Alliance is to foster collaboration among not-for-profit, nongovernmental organizations that support health research with the goal of enhancing biomedical science and its rapid translation into clinical applications that improve health.

BWF's Board of Directors authorized funds for infrastructure support for three years, beginning January 2005; as a first step, Kate Ahlport was hired as the executive director. HRA has developed a final draft of bylaws and articles of incorporation and is poised to elect officers to form the nucleus of an Executive Committee. The



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Kate Ahlport
Executive Director

Executive Committee will guide the formal membership process, including the development of membership criteria and a contributions structure. The HRA now has an official logo and printed materials, and its comprehensive new Web site (<http://www.healthra.org>) debuted in August 2005.

Among key activities and accomplishments to date, the HRA is developing a database of nongovernmental health research awards called gHRAsp, for Grants in the Health Research Alliance Shared Portfolio. This database will be the first comprehensive repository of health research awards made by nongovernmental, not-for-profit grantmakers. It will be searchable using standard search tools, and organizations participating in the database will be required to update their information annually. The new database should be of interest to both policymakers and grantmaking institutions, including their awardees and applicants. In the future, gHRAsp might become useful for evaluating career development programs.

HRA will hold a national conference in May 2006 in Washington, D.C. National leaders will provide updates on the funding and scientific environments and make presentations on new initiatives in clinical and translational research, examples of innovative funding partnerships, and workshops on operational interests.

INFECTIOUS DISEASES

For the past 25 years, the Burroughs Wellcome Fund has supported underserved research efforts to help in understanding how microbes cause disease, focusing on understanding specific diseases, and asking broader questions of how microbes interact with a human host. BWF's infectious disease program reached a milestone in 2005, delivering its 500th grant, including both competitive and ad hoc awards.

The current infectious disease competitive grant program now sponsors a total of 28 awardees, each of whom is taking new approaches to understand how humans affect and are affected by the viruses, bacteria, fungi, and protozoans that live in and on the human body. In 2005, BWF made 11 awards in its Pathogenesis of Infectious Disease Program.

For the past five years, BWF has focused on helping the infectious disease communities make fundamental changes in how they ask and answer questions about how individual microbes cause disease. But perhaps more importantly, we are working to give researchers a broader scope of understanding the general principles that govern the interactive relationship between human host and microbes.

Malaria is one disease in particular that requires a more complex type of analysis. In 1997, an international effort—partially funded by BWF—began to sequence the genome of *Plasmodium falciparum*, the most fatal of all malaria parasites. The sequence was published in 2005. Work done at the Institute for Genome Research to completely sequence *Plasmodium Vivax*, the life-draining but less fatal malaria agent—also partially funded by BWF—has put the microbial piece into place.

Projects sequencing the human genome and the anophelene mosquito genome have brought the other two critical elements of malaria—the host and the vector—within researchers' grasp. In spring 2005, BWF and the Broad Institute in Cambridge, Massachusetts, hosted a meeting of malariologists working with or interested in post-genomic approaches to understanding malaria. As one outcome, participants produced a list of priorities for advancing current understanding of the biology of *Plasmodium* and the ways that the microbe interacts with humans.

BWF's continued support, albeit modest, has helped yield results in efforts to sequence the genomes of another group of pathogens, the "tri-tryps." This group includes *Trypanosoma brucei*, the infectious agent involved in African sleeping sickness; *Trypanosoma cruzi*, the agent involved in Chagas' disease, and *Leishmania major*, the agent involved in several different human diseases. The sequencing project reached completion in 2005 and the genomes of the three pathogens were published in *Science* in July 2005.

As a small part of our overall programs, BWF supports international research on various aspects of infectious disease. We currently support the Joint Program on Infectious Diseases of the Tropical Developing World, cosponsored by the Wellcome Trust in England and the Burroughs Wellcome Fund/American Society

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In an increasingly interconnected world, it is important that researchers from developing countries or elsewhere, share a common sense of the importance of understanding infectious diseases where they happen, because diseases tell us more about themselves when they are studied in context.

of Tropical Medicine and Hygiene Infectious Disease Fellowships. These efforts are intended to help U.S. and Canadian medical residents interested in pursuing research careers in the tropical developing world by enabling them to participate in mentored internationally-based research training activities during their infectious disease fellowship training.

In an increasingly interconnected world, it is important that researchers from developing countries or elsewhere, share a common sense of the importance of understanding infectious diseases where they happen, because diseases tell us more about themselves when they are studied in context. The Fund's continued support of the Institution of Medicine's Forum on Microbial Threats helps facilitate broader national policy discussions around infectious disease – from the risks from emergence of new dangers, such as the spread of bird flu from Asia to the impact of globalization on who, why, and where diseases move.

Some of the things we have learned especially about mentoring and collaboration have been encapsulated into the laboratory management course put together by the Howard Hughes Medical Institute (HHMI) and BWF. Working with staff from HHMI and the National Institutes of Health's Fogarty International Center at the 2005 lab management course, we began efforts to transform the laboratory management manual *Making the Right Moves* into a more relevant guide for researchers working on underserved problems in research facilities beyond North America and Western Europe.

PROFILE

DAVID FIDOCK, Ph.D.

Each year in Africa, malaria strikes some 350 million people, and more than 1 million people die. Most of those affected are young children. In the past few decades, drug-resistant malaria—especially forms of the disease that are resistant to chloroquine, the primary treatment for malaria since the late 1940s—has increasingly spread across several continents. Chloroquine is known for its safety, rapid efficacy and affordability, but the rise in the number of deaths and severe disease resulting from chloroquine resistant malarial infection, and the rapid spread of resistance to the affordable replacement drug pyrimethamine-sulfadoxine, leaves doctors little choice but to prescribe other more toxic and/or expensive drugs.

Clinical manifestations of this disease begin when the malaria parasite invades the red blood cells of the host and begins feasting on the cells' hemoglobin molecules that are imported into the intracellular parasite's digestive vacuole. As a result, free heme is created—a toxic byproduct that the parasite has to detoxify. This is achieved by converting heme into a crystalline product called hemozoin. As an antimalarial drug, chloroquine works by blocking this detoxification process.

Malaria's renewed and devastating effect on global health has researchers racing to understand more about this disease. Dr. David Fidock, an associate professor of microbiology and immunology at the Albert Einstein College of Medicine of Yeshiva University and a 2003 recipient of a Burroughs Wellcome Fund Investigator in Pathogenesis of Infectious Disease Award, studies the genetic and molecular basis of malaria parasite resistance to drugs. He received his Ph.D. in microbiology from the Pasteur Institute.

In 2002, Dr. Fidock led an effort that conclusively demonstrated that chloroquine resistance (CQR) was attributed to a single parasite gene, called *pfcr*. The idea that one gene rather than multiple genes could determine CQR represented a dramatic change in dogma. Researchers had earlier believed that CQR must involve multiple genes because it arose independently in the Old and New Worlds and was an exceedingly rare event: the first cases of chloroquine resistant malaria were detected in Asia and South America 12 years after the drug was introduced in the 1940s. It took another two decades for CQR to first appear in East Africa.

To modify the *pfcr* DNA sequence in *Plasmodium falciparum*, which is the deadliest form of the malaria parasite, Dr. Fidock developed and applied precise molecular genetic approaches. This showed that as little as one amino acid change in the *pfcr* gene's protein could suffice to alter the drug response from chloroquine resistant to sensitive. Becoming chloroquine resistant however, required multiple mutations to occur in *pfcr*.

The *pfcr* gene's protein in the digestive vacuole is thought to help regulate the physiological functions of the digestive vacuole inside which chloroquine becomes concentrated and binds to heme. However, in chloroquine resistant malaria,



Dr. David Fidock is a Burroughs Wellcome Fund 2003 Investigator in Pathogenesis Disease Award recipient. He is an associate professor of microbiology and immunology at the Albert Einstein College of Medicine of Yeshiva University.



From very early on in his research career, Dr. Fidock knew he wanted to apply science to address issues that would improve the well being of people living in poorer countries.

mutations in this gene may export chloroquine out of the vacuole before it has the opportunity to stop heme detoxification. Recently, Dr. Fidock found that *pfert* can also mutate to produce resistance to other antimalarials agents including halofantrine and, surprisingly, the anti-influenzal drug amantadine.

Dr. Fidock's work further identified a number of other antimalarial drugs that became even more potent against parasites that had become chloroquine resistant. This unusual pattern—gaining resistance to one drug while simultaneously losing resistance to another—may shed light on the exact role that *pfert* plays in resistance, according to Dr. Fidock and colleagues. “Understanding the genetic basis of CQR and its effect on other antimalarial drugs has been pivotal in showing just how widespread CQR had become and has illustrated the urgency of implementing alternative antimalarials” Dr. Fidock said. He hopes that his research will stimulate further studies into other drugs as a means of controlling chloroquine resistant malaria.

From very early on in his research career, Dr. Fidock knew he wanted to apply science to address issues—such as improved protein yield in crops, or effective treatment of drug resistant infections—that would improve the well being of people living in poorer countries. “I saw how disproportionately little research was being done to address issues that directly affected impoverished regions of the world. Malaria in particular, and infectious disease in general, was a very attractive discipline for me because of its enormous impact on human health, especially in tropical regions” he said. “Malaria really suppresses Africa and keeps the continent very much at a subsistent level, where most people are struggling just to meet daily needs.”

SCIENCE EDUCATION

After studying the educational landscape of our home state of North Carolina, the Burroughs Wellcome Fund saw several opportunities to play an important role in helping to increase student interest and achievement in science and mathematics. By sponsoring instructional programs in informal settings, supporting the development of informed public policy and research, and creating partnerships between any number of organizations concerned with science, mathematics, and technology (SMT) education, BWF can contribute to the infrastructure of science education in North Carolina.

We began in 1996 by offering the Student Science Enrichment Program (SSEP) to support innovative science education projects for middle- and high school students. Awards go to nonprofit organizations—public and private schools, universities, colleges, museums, and community groups—that offer innovative hands-on science activities that can help increase students' competence in and enthusiasm for science and interest them in pursuing science careers. These enrichment activities must take place outside the classroom and must be aligned with the North Carolina Standard Course of Study.

BWF received 42 SSEP award applications in 2005 and made 11 awards totaling approximately \$1.6 million. We have now made an investment of \$10.8 million through 78 awards to 47 different nonprofit organizations throughout the state. These programs have reached nearly 24,000 middle- and high school students.

BWF has assessed the value of this program from the beginning and these efforts have led to a number of interesting findings. Data collected from survey descriptions provided by SSEP directors and student participants identified two types of students who participate in SSEP activities—gifted and general population students. Of those students, more than 46 percent of the students in the 2004 programs viewed science as a career option. And although program curriculum levels vary, all students participated in rigorous hands-on science activities, such as collecting DNA, measuring water quality, creating mathematical models, and growing plants to study nutrition.

Our surveys have also identified several characteristics as being critical for successful science enrichment activities. The curriculum must be appropriate for the grade-level of students. Incorporating critical and scientific minds-on, as well as, hands-on activities, interacting with professional scientists, and an opportunity to discuss and present their work to others seem to give student participants an extra nudge in pursuing science as a viable career option. Creating on-going relationships with students is also a key factor in keeping students engaged.

The SSEP Advisory Committee noted several years ago that North Carolina needed a champion to focus on advancing science education for all of the state's children. Therefore, BWF in 2003 created the North Carolina Science, Mathematics, and Technology Education Center to systematically improve performance in these areas

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in preK-12 education. We hired Dr. Sam Houston, formerly a teacher, superintendent, university faculty member, and policy leader, to head the center. As a testament to BWF's commitment to the center's success, BWF's Board of Directors provided a \$2.5 million grant made as part of the Fund's 50th anniversary celebration in May 2005.

This investment has yielded huge returns for North Carolina students. For example, the center recruited scientists to work with the N.C. Department of Public Instruction to revamp the state's science curriculum. Scientists now have a formal mechanism to work with teachers in the classroom on inquiry-based science kits. In addition, a statewide grassroots program called Think Science is taking hold in small towns across the state, eight new science and mathematics-themed high schools opened in the fall of 2005, and partnerships among science education stakeholders have taken shape.

We have also learned from our experience that to further contribute to the science education infrastructure in North Carolina we need to impact public policy. It became clear early on that the state needed a mechanism to help members of the State Board of Education and the North Carolina General Assembly better understand the complexities of the educational arena. For policymakers to make sound decisions, they need researched-based data, and they need to participate in bipartisan discussions about education. Toward these goals, BWF supports the North Carolina Institute for Educational Policymakers, under the leadership of the Public School Forum of North Carolina. The institute was the first such initiative in the United States, and similar institutes have now been developed in several other states, including Georgia and South Carolina. The Institute for Education Policymakers has reinforced the linkage between the state's economic welfare and education while making policymakers aware of the growing gap between the performance of American students and their peers in other countries.

PROJECT SEED

It was a sight not often witnessed at science meetings: 30 or so African American students walking in a row, all dressed in black suits and white shirts or blouses.

The scene: the American Association for the Advancement of Science's annual meeting in Washington, D.C. The students: participants in the Summer Educational Experience for the Disadvantaged Project—or Project SEED—an educational program run by the American Chemical Society. The Burroughs Wellcome Fund, through our Student Science Enrichment Program, supports a Project SEED chapter in North Carolina, and the string of impressive students at the meeting call this program home base.

The setting of the nation's capital is appropriate, as the U.S. Congress has proclaimed that science literacy is a critical national priority and that public education has a responsibility to ensure all students are well prepared.

The BWF supported Project SEED initiative offers talented disadvantaged high school students an opportunity to work with scientists in academic, industrial, and governmental laboratories to experience hands-on research. As part of their activities, the students develop scientific posters to describe and present their work at various association meetings across the nation to improve their communication skills and introduce them to the larger world of science.

