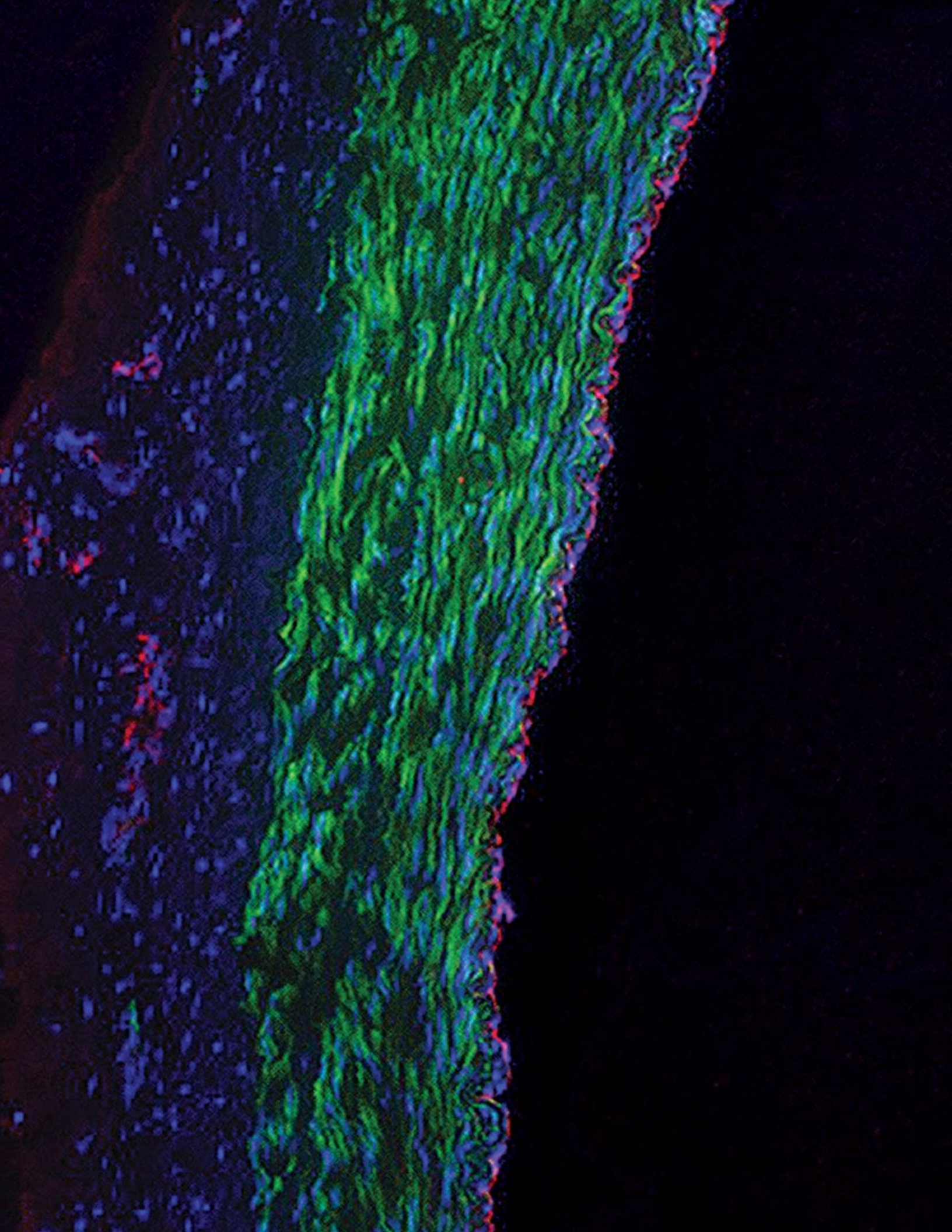
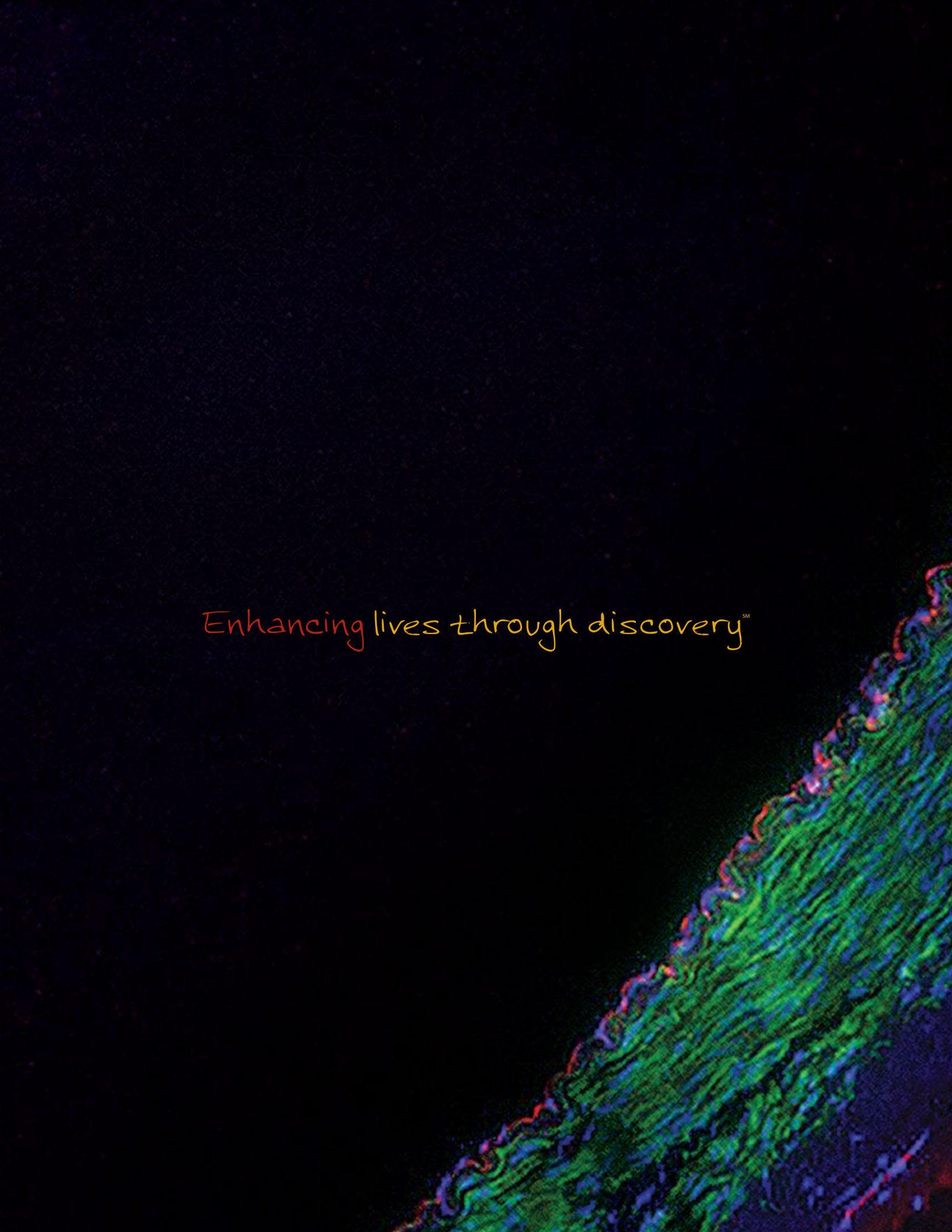
TEXAS BIOMEDICAL RESEARCH INSTITUTE

FORMERLY THE SOUTHWEST FOUNDATION FOR BIOMEDICAL RESEARCH

2010 ANNUAL REPORT

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Inside front cover: This image shows an endothelium monolayer formed from embryonic stem cells on the inside of a baboon blood vessel, with endothelial cells stained as pink and red, and smooth muscle cells stained as green. The blue color represents nuclei of all cells.

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ABOUT TEXAS BIOMED

The Texas Biomedical Research Institute is dedicated to improving the health of our global community through innovative biomedical research.

As one of the world's leading independent biomedical research institutions, the Texas Biomedical Research Institute is dedicated to advancing the health of our global community through innovative biomedical research. Today, Texas Biomed's multidisciplinary team of 72 doctoral-level scientists works on more than 200 major research projects.

Located on a 200-acre campus in San Antonio, Texas, the Institute partners with hundreds of researchers and institutions around the world, pursuing advances in the prevention and treatment of heart disease, diabetes, obesity, cancer, osteoporosis, psychiatric disorders, tuberculosis, AIDS, hepatitis, malaria, parasitic infections and a host of other diseases.

Texas Biomed is the site of the Southwest National Primate Research Center and home to the world's largest baboon research colony, including a unique pedigreed baboon colony that is invaluable for genetic studies on complex diseases. The Institute enjoys a distinguished history in the innovative, humane and appropriate use of nonhuman primates in biomedical research.

The Institute also is home to other extraordinary resources that give its scientists and their collaborators an advantage in the search for discoveries to fight disease. With the nation's only privately owned biosafety level four laboratory, designed for maximum containment, Texas Biomed investigators can safely study deadly pathogens for which there currently are no treatments or vaccines.

Institute scientists also have built the world's largest computing cluster for human genetic and genomic analysis. Housed in the AT&T Genomics Computing Center, the parallel-processing network allows Texas Biomed geneticists to search for disease-influencing genes at record speed.

Texas Biomed's population studies include the genetics of complex diseases in a variety of people, including Mexican Americans, American Indians, Alaskan Natives and Middle Easterners. A project in Nepal is looking at the genetic components of susceptibility to intestinal worm infections using newly developed statistical genetic methods.

Created through the philanthropic vision of Thomas B. Slick Jr. in 1941 and known until recently as the Southwest Foundation for Biomedical Research, Texas Biomed relies on philanthropy to maintain its excellence. Approximately 75 percent of the Institute's annual budget is funded from highly competitive, peer-reviewed federal research grants and contracts, while another 6 percent comes from commercial contracts with biotechnology and pharmaceutical firms. Philanthropy constitutes the second largest portion of the Institute's budget, as almost one-fifth of Texas Biomed expenses are met by the generous contributions of foundations, corporations, and individuals, as well as income from Texas Biomed's endowment and royalties.

LETTER FROM THE PRESIDENT

Working constructively together in 2010, the trustees, faculty and staff have reached some very important milestones in the continuing development of this organization as a world-class and internationally important center for biomedical research.

After extensive discussions on the campus and with several prominent San Antonians, we determined that a name change, or re-branding, of the Southwest Foundation for Biomedical Research was in order. There were several reasons for doing so. First, there has been continuing confusion between the Southwest Foundation and the Southwest Research Institute. Of course, both organizations were founded by Tom Slick, but both have distinct missions. As we have worked to raise the visibility of what we do and broaden our base of charitable support, this confusion has become a real impediment. Second, the word "foundation" in our name has misconstrued our primary mission of discovery. Third, we never really adopted an effective nickname. "SFBR" didn't convey a message, nor did "The Foundation."

The transition to "Texas Biomedical Research Institute" takes advantage of the pioneering, independent and courageous legacy that is so much a part of this state's history. Our organization, the first and largest of its kind in Texas, has earned and continues to merit the goodwill associated with a truly vibrant and visionary state. Similarly, our new nickname, "Texas Biomed," and our new tagline, "Enhancing lives through discovery," clearly underscore this message and instruct as to who we are and why we are important. Like all change, this one will take some adjustment. But over the next several months, with details and logistics of the name change behind us, I believe we will bear this name with great pride.

The new name comes at a fortuitous time, when elements of a programmatic and facilities master plan have been developed and approved that will transform the campus and bring added power to the research enterprise. Once again, the guidance of the Board of Trustees, and particularly its Facilities Committee led by Jim Zachry, played a key role in bringing different perspectives together. While planning had been underway for some time, the Facilities Committee sought additional review to be sure the proposed plans were economically sound, provided a blueprint for development over a 50-year timeframe and assured an aesthetically pleasing campus.

Working diligently over the summer, the Facilities Committee, outside planners, faculty and staff came up with a plan for three buildings, encompassing 93,000 gross square feet of new laboratory and procedure space, scientific services space, animal holding areas, and landscaping and mobility enhancements. A new "front door" to the campus will be created that reflects the outstanding quality of research undertaken here. And happily, by combining previously contemplated renovations into the new construction program, we are saving more than $7 million.

The greatest excitement involves plans for 10 new faculty members in the Genetics and Virology and Immunology Departments and the Primate Research Center. Just as the future of medicine is being reconfigured in our laboratories every day, the future of the Texas Biomedical Research Institute will be enhanced and enriched by these new scientists.

The Texas Biomedical Research Institute represents the best of San Antonio…the best of Texas. It also represents the realistic hope that we can successfully address the most pervasive and dangerous illnesses of our time, such as diabetes, heart and circulatory disease, AIDS and hepatitis. You are a part of that hope, and for your enthusiastic support, we at Texas Biomed are truly grateful.

KENNETH P. TREVETT, PRESIDENT AND CEO

"THE TRANSITION TO 'TEXAS BIOMEDICAL RESEARCH INSTITUTE' TAKES ADVANTAGE OF THE *pioneering, independent and courageous legacy* THAT IS SO MUCH A PART OF THIS STATE'S HISTORY."

– KENNETH P. TREVETT, PRESIDENT AND CEO

"THIS LEVEL OF SUCCESS IN THE CURRENT DIFFICULT FUNDING ENVIRONMENT ATTESTS TO THE *high level of creativity and competitiveness* OF OUR SCIENTISTS."

– JOHN L. VANDEBERG, PH.D., CHIEF SCIENTIFIC OFFICER

LETTER FROM THE CHIEF SCIENTIFIC OFFICER

Scientists at the Texas Biomedical Research Institute had an outstanding year in 2010 during which they made major advances that contributed to the Institute's mission of improving the health of our global community and enhancing lives through discovery.

During 2010, Texas Biomed investigators published well over 100 manuscripts in the national and international scientific literature. Every one of them is a step toward fulfilling our quest to understand human biology and to develop new strategies to protect humanity from the scourges of devastating diseases. Highlighted in this report are the advances presented in four of these publications. Our scientists:

- Discovered evidence that genetics plays a role in the "default-mode" network, the regions of the brain a person uses when day-dreaming or letting the mind wander (*Proceedings of the National Academy of Sciences, USA* 2010;107(3):1223-8). Texas Biomed's "computer ranch" was used in this study, which will help pinpoint specific genes and could eventually lead to identifying markers for mysterious psychiatric and neurological illnesses.
- Found a gene that causes high levels of bad cholesterol to accumulate in the blood of some laboratory opossums in response to a high-cholesterol diet (*Journal of Lipid Research* 2010(10):2922-9). The laboratory opossum is a specialized animal model developed at Texas Biomed. This research will improve the understanding of cholesterol metabolism and may shed light on why some people have high levels of bad cholesterol in blood while others do not when both groups consume cholesterol-enriched diets.
- Demonstrated that exposure to cigarette smoke can alter gene expression—the process by which a gene's information is converted into the structures and functions of a cell (*BMC Medical Genomics* 2010;3(1):29). These alterations in response to smoking have a wide-ranging negative influence on the immune system and a strong involvement in processes related to cancer, cell death and metabolism.
- Developed a highly sensitive means of detecting the seven types of botulinum neurotoxins simultaneously (*PLoS ONE* 2010;5(1):e8818). The finding may lead to improved techniques for testing water and food supplies should these neurotoxins, which target the nervous system and cause paralysis, be used as a bioterrorism weapon.

