



ALBERT AND MARY
LASKER FOUNDATION

60TH

ANNIVERSARY
LASKER MEDICAL
RESEARCH AWARDS

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**FATHERS OF STEM-CELL RESEARCH
AND PIONEERS IN GENE DETECTION AND DNA FINGERPRINTING
TO RECEIVE LASKER AWARDS FOR MEDICAL RESEARCH**

***LEADING ADVOCATE FOR BREAST CANCER RESEARCH AND TREATMENT
HONORED WITH PUBLIC SERVICE AWARD***

NEW YORK, Sunday, September 18, 2005 – The **2005 Albert Lasker Medical Research Awards** were announced today. Now celebrating its 60th anniversary, the Lasker Awards are the nation's most distinguished honor for outstanding contributions to basic and clinical medical research, as well as public service on behalf of the medical research enterprise.

The **Lasker Award for Basic Medical Research** will be presented to two scientists who **discovered the first stem cell**, a stem cell in the blood-forming system. Their work laid the foundation for all current work on adult and embryonic stem cells and transformed the study of blood-cell specialization from a field of observational science to a quantitative experimental discipline. In addition to catalyzing advances in stem-cell biology, the discoveries explained the basis of bone marrow transplantation, a procedure that prolongs the lives of people with leukemia and other blood-cell cancers.

The **Lasker Award for Clinical Medical Research** goes to two scientists who **revolutionized human genetics and forensic science** in two related breakthroughs. The first was a technique, called Southern blotting, that allows detection of a single gene in a complex genome, eventually enabling the rapid sequencing of entire genomes. This advance fostered the second breakthrough—genetic fingerprinting—which has led to astounding progress in solving both new and old crimes, settling paternity and immigration disputes, and diagnosing and understanding inherited diseases, as well as confronting a myriad of other sociological, medical, and scientific challenges.

The **Mary Woodard Lasker Award for Public Service**, awarded bi-annually, honors a tireless advocate in the **battle against breast cancer**.

The list of the 2005 Lasker Award recipients with their current institutional affiliations is on page five.

Often called "**America's Nobels**," the Lasker Awards have honored 70 scientists who subsequently went on to receive the **Nobel Prize**, including 19 in the last 15 years.

The Awards will be presented at a luncheon ceremony on **Friday, September 23rd** at the Pierre Hotel in New York City. U.S. Senator Kay Bailey Hutchison will be the keynote speaker; she serves on the Senate Committee on Commerce, Science, and Transportation.

The **2005 Lasker Award for Basic Medical Research** will be shared by **Ernest McCulloch and James Till** of the Ontario Cancer Institute and the University of Toronto (Canada) for ingenious experiments that first identified a stem cell—a blood-forming stem cell—which set the stage for all current research on adult and embryonic stem cells.

The **2005 Lasker Award for Clinical Medical Research** will be presented to **Edwin Southern** of the University of Oxford (UK) and **Alec Jeffreys** of the University of Leicester (UK) for development of two powerful technologies—Southern hybridization and DNA fingerprinting—that together revolutionized human genetics and forensic diagnostics.

The **2005 Mary Woodard Lasker Award for Public Service** honors **Nancy Brinker**, founder and President of the Susan G. Komen Breast Cancer Foundation for creating one of the world's great foundations devoted to curing breast cancer and dramatically increasing public awareness about this devastating disease.

Dr. Joseph L. Goldstein, recipient of the 1985 Lasker Award for Basic Medical Research and the Nobel Prize in Medicine in 1985 (both with Michael S. Brown) for discoveries regarding cholesterol, is **Chairman of the international jury** of researchers that selects recipients of the Lasker Awards. He explained the significance of this year's Basic Research and Clinical Research Awards with the following comments:

"Occasionally scientists take special note of an observation or interpret it in a novel way. These "eureka moments" can profoundly alter the course of scientific progress. This year's Lasker Awards honor three such achievements.