Project SEED provides students with a comprehensive experience in scientific research, offering instruction on scientific methodology, scientific research, and scientific ethics. Students receive individual mentoring from scientists and learn about careers in chemistry and other science fields. Working in the labs as paid researchers, students put to use a number of experimental techniques and methods. The program has trained about 120 high school students in North Carolina who eventually will help meet the nation's need for more people choosing to pursue careers in science and mathematics.

In any successful program, there is a committed person behind the scenes. Kenneth Cutler, a veteran educator and lecturer at North Carolina Central University, stands behind Project SEED, recruiting students, training them, exposing them to the questions of science, and engaging their parents or caregivers in understanding the value of a career in the sciences. For his work in science education, Mr. Cutler received the National Science Foundation's 1999 Presidential Award for Excellence in Secondary Science Teaching, the nation's highest honor for a K-12 mathematics and science teacher.

Mr. Cutler has been with Project SEED since 1991, and currently coordinates the local section of the program for the American Chemical Society, which developed the program to target underrepresented minorities who historically lag behind other students in science proficiency. During the academic year, students meet for Saturday academies to learn other life skills, such as planning, organizing, testing, and accepting community responsibility.



The Burroughs Wellcome Fund supported Project SEED initiative offers talented disadvantaged high school students an opportunity to work with scientists in academic, industrial, and governmental research laboratories to experience hands-on research.



Kenneth Cutler is the Project
SEED coordinator in
North Carolina.

Mr. Cutler said that past Project SEED students tell him that they simply did not know these types of opportunities existed for them in the scientific field. The experience, he said, gives them the drive and the confidence to pursue academically demanding fields, and their laboratory mentors give them support and guidance to ease the process.

Project SEED's motto is: "If excellence is possible, then good is not enough"—and Mr. Cutler has the statistics to back it up. "Our expectation is to have our students not only go to college, but to gain doctorates," he said. "We have high expectations. We prepare the students for academic excellence and behavioral excellence. They both go hand in hand."

In fact, since BWF began supporting Project SEED in 1999, all of its graduating students have gone on to major in science and mathematics in college. Four of the 2005 graduating students received full academic scholarships—and this pattern is representative of past years. Mr. Cutler said his ultimate goal is for every graduating student in the program to receive a full academic scholarship to study science. As it is, the students receive an average of \$100,000 in scholarship money to attend college.

CATALYTIC PROGRAMS

NORTH CAROLINA SCIENCE, MATHEMATICS, AND TECHNOLOGY EDUCATION CENTER

Catalytic programs and grants, or Innovative Catalyst Grants, are large grants designed to significantly advance an emerging field, build infrastructure in an area, create venues to grow more young scientists, or participate in innovations to advance biomedical sciences and provide important and worthwhile opportunities for the Burroughs Wellcome Fund and for science. Past grants of this type have ranged from \$250,000 to \$3 million.

As part of the Burroughs Wellcome Fund's 50th anniversary celebration, in May 2005, we gave a \$2.5 million grant to the North Carolina Science, Mathematics, and Technology Education Center (SMT Center) to secure its future. We incubated the center, and we believe it will be ready to take on more of its own responsibilities in the near future. The center's mission is to systematically improve performance in science, mathematics, and technology (SMT) preK-12 education as a means of providing all children in North Carolina with the necessary knowledge and skills in science, mathematics, and technology to have successful careers, be good citizens, and advance the economy of the state.

The SMT Center has made notable strides in achieving its mission, especially by working in partnership with other organizations. Its work aligns with the national movement to move more young Americans into the sciences and mathematics. A recent National Academy of Sciences report, *Rising Above The Gathering Storm—Energizing and Employing America for a Brighter Economic Future*, outlines the urgency of this issue at the national level and makes strong recommendations to be implemented at the state level. The SMT Center has initiated or supported efforts to recruit teachers and encourage unique partnerships between universities and schools, provide professional development opportunities to SMT teachers, increase the number of students in advanced SMT classes, and to expand inquiry-based SMT learning.

The SMT Center now participates in the thinking and decision making that relates to many current and pending issues that will impact N.C. schools and classrooms. For example, center staff members have assisted the state in developing its new 21st Century Skills Center and the early discussion of the expansion of the school of science and mathematics concept. In addition, center staff members have brought attention to the need to change how teachers are prepared in science and mathematics by, in one notable instance, meeting with the deans of the Schools of Arts and Science and the deans of the Schools of Education from all of the member schools in the North Carolina university system.

In the fall of 2005, the SMT Center, in partnership with the Teachers and Scientist Collaborating Program (TASC), reached 2,000 educators and community members. Through the TASC program, 84 active or retired scientists—known as Teacher Link Program (TLP) Fellows—have been trained in inquiry-based science learning

The North Carolina Science, Mathematics, and Technology Education Center's mission is to systematically improve performance in science, mathematics, and technology preK-12 education as a means of providing all children in North Carolina with the necessary knowledge and skills in science, mathematics, and technology to have successful careers, be good citizens, and advance the economy of the state.



Dr. Samuel H. Houston Jr.
President and CEO

for K-8 students. These fellows serve as advocates for SMT education and for expanding teacher resources in public schools. The SMT Center works with the N.C. Department of Public Instruction to host teachers, school administrators, and TLP scientists at forums on training and science and mathematics curriculum revisions for the state.

The SMT Center is partnering with the Public School Forum on the New School Project (NSP) to serve as the Network Center for high schools that focus on health careers. Eight such schools opened in N.C. in fall 2005. The Bill & Melinda Gates Foundation is funding this effort.

The SMT Center is also working with the National Science Resources Center to design a plan to bring professional development programs to North Carolina that address school reform and leadership focused on science and mathematics. The center is continuing to work with the Asia Society to develop SMT curriculum with a global perspective.

For more information on the SMT Center, visit the website at www.ncsmt.org.

REPORT ON FINANCE

The Burroughs Wellcome Fund's investments totaled \$689.9 million at August 31, 2005, 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, a high percentage of our investments are placed in strategies that derive the bulk of their returns from exposure to 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 seven voting members, including four representatives from outside BWF and three representatives of 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. At 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 \$166.8 million. The sector's target allocation was 26 percent, and actual holdings stood at 24.2 percent.
- U.S. small capitalization equity assets had a market value of \$118.5 million. The sector's target allocation was 19 percent, and actual holdings stood at 17.2 percent.
- International equity assets had a market value of \$179.8 million. The sector's target allocation was 27 percent, and actual holdings stood at 26.0 percent.
- Fixed income assets had a market value of \$123.6 million. The sector's target allocation was 25 percent, and actual holdings stood at 17.9 percent.
- Cash equivalent assets had a market value of \$15.6 million. The sector's target allocation was 3 percent, and actual holdings stood at 2.3 percent.
- Alternative assets had a market value of \$85.6 million. The sector did not have a target allocation and actual holdings stood at 12.4 percent. The maximum permitted allocation to alternative assets stood at 14.0 percent.

As of August 31, 2005, BWF employed 10 marketable securities investment managers. In the U.S. large capitalization equity sector, the managers were Independence Investment Associates; LSV Asset Management; and Cohen, Klingenstein and Marks. Credit Suisse Asset Management; Kennedy Capital Management; and U.S. Bancorp Asset Management managed U.S. small capitalization equities. Pacific Investment Management Company and Smith Breeden Associates were the fixed income managers. Capital Guardian Trust Company and Hansberger Global Investors managed international equities. BWF also held investments in eight venture capital funds: Intersouth Partners IV, V and VI, Spray Venture Funds I and II, Mission Ventures II, the North Carolina Bioscience Investment Fund and A. M. Pappas Life Science Ventures II. Barlow Partners and Winston Partners managed funds of equity oriented hedge funds. Finally, Quellos Capital Management managed a fund of absolute return strategies.

The total market value of BWF's investments increased by \$62.0 million, or 9.9 percent, from the end of the previous fiscal year. This increase in assets was due primarily to good returns in world equity markets in the final four months of 2004, as capital market returns for the first eight months of 2005 were fairly low. BWF's total investment return for the fiscal year was 15.6 percent. Returns in all three equity sectors and the fixed income sector were positive for the fiscal year. The U.S. large capitalization equity sector returned +16.7 percent, the U.S. small capitalization equity sector had a +20.1 percent result, the international equity sector posted a return of +25.0 percent for the fiscal year, and fixed income produced a +5.2 percent result.



REPORT OF INDEPENDENT AUDITORS

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, 2005 and 2004, 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 of America. 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 of America. Those standards 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 our opinion.

Our 2005 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
November 21, 2005

FINANCIAL STATEMENTS

	2005	2004
Assets		
Cash and cash equivalents	\$22,645	\$95,769
Marketable securities	666,144	508,623
Accrued interest and dividends receivable	1,482	1,564
Transactions receivable, net	603	22,158
Other assets	2	20
Property and equipment, net	12,104	12,652
Total assets	702,980	640,786

Liabilities and Net Assets

Accounts payable and other liabilities	771	900
Federal excise tax payable	372	521
Deferred excise tax payable	1,485	308
Unpaid awards	60,922	52,988
Total liabilities	63,550	54,717
Unrestricted net assets	639,430	586,069
Total liabilities and net assets	\$702,980	\$640,786

	2005	2004
Revenues		
Interest and dividends, less investment expenses of \$3,602 and \$3,805 in 2005 and 2004, respectively	\$10,465	\$9,588
Net realized gain on sales of marketable securities	38,830	52,330
Total revenues	49,295	61,918

Expenses

Program services	32,216	11,485
Management and general	6,551	5,451
Total expenses before net unrealized appreciation and deferred federal excise tax	38,767	16,936
Net unrealized appreciation of marketable securities, net of (benefit from) provision for deferred federal excise taxes of \$1,177 and (\$190) in 2005 and 2004, respectively	42,833	6,079
Change in net assets	53,361	51,061
Net assets at beginning of year	586,069	535,008
Net assets at end of year	\$639,430	\$586,069

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

Statements of Financial Position

August 31, 2005 and 2004

(All dollar amounts presented in thousands)

Statements of Activities

August 31, 2005 and 2004

(All dollar amounts presented in thousands)



Statements of Cash Flows

August 31, 2005 and 2004

(All dollar amounts presented in thousands)

	2005	2004
Cash flows from operating activities		
Change in net assets	\$53,361	\$51,061
Adjustments to reconcile change in net assets to net cash provided by (used in) operating activities		
Depreciation	656	641
Net realized gain on sales of marketable securities	(38,830)	(52,330)
Net unrealized appreciation of marketable securities	(44,010)	(5,772)
Provision for deferred federal excise taxes	1,177	331
Awards granted, net of cancellations and change in unamortized discount	32,285	11,545
Award payments made	(24,351)	(23,123)
Changes in operating assets and liabilities		
Accrued interest and dividends receivable	82	575
Other assets	18	20
Transactions receivable, net	21,555	(14,194)
Accounts payable and other liabilities	(278)	300
Net cash provided by (used in) operating activities	1,665	(30,946)
Cash flows from investing activities		
Purchases of marketable securities	(1,180,998)	(964,058)
Proceeds from sales of marketable securities	1,106,317	1,063,249
Purchase of property and equipment	(108)	(63)
Net cash (used in) provided by investing activities	(74,789)	99,128
Net (decrease) increase in cash and cash equivalents	(73,124)	68,182
Cash and cash equivalents at beginning of year	95,769	27,587
Cash and cash equivalents at end of year	22,645	95,769
Supplemental disclosure of cash flow information		
Cash paid during the year for federal excise taxes	\$1,212	\$140

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

NOTES TO FINANCIAL STATEMENTS

August 31, 2005 and 2004 (All dollar amounts presented in thousands)

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 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 gain (loss) on sales of marketable securities," and the changes in market value of open contracts is included within "net unrealized appreciation 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 currency contracts totaled \$10,672 and \$7,984 at August 31, 2005 and 2004, respectively. Realized gains and losses on forward currency contracts totaled \$235 and (\$236) in 2005 and 2004, respectively. The market value of open forward currency contracts at August 31, 2005 and 2004 was (\$80) and \$57, respectively. The market value is recorded as an asset (liability) in the Fund's financial statements. The average market value of open foreign currency contracts totaled (\$12) and (\$119) for the years ending August 31, 2005 and 2004, respectively.

Futures contracts

The Fund enters into futures contracts in the normal course of its investment activity to manage 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, 2005 and 2004 were \$425 and \$1,179, 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, 2005 and 2004 is the net settlement relating to these contracts of \$120 and \$1,502, respectively.

Options

The Fund utilizes options to manage the exposure to interest rate risk associated with mortgage backed securities. The market value of these options totaled \$0 and (\$120) at August 31, 2005 and 2004, respectively, which is recorded as an asset (liability) in the Fund's financial statements. The average fair value of open contracts totaled (\$29) and (\$36) for the years ending August 31, 2005 and 2004. Realized gains on options totaled \$181 and \$143 for the years ending August 31, 2005 and 2004, 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 related to the Fund's operations and activities have been summarized on a functional basis in the statements 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.

Concentration of credit risk

The Fund places cash deposits at federally insured depository institutions. At August 31, 2005, bank account balances exceeded federal depository insurance limits by \$838.

Reclassifications

Certain reclassifications of prior year amounts were made in order to conform to the current year presentation.

Property and Equipment

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

	2005	2004
Building	\$13,451	\$13,451
Furniture and fixtures	1,822	1,735
Computer equipment	778	757
	16,051	15,943
Less: accumulated depreciation	(3,947)	(3,291)
	\$12,104	\$12,652

Furniture and fixtures includes non-depreciated art work, as defined by Financial Accounting Standard Board Statement 93, of \$77 and \$76 at August 31, 2005 and 2004, respectively.

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. At August 31, 2005, the Fund is in a net unrealized appreciation position; therefore, a deferred federal excise tax liability of \$1,485 was recorded. At August 31, 2004, the Fund was in a net unrealized appreciation position; therefore, a deferred federal excise tax liability of \$308 was recorded.