This work was funded by grants and contracts. During 2010, Texas Biomed investigators were awarded $39 million in grant and contract funding. Four new multi-year grants in excess of $2 million were awarded. This level of success in the current difficult funding environment attests to the high level of creativity and competitiveness of our scientists.

While federal and contract support is important to our success, the interest, enthusiasm and generosity of our Board of Trustees and the rest of the San Antonio philanthropic community also is crucial for Texas Biomed investigators to conduct innovative research projects that will eventually result in much larger grants that support major new research programs.

Looking ahead to 2011, the Texas Biomedical Research Institute is in an extraordinarily strong position to tell our success story, both past and present. With a world-class team of principal investigators and additional state-of-the-art facilities that will enable the most sophisticated new technologies to be harnessed, the Institute will become even more highly productive in making critical advances in science and medicine.

Sincerely,

JOHN L. VANDEBERG, PH.D., CHIEF SCIENTIFIC OFFICER

Planning for the Future

The Texas Biomedical Research Institute is undertaking a major effort to recruit new scientists and upgrade its facilities in order to accelerate the pace of discovery at the 70-year-old institute.

The Board of Trustees approved new program initiatives and a campus master plan in 2010. The new plans are designed to enhance existing research programs and to initiate new ones. They include attracting world-class scientists and those who have the potential to be world-class.

"These very promising developments make all of us even more excited about a future that will dramatically accelerate our research efforts," said Texas Biomed Board Chair John R. Hurd.

Added Chief Scientific Officer John L. VandeBerg, Ph.D.: "This will advance us to a new threshold of making critically important new discoveries and of translating those discoveries into new medical approaches that will have an extraordinary impact on human health here and around the globe."

NEW PROGRAMS AND FACILITIES

Elements of the strategy include recruiting six additional faculty members in the Departments of Genetics and Virology and Immunology. A new director and a junior faculty member also will be recruited for the Southwest National Primate Research Center (SNPRC). The goal of these recruitments will be to promote the translation of discoveries into medical applications. Texas Biomed also plans to develop a regenerative medicine program with other San Antonio institutions to advance the effort to replace dead or dying tissue in people with a variety of conditions and illnesses. This effort will involve recruiting two researchers and will include collaborations with other investigators in San Antonio. (See article on regenerative medicine, page 16.)

To house these new programs and scientists, the plans include:

- A 70,000 square-foot building complex at the Military Drive entrance of the campus, incorporating 14 new laboratories and scientific services for the SNPRC and the Department of Virology and Immunology, as well as scientific services space. The scientific services wing, including primate center headquarters, will be adjacent to the laboratory building.
- A 23,000 square-foot Translational Primate Research Building consisting of 24 units of rooms for animals, two surgery suites, two animal procedure rooms and shared support space for instruments.

"These improvements will markedly increase our capacity to attack obesity, diabetes, mental illness, heart diseases and viral infections that afflict people everywhere," said Kenneth P. Trevett, Texas Biomed's President and CEO. "With more personnel and improved facilities, we will make even greater contributions to 'improve the health of our global community.' Now is the time to make this happen."

INCREASING RESEARCH CAPACITY

Over the past 12 years, the development of new campus facilities, such as the rhesus monkey breeding facility, the Primadomes® for the long-term housing of chimpanzees, the Betty Slick and Lewis J. Moorman Jr. Laboratory, the AT&T Genomics Computing Center, the Ledford Laboratory Building and the Earl Slick Center—the renovated Slick-Urschel Complex—has modernized parts of the campus to better serve the scientific mission. These projects have done much to improve the image of the campus and to better serve the specific needs

THE PLANS INCLUDE

6	2	2	70k	23k	14	24
additional faculty members in the Departments of Genetics and Virology and Immunology	additional faculty members recruited for the SNPRC	additional researchers recruited for regenerative medicine program	square footage of new laboratories and scientific service space	square footage of new Translational Primate Research Building	additional research laboratories	additional units of rooms for animals

IMPORTANT MILESTONES

1941 Foundation of Applied Research founded by Tom Slick, age 25

1952 Foundation of Applied Research is renamed Southwest Foundation for Research and Education

"THESE IMPROVEMENTS WILL *markedly increase our capacity* TO ATTACK OBESITY, DIABETES, MENTAL ILLNESS, HEART DISEASES AND VIRAL INFECTIONS...NOW IS THE TIME TO MAKE THIS HAPPEN." – KENNETH P. TREVETT

of the staff, but much remains to be done. "Some programs have grown beyond current laboratory capacity, and scientific progress is difficult without these contemplated improvements," said Jim Zachry, chair of Texas Biomed's Facilities Committee.

NEW BUILDINGS

The 70,000 square-foot building complex will consolidate researchers and laboratories that now are in multiple buildings around the campus. The building will provide space for a number of nationally prominent visiting scientists who will collaborate with Texas Biomed researchers. Furthermore, it will serve as a visible focal point for the SNPRC, one of only eight such centers in the United States and the only one in the Southwest.

The second project is a proposed translational primate research building that will reduce the waiting time for critical research, add space that meets biosafety laboratory level two standards, allow for AIDS and other infectious disease studies, increase revenue of the SNPRC and allow the center's research portfolio to grow.

Several primate facility construction and renovation projects have been completed in the past few years, including new macaque, baboon and chimpanzee housing facilities; however, some important projects remain undone. The master plan will provide the flexibility for these projects and the infrastructure to support them to come on line in a designated area on campus as funding is acquired. The plan also allows for most of the existing facilities, such as the aged baboon cages, to be replaced when it becomes necessary to do so.

A MORE FUNCTIONAL AND ATTRACTIVE CAMPUS

The campus master plan also envisions projects that will address needs far into the future—as much as 25 years—a significant planning horizon, considering the blistering pace of innovation in science. The plan includes support infrastructure—engineering, energy, utilities, communications and transportation—and provides more open, green and pedestrian-friendly spaces. This also will involve a rearrangement of the campus with a new entrance and new courtyard and common areas that will make Texas Biomed a more aesthetically pleasing place to work and visit.

The master plan is viewed as a road map and will be reviewed and updated on a regular basis, perhaps every five years, to adjust for changing conditions, trends and funding opportunities. The plan will provide a rational blueprint for addressing Texas Biomed's needs through a system of priorities that places the greatest impact on projects higher on the list. The plan also will make it easier for leaders and stakeholders of the institution to understand its vision for the future and to understand Texas Biomed's needs and how these needs can be addressed. ▪

Artist's rendering of the campus of the future.

1956 Betty Slick Moorman purchases and restores the Argyle as a private dinner club to support biomedical research

1958 National Institutes of Health provides funds for establishing a baboon colony at the Foundation and a baboon trapping station in Kenya

Within the next few years, the opportunities have never been better to capitalize on novel vaccine strategies.

Research at the Texas Biomedical Research Institute offers real hope for the development of vaccines to prevent infectious diseases that afflict millions of people worldwide. In addition, some of these diseases may represent a bioterrorism threat, which also can be mitigated by new vaccines. Within the next few years, the opportunities have never been better to capitalize on novel vaccine strategies against illnesses ranging from hemorrhagic fevers to AIDS and hepatitis C. For this roundtable discussion, annual report editor Joseph Carey interviewed three Texas Biomed vaccine experts: Jean L. Patterson, Ph.D., Luis D. Giavedoni, Ph.D. and Robert E. Lanford, Ph.D.

Q: *What are the different diseases or targets for which vaccines are being developed at Texas Biomed?*

ROBERT LANFORD: We have a vaccine that we are testing with outside collaborators that is using the *Listeria* bacterium to deliver the antigens of hepatitis C and HIV. We are in trials with macaque monkeys right now and looking at how well the vaccine induces an immune response. Marie-Claire Gauduin in our department is working with us on this program, and she has a very novel HIV vaccine that she is working on. Her vaccine uses stem cells to continuously express the vaccine in your body. These are not embryonic stem cells, but rather the type of stem cell that constantly produces new skin cells. We have plans to work with Emory University and the Columbus, Ohio Children's Hospital on a hepatitis C vaccine that takes a really new approach to cure people who are already infected. The approach would use a vaccine, combined with an immunomodulator and an antiviral—a three-pronged approach to try to eliminate chronic infections.

JEAN PATTERSON: We have two major viruses that we are working on in my group, and that includes Ricardo Carrion and Anthony Griffiths. One of these viruses is targeted against Lassa fever, a hemorrhagic fever that occurs in West Africa in about a half million cases a year. It has about a 10 percent mortality rate and a lot of serious morbidity afterwards, such as deafness. One approach is a live attenuated vaccine, which produces sterilizing immunity and 100 percent protection. The problem is that a live attenuated vaccine can always mutate back to its virulent form. It is scary when you have something growing and reproducing if you have an immunocompromised population, which exists in Africa. But it has taught us what is important in the immune system to produce an effective vaccine. Another approach is to insert a protein from Lassa fever into the existing yellow fever vaccine to generate a new vaccine. This has a lot of potential. The other major effort is for an Ebola vaccine. So far we have not had much success. But we have a virus-like particle (VLP) vaccine that has produced very good results in guinea pigs. A VLP vaccine is made from proteins produced in the laboratory that assemble into a particle that, to the human immune system, looks like the virus, but cannot cause disease. We also have two adenovirus projects with Ebola and, so far, very good results. The ideal is to develop a single vaccine—like for measles, mumps and rubella—for both Ebola and Marburg.

LUIS GIAVEDONI: We have run a small pilot test with an AIDS vaccine based on a combination of DNA and then a poxvirus boosting immunization, which protected a small group of animals, and had a particularly significant percentage of these animals protected against repeated high-dose challenges with a monkey form of AIDS. We hope to obtain more funding to conduct a study with a larger number of animals. We are also using a novel approach for presenting the envelope protein of HIV by combining a portion of the envelope with a naturally occurring molecule that can boost the immune system and stimulate the production of antibodies.

JEAN PATTERSON: Anthony Griffiths of our department is working on a vaccine against herpes B, a virus that is relatively benign in macaque monkeys but, when transmitted to humans, can be extremely lethal. This is very important for those working with macaques in research situations.

1959 The Foundation moves to a new location on Loop 410

1960 The first baboons arrive from Kenya

Luis D. Giavedoni, Ph.D., Jean L. Patterson, Ph.D. and Robert E. Lanford, Ph.D.

Q: *Dr. Giavedoni, the AIDS virus was discovered 25 years ago; why is it taking so long for the development of an effective vaccine?*

LUIS GIAVEDONI: It is a complicated story because the virus is complicated. It infects the very components of the immune system that are supposed to fight infection. So you have a virus that is crippling all these cells that interact with cells that are key to mounting immune responses. In addition, the virus itself mutates at a very high rate, making an effective immune response very difficult. Our expectation is that the mechanism of infection is going to be unraveled and a therapy can be developed, but nobody exactly knows how or when it is going to happen.

Q: *Dr. Lanford, when might the vaccines you are working on be ready?*

ROBERT LANFORD: One of the barriers is the animal model. For hepatitis C virus, it has got to be a chimpanzee. There are no other animals susceptible to hepatitis C. So that is an enormous barrier. We are limited to doing a small number of very well thought-out trials in chimpanzees that often take many years to get the funding from the government. It is the same for HIV, using the SIV-infected macaque as a model for HIV. We have some novel approaches, but each one of them requires millions of dollars to take through a chimpanzee trial.

Q: *Dr. Patterson, how do you measure whether your Ebola or Marburg vaccine will be good enough if a bioterror attack actually occurs?*

JEAN PATTERSON: It would not be my decision. It would be the government's decision. Everyone presents their data, and the government makes the decision of what will be stockpiled. But sterilizing immunity and 100 percent protection are what we are all seeking—even if we can't fully explain the mechanism. And a vaccine that goes after more than one disease at the same time, like an Ebola and Marburg bivalent vaccine, is certainly more exciting to the government than having to make a vaccine for each possible agent of bioterrorism.

Q: *What vaccines ought to be developed against agents that are not on the radar of funders, either government or private?*

ROBERT LANFORD: Viruses that are coming out of the rain forest, or emerging viruses that nobody could have predicted because they could be very lethal and spread rapidly once they get across the globe. We escaped an international epidemic with SARS, because the spread of the virus declined for reasons that we still do not understand. There are other new viruses emerging from tropical areas. It is also the common viruses that we fail to develop vaccines for, and several of the herpes viruses are great examples. Herpes simplex causes lifelong bouts with cold sores—a virus that many would like to see eliminated. Another herpes virus, zoster, causes shingles in adults and is caused by the virus that infects us as children and causes chickenpox, then decades later causes this very painful outbreak. Cytomegalovirus is another herpes virus that causes severe infection in immunosuppressed patients, especially transplant patients.

LUIS GIAVEDONI: Tuberculosis and Chagas disease and a number of other parasitic or bacterial diseases are good examples. Chagas was once thought to be a problem of Latin America, but the agent is present in Texas. Nowadays, when we have people traveling all over the world, getting sick in Africa and being in New York the following day, there is no "small" disease.

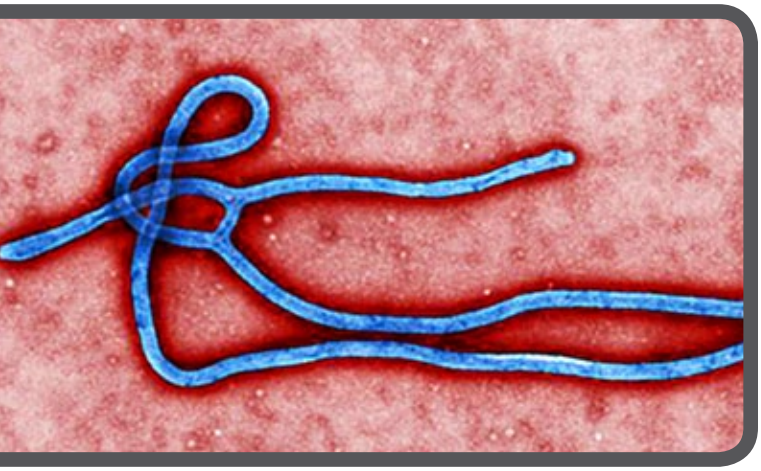
Q: *It sounds like the government probably is going to have a major role in combating emerging diseases like this when they are identified. Are they prepared to do that?*

ROBERT LANFORD: Well, they are. There are multiple branches in the government involved in any vaccine. If it is perceived to be a threat to our military, the Department of Defense becomes immediately involved. They also fund more basic research that is looking at platforms for vaccines that they could use when they make vaccines to multiple agents. Historically, the National Institutes of Health has been the source of funding for vaccine money, but we are in an economic downturn with declining

1963 The Foundation sponsors the First International Symposium on the Baboon and its use as an Experimental Animal

1966 Joseph Goldzieher publishes a key paper that paves the way for oral contraceptive development

funds for research from our government. We are going to have to make a decision whether this country is going to be a leader in vaccine research in the future. And if we are, we are going to need to make a bigger commitment to it.



