BURROUGHS WELLCOME FUND

2007 Annual Report

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2007
ANNUAL REPORT

RESEARCH TRIANGLE PARK, NORTH CAROLINA

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About 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, BWF seeks 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.

With an endowment of more than $800 million, BWF invests nearly $40 million in grants annually in the United States and Canada. During the past fiscal year, financial support was channeled primarily through competitive peer-reviewed award programs, which encompass five major categories—biomedical sciences, infectious disease, interfaces in science, translational research, and science education. Grants are made primarily to degree-granting institutions on behalf of individual researchers, who must be nominated by their institutions. To complement these competitive award programs, grants are also made to nonprofit organizations conducting activities intended to improve the general environment for science.

BWF 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. In 1993, BWF received a $400 million gift from the Wellcome Trust to become a fully independent foundation.

The Wellcome enterprise was founded in 1880 by two young American pharmacists, Henry Wellcome and Silas Burroughs, who moved to London to manufacture and sell "compressed medicines"—that is, pills—which they believed could replace the potions and powders of the day.

The firm prospered. After Burroughs died in 1895, Wellcome directed the growth of the company into an international network with subsidiaries in numerous countries on several continents. As the business grew, Wellcome held firm to his belief that research was fundamental to the development of excellent pharmaceutical products and established the industry's first research laboratories.

When 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. The Trust grew to become the world's largest charitable foundation devoted exclusively to the biomedical sciences.

The importance of curiosity-driven research, as endorsed by Henry Wellcome, guides the mission of the Burroughs Wellcome Fund and our commitment to the belief that fostering research by the best and brightest scientists offers the fullest promise for improving human health.

President's Message

Among the various inputs into scientific innovation, the most important, and the hardest to get right, is the people who do the work. For a nation to do science well, it must attract the best and brightest, train them well, and give them the support and infrastructure they need to be creative.

Enriqueta Bond, Ph.D.

Believing that a private philanthropic organization can take risks by betting on people whom government agencies may be less likely to support, the Burroughs Wellcome Fund's Board of Directors selected to carry out our mission—advancing the medical sciences through the support of research and education—by investing in human resources for the research enterprise, targeting support to young scientists, and supporting investigators in undervalued or underfunded areas of science. Our awards are meant to jump-start awardees' careers in science and enable them to take risks by trying new approaches in their laboratories. In addition to providing financial support, our programs also feature career development activities to train awardees to better manage their laboratories, navigate the scientific enterprise, and emerge as leaders. We also make grants intended to enhance and improve the environment for science and the conduct of research.

This annual report message will be my last at BWF (my first appeared in 1995), as I have announced my intent to retire in July 2008 and our board has appointed a search committee to select my successor. Therefore, I not only will review BWF's accomplishments of the past year but also reflect on developments in philanthropy and the research enterprise that have occurred during my tenure.

Within BWF, perhaps the most significant accomplishment is that we transformed the corporate foundation of the pharmaceutical firm Burroughs Wellcome Co. into a private philanthropy. In the process, we appointed an independent Board of Directors, hired additional staff, expanded our slate of programs, and constructed a new headquarters building that would provide neutral convening space for myriad activities. Our growth was made possible by a generous $400 million gift from the Wellcome Trust, our sister foundation in the United Kingdom, and a $30 million

endowment from our former corporate parent. Today, BWF's assets total more than $800 million, and we have awarded more than $350 million in grants. BWF's grant-making continues to evolve, and our board has been making a series of catalytic grants to complement our competitive award programs.

Growth in Philanthropy

Just as BWF has grown, the larger world of philanthropy has expanded dramatically since the mid-1990s, as symbolized by the formation of the Bill & Melinda Gates Foundation with more than $30 billion in assets and Warren Buffett's gift of equal value to that foundation. There are now an estimated 70,000 foundations (*Giving USA 2006*), with their total assets exceeding $500 billion. Philanthropy is becoming more innovative, with foundations modeling a variety of new approaches to charitable work. New models include venture philanthropy, for-profit philanthropy, and "rapid pay-out" philanthropy, in which foundations, exemplified by the Gates, Whitaker, and Markey foundations, spend out their assets over a specified period in order to make larger grants that may have more impact. As Sara L. Engelhardt, president of the Foundation Center, says, "The field is growing more diverse, more entrepreneurial, more collaborative, and more global." The new and emerging forms of philanthropy also are increasing the push for accountability. There is pressure on foundations to be more relevant, to produce measurable results, and to be transparent in their work.

As philanthropic dollars grow and new, very large foundations come into being, smaller foundations such as BWF have to work harder to define a niche where they can make a difference. For example, BWF now contributes nearly $40 million per year to biomedical research—which means we essentially live in the shadow of the National Institutes of Health, with its budget of close to $30 billion in 2007. Indeed, the total of philanthropic giving for medical research approaches $3 billion annually—significant, but still modest compared with government and industry funding. Given such a large difference in grantmaking power, foundations such as BWF see themselves as the "risk capital" in the research enterprise.

Growth in the Research Enterprise

Since the mid-1990s, funding for research by industry and government has increased, with government funding leveling off more recently. One report found that from 1994 to 2003, annual funding for biomedical research doubled to $94.3 billion, with industry providing 57 percent and NIH 28 percent (Hamilton Moses et al., *JAMA*, Sept. 21, 2005). However, NIH has lost significant ground since 2003, due to stagnant and declining funding in recent budgets and President George Bush's yet smaller funding request for fiscal year 2008. Still, NIH has modestly

expanded funding for clinical research, high-risk basic research, new research tools, and multidisciplinary collaborative research through the "roadmap initiatives" of NIH Director Elias Zerhouni. Although competitive awards for individual investigators, called R01 awards, have been squeezed in this funding climate, NIH continues to recognize the importance of investing in people. Among the agency's priority projects are the Pioneer Awards, which give established investigators the flexibility to innovate; the Innovation Awards to young scientists; and the Pathways to Independence Awards, which enable postdoctoral researchers to become independent sooner in their careers. The postdoctoral awards (known as K99 awards) are modeled on BWF's former Career Awards in the Biomedical Sciences, but they also provide overhead dollars, making them even more desirable to institutions and awardees. We were delighted to see this affirmation of our flagship program, as NIH intends to make 175 of these awards this year (in contrast to our 20) and up to 200 in following years. Since NIH determined that K99 awardees could not hold a similar BWF award simultaneously, our board sought to define a niche government does not fill as well, promptly reshaping our award to support physician-scientists (more on this is reported in later sections).

As reported by the American Association for the Advancement of Science, Congress wrapped up another disappointing year for federal research and development funding when it gave final approval on December 19 to an omnibus appropriations bill that the president signed into law. The federal investment in research and development declined in real terms for the fourth consecutive year. Funding for basic research in the physical sciences, a key element of various plans to sustain U.S. economic competitiveness, fell short of a planned doubling path over the next decade. The National Science Foundation saw a 1 percent increase in its research and development funding, while most of the National Institutes of Health received flat funding at fiscal year 2007 levels. With NIH funding constrained, the career development awards made by BWF are ever more coveted to stabilize the careers of a cadre of elite young scientists who can continue to take risks with our flexible dollars.

Scientific Workforce Issues

Because our main strategy for grantmaking is career development of young scientists, BWF monitors trends in the scientific workforce. Notably, our board continues to follow the preparation of underrepresented minorities and women in certain fields of science, and the influx of foreign-born scientists into the United States. Two propositions offered by Richard Freeman (National Bureau of Economic Research Working Paper Number 11457, June 2005) are especially relevant: "The U.S. share of the world's science and engineering graduates is

declining rapidly as European and Asian universities, particularly in China, have increased S&E degrees while U.S. degree production has stagnated," and "The job market has worsened for young workers in S&E fields relative to many other high-level occupations, which discourages U.S. students from going on in S&E, but which still has sufficient rewards to attract large immigrant flows, particularly from developing countries." According to Freeman, "For the past half century the U.S. has been the world scientific and technological leader and pre-eminent market economy. With just 5 percent of the world's population, the U.S. employs nearly one-third of the world's scientific and engineering researchers, accounts for 40 percent of research and development spending, publishes 35 percent of science and engineering articles, obtains 44 percent of S&E citations and wins numerous Nobel prizes." But this is changing in an expanding global S&E enterprise. Overall, the U.S. share of the world's Ph.D.s in science and engineering will fall to about 15 percent by 2010.

Indicative of the United States' leadership position, international students flock to the country to enhance their skills. International students in 2002 received 18 percent of all doctorates awarded in the life science, 35.4 percent in the physical sciences, and 58.7 percent in engineering. More than two-thirds of these students remained in the United States to work. The nation's ability to recruit international students, along with foreign-born scientists and engineers, benefits the country by tapping a large and relatively inexpensive pool of talent—but at the cost of reduced incentives for native-born individuals to pursue careers in science and engineering. U.S. citizens have access to a variety of other promising careers, whereas science and engineering careers may be the only way for many talented foreign-born persons to enter the U.S. job market. Freeman suggests that the United States would benefit by providing its own students with more lucrative graduate research fellowships and by giving them more opportunities to do independent research early in their careers. He believes such actions could substantially increase the supply of U.S. citizens choosing S&E studies, without discouraging foreign students and immigrants.

These trends support BWF's policies to emphasize permanent residents of the United States and Canada in all but one of our award programs. Moreover, all of our programs seek nominations especially of women and underrepresented minorities in hopes of supporting these communities. In addition, BWF's focus on supporting science and mathematics education in our home state of North Carolina, from kindergarten through twelfth grade, is all about increasing the pipeline for careers in science as well as assuring a scientifically literate population.

BWF Programs

Kathleen McCarthy, director of the Center on Philanthropy and Civil Society at the City University of New York, has noted that "foundations have always made their impact doing four things….building institutions, forging partnerships to leverage their grants, training new managerial elites in new fields, and investing in new ideas" (*Carnegie Reporter*, Spring 2007). Through BWF's competitive peer-reviewed programs, we make grants to young scientists as a strategy for investing in new ideas. Furthermore, our career development activities are all about training "managerial elites" in new fields, such as interdisciplinary work and translational research. BWF also has been incubating two new institutions: the North Carolina Science, Mathematics, and Technology Education Center (SMT Center) and the Health Research Alliance (HRA). These various efforts are described in their own sections of this annual report. In my remaining message, I wish to describe some of our career development activities as well as some new programs and the role of recent catalytic grants.

Career Development Activities

It has long been a BWF hallmark to invest in a variety of career development efforts, such as meetings and other activities, that enable our awardees to gain insight and information that will help them in their careers. One successful collaboration with the Howard Hughes Medical Institute (HHMI) has resulted in publication of *Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty*, which is now in its second edition, and *Training Scientists to Make the Right Moves: A Practical Guide to Developing Programs in Scientific Management*, a companion manual that we hope universities, professional societies, and other groups will use to develop programs for their young scientists. In order to expand the value of the lab management course, BWF and HHMI continue to work in partnership with the NIH Fogarty International Center and the Wellcome Trust on developing a manual that will meet the needs of scientists in the developing world.

Based on the widespread use of the lab manual, BWF has posted a series of career development tips on our website and is sponsoring the production of a series of booklets to give advice. The first booklet, *Communicating Science: Giving Talks*, published in May 2007, includes material covering such issues as fear of speaking and methods for non-native English speakers to improve their English, and also provides insight into how to prepare different kinds of talks, including the brief (but high-stakes) BWF award interviews, job talks, and bread-and-butter scientific seminars.

In July 2007, we held a meeting in California of awardees, staff, advisory committee members, and board members from three programs—Career Awards in the Biomedical Sciences; Career Awards at the Interface of the Physical, Computational, and Biological Sciences; and Career Awards in the Medical Sciences. The meeting, which brought together nearly 250 people, enabled awardees to learn about some great science, network and form collaborations, and gain valuable advice on a host of career development issues. Such meetings also provide our board and advisory committees with feedback on program management and direction.

In partnership with Sigma Xi, BWF offered an intensive two-part grant writing course to postdoctoral fellows (and extremely new faculty) in parasitology. Attendees developed proposals that were then critiqued and reviewed by colleagues and senior scientists in the field. The hope is that Sigma Xi can develop this course into something that funders, professional societies, or even groups of interacting labs can bring into well-defined research fields to enhance the chance of "their" "postdocs gaining critical early funding.