Qualified Distributions

The Fund is required to distribute 5 percent of the excess of the aggregate fair market value of the assets over the acquisition indebtedness with respect to such assets. Failure to distribute according to Section 4942(e)(1) results in a tax equal to 15 percent of the undistributed income of the Fund.

Unpaid Awards

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

	2005	2004
Payable in less than one year	\$22,959	\$20,769
Payable in one to five years	38,682	32,555
	61,641	53,324
Unamortized discount	(719)	(336)
Total	\$60,922	\$52,988

The expected future liability to the Fund has been calculated based on discount rates ranging from 1.89 percent to 3.52 percent.

Marketable Securities

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

	Cost	2005 Estimated Market Value	Cost	2004 Estimated Market Value
U.S. and foreign governmental obligations	\$77,522	\$80,179	\$16,922	\$18,920
Corporate bonds	33,872	34,129	21,315	22,111
Common and preferred stocks	263,467	301,965	254,562	272,888
Foreign stocks and foreign equity funds	129,725	164,307	123,765	138,869
Option and forward foreign currency investments	-	-	(87)	(120)
Venture capital investments	20,976	13,616	19,010	12,475
Mutual fund	66,276	71,948	42,454	43,480
	\$591,838	\$666,144	\$477,941	\$508,623

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 \$230 and \$204 during fiscal 2005 and 2004, 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 percent of all employees' contributions up to 6 percent of the employee's annual compensation.

Employees are 100 percent 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 percent of the employee's annual compensation. This plan covers all employees and vesting in contributions is immediate. The expense for these retirement plans was \$47 and \$189 in fiscal 2005, and \$46 and \$177 in fiscal 2004, respectively.

Related Parties

North Carolina Science, Mathematics, and Technology Education Center, Inc. (the "Center") was formed on April 24, 2002. This not-for-profit corporation solicits grants for the purpose of providing funding to improve the performance of students in science, mathematics, and technology.

The Fund granted \$2,500 and \$25 to the Center during the years ended August 31, 2005 and 2004, respectively. In addition, the Fund paid \$360 and \$60 of expenses on behalf of the Center during 2005 and 2004, respectively. Expenses included salaries, travel, entertainment, maintenance, supplies, professional fees, printing cost, and other miscellaneous items.

The financial statements of the Fund and the Center are not presented on a consolidated basis, as the Fund is not the legal owner of the Center, does not have controlling interest of the Center's financial transactions, and does not have considerable representation on the board of the Center.



Classification of Expenses

During the years ended August 31, expenses were classified as follows:

	Program Services	2005 Management and General	Program Services	2004 Management and General
Awards granted, net of cancellations and refunds of \$1,982 and \$3,099 in 2005 and 2004, respectively	\$31,856	\$-	\$11,286	\$-
Federal excise tax	-	1,584	-	661
Salaries and other employee expenses	208	2,441	140	2,340
Depreciation expense	-	656	-	641
Travel and entertainment	21	428	14	628
Maintenance and supplies	15	658	1	559
Honoraria	-	441	-	267
Professional fees	83	139	43	190
Printing and design costs	31	98	-	86
Miscellaneous	2	106	1	79
	\$32,216	\$6,551	\$11,485	\$5,451

Schedule I : Statement of Award Transactions

Year Ended August 31, 2005

(All dollar amounts presented in thousands)

Unpaid awards, beginning of year	\$52,988
Add - Awards granted (Schedule II)	34,223
Less - Award payments made	(24,351)
Award cancellations (excluding refunds)	(1,555)
Net decrease in unamortized discount	(383)
Unpaid awards, end of year	\$60,922

Schedule II : Statement of Awards Granted

Year Ended August 31, 2005

Schedule II information is included in the "Grants Index" beginning on the opposite page. 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*
Basic Biomedical Sciences			
Career Awards in the Biomedical Sciences	\$12,623,874.25	\$7,361,316.34	\$1,414,619.55
Hitchings-Elion Fellowships	4,000.00	342,036.00	0.00
Reproductive Science	15,000.00	311,367.00	0.00
Other Grants	152,977.00	145,977.00	0.00
Total	12,795,851.25	8,160,696.34	1,414,619.55
Infectious Diseases			
Investigators in Pathogenesis of Infectious Disease	4,400,000.00	1,760,000.00	0.00
New Initiatives in Malaria Research	0.00	150,000.00	0.00
Scholar Awards in Molecular Parasitology	0.00	340,000.00	0.00
Scholar Awards in Molecular Pathogenic Mycology	0.00	170,000.00	0.00
Other Grants	594,500.00	619,500.00	5,000.00
Total	4,994,500.00	3,039,500.00	5,000.00
Interfaces in Science			
Career Awards at the Scientific Interface	5,360,000.00	2,488,683.30	0.00
Functional Genomics Innovation Awards	40,894.95	125,000.00	40,894.95
Interfaces Award	0.00	3,340,238.00	0.00
Other Grants	365,000.00	205,000.00	0.00
Total	5,765,894.95	6,158,921.30	40,894.95
Translational Research			
Clinical Scientist Awards in Translational Research	5,250,000.00	4,950,000.00	0.00
New Investigator Awards in the Basic Pharmacological Sciences	0.00	35,000.00	0.00
Other Grants	257,383.00	257,383.00	0.00
Total	5,507,383.00	5,242,383.00	0.00
Science Education			
Student Science Enrichment Program	1,688,854.00	1,165,065.00	0.00
Other Grants	3,113,728.00	348,631.00	10,000.00
Total	4,802,582.00	1,513,696.00	10,000.00
Science and Philanthropy			
Communications/Science Writing	44,000.00	44,000.00	0.00
General Philanthropy	81,600.00	81,600.00	0.00
Science Policy	60,000.00	110,000.00	0.00
Special Award	169,320.00	0.00	83,000.00
Total	354,920.00	235,600.00	83,000.00
GRAND TOTAL†	\$34,221,131.20	\$24,350,796.64	\$1,553,514.50

* The "Transferred/Cancelled" totals reflect grants made to award recipients who changed institutions, modified the terms of their grant at their current institution, or both changed institutions and modified their grant. In these cases, BWF's policy has been to cancel the remaining portion of the original grant and, as necessary, approve a new grant. When the award recipient has changed institutions, the new grant is made to the new institution; when the award recipient has not moved but has modified the terms, the new grant 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 award recipient's project is listed second, and the name of the organization that received the money is listed third. For programs that may have coaward recipients, the award recipients 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.



BASIC BIOMEDICAL SCIENCES

Totals

Approved: \$12,795,851.25

Paid: \$8,160,696.34

Transferred/Cancelled: \$1,414,619.55

CAREER AWARDS IN THE BIOMEDICAL SCIENCES

Career awards are postdoctoral-faculty bridging awards. During the fiscal year, some award recipients 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 award recipient has changed institutions, the new award is made to the new institution; when the award recipient 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 award recipient is listed first, the title of the project is listed second, the award recipient's current institution is listed third, and the amount approved or paid to the institution is listed fourth. For award recipients 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 award recipients still in the postdoctoral period, the portion of the award intended to cover a future faculty appointment is listed last, in parentheses.

Suzanne J. Admiraal, Ph.D.

Biosynthesis of hybrid natural products
University of Michigan Medical School
Approved \$38,564.30 Paid \$128,000

Geoffrey K. Aguirre, M.D., Ph.D.

fMRI studies of the process architecture of face perception
University of Pennsylvania School of Medicine
Paid \$29,000

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

Role of T-type calcium channels in thalamic and hippocampal rhythmic activity
Harvard Medical School
Paid: \$127,500

Kaveh Ashrafi, Ph.D.

Comprehensive analysis of regulatory mechanisms of fat biology
University of California-San Francisco School of Medicine
Paid \$100,000

Vahe Bandarian, Ph.D.

Biosynthesis of deazapurine secondary metabolites
University of Arizona
Paid \$103,000

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
Paid \$193,000

Aaron P. Batista, Ph.D.

Neural gating within the cerebral cortex during sensory-motor behavior
Stanford University School of Medicine
Approved \$63,000 Paid \$63,000
(\$63,000 of the original award for future faculty appointment was transferred/cancelled)

Diana M. Bautista, Ph.D.

Molecular and cellular mechanisms of mechanotransduction in mammalian sensory neurons
University of California-San Francisco
Approved \$116,000 Paid \$29,000
(\$334,000 approved for future faculty appointment)

David Bilder, Ph.D.

Genetic analysis of epithelial cell architecture
University of California-Berkeley
Paid \$75,760

Ben E. Black, Ph.D.

Epigenetic mechanisms for centromere specification
University of California-San Diego School of Medicine
Approved \$58,000 Paid \$21,600*
(\$442,000 approved for future faculty appointment)
*Paid to Ludwig Institute for Cancer Research.

Cornelius F. Boerkoel, M.D., Ph.D.

Drosophila model for dissection SMARCA1 function
Baylor College of Medicine
Paid \$123,000

Carrie B. Brachmann, Ph.D.

Using *Drosophila* as a tool for the study of apoptotic regulation
University of California-Irvine
Paid \$131,000

Edward S. Brodtkin, M.D.

Genetic analysis of anxiety-related behaviors in mice
University of Pennsylvania School of Medicine
Paid \$60,500

David L. Brody, M.D., Ph.D.

Amyloid-beta and apolipoprotein E in traumatic brain injury
 Washington University School of Medicine
 Approved \$58,000 Paid \$29,000
 (\$442,000 approved for future faculty appointment)

Richard K. Bruick, Ph.D.

Investigation of hypoxia sensing and signaling pathways
 University of Texas Southwestern Medical Center-Dallas
 Paid \$110,500

Michael D. Bulger, Ph.D.

Relationship between organization and function at the
 mammalian beta-globin locus
 University of Rochester Medical Center
 Paid \$127,500

Kathleen M. Caron, Ph.D.

Reproductive and cardiovascular effects of the
 adrenomedullin system
 University of North Carolina-Chapel Hill School of Medicine
 Paid \$127,500

Mark M. Churchland, Ph.D.

Experimental study of settling neural processes in the
 primate brain
 Stanford University
 Approved \$58,000
 (\$442,000 approved for future faculty appointment)

Thomas R. Clandinin, Ph.D.

Dissecting neuronal target selection in the *Drosophila* visual system
 Stanford University School of Medicine
 Paid \$65,500

William M. Clemons, Ph.D.

Structural studies of complexes involved in protein
 translocation and synthesis
 Harvard Medical School
 Approved \$58,000
 (\$442,000 approved for future faculty appointment)

Michael K. Cooper, M.D.

Modulation of sonic hedgehog signal transduction by
 cholesterol homeostasis
 Vanderbilt University Medical Center
 Paid \$65,500

Nika N. Danial, Ph.D.

Integration of glycolysis and apoptosis by the pro-apoptotic
 protein BAD
 Harvard Medical School
 Paid \$84,250

Jeremy S. Dasen, Ph.D.

Role of Hox proteins in sensory-motor neuronal connectivity and identity
 Columbia University
 Paid \$58,000

Daniela M. Dinulescu, Ph.D.

Role of endometriosis in fertility and ovarian cancer pathogenesis
 Massachusetts Institute of Technology
 Approved \$58,000
 (\$442,000 approved for future faculty appointment)

Ricardo E. Dolmetsch, Ph.D.

Voltage-gated calcium channel signaling the nucleus
 Stanford University School of Medicine
 Paid \$127,500

Kelly S. Doran, Ph.D.

Penetration of the blood-brain barrier in GBS meningitis
 University of California-San Diego
 Paid \$65,500

Charles G. Eberhart, M.D., Ph.D.

Analysis of medulloblastoma pathobiology and response to novel
 therapies using murine transgenic models
 Johns Hopkins University School of Medicine
 Paid \$131,000

Peter J. Espenshade, Ph.D.

Molecular mechanism of cholesterol homeostasis in mammalian cells
 Johns Hopkins University School of Medicine
 Paid \$131,000

Miguel Estevez, M.D., Ph.D.

Investigation of a calcium channel related to migraine and epilepsy
 in both an invertebrate and a mouse model
 University of Pittsburgh Medical Center
 Paid \$127,500

Kathryn M. Ferguson, Ph.D.

Structural basis for erbB receptor activation by epidermal growth
 factor agonists and neuregulin
 University of Pennsylvania School of Medicine
 Paid \$127,500

Seth J. Field, M.D., Ph.D.

Comprehensive analysis of phosphoinositide function
 University of California-San Diego School of Medicine
 Paid \$55,250
 (\$29,000 of the original award to Harvard Medical School was paid)



Nicholas R. Gaiano, Ph.D.

Neural stem cells in the mammalian forebrain: the roles of Notch and FGF signaling
Johns Hopkins University School of Medicine
Paid \$65,500

Erin C. Gaynor, Ph.D.

Molecular basis of colonization and invasion in the foodborne enteric pathogen *Campylobacter jejuni*
University of British Columbia
Approved \$16,816.27 Paid \$110,500

Joshua I. Gold, Ph.D.

Neural basis of perceptual-decision formation
University of Pennsylvania School of Medicine
Paid \$65,500

Ruben L. Gonzalez Jr., Ph.D.

Single-molecule fluorescence studies of eukaryotic translation initiation and regulation
Stanford University School of Medicine
Approved \$58,000 Paid \$29,000
(\$58,000 of the award for a future faculty appointment was transferred/cancelled)

Or P. Gozani, M.D., Ph.D.

Regulation of chromatin remodeling events by nuclear phosphoinositides
Stanford University
Paid \$55,250
(\$16,807 of the original award to Stanford University was transferred/cancelled)
(\$16,807 of the original award to Harvard Medical School was awarded and paid to Harvard Medical School)

Victoria G. Herman, Ph.D.

Defining the molecular code for synaptic target selection
University of Oregon
Approved \$22,504 Paid \$127,500

Lora V. Hooper, Ph.D.

Molecular analysis of commensal host-microbial interactions in the intestine
University of Texas Southwestern Medical Center-Dallas
Paid \$127,500

Jennifer S. Hovis, Ph.D.