Ebola virus

Q: *What are the challenges, other than scientific, to successfully developing, testing, and making new vaccines available to the public?*

ROBERT LANFORD: People will not pay for their own vaccine. In most instances, whether in the United States or other developed countries, it's an insurance company or the government that pays for a lot of mandatory vaccines. But in developing countries, it's the World Health Organization (WHO). The WHO develops the infrastructure to deliver the vaccine, and the price needs to be down to about a dollar a dose. Also, the vaccine needs to be stable enough to be carried across the African continent without refrigeration and still deliver an efficacious vaccine.

JEAN PATTERSON: We have to keep educating people about the role of vaccines. This is illustrated in the fact that we are seeing an increase in whooping cough and measles. Everyone agrees that a measles outbreak should not be occurring in this country. People are misinformed about what the role of vaccines is and how beneficial they are.

Q: *Can you briefly review the process that a vaccine takes, once it has been successfully tested in animals and in humans. How does it get to the market?*

ROBERT LANFORD: At some point, animal data indicates that a product is ready for an institute or company to pursue an investigational new drug application to the Food and Drug Administration. After that, there are three phases of clinical trials. Phase I is a safety study involving a small population of people with the intent of trying to make sure you are not going to harm anybody with the vaccine. Hopefully, studies in primates have already proved this. Phase II increases the number of people and the number of different places where it is being used and tries to get some limited efficacy and additional safety data. The final step is Phase III, a large-scale study that has to convincingly show efficacy.

Q: *Would a national center for vaccine policy be a good idea?*

JEAN PATTERSON: The National Institute of Allergy and Infectious Diseases does this kind of thinking all the time. They can come up with a lot of ideas, but unfortunately, there isn't a lot of money to implement them.

Q: *What are some of the technological developments that have occurred over recent years that help bring new vaccines closer to reality?*

ROBERT LANFORD: One breakthrough has been the use of harmless viruses as viral vectors to express proteins from more deadly viruses. The best examples are adenovirus vectors that are related to one of the viruses that causes the common cold and vaccinia virus which is related to the virus that causes smallpox. These viruses have been engineered to be harmless, while expressing proteins from HIV, hepatitis C or other deadly pathogens. Another development is trying to boost the effect of vaccines by using immunomodulators that enhance the immune response. It is a technological breakthrough, although it has not yet been highly successful.

LUIS GIAVEDONI: I would add the use of nucleic acids in vaccine development, the use of DNA as an immunogen and new technologies for delivering the DNA in a more efficient way. In some animal models, including nonhuman primates, they seem to be working very well for some diseases.

1967 The Tom Slick Building, dedicated by Governor John Connally, becomes the main laboratory building

1965-69 The Foundation triples in size with the addition of the Ferdinand P. Herff Memorial Research Laboratory and primate quarantine buildings and the development of a chimpanzee breeding program

Q: Which diseases would be the ones that lend themselves most easily to some of these technologies you've just described?

JEAN PATTERSON: We are still looking for vaccines against pathogens for which natural infection doesn't provide lifelong immunity. This is a very critical question in vaccine development. The first real candidates would be those, such as respiratory syncytial virus and HIV, for which we can't develop a vaccine because the natural infection doesn't induce immunity that prevents further infection.

ROBERT LANFORD: Today, vaccines developed by virologists have virtually eradicated many of the infectious diseases that once plagued people, such as polio, smallpox, measles and mumps; and recent vaccines have been developed for human papilloma virus (which causes cervical cancer) and chicken pox. Now, we are fighting viruses like hepatitis C and HIV, where the natural course of the infection is a lifelong infection. The vaccines have for the most part failed, such that the immune system cannot clear the virus. We need to go back into the laboratory to understand why we fail to get an adequate immune response in the natural infection, so we can better predict how to make a successful vaccine.

JEAN PATTERSON: We have totally eradicated some diseases, and we are close to eradicating polio and measles. Anything that does not have an animal reservoir can potentially be eradicated. The trickiest diseases for which to develop a vaccine are those that cause lifelong infection that the immune system eventually just can't handle.

LUIS GIAVEDONI: The viral hemorrhagic fevers are the ones likely to be the next in line because some effective vaccines based on recombinant viruses or DNA seem to be working efficiently or effectively in non-human primates. Most likely they will work in humans.

ROBERT LANFORD: For some diseases, such as HIV or hepatitis C, we don't know where to start with the next vaccine. Many different novel approaches are being tried right now. The public will need to understand the need for investment in these vaccines. Pharmaceutical companies are beginning to pull out. Philanthropic donors like the Bill & Melinda Gates Foundation or the government or somebody else will need to step forward if we ever want to get these vaccines to the public.

Q: How do you put the funding situation and promise in research into perspective?

LUIS GIAVEDONI: The problem is that there is less and less money to distribute. The big players seem to be getting more and more. And for the newcomers or people who have novel ideas that are outside these groups, it is difficult for them to get any funding.

ROBERT LANFORD: The funding situation means that we have to become better at what we do. We may have to persevere a little bit longer before we are going to see the light of day on some of these vaccines.

JEAN PATTERSON: The better scientists are the ones who think outside of the box, who look at something and say, "that does not make sense," and then say, "what does it mean?" rather than, "ah, we'll just toss that result out and go on." I am confident that, given adequate funds, all of these diseases will be conquered. ▪

Marburg virus

1973 Henry McGill joins the Foundation and in 1979 becomes its first scientific director; he establishes the pedigreed baboon colony

1976 Hixon Memorial Hospital opens

New Initiative in Regenerative Medicine Promises to Transform Medicine

The Texas Biomedical Research Institute is initiating research in regenerative medicine utilizing stem cells, a dynamic, new area of inquiry that promises to transform clinical medicine.

"Stem cell research involves fixing broken bodies and damaged minds—regenerating tissues and organs that are damaged or injured or just worn out, and repairing the brains that are ravaged by Parkinson's or Alzheimer's disease," said John L. VandeBerg, Ph.D., Texas Biomed's Chief Scientific Officer.

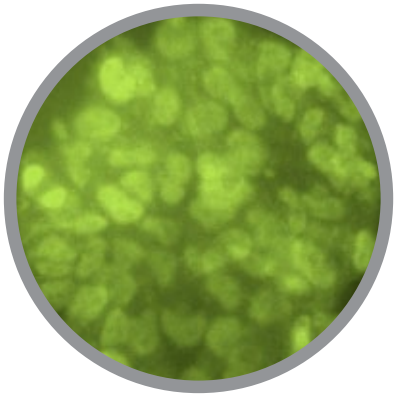
He noted how medical advances have transformed health in the last century. In 1920, life expectancy was only 56 years, by comparison with 78 years for a baby born today. Thanks to the development of vaccines, medical devices, antibiotics and other drugs, many common killers are no more, or are effectively controlled. Hepatitis B will soon be a disease of the past because of a vaccine which is now given to every preschool child in 116 countries. Texas Biomed scientists played a key role in developing the vaccine using chimpanzees.

Fast forward to today where we can now catch a glimpse of the bold new future of stem cell regenerative medicine.

Adult stem cells were first discovered during the 1950s. Conceptually, adult stem cells could treat any disorder. An example of their potential therapeutic use would be to harvest adult stem cells, treat them in ways that make them more effective than they would normally be in repairing damage, and then put them into a patient who has just had a heart attack to accelerate the natural repair process.

Human embryonic stem cells (ESCs), discovered in 1998, have far greater potential for use in therapy than do adult stem cells because they have much more capacity to create complete tissues and organs. The dream beyond the horizon is not just, for example, to put some stem cells into a patient with hepatitis to participate in the repair of a damaged liver, but to grow a whole new liver from embryonic stem cells or to grow an entire arm or leg for a trauma victim.

In 2007, a new type of human stem cell was developed experimentally. It is called an induced pluripotent stem cell. A skin cell or a cell from any body tissue can be induced to become just like an embryonic stem cell in being pluripotent—that is, in having the capacity to differentiate into many tissues or organs.



THE GREATEST PROMISE OF STEM CELL RESEARCH MAY LIE IN AN AREA *not yet imagined.*

Above, magnification of a cluster of baboon embryonic stem cells.

Major technical hurdles must be overcome with these cells. However, the vision is that, if a person has a damaged pancreas because of diabetes, a skin cell from that patient could be induced to become a stem cell. It could then be used to develop a new pancreas that is just like the original one. Broken body parts could be replaced with brand new parts created from an individual's own cells.

In an effort to pool regenerative medicine resources and expertise in San Antonio, very preliminary discussions have taken place with representatives of Texas Biomed, the University of Texas at San Antonio and the University of Texas Health Science Center at San Antonio with the idea of setting up a collaboration among these groups. The sophisticated military medicine presence in San Antonio may also be tapped, particularly in the area of wound healing.

1979 Coates-Kerns Cardiopulmonary Laboratory Building opens

1980 The first baboon breeding corral opens

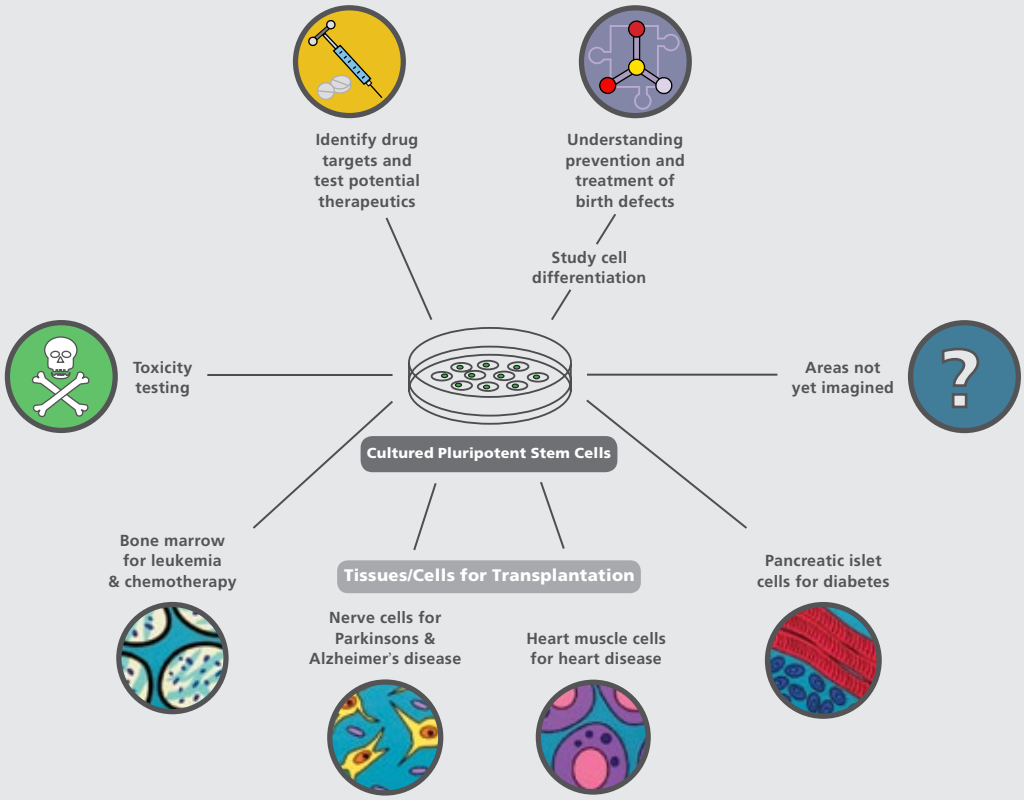
This knowledge may be used to generate cells for transplantation therapies.

Already, Texas Biomed scientists have begun to use the baboon as a model system to develop ESC therapies as a prelude to planned work on induced pluripotent stem cell therapies. VandeBerg's colleague, Qiang Shi, Ph.D., is using ESCs from baboons to develop therapies for cardiovascular disease. Preliminary experiments indicate that an artery that has been stripped of the cells that line its interior surface can be completely regenerated within five days when ESCs that are preprogrammed by special culture conditions are put into it. "Just think of what this kind of treatment would mean to a patient who had just suffered a heart attack," VandeBerg said.

The first clinical trial with ESCs, initiated in October 2010, is testing a treatment for spinal cord injury. That trial will pave the way for thousands of clinical trials; and in the decades ahead, those clinical trials with ESCs will be displaced with clinical trials using induced pluripotent stem cells created from the patient's own body. All of the replacement parts that a person needs will be generated from a patient's own cells, and the use of stem cells in clinical medicine will become a vital component of the routine arsenal of weapons used to treat disease. "That is what I envision," VandeBerg said. "The promise of fixing broken bodies and damaged minds through stem cell regenerative medicine." ▪

THE PROMISE OF STEM CELL RESEARCH

Pluripotent stem cells give rise to almost all of the cell types of the body, such as muscle, nerve, heart and blood. They hold great promise for both research and health care. This advance in human biology continues to generate enthusiasm among scientists and patients suffering from a broad range of diseases including cancer, heart disease and diabetes.



1980 The Corwin D. Denney Conference Center opens

1981 A neonatal intensive care unit established to study premature births and results in the high frequency ventilator and evaluation of novel surfactant therapy

Texas Biomed Scientists Look for Genes for Psychiatric Disorders

Texas Biomedical Research Institute scientists and local collaborators are performing novel and exciting research to pinpoint which genes influence the risk of health problems like depression, Alzheimer's, attention deficit hyperactivity disorder and schizophrenia. They are using brain scans to determine what is normal by looking at brain formations and functions showing which areas of the brain light up when certain tasks are performed and when a person is at rest.

Hundreds of scans in San Antonio are being processed at Texas Biomed, where geneticists are using software and a giant computer system to try to identify which genes are involved. That could eventually give doctors markers for these mysterious psychiatric and neurological illnesses and suggest ways to plan new treatments.

The scans are processed at Texas Biomed's AT&T Genomics Computing Center, which is overseen by John Blangero, Ph.D. The center houses the world's largest computer cluster for human genetic and genomic research, allowing scientists to search for disease-influencing genes at record speed.

"Our large computer cluster is critical for the timely analysis of the massive amounts of data that we obtain during imaging, especially when it is compounded with the potentially millions of DNA variants that we will be searching through to identify causal genes influencing brain function," Blangero said.