"The **Lasker Basic Research Award** honors two individuals who uncovered the first stem cell, thus laying the groundwork for the entire field of stem cell biology. Although the notion of self-renewing cells that could mature and specialize in multiple ways had been floating around for decades, no one had ever found them. By properly interpreting and then analyzing an observation that easily could have been overlooked, the awardees showed that stem cells indeed existed in the blood-forming system. They devised a series of clever and

rigorous tests that established an experimental prototype for demonstrating the existence of stem cells and a system for studying the factors that send those stem cells down different developmental paths. Their work revealed that molecules within cells as well as in the tissue environment can influence a cell's fate, an insight that has had a dramatic impact on multiple areas of medical science. Till and McCulloch's findings not only built the foundation of all stem cell research today, but gave scientists who were working on human bone marrow transplantation in the early 1960s the inspiration to continue by revealing why the technique replenishes cells of the blood system.

"The **Lasker Clinical Research Award** honors two investigators who transformed human genetic analysis. Their work eventually led to the mapping of the human genome. Edwin Southern invented a method for detecting subtle DNA differences among individuals and Alec Jeffreys exploited this technique, developing a way to distinguish all humans—except for those who are genetically identical—from each other. Southern's "eureka moment" came when he noticed how porous the agarose gels were that scientists use for separating DNA fragments of different size. Immediately, he realized that he could harness this property to transfer DNA from the gels to a filter. This advance sparked rapid progress in genetic analysis because suddenly scientists could search for sequences of interest on an easily manipulated solid membrane. Within several years of the development of this technique, scientists were exploiting it for many purposes. They employed it, for example, to pinpoint mutations associated with inherited diseases, an endeavor that has allowed for prenatal diagnosis of diseases such as sickle cell anemia and thalassemia.

"Alec Jeffreys, interested in uncovering genetic variation in different populations, put Southern's "blot" to work in numerous ways. One project involved analyzing repeated DNA segments carried by all humans. At 9:05 a.m. on Monday, September 10, 1984, he took one of his Southern blots out of the developing tank and noticed something thrilling. The pattern of the repeated stretches varied from person to person—and it generated a unique genetic "fingerprint" of an individual. Furthermore, the patterns were passed on from parent to child, so each child carries half of each parent's fingerprint. By the end of the day, he was making a list of applications for his finding; he realized that it could be used for forensics, in transplant biology, to establish family relationships, and for a multitude of other human and non-human problems. Since then, his predictions about the utility of the method not only have been borne out, but have been surpassed."

Dr. Daniel Koshland, recipient of the 1998 Lasker Award for Special Achievement in Medical Science, and Professor Emeritus at the University of California, Berkeley, is **Chairman of the Selection Committee** for the **Mary Woodard Lasker Award for Public Service in Support of Medical Research and the Health Sciences**. He offered this comment on the 2005 Awardee:

"The **Mary Woodard Lasker Public Service Award** honors **Nancy G. Brinker**, founder of the Susan G. Komen Breast Cancer Foundation. Brinker has devoted her life to fulfilling a pledge to her dying sister to raise public awareness about breast cancer, promote its early

diagnosis and effective treatment, and increase medical research to achieve its eventual eradication. Brinker built a world-class foundation designed to meet those goals.

“Soon to celebrate its 25th anniversary, the Komen Foundation has more than 100 affiliates in the U.S. and abroad, and has raised \$750 million in support of research, education, screening and treatment to support people faced with a breast cancer diagnosis. Because of Brinker’s leadership, the topic of breast cancer—once discussed only in whispers—is now fully in the open, helping alleviate pain and isolation for hundreds of thousands of people, as well as saving lives. Brinker’s own encounter with breast cancer stands as a model for confronting the disease with aggressive treatment and ultimate success.”

The Lasker Awards, first presented in 1946, are administered by the Albert & Mary Lasker Foundation. The late Mary Lasker is widely recognized for her singular contribution to the growth of the National Institutes of Health and her unflagging commitment to government funding of medical research in the hope of curing devastating diseases. Her support for medical research spanned five decades, during which she was the nation’s foremost citizen-activist on behalf of medical science.