Understanding lipid and protein interactions at the molecular level in model cell membranes
Purdue University
Paid \$65,500

Chyi-Song Hsieh, M.D., Ph.D.

Determining the antigen specificity of CD²⁵⁺ CD⁴⁺ regulatory T cells
Washington University School of Medicine
Approved \$500,000 Paid \$50,000
(\$500,000 of the original award to the University of Washington School of Medicine was transferred/cancelled)

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

Identification and characterization of novel components in the TGF-beta signaling pathway
University of Pennsylvania Health System
Paid \$60,500

Christina M. Hull, Ph.D.

Cell identity, sexual development, and virulence in the human fungal pathogen *Cryptococcus neoformans*
University of Wisconsin Medical School
Paid \$100,000

James D. Jontes, Ph.D.

Role of protocadherins in neural development studied in living zebrafish embryos
Stanford University
Approved \$30,500 Paid \$30,500

Susan M. Kaech, Ph.D.

Investigation of the mechanisms that regulate memory CD8 T cell development
Yale University School of Medicine
Paid \$165,750

David K. R. Karaolis, Ph.D.

Study of cyclic dinucleotides
University of Maryland-Baltimore School of Medicine
Approved \$87,500 Paid \$87,500

Alla Y. Karpova, Ph.D.

Using molecular inactivators of synaptic transmission to study cortical function and its modulation by subcortical systems in health and disease
Cold Spring Harbor Laboratory
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Leslie S. Kean, M.D., Ph.D.

Innate immunity and transplantation tolerance: Defining the role of natural killer in allograft rejection
Emory University School of Medicine
Approved \$500,000 Paid \$50,000

William R. Kobertz, Ph.D.

Molecular interactions of the lipid-exposed surfaces of integral membrane proteins
University of Massachusetts Medical School
Paid \$65,500

Tobias R. Kollmann, M.D., Ph.D.

Induction of protective immunity to *Listeria* in neonates
University of British Columbia Faculty of Medicine
Approved \$500,000

Steven T. Kosak, Ph.D.

Genomic organization of hematopoietic differentiation
University of Washington
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Eric C. Lai, Ph.D.

Genomewide analysis of microRNA function in *Drosophila*
University of California-Berkeley
Approved \$58,000 Paid \$58,000
(\$58,000 of the original award for future faculty appointment was transferred/cancelled)

Brian C. Lewis, Ph.D.

Modeling tumor initiation, progression, and metastasis using tissue-specific somatic gene transfer
University of Massachusetts Medical School
Approved \$3,949 Paid \$110,500

Yaping J. Liao, M.D., Ph.D.

Neurophysiological dysfunction in calcium channelopathies
Stanford University School of Medicine
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

George Y. Liu, M.D., Ph.D.

Role of Group B *Streptococcal* hemolysin/cytolysin and pigment in the pathogenesis of invasive neonatal infections
University of California-San Diego School of Medicine
Paid \$58,000

Minmin Luo, Ph.D.

Integration of pheromonal signals and hormonal cues in mammalian reproduction
Yale University School of Medicine
Approved \$29,000 Paid \$29,000
(\$384,000 of the original award for future faculty appointment was transferred/cancelled)

Anna K. Majewska, Ph.D.

Imaging rapid plasticity in the visual cortex
Massachusetts Institute of Technology
Approved \$58,000 Paid \$58,000
(\$58,000 of the original award to the University of Rochester was transferred/cancelled)

Margaret E. McLaughlin, M.D.

Effects of heterotypic cell interactions and bloodborne signals on tumors of the nervous system
Massachusetts Institute of Technology
Approved \$58,000 Paid \$58,000
(\$58,000 of the original award for future faculty appointment was transferred/cancelled)

Marc D. Meneghini, Ph.D.

Regulating chromatin domains in yeast and during animal development
University of California-San Francisco
Paid \$29,000

Karen L. Mohlke, Ph.D.

Genetic analysis of type 2 diabetes susceptibility
University of North Carolina-Chapel Hill School of Medicine
Paid \$62,000

Vamsi K. Mootha, M.D.

Genomic approaches to mitochondrial biogenesis
Harvard Medical School
Approved \$58,000 Paid \$150,000
(\$58,000 of the original award to the Massachusetts Institute of Technology was transferred/cancelled)

Suzanne M. Noble, M.D., Ph.D.

Identification of virulence genes in *Candida albicans*, a diploid, commensal human fungal pathogen
University of California-San Francisco School of Medicine
Paid \$58,000

Feroz R. Papa, M.D., Ph.D.

Connection between endoplasmic reticulum stress and type 2 diabetes
Faculty appointment to be determined
(\$500,000 approved for future faculty appointment)

Catherine L. Peichel, Ph.D.

Genetic and molecular basis of reproductive isolation of threespine sticklebacks
Fred Hutchinson Cancer Research Center
Paid \$128,000

Bijan Pesaran, Ph.D.

Cortical mechanisms for hand-eye coordination
California Institute of Technology
Approved \$20,000 Paid \$49,000
(\$20,000 of the original award for future faculty appointment was transferred/cancelled)



Michael G. Poirier, Ph.D.

A study of DNA accessibility within nucleosome arrays
Northwestern University
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Martin R. Pollak, M.D.

Mouse molecular genetic studies of the extracellular
Ca²⁺-sensing receptor
Harvard Medical School
Paid \$60,500

Matthew H. Porteus, M.D., Ph.D.

Regulation of gene targeting in vertebrate somatic cells
University of Texas Southwestern Medical Center-Dallas
Paid \$110,500

Salman T. Qureshi, M.D.

Genetic analysis of innate resistance to bacterial pathogens
McGill University Faculty of Medicine
Paid \$118,250

Jill A. Rafael-Fortney, Ph.D.

Role of muscle proteins in synaptic structure and neuromuscular disease
Ohio State University College of Medicine and Public Health
Approved \$58,000 Paid \$58,000

David E. Reich, Ph.D.

Applying population genetics to find genes for common diseases
Harvard Medical School
Paid \$100,000

Jeremy F. Reiter, M.D., Ph.D.

Tectonic: discovery of novel signal directing mammalian development
University of California-San Francisco
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Kyu Y. Rhee, M.D., Ph.D.

Enzymes of intermediary metabolism in *Mycobacterium tuberculosis*:
Anti-mycobacterial targets of nitric oxide
Weill Medical College of Cornell University
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Noah A. Rosenberg, Ph.D.

Efficient genome-based inference of ancestry for use in genetic
association studies
University of Southern California
Paid \$29,000

Alvaro Sagasti, Ph.D.

Development of morphological diversity in trigeminal sensory neurons
New York University School of Medicine
Paid \$29,000

Alan Saghatelian, Ph.D.

Identifying functional connections between the proteome and
metabolome by global metabolite profiling
Scripps Research Institute
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Annette E. Salmeen, D.Phil.

Reactive oxygen species as temporal coordinators of cell
signaling pathways
Stanford University School of Medicine
Approved \$58,000
(\$442,000 approved for future faculty appointment)

Stephen W. Santoro, Ph.D.

Directed evolution of natural and unnatural proteins and oligomers
for gene manipulation, drug discovery, and biochemical investigation
Harvard University
Approved \$29,000 Paid \$29,000
(\$29,000 of the original award for future faculty appointment was
transferred/cancelled)

Erica O. Saphire, Ph.D.

Structural studies of Ebola pathogenesis
Scripps Research Institute
Paid \$100,000

Bradley L. Schlaggar, M.D., Ph.D.

Development of cognition: fMRI studies
Washington University School of Medicine
Paid \$110,500

Maria A. Schumacher, Ph.D.

Structural biology of cell growth, development, and regulation
Oregon Health & Science University
Paid \$7,500

Kristin E. Scott, Ph.D.

Taste representation in *Drosophila* brain
University of California-Berkeley
Approved \$16,308.43 Paid \$55,250

Nirao M. Shah, Ph.D.

Genetic analysis of neural circuits mediating sexually dimorphic
behaviors in mammals
University of California-San Francisco School of Medicine
Paid \$62,000

Shu-ou Shan, Ph.D.

Mechanism of signal recognition particle-mediated protein targeting
University of California-San Francisco School of Medicine
Paid \$29,000

Michael D. Shapiro, Ph.D.

Genetic and developmental basis of skeletal diversity in
ninespine sticklebacks
Stanford University School of Medicine
Approved \$116,000 Paid \$29,000
(\$384,000 approved for future faculty appointment)

Donald C. Sheppard, M.D.

Isolation and characterization of genes involved in morphogenesis
and virulence of *Aspergillus fumigatus*
McGill University
Approved \$62,256.99 Paid \$192,000

Upinder Singh, M.D.

Transcriptional control in *Entamoeba histolytica*
Stanford University School of Medicine
Paid \$60,500

Michele M. Solis, Ph.D.

Telencephalic pattern generator for song
University of Washington School of Medicine
Paid \$29,000

Collin M. Stultz, M.D., Ph.D.

Conformational free energy landscape of collagen and its relationship
to atherosclerotic plaque rupture
Massachusetts Institute of Technology
Paid \$110,500

Helen C. Su, M.D., Ph.D.

Molecular function of caspase-8 for lymphocyte activation
(\$384,000 approved for future faculty appointment; postdoctoral
support provided by the National Institute of Allergy and
Infectious Diseases)

Xin Sun, Ph.D.

Understanding the endoderm in organogenesis and regeneration
University of Wisconsin Medical School
Paid \$131,000

Roger B. Sutton, Ph.D.

Biophysical and structural investigation of Ca^{2+} in
neurotransmitter release
University of Texas Medical Branch-Galveston
Paid \$36,824

Heidi A. Tissenbaum, Ph.D.

Genetic and molecular analysis of genes controlling longevity in
Caenorhabditis elegans
University of Massachusetts Medical School
Approved \$116,000 Paid \$116,000

Stephen H. Tsang, M.D., Ph.D.

Unraveling genetic pathways leading to cell death in mice lacking
the gamma subunit of the cGMP phosphodiesterase
Columbia University College of Physicians and Surgeons
Paid \$127,500

Sinisa Urban, Ph.D.

Exploring the role of rhomboid signaling in development and disease
Harvard Medical School
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

Kevin B. Urdahl, M.D., Ph.D.

Role of MHC class I molecules against tuberculosis
University of Washington School of Medicine
Paid \$29,000

Amy J. Wagers, Ph.D.

Dynamic circulation of hematopoietic stem cells: implications for
stem cell function
Joslin Diabetes Center
Paid \$165,750

Loren D. Walensky, M.D., Ph.D.

Targeting protein interactions in vivo using chemically reinforced
helical peptides
Harvard Medical School
Approved \$58,000 Paid \$29,000
(\$442,000 approved for future faculty appointment)

John B. Wallingford, Ph.D.

Molecular control of cell motility during vertebrate gastrulation
University of Texas-Austin
Paid \$110,500

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

Estrogen receptors and neuroprotection against excitotoxic injury
University of Michigan Health System
Paid \$98,216.34

Jennifer A. Zallen, Ph.D.

Molecular analysis of dynamic cell rearrangements in *Drosophila*
Memorial Sloan-Kettering Cancer Center
Approved \$38,230 Paid \$64,000
(\$29,000 of the original award to Princeton University was paid)



Yanping Zhang, Ph.D.

ARF-MDM-p53 tumor suppression pathway
University of North Carolina-Chapel Hill School of Medicine
Approved \$267,438.26 Paid \$66,859
(\$77,312.55 of the original award to the University of Texas M. D. Anderson Cancer Center was transferred/cancelled)

Hong Zhang, Ph.D.

Role of RNA and nuclear bodies in PcG-mediated epigenetic gene silencing
Harvard Medical School
Approved \$58,000
(\$442,000 approved for future faculty appointment)

Karen M. Zito, Ph.D.

Regulation of synapse formation in the mammalian cortex
Cold Spring Harbor Laboratory
Approved \$29,000 Paid \$29,000
(\$29,000 of the original award for future faculty appointment was transferred/cancelled)

Subtotals

Approved: \$12,623,874.25
Paid: \$7,361,316.34
Transferred/Cancelled: \$1,414,619.55

HITCHINGS-ELION FELLOWSHIPS

Tamara Caspary, Ph.D.

Identification and characterization of novel genes involved in mammalian sex determination
Emory University School of Medicine
Paid \$77,500

John W. R. Copeland, Ph.D.

Activation of the transcription factor SRF by actin remodeling proteins
University of Ottawa Faculty of Medicine
Paid \$90,500

Aaron R. Dinner, Ph.D.

Molecular mechanism of free radical oxidative DNA damage
University of Chicago
Paid \$45,250

Daniel Durocher, Ph.D.

Role of FHA domains during DNA damage signaling
University of Toronto
Paid \$30,536

Reuben S. Harris, Ph.D.

Delineation of the mechanisms of immunoglobulin gene hypermutation
University of Minnesota-Twin Cities
Paid \$45,250

Alan J. Herr, Ph.D.

Probing the pathway of RNA-mediated defense with viral suppressor genes
Sainsbury Laboratory
Approved \$4,000 Paid \$4,000

Michael J. Schell, Ph.D.

Brain calcium homeostasis: functional roles of GAP1-IP4BP
Uniformed Services University of the Health Sciences
Paid \$49,000*

*Paid to Henry M. Jackson Foundation for the Advancement of Military Medicine.