THE DEFAULT-MODE

Two recent studies published in the *Proceedings of the National Academy of Sciences, USA (PNAS)* offered evidence that genetics play a role in what's called the "default-mode" network, the regions of the brain a person uses when day-dreaming or letting the mind wander. Abnormalities in the default-mode network can influence interpersonal interactions, decisions, and coping mechanisms. "Our results clearly indicate that, in aggregate, genes play a large role in the actual workings of the brain," said Blangero. "Thus, there is a major biologically determined component involved in critical brain function."

"The default-mode network appears to be the brain's back-burner for social decision making," said Peter T. Fox, M.D., director of the Research Imaging Institute at The University of Texas Health Science Center at San Antonio (UTHSCSA). "Usually these back-burner ideas relate to interpersonal interactions and decisions that can't readily be quantified and shouldn't be rushed." The default-mode functions like a crock pot cooking dinner while you wash clothes or rake leaves.

One study from UTHSCSA, Texas Biomed and other institutions showed that genetics play a role in the brain's ability to put ideas in a low-priority area until a later time when they can be considered. This "back-burner" setup has been shown to be abnormal in a variety of psychiatric disorders.

This default-mode network is one of several neural networks that operate whether the mind is at rest or is occupied doing a task. A separate *PNAS* paper, published in 2009 by the same collaborators, presented a strong case that all human behaviors may be properly viewed as cooperative interactions among these networks, Fox said.

The newer research estimated the importance of genetic effects on the default-mode network by creating maps of eight anatomically distinct regions within the network. These maps were obtained by functional magnetic resonance imaging studies in 333 individuals from 29 randomly selected, extended-family pedigrees.

CORRELATING GRAY MATTER AND GENES

Network connectivity and gray-matter density are correlated to genetic factors. "We found that more than 40 percent of the between-subject variance in functional connectivity within the default-mode network was under genetic control," Fox said. Based on this information, it is possible that new diagnostic tools could be considered for various psychiatric or neurological illnesses.

The study also included collaborators from the Yale University School of Medicine, the University of Oxford in England, and Imperial College, London. The project is an outgrowth of long-standing collaborations between the UTHSCSA and Texas Biomed using tools for gene discovery.

"One long-term research goal is to test whether other intrinsically connected networks are also under genetic control, which we expect they will be," Fox said. "We also want to identify the genes that are controlling the default-mode network and other networks and identify disorders associated with their abnormalities. A final goal is to develop treatment strategies."

Blangero added, "The current study proves that genes are important in brain function. Our next goal is to identify the specific genes that are involved and to use them to reveal the underlying biological pathways that can be pursued for potential drug development to improve human brain function."

The brain remains one of the final frontiers of modern medicine. Using images to help crack the genetic code of inherited tendencies could revolutionize how many diseases are diagnosed and eventually treated. ▪

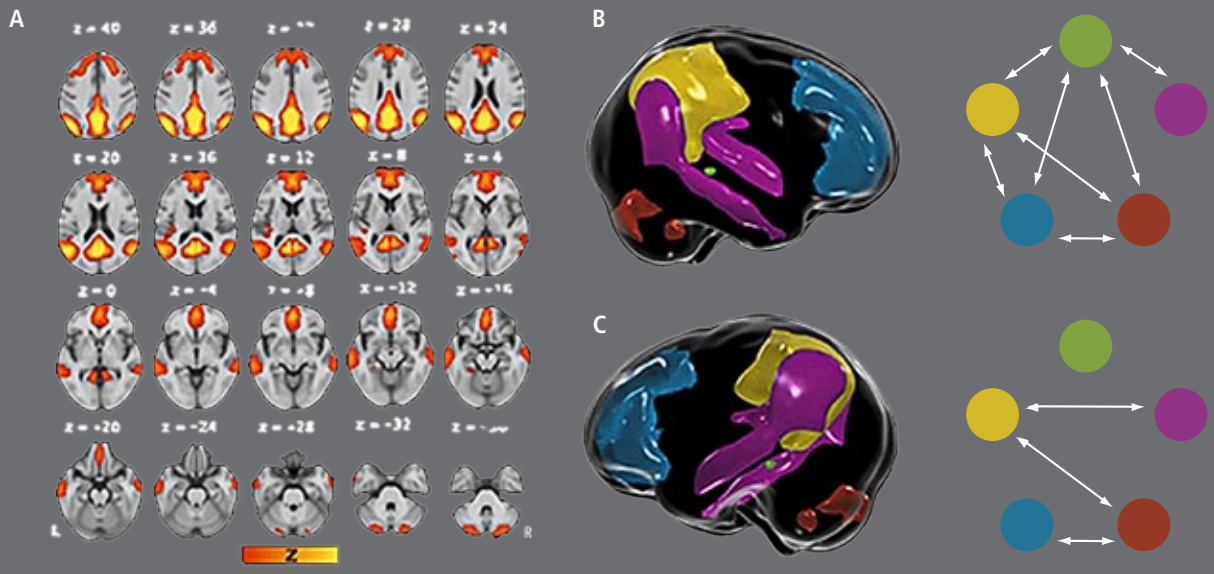
1981 James R. Dougherty Memorial Research Laboratory opens for small animal research

1982 Southwest Foundation for Research and Education is renamed Southwest Foundation for Biomedical Research

Results clearly indicate that, in aggregate, genes play a large role in the actual workings of the brain.

IMAGING THE FUNCTIONING HUMAN BRAIN

Image A below shows a map of the default-mode network derived from scans of 333 individuals from large extended pedigrees. Image B shows significant genetic correlations for functional connectivity between heritable regions in the default-mode network. The brain region called the left parahippocampal gyrus (green) was genetically correlated with the posterior cingulate/precuneus (yellow), medial prefrontal (blue), right cerebellar (red), and right temporal-parietal (pink) regions. Image C shows significant environmental correlations between these same regions.



1982 The Department of Genetics is established by John VandeBerg

1982 The Genetics Analysis Workshop is established by Foundation scientists, headed by Jean MacCluer, at the American Society of Genetics annual meeting

Gene Identified for High Cholesterol Levels in Blood; Finding in Animals Offers Hope for Reducing Risk in Humans

Scientists at the Texas Biomedical Research Institute have found a gene that causes high levels of bad cholesterol to accumulate in the blood as a result of a high-cholesterol diet.

Researchers studied a strain of laboratory opossums developed at Texas Biomed that has normal blood levels of "bad" low-density lipoprotein (LDL) cholesterol when fed a standard low-cholesterol diet but extremely elevated levels of LDL cholesterol when fed a high-cholesterol diet. These high-responding opossums are used to identify the genes and the underlying mechanisms that control response to dietary cholesterol.

"This research will improve our understanding of cholesterol metabolism and may shed light on why some people have high levels of bad cholesterol in blood while others do not when they consume cholesterol-enriched diets," said John L. VandeBerg, Ph.D., Texas Biomed's chief scientific officer and senior author of the paper.

Published in the *Journal of Lipid Research*, the work was funded by the National Institutes of Health and the Robert J. Kleberg Jr. and Helen C. Kleberg Foundation. Other authors of the paper were Jeannie Chan, Ph.D.; Michael C. Mahaney, Ph.D.; Rampratap S. Kushwaha, Ph.D.; and Jane F. VandeBerg of the Southwest National Primate Research Center and Texas Biomed's Department of Genetics.

CHOLESTEROL AND HEART DISEASE

People's blood cholesterol levels have a lot to do with their chances of getting heart disease. The higher one's blood cholesterol level, the greater the risk for developing heart disease or having a heart attack. Heart disease is the number one killer of women and men in the United States. Each year, more than a million Americans have heart attacks, and about a half million people die from heart disease.

When too much cholesterol, a fat-like substance, accumulates in a person's blood, it builds up in the walls of arteries. Over time, this buildup narrows the arteries and slows or blocks blood flow to the heart. The blood carries oxygen to the heart, and if enough blood and oxygen cannot reach the heart, a person may suffer chest pain. A blockage that completely cuts off the blood supply to a portion of the heart can result in a heart attack.

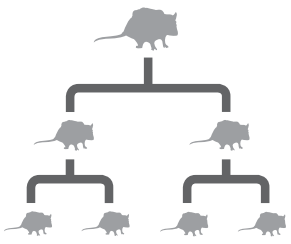
High blood cholesterol itself does not cause symptoms, so many people are unaware that their cholesterol level is too high. Lowering cholesterol levels that are too high lessens the risk for developing heart disease and reduces the chance of a heart attack or death from heart disease, even if a person already has heart disease.

DEFECTIVE GENE FOUND

The new study involved analyzing various lipids, or fats, in blood and bile to find differences in cholesterol metabolites; sequencing candidate genes of interest to find mutations; and determining the impact of each mutation by genetic analyses. The results led to the discovery that the *ABCB4* gene, which encodes a protein known to transport cholesterol from the liver into bile to facilitate excretion of cholesterol from the body, is defective in the high responders. Malfunction of the ABCB4 protein was found to impair cholesterol excretion, causing bad cholesterol to accumulate in the blood when a high-cholesterol diet is consumed.

"This is the first report to show that ABCB4 has a role in controlling blood cholesterol levels in response to dietary cholesterol in an animal model," said VandeBerg.

The next step is to determine if any *ABCB4* mutations have an effect on levels of LDL cholesterol in humans who consume a high cholesterol diet. VandeBerg added, "If we can identify early in life those people who are going to be adversely affected by consumption of high levels of cholesterol, we can encourage their parents and them to receive individually tailored counseling to establish dietary habits that protect them from cardiovascular disease." ▪



The current Texas Biomed opossum colony consists of approximately 2,200 individuals with pedigrees that extend as far back as 39 generations.

1982–84 The safety and efficacy of hepatitis B vaccine, now used in 116 countries, is established in chimpanzees

1983 The first birth of a nonhuman primate from in-vitro fertilization and embryo transfer; the baby baboon was named E.T., after the character in the 1982 Steven Spielberg film *E.T.: The Extra-Terrestrial*

"This is the first report to show that ABCB4 has a role in controlling blood cholesterol levels in response to dietary cholesterol in an animal model." – John VandeBerg, Ph.D.

The laboratory opossum, *Monodelphis domestica*, was developed as an animal model in the Department of Genetics at Texas Biomed. This animal model has become the most commonly used marsupial in biomedical research.

1983 The Department of Microbiology becomes the Department of Virology and Immunology

1983 AIDS research program begins

Smoking Has a Significant Influence on Genes and Their Function

In the largest study of its kind, researchers at the Texas Biomedical Research Institute have found that exposure to cigarette smoke can alter gene expression, the process by which a gene's information is converted into the structures and functions of a cell. These alterations in response to smoking appear to have a wide-ranging negative influence on the immune system and a strong involvement in processes related to cancer, cell death, and metabolism. They are putting the more than 20 percent of American adults who smoke at risk for a number of serious health problems.

The scientists identified 323 unique genes whose expression levels were significantly correlated with smoking behavior in their study of 1,240 people. The changes were detected by studying the activity of genes within white blood cells of study participants. Texas Biomed's massive, high-speed computer ranch, located in the AT&T Genomic Computing Center, made the study possible.

"Our results indicate that not only individual genes but entire networks of gene interaction are influenced by cigarette smoking," wrote lead author Jac Charlesworth, Ph.D., in the open access journal *BMC Medical Genomics*. Charlesworth, formerly at Texas Biomed, is now a research fellow at the Menzies Research Institute Tasmania in Australia.

The study was funded by the National Institutes of Health, the Azar and Shepperd families of San Antonio, ChemGenex Pharmaceuticals, and the AT&T Foundation. It is part of Texas Biomed's San Antonio Family Heart Study (SAFHS), which includes 40 families in the Mexican American community. All of Charlesworth's 10 co-authors on the paper are doctoral-level faculty and staff in Texas Biomed's Department of Genetics and members of the group of investigators working on the SAFHS, led by Principal Investigator John Blangero, Ph.D.

EXPOSURE IS SOBERING

"Previous studies of gene expression as influenced by smoking have been seriously limited in size, with the largest of the in-vivo studies including only 42 smokers and 43 non-smokers. We studied 1,240 individuals, including 297 current smokers," Charlesworth said.

"THE EXPRESSION OF OVER 323 GENES IN THE LYMPHOCYTE SYSTEM ALONE ARE *modified by cigarette smoking.*"

– JAC C. CHARLESWORTH, PH.D.

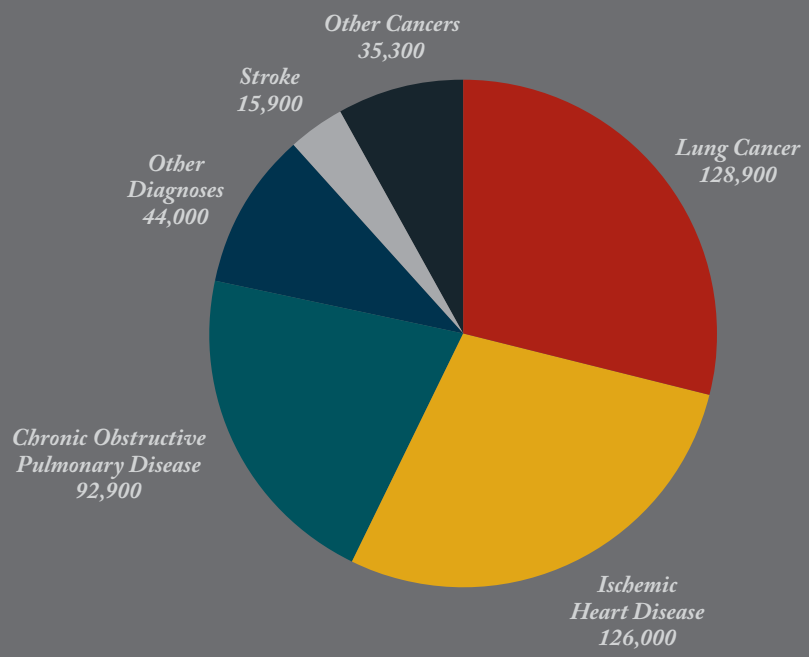
"Never before has such a clear link between smoking and gene activity been revealed, and the scale at which exposure to cigarette smoke appears to influence the expression levels of our genes is sobering," she added. "It is likely that this observed effect of smoking on transcription has larger implications for human disease risk, especially in relation to the increased risk of a wide variety of cancers throughout the body as a result of cigarette smoke exposure."

The researchers plan to examine the impact of gender on gene expression levels as well as environmental exposures such as alcohol and dietary fat consumption. ▪

1991 San Antonio Family Heart Study begins

1995 SOLAR, a Foundation-developed genetics analysis software, is made available; it is now used by more than 2,300 researchers worldwide to analyze data from large families in which susceptibility to specific diseases appears to be inherited

Never before has such a clear link between smoking and gene activity been revealed.