Lasker Award recipients receive a citation highlighting their achievements, and an inscribed statuette of the Winged Victory of Samothrace, the Albert and Mary Lasker Foundation’s traditional symbol representing humanity’s victory over disability, disease, and death. Recipients of the Lasker Awards for Basic and Clinical Medical Research also receive an honorarium.

Press materials available from www.laskerfoundation.org include:

- Photographs
- Contemporary interviews (posted in October)
- Information about past Awardees, including those who have received the Nobel Prize
- Links to Web sites for additional information
- **To arrange interviews**, contact the Lasker Foundation’s public relations counsel:
Kendall Christiansen - 212.686.4551 x.17
or kchristiansen@getodemilly.com

NEW: Illustrated time-line of the Lasker Awards 60-year history.

NEW – for broadcast media: A professional quality **DVD-video** is available, with original material available upon request, explaining the work the 2005 Lasker Award recipients; includes rich resources, interviews and animations. The NTSC DVD will run in all compatible DVD players and on most computers. [This Neil Patterson Productions DVD was made possible by a grant from Thomson Scientific and Healthcare.]

Full descriptions of the work of the recipients of the **2005 Lasker Awards** follow:

- **Basic Medical Research** (pp. 6 through 9);
- **Clinical Medical Research** (pp. 10 through 13); and,
- **Public Service** (pp. 14 through 15).

ALBERT LASKER AWARD FOR BASIC MEDICAL RESEARCH

For ingenious experiments that first identified a stem cell - the blood-forming stem cell – which set the stage for all current research on adult and embryonic stem cells.

ERNEST A. McCULLOCH
University Professor Emeritus
University of Toronto
and Senior Scientist
Ontario Cancer Institute
at Princess Margaret Hospital

JAMES E. TILL
University Professor Emeritus
University of Toronto
and Senior Scientist
Ontario Cancer Institute
at Princess Margaret Hospital

ALBERT LASKER AWARD FOR CLINICAL MEDICAL RESEARCH

For development of two powerful technologies – Southern hybridization and DNA fingerprinting – that together revolutionized human genetics and forensic diagnostics.

SIR EDWIN SOUTHERN
Whitley Professor of Biochemistry
Department of Biochemistry
University of Oxford

SIR ALEC JEFFREYS
Royal Society Wolfson Research Professor
Department of Genetics
University of Leicester

MARY WOODARD LASKER AWARD FOR PUBLIC SERVICE IN SUPPORT OF MEDICAL RESEARCH AND THE HEALTH SCIENCES

For creating one of the world's great foundations devoted to curing breast cancer and dramatically increasing public awareness about this devastating disease.

NANCY G. BRINKER
Founder
Susan G. Komen Breast Cancer Foundation

The Albert Lasker Award for Basic Medical Research

Presented to: Ernest McCulloch and James Till

**For ingenious experiments that first identified a stem cell
— a blood-forming stem cell —
which set the stage for all current research
on adult and embryonic stem cells.**

The **2005 Albert Lasker Award for Basic Medical Research** honors two scientists who first identified a stem cell, which set the stage for all current research on adult and embryonic stem cells. By the turn of the 20th century, scientists were postulating the existence of self-renewing cells that could specialize for a wide variety of purposes. In a series of ingenious and elegant experiments 60 years later, **Ernest McCulloch** and **James Till** demonstrated that such a type of cell in the blood-forming—or hematopoietic—system existed. They established the properties of stem cells, which still hold true today. Furthermore, they laid the foundation for the isolation of stem cells and for the detection of proteins that help these precursor cells to develop and mature. Till and McCulloch's discoveries explained the basis of bone marrow transplantation, which prolongs the lives of patients with leukemia and other cancers of the blood. Moreover, the team set a new standard of rigor for the field of hematology, transforming it from an observational science to a quantitative experimental discipline.