Subtotals

Approved: \$4,000
Paid: \$342,036
Transferred/Cancelled: n/a

REPRODUCTIVE SCIENCE

Marine Biological Laboratory

Renewal for the Frontiers in Reproduction course
Paid \$141,367

National Institutes of Health

Support for the First Annual Summer Institute in Maternal-Fetal Pharmacology
Approved \$5,000

Society for the Study of Reproduction

Support for the society's annual meeting
Approved \$10,000 Paid \$10,000

University of California-San Francisco School of Medicine

Support for effect of cigarette smoking on HPV and cervical neoplasia
Paid \$160,000

Subtotals

Approved: \$15,000
Paid: \$311,367
Transferred/Cancelled: n/a

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 *Science's* Next Wave Career Development Center Web site
 Paid \$23,000

American Evaluation Association
 Support for the joint annual conference of the association and the Canadian Evaluation Society
 Approved \$3,000 Paid \$3,000

American Society for Cell Biology
 Support for the association's annual meeting
 Approved \$12,500 Paid \$12,500

Commission on Professionals in Science and Technology
 Support for general activities
 Approved \$5,000 Paid \$5,000

Gordon Research Conferences
 Support for the Conference on Fertilization and the Activation of Development
 Approved \$5,000 Paid \$5,000

Harvard Medical School
 Support for behavioral and psychological correlates of salivary testosterone
 Approved \$4,750 Paid \$4,750

National Academies
 Support for producing the guidebook *Women in Science*
 Approved \$25,000 Paid \$25,000

National Academies
 Support for disseminating the National Research Council report *Bridges to Independence: Fostering the Independence of New Investigators in Biomedical Research*
 Approved \$27,677 Paid \$27,677

National Postdoctoral Association
 Support for association activities at the American Association for the Advancement of Science annual meeting and for enhancing Web-based resources
 Approved \$20,050 Paid \$20,050

National Postdoctoral Association
 Support for general activities
 Approved \$2,000 Paid \$2,000

Sigma Xi, The Scientific Research Society
 Support for the NIEHS-NTA Biomedical career fair
 Approved \$2,000 Paid \$2,000

Sigma Xi, The Scientific Research Society
 Support for promoting the society's survey
 Approved \$30,000

Society for Neuroscience
 Support for postdoctoral travel awards to the society's annual meeting
 Approved \$10,000 Paid \$10,000

University of California-Davis
 Support for Dr. Milton Datta to present a seminar on project management
 Approved \$2,000 Paid \$2,000

University of North Carolina-Chapel Hill
 Support for program on grant-writing skills
 Approved \$4,000 Paid \$4,000

Subtotals

Approved: \$152,977
 Paid: \$145,977
 Transferred/Cancelled: n/a



INFECTIOUS DISEASES

Totals

Approved: \$4,994,500.00

Paid: \$3,039,500.00

Transferred/Cancelled: \$5,000.00

INVESTIGATORS IN PATHOGENESIS OF INFECTIOUS DISEASE

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

Understanding immunopathogenesis of hepatitis B virus
University of California-San Francisco School of Medicine
Approved \$400,000

David C. Bloom, Ph.D.

Identification of neuron-specific factors that regulate HSV-1
chromatin structure and transcription during latency
University of Florida College of Medicine
Paid \$80,000

Matthew S. Bogoy, Ph.D.

Chemical mapping of proteolytic networks involved in
Toxoplasma gondii pathogenesis
Stanford University School of Medicine
Approved \$400,000 Paid \$40,000

John H. Brumell, Ph.D.

Recognition of bacteria in the cytosol of mammalian cells by
protein conjugation systems
University of Toronto
Approved \$400,000 Paid \$40,000

Barbara A. Burleigh, Ph.D.

Functional characterization of the role of the host cell fibrogenic
response in *Trypanosoma cruzi* infection
Harvard School of Public Health
Paid \$80,000

Zhijian J. Chen, Ph.D.

Role of TRAF5-regulated IKK activators in innate immunity
University of Texas Southwestern Medical Center-Dallas
Paid \$80,000

Dana A. Davis, Ph.D.

Control of phenotypic switching and pathogenesis by the
Mds3 protein
University of Minnesota-Twin Cities
Paid \$80,000

Maurizio Del Poeta, M.D.

Role of inositol phosphoryl ceramide synthase 1 in
fungal-host interaction
Medical University of South Carolina College of Medicine
Paid \$80,000

Tatjana Dragic, Ph.D.

Entry and intracellular trafficking of hepatitis C virus
Albert Einstein College of Medicine of Yeshiva University
Approved \$400,000 Paid \$40,000

David A. Fidock, Ph.D.

Plasmodium falciparum transmembrane proteins and their role in
parasite susceptibility to heme-binding antimalarials
Albert Einstein College of Medicine of Yeshiva University
Paid \$80,000

Michael J. Gale Jr., Ph.D.

Control of hepatitis C virus replication
University of Texas Southwestern Medical Center-Dallas
Paid \$80,000

Michael S. Glickman, M.D.

Role of regulated intramembrane proteolysis in controlling
Mycobacterium tuberculosis virulence and cell envelope composition
Memorial Sloan-Kettering Cancer Center
Approved \$400,000 Paid \$40,000

Heidi Goodrich-Blair, Ph.D.

Pathogenesis of *Xenorhabdus nematophilus* in insects: a model for
the innate immune response to bacterial pathogens
University of Wisconsin-Madison
Paid \$80,000

David B. Haslam, M.D.

Mechanisms of *Shiga* toxin translocation and intoxication
within host cells
Washington University School of Medicine
Paid \$80,000

Akiko Iwasaki, Ph.D.

Stromal cell contributions in innate and adaptive immune
responses to mucosal viral infection
Yale University
Approved \$400,000 Paid \$40,000

Margarethe J. Kuehn, Ph.D.

Toxin trafficking via vesicles
Duke University Medical Center
Paid \$80,000

Andrew S. Neish, M.D.

Transgenic analysis of prokaryotic effector proteins in the eukaryote *Drosophila melanogaster*
Emory University School of Medicine
Paid \$80,000

John S. Parker, BVMS., Ph.D.

Reovirus-induced apoptosis: the role of the viral outer-capsid protein mu1
Cornell University College of Veterinary Medicine
Approved \$400,000 Paid \$40,000

Lalita Ramakrishnan, M.D., Ph.D.

Forward genetic screens in the zebrafish to identify host determinants of susceptibility to tuberculosis
University of Washington School of Medicine
Approved \$400,000 Paid \$40,000

Eric J. Rubin, M.D., Ph.D.

Cell signaling by bacterial cytokines in *Mycobacterium tuberculosis*
Harvard School of Public Health
Paid \$80,000

Gregory A. Smith, Ph.D.

Coordination of herpes virus assembly and transport in axons of sensory neurons
Northwestern University Feinberg School of Medicine
Approved \$400,000 Paid \$40,000

C. Erec Stebbins, Ph.D.

Structural studies of bacterial virulence factors
Rockefeller University
Paid \$80,000

Ren Sun, Ph.D.

Identification of cellular factors that determine the fate of herpes virus infection: latency versus lytic replication
University of California-Los Angeles School of Medicine
Paid \$80,000

Chloe L. Thio, M.D.

Identification of human genes associated with hepatitis B virus outcomes
Johns Hopkins University School of Medicine
Paid \$80,000

Linda F. van Dyk, Ph.D.

Analyzing the role of tumor suppressors in the control of virus infection and inflammation
University of Colorado Health Sciences Center
Approved \$400,000 Paid \$40,000

Sean P. Whelan, Ph.D.

Exploration of the interaction of RNA viruses with their host cells
Harvard Medical School
Approved \$400,000 Paid \$40,000

Wenqing Xu, Ph.D.

Innate immunity: how do toll-like receptors recognize microbial pathogens?
University of Washington School of Medicine
Paid \$80,000

Thomas C. Zahrt, Ph.D.

Mycobacterium tuberculosis regulators modulating reactivation
Medical College of Wisconsin
Paid \$80,000

Subtotals

Approved: \$4,400,000
Paid: \$1,760,000
Transferred/Cancelled: n/a

NEW INITIATIVES IN MALARIA RESEARCH**Fred E. Cohen, M.D., D.Phil.**

University of California-San Francisco

Joseph L. DeRisi, Ph.D.

Functional genomics approach to identification of new antimalarials drug targets
University of California-San Francisco School of Medicine
Paid \$50,000

Keith A. Joiner, M.D.

Mechanism of hemoglobin uptake in malaria
University of Arizona
Paid \$100,000

Subtotals

Approved: n/a
Paid: \$150,000
Transferred/Cancelled: n/a

SCHOLAR AWARDS IN MOLECULAR PARASITOLOGY**Alan A. Aderem, Ph.D.**

Macrophage responses to *Leishmania* infection
University of Washington
Paid \$42,500



Paul J. Brindley, Ph.D.
Schistosome transgenesis
Tulane University School of Public Health and Tropical Medicine
Paid \$85,000

Marc Ouellette, Ph.D.
Functional genomics of drug resistance in *Leishmania*
Laval University Hospital Center
Paid \$85,000

Edward J. Pearce, Ph.D.
Role of the TGF-beta superfamily in host signaling to schistosomes
University of Pennsylvania School of Veterinary Medicine
Paid \$85,000

L. David Sibley, Ph.D.
Molecular pathogenesis in toxoplasmosis
Washington University School of Medicine
Paid \$42,500

Subtotals

Approved: n/a
Paid: \$340,000
Transferred/Cancelled: n/a

SCHOLAR AWARDS IN MOLECULAR PATHOGENIC MYCOLOGY

Carol S. Newlon, Ph.D.
Analysis of chromosome structure and function in the pathogenic
basidiomycete *Cryptococcus neoformans*
University of Medicine and Dentistry of New Jersey
Paid \$85,000

Michael P. Snyder, Ph.D.
Analysis of morphogenic differentiation in *Candida albicans*
Yale University
Paid \$42,500

Paula Sundstrom, Ph.D.
Global regulatory circuits and candidiasis
Dartmouth College
Paid \$42,500

Subtotals

Approved: n/a
Paid: \$170,000
Transferred/Cancelled: n/a

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.

Albert Einstein College of Medicine of Yeshiva University
Support for a seminar presented by Dr. Maurizio Del Poeta, a BWF Investigator in Pathogenesis of Infectious Disease
Approved \$800 Paid \$800*
*Paid Montefiore Medical Center

American Society for Microbiology
Support for the symposium "Mechanisms and Applications of RNAi in Microbes," held at the society's annual meeting
Approved \$3,000 Paid \$3,000

American Society for Microbiology
Support for the meeting "Dimorphic Fungal Pathogens"
Approved \$15,000 Paid \$15,000

American Society of Tropical Medicine and Hygiene
Support for the Burroughs Wellcome Fund/American Society of Tropical Medicine and Hygiene Fellowship in Tropical Infectious Diseases
Approved \$30,000 Paid \$67,000

American Society of Tropical Medicine and Hygiene
Support for the society's annual meeting and two BWF sessions held at the meeting
Approved \$25,000 Paid \$25,000

Baylor College of Medicine
Support for the first-stage design and development of a multidimensional, cross-disciplined database
Approved \$5,000 Paid \$5,000

Baylor College of Medicine
Support for a seminar presented by a BWF Investigator in Pathogenesis of Infectious Disease
Approved \$800 Paid \$800

Boston University
Support for a Global Health Initiative meeting
Approved \$15,000 Paid \$15,000

Broad Institute of Harvard and Massachusetts Institute of Technology
Support for a meeting titled "Next steps for malaria research: Where are We Going in the Post-Genomic Era?"
Approved \$32,500 Paid \$32,500*
*Paid Massachusetts Institute of Technology

Cornell University College of Veterinary Medicine

Support for a seminar presented by a BWF Investigator in Pathogenesis of Infectious Disease

Approved \$800 Paid \$800

Courtesy Associates

Support for a conference titled "Dendritic Cells at the Host Pathogen Interface"

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

Environmental Mutagen Society

Support for symposia at the 9th International Conference on Environmental Mutagens

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

Federation of American Societies for Experimental Biology

Support for a society meeting titled "Lymphocytes and the Immune System: Molecular, Cellular, and Integrative Mechanisms"

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

Foundation for Advanced Education in the Sciences

Support for a New Investigator seminar at the National Institute of Allergy and Infectious Diseases

Approved \$800 Paid \$800

Foundation for the National Institutes of Health

Support for a conference titled "Emergence and Evolution of Infectious Disease"

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

Genetics Society of America

Support for the 23rd Fungal Genetics Conference

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

Gordon Research Conferences

Support for the Conference on Malaria

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

Gordon Research Conferences

Support for the Conference on the Biology of Host-Parasite Interactions

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

Institute for Genomic Research

Support for completing the *Plasmodium vivax* genome sequencing project

Paid \$100,000

Institute of Medicine

Support for the Forum on Emerging Infections

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

Johns Hopkins University Bloomberg School of Public Health

Support for a seminar by Dr. Akiko Iwasaki, a BWF Investigator in Pathogenesis of Infectious Disease

Approved \$800 Paid \$800

Keystone Symposia

Support for the 2005 conference series

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

Marine Biological Laboratory

Support for the training course "Biology of Parasitism: Modern Approaches"

Paid \$100,000

Marine Biological Laboratory

Support for the Trager Lectures during the "Biology of Parasitism" course

Approved \$4,500 Paid \$4,500

Marine Biological Laboratory

Support for a seminar by Dr. Lalita Ramakrishnan and Dr. Sean Whelan, BWF Investigators in Pathogenesis of Infectious Disease

Approved \$800 Paid \$800

Marine Biological Laboratory

Support for the training course titled "Molecular Mycology: Current Approaches to Fungal Pathogenesis"

Approved \$207,000

McGill University

Support for a seminar by a BWF Investigator in Pathogenesis of Infectious Disease

Approved \$800 Paid \$800

Medical University of South Carolina

Support for the 3rd Charleston Ceramide Conference

Approved \$1,000 Paid \$1,000

Michigan State University

Support for the 11th Annual Midwest Microbial Pathogenesis Conference

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

National Academy of Sciences

Support for graduate students and postdoctoral fellows to attend the Sackler Colloquium

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



New York University

Support for strain collection and capacity building for the malaria community

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

Northwestern University Feinberg School of Medicine

Support for meetings organized by the Chicago-Area Mycology and Parasites Club

Approved \$11,000 Paid \$11,000

Pasteur Institute

Support for the first Federation of European Biochemical Societies training course titled "Human Fungal Pathogens: Molecular Mechanisms of Host-Pathogen Interactions and Virulence"

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

Seattle Biomedical Research Institute

Support for researchers from developing countries to attend institute

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

Society of Toxicology

Support for graduate students to attend the society's annual meeting

Approved \$10,000 Paid \$5,000

(\$5,000 of the original award to the Society of Toxicology was transferred/cancelled)

University of Alabama-Birmingham

Support for a seminar presented by Dr. Akiko Iwasaki, an a BWF Investigator in Pathogenesis of Infectious Disease

Approved \$800 Paid \$800

University of California-San Francisco

Support for postdoctoral education

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

University of Cincinnati

Support for the IX International Workshops on Opportunistic Protists

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

University of Georgia

Support for the Coccidiosis Conference, held in conjunction with the 80th American Society of Parasitologists meeting

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

University of Minnesota-Twin Cities

Support for a New Investigator seminar

Approved \$800 Paid \$800

University of Oklahoma Health Sciences Center

Support for a seminar by Dr. Lalita Ramakrishnan, a BWF Investigator in the Pathogenesis of Infectious Disease

Approved \$800 Paid \$800

University of Wisconsin Medical School

Support for the *Cryptococcus* community to develop microarrays

Approved \$40,000 Paid \$40,000

Subtotals

Approved: \$594,500

Paid: \$619,500

Transferred/Cancelled: \$5,000

INTERFACES

Totals

Approved: \$5,765,894.95

Paid: \$6,158,921.30

Transferred/Cancelled: \$40,894.95

CAREER AWARDS AT THE SCIENTIFIC INTERFACE

Emre Aksay, Ph.D.