DISEASES FROM CIGARETTE SMOKING ARE ATTRIBUTED TO 443,000 U.S DEATHS ANNUALLY

1997 Identification begins of more than a half dozen genes influencing food intake, body fat, and endocrine function

1999 National Institutes of Health establishes the Southwest National Primate Research Center on the Foundation campus

New Detection Methods Could Play Vital Role in the War on Terror

Scientists at the Texas Biomedical Research Institute have for the first time developed a rapid and highly sensitive means of detecting the seven types of botulinum neurotoxins simultaneously. The finding may lead to improved techniques for testing water and food supplies should these neurotoxins be used as a bioterrorism weapon.

The threat is real. Some scientists predict, for instance, that contamination of centralized milk supplies could result in hundreds of thousands of cases of severe poisoning and death in the absence of suitable detection methods. Scientists also speculate that it is likely only a matter of time until botulism is intentionally used to cause harm. Because intoxication can result in a paralysis so severe it can require mechanical ventilation for weeks to months, health authorities would be overwhelmed, and there would be mass casualties. Countermeasures to prevent and treat botulism, such as vaccines and therapeutics, are extremely limited, especially for the rarer botulinum neurotoxin types. Consequently, the ability to detect these toxins in the environment is critically important.

ANTIBODIES FIND NEUROTOXINS

Botulinum neurotoxins are made by specific strains of the bacteria Clostridia, which are widely distributed in soils and aquatic sediments. Most cases of botulism are the result of improperly stored foods, which can encourage growth of Clostridia and production of toxin that is then ingested.

The neurotoxin-detecting substances are antibodies, proteins made by the body to fight diseases, that are found in llamas. Botulinum neurotoxins are about 100 billion times more toxic than cyanide, and, collectively, they are the only toxins in the federal Centers for Disease Control and Prevention (CDC) "category A" list of potential bioterror threats alongside anthrax, Ebola virus, and other infectious agents.

Andrew Hayhurst, Ph.D., is working on a quick and easy method to identify microbes and toxins that could be used in bioterrorism attacks.

The llama antibodies, called single domain antibodies or "nanobodies," are molecularly flexible, unlike conventional antibodies. "As such, nanobodies may allow biosensors to be regenerated and used over and over without loss of activity. Also, for some types of botulinum neurotoxins, conventional antibodies are not generally available, and we are filling this biosecurity gap," said Andrew Hayhurst, Ph.D., a Texas Biomed virologist. Because some nanobodies have been shown to have inhibitory activity and can block toxin function, they may play a key role as part of a future anti-botulism treatment.

The new work, funded by the Defense Department's Defense Threat Reduction Agency Medical Diagnostics Program, was described in the journal *PLoS ONE*.

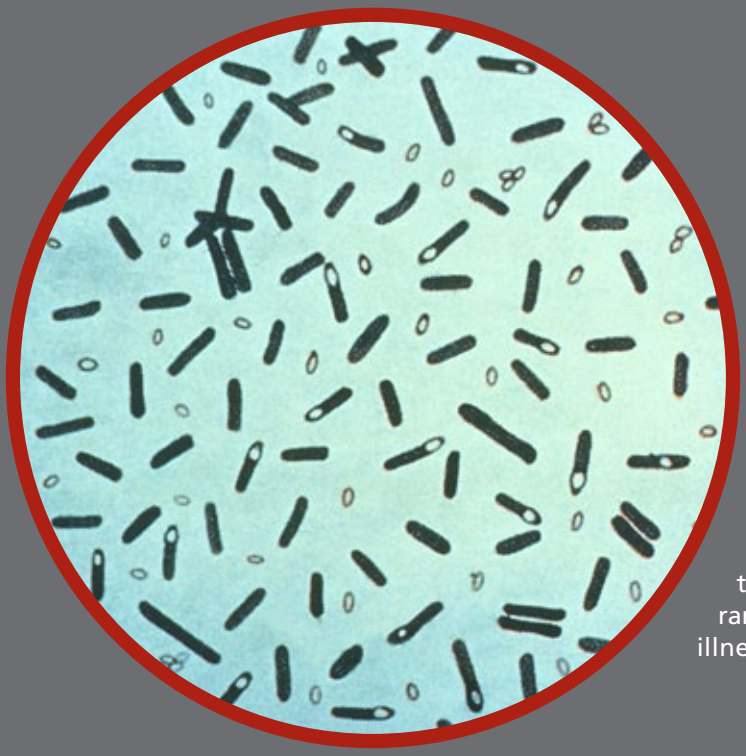
IMPROVING DETECTION

"We not only aim to use the antibodies to detect botulinum neurotoxins, but also to understand how they bind and inhibit these fascinating molecules," Hayhurst said. "We are also striving to improve our test by making it more sensitive such that one day it may be able to detect much smaller amounts of toxin found in patients' blood. Since these neurotoxins have therapeutic applications with carefully controlled preparations and dosing regimens, there is also an increasing need to monitor their levels in these treatments."

In the new study, a llama was immunized with harmless versions of seven types of botulinum neurotoxins and blood taken to provide antibody-producing cells. Using bioengineering techniques, the antibody genes were cloned, and the resulting antibodies were tested for their ability to detect botulinum neurotoxins in a selection of liquids including milk. Hayhurst and his team are continuing to study the molecular interactions of the llama antibodies to find out why they are so specific and why some of them inhibit toxins. The laboratory capabilities of Texas Biomed enabled this research to be performed according to all applicable federal guidelines of biosafety and biosecurity under the CDC Select Agent Program. ▪

1999 The Betty Slick and Lewis J. Moorman Jr. Laboratory opens with BSL-4, BSL-3, and BSL-2 laboratories as the new home of the Department of Virology and Immunology

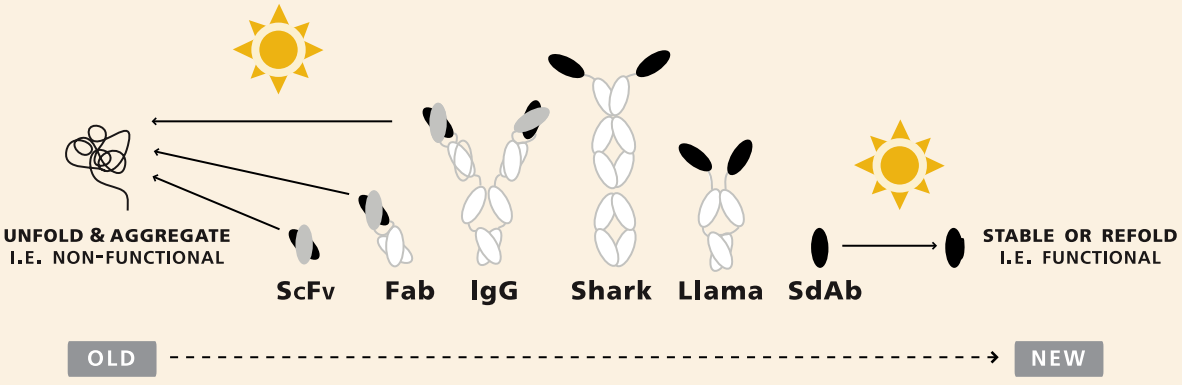
1999 Publication of the baboon gene map, the first genetic linkage map of a nonhuman primate species



Clostridium botulinum, at left, produces a nerve toxin which causes the rare but serious paralytic illness botulism.

ANTIBODIES FOR BIOTHREAT DETECTION

Conventional antibodies (IgG) and their recombinant fragments (Fab and scFv) unfold and irreversibly aggregate after exposure to high temperatures. SdAb, derived from unconventional shark and llama antibodies, can refold and will enable reusable biothreat detection systems with long shelf-lives.



2003 The AT&T Genetics Computing Center, the largest resource of its kind in the world, opens with 3,000 processors to help scientists find disease-influencing genes

2003 Transplanting human cancer cells and tumors into the laboratory opossum is reported, marking the first time that human cancers grow and spread in another animal with an active immune system

Pat Moore Reflects on 50-Year Career at Texas Biomed

Perry "Pat" Moore is a self-described "morning person." In the 50 years since he started working at Texas Biomed, it was common to see him coming to work at 6 a.m. to get an early start on the day. Most recently, just before retirement, that meant arriving to separate different types of cholesterol to understand how these substances contribute to the start and progression of atherosclerosis.

At age 72, Moore retired from Texas Biomed in December after a fulfilling career that started at the old Callaghan Road facility in a dairy barn converted into rustic lab space. He has watched the "pieces and parts" of the Institute, located in a rural area that seemed far from San Antonio, evolve into today's modern campus.

Moore has been involved with many groundbreaking studies in organic chemistry and genetics. His name appears on scientific papers that Institute researchers have published during his tenure here. The Institute "has been my home for 50 years, and I love this place," said Moore, who retired as a senior research associate.

If he has any regret, it is only that he never met Institute founder Tom Slick, despite many opportunities to do so while his uncle, Bill Kane, worked as Slick's geologist.

A San Antonio native and graduate of Jefferson High School, Moore started at Texas Biomed in 1960. His first assignment was working for Leonard Axelrod, M.D., a pioneer in steroid biochemistry. Moore quickly became an important figure in the lab, developing various assays, or tests, used for measuring hormones and other substances.

Ever the hard worker, Moore also served in the Air Force Reserve, using his vacation time for training, and did a 13-month tour of duty in Vietnam in 1968–69. "I don't think I had a vacation for 10 years during that time," Moore recalled. Retiring as a lieutenant colonel, he remained with the Air Force Reserve for 25 years, including 13 years commanding the Air Evac squadron at what then was Kelly Air Force Base. The base was realigned in the late 1990s and was absorbed into neighboring Lackland Air Force Base on the city's South Side.

In 1969, when Moore returned from Vietnam, the latest trend in organic chemistry research was the use of radioimmunoassay, a method that used radioactive materials to measure hormones and other substances in a laboratory sample. The samples were run through a device known as a "scintillation counter" to make those measurements.

Axelrod sent Moore to California to meet with some of the leading experts on radioimmunoassay research methods. Moore brought back that knowledge and developed the methodology for use at the Institute. Among other publications, he and Axelrod published the Institute's first paper on radioimmunoassay research.

Moore's tenure at Texas Biomed gave him a front seat view of progressive advances in technology. "The first computers that we had here were hooked up to the old card-punch machines," he said of the devices that were cutting-edge technology in the 1970s. "We hooked the scintillation counter up to a card-punch machine. We could take the deck of cards and drop it in. We had an old 1120, one of the first IBMs, and we could do the calculations. When a team from the National Institutes of Health (NIH) came for a visit, they were definitely impressed and stated that we had a 'first.' The IBM 1120 was a big step forward," Moore said. "It was our first introduction to computers."

Around that same time, Moore also worked with the Institute's first hand-held calculator. "It was a Monroe, a big, brick-looking thing. It could add, subtract, multiply and divide, and it had one constant," he said, "and it cost $400. We had a service agreement on it, and the batteries cost $40 to replace."

2005 Frank F. Ledford Jr. Building opens for infectious disease research

2006 A second genetic linkage map is published, this time for the rhesus monkey. Monkey and baboon maps are used to find susceptibility genes for heart disease, osteoporosis, obesity, diabetes, and other disorders

Moore has been involved with many groundbreaking studies in organic chemistry and genetics.

After Axelrod left the Institute in 1973, Moore moved to the laboratory of P.N. Rao, Ph.D., in Texas Biomed's then-new Department of Organic Chemistry. He worked closely with Rao, a world-renowned organic chemist known for his steroid research, including the project for which Rao obtained his first NIH grant.

Much of the research involved developing assays to determine the levels of hormones such as estrogen, testosterone and dehydrotestosterone that people had in their systems. "I couldn't wait to get to work when I was developing all the assays," Moore said. "I'd set them up overnight and then come in and see if the antibodies were developing. Did it work? Is it specific or nonspecific? I couldn't wait to get to work, so I've been really fortunate."

Moore estimates that he and Rao published more than two dozen papers, and various patents resulted from their laboratory studies.

"We had a great collaboration for seven or eight years," said Rao, who retired from Texas Biomed in 2009, and from spinoff company Evestra™ in October 2010. "He was very cordial, but very tenacious. When he took a project on, he was very detail-oriented, very thorough. And when he did something, he was very meticulous."

In 1991, Moore moved to the Department of Genetics and spent much of his time there helping researchers advance knowledge of genetic factors related to cardiovascular disease. He worked closely with David Rainwater, Ph.D., on that cardiovascular research, including development of a gel used for separating lipoproteins, which was patented.

"Pat was the mainstay of the lab. I relied on him to produce the very high-quality data that we need for our genetic studies," Rainwater said. "These data have provided the foundation of our search for the genetic causes of heart disease."

Department of Genetics Chair Sarah Williams-Blangero added, "Pat Moore has been one of our most dedicated employees. He rapidly made the transition to genetic research, applying his extensive laboratory skills to our research programs. His work was of particular benefit to the two program projects based in the department that are focused on understanding the genetic risk factors for heart disease. Our knowledge of the genetic determinants of atherosclerosis in both the baboon model and in humans has been greatly enhanced because of Pat Moore's work."

In turn, the Institute has made it possible to provide a good life for Moore's family over the years. He and his wife, Becky, whom he met at Kelly Air Force Base when she was an Air Evac flight nurse, have three daughters and a son.

Moore put his work experience into perspective. "What we do here is mostly basic research," he said. "We give people the tools to do research. For a while, you have something that is the latest, greatest thing, and then someone develops something better. One thing leads to something else."

And that perspective applies to life outside of work, as well. Moore and his family moved 35 years ago to a five-acre tract in what used to be a rural area and is now part of northwestern San Antonio, specifically so they could have horses. They own six horses, including three Paso Finos and three Peruvian Paso Finos and, over the years, have shown three national champions. Now that he is retired, Moore hopes to get started on his dream of planting an orchard of olive trees on land he and his wife own in East Texas.

And, no doubt, he'll continue to start most days by 6 a.m. ▪

Pat Moore: yesterday and today.

2007 The discovery of *VNN1*, a gene that plays a major role in the regulation of human HDL (good) cholesterol levels, has important implications for heart disease prevention

2007 Earl Slick Center opens to house offices and laboratories of the Department of Genetics

YEAR IN REVIEW

Several major events during the year marked Texas Biomed's continuing success in expanding its scientific research. Highlights included the first meeting of a national advisory board; receiving funding to more than double the number of linked processors in the AT&T Genomics Computing Center; obtaining support for crucial anti-bioterrorism research; and conducting important outreach to the San Antonio and scientific communities.

ADVISORY BOARD MEETS

In April, Texas Biomed hosted the first meeting of its new national advisory board composed of individuals with outstanding scientific credentials. The board meets periodically to advise the Texas Biomed board of trustees and management on strategic issues. Chaired by Robert Mahley, M.D., Ph.D., president of the J. David Gladstone Institutes and professor of medicine and pathology at the University of California at San Francisco, the board issued a report in June that contained constructive suggestions for how the Institute might enhance its research and administrative infrastructure.