Among BWF's efforts to help improve science education "capacity building" in North Carolina, we conducted several "pre-proposal" writing workshops to encourage groups in underrepresented and resource-poor areas to apply for our Student Science Enrichment Program (SSEP) awards. SSEP directors were also coached in how to evaluate their programs and use the information to improve their work, as well as in how to gather information that can be used to seek other support for their programs.

Catalytic Grants

Over the past two years, BWF has made a series of catalytic grants for programs to improve the research environment for our awardees or extend and complement our program areas.

In September 2006, BWF announced a major grant to the Health Research and Education Foundation at the CIIT Centers for Health Research (now The Hamner Institutes for Health Sciences) to support Project Suc-Seed. This project will recruit and support talented economically disadvantaged high school students, including minority students, to pursue Ph.D. degrees in the sciences, especially chemistry and other chemistry-related disciplines. The project, which will be open to students statewide, is an extension of a proven SSEP-supported local activity.

We made another education-related grant to the University of North Carolina System to support a "fast track" program at North Carolina Central University, North Carolina State University, the University of North Carolina-Chapel Hill, and the University of North Carolina-Asheville in which students who major in

science are able to get a teaching certificate at the same time as their science degrees. The grant provides scholarships, support for enrichment experiences, and bonus teacher pay for five years after graduation. The program is modeled on the University of Texas-Austin's successful UTEACH program, which was highlighted in the landmark 2007 National Academies report *Rising Above the Gathering Storm*.

To aid the broader science community, our board approved a grant to the Kavli Institute for Theoretical Physics for an Interdisciplinary Biology Initiative to stimulate interdisciplinary research via a series of workshops over the next five years. The programs will alternate among the fields of systems biology/bioinformatics, population biology and genetics, neuroscience, and biophysics. The main goal is to create a quantitative biology community at the interface between the life sciences and the physical sciences. In keeping with BWF's focus, young scientists will comprise 50 percent of the participants. We hope that a number of awardees of our interfaces program will be able to benefit from these workshops.

To help foster greater recognition of Canada's research enterprise, as well as to leverage our monetary support for Canadian scientists, BWF will partner with the Gairdner Foundation to host a series of symposiums recognizing recipients of that group's international awards in medical research. The "Gairdners," as the awards are known, are similar in luster to the Lasker Awards made by the euphonious foundation in the United States. The symposiums are expected to provide an ideal forum for BWF to attract more Canadian scientists to apply for our grant programs.

New Programs

BWF's board has determined that preterm births not only carry enormous health and economic consequences, but also represent an area with an urgent need for talented investigators to address its many unanswered scientific questions. BWF approved establishing a network of scientists with expertise in maternal fetal medicine, obstetrics, pediatrics, immunology, and other related fields, as well as in evolutionary biology, comparative genomics, microbiology, and proteomics, to address scientific issues related to preterm birth. Chaired by Louis Muglia, M.D., Ph.D., a distinguished professor at Washington University School of Medicine, the program will consist of a series of workshops and collaborations supported by small grants.

We also have approved a program designed to expand the capacity for research on parasitic helminthes, an area that continues to lag behind research on other pathogenic eukaryotes. Parasitic helminthes are difficult to work with, as they require both an intermediate and definitive host and cannot replicate in vitro. However, integration of communities that work on the roundworm *C. elegans* and those that work on the parasitic helminthes might foster work at this interface and

open new channels of inquiry. The program will start modestly with a series of meetings to explore whether collaborations would be possible and fruitful.

To help improve health in the developing world, BWF has approved a new program that rests solidly on previous—and highly successful—collaborative international efforts. In one effort, we worked with the Wellcome Trust, along with the NIH and the U.S. Department of Defense, to sequence the genome of *Plasmodium falciparum*, the parasite that causes malaria when transmitted by Anopheles mosquitoes, and advance the scientific understanding of the parasite. We also participated in a recently concluded 10-year program with the Wellcome Trust to support collaborative research on health issues with a center of gravity in the developing world. The Wellcome Trust has agreed in principle to continue our collaboration, and we are now "mapping the terrain" through a series of "Frontier" meetings, hosted by the Wellcome Trust, on issues such as emerging zoonotic infections, connections of animal health to human health, and postgenomic surveillance. In July 2007, BWF's board approved an exciting new institutional training award that creates opportunities to bridge the gap between population and computational sciences and laboratory-based biological sciences. The goal of the Institutional Program Unifying Population and Laboratory Based Sciences is to establish programs that join schools of medicine and schools (or academic divisions) of public health to train researchers who will be equally at home with the ideas, approaches, and insights generated at the molecular scale and at the populations scale and who can explore the genomic/phenomic/environmental interface.

Building Institutions

Among our efforts in incubating innovative new institutions, two achievements have gained especially notable attention—the North Carolina Science, Mathematics, and Technology Education Center, and the Health Research Alliance.

The SMT Center, led by Samuel Houston, Ed.D., serves as a champion for improving K-12 science, mathematics, and technology education in North Carolina, and provides a central and enduring organization for addressing the needs of students, communities, and the state. In May 2007, BWF's board reviewed the center's progress and how it should be organized and funded in the future. Among its contributions, the center was instrumental in helping the James B. Hunt Jr. Institute for Educational Leadership and Policy plan its North Carolina Science Summit, held in May 2007, and is leading a state effort to revisit testing and accountability issues. Finding that the SMT Center has made substantial contributions and stands poised to take on an even larger role, the board voted to continue its support for another four years.

The Health Research Alliance is a national consortium of not-for-profit, nongovernmental funders of health research and training. Its mission is to foster collaboration among such funders to support the various components of health research and training—from biomedical science to applications—that advance health. HRA improves communication and collaboration, provides information about research supported by this community, and enhances the overall effectiveness of grantmaking by sharing best practices. The group now has approximately 28 members, and effective January 2007, HRA assumed responsibility for paying its own bills and the salary and benefits of its executive director, Kate Ahlport.

In looking ahead, I cannot help but recall a comment by the late Trudy Elion, Nobel laureate and long-time member of the Burroughs Wellcome Fund family: "Man the torpedoes and fast forward," because BWF is on a "roll." Our programs continue to evolve and have impact. As we pause to appoint a new leader, I want to take this opportunity to thank our board members, advisory committee members, staff, and especially our awardees for making the Burroughs Wellcome Fund the success story we are today—and for giving me the privilege to be part of the remarkable odyssey.

Biomedical Sciences

The Burroughs Wellcome Fund's Career Awards for Medical Scientists (CAMS) program completed its inaugural year in 2007. The program provides support for physician-scientists who are making the transition from a mentored position to that of an independent investigator.

The first class comprises 21 physician-scientists who are early in their careers, representing a total investment of $14.7 million. Selected from 153 candidates, the awardees include 18 men and three women from 15 institutions in the United States and Canada. They will be working in a range of scientific areas, including cell biology, parasitology, radiation oncology, and genetic epidemiology. One awardee is a dental surgeon who is looking at an innovative cell therapy approach for the engineering and regeneration of alveolar bone where teeth arise.

The CAMS program, patterned after BWF's long-running Career Awards in the Biomedical Sciences (CABS) program, has many unique factors that help to promote success and encourage the new physician-scientists to launch academic careers as independent investigators. Some of these factors are award flexibility, personal advice on career development issues, and promoting networking activities through both formal and informal convening activities.

It is our hope that by providing physician-scientists with early career funding, we will help keep them within the academic research enterprise. Unpublished comparative data show that physician-scientists who received funding under the CABS program, which ran from 1995 to 2006, are five times more likely to compete successfully for a National Institutes of Health independent investigator grant (an R01 grant) than are physician-scientists who applied but did not receive an award. Also, all of the physician-scientists who received CABS awards are now employed by academic institutions, compared with roughly 80 percent of those not selected for a CABS award. In addition, CABS awardees who now hold academic appointments are much more likely to be working in one of the top 25 NIH-funded institutions. Another indication of the impact of early career funding is that 59 percent of the physician-scientists who competed successfully for a CABS award had both an R01 and at least one publication in a top-ranked journal, while only 10 percent of the physician-scientists who applied but did not receive a CABS award achieved similar records.

Even as the CABS program has been refocused to concentrate on physician-scientists, it will continue to have a significant impact at BWF. The lessons we are learning from the more than 100 active awardees can be directly applied to our new CAMS program. The monitoring of our awardees through annual surveys and convening activities provides us with useful information about the administration of our awards and types of career development activities that need to be provided.

In one major convening activity, BWF held a Career Awardees' Summer Conference in July 2007, which brought together 140 active awardees from our three career awards programs—Career Awards in the Biomedical Sciences, Career Awards for Medical Scientists, and Career Awards at the Scientific Interface. Young scientists from many disciplines, who might not otherwise have a chance to interact, shared in a number of scientific discussions. Poster sessions highlighted the work of the awardees and several distinguished senior scientists made presentations. BWF believes that such meetings add real value to the research funds we provide, and we consider them an important part of our career development strategy.

Profile: Pardis Sabeti, M.D., D. Phil.
Uncovering the Past

Pardis Sabeti

It's hardly common to lead a double life as a top scientific researcher and cutting-edge rock musician. But Pardis Sabeti, M.D., D. Phil., who received a Burroughs Wellcome Fund Career Award in the Biomedical Sciences in 2005, satisfies that billing.

On the science side, Dr. Sabeti is an assistant professor of organismic and evolutionary biology at Harvard University who studies the evolution of infectious diseases and their effects on the human genome. Her work already has earned her a spot on a "top 100 living geniuses" list compiled by Creators Synectics, a global consulting firm.

On the music side, Dr. Sabeti is lead singer with the well-reviewed alternative rock band Thousand Days, which has released three albums. In addition, she is creating a series of music videos to spark young people's interest in science.

"I think the reason I can do as much as I can is that I'm doing things I'm really passionate about," Dr. Sabeti said.

Dr. Sabeti's science career began as an undergraduate student at the Massachusetts Institute of Technology, where she majored in biology and worked in the laboratory of genomics pioneer Eric Lander, Ph.D. She then earned a doctorate in biological anthropology at the University of Oxford as a Rhodes scholar, where she specialized in genetic diversity.

While in graduate school, Dr. Sabeti discovered that her interests in genetics and evolution intersected at infectious disease. "I got really excited about the idea that evolution would tell you a lot about infectious disease," Dr. Sabeti said. "You can see these waves of history—we can find out what infections were major killers thousands of years ago."

Following her graduation from Oxford, Dr. Sabeti enrolled in Harvard Medical School to improve her understanding of infectious disease. She graduated summa cum laude in 2006, the third women to receive the honor since the school admitted its first group of female medical students in 1945.

At the same time she attended Harvard, Dr. Sabeti was a postdoctoral fellow at the Broad Institute—a joint initiative of Harvard and MIT—working again with Dr. Lander. There, Dr. Sabeti began to probe the link between pathogens and the human genome with a new data set, the HapMap.

The International HapMap project parsed the massive amounts of information hidden in the human genome by identifying common regions of genetic variations called single-nucleotide polymorphisms, or SNPs.

SNPs are sites where the DNA sequence of individuals differs by just one of four nucleotides that comprise the building blocks of genes. For example, some people may have a chromosome with one particular nucleotide at a particular site, while others have a chromosome with a different nucleotide at that site. Research shows that such variations are responsible for person-to-person differences in diseases as varied as diabetes, cancer, depression, and asthma. SNPs also affect a person's response to infectious diseases and drugs.

There are about 10 million SNPs in the human genome, making the search for specific genetic variations akin to finding a needle in a haystack. But it turns out that SNPs tend to carry many of their chromosomal neighbors along with them as they rise in frequency among a population. These neighborhoods, called haplotypes, are inherited in long connected chunks of DNA. With only a few hundred thousand haplotypes accounting for most of the genetic variation in a population, researchers can quickly zoom in on chromosomal regions most likely to affect disease.

With help from haplotypes, Dr. Sabeti developed a method to measure how long ago a genetic variation arose and to determine how old it is. This provided the ability to identify evolutionary effects in the human genome.

