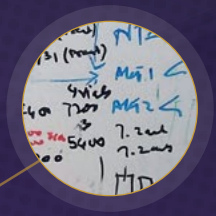
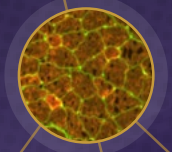
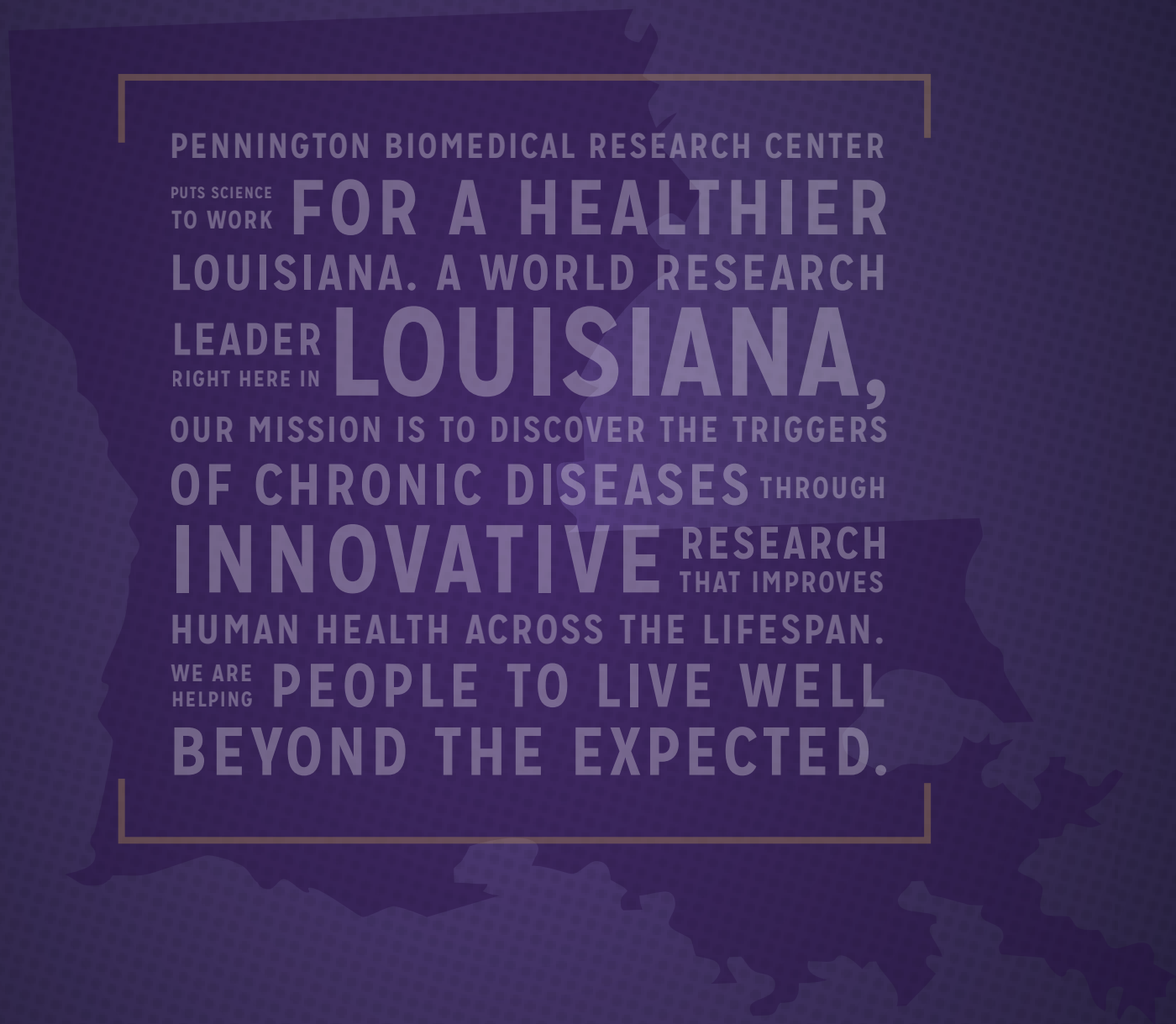