In the late 1950s, University of Toronto professors McCulloch and Till, newly appointed scientists at the Ontario Cancer Institute in Toronto, began to explore how ionizing radiation affects mammalian cells. This enterprise held great importance for several reasons. Scientists were trying to understand why and under what circumstances radiation therapy defeated cancer. Furthermore, the Cold War was in full swing, so people wanted to devise strategies to save military personnel who might sustain whole-body irradiation from nuclear weapons. Finally, the technique of bone marrow transplantation was in its infancy; investigators knew that this treatment replenished the essential cells of the blood system and were eager to define the source of these cells.

Till and McCulloch worked out a system for measuring the radiation sensitivity of bone marrow cells. The researchers accomplished this feat by zapping mice with a dose that would kill the animals within 30 days if they did not receive a bone marrow transplant of fresh, undamaged cells. To obtain the donor material, the team divided bone marrow from unirradiated animals into portions, and exposed each to a different amount of radiation. The largest dose killed enough donor cells to obliterate their ability to rescue the mice; the smallest dose left much of it intact. The investigators knew how many unirradiated cells were needed to save the animals,

so by counting the mouse survivors, they could infer the number of cells that had withstood a given amount of radiation.

Clumps or Clones?

The scientists subsequently repeated the experiment but performed autopsies on the animals 10 days after transplantation. They noticed spleen nodules that contained dividing cells, some of which were specializing—or differentiating—into the three main types of blood cells—red cells, white cells, and platelets. The number of nodules was directly proportional to the number of live marrow cells the irradiated animals had received. The crucial entity was rare: About 10,000 marrow cells had to be injected for each nodule observed.

Aspects of the experiment and its results reminded the researchers of the test for live bacteria, which depends on the ability to reproduce. Scientists disperse bacteria on a Petri dish and each bacterium multiplies to form a colony. Counting colonies reveals the number of viable cells that were in the original sample. McCulloch and Till's experiment, however, didn't distinguish whether the spleen nodules originated from single cells that reproduced and differentiated, or came from clumps of multiple kinds of cells that then simply divided. The researchers wanted to find out whether all of the cells in a nodule—or colony, adopting the language of bacteriology—descended from a single cell (and thus represented a clone) or from multiple cells.

To accomplish this task, they needed cells that carried unique inheritable markers. They realized that irradiating cells would produce—at low frequency—exactly such markers in the form of visibly abnormal chromosomes. By dissecting spleen nodules into their constituent cells, Till and McCulloch could determine whether each cell from a given nodule contained the same rare chromosome. If so, the "colony-forming unit" must have been a single cell; if not, it must have been composed of multiple cells.

Andrew Becker, a graduate student working with McCulloch and Till, examined hundreds of cells from 42 nodules obtained from 36 animals. Most contained only normal cells but four contained cells with distinctive chromosomes. Almost all of the dividing cells in each of these nodules carried a unique chromosomal alteration. The colonies thus arose from a single cell.

Till and McCulloch next wanted to know whether the colony-forming cells could renew themselves, forming new colony-forming cells. To answer this question, they and their colleague Louis Siminovitch broke up spleen nodules into their cellular components. The scientists then injected irradiated mice such that each animal received most of the cells from a single colony. If the colony-forming cells could duplicate themselves, the second-round animals would develop nodules. They did, thus establishing that colony-forming cells can self renew.

Later, the team showed that the multiple cell types within a colony arose from a single cell. This experiment addressed a key question in hematology at the time—whether three separate types of precursor cells headed the lineages that produced red cells, white cells, and platelets, or whether a single common stem cell gave rise to all three lineages.

By the early 1970s, Till and McCulloch's experimental observations were clear-cut: They revealed that bone marrow transplantation owes its restorative powers to a single type of cell that not only can divide, but can differentiate into all three types of mature blood cells—red cells, white cells, and platelets. These features meant that the colony-forming cells represented a new class of progenitor cells—ones that could proliferate enough to repopulate the bone marrow of an entire animal, self-renew, and give rise to specialized cells that have limited life spans. This definition of a stem cell still holds true today.