In one study using the technique, Dr. Sabeti and her colleagues discovered three examples of population-specific natural selection based on geographic area. These examples involved genes linked to Lassa virus in West Africa, skin pigmentation in Europe (for lighter hair and paler skin), and hair follicle development in Asia.

Now Dr. Sabeti is applying her expertise in medicine and genomics to understanding the interplay between humans and pathogens such as malaria, tuberculosis, and other difficult-to-treat scourges.

Infectious diseases have powerfully shaped the human genome through natural selection, according to Dr. Sabeti. Similarly, human influence is just as apparent in the genomes of disease-causing microbes.

When Dr. Sabeti analyzed the malaria parasite genome, she found genes involved in drug resistance and in evading the human immune system, revealing new treatment routes and clues to the global spread of malaria.

One of the major hurdles in the battle to eradicate malaria is the parasite's rapidly evolving drug resistance. Chloroquine, the most effective antimalaria drug currently available, worked for just 16 years before widespread resistance developed.

Dr. Sabeti and her colleagues are working to identify genetic variations crucial to malaria's drug resistance and disease severity. The researchers hope to identify vaccine and drug targets, as well as develop an early warning system to detect drug resistance.

And as she embarks on her research career, Dr. Sabeti continues to bring the two sides of her life together, using music to interest children, particularly girls, in science.

With support from the MIT Council for the Arts and a women-in-science program sponsored by L'Oreal, Dr. Sabeti is planning a series of music videos featuring Boston-based science luminaries such as Dr. Lander and artificial intelligence expert Marvin Minsky.

Dr. Sabeti, who was born in Iran and raised in Florida, grew interested in reaching young people after she was awarded a L'Oreal For Women in Science Fellowship.

"L'Oreal started putting me in front of high school students," Dr. Sabeti said. "It's been great to increase awareness about science to girls and boys."

The videos, which Dr. Sabeti would like to distribute online, will use pop culture to show that science is cool. Her hope is that young viewers will want to learn more about the people in the videos.

"One thing I've noticed, having been caught between the two worlds of music and science, is that there's such a public fascination with artists and musicians," Dr. Sabeti said. "But really, scientists are much more fascinating."

—By Becky Oskin, a freelance science journalist based in Chapel Hill, North Carolina.

Infectious Disease

The Burroughs Wellcome Fund's Investigators in the Pathogenesis of Infectious Disease—or PATH—program supported 16 new awardees in 2007, bringing to 58 the number of assistant professors who have been funded for their work at the intersection of human and microbial biology.

The program has now run its fifth cycle. BWF's Board of Directors voted in May 2007 to increase the value of the awards from $400,000 to $500,000, beginning with the current round. Past awards were increased to $450,000 by distribution of a one-time supplement of $50,000 to each of the 42 grants made in earlier years.

The PATH program's roots go back to BWF's earliest days and beyond: finding solutions to some of humanity's most persistent microbial threats occupied Sir Henry Wellcome himself. The work of today's awardees moves beyond the traditional "bug by bug" approach to focus on bigger questions: why do we stay well and what goes wrong when we become ill from the microbes around us?

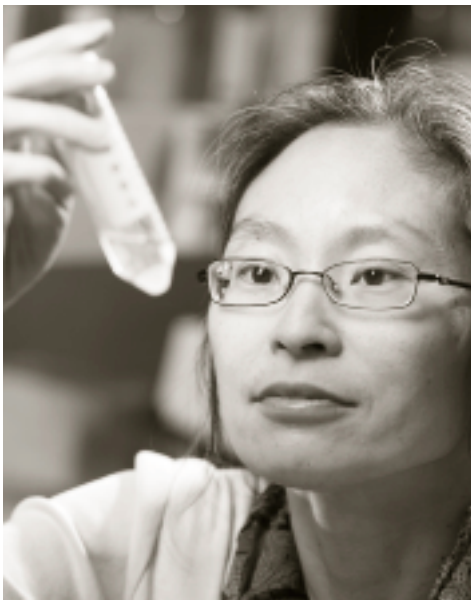
Since the mid-1990s, BWF has played a role in international health via long-term investments in basic tool development in parasitic diseases, including African trypanosomiasis, leishmaniasis, Chagas disease, and, especially, malaria. We also have helped in jump-starting fungal genomics. The change in the kinds of work that can be done in these organisms has been dramatic, and the availability of genomic and postgenomic resources should make way for a new generation of researchers to understand how such pathogens interact with, interfere with, and evade the human host's best defenses.

One group of pathogens, the helminth parasites, continues to stand out as a mystery. Tool development for understanding these human-infecting worms has lagged behind other pathogen systems, but recently progress has been made in transgenesis in schistosomes, perhaps opening a door for new insights that will unlock the mysteries of the worms, which are masters at manipulating the human immune system.

In hope of accelerating progress in the helminth parasites, BWF's board has set aside modest resources for a 2008 gathering that will bring together researchers working in well-studied worm model systems and researchers working in the models' distant infectious cousins. At the same time, we continue to help advance development of new tools for malaria research, in parallel with efforts (funded by others) to build better resources for understanding the parasite's human host and its mosquito carrier.

BWF in 2007 also focused resources on young researchers working on neglected diseases who are about to begin their independent careers. Along with our North Carolina neighbor Sigma Xi, we organized and held a grantwriting workshop for 24 postdoctoral fellows, all working in parasitology, as they wrote grants for submission to funding groups other than BWF. The postdocs were paired with senior scientists who critiqued the nascent grants and provided feedback on the funding system. One-third of the postdocs who took the course have had their grants successfully funded, and many proposals are still under review at various agencies. We anticipate working with Sigma Xi and other organizations so that similar courses may be put in place for broader audiences.

Profile: Chloe Thio, M.D.
Trickiness of Treating Coinfections



Chloe Thio

When Chloe Thio, M.D., first began to look for the genes that underlie people's ability to cope with an infection of hepatitis B, she did not expect that her search would lead to an announcement from the U.S. Food and Drug Administration.

But in 2007, Dr. Thio's group reported that in patients who are "coinfected" with hepatitis B and the AIDS virus HIV-1, taking the antihepatitis drug entecavir may make the other virus more difficult to treat. As a result, the FDA formally revised its treatment guidelines for patients who have this dual infection and have not yet begun treatment for their hepatitis.

In making this discovery, Dr. Thio, who received a Burroughs Wellcome Fund Investigator in Pathogenesis of

Infectious Disease award in 2002 and is an associate professor of infectious disease at the Johns Hopkins School of Medicine, worked with others at Hopkins and at the Naval Medical Center in San Diego to study three patients coinfected with HIV-1 and hepatitis B. The researchers found that entecavir effectively prevented the hepatitis virus from replicating and thereby helped the patients' immune system to clear that virus.

But they also found that entecavir also inhibited the replication of HIV, to some extent. It was this partial inhibition that proved problematic, because in one of the patients it allowed a particular strain of HIV—a strain that is resistant to most of the standard treatments—to emerge and become dominant. Thus, giving a coinfected patient entecavir for hepatitis B may narrow the options for treating his or her HIV. Such information is vital, Dr. Thio said, as an estimated 4 million patients worldwide carry both viruses.

Teasing apart such complex interactions is all in a day's work for Dr. Thio. "I was attracted to medical research on infectious diseases because it required an understanding of all the body's systems, a complexity that I enjoyed," she said. But something was missing from the investigative picture. Dr. Thio soon added genetics to her field of interests, because she felt "this was an unexplored area in terms of how the immune system responds to infection."

The findings on coinfection, entecavir, and drug-resistant HIV-1 have brought considerable attention to Dr. Thio's lab, and she plans to include an immunological approach in the next stage of her research. However, she is still deeply engaged in unraveling the genetics of the immune response to hepatitis B.

The hepatitis B virus can spread through unprotected sex or the sharing of needles, or during childbirth. In most cases, the infection does not produce any significant illness. (Moreover, the rate of new infections has declined greatly in the United States since a preventive vaccine was introduced in 1982.)

"Most healthy individuals mount an effective immune response that can bring the levels of virus down to undetectable levels; some people never even know they've had the infection," according to Dr. Thio. But about 5 percent of those infected are unable to clear the virus from their system. For them, the consequences can be serious or even fatal: the chronic infection puts them at risk of developing cirrhosis, liver-cell carcinoma, or liver failure.

What makes the immune response less effective in this small group of people? Dr. Thio believes the answer lies in their genes. "The genetics of susceptibility is complex," she said. "Multiple genes are involved—probably more than half a dozen—and some have an additive effect, so that together they weaken the immune response to a greater degree than any one of these genes could manage to do on its own. Other genes may have a protective effect, helping to produce a stronger immune response than usual."

For more than 10 years, Dr. Thio has been poring over the data from four cohorts of people infected with hepatitis B virus: one group of injection drug-users in Baltimore, one group of gay men in several U.S. cities, and two different groups of people with hemophilia. Rather than interviewing or observing her research subjects, she analyzes their DNA. Specifically, she checks the gene that regulates a particular receptor protein known as CCR5, which appears to play a role favorable to hepatitis B infection.

In a recent study of more than 500 people who had been infected with hepatitis B, Dr. Thio and her collaborators sorted the data from the research volunteers into two groups: those who had cleared the virus from their system, and those who remained chronically infected. The scientists then looked at each person's two copies of the CCR5 receptor gene to see whether both copies, one copy, or neither copy was functional—that is, whether the gene produced or did not produce the receptor protein.

The researchers found that people who carried one functional copy of the CCR5 gene had only about half as high a risk of remaining chronically infected with hepatitis B as did people who had two functional copies. In people in whom neither copy was functional, the risk of persistent infection was lower still—only about one in nine.

Genetic variations need not be major in terms of protein structure in order to exert a large effect on an individual's health. In fact, Dr. Thio said, "What's pretty clear so far is that whatever variations we find will be small. That is, a particular gene may confer only a 10 percent increase in the person's ability to control infection—but it may provide important clues about the way the hepatitis B virus works. And with that new understanding, we may be in a better position to develop therapies for the treatment of hepatitis infection."

Dr. Thio's research currently centers on the DNA of some 700 to 800 research participants, but she is always on the lookout for new recruits to the genetic collection. "The more people we can study, the better," she said. "The more people we have, the more likely it is that if the genetic difference is small, we'll find it."

—By Sandra J. Ackerman, who writes about science and medicine from Durham, North Carolina.

Interfaces in Science

Identifying patterns in mechanical forces that influence biochemical changes inside cells, modeling brain activity in response to sensory stimuli, imaging molecular structure and function of membranes to understand how viruses work—these are a few of the projects in progress by the latest recipients of Burroughs Wellcome Fund Career Awards at the Scientific Interface (CASI).

Designed to support scientists whose work bridges biology with the physical, computational, and theoretical sciences, the program has supported 46 awards to date, representing a total investment of more than $23 million. We made a dozen new awards in 2007. The program attracts scientists early in their careers who are tackling scientific questions at frontiers between disciplines—a risky proposition, since academic careers typically are built within discipline-centered departments. The burgeoning applicant pool—which has doubled since the program started in 2001—suggests that the scientific opportunity justifies the risk.

Thirty-six program awardees have made the move from a postdoctoral position into their first tenure-track faculty appointment. A slight majority (55 percent) have landed in nonbiological departments, such as mathematics, physics, or engineering. For all awardees, BWF staff analyze the faculty appointment letters to help them place their offers in context. Some awardees may be advised to seek more specificity regarding lab space, or teaching requirements, or funding for trainees, while others are assured that their offers are solid. We feel such a hands-on approach takes some of the stress out of navigating this important career juncture, since BWF can provide comparison data on elements of the terms and start-up package.

BWF also tracks the course of the awardees' early careers. They are expected to teach, serve on university committees, be effective lab managers, attract federal funding, publish world-class research, and become thought leaders. As interdisciplinary scientists, their success will also depend on their ability to forge productive collaborations with colleagues. For many young scientists, the skills needed to take on such a multifaceted job description are not part of their training, and the learning curve is steep.