Neural mechanisms for control of eye position

Princeton University

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Rachel Brem, Ph.D.

Genetics of transcription in budding yeast

University of Washington

Approved \$140,000 Paid \$80,000

Fred Hutchinson Cancer Research Center

(\$360,000 approved for future faculty appointment)

Yann R. Chemla, Ph.D.

Single-molecule study of bacteriophage DNA packaging and mitochondrial protein import

University of California-Berkeley

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Oksana Cherniavskaya, Ph.D.

Exploring the spatial interactions in cytoskeletal proteins using nanoscale bioarrays

Columbia University

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Lindsay G. Cowell, Ph.D.

Novel statistical approach to deducing the function of regulatory DNA: examples from analyses of recombination signal sequences

Duke University Medical Center

Paid \$120,000

Michael B. Elowitz, Ph.D.

In vivo modeling: a synthetic approach to regulatory networks

California Institute of Technology

Paid \$130,000

Adrienne L. Fairhall, Ph.D.

Neural computation, adaptation, and information processing

University of Washington

Paid \$130,000

Timothy J. Gardner, Ph.D.

Tracking neural programs for song

Massachusetts Institute of Technology

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Robert H. Havlin, Ph.D.

Snapshots of proteins in action: elucidating freeze-trapped intermediates with solid state nuclear magnetic resonance

(\$360,000 approved for future faculty appointment; postdoctoral support provided by the National Institutes of Health)

Christine E. Heitsch, Ph.D.

Combinatorial and computational approach to deciphering the biological information encoded by single-stranded nucleotide sequences

University of Wisconsin-Madison

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Lisa J. Lapidus, Ph.D.

Dynamics of polypeptides from measurement of intramolecular contact formation

Michigan State University

Paid \$155,000

Patrick W. Nelson, Ph.D.

Theoretical study of HIV-1 pathogenesis: from primary infection, through latency, to effective drug therapy or progression to AIDS

University of Michigan-Ann Arbor

Paid \$130,000

Todd E. Peterson, Ph.D.

Ultrahigh-resolution in vivo imaging

Vanderbilt University

Paid \$130,000

Joshua B. Plotkin, Ph.D.

Novel methods to compute selection pressures on proteins at the genome-wide scale

Harvard University

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Astrid A. Prinz, Ph.D.

Models of activity-dependent homeostatic regulation in neural networks on the basis of brute force exploration of high-dimensional parameter spaces

Emory University

Approved \$500,000 Paid \$100,000



Jianghong Rao, Ph.D.

Imaging gene expression and protein phosphorylation in living organisms

Stanford University School of Medicine

Paid \$183,683.30

Benjamin J. Raphael, Ph.D.

High-resolution analysis of tumor genome architectures

University of California-San Diego

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Ronald S. Rock Jr., Ph.D.

Exploring the protein folding energy landscape at the single molecule level

University of Chicago

Paid \$130,000

Brent R. Stockwell, Ph.D.

Chemical profiling of cellular disease states

Columbia University

Paid \$130,000

Megan T. Valentine, Ph.D.

Establishing the mechanism of kinesin processivity

Stanford University

Approved \$140,000 Paid \$80,000

(\$360,000 approved for future faculty appointment)

Keith R. Weninger, Ph.D.

Single molecule study of the role of SNARE protein-assisted membrane fusion in calcium-triggered neurotransmitter release

North Carolina State University

Paid \$130,000

Ryohei Yasuda, Ph.D.

Visualization of biochemical signaling in single dendritic spines

Duke University

Paid \$60,000

Matthew A. Young, Ph.D.

Allosteric regulation in cell signaling proteins

University of Michigan-Ann Arbor

Paid \$120,000

Muhammad N. Yousaf, Ph.D.

Surface chemistry and materials approach to develop model substrates to study PI(4,5)P2 lipid raft dependent actin polymerization

University of North Carolina-Chapel Hill

Paid \$120,000

Subtotals

Approved: \$5,360,000

Paid: \$2,488,683.30

Transferred/Cancelled: n/a

FUNCTIONAL GENOMICS INNOVATION AWARDS

Listed by names, institutions, and research subjects. In the case of collaborators at two different institutions, the institution listed first received the award payment. These special one-time awards were made in conjunction with the dedication of BWF's building in 2000. BWF also provides support for functional genomics through our other programs.

Leonid Kruglyak, Ph.D.

Princeton University

Elaine A. Ostrander, Ph.D.

National Human Genome Research Institute

Mapping cancer susceptibility genes in dogs by linkage disequilibrium

Approved \$40,894.95 Paid \$40,894.95*

(\$59,105.05 of the original award to the University of Washington was paid; \$40,894.95 of the original award to the University of Washington was transferred/cancelled.)

*Grant was transferred to Princeton University after the PI left Washington University and moved to a govt. institution.

Eric D. Siggia, Ph.D.

Frederick R. Cross, Ph.D.

Rockefeller University

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

Paid \$25,000

Subtotals

Approved: \$40,894.95

Paid: \$125,000

Transferred/Cancelled: \$40,894.95

INTERFACES AWARD

Listed by name of the training program, the institution or consortium conducting the program, and the researchers directing the program. In cases where codirectors have differing affiliations, their affiliations are listed after their names.

Cross-Disciplinary Training Program in Biophysical Dynamics

University of Chicago

Stephen J. Kron, M.D., Ph.D.

Norbert F. Scherer, Ph.D.

Paid \$500,000

Graduate Program in Quantitative Biology

David A. Agard, Ph.D.

University of California-San Francisco School of Medicine

Ken A. Dill, Ph.D.

University of California-San Francisco School of Pharmacy

Paid \$1,000,000

Interdisciplinary Training Program in Brain Science

Brown University

John P. Donoghue, Ph.D.

David Mumford, Ph.D.

Paid \$115,238

LaJolla Interfaces in Science Training Program

Consortium of the University of California-San Diego, the Scripps Research Institute, the Salk Institute of 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 \$125,000

Program in Computational Biology

Michael Paulaitis, Ph.D.

Johns Hopkins University

George D. Rose, Ph.D.

Johns Hopkins University School of Medicine

Paid \$500,000

Program in Mathematical and Computational Neuroscience

Boston University

Howard B. Eichenbaum, Ph.D.

Nancy J. Kopell, Ph.D.

Paid \$350,000

Program in Mathematics and Molecular Biology

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

Wilma K. Olson, Ph.D.

Rutgers, the State University of New Jersey-New Brunswick

DeWitt L. Summers, Ph.D.

Florida State University

Paid \$250,000

Training Program in Biological Dynamics

Princeton University

John J. Hopfield, Ph.D.

Simon A. Levin, Ph.D.

Paid \$500,000

Subtotals

Approved: n/a

Paid: \$3,340,238.00

Transferred/Cancelled: n/a

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 Physiological Society

Support for the International Congress of Physiological Sciences:

From Genomes to Functions

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

Biophysical Society

Support for sessions on career development and for child care program at the society's annual meeting

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

Canadian Genetic Diseases Network

Support for the Canadian Bioinformatics Workshop series

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

Harvard University

Support for the Sixth International Conference on Systems Biology

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

Kavli Institute for Theoretical Physics

Support for the workshop "Understanding the Brain"

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

Marine Biological Laboratory

Support for a interdisciplinary physiology course

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

Subtotals

Approved: \$365,000

Paid: \$205,000

Transferred/Cancelled: n/a



TRANSLATIONAL RESEARCH

Totals

Approved: \$5,507,383

Paid: \$5,242,383

Transferred/Cancelled: n/a

CLINICAL SCIENTIST AWARDS IN TRANSLATIONAL RESEARCH

During the fiscal year, some award recipients change institutions or modify the terms of their award at their current institution, or both. In these cases, BWF's policy is to cancel the remaining portion of the original award and, as necessary, approve a new award. When the award recipient has changed institutions, the new award is made to the new institution; when the award recipient 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 award recipient is listed first, the title of the project is listed second, the award recipient's current institution is listed third, and the amount approved or paid to the institution is listed fourth. For award recipients who either changed institutions or modified their awards, 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.

Sunil K. Ahuja, M.D.

HIV-1 AIDS pathogenesis: bridging the gap between host genotype and HIV transmission/disease phenotype
University of Texas-San Antonio Health Science Center
Paid \$150,000

David M. Altshuler, M.D., Ph.D.

Genomic approaches to the genetics of type 2 diabetes and response to antidiabetic medication
Massachusetts General Hospital
Paid \$150,000

Andrew D. Badley, M.D., F.R.C.P.

Novel antiapoptotic therapies for sepsis
Mayo Clinic-Rochester
Approved \$750,000 Paid \$75,000

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

Vaccination of HIV-1 positive individuals by antigen-pulsed dendritic cells
New York University School of Medicine
Paid \$75,000

Cameron S. Carter, M.D.

Multimodal brain imaging and the pharmacotherapy of cognitive disability in schizophrenia
University of California-Davis
Paid \$150,000

Judy H. Cho, M.D.

Characterization of expression patterns in monocyte-derived cells in inflammatory bowel disease
University of Chicago Pritzker School of Medicine
Paid \$150,000

Kenneth R. Cooke, M.D.

Acute lung injury after SCT: from laboratory insights to novel strategies for diagnosis and treatment
University of Michigan Medical School
Approved \$750,000 Paid \$75,000

James E. Crowe Jr., M.D.

Immunology and cell biology of human metapneumovirus infections
Vanderbilt University School of Medicine
Approved \$750,000 Paid \$75,000

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

Chemotherapy and stem cell transplantation in leukemia
Harvard Medical School
Paid \$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
Paid \$75,000

Jeffrey A. Drebin, M.D., Ph.D.

Targeted suppression of Beta-catenin in colorectal cancer
University of Pennsylvania School of Medicine
Paid \$225,000

Brian J. Druker, M.D.

Mechanism-based therapy for chronic myelogenous leukemia
Oregon Health & Science University
Paid \$75,000

Dean W. Felsher, M.D., Ph.D.

Preclinical validation of g-quadruplex drugs that target MYC to treat cancer
Stanford University School of Medicine
Approved \$750,000 Paid \$75,000

Barry A. Finette, M.D., Ph.D.

Mechanisms of malignant transformation in humans
University of Vermont College of Medicine
Paid \$150,000

Glenn I. Fishman, M.D.

Gap junction channels as novel antiarrhythmic targets
New York University School of Medicine
Paid \$150,000

Thomas F. Gajewski, M.D., Ph.D.

Development of a second generation melanoma vaccine
University of Chicago Pritzker School of Medicine
Paid \$75,000

Joseph G. Gleeson, M.D.

Causes and pathogenesis of cerebellar malformation syndromes in humans: bedside to bench
University of California-San Diego School of Medicine
Approved \$750,000 Paid \$75,000

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

Hepatitis C virus: from molecular virology to effective pharmacologic eradication
Stanford University School of Medicine
Approved \$750,000 Paid \$75,000

Lisa M. Guay-Woodford, M.D.

Genetic modifiers in recessive polycystic kidney disease: implications for pathogenesis and therapeutics
University of Alabama-Birmingham School of Medicine
Paid \$150,000

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

Therapeutic inhibition of aberrant protease activity in inherited neutropenias
University of Washington School of Medicine
Paid \$150,000

Thomas J. Hudson, M.D.

Genomic approaches to identify genes predisposing to asthma
McGill University Faculty of Medicine
Paid \$150,000

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

NMDA-based treatment development for schizophrenia
New York University School of Medicine
Paid \$75,000

Jane E. Koehler, M.D.

Genomic and clinical correlates of human *Bartonella quintana* infection
University of California-San Francisco School of Medicine
Paid \$150,000

Jonathan D. Licht, M.D.

Targeting aberrant repression as a therapeutic strategy in hematological malignancy
Mount Sinai School of Medicine
Paid \$150,000

David M. Markovitz, M.D.

New approaches to inhibiting HIV replication
University of Michigan-Ann Arbor
Paid \$150,000

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

Regulation of human thymic function in vivo
University of California-San Francisco School of Medicine
Paid \$75,000

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

Induction of cellular immunity in HIV-1 exposed seronegative individuals
Fred Hutchinson Cancer Research Center
Paid \$75,000

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

Microvascular spasm in the progression of cardiomyopathy
University of Chicago
Paid \$150,000

Sofia D. Merajver, M.D., Ph.D.

Genetic determinants of aggressive breast cancer phenotypes: translation to the clinic
University of Michigan-Ann Arbor
Paid \$150,000

Hector D. Molina, M.D.