Randomness and Genetic Programs

A particular feature of the results struck the scientists, however. Although nearly all of the spleen nodules contained new colony-forming units, some had many and some had few or none.

They repeated the experiment with these second-round cells to find out whether the colonies would breed true: Would a nodule from a colony that had produced many nodules contain many colony-forming cells? The results they obtained indicated that the number of new colonies produced wasn't genetically programmed; instead it was random. Borrowing from the field of cosmic radiation, Till worked out a theory in which chance determined a stem cell's fate—whether it would begin to differentiate or instead divide to generate two new stem cells. Till tested this model of spleen-colony growth by computer simulation and the results agreed with the experimental observations. The theory remains strong today, more than four decades after its conception.

The researchers next homed in on molecules in the stem cells and the blood-forming environment that play crucial roles in stem-cell function. Elizabeth Russell and Seldon Bernstein, of the Jackson Laboratory in Bar Harbor, Maine, studied a particular strain of mouse that was anemic and exceptionally susceptible to radiation. The animals' anemia could be cured by injection of cells from mice that carried a regular version of the so-called "W" gene. McCulloch, Till, and Siminovitch showed that these genetically normal animals were donating colony-forming cells to their anemic siblings. Furthermore, they found that bone marrow from the anemic mice didn't form colonies when injected into genetically intact but irradiated mice. The anemic mice therefore carried a genetically encoded defect in their blood-forming stem cells.

A different strain of mouse—with flaws in the "Sl" gene—seemed very similar to the "W" mice, at least on the surface. These animals were also anemic and unusually radiation sensitive. So Till, McCulloch, and Siminovitch performed analogous experiments on them, expecting similar results. The results surprised them. Marrow from these mice behaved normally when injected into irradiated recipients. However, marrow from genetically normal mice didn't cure their anemia. These observations suggested that, rather than carrying defects in the stem cells themselves, the anemic "Sl" mice failed to support stem-cell growth. The results established the importance of the tissue environment in promoting normal stem cell duplication and specialization. Together, the work on "Sl" and "W" opened the door to the study of genetic regulation of stem-cell formation in mice, setting the stage for finding hematopoietic cytokines—proteins made by cells that affect the behavior of other cells—and their cellular receptors.

McCulloch and Till set a high standard for work on cell progenitors, and their findings strongly supported the hypothesis that cells with the capacity to self renew, divide, and differentiate along many lineages existed and were available for rigorous analysis in adult animals. This finding paved the way for current attempts to physically isolate such cells, study their characteristics, and develop them for medical use. It also encouraged the pursuit of other types of stem cells, including embryonic stem cells. Like the stem cells they discovered, Till and McCulloch's work has differentiated and matured in many directions.

The Albert Lasker Award for Clinical Medical Research

Presented to: Edwin Southern and Alec Jeffreys

**For development of two powerful technologies
— Southern hybridization and DNA fingerprinting —
that together revolutionized human genetics and forensic diagnostics.**

The **2005 Albert Lasker Award for Clinical Medical Research** honors two scientists who revolutionized human genetics and forensic diagnostics. By inventing a method for detecting specific DNA sequences amidst the huge genomes of complex organisms, **Edwin Southern** infused genetic analysis with tremendous power. Suddenly scientists could study genetic variation in detail and decipher gene structures. Using this technology, **Alec Jeffreys** devised "genetic fingerprinting," a way to distinguish every person from every other person, except an identical twin. Its ability to establish family relationships as well as individual identity has helped solve crimes, settle paternity and immigration disputes, establish the bases of inherited diseases, enhance transplantation biology, save endangered species, establish human origins and migrations, and advance countless other beneficial endeavors.