Recognizing that building relationships with colleagues is critical for success, BWF convened all CASI awardees in July 2007, along with awardees from our other career awards programs. The agenda included scientific presentations as well as sessions on managing a lab, being a mentor, and navigating the nonscientific

issues that new faculty face. These convening events not only add value to the monetary support that BWF provides, but they give us an opportunity to learn firsthand what the burning issues and emerging opportunities are, so that we can shape future initiatives aimed at developing careers.

Before launching the CASI awards, BWF invested in interdisciplinary science through our Institutional Awards at the Scientific Interface (IASI). The awards, made from 1996 to 2000, supported 10 training programs. The majority of the funds, which totaled over $26 million, provided stipend support for graduate students and postdocs from the physical sciences and mathematics, who were getting their first taste of biology. More than 400 trainees participated in the programs, and BWF is now tracking them to determine what the early careers of such cross-trained young scientists look like. We hope to report the results in 2008.

BWF is gratified that our "experiment" in interdisciplinary training may have provided the proof-of-principle that helped foster the current increased availability of funding for interdisciplinary research and training. Examples include the National Institutes of Health's New Innovator and Eureka Awards, as well as its Interdisciplinary Research Consortia. Private nonprofit funders are also investing in this area; for example, the Howard Hughes Medical Institute's initiative in Interdisciplinary Graduate Education picks up where our IASI program left off, and the Damon Runyon-Rachleff Innovation Award provides funds for early career scientists whose work bridges biology with physical science, informatics, and engineering.

To complement our competitive career awards, BWF is supporting the Biological Sciences Initiative at the Kavli Institute for Theoretical Physics (KITP), based at the University of California-Santa Barbara. Historically, the institute has been a "think tank" for theoretical physicists, but biological topics have increasingly appeared on its slate of programs. BWF has supported programs on topics such as pattern formation, biological information, understanding the brain, and molecular machines. Our funding has encouraged the development of a formal biological focus at KITP, and has also facilitated the inclusion of younger scientists, whose participation enables them to carve out an independent niche for their science. Beginning in 2007, BWF is supporting KITP's Interdisciplinary Biology Initiative, a series of programs over the next five years that will focus on the interface of biology and theoretical physics.

Profile: Dana Pe'er, Ph.D., and Aviv Regev, Ph.D.
Evolution of a Network

Aviv Regev

Genes don't work in isolation, and neither do scientists. Collaboration among colleagues and across disciplines often leads to unexpected insights.

For Dana Pe'er, Ph.D., and Aviv Regev, Ph.D., combining their experience in computational analysis and biology led to a breakthrough in analyzing the signaling pathways cells use to perform tasks. Their shared insight—sets of genes acting in concert can be considered single variables, or modules—provided scientists with the computing tools to model entire signaling networks at once.

Cell regulatory networks encompass the individual pathways that guide information flow within cells. It's an intricate version of a children's telephone game, with messages transmitted molecule by molecule. To carry a message, Dr. Pe'er explains, a network must sense multiple signals from the environment, process an appropriate cellular response, and orchestrate the regulation of hundreds of genes and proteins to execute the response.

Ten years ago, scientists who wanted to assemble a global picture of communication inside a cell were studying networks one pathway at a time. Dr. Pe'er, then a graduate student at Hebrew University in Jerusalem, wanted to circumvent this painfully slow process. "Because I trained as a computer scientist, I thought you could take a couple of computer programs and some high throughput data and reconstruct an entire regulatory network accurately," she said.

But Dr. Pe'er was struggling with her thesis, the application of Bayesian analysis to construct cell regulatory networks from observed data. Bayesian analysis, which uses statistics to determine associations and dependencies among variables in a network, was a good choice for studying cell signaling. The molecules that make up individual pathways in signaling networks rarely operate in isolation. However, the technique runs into problems when faced with a large number of variables, such as the simultaneous activities of signaling molecules in thousands of individual cells.

Dr. Pe'er was ready to abandon the approach when she met Dr. Regev in 1999, at a computational molecular biology conference in Lyon, France.

At the conference, Dr. Regev's curiosity was piqued by the project. "Dana was looking at the first piece of research on how to construct networks from data. It was a really good fit from day one," said Dr. Regev, who was pursuing the evolution of molecular networks via computer modeling as a graduate student at Tel Aviv University.

Dr. Pe'er said her biology education began when she met Dr. Regev. "My first and most significant biology teacher was Aviv," Dr. Pe'er said. "She was patient enough to answer my silly questions." Dr. Pe'er, whose interest in biology began in high school, had focused on computer science and mathematics prior to graduate school, in order to build a solid foundation for pursuing computational biology.

"Through time, as I became more educated in biology, I realized how crazy and impossible my first goal was," Dr. Pe'er said. "I also realized that it was a pretty boring Holy Grail. What's really interesting is to understand how a network works and how it evolves."

Following the conference, the pair brainstormed a novel solution for the problem of too many variables. Dr. Regev's understanding of basic biology and cellular networks led to the realization that genes can be organized into modules. The modules are set of genes and proteins that come together to perform a specific biological task or process, typically orchestrated by a common and shared regulatory program.

Dana Pe'er

Considered a significant breakthrough in the field, the module approach has since proved adept at handling the increasingly vast amounts of data produced by whole-genome analysis. Dr. Pe'er's and Dr. Regev's subsequent research has illuminated the evolution of cell regulatory networks and led to discoveries in diseases as varied as cancer and malaria.

Dr. Pe'er, now an assistant professor of biology at Columbia University, continues to focus on unraveling the molecular workings of the cell. With support from a

Burroughs Wellcome Fund 2006 Career Award at the Scientific Interface, she is building a computational infrastructure to understand how a cell processes signals.

The award will also support exploratory experiments as Dr. Pe'er develops new applications of network analysis. The technique is particularly useful for understanding diseases where signaling malfunction plays a prominent role, such as cancer, she said. Using genomics data (the variation of gene expression across individuals) Dr. Pe'er and other researchers have uncovered a wide variety of modules involved in cancer. Some of the modules characterize only one type of cancer, but others are shared by many different tumors.

Dr. Regev, now a core member of the Broad Institute, a joint effort of the Massachusetts Institute of Technology and Harvard University, also received a 2006 Career Award at the Scientific Interface. The grant funds her work in deciphering the history of how and when various genes appeared within and across species.

Among her research efforts, Dr. Regev is profiling 13 yeast species and their transcriptional and metabolic responses to different biological conditions. She plans to reconstruct and compare the yeasts' cellular networks to find the last common ancestor among the species. By identifying a common ancestor, Dr. Regev hopes to trace the evolution of cell signaling networks through time. "We can look forward in time and ask how a complex response evolves," she said.

And in an unexpected development, the yeast data and the modular approach played an important role in a recent malaria study led by Dr. Regev's collaborators at MIT and Harvard. Dr. Regev compared the malaria parasite genome, which is poorly understood, to baker's yeast, a standard laboratory organism. Both are single-celled eukaryotes, and it was possible they shared similar regulatory networks.

The comparison revealed a never-before-seen behavior in the malaria parasite. Like yeast, the organism responds to extreme environmental stress. The response correlates with patient symptoms, including high fevers and elevated levels of inflammatory markers in the blood, opening a new path for drug development.

"That's the power of comparative genomics," Dr. Regev said. "If you have the right way of mapping information between species, you can take a species you know a lot about and understand species that you know very little about."

—By Becky Oskin, a freelance science journalist based in Chapel Hill, North Carolina.

Translational Research

The year 2007 marked the 10th award cycle for the Burroughs Wellcome Fund's Clinical Scientist Awards in Translational Research. When the program was conceived, "translational research" were new buzzwords, indicating the movement of basic science discoveries with therapeutic potential through preclinical testing and into their first use in humans.

Beyond facing a paucity of grant funding, investigators desiring to participate in this "translation" faced many obstacles, including finding "protected time" for research away from the demands of patient care, and complying with the many necessary regulations surrounding use of human subjects. BWF has made 80 awards to date, for a total investment of $60 million, to recipients at 37 institutions in the United States and three institutions in Canada.

Historically, the most well-represented specialties among awardees have been oncology (29 percent) and cardiovascular medicine (14 percent). The 2007 cohort of 11 awardees are working on a broad range of issues, including autoinflammatory disease, antibiotic resistance, female infertility, and sickle-cell anemia, among others. For the first time in the program's history, the group also includes investigators working in ophthalmology; one is using an exciting new class of molecules called "silencing RNAs" to inhibit blood vessel growth in age-related macular degeneration, and the other is exploring the infectious hypothesis for inflammation that occurs within the eyeball.

BWF employs a rigorous selection process—even though the number of awards made annually has nearly doubled since 2003, the award rate remains under 10 percent. We received 60 percent more applications in 2007 than in 2003, reflecting strong demand for this type of funding targeted to mid-career physician-scientists seeking to translate their discoveries.

The competitive awards reflect BWF's primary strategy of investing in the career development of individual scientists. But we recognize that with relatively modest investments, we can also catalyze change in the environment in which our awardees work, in an effort to address any obstacles or disincentives they face. One such issue is the length of time it takes to prepare for a career in translational research. Clinical training cannot be shortchanged, nor are solid researchers made overnight. To understand this issue better, BWF has provided support for a project led by the Association of American Medical Colleges to accelerate the training of clinical and translational physician-scientists. The study will examine the training continuum—from undergraduate through medical school through residency and fellowship—and the resulting report will highlight promising models and recommend new approaches.

BWF also supports an initiative of the Association of Professors of Medicine to better understand how to attract and retain well-trained investigators in research careers. The goal of the initiative, which pulls together leaders from a range of medical specialty areas, is to develop a coordinated national strategy for keeping physicians in research.

Beyond having adequate research grants and sufficient numbers of trained people in their research groups, "translational" investigators also must navigate a gauntlet of nonacademic issues in order to be successful. For investigators working in disease areas with small patient populations (so-called "orphan diseases"), this issue is compounded by the necessity of involving multiple institutions in the earliest phases of human studies, a situation that invariably results in delays due to multiple institutional review boards. Likewise, finding industry partners to move a potential therapeutic approach into clinical trials is not a transparent or simple process. These issues are complex and involve a range of stakeholders, including government funding and regulatory agencies, the pharmaceutical and biotech industries, academics, and patient advocacy groups. BWF facilitates high-level consideration of many of these issues through our support for the Institute of Medicine's Forum on Drug Discovery, Development, and Translation, which is cochaired by Gail Cassell, Ph.D., a member of BWF's Board of Directors until October 2007.

BWF is gratified to see that there is growing national emphasis on translational research, perhaps best evidenced by the National Institutes of Health's Clinical and Translational Science Awards. NIH has granted 24 awards in an effort to turn translational research from a cottage industry into an integrated infrastructure within academic health centers. Nongovernmental funders are also increasingly diversifying their portfolios to include translational research in addition to basic discovery research. BWF believes that we may be able to leverage our modest support for translational research by promoting collaboration among these funders, who share a common interest in the health of the U.S. biomedical research enterprise. Collectively, funders may be better able to beneficially affect not only the number of funded investigators, but also the system in which they work. BWF has thus expended considerable effort to facilitate communication among like-minded funders, and has been instrumental in the formation of the Health Research Alliance, described elsewhere in this report.

Profile: James E. Crowe Jr., M.D.
Understanding the Human Metapneumovirus

James E. Crowe Jr.

In the 1950s and '60s, advances in cell culturing techniques provided researchers with the ability to isolate viruses from patient samples and thus identify the viruses that caused many major illnesses. James E. Crowe Jr., M.D., who received a Burroughs Wellcome Fund Clinical Scientist Award in Translational Research in 2005, not only admires the advances made during these decades, but also wishes he could have been there.

"I sort of feel like the fun days are gone, and only the hard problems are left," he jokes.

But Dr. Crowe, an associate professor at the Vanderbilt University School of Medicine, quickly adds that he is not without scientific opportunities. His career as a molecular virologist and clinician has brought him to a place where he, too, can study and work on an important new pathogen: human metapneumovirus.

Human metapneumovirus was discovered in 2001 when researchers in the Netherlands isolated the virus from young children with respiratory disease symptoms. As Dr. Crowe recalls, when he read of these findings, he became excited at the prospect of working on a brand new pathogen. The virus also seemed similar to another virus, called respiratory synctial virus, commonly found in children. The virus caused a similar spectrum of symptoms, including pneumonia and wheezing.