PENNINGTON BIOMEDICAL RESEARCH CENTER

LSU

2012-2013 SCIENTIFIC REPORT


PENNINGTON BIOMEDICAL RESEARCH CENTER
PUTS SCIENCE TO WORK FOR A HEALTHIER LOUISIANA. A WORLD RESEARCH LEADER RIGHT HERE IN LOUISIANA,
OUR MISSION IS TO DISCOVER THE TRIGGERS OF CHRONIC DISEASES THROUGH INNOVATIVE RESEARCH THAT IMPROVES HUMAN HEALTH ACROSS THE LIFESPAN.
WE ARE HELPING PEOPLE TO LIVE WELL BEYOND THE EXPECTED.

CONTENTS

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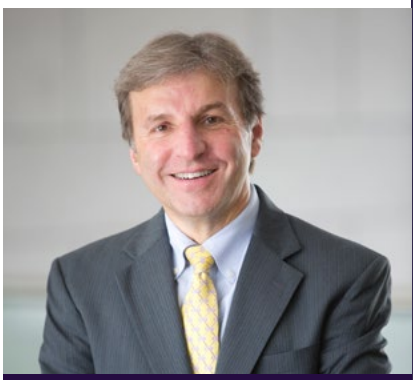
FROM THE EXECUTIVE DIRECTOR

When C.B. "Doc" Pennington and his wife Irene W. Pennington bestowed on Louisiana State University a $125 million gift to create "the biggest and best nutrition research center in the country" in 1988, who could have imagined what would become of their generosity? Their gift created a stunning 222-acre campus in Baton Rouge that today houses 688,000 square-feet of state-of-the-art laboratories, clinics, conference facilities, and office space. In fulfillment of Doc's wishes, Pennington Biomedical has become one of the foremost academic nutritional research institutions in the world.



pbrc.edu/willcefalu
@willcefalu

In 2013 Pennington Biomedical celebrated its 25th anniversary. Doc and Irene's vision has enabled scientific discoveries that have guided advances in nutrition, activity and the way we view aging and chronic diseases. This research has furthered treatments for diseases from diabetes to obesity. Today, we are putting science to work for a healthier Louisiana – and our research is recognized around the globe.

Our science yields results. *U.S. News & World Report* selected our DASH Diet as the #1 best diet in America in 2014 - our fourth consecutive year at the top. In 2013, our scientists were awarded two new military research and health promotion grants totaling nearly $16 million to support nutrition, fitness, combat readiness, warfighter performance, and resilience, making us the primary provider of nutritional research for the U.S. military. These are just a few of the amazing activities underway that are highlighted in this report.

We undertake the challenge of research because we are committed to reducing the number of deaths from lifestyle or chronic diseases, and to helping people live healthier lives. When I accepted the position of executive director in 2013, I knew there would be challenges ahead and that we'd need to tackle those challenges head on. The face and funding of research is changing. Resources at the federal and state levels are constrained. At the same time, our health challenges are growing and answers to those challenges are still elusive. There is no easy means of bridging this gap, but at Pennington Biomedical we are in a unique position to respond to and view the current realities as opportunities.

Pennington Biomedical is planning strategically to build for our future. We are investing in talent and research with an eye toward impact. We recruited a new director for our growing imaging center. Our capabilities in this arena will significantly advance our research. We have invested in a new clinician scientist to expand our clinical trial testing and capacity. We also hired a chief business development officer who is getting to work building new business initiatives, strategic partnerships, and developing commercialized technologies to enhance revenue generation and leverage our scientific expertise and facilities. Finally, we hired a communications director who is in the process of establishing a team to help us tell our story here at home and in creative venues far and wide. I want to move our research into the real world and these positions are key.

Today, I remain very optimistic for the future. I am excited about the direction we are taking. Research is a business and our faculty are entrepreneurs, but how do we best sustain our infrastructure from our knowledge? This is a question we are working to answer. Research - from the discovery in the lab to clinical testing - is a process that can take years to come to fruition. But, each and every day we work for a better understanding of and treatment options for obesity, diabetes, Alzheimer's and many other diseases. If we don't continue to invest in this research, we risk losing our edge.

I know that we will get there. This work is vital and I am honored to be among the stewards of Doc and Irene's vision.