Technology has always defined the strength of genetic analysis. Until the mid 1970s, the ability to locate most genes or sequences of interest on the chromosomes of complex organisms was nearly impossible. This situation severely restricted efforts to define genetic differences that characterize species, individuals, and specific cell types, thus hampering the study of subjects as diverse as evolution and the physiological characteristics of distinct tissues.

Going With the Flow

In the mid 1970s, Ed Southern (at the Medical Research Council Mammalian Genome Unit in Edinburgh) wanted to develop a method that would pinpoint a particular gene amidst the more than a billion building blocks—or basepairs—that compose the frog *Xenopus laevis* genome. Scientists knew that they could chop up DNA using restriction enzymes, proteins that cut DNA at particular sequences. They could then separate the resulting pieces by loading the collection onto an agarose gel and applying an electric current. The pieces would migrate at different rates, depending on size. For organisms with large genomes, however, this procedure generated a smear of DNA because of the millions of fragments. Finding a single piece of DNA that carried a specific sequence was hopeless.

Southern realized that he could accomplish his task by brute force: carving the gel into small horizontal slabs, washing the DNA out of each gel slice, attaching every portion to a separate filter, fishing for the particular DNA with a piece of matching, radioactively tagged RNA that would bind to it, and then measuring the amount of bound radioactivity. The tedium and labor involved in such a scheme spurred Southern to think of a better way.

If he could move DNA fragments from the gel to a membrane made of nitrocellulose, which grabs and clings to DNA, he knew he could then bind radioactively labeled RNA to the trapped DNA because that method was well established. However, he needed a way to transport the DNA. During pilot experiments, he realized that the trick would be to soak the DNA fragments out of the gel by forcing liquid to flow through the gel onto the nitrocellulose; he could accomplish this task by piling dry filter paper on top of the nitrocellulose, which would draw the liquid that would carry the DNA. The transfer worked. After applying radiolabeled RNA to the membrane and washing off all of it that didn't stick to matching DNA sequences, Southern exposed the membrane to X-ray film. This procedure generated a high-resolution picture of the DNA bands that held sequences of interest.

Suddenly scientists could detect a segment of DNA without purifying it from the rest of the genome. Researchers quickly exploited the technique of "Southern blotting" for a wide variety of purposes. In 1978, they found, for example, that people with sickle cell anemia often lack the sequence for a particular restriction enzyme near the beta globin gene. Similarly, the method uncovered mutations that are associated with other "diseased" versions of genes. On a large scale, it played a crucial role in mapping the human genome. Thirty years after publication, Southern's original article holds the record for the most highly cited paper in the *Journal of Molecular Biology*.

Later, others developed a method for transferring and detecting RNA (as opposed to DNA) and, as a joke, called it "northern blotting." The name stuck. Similarly, when investigators designed a related technique for proteins, they dubbed it "western blotting." These procedures have made a huge impact on the study of genes and proteins, and have accelerated many advances in medical science.

Southern subsequently made another momentous contribution to the field of molecular biology. He conceived the notion of performing genetic analysis using tiny arrays of short DNA sequences—called DNA chips or microarrays—and he pioneered methods for building them. Because this technology allows researchers to conduct a tremendous number of experiments in parallel, it has unlocked countless realms of inquiry that biologists could only dream of 20 years ago and has already advanced the practice of medicine. For example, the use of microarrays allows cancers of the breast and blood system to be classified, which aids diagnosis and treatment.

Mini but Mighty

In the mid 1970s, scientists could group people based on proteins in the blood and other bodily fluids, but these typing schemes were inadequate. For example, the ABO blood-typing system divides humans into only four groups (A, B, AB, and O). Alec Jeffreys (at the University of Leicester) wanted to find DNA that might uniquely identify individuals—variations associated with normal differences as well as those that cause disease—and he seized on the Southern blot to aid his search. He and others showed that single basepair changes at restriction sites existed, but were insufficiently informative to act as distinctive markers.