Prior to discovery of the new virus, doctors examining sick children with wheezing, cough, or fever—or all of the symptoms together—would sometimes find themselves perplexed. They often would discover that the children had pneumonia. And by testing samples taken from children's nasal passages, they often could identify which viruses were present and thus likely to be causing the pneumonia. Influenza and respiratory syncytial viruses usually proved to be the culprits. But in some cases, pathologists could not identify what virus was present.

So, Dr. Crowe and his laboratory colleagues took advantage of their access to Vanderbilt University's library of thousands of patient test samples, which spanned over 30 years. Following the identification of human metapneumovirus, Dr. Crowe's group was able to retrospectively probe these samples for this previously unknown virus. He and his colleagues discovered that the human metapneumovirus caused 12 percent of serious lower respiratory tract illness in children, making it one of the major causes of childhood illness. Dr. Crowe has since published additional studies on the epidemiology of human metapneumovirus in a variety of patients, including bone marrow transplant recipients, children with asthma, and adults with asthma.

Dr. Crowe's current work includes studying the basic biology of the human metapneumovirus in order to create therapeutics against it. "I love the aesthetics of research and the process of discovery," he said. "But I also want my lab to be continually focusing on research that really works in a medical setting to induce immunity and protect children against viruses, particularly viruses that affect children in the developing world." His lab has prior experience in designing vaccines for other viruses, and his group is now using a variety of approaches to quickly identify and develop a potent human metapneumovirus vaccine for clinical testing. One of the new technologies the researchers are testing uses a vaccine design system that may provide an enhanced mucous membrane defense against pathogens. They currently have several vaccine candidates in preclinical trials, as well.

Dr. Crowe's lab is also studying antiviral drugs as another type of defense against human metapneumovirus. The researchers first focused on studying the mechanism of how the virus attaches to cells, and they now are collaborating with chemist colleagues to identify compounds that can prevent the virus from attaching and entering cells of its host.

Dr. Crowe did not initially intend to become a molecular virologist and immunologist. After finishing medical school and residency at the University of North Carolina-Chapel Hill, he planned to pursue medical missionary work in Africa, fueled by his impulse to change the state of children's health in the developing world. He did short-term missions in both East and West Africa, where pneumonia and diarrhea are the two leading contributors to childhood death.

"Seeing the morbidity and mortality in those settings really moved me," Dr. Crowe said. "I felt like more needed to be done about these preventable diseases."

This work convinced him that research would be the best way he could make an impact on children in the developing world. He chose to study pneumonia, and he spent five years in training as a research fellow in the laboratory of the noted virologist Robert Chanock, at the National Institutes of Health. Dr. Crowe saw no patients during this time, choosing to focus on building a solid foundation in laboratory research. He moved to Vanderbilt in 1995, where he resumed work as a practicing physician, while also teaching, mentoring graduate students and research fellows, and pursuing molecular immunology and virology research.

Dr. Crowe says he strongly believes that there is an important need for translational research, and for training individuals who are well versed in both the clinical and research settings. His interest in connecting research science with clinical practice does not end when he leaves the lab or clinic. His wife is a family physician involved in primary medical care, and he says their conversations illustrate the "gulf" between the tools available to practicing clinicians and the basic science studies of research scientists. "We experience it over the dinner table," he said.

Dr. Crowe sees his BWF award as helping to bridge this gap by fostering rapid advances in creating tools to use against the new human metapneumovirus: "The award has funded us to do work that not only pursues basic science studies but allows us to translate those studies immediately into areas such as vaccine development."

—By Nicole Garbarini, a freelance science journalist based in Nashville, Tennessee.

Catalytic Program in Translational Research: Health Research Alliance

Kate Ahlport, executive director Health Research Alliance

The Health Research Alliance (HRA)—a national consortium of nongovernmental, not-for-profit funders of health research and training—increased membership by nearly 50 percent during fiscal year 2007. The 29 organizations that make up HRA's roster collectively provide more than $1.3 billion annually to support more than 5,600 researchers.

The Burroughs Wellcome Fund has played a key role in HRA's formation and development. During HRA's formative years, from 1998 to 2004, BWF helped catalyze its emergence as the only professional organization in the United States aimed at the staff of foundations and voluntary health agencies that support biomedical and health research. In 2004, BWF approved two years of funding and other infrastructure support to enable the alliance to become an independent entity. HRA was incorporated in November 2005 and designated by the Internal Revenue Service as tax-exempt in April 2006, and the alliance began covering its own expenses in January 2007 with dues paid by member organizations. BWF continues to provide HRA with office space and other in-kind services.

In recent years, the federal government's stagnant funding for the National Institutes of Health has affected the entire landscape for health research and training, including HRA member organizations. An informal HRA member survey in April 2007 indicated that numbers of grant applications to private funders have increased substantially, while at the same time the aggregate success rate for new investigators applying for grants has decreased from 26 percent in 2002 to 19 percent in 2005. These changes in the landscape underscore the importance of HRA's mission: to foster collaboration among funders of health research and training by improving communication, creating new means for working together, and providing information about the research supported by private funders; and to help private funders enhance their overall effectiveness through the sharing of information and best practices.

Toward these goals, HRA organized three members-only advisory committee meetings to explore a number of questions involving the changes in the landscape for health research and training and how member organizations can improve their effectiveness as grantmakers. How does the new NIH Clinical and Translational Science Awards program create opportunities for private funders? What can private funders learn from each other about mentoring of young scientists? How can nonprofit funders work with industry to accomplish translation of basic discovery into cures? What do funders need to know about working with university technology transfer offices? How should funders evaluate their work so that their investment portfolios are most likely to achieve organizational missions? What can funders learn from each other in terms of setting the research agenda for their funding? What does effective peer review look like? What opportunities are ripe for collaborative funding?

HRA also continues to expand its database of awards made by its member organizations (called gHRAsp, for Grants in the Health Research Alliance Shared Portfolio) and to refine its activities in program evaluation and grants administration. In addition, the HRA Board of Directors has approved a process the alliance can use to issue position statements and recommendations, increasing its ability to "speak with one voice." A program committee has been formed to oversee planning for the next biennial HRA conference, Accelerating Medical Discovery Through Strategic Philanthropy, to be held in March 2008 in Washington, D.C.

In light of HRA's recent growth spurt and the changes in the landscape for health research and training, the alliance's Board of Directors elected to undertake a year-long strategic planning process. HRA staff collected data by interviewing chief executive officers and other senior leaders of nonmember organizations that are key players nationally in health research, interviewing officials at each HRA member organization, and talking with officials at a similar organization in the United Kingdom that is larger and more mature than HRA. This data is informing the HRA Board of Directors' preparation of a strategic plan to guide the continued development of the alliance over the next three years.

For more information on the Health Research Alliance and member organizations, visit healthra.org.

Science Education

The Burroughs Wellcome Fund's overarching goal in science education is to inspire primary and secondary students—particularly in our home state of North Carolina—to pursue careers in science and science-related disciplines and to give them the tools needed for success.

We follow four key strategies: offering science enrichment activities for students, informing legislators who will in turn improve public policy and research, building the capacity of the groups who receive our grants, and forging partnerships to sustain our work. In 2007, we also expanded our reach into teacher education.

Among our activities, BWF staff participated in a national panel discussion on efforts to increase the number of teachers in U.S. schools who are trained in science, mathematics, engineering, or technology. The convocation was organized by the National Academies and built around its recent landmark report *Rising Above the Gathering Storm*. A cohort of education stakeholders from North Carolina met afterward to determine next steps, which have sparked such activities as science summits, a review of the state's education accountability system, and statewide forums to engage various communities in science education. For our part, BWF established a partnership with North Carolina's university system to develop a program to produce more teachers with undergraduate degrees in the sciences or mathematics. This FastTrack initiative, which is modeled after the UTEACH program at the University of Texas-Austin, is a pilot program involving the University of North Carolina-Chapel Hill, the University of North Carolina-Asheville, North Carolina Central University, and North Carolina State University. Scholarships will be offered to science and mathematics majors who are interested in teaching, and once they are in the field these teachers will receive five years of funding, mentoring, and professional development. According to UNC President Erskine Bowles, FastTrack is designed to change the culture of how the state produces teachers. The initiative also is expected to improve program coordination and curriculum integration among the colleges of education and colleges of sciences on the participating university campuses.

To support teachers who are currently in classrooms across the state, BWF made a $35,000 grant to DonorsChoose, a nonprofit website created by Charles Best, a teacher in Bronx, New York, as a simple way to provide students with resources that public schools often lack. Teachers submit proposals for materials or experiences their students need, and these ideas become classroom realities when selected for funding. BWF funded 59 science and mathematics projects in 38

counties across North Carolina, providing 2,360 hours of learning for 1,534 students. Approximately 97 percent of the materials and experiences went to students in Title 1 schools, in which 40 percent or more of students receive free or reduced-cost lunches.

The Student Science Enrichment Program (SSEP)—the cornerstone of BWF's efforts in science education—supports high-quality science and mathematics after-school programs for K-12 students. The program, which provides grants of $180,000 over three years to a variety of nonprofit organizations, including universities, public and private schools, museums, and community organizations, has reached some 27,000 students statewide. BWF's total investment of $14.8 million since SSEP began in 1996 has provided 108 awards to 60 organizations. In one of the most rewarding outcomes, 59 percent of the student participants reported that their experiences encouraged them to view science as a career option. In 2007, BWF made 16 awards, selected from among 42 eligible applications. We also worked to build the capacity of potential applicants by holding a workshop—in partnership with the Cherokee Preservation Foundation—to reach groups in the western part of the state, which includes regions where science education has often lacked sufficient support. Ten workshop participants submitted applications for the latest award series; seven were finalists.

Through SSEP, we also are learning valuable lessons about making strategic partners. Working with The Hamner Institutes for Health Sciences and the American Chemical Society on Project Suc-SEED, we are giving high school students from across the state access to rich, real-world research under the tutelage of laboratory scientists. The project places economically disadvantaged but talented high school students in academic research laboratories to experience hands-on chemistry and chemistry-related sciences. Thirty-two students participated in 2007—12 as residential summer students on Duke University's campus and the rest in laboratories at the University of North Carolina-Chapel Hill and North Carolina State University. At the end of their research experience, students presented their work at a symposium of peers, parents, mentors, and supporters. As the pudding's proverbial proof, nine minority students who participated in the program now are in doctoral programs in the sciences or mathematics at major universities across the country. The first participant to earn a Ph.D. is Ticora Jones, who completed her undergraduate studies at the Massachusetts Institute of Technology and graduate work in materials science at the University of Massachusetts-Amherst.

Profile: Schiele Museum of Natural History
Environmental Science Partnership

Some people would call the partnership between Gastonia's Schiele Museum of Natural History and Grier Middle School progressive. Some, serendipitous.

Tony Pasour has another word for it.

The Environmental Science Partnership has helped a great number of participants focus on possible science careers.

"It's really neat," said Mr. Pasour, director of education for the museum, which during the 2005 school year launched the Environmental Science Partnership (ESP) with the nearby middle school. Gastonia is a mid-sized city located near Charlotte, N.C.

Funded in part by the Burroughs Wellcome Fund, ESP pairs the museum's staff and resources with students in sixth through 12th grades who have demonstrated an interest in or aptitude for science.

What makes the partnership program "neat," according to Mr. Pasour, is that it grew out of community discussions that transformed Grier from a traditional middle school to a full-fledged science academy, replete with science-focused curricula and integrated learning activities. Mr. Pasour said the partnership sparked an "explosion of activity on the part of the school system."

Students from Grier who participate in the voluntary program come to the museum, which shares an expansive natural area with the school, for school-year and summertime learning sessions. They learn about various science disciplines and are exposed to information about possible careers in the field.

Deb Nahikian, a sixth grade science and social studies teacher at Grier, said the hands-on opportunities at Schiele have changed her students' perceptions of what it means to be a part of the science community.

"I think that for a lot of them, the old image of the scientist in the lab—with the white hair and test tubes—has been thrown out the window," she said.