The first meeting of Texas Biomed's newly appointed national advisory board was held April 14–16 on the Institute campus. Left to right, are Kenneth Shine, M.D.; Richard Doughty, M.S., C.M.A.; Margaret Kripke, Ph.D.; Board Chair Robert Mahley, M.D., Ph.D.; Claude Bouchard, Ph.D.; and James LeDuc, Ph.D.

2008 The Department of Organic Chemistry, led for several decades by P.N. Rao, becomes Evestra™, a private pharmaceutical company to develop new contraceptives and treatments for breast cancer and other women's health issues

COMPUTER RANCH EXPANDS

From initial processors stored in a closet, the "computer ranch" at Texas Biomed has more than doubled in size, thanks to a $2 million federal grant that created new jobs to help speed the pace of discovery at the Institute's AT&T Genomics Computing Center. The grant from the 2009 American Recovery and Reinvestment Act was provided through the National Center for Research Resources, part of the National Institutes of Health (NIH). The grant funded the manufacture and installation of 5,004 more processors, bringing the total to 8,004.

The investment also provided a 20-fold increase in data storage capacity. "Our expansion will provide us with sufficient computational resources to handle the coming flood of whole human genome sequencing, which will become cost-effective in the next one to two years," said John Blangero, Ph.D., the computing center director. "This investment will keep the Institute at the forefront of the expanding genetic frontier."

Until recently, cost and technological limits meant that scientists had to focus any study on a limited sample of the genome. The field is advancing rapidly, though, and soon computational geneticists will be able to undertake complete genome sequencing of individual subjects in their studies.

Texas Biomed scientists are directing or supporting a number of studies that employ extended family pedigrees to track down the genetic basis of chronic complex diseases. These include the San Antonio Family Heart Study, begun in 1991, which has involved 1,400 Mexican Americans from 40 San Antonio-area families in the search for genes that influence heart disease, diabetes, and obesity. The genetic data collected in that study have given rise to several other studies, including studies now looking at the genetic determinants of brain structure and the genetic basis of psychiatric illnesses.

"This investment will keep the Institute at the forefront of the expanding genetic frontier."
– John Blangero, Ph.D.

TEXAS BIOMED SCIENTISTS ARE TESTING A VACCINE THAT IS BASED ON INSERTING GENETIC MATERIAL FROM THE DISEASE-CAUSING VIRUS OR PARASITE INTO A VEHICLE CALLED A VECTOR, WHICH THEN DELIVERS THE IMMUNOGENIC MATERIAL *directly to the immune system.*

TESTING VACCINES

Texas Biomed received a contract from the Dutch pharmaceutical firm Crucell to test a vaccine against the Ebola and Marburg viruses. The initial contract was for $456,216 with additional potential subcontracts to be signed worth another $2.2 million.

The immunogenicity and efficacy of this multivalent vaccine is being tested against five different strains of the viruses by the Institute's Department of Virology and Immunology. Texas Biomed's high-level biocontainment facilities will be used to study the vaccines. The work is part of a $30 million primary contract awarded to Crucell by the National Institute of Allergy and Infectious Diseases, part of the NIH. Jean L. Patterson, Ph.D., Texas Biomed scientist and department chair, leads the subcontract.

Crucell's vaccine is based on inserting genetic material from the disease-causing virus or parasite into a vehicle called a vector, which then delivers the immunogenic material directly to the immune system.

The Ebola and Marburg viruses are capable of causing hemorrhagic fever, a severe, often-fatal disease in humans characterized by high fever and massive internal bleeding resulting in death in 50 to 80 percent of all cases. Ebola and Marburg outbreaks occur periodically in tropical Africa, affecting both human and great ape populations. Since the Ebola virus was first recognized, approximately 2,200 cases, including more than 1,500 deaths, have been reported. To date, over 440 cases of Marburg have been reported with approximately 360 fatalities. Ebola and Marburg usually appear in sporadic outbreaks and spread within a healthcare setting.

2009 Publication of *The Baboon in Biomedical Research*

2009 A novel drug for treating hepatitis C is demonstrated to reduce the levels of virus in infected chimpanzees by 350-fold; the drug enters human clinical trials

L to R: City Manager Sheryl Sculley, Kenneth Trevett, Jean Patterson, Ph.D., Sarah Williams-Blangero, Ph.D.

OUTREACH TO SAN ANTONIO AND BEYOND

Texas Biomed President and CEO Kenneth P. Trevett strengthened collaborations during 2010 with other research organizations and enhanced the organization's visibility within the community. He serves on the executive committees of the United Way and BioMed SA, on the board of the Texas Research and Technology Foundation, and on the advisory boards of the Southwest Research Institute and South Texas Accelerated Research Therapeutics.

Texas Biomed is an active member of the Association of Independent Research Institutes (AIRI) and played a significant role at its 2010 annual meeting. Gregory M.L. Patterson, Ph.D., served on the AIRI Board of Directors and as a member of the annual meeting program planning committee. Texas Biomed attended the annual meeting in Washington, D.C., of Research!America, a nonpartisan alliance in support of public education and advocacy to make health research a higher national priority. The Institute is also a member of the Scientists' Center for Animal Welfare (SCAW). Chief Scientific Officer John L. VandeBerg, Ph.D., served as a member of the SCAW board of trustees.

Trevett and VandeBerg hosted visits by U.S. Representative Charles Gonzalez, City Councilman Ray Lopez, and San Antonio City Manager Sheryl Sculley. These visitors listened to presentations about the Institute's programs and toured the campus.

Texas Biomed opened its doors during the first three months of 2010 to 10 classes of high school seniors when the Institute's Forum hosted its annual tours for advanced biology and chemistry students. The students learned about the exciting possibilities of careers in science by viewing a video overview of the Institute, visiting the AT&T Genomics Computer Center and the Southwest National Primate Research Center, and speaking with Texas Biomed scientists working on hepatitis C, heart disease, diabetes, obesity, and other health problems. Texas Biomed also hosted a tour of 25 sales and marketing representatives of Takeda Pharmaceutical Company of Osaka, Japan, who were particularly interested in genetics and virology.

In addition, John Kerr and VandeBerg, both for many years affiliated with Texas Biomed, were designated Health Care Heroes by the *San Antonio Business Journal*. The annual award honors leaders in the city's health care and biomedical fields. Kerr, an investor who heads Moorman Kerr Interests, was recognized as a health care advocate. He is a Texas Biomed trustee and served as its board chair from 1998 until 2007 and as its interim president from 2006 to 2008. He was crucial in establishing the Institute's spin-off company Evestra™. VandeBerg, Texas Biomed's chief scientific officer and director of the Southwest National Primate Research Center, was recognized for his work in biomedical research. He joined the Institute in 1980 and started its Department of Genetics in 1982. His research interests include heart disease, Chagas disease, cancer, and tuberculosis.

MOVING ON

In 2010, two long-time Texas Biomed staffers, representing 93 years of service, retired. Pat Moore (see profile, page 26), retired after 50 years, most recently working in the Department of Genetics. Leroy Wertz, 80, who had been at Texas Biomed in various positions since 1967, also retired to spend time with his family and hone his fishing skills.

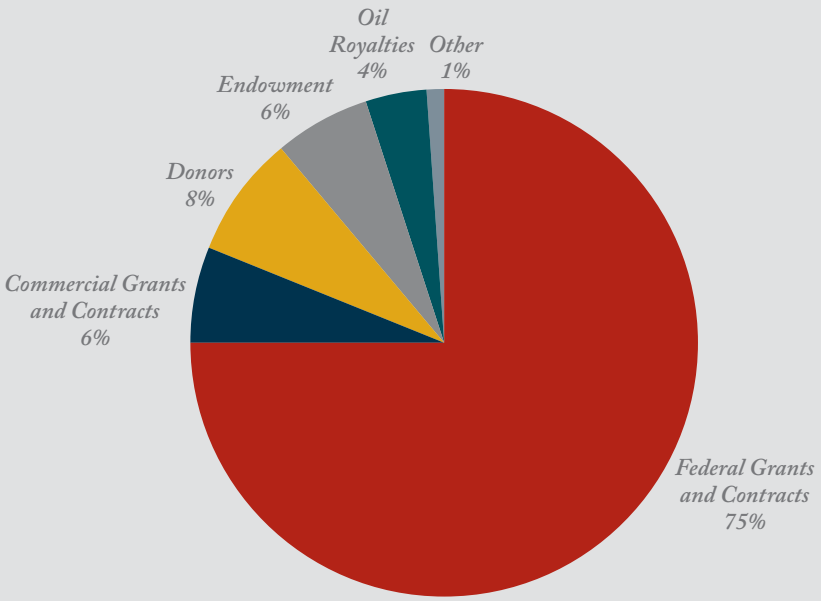
A building wing on the Institute campus was dedicated in recognition of retiree Pemmaraju N. Rao, Ph.D., and his status as a highly valued colleague, an internationally respected scientist, and a true change agent in the field of women's health.

LOOKING AHEAD

Texas Biomed's leadership has enabled the organization to thrive during an era of limited funding from the NIH. The Institute continues to study and look for ways to attract top-notch scientists, improve its physical plant, and create optimal conditions in which to conduct first-rate science. As the Texas Biomedical Research Institute moves forward into 2011 and beyond, it will continue to identify ways to build on its record of research accomplishments and to enhance its ability to advance the health of people everywhere.

2011 The Southwest Foundation for Biomedical Research is renamed the Texas Biomedical Research Institute

FINANCIALS



SOURCES OF FUNDING IN 2010

Financial Performance in 2010

In 2010, Texas Biomed experienced a more challenging financial environment than in the recent past but was able to take advantage of some opportunities. The Southwest National Primate Research Center received grant supplements to facilitate extra studies and obtained funding for cage renovation. Donor-funded research remained strong. Staff members worked diligently to respond to some unusual one-time financial demands, such as reduced federal reimbursement for employee fringe benefits. These efforts to bring in new revenue and contain costs will continue into 2011 to ensure that Texas Biomed retains a healthy financial performance.

Ernst & Young's audit of Texas Biomed's operations for the fiscal year ending December 31, 2010 is expected to be completed in late spring 2011. As in prior years, no material adjustments are expected. Because of the audit schedule, the figures displayed here have not been independently audited. The final audit for 2010 will be available in the summer of 2011. Copies may be obtained through Texas Biomed's Vice President for Finance and Administration and Chief Financial Officer, Jeannie Frazier (210-258-9404).

In 2010, three-quarters of Texas Biomed's funding came through highly competitive, peer-reviewed research grants and contracts from the National Institutes of Health (NIH) and other federal agencies. The organization's scientific expertise and extraordinary research resources were instrumental in maintaining commercial contracts with biotechnology firms and pharmaceutical companies at the same level as in 2009, approximately 6 percent of the Institute's operating revenue.

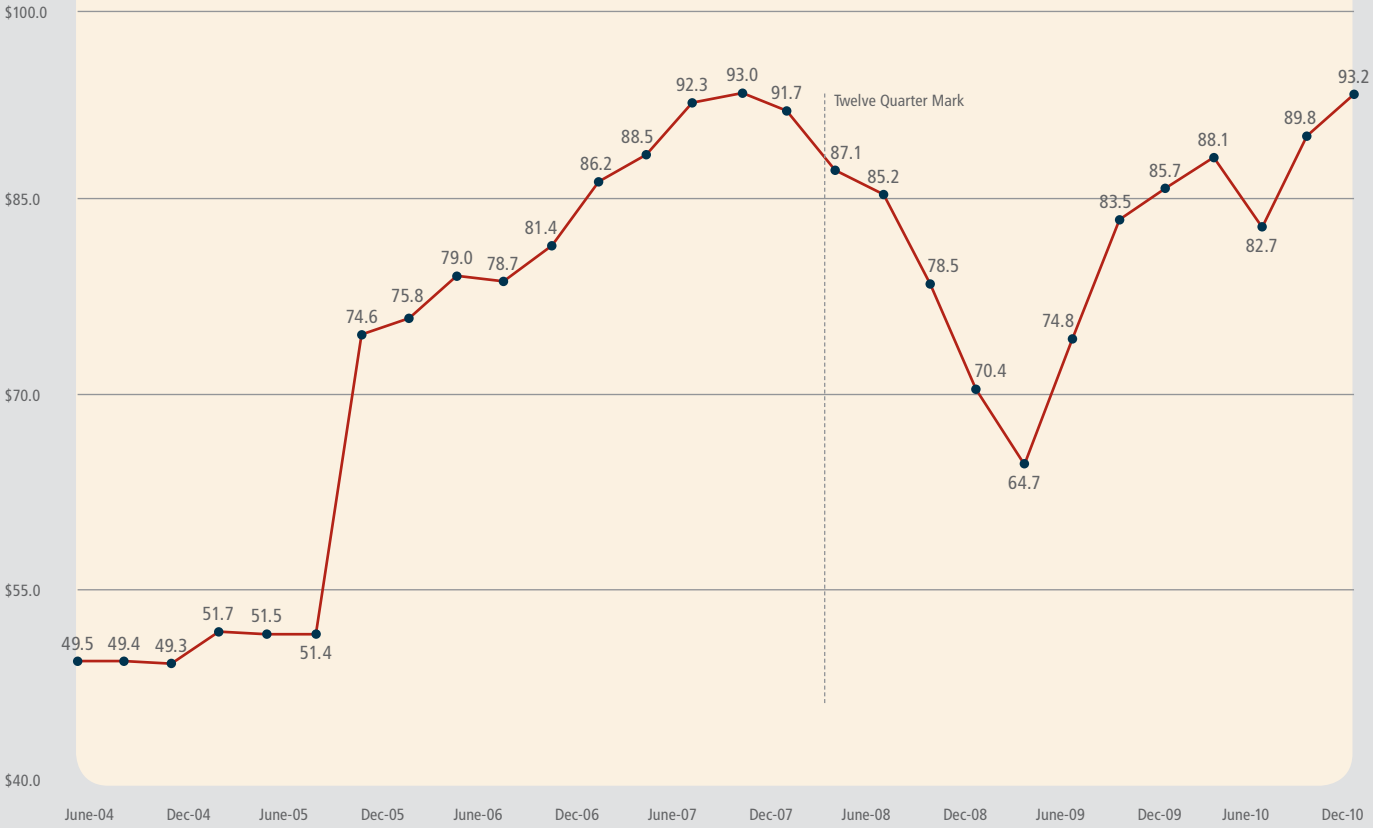
As the accompanying chart shows, philanthropy continues to play the vital role in Texas Biomed research that Tom Slick envisioned when he founded the organization in 1941. Altogether, philanthropic sources provided nearly 18 percent of the Institute's funding, making Texas Biomed and its donors true partners in scientific progress.

Financial support from donors enables Texas Biomed to attract and retain the world's top scientists, to provide researchers with state-of-the-art technology and laboratories needed to advance their work, and to launch innovative pilot projects to explore new ways to understand and eliminate diseases. Private gifts also leverage significant additional investment by allowing investigators to compete successfully for prestigious foundation grants that do not cover the full cost of research. Important Texas Biomed sources of philanthropic funding include the Golden Circle, the Founder's Council, the Forum, and annual contributions from Argyle members.