Several research groups had noticed highly variable regions present at diverse spots in the human genome. In each case, the spans—or "minisatellites"—consisted of short repeated DNA sequences; different people carried different numbers of repeats.

When Jeffreys was analyzing the human myoglobin gene for other reasons, he found a minisatellite consisting of a 33-basepair repeat. To determine whether related sequences exist, he probed the entire genome with a piece of radioactively labeled single-stranded DNA that contained multiple copies of this sequence. It bound at several sites, four of which varied greatly from person to person, differing in length by an integral number of repeat units. The repeats differed somewhat in sequence, but all carried a common core.

Jeffreys engineered a piece of single-stranded DNA that contained multiple copies of this shared core and tagged it with radioactivity. He then used this DNA to scour the human genome for additional minisatellites, reasoning that each person's constellation of minisatellites should identify him or her because lengths vary from individual to individual. Together, they comprise a unique genetic fingerprint. Jeffreys showed that members of a family can be distinguished—and that each offspring carries only bands from the parents—half from the mother and half from the father, except in the occasional case where a new mutation crops up.

Satellites Land in the Real World

Jeffreys soon applied his technique to a number of practical problems. The first such use, in 1985, involved the immigration case of a UK citizen who was returning to join his mother and siblings after a long visit to his original home of Ghana. Officials said that this boy's passport was forged and, as a consequence, he faced deportation. The authorities thought he might be a nephew or unrelated. But DNA fingerprint analysis showed that all of the boy's DNA bands matched either those of the mother or one of her undisputed children (and by inference, the father), and the family was reunited.

Jeffreys improved and adapted the technology so it would work on tiny amounts of forensic biological samples and lend itself to computer database manipulation, which facilitates DNA comparisons. In 1986, he used the related method of DNA profiling in a confounding case of two brutal rape and murder attacks in Leicestershire, UK. Eventually the police instigated the first DNA-based manhunt, asking for voluntary samples from all men of a certain age in the area's villages. After a convoluted series of events, which included a false confession, the murderer persuading a colleague to act as a proxy for the blood test, and an overheard conversation in a pub, the police tracked down the killer, who is serving a life sentence for each murder. Forensic teams worldwide now routinely use DNA profiling. It has not only convicted many criminals, but also has absolved innocent people who were wrongly accused. Furthermore, DNA is quite stable and remains relatively intact after death. As a result, scientists could take advantage of the method to name disaster victims, including those of 9/11, and Jeffreys could confirm the identity of an exhumed body thought to be the Nazi war criminal Josef Mengele.

Applications of DNA fingerprinting and related techniques are endless. In bone marrow transplants, for example, the circulating blood cells should carry donor, not recipient, DNA patterns. Scientists can ferret out DNA signatures of inherited diseases and cancers. The method has addressed problems in international smuggling, conservation biology and molecular anthropology as well. Investigators can establish, for instance, that a wildlife trophy came from the corpse of a protected animal. Furthermore, they can use it to avoid mating close relatives while trying to save an endangered population. Molecular ecologists have harnessed the strategy to figure out which individuals have spawned the most offspring. It has advanced the fields of evolutionary and population biology, enabling detailed genetic comparisons of various groups. For example, Jeffreys and others showed that the breadth of human variation in Africa was considerably greater than that in non-African populations. These observations supported the theory that people originated in Africa.

Southern invented a technology that made complex genomes accessible to meticulous analysis, and Jeffreys capitalized on this method to uncover the huge diversity of genetic variation. The effects of these innovations have been profound—reverberating over a wide range of sociological, medical, scientific, and forensic arenas.