Ms. Nahikian, who has been with the partnership since its launch, said that opportunities at Shiele and the science-focused curriculum at Grier have gotten students excited about science.

"I think they get in the museum programs and it's exciting, it's in a different setting," she said. "They don't think of it as classroom as they're learning. They think of it as, 'Wow, this is cool!' "

Made possible by a three-year, $179,000 grant from BWF's Student Science Enrichment Program, the partnership program uses the 30 acres of land shared by the museum and the school as an outdoor laboratory to expand and reinforce the lessons in the classroom. The program gives students an opportunity to participate in hands-on, inquiry-based science activities, which organizers say have been powerful in increasing students' understanding of and appreciation for science. Project activities incorporate chemistry, observation, measuring, drawing, photography, history, language arts, and analytical thinking.

Mr. Pasour said the idea for the partnership grew out of the observation that students from Grier would often pass through the shared natural area after class. They would be "getting into mischief" there, Mr. Pasour said, but they also were demonstrating curiosity about the world around them.

"We'd been looking for a couple of years at how to harness that natural curiosity," he said. "We wondered how we could take kids who are interested in science and extend that interest to make them think about possible careers in science, extend their science skills, and also get them to understand the role of science in everyday life."

In the program's first year, 42 students participated in the school-year academy program and 50 completed the summer institute. In the 2007-08 school year, 44 students are participating. The museum expects to receive 50 to 60 applications for the 2008 summer institute.

The following year, the program will be divided into two semester-long programs and the summer institute to make it available to students who cannot commit to a full year.

"The program does a wonderful job delivering to an audience that can participate for a full year," Rebecca Kirin, the project coordinator for ESP, said. "By offering the program in semester-long sections, we could double the number of participants."

The museum has a staff of 40, and roughly a quarter to half of them might work on a science education partnership project at any given time, depending on the subject.

The programs are free and provide participants with a nominal stipend. In the school-year projects, students work with a team of teachers and participate in a calendar of activities and events throughout the year, working after school during selected weeks.

The school-year academy and the summer institute are designed to engage students in different ways. Students have taken field trips to investigate a water treatment facility, a nuclear power plant, and the inner workings of a local hospital.

A cornerstone of the academy is its career day, held in early March, in which students shadow someone in a science career for a day. Some students work with experts at the museum; others visit the hospital or explore other careers.

In the first year, the academy was geared generally toward middle-school students, but now participants are separated by grade and exposed to grade-specific activities designed to complement the North Carolina Standard Course of Study. Ms. Nahikian's sixth graders, for example, are given the most introductory courses about science.

In a geology session, they might learn "what kind of components go into forming the soil in our area, or what comprise the local flora and fauna," Mr. Pasour said, while older students collect more data and talk with scientists.

By using hands-on learning, students discover what components form the soil.

The summer institute is similar to the academy but more extensive. Students participate in daylong field trips and other projects that have the flexibility to be longer since the students are not in school. Mr. Pasour said students in both programs have proved receptive to the inquiry-based learning.

"Anytime there's water or anything hands-on involved, it really works and is rated very highly," he said.

The students who participate are self-selected science types, Mr. Pasour said, so it has been no surprise to find that most of them rate their interest in science as very high on year-end evaluations. But it has proved interesting to learn, he said, that the program has helped a great number of participants narrow their focus on possible science careers.

"We are seeing that the kids are showing more interest," he said. "What seems to happen is that students 'fine tune' their interests. Maybe someone might mark off environmental science as an interest or add geology."

Of course, the idea that students who take part in the partnership become better equipped to narrow their focus and make conclusions based on experimentation should come as no surprise.

As Ms. Nahikian said, "That's what science is all about."

—By Jim Walsh, a recent graduate of the University of North Carolina-Chapel Hill. He now lives in Chicago.

Catalytic Program in Science Education: North Carolina Science, Mathematics, and Technology Education Center

Sam Houston, Ed.D., President and chief executive officer SMT Center

The North Carolina Science, Mathematics, and Technology Education Center (SMT Center) concentrated its efforts in 2007 on deepening and widening its role as an advocate for improved education in these vital areas. The Burroughs Wellcome Fund founded the center in 2002 to promote and support innovation in science, mathematics, and technology learning. Focusing on the state's elementary and secondary schools, the center works to provide all students with the knowledge and skills to have successful careers, be good citizens, and advance the economy of the state—goals that increasingly depend on a student's proficiency in science and mathematics.

In August 2007, the SMT Center, in partnership with the National Science Resources Center, brought together representatives from 17 state school districts to participate in a planning institute to develop high-quality science education programs —especially programs that emphasize inquiry-based science. At the LASER Institute—Leadership and Assistance for Science Education Reform—participants worked alongside experts to develop plans that address a range of key issues, including curriculum, professional development, student assessment, materials support and community involvement, and administrative support. In the inaugural gathering, more than 375,000 North Carolina students were represented. The center will reconvene the district representatives several times during the year to provide additional consulting and to further build a communication network among the schools. A second planning institute is slated for summer 2008 in Asheville, N.C.

The Burroughs Wellcome Fund enabled the program to take place in North Carolina with a $1 million grant. It is hoped that all of North Carolina's school districts will participate in the LASER Institute within the next five years.

Among its charges, the SMT Center plays a key role in promoting conversations among various stakeholders about how students access learning. In 2007, such conversations led to significant movement in developing assessment tools that can better serve as instructional strategies. The center partnered with a team from the University of Washington to develop a prototype instructional tool that will enable students to demonstrate their capacity to solve problems while learning new knowledge. Such problem-solving skills are expected to be necessary for students to gain success in the nation's increasingly technological workplace. In another effort, the SMT Center's president and chief executive officer, Sam Houston, Ed.D., served as chair of the State Board of Education's Blue Ribbon Commission on Testing and Accountability, which is reviewing the state's testing program and accountability system and will offer recommendations for improvements.

As part of efforts to "champion" science education, the SMT Center held its first Celebration of Science, Mathematics, and Technology Education in April 2007. The gala brought together teachers, students, parents, policymakers, and supporters of K-12 education to recognize the achievements and hard work of students and teachers. Those recognized participated in prestigious science competitions and received national and statewide honors. In 2008, the SMT Center will add its own awards that will recognize organizations and individuals that are using innovative approaches to strengthen science, mathematics, and technology education.

Report on Finance

The Burroughs Wellcome Fund's investments totaled $791.2 million at August 31, 2007, 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. As of the end of the fiscal year, BWF's asset mix and market values were:

- U.S. large capitalization equity assets had a market value of $177.4 million. The sector's target allocation was 25 percent, and actual holdings stood at 22.4 percent.
- U.S. small capitalization equity assets had a market value of $119.8 million. The sector's target allocation was 18 percent, and actual holdings stood at 15.2 percent.
- International equity assets had a market value of $225.6 million. The sector's target allocation was 32 percent, and actual holdings stood at 28.5 percent.
- Fixed income assets had a market value of $119.5 million. The sector's target allocation was 22 percent, and actual holdings stood at 15.1 percent.
- Cash equivalent assets had a market value of $13.5 million. The sector's target allocation was 3 percent, and actual holdings stood at 1.7 percent.
- Alternative assets had a market value of $135.4 million. The sector did not have a target allocation, and actual holdings stood at 17.1 percent. The maximum permitted allocation to alternative assets stood at 20 percent.

The total market value of BWF's investments increased by $64.4 million, or 8.9 percent, from the end of the previous fiscal year. This increase in assets was due primarily to strong returns in global equity markets throughout the fiscal year. Bonds had low positive returns for the 12 month period. BWF's total investment return before investment management fees for the fiscal year was 15 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 +13.7 percent, the U.S. small capitalization equity sector had a +13.9 percent result, the international equity sector posted a return of +23 percent for the fiscal year, and fixed income produced a +4.5 percent result.

As of August 31, 2007, 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 Enhanced Investment Technologies. A.G. Asset Management, Kennedy Capital Management, and FAF Advisors 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. Quellos Capital Management and Franklin Street Partners managed funds of absolute return strategies. Hamilton Lane Advisors managed a fund of private equity strategies. Finally, Mellon Capital Management managed a global macro strategy.

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, 2007 and 2006, 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 2007 audit was conducted for the purpose of forming an opinion on the basic financial statements taken as a whole. The information presented in Schedules I and II is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

PricewaterhouseCoopers LLP

Raleigh, North Carolina
October 19, 2007

Statements of Financial Position

August 31, 2007 and 2006

(All dollar amounts presented in thousands)

	2007	2006
Assets		
Cash and cash equivalents	$ 36,738	$ 30,060
Marketable securities	798,970	733,955
Accrued interest and dividends receivable	1,709	1,870
Federal excise tax receivable	243	–
Other assets	41	39
Property and equipment, net	11,209	11,695
Total assets	$ 848,910	$ 777,619
Liabilities and Net Assets		
Transactions payable, net	$ 45,390	$ 39,013
Accounts payable and other liabilities	1,406	1,101
Federal excise tax payable	–	770
Deferred excise tax payable	1,855	1,474
Unpaid awards	90,697	72,557
Total liabilities	139,348	114,915
Unrestricted net assets	709,562	662,704
Total liabilities and net assets	$ 848,910	$ 777,619

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

Statements of Activities

August 31, 2007 and 2006

(All dollar amounts presented in thousands)

	2007	2006
Revenues		
Interest and dividends, less investment expenses of $4,765 and $3,842 in 2007 and 2006, respectively	$ 12,215	$ 11,988
Net realized gain on sales of marketable securities	71,056	56,394
Total revenues	83,271	68,382
Expenses		
Program services	47,620	37,657
Management and general	8,244	7,286
Total expenses before net unrealized appreciation and deferred federal excise tax	55,864	44,943
Net unrealized appreciation of marketable securities, net of provision for (benefit from) deferred federal excise taxes of $381 and ($11) in 2007 and 2006, respectively	19,451	(165)
Change in net assets	46,858	23,274
Net assets at beginning of year	662,704	639,430
Net assets at end of year	$ 709,562	$ 662,704

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

Statements of Cash Flows

August 31, 2007 and 2006

(All dollar amounts presented in thousands)

	2007	2006
CASH FLOWS FROM OPERATING ACTIVITIES		
Change in net assets	$ 46,858	$ 23,274
Adjustments to reconcile change in net assets to net cash provided by operating activities:		
Depreciation	613	732
Net realized gain on sales of marketable securities	(71,056)	(56,394)
Net unrealized appreciation of marketable securities	(19,832)	176
Provision for (benefit from) deferred federal excise taxes	381	(11)
Awards granted, net of cancellations and change in unamortized discount	47,585	37,445
Award payments made	(29,445)	(25,810)
Changes in operating assets and liabilities:		
Accrued interest and dividends receivable	161	(388)
Other assets	(245)	(37)
Transactions payable, net	6,377	39,616
Accounts payable and other liabilities	(465)	728
Net cash (used in) provided by operating activities	(19,068)	19,331
CASH FLOWS FROM INVESTING ACTIVITIES		
Purchases of marketable securities	(1,172,799)	(1,255,010)
Proceeds from sales of marketable securities	1,198,672	1,243,417
Purchase of property and equipment	(127)	(323)
Net cash provided by (used in) investing activities	25,746	(11,916)
Net increase in cash and cash equivalents	6,678	7,415
Cash and cash equivalents at beginning of year	30,060	22,645
Cash and cash equivalents at end of year	$ 36,738	$ 30,060
Supplemental disclosure of cash flow information:		
Cash paid during the year for federal excise taxes	$ 2,779	$ 1,050

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

Notes to Financial Statements

August 31, 2007 and 2006

(All dollar amounts presented in thousands)

1. Organization and Summary of Significant Accounting Policies

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

Cash equivalents

Cash equivalents are short-term, highly liquid investments that are readily convertible to known amounts of cash and have 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 $135,272 and $63,181 at August 31, 2007, and 2006, respectively. Realized losses on forward currency contracts totaled ($260) and ($369) in 2007 and 2006, respectively. The market value of open forward currency contracts at August 31, 2007, and 2006 was ($67) and $526, 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 ($147) and ($9) for the years ending August 31, 2007, and 2006, 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, 2007, and 2006 were $18,279 and $2,764, 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, 2007, and 2006 is the net settlement relating to these contracts of ($308) and $306, 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 $241 and $272 at August 31, 2007, and 2006, respectively, which is recorded as an asset (liability) in the Fund's financial statements. The average fair value of open contracts totaled $220 and $42 for the years ending August 31, 2007, and 2006. Realized gains and losses on options totaled ($111) and $29 for the years ending August 31, 2007, and 2006, 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, and accounts payable. All financial instruments are reported at their estimated fair value. The carrying values of accrued interest and dividends receivable, and accounts payable approximate fair values based upon the timing of future expected cash flows. The estimated fair value of marketable securities is determined based upon the latest quoted sales price for such securities as of the balance sheet date. The Fund's remaining assets and liabilities are not considered financial instruments.