William T. Cefalu, MD

William T. Cefalu, MD
Executive Director

PENNINGTON BIOMEDICAL BY THE NUMBERS

529 EMPLOYEES | **10** RESEARCH AREAS | **44** LABORATORIES | **5** CENTERS | **$127.5M** GRANT FUNDING (FY 2012-2014)

RESEARCH AREAS

- Cancer
- Diabetes
- Epidemiology & Prevention
- Genomics & Molecular Genetics
- Neurobiology
- Neurodegeneration
- Nutrient Sensing & Signaling
- Obesity
- Physical Activity & Health
- Developmental Biology

CENTERS

- Botanical Research Center
- Nutrition Obesity Research Center
- Center of Biomedical Research Excellence
- Institute for Dementia Research & Prevention
- Louisiana Clinical & Translational Science Center

WE YIELD RESULTS

1 in 2 children in Louisiana are overweight or obese.

Pennington Biomedical has a long history of conducting research that targets childhood obesity and diabetes. Our Prevention Impact Systems Model (PRISM) Report *Reducing Childhood Obesity in Louisiana* sets forth policy opportunities aimed at reducing the prevalence of childhood obesity.

50%↑ In many parts of the state we are 50% above the national average for prevalence of diabetes.

Pennington Biomedical has contributed to the development of every new class of diabetes and obesity drug on the market. Our center remains active in conducting landmark diabetes prevention and treatment trials.

Pennington Biomedical is home to breakthrough discoveries.

In January, our own DASH Diet (**D**ietary **A**pproaches to **S**top **H**ypertension) was recognized by *U.S News & World Report* as the #1 best diet in America for the 4th year in a row.

Pennington Biomedical is the primary provider of nutritional research for the U.S. Military.

Long standing collaborations with the U.S. Department of Defense are exploring dietary proteins, physical and mental performance, and new food rations with the goal of improving the health preparedness of our nation's military. Pennington Biomedical was part of the team that developed the First Strike Ration which is now in widespread military use.

Pennington Biomedical was recognized as one of the Best Places to Work for Postdocs.

In 2012, *The Scientist* surveyed more than 1,500 postdoctoral fellows globally and ranked Pennington Biomedical near the top, among a prestigious group of research institutions.

Our faculty create jobs.

On average, 1 faculty member will produce nearly 5 jobs.

Our research generates dollars.

For every $1 in state funding, our research generates $3.

BASIC SCIENCE

Basic Science is comprised of faculty with diverging expertise including biochemistry, molecular biology, genomics, neurobiology, and metabolism. Funding for basic science projects at Pennington Biomedical largely comes from federal grants via the National Institutes of Health (NIH). Basic science faculty are studying metabolic and neuronal related disease states to improve understanding and treatment of a variety of diseases.

Our 42 basic science faculty and approximately 80 research staff have made a number of significant discoveries related to understanding physiology and neurobiology in the context of several human diseases.

For example, Pennington Biomedical is recognized around the globe for our state-of-the-art research in characterizing mice with modern diseases that are of epidemic proportion in Louisiana, including obesity and Type 2 diabetes.

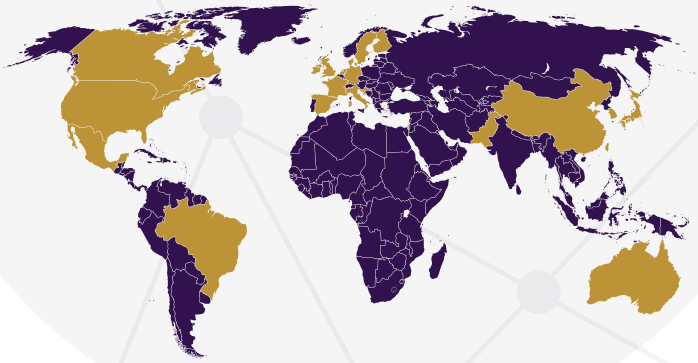
YIELDING RESULTS

- Working at the research bench, our biologists have discovered new ways of seeing in real time the communication between certain types of brain cells, astrocytes, and neurons. Using this technique they have determined that these cells are important detectors of glucose. Since glucose is an energy source, this type of detection is critical to human survival. ***This discovery may lead to new ways of thinking about how the brain monitors the nutrient levels in our bodies and how that may influence our desire for food and thus our feeding behavior; from overeating and under eating, to cravings for certain food types.***

- Optigenetics is a new and novel state-of-the-art technique introduced to Louisiana by Pennington Biomedical. ***Using this innovative methodology, one of our research labs can analyze neurons by using light to control specific regions of the brain.*** This is accomplished with the precise use of optical fibers. With this method, a specific type of neuron in the brain has been identified that is associated with hunger and controls the pleasure we experience when eating sugar or fat.