***The Mary Woodard Lasker Award
for Public Service***

Presented to: Nancy G. Brinker

**For creating one of the world's great foundations
devoted to curing breast cancer
and dramatically increasing public awareness
about this devastating disease.**

The **2005 Mary Woodard Lasker Award for Public Service in Support of Medical Research and the Health Sciences** honors an advocate who has created one of the world's great foundations devoted to fighting breast cancer and dramatically increased public awareness about this devastating disease. In fulfilling a promise to her dying sister Susan G. Komen, Nancy Brinker has improved the plight of breast cancer patients across the globe. Her work has stripped the cloak of secrecy from a disease that strikes more than a million people annually. The organization she built, the Susan G. Komen Breast Cancer Foundation, boasts more than 75,000 volunteers and has raised more than \$750 million to support breast cancer research, education, screening and treatment. Presidents Ronald Reagan, Bill Clinton, and George W. Bush have recognized Brinker's acumen and achievements, appointing her to various cancer advisory boards and committees. In 2001, President Bush appointed her to serve as U. S. Ambassador to the Republic of Hungary, where she continued her breast cancer and women's health advocacy abroad. By personal example, Brinker has demonstrated a successful encounter with breast cancer and by speaking out in various forums, she has nurtured the grassroots breast cancer advocacy movement that she launched.

Brinker's sister, Suzy, was diagnosed with breast cancer in 1977, when public knowledge about the illness barely existed, fear ran rampant, and medical options were few. Despite surgery, radiation treatments, and chemotherapy, her disease spread, killing her in 1980 when she was 36 years old. Before she died, Suzy asked her sister to do something so that others would not suffer as she had. After Suzy's death, Brinker took up the crusade to eradicate breast cancer as a life-threatening disease.

Brinker started on her mission with a few close friends and some vague ideas. In the early 1980s, no one talked about breast cancer in private, much less in public. People, especially potential corporate donors, hesitated to help. This environment of silence made raising money difficult and fed the isolation and desperation that individuals felt when confronting breast cancer. Brinker wanted to make a cultural and a clinical change, bringing the disease into the open, sparking research, and improving patient care. She started the Komen Foundation in 1982 with \$200 and a shoebox filled with names of people who might help in some way.

Now, 23 years later, the Susan G. Komen Breast Cancer Foundation has grown into an international organization as well as the nation's largest private funder of breast cancer research and community outreach programs. It has awarded more than 1,100 grants for breast cancer research and funded community-based screening, treatment, and education programs for the medically underserved, focusing on programs that address unmet breast health needs in more than 15,000 communities. It supports activities in 23 countries, funds research grants in eight countries, and has developed educational materials in 14 languages. The foundation hosts online message boards and forums, and a national toll-free breast cancer helpline to answer questions, boost morale, and inform people about local resources.

Brinker conceived of the Komen Race for the Cure® Series, which fosters awareness about breast cancer and raises money to combat the disease. This event celebrates breast cancer survivors and empowers women to take charge of their breast health. The Komen Race participants have grown in number from 800 at the first race in 1983 to more than 1 million in 2004.

Since her sister's death, Nancy Brinker not only has established a worldwide source of information, support, and funding, but has faced her own breast cancer diagnosis in 1984. With determination to provide an example of survivorship by fully participating in her own treatment decisions, she fought the disease and served as a symbol to many who have grappled with the realities of breast cancer. As a survivor, she has used her own experience to enhance understanding of breast cancer, and has contributed immeasurably to the international grassroots effort to eradicate the disease.

In addition to her work with the Komen Foundation, Brinker has spoken out about the importance of patients' rights and medical advances in the area of breast cancer research and treatment and has advocated women's health issues in congressional hearings. She has taken leadership roles in numerous private and public organizations, and has testified before the United States Democratic Policy Committee's Congressional Breast Cancer Forum. She has received numerous awards from a wide range of organizations, including the Centers for Disease Control, the Dana-Farber Cancer Institute, and American Society of Clinical Oncologists.

Nancy Brinker transformed an issue that was not mentioned in polite conversation into an international discussion. The loss of her sister, compounded by her own breast cancer diagnosis, instilled her with powerful knowledge and motivation. She created an advocacy movement where none existed before, building a world-class organization with the Susan G. Komen Breast Cancer Foundation and spawning a global effort aimed at wiping out this ruinous illness.