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

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

2. Property and Equipment

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

	2007	2006
Building	$ 13,451	$ 13,451
Furniture and fixtures	1,964	1,915
Computer equipment	1,087	1,009
	16,502	16,375
Less: accumulated depreciation	(5,293)	(4,680)
	$ 11,209	$ 11,695

Furniture and fixtures includes non-depreciated art work, as defined by the provisions of Statement of Financial Accounting Standards No. 93 "Recognition of Depreciation by Not-for-Profit Organizations" ("FAS 93"), of $77 at August 31, 2007, and 2006.

3. Federal Excise Taxes

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

Deferred federal excise taxes represent the tax liability on unrealized appreciation of marketable securities. At August 31, 2007, and 2006, the Fund was in a net unrealized appreciation position; therefore, a deferred federal excise tax liability of $1,855 and $1,474, respectively, was recorded.

4. Qualified Distributions

The Fund is required to distribute 5% 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% of the undistributed income of the Fund.

5. Unpaid Awards

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

	2007	2006
Payable in less than one year	$ 28,264	$ 24,885
Payable in one to five years	66,846	50,574
	95,110	75,459
Unamortized discount	(4,413)	(2,902)
Total	$ 90,697	$ 72,557

The expected future liability to the Fund has been calculated based on discount rates ranging from 4.05% to 4.30%.

6. Marketable Securities

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

	2007		2006	
	Cost	*Estimated Market Value*	*Cost*	*Estimated Market Value*
U.S. and foreign governmental obligations	$104,426	$104,412	$117,966	$118,353
Corporate bonds	43,422	42,039	31,155	30,739
Common and preferred stocks	267,976	291,531	271,399	298,439
Foreign stocks and foreign equity funds	168,461	233,522	140,972	188,579
Option and forward foreign currency investments	317	241	1	272
Venture capital investments	27,507	17,024	23,749	14,939
Mutual fund	94,068	110,201	75,560	82,634
	$706,177	$798,970	$660,802	$733,955

7. Employee Benefit and Retirement Plans

The Fund provides medical insurance to all employees working at least 30 hours per week. The Fund also pays 80% of the cost to cover each employee's spouse and dependent children, if applicable. The expense for this employee benefit was $188 and $205 during fiscal 2007 and 2006, respectively. The Fund has a defined-contribution retirement plan covering all employees working at least 20 hours per week. Under the terms of the plan, the Fund matches 50% of all employees' contributions up to 6% of the employee's annual compensation. Employees are 100% vested in employee and employer contributions immediately. The Fund also has a defined-contribution retirement plan funded solely through employer contributions. Under the terms of the plan, the Fund contributes 10% of the employee's annual compensation. This plan covers all employees and vesting in contributions is immediate. The expense for these retirement plans was $47 and $199 in fiscal 2007, and $50 and $203 in fiscal 2006, respectively.

8. Classification of Expenses

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

	2007		2006	
	Program Services	*Management and General*	*Program Services*	*Management and General*
Awards granted, net of cancellations and refunds of $2,162 and $1,982 in 2006 and 2005, respectively	$ 47,025	$ -	$ 37,022	$ -
Federal excise tax	-	2,536	-	1,820
Salaries and other employee expenses	301	2,556	353	2,467
Depreciation expense	-	613	-	732
Travel and entertainment	101	903	120	820
Maintenance and supplies	6	715	21	677
Honoraria	-	416	-	436
Professional fees	166	182	123	157
Printing and design costs	19	148	12	44
Miscellaneous	2	175	6	133
Total expenses	$ 47,620	$ 8,244	$ 37,657	$ 7,286

9. Related Parties

The 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 $0 and $35 to the Center during the years ended August 31, 2007, and 2006, respectively. In addition, the Fund paid $529 and $423 of expenses on behalf of the Center during 2007 and 2006, respectively. Expenses included salaries, travel, entertainment, maintenance, supplies, professional fees, printing cost, and other miscellaneous items.

The Health Research Alliance ("HRA") was formed in November 2005. HRA is a public charity focusing on improving and building strategic partnerships to advance health research. The Fund paid $65 and $212 of expenses on behalf of HRA during 2007 and 2006, respectively. Expenses included salaries, travel, entertainment, maintenance, supplies, professional fees, printing cost, and other miscellaneous items.

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

Schedule I:
Statement of Award Transactions

Year Ended August 31, 2007

(All dollar amounts presented in thousands)

Unpaid awards, beginning of year	$ 72,557
Add – Awards granted (Schedule II)	54,440
Less – Award payments made	(29,445)
Award cancellations (excluding refunds)	(5,344)
Net increase in unamortized discount	(1,511)
Unpaid awards, end of year	$ 90,697

Schedule II:
Statement of Awards Granted

Year Ended August 31, 2007

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. For a complete listing of all 2007 awards, see the Grants Index on the CD provided at the end of this report.

PROGRAM SUMMARY

	Approved	Paid	Transferred/ Cancelled*
BIOMEDICAL SCIENCES			
Career Awards in the Biomedical Sciences	$ 739,148.07	$5,664,743.01	$1,600,311.21
Career Awards for Medical Scientists	15,400,000.00	0.00	700,000.00
Hitchings-Elion Fellowships	14,603.28	14,603.28	0.00
Career Development of Postdoctoral Scientists	326,000.00	177,000.00	0.00
Medical Sciences	38,000.00	38,000.00	0.00
Reproductive Science	856,000.00	176,650.00	0.00
Total	$17,373,751.35	$6,070,996.29	$2,300,311.21
INFECTIOUS DISEASE			
Investigators in the Pathogenesis of Infectious Disease	$10,508,785.22	$5,898,785.22	$ 320,000.00
Scholar Awards in Molecular Pathogenic Mycology	0.00	42,500.00	0.00
Other Grants	893,412.03	911,612.03	800.00
Total	$11,402,197.25	$6,852,897.25	$ 320,800.00
INTERFACES IN SCIENCE			
Career Awards at the Scientific Interface	$ 6,883,279.28	$3,659,027.70	$1,523,000.00
Interfaces Awards	0.00	1,225,000.00	0.00
Other Grants	482,500.00	262,500.00	0.00
Total	$ 7,365,779.28	$5,146,527.70	$1,523,000.00
TRANSLATIONAL RESEARCH			
Clinical Scientist Awards in Translational Research	$ 9,450,746.06	$4,875,746.06	$1,200,000.00
Other Grants	334,500.00	301,166.67	0.00
Total	$ 9,785,246.06	$5,176,912.73	$1,200,000.00

	Approved	Paid	Transferred/ Cancelled*
SCIENCE EDUCATION			
Student Science Enrichment Program	$ 2,178,583.57	$ 2,027,916.20	$ 0.00
Other Grants	5,859,811.13	3,670,572.13	0.00
Total	$ 8,038,394.70	$ 5,698,488.33	$ 0.00
SCIENCE AND PHILANTHROPY			
Communications/ Science Writing	$ 73,000.00	$ 63,000.00	$ 0.00
General Philanthropy	151,400.00	186,400.00	0.00
Science Policy	250,000.00	250,000.00	0.00
Total	$ 474,400.00	$ 499,400.00	$ 0.00
GRAND TOTAL†	**$54,439,768.64**	**$29,445,222.30**	**$5,344,111.21**

* 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 under the Grants Index on the CD provided at the end of this report, 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.

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 2009 award series are listed in the "Program Application Deadlines" section on page 64.

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 began accepting electronic applications. Now all of our programs accept electronic applications only. To obtain the most up-to-date information about our award programs, visit our website at www.bwfund.org

COMPETITIVE AWARD PROGRAMS

Biomedical Sciences

Career Awards in the Medical Sciences

The awards are intended to foster the development and productivity of physician-scientists who are early in their careers and to help them make the critical transition to becoming independent investigators. CAMS provides $700,000 over five years to bridge advanced postdoctoral/fellowship training and the early years of faculty service. Candidates should have an M.D., D.D.S., D.V.M., or equivalent clinical degree. Proposals must be in the area of basic biomedical, disease-oriented, translational, or epidemiological research. Anyone interested in making a proposal in the area of epidemiology should contact BWF to determine the eligibility of the proposal. Proposals in health services research or involving large-scale clinical trials are ineligible. Postdoctoral, fellowships, and faculty positions must be taken at U.S. or Canadian degree-granting institutions. During the award period, at least 75 percent of the awardee's time must be devoted to research-related activities. Researchers who hold a faculty appointment as an assistant professor or the equivalent are not eligible. The CAMS program is the result of the reformulation of the Career Awards in the Biomedical Sciences, which was instituted in 1995 and ran through the 2006 award year.

Infectious Disease

Investigators in the Pathogenesis of Infectious Disease

These awards provide new opportunities for accomplished investigators at the assistant professor level to study pathogenesis of infectious disease, with a focus on the intersection of human and microbial 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.

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 12 of these grants annually. Candidates should hold a Ph.D. degree in physics, chemistry, mathematics, computer science, statistics, or engineering. Exceptions will be made if the candidate can demonstrate significant expertise in one of these areas, evidenced by publications or advanced course work, and use of nonbiological approaches in the proposal. Candidates must have completed at least 12 months but not more than 48 months of postdoctoral research at the time of application. This program is open to U.S. and Canadian citizens and permanent residents as well as U.S. temporary residents.

Population and Laboratory Based-Sciences

Institutional Program Unifying Population and Laboratory-Based Sciences

The awards will provide $500,000 a year for five years in order to stimulate institutional training programs that partner researchers working in schools of medicine and schools (or academic divisions) of public health to train graduate students. Our hope is to develop a new cadre of scientists working at the connections between population approaches to human health and basic biomedical research. Understanding human health will be a focal priority for the programs that are funded. There is ample room for building on institutional strengths to achieve this focus. For example, areas of institutional interest include chronic diseases, autoimmune diseases, infectious diseases, genetic diseases, toxicology and reproductive health, and other areas where questions relating to human health are ripe for exploration at both the population and molecular scale. Likewise, institutional strengths in applied mathematics and modeling, statistics, genomics, bioinformatics and other informatics and data-driven sciences including geography and demographics, and phenomic approaches could provide excellent foundations for programs that encourage such work.

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). 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. Candidates must hold a current medical license to practice medicine in the United States or Canada. Candidates must be tenure-track investigators at the assistant professor level or the early 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 and provide up to $180,000 for three years ($60,000 per year). The program's goals include improving students' competence in science and mathematics, nurturing their enthusiasm for science mathematics, 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 elementary and secondary students 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 public and private schools, colleges and universities, community groups, museums and zoos, scientific groups, and others that can provide experiential activities for K-12 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 nonprofit organizations, including government agencies, to leverage financial support for our targeted areas of research, and on encouraging other foundations to support biomedical research. Proposals should be submitted to BWF in the form of a letter, which should be no more than five pages. Applicants should describe the focus of the activity, the expected outcomes, and the qualifications of the organization or individuals involved; provide certification of the sponsor's Internal Revenue Service tax-exempt status; and give the total budget for the activity, including any financial support obtained or promised. Proposals are given careful preliminary review, and those deemed appropriate are presented for consideration by BWF's Board of Directors.