- Our scientists are also studying muscle tissue. It is well known that muscle mass can decrease with aging. Our investigators are looking at how components get broken down in muscle and they have discovered a novel way of controlling a part of the cell that is involved with breaking down cellular fuel. ***These experiments could eventually lead to new treatments to prevent the accumulation of fat that can promote the development of diabetes.***

BASIC SCIENTISTS COLLABORATE WITH
49 LABORATORIES
ACROSS LSU CAMPUSES
and with
293 INSTITUTIONS OR COMPANIES
IN OVER 20 COUNTRIES



- Our investigators are focused on the liver because fat accumulation in the organ is associated with fatty liver disease, high blood pressure, high cholesterol, and diabetes. Their studies have ***identified new causes for lipid accumulation in the liver.***

- We've made significant advancements in discovering the link between excess fat and the development of diabetes with ***the discovery of a hormone that links obesity with inflammation in fat tissue.*** Inflammation in fat tissue is known to be associated with Type 2 diabetes.

- We are making progress looking at the process by which maternal diabetes can cause birth defects and how drugs that target this mechanism may be of use.

- We have discussed methods of inhibiting some of the genetic functions of cells by the use of epigenetic drugs. This may lead to treatments for cancer and other diseases.

DID YOU KNOW?

Pennington Biomedical is home to an NIH funded Botanical Research Center - one of only five such centers in the U.S. The goal is to provide a comprehensive evaluation of mechanisms that lead to development of metabolic dysfunction (obesity, pre-diabetes, diabetes) and determine whether botanicals and natural products play a role in the prevention of disease or in treating underlying diseases. › *Learn more: www.pbrc.edu/botanicals*

FUTURE DIRECTIONS IN BASIC SCIENCE

- Continue active research projects, and develop new Louisiana collaborations with entities such as LSUHSC Shreveport relating to the study of kidney disease and diabetes, and with Tulane University to study the neurobiology of hormone activity.
- Enhance our government funding in basic science projects related to metabolic diseases by fostering collaborations among in-house researchers.
- Work to understand how modulation of gut bacteria is affected by diet and can contribute to overall health.
- Develop a federally funded program to understand how different organ systems (fat, muscle, liver) are modulated by gastric bypass surgery.
- Prioritize resources for junior faculty who are the future leaders in basic science research in an effort to enhance their national research profile and competitiveness.
- Continue collaboration with the University of Louisiana at Lafayette and the U.S. Geological Survey to identify plants that may have medical use for metabolic disease states, including obesity and Type 2 diabetes.

CLINICAL SCIENCE

Clinical research is a vital component of our enterprise. In collaboration with basic scientists, we design and implement novel studies that inform us on the mechanisms and treatment strategies for individuals of all ages affected by disease.

Over the past twenty-five years, Clinical Science at Pennington Biomedical has conducted many randomized clinical trials in the field of obesity and Type 2 diabetes.

Today, we are widely recognized in the development of landmark studies that prove key lifestyle changes – if maintained – can lead to successful outcomes for weight loss and health benefits.

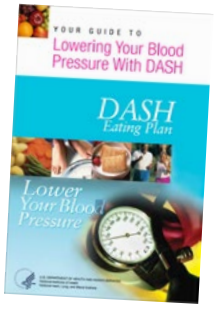
LANDMARK NIH STUDIES AT PENNINGTON BIOMEDICAL

- ***Dietary Approaches to Stop Hypertension (DASH Diet)***
- ***The Diabetes Prevention Program (DPP)***
- ***The Look Ahead Study***
- ***Glycemia Reduction Approaches in Diabetes: A Comparative Effectiveness Study (GRADE)***
- ***The Vitamin D and Type 2 Diabetes Study (D2d)***
- ***The Comprehensive Assessment of Long-Term Effects of Reducing Intake of Energy Study (CALERIE)***

YIELDING RESULTS

Pennington Biomedical has a proven history of attracting landmark NIH studies to our campus.