In addition to these current contributions, Texas Biomed research is supported through annual earnings on previous philanthropic gifts to the Institute's endowment, accounting for 6 percent of revenue. At the end of fiscal year 2010, Texas Biomed's endowment was valued at approximately $93.2 million, bringing the endowment to a new high, recovering from the economic downturn in 2008 and 2009. The Investment Committee of the Board of Trustees was instrumental in achieving this result.

In 2010, Texas Biomed also received significant royalties on oil and gas properties that had previously been contributed by donors. This revenue was critical to Institute programs, making up 4 percent of total revenue at a time when other sources were under stress. With continuing prudent financial management, a strong donor base, and the rebound in the endowment value, Texas Biomed looks forward to a strong financial forecast in the coming years. ■

TEXAS BIOMED VALUE OF ENDOWMENT – IN MILLIONS OF DOLLARS



2010 NEW GRANTS AND CONTRACTS AWARDED

In addition to the competitive grants and contracts that fund Texas Biomed's research, a significant portion of its nearly $55 million annual budget is met through the financial contributions of foundations, corporations and individuals.

FEDERAL RESEARCH GRANTS AND CONTRACTS	PRINCIPAL INVESTIGATOR	LENGTH	TOTAL AMOUNT TO TEXAS BIOMED
National Institutes of Health (NIH) *Antigen Presentation by Epithelial Stem Cells to Promote Life Long Immunity*	Dr. Marie-Claire Gauduin	4 yrs	**$3,165,335**
NIH *Large-Scale Methylation Profiling in Metabolic Syndrome Phenotypes*	Dr. Melanie Carless	5 yrs	**$2,593,155**
NIH *Identification of Novel MicroRNAs Associated with Brain Structure and Function*	Dr. Melanie Carless	5 yrs	**$2,535,244**
NIH *Integrative Genomics of Vanin Gene Expression in Relation to CVD Risk*	Dr. Eric Moses	5 yrs	**$2,034,282**
NIH/University of Texas Health Science Center San Antonio *Programming, Maternal Obesity and Overnutrition*	Dr. Patrice Frost	5 yrs	**$1,907,630**
NIH *The Southwest National Primate Research Center - Consortium and Translational Activities Supplement*	Mr. Kenneth Trevett	8 mos	**$1,080,295**
NIH *Identification of Pre-eclampsia Susceptibility Genes (ARRA, 1502) Supplement*	Dr. Eric Moses	2 yrs	**$735,903**
Department of Defense/Aduro BioTech *Molecular Switch Vaccine for Biodefense, Cancer, and Infectious Disease*	Dr. Robert E. Lanford	1 yr	**$643,707**
NIH/Sepulveda Research Corporation *Mechanisms of Race-Based Differences in Factor VIII Immunogenicity in Hemophilia (ARRA RC2)*	Dr. Shelley Cole	2 yrs	**$566,149**
NIH *SNPRC-FY10 Supplement: Maintenance of NCRR-owned Chimpanzees Supplement*	Mr. Kenneth Trevett	1 yr	**$547,374**
NIH/Crucell *Advanced Development of Multivalent Filovirus (Ebola and Marburg) Hemorrhagic Fever Vaccine*	Dr. Jean L. Patterson	2 yrs	**$391,434**
Defense Threat Reduction Agency/Evolva SA *In Vitro and In Vivo Evaluations of Drug Candidates*	Dr. Ricardo Carrion Jr.	8 mos	**$300,000**
NIH/SIGA Technologies *Antiviral Drugs for Lassa Fever Virus Supplement*	Dr. Ricardo Carrion Jr.	1 yr	**$300,000**
NIH/Johns Hopkins University *Family-based Genome-wide Methylation Scan in Schizophrenia (ARRA RC2)*	Dr. Laura Almasy	2 yrs	**$298,626**
NIH/Stanford Research Institute *Broad-spectrum Agents for Prophylaxis and Treatment Against Bacterial Threat (New Task Orders) Supplement*	Dr. Ricardo Carrion Jr.	8 mos	**$237,035**
NIH/Wright State University *Genetic, Somatic, and Maturational Influences on Pediatric Skeletal Health*	Dr. John Blangero	2 yrs	**$213,930**
National Institutes of Health *Mapping Drug Resistance Genes in Plasmodium Falciparum(ARRA) Supplement*	Dr. Timothy J. C. Anderson	1 yr	**$207,092**

U.S. Army *Feasibility of Lower Body Negative Pressure as a Hypovolemia Model in Baboons*	Dr. Robert E. Shade	1 yr	**$191,112**
Defense Threat Reduction Agency/Peregrine Pharmaceuticals, Inc. *Anti-phosphatidylserine Antibodies as Therapeutics for Hemorrhagic Fever Virus Infections Supplement*	Dr. Ricardo Carrion Jr.	1 yr	**$166,387**
Defense Threat Reduction Agency/Peregrine Pharmaceuticals, Inc. *Anti-phosphatidylserine Antibodies as Therapeutics for Hemorrhagic Fever Virus Infections Supplement*	Dr. Ricardo Carrion Jr.	1 yr	**$166,387**
NIH/University of California - San Francisco *A Rapid Pan-Viral Microarray Diagnostic for Category A-C Biodefense Pathogens*	Dr. Jean L. Patterson	5 yrs	**$107,417**
NIH/Seattle Biomedical Research Institute *Factors Influencing Oral Transmission of SIV Supplement*	Dr. Luis D. Giavedoni	1 yr	**$101,226**
NIH *The Southwest National Primate Research Center - Animal Records Management System Supplement*	Mr. Kenneth Trevett	9 mos	**$100,591**
NIH/Trinity University *Macrostructural and Microstructural Analysis of the Primate Corpus Callosum*	Dr. Karen Rice	3 yrs	**$61,157**
NIH/University of Texas Health Science Center San Antonio *Developmental Programming of Post-Natal Pancreatic Islet Function (Co-PI-Anthony Comuzzie)*	Dr. Laura A. Cox	2 yrs	**$58,471**
U.S. Department of Agriculture/Guild Associates, Inc. *Phage-mediated Detection of Bacillus Anthracis on Deliberately Contaminated Fresh Foods*	Dr. Ricardo Carrion Jr.	1 yr	**$54,867**
U.S. Army *Genotyping and Statistical Analysis of Thai Pediatric Clinical Samples*	Dr. Sarah Williams-Blangero	4 mos	**$52,360**
NIH/Stanford Research Institute *Broad-spectrum Agents for Prophylaxis and Treatment Against Bacterial Threat (New Task Order) Supplement*	Dr. Ricardo Carrion Jr.	2 mos	**$47,407**
NIH/University of Texas San Antonio *Effects of Aging on Evoked Otoacoustic Emissions in the Common Marmoset*	Dr. Kathleen M. Brasky	6 mos	**$38,210**
NIH *A Neurobehavioral Family Study of Schizophrenia (ARRA , 4126) Supplement*	Dr. Laura Almasy	2 yrs	**$27,710**
NIH/University of Texas San Antonio *Effects of Aging on Evoked Otoacoustic Emissions in the Common Marmoset*	Dr. Kathleen M. Brasky	6 mos	**$24,227**
NIH/Trinity University *Development of Hemispheric Specialization in Capuchin Monkeys*	Dr. Karen Rice	1 yr	**$18,803**
NIH/SIGA Technologies *Antiviral Drugs for Lassa Fever Virus*	Dr. Ricardo Carrion Jr.	2 mos	**$13,359**
NIH *Anti-filovirus Compound Testing*	Dr. Jean L. Patterson	1 yr	**$12,665**
NIH/Trinity University *Development of Hemispheric Specialization in Capuchin Monkeys*	Dr. Karen Rice	1 yr	**$11,514**
NIH *Ebola Virus Drug Testing*	Dr. Jean L. Patterson	6 mos	**$6,333**
Defense Threat Reduction Agency/Peregrine Pharmaceuticals, Inc. *Anti-phosphatidylserine Antibodies as Therapeutics for Hemorrhagic Fever Virus Infections*	Dr. Ricardo Carrion Jr.	1 yr	**$2,736**
NIH/Stanford Research Institute *Broad-spectrum Agents for Prophylaxis and Treatment Against Bacterial Threat Supplement*	Dr. Ricardo Carrion Jr.	9 mos	**$2,356**
TOTAL FEDERAL RESEARCH GRANTS AND CONTRACTS			**$18,856,099**

ACADEMIC RESEARCH GRANTS AND CONTRACTS

Baylor Research Institute *Reversal of STZ-Induced Diabetes Using Ultrasound Destruction of Microbubbles for the Delivery of Genes to the Baboon Pancreas*	Dr. Anthony Comuzzie	1 yr	**$129,352**
University of Texas Health Science Center San Antonio *A Nonhuman Primate Model of Teenage Pregnancy*	Dr. Laura A. Cox	11 mos	**$49,924**
University of Heidelberg *PK of HBV Entry Inhibitor Peptide*	Dr. Robert E. Lanford	6 mos	**$41,733**
University of Oxford *ART Resistance Project – WorldWide Antimalarial Resistance Network (WWARN)*	Dr. Timothy J. C. Anderson	1 yr	**$26,966**
Wake Forest University *Personnel Funding*	Dr. Anthony Comuzzie	6 mos	**$14,782**
Barshop Institute for Longevity and Aging Studies *Development of a NHP Model of Age-related Functional Decline Common Marmoset*	Dr. Kathleen M. Brasky	1 yr	**$10,558**
TOTAL ACADEMIC RESEARCH GRANTS AND CONTRACTS			**$273,315**

CONSTRUCTION AND RENOVATION GRANTS

National Institutes of Health *High Performance Computing System for Human Genomics (ARRA S10)*	Dr. John Blangero	1 yr	**$2,068,328**
National Institutes of Health *Renovation of SNPRC Chimpanzee Housing (Bldg. 112) Supplement*	Mr. Kenneth Trevett	1 yr	**$1,000,000**
National Institutes of Health *Maintenance of SNPRC Chimpanzee Cages Supplement*	Mr. Kenneth Trevett	1 yr	**$499,995**
National Institutes of Health *Nonhuman Primate Caging for the SNPRC*	Dr. Larry B. Cummins	1 yr	**$474,534**
National Institutes of Health *Improvement of Nonhuman Primate Group Housing*	Dr. John L. VandeBerg	1 yr	**$466,835**
TOTAL CONSTRUCTION AND RENOVATION GRANTS			**$4,509,692**

PHILANTHROPIC RESEARCH GRANTS

G. Harold and Leila Y. Mathers Charitable Foundation *Research in Brains Function*	Dr. Derek Denton, Dr. Robert E. Shade	3 yrs	**$900,000**
Max & Minnie Tomerlin Voelcker Fund *The Effect of Genes on Osteoarthritis Risk*	Dr. Lorena M. Havill	3 yrs	**$450,000**
Robert J. Kleberg Jr. & Helen C. Kleberg Foundation *Monodelphis Research Program*	Dr. John L. VandeBerg	1 yr	**$408,724**
Robert J. Kleberg Jr. & Helen C. Kleberg Foundation *Chagas Disease: An Emerging Fatal Disease in Texas*	Dr. John L. VandeBerg	1 yr	**$345,751**
Hearst Foundations *Liver Cancer Model*	Dr. Robert E. Lanford	1 yr	**$150,000**
Cowles Memorial Trust *Cowles Fellowship*	J. Cox-V&I, Amungongo-Genetics Dr. Gregory M. L. Patterson	1 yr	**$104,496**
Morrison Trust *Genetic Determinants of Lipidomic Profiles: Novel High-Dimensional Bio-Markers for Cardiovascular Disease*	Dr. John Blangero	1 yr	**$59,807**
National Alliance for Research on Schizophrenia and Depression *Genome-wide Transcriptional Profiling for the Identification of Genes Influencing Bipolar I Disorder*	Dr. Melanie Carless	2 yrs	**$59,500**

Max & Minnie Tomerlin Voelcker Fund *Investigation of a Potential Therapeutic Molecule Targeted at miRNA Induced Gene Regulation*	Dr. Melanie Carless	1 yr	**$40,000**
Max & Minnie Tomerlin Voelcker Fund *Effect of Insulin on Hypothalamic Function Measured with fMRI*	Dr. Venkata Saroja Voruganti	1 yr	**$39,708**
San Antonio Area Foundation *Llama Single Domain Antibodies as Novel Broad Spectrum Influenza Inhibitor*	Dr. Andrew Hayhurst	1 yr	**$37,678**
Southwest Foundation Forum *Mosquito Saliva Modulators of Dengue Virus Pathogenesis*	Dr. Jonathan Cox	1 yr	**$35,000**
Southwest Foundation Forum *In Utero Exposure of bis(2-ethylhexyl)phthalate (DEHP) and Predisposition to Risk of Breast Cancer*	Dr. Hareesh B. Nair	1 yr	**$35,000**
Southwest Foundation Forum *Exploring the Host Specificity of Malaria Parasites*	Dr. Ian H. Cheeseman	1 yr	**$35,000**
Southwest Foundation Forum *The Role of IL28B in GBV-B Infections: A Model for Hepatitis C Virus*	Dr. Robert E. Lanford	1 yr	**$35,000**
Southwest Foundation Forum *Human Exome Sequencing for a Complex Disease: A Pilot Project*	Dr. Joanne E. Curran	1 yr	**$34,750**
Max & Minnie Tomerlin Voelcker Fund *Knee Morphological Variation and Osteoarthritis Risk*	Dr. Lorena M. Havill	1 yr	**$30,666**
Jean Marmion *Genetic Determinants of Multiple Sclerosis*	Dr. John Blangero	1 yr	**$30,000**
San Antonio Area Foundation *Search for Novel Genetic Variants Influencing Birth Weight in Mexican Americans*	Dr. Sobha Puppala	1 yr	**$28,148**
Joe and Jessie Crump Foundation *Addressing a Critical Need in Liver Cancer - Developing an Animal Model to Advance New Treatments*	Dr. Robert E. Lanford	1 yr	**$25,000**
Cowden Charitable Foundation *Assessing Transcriptional Profiles of the Decidua in Preeclamptic and Non-preeclamptic Pregnancies*	Dr. Matthew Johnson	1 yr	**$10,000**
Society for Women's Health Research *Determination of Sex Differences, Heritability, and Sex-specific Genetic Effects on Knee Arthritis in a Non-human Primate Model*	Dr. Lorena M. Havill	1 yr	**$5,191**
TOTAL PHILANTHROPIC RESEARCH GRANTS			**$2,899,419**

TOTAL FEDERAL RESEARCH GRANTS AND CONTRACTS	**$18,856,099**
TOTAL ACADEMIC RESEARCH GRANTS AND CONTRACTS	**$273,315**
TOTAL CONSTRUCTION AND RENOVATION GRANTS	**$4,509,692**
TOTAL PHILANTHROPIC RESEARCH GRANTS	**$2,899,419**
TOTAL COMMERCIAL RESEARCH GRANTS AND CONTRACTS	**$1,399,006**
TOTAL GRANTS AND CONTRACTS AWARDED TO TEXAS BIOMED IN 2010	**$27,937,531**

WHY SUPPORT TEXAS BIOMED?