Program Application Deadlines

2009 Award Series

Biomedical Sciences
Career Awards in the Medical Sciences
October 1, 2008

Infectious Disease
Investigators in the Pathogenesis of Infectious Disease
November 1, 2008

Interfaces in Science
Career Awards at the Scientific Interface
April 15, 2008

Population and Laboratory Based-Sciences
Institutional Program Unifying Population and Laboratory-Based Sciences
May 15, 2008

Science Education
Student Science Enrichment Program
April 10, 2008

Translational Research
Clinical Scientist Awards in Translational Research
August 15, 2008

Science and Philanthropy
Received all year

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 BWF's investment policies. This committee is appointed by and reports to the Board of Directors.

Career Awards in the Biomedical Sciences

Aravinda Chakravarti, Ph.D.
Henry J. Knott Professor and Director
McKusick-Nathans Institute
of Genetic Medicine
Department of Medicine, Pediatrics,
Molecular Biology and Genetics
Johns Hopkins University School
of Medicine

Thomas M. Jessell, Ph.D.
Investigator, Howard Hughes
Medical Institute
Professor of Biochemistry
and Molecular Biophysiology
Columbia University

George M. Langford, Ph.D.
Dean of Natural Sciences
and Mathematics
University of Massachusetts-Amherst

J. Anthony Movshon, Ph.D.
Silver Professor
New York University

Cecil B. Pickett, Ph.D.
President, Research & Development
Biogen IDEC

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

John York, Ph.D.
Investigator, Howard Hughes
Medical Institute
Associate Professor, Pharmacology and
Cancer Biology
Duke University Medical Center
(BWF Career Awardee in the Biomedical Sciences - 1995)

Career Awards for Medical Scientists

Jack Antel, M.D.
Professor of Neurology and
Neurosurgery
McGill University

Piet de Groen, M.D.
Professor of Medicine
Mayo Clinic College of Medicine

H. Shelton Earp III, M.D.
Professor and Director, Lineberger Comprehensive Cancer Center
University of North Carolina-Chapel Hill School of Medicine

Laurie Glimcher, M.D.
Irene Heinz Given Professor of Immunology
Harvard School of Public Health

Margaret K. Hostetter, M.D. (Cochair)
Jean McLean Wallace Professor of Pediatrics
Professor of Microbial Pathogenesis
Chair, Department of Pediatrics
Yale University School of Medicine

Martin M. Matzuk, M.D., Ph.D.
Stuart A. Wallace Professor of Pathology
Baylor College of Medicine

Roderick R. McInnes, M.D., Ph.D.
(Cochair)
Anne and Max Tanenbaum Chair in Molecular Medicine
Scientific Director, Institute of Genetics
Canadian Institutes of Health Research

Elizabeth McNally, M.D., Ph.D.
Professor of Medicine and Human Genetics
University of Chicago

Louis J. Muglia, M.D., Ph.D.
Professor, Department of Pediatrics
Director, Division of Pediatric Endocrinology and Diabetes
Washington University
(BWF Career Awardee in the Biomedical Sciences – 1995)

Jeffrey A. Whitsett, M.D.
Chief, Section of Neonatology, Perinatal and Pulmonary Biology
University of Cincinnati Children's Hospital

J. Lindsay Whitton, M.D., Ph.D.
Professor, Molecular and Integrative Neurosciences
Scripps Research Institute

John York, Ph.D.
Investigator, Howard Hughes Medical Institute
Associate Professor, Pharmacology and Cancer Biology
Duke University Medical Center
(BWF Career Awardee in the Biomedical Sciences – 1995)

Institutional Program Unifying Population and Laboratory Based Sciences

Mark Boguski, M.D., Ph.D.
Vice President and Global Head of Genome and Proteome Sciences
Novartis Institutes for Biomedical Research

Rita Colwell, Ph.D. (Chair)
Distinguished Professor
University of Maryland-College Park
Johns Hopkins University Bloomberg School of Public Health

King K. Holmes, M.D., Ph.D.
Professor of Medicine
University of Washington

Frederick A. Murphy, D.V.M., Ph.D.
Professor of Pathology
University of Texas Medical Branch-Galveston

Leona D. Samson, Ph.D.
Ellison American Cancer Research Professor of Toxicology and Biological Engineering
Massachusetts Institute of Technology

H. Steven Wiley, Ph.D.
Director, Biomolecular Systems
Pacific Northwest National Laboratories

Investigators in the Pathogenesis of Infectious Disease

Nina Agabian, Ph.D.
Professor of Cell and Tissue Biology
University of California-San Francisco

Terence S. Dermody, M.D.
Professor of Pediatrics and Microbiology and Immunology
Director, Elizabeth B. Lamb Center for Pediatric Research
Vanderbilt University School of Medicine

William E. Goldman, Ph.D.
Professor of Molecular Microbiology
Washington University School of Medicine

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

Anne Moscona, M.D.
Professor of Pediatrics, Microbiology and Immunology
Weill Medical College of Cornell University

David G. Russell, Ph.D.
Professor and Chair of Microbiology and Immunology
Cornell University College of Veterinary Medicine

Alan Sher, Ph.D.
Bethesda, Md.

Joseph W. St. Geme III, M.D.
Professor and Chair of Pediatrics
Professor of Molecular Genetics and Microbiology
Duke University Medical Center

Interfaces in Science

James B. Bassingthwaighte, M.D., Ph.D.
Professor of Bioengineering and Radiology
University of Washington

Bonnie Bassler, Ph.D.
Investigator, Howard Hughes Medical Institute
Professor, Molecular Biology
Princeton University

Emery N. Brown, M.D., Ph.D. (Cochair)
Professor, Computational Neuroscience and Health Sciences and Technology
Massachusetts Institute of Technology
Associate Professor of Anaesthesia
Harvard Medical School

Julio M. Fernandez, Ph.D.
Professor of Biological Sciences
Columbia University

Gene Myers, Ph.D.
Group Leader
HHMI Janelia Farm Research Campus

Erin O'Shea, Ph.D.
Investigator, Howard Hughes Medical Institute
Professor, Molecular and Cellular Biology
Harvard University

Susan R. Pfeffer, Ph.D.
Professor and Chair
Department of Biochemistry
Stanford University

Eric Siggia, Ph.D. (Cochair)
Professor of Physics
Rockfeller University

Clinical Scientist Awards in Translational Research

Andrea Dunaif, M.D. (Cochair)
Charles F. Kettering Professor of Medicine
Chief, Division of Endocrinology, Metabolism, and Molecular Medicine
Northwestern University Feinberg School of Medicine

Garret A. FitzGerald, M.D.
Chair, Department of Pharmacology
Director, Institute for Translational Medicine and Therapeutics
University of Pennsylvania School of Medicine

Lisa M. Guay-Woodford, M.D.
Professor, Departments of Medicine, Pediatrics, and Genetics
Director, Division of Genetics and Translational Medicine
University of Alabama-Birmingham School of Medicine

Gail Jarvik, M.D., Ph.D.
Professor of Medicine
University of Washington Medical Center

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

H. Kim Lyerly, M.D.
Director, Duke Comprehensive Cancer Center
George Barth Geller Professor for Research in Cancer
Duke Medical Center

Justin C. McArthur, M.B.B.S., M.P.H.
Professor and Interim Chair, Department of Neurology
Professor, Departments of Pathology and Epidemiology
Johns Hopkins University School of Medicine

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

Jennifer M. Puck, M.D.
Professor, Department of Pediatrics
University of California-San Francisco

Marlene Rabinovitch, M.D.
Dwight and Vera Dunlevie Professor of Pediatrics
Research Director, Wall Center for Pulmonary Hypertension
Stanford University School of Medicine

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. (Cochair)
Investigator, Howard Hughes Medical Institute
Professor, Departments of Internal Medicine, Physiology, and Biophysics
University of Iowa Carver College of Medicine

Student Science Enrichment Program

Julia V. Clark, Ph.D.
Program Director
Division of Elementary, Secondary, and Informal Education
National Science Foundation

G. Thomas Houlihan, Ed.D.
President and CEO
Institute for Breakthrough Performance

Matty Lazo-Chadderton
Director, Hispanic/Latino Affairs
President Pro Tempore's Office
North Carolina Senate

William McNeal
Executive Director
North Carolina Association of School Administrators

Greg Mitchell
Environmental Science Teacher
Durham School of the Arts

Willie Pearson Jr., Ph.D.
Professor of Sociology and Chair
School of History, Technology and Society
Georgia Institute of Technology

Sylvia Sanders, Ph.D.
Elementary Educator
Palo Alto, California
(*Past BWF Career Award Recipient)*

Brenda Wojnowski, Ed.D.
Program Officer
Texas Science, Technology, Engineering, and Mathematics Initiatives
Communities Foundation of Texas

Terri L. Woods, Ph.D.
Associate Professor of Geology
East Carolina University

Margaret M. Young, Ph.D.
Assistant Professor
Department of Biology
Elizabeth City State University

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.

Michael Even
Numeric Investors

Geoff Gerber, Ph.D. (chair)
Twin Capital Management

James Hirschmann
Western Asset Management

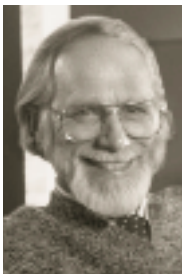
Melissa Hieger

I. George Miller, M.D.
BWF Board of Directors

Walter Niemasik
Snyder Capital Management

Philip R. Tracy, J.D.
BWF Board of Directors

Board of Directors



J. Michael Bishop, M.D.
Chancellor
University of California-San Francisco

Enriqueta C. Bond, Ph.D.
President
Burroughs Wellcome Fund

Carlos J. Bustamante, Ph.D.
Investigator, Howard Hughes Medical Institute
Luis Alvarez Professor of Physics
Professor of Molecular and Cell Biology
University of California-Berkeley

Geoff Gerber, Ph.D.
President
Twin Capital Management

Phil Gold, M.D., Ph.D. (Chair)
Douglas G. Cameron Professor of Medicine
McGill University

George Langford, Ph.D.
Dean of Natural Sciences and Mathematics
University of Massachusetts-Amherst

I. George Miller, M.D.
John F. Enders Professor of Pediatric
Infectious Diseases
Professor of Epidemiology and Molecular
Biophysics and Biochemistry
Yale University School of Medicine

Mary-Lou Pardue, Ph.D.
Boris Magasanik Professor of Biology
Massachusetts Institute of Technology

Jerome F. Strauss III, M.D., Ph.D.
Dean, School of Medicine
Executive Vice President for Medical Affairs
Virginia Commonwealth University

Judith L. Swain, M.D.
Executive Director, Singapore Institute
for Clinical Sciences (A*STAR)
Professor of Medicine
National University of Singapore
Adjunct Professor of Medicine
University of California-San Diego

Philip R. Tracy, J.D.
Of Counsel
Smith, Anderson, Blount, Dorsett, Mitchell
& Jernigan, L.L.P.

Dyann F. Wirth, Ph.D.
Professor, Immunology and
Infectious Diseases
Harvard School of Public Health

Staff

Executive

Enriqueta C. Bond, Ph.D., President
Scott G. Schoedler, Vice President, Finance

Administration, Finance, Meetings, and Technology

Sitting, left to right: Barbara Evans, Administrative Meeting Assistant; Jennifer Caraballo, Accountant; Wendell Jones, Technology Coordinator

Standing, left to right: Sam Caraballo, Systems and Web Engineer; Glenda Oxendine, Facilities and Administration Manager; Ken Browndorf, Senior Asset and Accounting Manager; Catherine Voron, Meeting Professional; Betsy Stewart, Secretary; Brent Epps, Administrative Assistant

Programs and Communications

Sitting, left to right: Nancy Sung, Ph.D., Senior Program Officer; Jean Kramarik, Senior Program Associate; Melanie Scott, Senior Program Associate and Database Specialist; Kendra Tucker, Programs Assistant and Data Specialist

Standing, left to right: Debra Vought, Senior Program Associate; D. Carr Thompson, Senior Program and Communications Officer; Russ Campbell, Communications Officer; Victoria McGovern, Ph.D., Senior Program Officer; Debra Holmes, Program Associate; Rolly Simpson Jr., Program Officer

Contact Information

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Infectious Diseases; Population and Laboratory Based Sciences

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Interfaces in Science; Translational Research

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Melanie B. Scott
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and Database Specialist
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Russ Campbell
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To Obtain Information About Programs

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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