Mechanisms of complement-induced abnormalities in fetomaternal tolerance
Washington University School of Medicine
Paid \$150,000

Anthony J. Muslin, M.D.

Signaling mechanisms in cardiovascular disease
Washington University School of Medicine
Paid \$150,000

Richard J. O'Brien, M.D., Ph.D.

Alzheimer's disease and synaptic transmission
Johns Hopkins University School of Medicine
Approved \$750,000 Paid \$75,000

W. Cam Patterson, M.D.

Oxidative profiles in cardiovascular diseases
University of North Carolina-Chapel Hill School of Medicine
Paid \$150,000

Mark R. Philips, M.D.

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

Steven A. Porcelli, M.D.

Defining the protective human CD8+ T cell response against *Mycobacterium tuberculosis*
Albert Einstein College of Medicine of Yeshiva University
Paid \$150,000

Daniel J. Rader, M.D.

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



Don C. Rockey, M.D.

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

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

Experimental analysis of eosinophil-associated gastrointestinal inflammation
University of Cincinnati College of Medicine
Paid \$150,000

David T. Scadden, M.D.

Developing control mechanism-based stem cell therapies
Massachusetts General Hospital
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
Columbia University College of Physicians and Surgeons
Paid \$75,000

Donald Small, M.D., Ph.D.

Translating FLT3 inhibition into improved therapy for pediatric AML and infant ALL
Johns Hopkins 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
Paid \$75,000

Subtotals

Approved: \$5,250,000
Paid: \$4,950,000
Transferred/Cancelled: n/a

NEW INVESTIGATOR AWARDS IN THE BASIC PHARMACOLOGICAL SCIENCES

Lu-Yang Wang, Ph.D.

Regulation of synaptic strength by subtype-specific coupling between Ca^{2+} channels and metatropic receptors
University of Toronto
Paid \$35,000

Subtotals

Approved: n/a
Paid: \$35,000
Transferred/Cancelled: n/a

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 Medical Informatics Association

Support for activities to improve clinical trial registries
Approved \$10,000 Paid \$10,000

Association of Academic Health Centers

Support for the association's annual meeting
Approved \$10,000 Paid \$10,000

Association of American Medical Colleges

Support for the association's Task Force II on Clinical Research
Approved \$50,000 Paid \$50,000

Center for Information and Study on Clinical Research Participation

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

General Hospital Corporation

Support for an Academic Health Center Clinical Research forum on the use of information technology in clinical research
Approved \$10,000 Paid \$10,000*
*Awarded to Association of Academic Health Centers, Inc.

Institute of Medicine

Support for the Forum on Drug Discovery, Development, and Translation
Approved \$40,000 Paid \$40,000

Institute of Medicine

Support for a study "Understanding Premature Birth and Assuring Healthy Outcomes"
Approved \$124,583 Paid \$124,583

International Society for Pharmacoepidemiology

Support for a session to recognize the contribution of the BWF Scholars in Pharmacoepidemiology program, held at the society's International Conference
Approved \$11,800 Paid \$11,800

Subtotals

Approved: \$257,383.00
Paid: \$257,383.00
Transferred/Cancelled: n/a

SCIENCE EDUCATION

Totals

Approved: \$4,802,582

Paid: \$1,513,696.00

Transferred/Cancelled: \$10,000

STUDENT SCIENCE ENRICHMENT PROGRAM

Bladen County Schools

Excite-Sci

Approved \$60,000 Paid \$60,000

Campbell University School of Pharmacy

High School Science Seminars

Paid \$36,600

Duke University

RoboCupJunior: exhibitions of problem solving, teamwork, and creativity

Approved \$179,978 Paid \$59,992

Duke University

Techtronics: Hands-on exploration of technology in everyday life

Approved \$180,000 Paid \$60,000

Duke University Comprehensive Cancer Center

Summer on the Edge

Paid \$60,000

Duke University Nicholas School of the Environment and Earth Sciences

Connecting Coastal Communities

Paid \$46,897

Evergreen Community Charter School

Girls in Research, Invention, Technology, and Science

Approved \$156,800 Paid \$59,600

Friends of Great Smoky Mountains National Park

Smoky Mountain Heights: Science Education in Western North Carolina

Paid \$55,500

Laboratories for Learning

BioSummer

Paid \$60,000

Lenoir-Rhyne College

Carolina Institute for the Multicultural Approach to Science

Approved \$168,000 Paid \$56,000

Montreat College

Center for Learning and Investigation in Mountain

Backcountry Ecosystems

Approved \$180,000 Paid \$60,000

North Carolina A&T State University

Academy for Computational Explorations in Science

Approved \$180,000 Paid \$60,000

North Carolina A&T State University

Students Hot on the Sciences

Approved \$180,000 Paid \$60,000

North Carolina Museum of Life and Science

Mentors Opening Doors: Experiential Links to Science

Paid \$59,952

North Carolina Science Olympiad

Science Olympiad Student Enrichment Program

Paid \$60,000

North Carolina State University Science House

Photonics Xplorers

Paid \$45,470

Onslow Community Ministries

Sturgeon City Student Science Series

Paid \$59,057

Ranger Elementary/Middle School

Wild Rides!

Paid \$22,605

Schiele Museum of Natural History and Planetarium

Environmental Science Partnership

Approved \$175,000 Paid \$57,600

Shodor Education Foundation

Mentor Center at Shodor

Paid \$60,000

University of North Carolina-Asheville

Bug Camp

Approved \$90,776 Paid \$33,592

University of North Carolina-Greensboro

All Arts and Sciences Camp

Approved \$138,300 Paid \$32,200

Subtotals

Approved: \$1,688,854

Paid: \$1,165,065

Transferred/Cancelled: n/a

OTHER GRANTS

Delta Research and Educational Foundation

Support for North Carolina Chapters of Delta Science and Everyday Experiences, in lieu of an honorarium for SSEP Advisory Committee member Dr. Marian Johnson-Thompson

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



DonorsChoose

Support for science and mathematics projects posted by N.C. teachers on the group's Web site
Approved \$25,000 Paid \$25,000

Durham Public Education Network

Support for the K-8 Science Initiative
Approved \$5,000

Grantmakers for Education

Support for general activities
Approved \$3,000 Paid \$3,000

Mentoring Center

Support for general activities
Approved \$20,000 Paid \$10,000

National Association of Academies of Science

Support for the "Breakfast with Scientists" session at the association's annual meeting
Approved \$2,500 Paid \$2,500

North Carolina Leadership Conference

Support for upgrading technology at Hillside High School
Approved \$1,000

North Carolina Museum of Life and Science

Support for producing take-home activity packs for a mathematics exhibit titled "Flip It, Fold It, Figure It Out!"
Approved \$10,000

North Carolina School of Science and Mathematics Foundation

Support for Science Now
Paid \$151,751

North Carolina School of Science and Mathematics Foundation

Support for the North Carolina Student Science Academy
Approved \$18,900 Paid \$18,900

North Carolina Science Leadership Association

Support for the association's Leadership Fellows program
Approved \$10,000 Paid \$10,000

North Carolina Science, Mathematics, and Technology Education Center

Support for general activities
Approved \$2,500,000

North Carolina State University

Support for the State of North Carolina Undergraduate Research Symposium
Approved \$14,375

Public School Forum of North Carolina

Support for the N.C. Institute for Educational Policymakers
Paid \$90,000

Public School Forum of North Carolina

Support for the International Studies Program and the N.C. Institute for Educational Policymakers
Approved \$466,473

Shodor Education Foundation

Support for the North Carolina High School Computational Chemistry Server
Approved \$12,480 Paid \$12,480

University of North Carolina-Chapel Hill

Support for education outreach efforts of the Center for Functional Nanostructures
(\$10,000 of the original award was transferred/cancelled)

Yale University

Support for undergraduate students at the university to engage in biomedical research internships; made on behalf of BWF Board of Directors member Dr. I. George Miller
Approved \$10,000 Paid \$10,000

Yale University School of Medicine

Support for medical students in the school to engage in biomedical research
Approved \$10,000 Paid \$10,000

Subtotals

Approved: \$3,113,728
Paid: \$348,631
Transferred/Cancelled: \$10,000

SCIENCE AND PHILANTHROPY AD HOC GRANTS

Totals

Approved: \$354,920
Paid: \$235,600
Transferred/Cancelled: \$83,000

COMMUNICATIONS/SCIENCE WRITING

American Association for the Advancement of Science
Support for a science writer's workshop at the association's annual meeting
Approved \$5,000 Paid \$5,000

American Association for the Advancement of Science
Support for the Mass Media Science and Engineering Fellowship Program
Approved \$17,000 Paid \$17,000

Council for the Advancement of Science Writing
Support for the New Horizons Briefing and the Traveling Fellowship Program
Approved \$20,000 Paid \$20,000

D.C. Science Writers Association
Support for activities for science journalists covering the association's annual meeting
Approved \$2,000 Paid \$2,000

Subtotals

Approved: \$44,000
Paid: \$44,000
Transferred/Cancelled: n/a

GENERAL PHILANTHROPY

Council on Foundations
Support for general activities
Approved \$39,600 Paid \$39,600

Friends of the National Library of Medicine
Support for general activities
Approved \$5,000 Paid \$5,000

North Carolina Central University
Support for undergraduate scholarships in biology and chemistry, in lieu of an honorarium for CABS Advisory Committee member Dr. Cecil B. Pickett
Approved \$5,000 Paid \$5,000

Oregon Health & Science University
Support for a public meeting on the dangers of excessive noise, held at the Ninth International Symposium on the Mechanics of Hearing
Approved \$7,000 Paid \$7,000

Philanthropic Research

Support for general activities
Approved \$5,000 Paid \$5,000

Triangle Community Foundation

Support for the Stephen D. and Sandra L. Corman Donor Advised Fund, directed by BWF Board of Directors member Stephen D. Corman
Approved \$20,000 Paid \$20,000

Subtotals

Approved: \$81,600
Paid: \$81,600
Transferred/Cancelled: n/a

SCIENCE POLICY

American Association for the Advancement of Science
Support for the AAAS Center for Science, Technology, and Congress
Paid \$50,000

Association for Women in Science
Support for general activities
Approved \$5,000 Paid \$5,000

Foundation Center
Support for the Foundation Center Online Project
Approved \$10,000 Paid \$10,000

Grantmakers in Health
Support for general activities
Approved \$5,000 Paid \$5,000

Institute of Medicine
Support for the Kellogg Health of the Public Fund
Approved \$10,000 Paid \$10,000

Research!America
Support for an internship program
Approved \$25,000 Paid \$25,000

Society for Women's Health Research
Support for a conference titled "Sex and Gene Expression"
Approved \$5,000 Paid \$5,000

Subtotals

Approved: \$60,000
Paid: \$110,000
Transferred/Cancelled: n/a

SPECIAL AWARD

University College London
Support a publication on the history of Burroughs Wellcome Co. USA post-1940
Approved \$86,320
(\$83,000 of the original award was made to the University of East Anglia and was transferred/cancelled.)
Note: The above award originally was minuted to University of East Anglia, then transferred to University College London.

Subtotals

Approved: \$169,320
Paid: n/a
Transferred/Cancelled: \$83,000



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 2007 award series are listed in the next column.

Most grants are made only to degree-granting institutions on behalf of individual researchers, who must be nominated by their institution. Institutions receiving grants 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 grants.

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.

In 2005, BWF moved towards accepting electronic applications. To obtain the most up-to-date information about our award programs, visit our website at www.bwfund.org

PROGRAM APPLICATION DEADLINES

2007 AWARD SERIES

BASIC BIOMEDICAL SCIENCES

Career Awards in the Biomedical Sciences

October 2, 2006

INFECTIOUS DISEASES

Investigators in Pathogenesis of Infectious Disease

November 1, 2006

INTERFACES IN SCIENCE

Career Awards at the Scientific Interface

May 1, 2006

SCIENCE EDUCATION

Student Science Enrichment Program

April 10, 2006

TRANSLATIONAL RESEARCH

Clinical Scientist Awards in Translational Research

September 1, 2006

SCIENCE AND PHILANTHROPY

Received all year

COMPETITIVE AWARD PROGRAMS

BASIC 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 grants provide \$500,000 over five years to bridge advanced postdoctoral training and the first three years of faculty service. Recipients may spend part of the grant period at institutions in the United Kingdom. BWF expects to award up to 20 of these grants annually. 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.

INFECTIOUS DISEASES

Investigators in Pathogenesis of Infectious Disease

These awards provide new opportunities for accomplished investigators at the assistant professor level to study pathogenesis, with a focus on the intersection of human and pathogen biology. The program is intended to shed light on the overarching issues of how human hosts handle infectious challenge. These five-year grants, which provide \$80,000 per year, are intended to give recipients the freedom and flexibility to pursue new avenues of inquiry and higher-risk research projects that hold potential for advancing significantly the biochemical, pharmacological, immunological, and molecular biological understanding of how infectious agents and the human body interact. BWF is particularly interested in work focused on the host, as well as host-pathogen studies originating in viral, bacterial, fungal, or parasite systems. Studies in these areas may have their root in the pathogen, but the focus of the work should be on the effects on the host at the cellular and/or systemic levels. Excellent animal models of human disease are within the scope of the program. Candidates must have an established record of independent research and hold a tenure-track position as an assistant professor or equivalent at a degree-granting institution in the United States or Canada. Up to eight of these grants will be awarded annually.

INTERFACES IN SCIENCE

Career Awards at the Scientific Interface

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 grants provide up to \$500,000 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 award up to eight of these grants annually. 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. This program is open to U.S. and Canadian citizens and permanent residents as well as temporary residents whose H1B visa was granted on or after January 1, 2003. Degree-granting institutions may nominate up to two candidates.

TRANSLATIONAL RESEARCH

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 grants provide \$750,000 over five years (\$150,000 per year). BWF expects to award up to eight of these grants 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.