It's a fact of life that grant and contract income are insufficient for Texas Biomedical Research Institute to achieve its important mission. Since the organization's founding, giving has played the role of a powerful enabler of progress, making philanthropy one of the cornerstones of the success of this institution. Here are a few examples of how financial support can make all the difference to Texas Biomed scientists:

LEVERAGE. On average, for every $1 contributed, Texas Biomed scientists gain another $12 in competitive grant support, making Institute researchers among the most productive anywhere.

CRITICAL PROGRAMS AND PROJECTS. Research grant and contract funding is the primary funding source of Texas Biomed, totaling about 75 percent of revenue. The remaining support must come from endowment income and current donations.

KEY RESEARCH VENTURES. Donations fund recruitment of key scientists and pilot studies, each representing strategies that encourage bold initiatives by new and existing faculty.

EXTRAORDINARY RESOURCES. Texas Biomed has a history of developing rare, but highly important, scientific resources. The AT&T Genomics Computing Center and the BSL-4 maximum containment laboratory are examples of such resources funded by donations.

TECHNOLOGY. Modern research is made more productive by the latest in technology. The higher cost of the newest technology usually requires philanthropic support.

Make the difference. Unlike some research organizations, Texas Biomed does not have patient or tuition revenue to fund capital and operating expenses. Donations are critical for funding new programs and capital purchases at Texas Biomed.

Texas Biomed excels as a center for scientific research because of the philanthropic support of donors. Will you consider becoming a partner in progress? In addition to donor opportunities highlighted in this report—such as the Golden Circle, The Argyle, the Founder's Council, and the Forum—the Institute offers opportunities for legacy gifts, capital and endowment gifts, and memorial and honor gifts.

For more information about any of these giving opportunities, please contact Texas Biomed's Vice President for Institutional Advancement Corbett Christie at 210-258-9870 or cchristie@TxBiomed.org, or visit the Web site at www.TxBiomed.org and click on "Support Texas Biomed."

FORUM

Out with the old, in with the new! The Southwest Foundation for Biomedical Research's transformation into the Texas Biomedical Research Institute is bringing about a change of name for the Southwest Foundation Forum as well. Benefitting from the guidance of a collection of past presidents, the Forum has begun the process of renaming and rebranding itself to reflect its tie to the newly christened Texas Biomed. The Forum will keep its members abreast of the group's progress on the name change and hopes to have an announcement about its new name in the near future. Even though the Forum's name will change, its mission to support Texas Biomed through community relations, volunteer services, and fund-raising will continue.

The Forum celebrated its 40th anniversary in 2010, and it was another busy year. The annual spring lecture luncheon featured Texas Biomed's John Blangero, Ph.D., speaking on "What Our Genes Tell Us." Always engaging and entertaining, Blangero gave an interesting and informative talk about the progress in the area of human genome sequencing and the practical applications of his work with genes.

The highlight of the social season, the 2010 gala, Esplendores de la Culturas de Mexico, was another sellout success. It was a beautiful evening at the Argyle, featuring delicious food, fabulous music, and great conversation with friends. The gala also raised $160,000 for seed money grants awarded to Texas Biomed scientists. Since 1999, scientists who have received seed monies from the Forum have applied to federal and private organizations for further funding. They have been awarded over $23 million in federal grants as a result of the Forum's seed money. You can learn more about the grant recipients on page 36.

In May, President Terry Gouger passed the gavel at the annual board luncheon. Terry was a dynamic leader who brought fresh ideas to the Forum, and our members are very grateful for her service.

Forum members returned from the summer to a busy fall schedule. The fall kicked off with a beautiful committee breakfast to announce the 2011 gala—A Shanghai Affair. Thanks to the gracious hospitality of Texas Biomed President Kenneth Trevett and Vice President for Institutional Advancement Corbett Christie, the Forum board of trustees held its October board meeting at the Institute. Following the meeting, board members were joined by other Forum members for the second annual Insider's Tour. Kenneth Trevett welcomed the Forum members and provided an update about the exciting advances being made at Texas Biomed. Following the tour, Forum members had the opportunity to dine with Institute scientists to learn more about their innovative work.

The Forum is grateful to its longtime friend and supporter, Julian Gold, for expanding its traditional "Ladies' Night Out" to an all-day "Shop 'Til You Drop" event, from which Julian Gold donated to the Forum 10 percent of the day's sales—a total of $3,000.

The fall lecture luncheon drew the largest crowd in Forum history. Peter Ravdin, M.D., a prominent breast cancer expert, spoke to Forum members about the latest advances in breast cancer detection, diagnosis, and treatment.

Karen Lee Zachry,
Forum President

December is usually a quiet month for the Forum while members turn to time with family and friends. This year, though, the Forum hosted a holiday coffee, giving members a chance to mix and mingle and help get everyone in the holiday spirit.

The spring will bring the Forum's two pieces of its educational mission. Every spring the Forum hosts tours of high-school juniors and seniors so that local students can learn more about the innovative work being done at Texas Biomed and have the opportunity to interact with Institute scientists.

The Forum will also award science education grants up to $7,000 each year to local teachers to support supplemental science learning or programs. Given jointly by the Forum and the V.H. McNutt Memorial Foundation, the awards offer an opportunity for Bexar County area teachers to apply for grants to benefit their school's science programs. The goal is to assist in the purchase of teaching materials for creative, hands-on projects. The L.D. Ormsby Foundation also supports the science education awards by funding stipends to applicants. In total, $20,000 in awards will be granted this spring, which will mark the 18th anniversary of the awards.

It has been a fabulous 40 years, and the Forum looks to the future with great enthusiasm.

IN ITS 40TH YEAR, THE FORUM REMAINED TRUE TO ITS MISSION

Educating its members, members of the community, and students.

Raising funds to directly support that important and life-saving work.

Enjoying the camaraderie of working together to make a difference.

FOUNDER'S COUNCIL

The Founder's Council encourages today's young leaders to leave a legacy inspired by Texas Biomed founder, Tom Slick. In establishing the Institute, Slick envisioned "a great center for scientific progress through biomedical research." Today, the young men and women of the Founder's Council, whose ages of 25 to 46 reflect Slick's visionary initiative to found the Institute at age 25, provide financial support to scientific research at Texas Biomed.

To advance the awareness of Texas Biomed and its research efforts, three lecture luncheons were hosted featuring Institute scientists as guest speakers. The signature event, "Dining and Discourse," allowed members to have lively discussions over dinner with the Institute's leading researchers. Founder's Council members also enjoyed informal social mixers to network and meet colleagues. Texas Biomed is stronger because of the visionary young leadership fostered through this energetic and enthusiastic group of supporters.

Members' annual donations of $135 per individual, $195 per couple, and $500 or $1,000 at the higher levels of giving fund competitive grants to Institute researchers for the purchase of key pieces of scientific equipment.

In 2010 more than $28,000 in grants were awarded to the following recipients:

- Tim Anderson, Ph.D., for an instrument used to sort infected blood cells of those infected with malaria.
- Cassondra Bauer, D.V.M., for a warming system used during surgery.
- Melanie Carless, Ph.D., for a device to help study genetic pathways associated with acute myeloid leukemia.
- Melissa de la Garza, D.V.M., for a machine to perform regular echocardiograms on nonhuman primates.
- John Garza, Ph.D., for a high-performance computer workstation to study potential agents of bioterrorism.
- Luis Giavedoni, Ph.D., for an instrument to document the steps in construction and characterization of novel vaccines against HIV and other work in vaccine development.
- Ana Cristina Leandro, Ph.D., for a special microscope that allows detailed evaluations critical to the success of research to develop a new vaccine for tuberculosis.
- Javier Mota, Ph.D., for a device to allow the microinjection of mosquitoes with dengue virus to study disease transmission.
- Jennifer Neary, Ph.D., for a workstation to be used in investigations of a variety of mental illnesses.

At the holiday party, Founder's Council President John W. Feik Jr. presented an additional check in the amount of $26,500 to Kenneth P. Trevett, president of Texas Biomed. These monies signify donations by members in the Explorer and Adventurer categories.

THE ARGYLE

For more than 50 years, The Argyle, a stately Southern mansion and unique private club, has been devoted exclusively to the support of the life-saving efforts of the Texas Biomedical Research Institute. Founded in the 1950s and located about three and a half miles from downtown San Antonio, the 1,400-member club serves as a bond between one of the country's leading independent research institutions and those who give time and money to support it.

Originally built in 1854 as the headquarters of a horse ranch which extended from downtown San Antonio to the town of Boerne, some 30 miles distant, the mansion was an outpost of Texas hospitality. Through a succession of owners, it epitomized the pleasant ways and good living of the storied South. It was purchased in 1884 by two Scotsmen, who added the third floor and opened a hotel. They named it The Argyle because the surrounding rolling hills reminded them of their native Scotland. The hotel was legendary throughout the world for its fine table and illustrious guests.

In 1954, Dr. Harold Vagtborg, the Institute's first president, and Betty Slick Moorman, sister of founder Tom Slick Jr., discussed ways to interest more people in the Institute's work and to create a broader and more permanent base of support for its research programs. Betty Moorman suggested the establishment of a high-caliber club, the members of which would make an annual contribution to Texas Biomed, and thus The Argyle of today was formed.

Restored in 1956, The Argyle stands as a symbol, both of its rich past and of progress toward a healthier tomorrow for the global community. Formed by persons deeply interested in the Texas Biomedical Research Institute, the club is a meeting place for men and women of science and civic leaders who have dedicated personal resources for the advancement of the Institute.

The Argyle is the scene of many grand occasions such as weddings and family events, as well as meetings of numerous Texas Biomed support groups and trustees. One of the most popular initiatives is a series of "Fireside Chats" held for Argyle members and guests. This program allows members to meet with Institute scientists and others in a social setting to enjoy a conversational exchange of ideas.

Five of these popular "chats" were hosted in 2010. Members were treated to a talk in March by Catherine Nixon Cooke, author of the book *Tom Slick, Mystery Hunter.* In April, Melanie Carless, Ph.D., discussed recent developments in genetics in a talk on "Why Your DNA Isn't Your Destiny." Jean L. Patterson, Ph.D., chair of Texas Biomed's Department of Virology and Immunology, spoke in September on "Life in the Hot Zone " and described research in the biocontainment laboratories. In October, Nathan Wolfe, Ph.D., of Stanford University and director of the Global Viral Forecasting Initiative, spoke about efforts to track infectious diseases worldwide. The year was capped by a November talk by Texas Biomed's Chief Scientific Officer John L. VandeBerg, Ph.D., on "The Bold Future of Biomedical Research."

Argyle members continue to live up to their vision of honoring the past while at the same time changing the future through their philanthropic investments in Texas Biomed.

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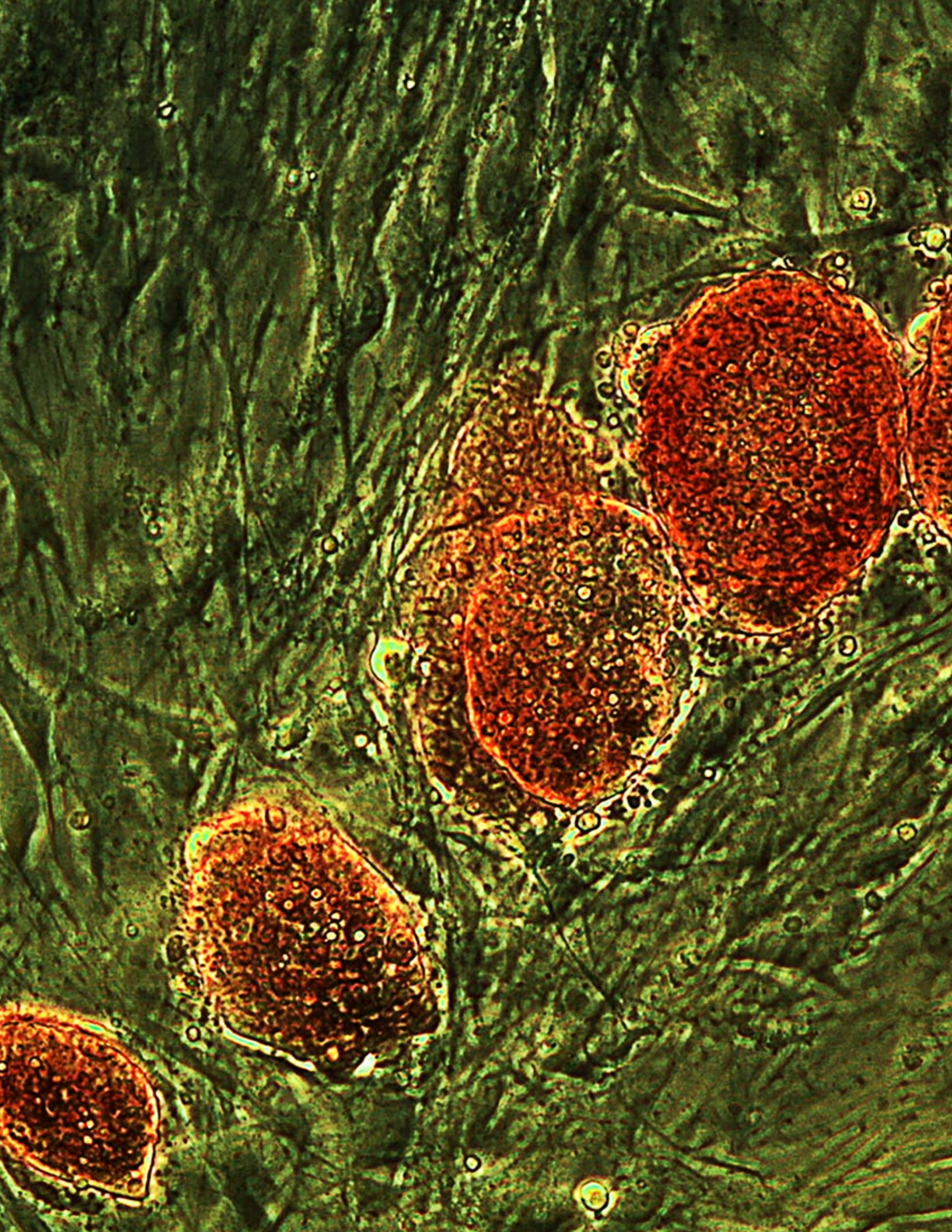
This image shows stem cell clusters with red staining. Researchers at Texas Biomed and the Southwest National Primate Research Center are growing embryonic stem cells under conditions that cause them to differentiate into blood cells to treat cardiovascular disease.



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Texas Biomedical Research Institute, PO Box 760549, San Antonio, TX 78245

210-258-9400

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