SCIENCE EDUCATION

Student Science Enrichment Program

These awards are limited to nonprofit organizations in BWF's home state of North Carolina. BWF provides \$2 million annually for this program, and grants 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.

SCIENCE AND PHILANTHROPY

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 disease. We place special priority on working with non-profit 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.

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

Jack Antel, M.D.

Professor of Neurology and Neurosurgery
McGill University

Aravinda Chakravarti, Ph.D.

Henry J. Knott Professor of Medicine
Director, McKusick-Nathans Institute of Genetic Medicine
Dept. of Medicine, Pediatrics, Molecular Biology and Genetics
Johns Hopkins University School of Medicine

Patricia K. Donahoe, M.D.

Chief, Pediatric Surgical Services
Director, Pediatric Surgery Research Laboratories
Massachusetts General Hospital

H. Shelton Earp, M.D.

Lineberger Professor of Cancer Research
Director, Lineberger Comprehensive Cancer Center
University of North Carolina-Chapel Hill School of Medicine

Laurie H. Glimcher, M.D.

Irene Heinz Given Professor of Immunology
Harvard School of Public Health

Margaret K. Hostetter, M.D.

Jean McLean Wallace Professor of Pediatrics
Chair, Department of Pediatrics
Professor of Microbial Pathogenesis
Yale University School of Medicine

Tyler Jacks, Ph.D.

Investigator, Howard Hughes Medical Institute
David H. Koch Professor of Biology
Director, Center for Cancer Research
Massachusetts Institute of Technology

Thomas M. Jessell, Ph.D.

Investigator, Howard Hughes Medical Institute
Professor of Biochemistry and Molecular Biophysics
Columbia University

George M. Langford, Ph.D. (cochair)

Dean of Natural Sciences and Mathematics
University of Massachusetts-Amherst

Martin M. Matzuk, M.D., Ph.D. (cochair)

Stuart A. Wallace Professor of Pathology
Baylor College of Medicine

Roderick R. McInnes, M.D., Ph.D.

University Professor
Anne and Max Tanenbaum Chair in Molecular Medicine
Professor of Pediatrics and Molecular and Medical Genetics
Senior Scientist, Hospital for Sick Children, University of Toronto
Scientific Director, Institute of Genetics, CIHR

J. Anthony Movshon, Ph.D.

Silver Professor
New York University

Louis J. Muglia, M.D., Ph.D.

Associate Professor of Pediatrics
Director, Division of Pediatric Endocrinology and Diabetes
Washington University School of Medicine
(BWF Career Awardee in the Biomedical Sciences - 1995)

Cecil B. Pickett, Ph.D.

President
Schering-Plough Research Institute

Matthew R. Redinbo, Ph.D.

Associate Professor of Chemistry, Biochemistry and Biophysics
University of North Carolina-Chapel Hill
(BWF Career Awardee in the Biomedical Sciences - 1999)

David Tank, Ph.D.

Professor of Molecular Biology
Lewis-Sigler Institute for Integrative Genomics
Princeton University

Jeffrey A. Whitsett, M.D.

Chief, Section of Neonatology, Perinatal, and Pulmonary Biology
University of Cincinnati Children's Hospital

John York, Ph.D.

Assistant Investigator, Howard Hughes Medical Institute
Associate Professor of Biochemistry, Pharmacology,
and Cancer Biology
Duke University Medical Center
(BWF Career Awardee in the Biomedical Sciences - 1995)



INVESTIGATORS IN PATHOGENESIS OF INFECTIOUS DISEASE

Arturo Casadevall, M.D., Ph.D.

Professor of Medicine and Microbiology and Immunology
Albert Einstein College of Medicine

Mary K. Estes, Ph.D.

Professor of Molecular Virology and Medicine
Baylor College of Medicine
Director, Texas Gulf Coast Digestive Diseases Center

William E. Goldman, Ph.D.

Professor of Molecular Microbiology
Washington University School of Medicine

Diane E. Griffin, M.D., Ph.D.

Professor and Chair, Molecular Microbiology and Immunology
Johns Hopkins University
Bloomberg School of Public Health

Philippe Gros, Ph.D.

Professor of Biochemistry
McGill University Faculty of Medicine

Stephen L. Hajduk, Ph.D. (Chair)

Director, Global Infectious Disease Laboratory
Marine Biological Laboratory

Kasturi Haldar, Ph.D.

Charles E. and Emma H. Morrison Professor of Pathology
and Microbiology-Immunology
Northwestern University Feinberg School of Medicine

David G. Russell, Ph.D.

Professor and Chair, Microbiology and Immunology
Cornell University College of Veterinary Medicine

Alan Sher, Ph.D.

Head, Immunobiology Section
National Institute of Allergy and Infectious Diseases

INTERFACES SCIENCE

Laurence F. Abbott, Ph.D. (Cochair)

Professor of Neurobiology and Behavior
Columbia University College of Physicians and Surgeons

Robert H. Austin, Ph.D. (Cochair)

Professor of Physics
Princeton University

James B. Bassingthwaite, M.D., Ph.D.

Professor of Bioengineering and Radiology
University of Washington

Emery N. Brown, M.D., Ph.D.

Associate Professor of Anesthesia and Health Sciences Technology
Harvard Medical School
Professor of Computational Neuroscience and Health Sciences
Technology
Massachusetts Institute of Technology

Julio M. Fernandez, Ph.D.

Professor of Biological Sciences
Columbia University

Douglas A. Lauffenburger, Ph.D.

Whitaker Professor of Bioengineering
Director, Biological Engineering Division
Massachusetts Institute of Technology

Wendell Lim, Ph.D.

Professor of Cellular and Molecular Pharmacology
and Biochemistry and Biophysics
University of California-San Francisco

Suzanne R. Pfeffer, Ph.D.

Professor and Chair, Biochemistry
Stanford University School of Medicine

Michael C. Reed, Ph.D.

Professor of Mathematics
Duke University

Eric D. Siggia, Ph.D.

Professor of Physics
Rockefeller University

Susan S. Taylor, Ph.D.

Investigator, Howard Hughes Medical Institute
Professor of Chemistry, Biochemistry, and Pharmacology
University of California-San Diego

CLINICAL SCIENTIST AWARDS IN TRANSLATIONAL RESEARCH

Andrea Dunaif, M.D.

Charles F. Kettering Professor of Medicine
Chief, Division of Endocrinology, Metabolism, and Molecular
Medicine
Northwestern University Feinberg School of Medicine

John W. Griffin, M.D.

Professor of Neurology, Neuroscience, and Pathology
Director, Department of Neurology
Johns Hopkins University School of Medicine

Shannon Kenney, M.D.
Kenan Distinguished Professor of Medicine and Microbiology
University of North Carolina-Chapel Hill School of Medicine

Alan M. Krensky, M.D.
Shelagh Galligan Professor of Pediatrics
Chief, Division of Immunology and Transplantation Biology
Stanford University School of Medicine

Beverly S. Mitchell, M.D. (Cochair)
George E. Beckman Professor of Medicine
Deputy Director, Comprehensive Cancer Center
Stanford University School of Medicine

John E. Niederhuber, M.D.*
Deputy Director, National Cancer Institute
Director, Translational and Clinical Sciences
National Institutes of Health

Jennifer M. Puck, M.D. (Cochair)*
Chief, Genetics and Molecular Biology Branch
National Human Genome Research Institute
National Institutes of Health

Steven S. Rosenfeld, M.D., Ph.D.
Professor of Neurology
Director, Division of Neuro-Oncology
Columbia University

Christine E. Seidman, M.D.
Investigator, Howard Hughes Medical Institute
Professor of Medicine and Genetics
Harvard Medical School

Michael J. Welsh, M.D.
Investigator, Howard Hughes Medical Institute
Professor of Internal Medicine, Physiology, and Biophysics
University of Iowa Carver College of Medicine

Wayne M. Yokoyama, M.D.
Investigator, Howard Hughes Medical Institute
Chief, Rheumatology Division
Washington University School of Medicine

* Serving in a personal capacity, not as a representative of NIH

Note: Other members will be added to the committee in the areas of infectious diseases and reproduction/endocrinology.

NEW INVESTIGATOR AWARDS IN THE PHARMACOLOGICAL OR TOXICOLOGICAL SCIENCES

This program was discontinued after the 2001 award series; however, the advisory committees will continue to monitor awardees' progress

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.
British Columbia Cancer Research Centre

Palmer Taylor, Ph.D.
University of California-San Diego School of Medicine

Jeffrey M. Trent, Ph.D.
Translational Genomics Research Institute

Barbara F. Hales, Ph.D.
McGill University Faculty of Medicine

Philip Hanawalt, Ph.D.
Stanford University

Victor A. Levin, M.D.
University of Texas M. D. Anderson Cancer

Baldomero M. Olivera, Ph.D.
University of Utah

Stephen H. Safe, D.Phil.
Texas A&M University College of Veterinary

Thomas J. Slaga, Ph.D. (Chair)
AMC Cancer Research Center



STUDENT SCIENCE ENRICHMENT PROGRAM

Julia V. Clark, Ph.D.

Program Director

Division of Elementary, Secondary, and Informal Education
National Science Foundation

Luciano Corazza, Ph.D.

Special Assistant to the Director

Lawrence Hall of Science

University of California-Berkeley

Bonita Ewers, Ed.D.

Interim Vice Chancellor for Academic Affairs

Elizabeth City State University

G. Thomas Houlihan, Ed.D.

Executive Director

Council of Chief State School Officers

Marian Johnson-Thompson, Ph.D. (Chair)

Director, Education and Biomedical Research Development

National Institute of Environmental Health Sciences

Willie Pearson Jr., Ph.D.

Professor and Chair, Sociology

School of History, Technology and Society

Georgia Institute of Technology

Sylvia Sanders, Ph.D.

Past BWF Career Award Recipient

Elementary Educator

Palo Alto, California

Terri L. Woods, Ph.D.

Associate Professor of Geology

East Carolina University

Elizabeth Woolard

Science Chair and AP/IB Physics Teacher

W.G. Enloe GT/IB Magnet High School

The Honorable Douglas Yongue

House of Representatives

North Carolina General Assembly

INVESTMENT COMMITTEE

The committee is composed of four members from outside BWF and three members from BWF's Board of Directors. The board's chair, BWF's president, and BWF's vice president for finance also serve on the committee as nonvoting members.

Stephen D. Corman (Chair)

BWF Board of Directors

Michael Even

Citigroup

Geoff Gerber

Twin Capital Management

James Hirschmann

Western Asset Management

I. George Miller, M.D.

BWF Board of Directors

Walter Niemasik

Snyder Capital Management

Philip R. Tracy

BWF Board of Directors

CURRENT BOARD OF DIRECTORS



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University of California-Berkeley



Gail H. Cassell, Ph.D.
Chair (2003-2004)
Eli Lilly and Company



Stephen D. Corman
PharmaLink Inc.



Marye Anne Fox, Ph.D.
University of California-San Diego



Phil Gold, M.D., Ph.D.
McGill University



A. James Hudspeth, M.D., Ph.D.
Rockefeller University



I. George Miller, M.D.
Yale University School of Medicine



Mary-Lou Pardue, Ph.D.
Massachusetts Institute of Technology



Jerome F. Strauss III, M.D., Ph.D.
Virginia Commonwealth University



Judith L. Swain, M.D.
University of California-San Diego



Philip R. Tracy
Smith, Anderson, Blount, Dorsett,
Mitchell & Jerrigan L.L.P.



Jean D. Wilson, M.D.
Chair
University of Texas Southwestern
Medical Center-Dallas

STAFF

EXECUTIVE



Enriqueta C. Bond, Ph.D.
President



Scott G. Schoedler
Vice President, Finance

ADMINISTRATION, FINANCE, MEETINGS, AND TECHNOLOGY



Ken Browndorf
Senior Asset and
Accounting Manager



Jennifer Caraballo
Accountant



Sam Caraballo
System and Web Engineer



Brent Epps
Administrative Assistant



Barbara Evans
Administrative Assistant



Wendell Jones
Technology Coordinator



Martie Nolan
Senior Manager,
Facility and Administrative Services



Glenda Oxendine
Document/Web Specialist



Betsy Stewart
Secretary



Catherine Voron
Meeting Professional

PROGRAMS AND COMMUNICATIONS



Russ Campbell
Communications Officer



Debra Holmes
Program Assistant



Martin Ionescu-Pioggia, Ph.D.
Senior Program Officer



Jean Kramarik
Senior Program Associate



Victoria McGovern, Ph.D.
Senior Program Officer



Melanie Scott
Senior Program Associate and Database
Specialist



Rolly Simpson Jr.
Senior Program Associate



Nancy Sung, Ph.D.
Senior Program Officer



Carr Thompson
Senior Program and Communications
Officer



Debra Vought
Senior Program Associate



CONTACT INFORMATION

STAFF E-MAIL ADDRESSES AND FOCUS AREAS

Basic Biomedical Sciences

Martin Ionescu-Pioggia, Ph.D., mionescu@bwfund.org
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Rolly L. Simpson Jr., rsimpson@bwfund.org
Senior Program Associate

Infectious Diseases

Victoria P. McGovern, Ph.D., vmcgovern@bwfund.org
Senior Program Officer

Jean A. Kramarik, jkramarik@bwfund.org
Senior Program Associate

Interfaces in Science; Translational Research

Nancy S. Sung, Ph.D., nsung@bwfund.org
Senior Program Officer

Debra A. Vought, dvought@bwfund.org
Senior Program Associate

Science Education

D. Carr Thompson, cthompson@bwfund.org
Senior Program and Communications Officer

Melanie B. Scott, mScott@bwfund.org
Senior Program Associate and Database Specialist

TO OBTAIN INFORMATION ABOUT PROGRAMS

Burroughs Wellcome Fund

The most up-to-date information about our programs, including complete application information, can be found on our website at www.bwfund.org

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Keeping stride with research encourages us to be mindful of the field and gives us the ability to determine where need is the greatest.



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