- ***The DASH Diet (Dietary Approaches to Stop Hypertension).*** Ranked as the #1 diet in America by *US News & World Report* for the fourth year in a row. The DASH Diet is scientifically proven to improve health, and is a tool for weight management and the prevention of metabolic syndrome.



- ***The Diabetes Prevention Program (DPP).*** Advocating intensive lifestyle changes (developed in part at Pennington Biomedical), the DPP is a state-of-the-art intervention program proven to reduce the incidence of diabetes by more than 55%. It is also considered one of the best known strategies for weight management.
- ***The Look AHEAD study.*** Developed and tested at Pennington Biomedical, this study includes an intensive lifestyle intervention plan designed to achieve and maintain weight loss by decreased caloric intake and increased physical activity – all aiming to prevent the complications of Type 2 diabetes in overweight individuals with the disease.
- Type 2 diabetes is a major public health problem. It is important to have a comprehensive comparison of the long-term effects of treatment medications. Pennington Biomedical is participating in the ***GRADE study***, the largest Type 2 diabetes study conducted to date. The study is comparing the long-term effectiveness of glycemia-lowering medications to provide guidance to clinicians on appropriate medications to treat Type 2 diabetes.
- Studies suggest that factors of dietary intake may lower the risk of Type 2 diabetes. Vitamin D is proposed as one of those factors, yet definitive data is lacking. Pennington Biomedical is participating in the ***D2d study*** designed to examine the relationship between vitamin D supplementation and the development of diabetes in persons at high risk for Type 2 diabetes.
- ***The CALERIE study***, conducted at Pennington Biomedical, was designed to test the effect of calorie restrictrion on health and markers of longevity.

DID YOU KNOW?

Faculty in Clinical Science are attracting more than

$15 MILLION

annually in grants and contracts.

› Learn more about our clinical trials: www.pbrc.edu/clinical-trials

OTHER CLINICAL STUDIES UNDERWAY ARE FOCUSED ON:

- The natural history of obesity and Type 2 diabetes
- The clinical and molecular determinants of weight gain and the development of insulin resistance
- The treatment of obesity and diabetes
- The progressive cognitive deterioration often occurring with aging leading to early dementia and later to Alzheimer's disease
- Industry sponsored research programs, including the efficacy and safety of topical geranium oil for the treatment of neuropathic pain; the synergy between Albuterol and caffeine to improve weight management in adolescents; investigating the role of blockers of angiogenis and activators of lipolysis on weight control; and strategies to increase energy expenditure by nerve stimulation

In collaboration with basic science faculty and with the assistance of our outstanding scientific resources, our clinical faculty design studies that uncover the triggers of chronic diseases. ***We are working to identify and understand what is happening in the body before disease occurs***. Chronic diseases like heart disease and diabetes share similar triggers such as increased body fat or obesity. ***Our scientists have learned that other seemingly unrelated diseases - like dementia, Alzheimer's, obesity, and cancer - are connected***. This connectivity led us to create a collaborative, multidisciplinary approach to our research that we call "science without walls."

CLINICAL SCIENCE RESOURCES

Clinical Science currently includes 19 faculty members and approximately 130 research staff. Our faculty members and staff are involved in initiatives aimed at behavioral strategies to cope with lifestyle interventions and education - all directed at fufilling our mission.

- ***The Reproductive Endocrinology & Women's Health Laboratory*** serves "to investigate the impact of the obesogenic environment on health issues in women." This lab was successful in securing a NIH-funded study and is part of the Lifestyle Interventions in Expectant Moms Consortium (Life-Moms) which is now underway to test the effectiveness and feasibility of interventions to limit weight gain in overweight and obese pregnant women. This lab was also awarded NIH study MomEE which will evaluate energy intake and energy expenditure during pregnancy and postpartum in obese women.

- ***The Ingestive Behavior Laboratory*** was established with a focus on understanding the regulation of food intake and activity. The lab also develops and tests the efficacy of interventions to reduce food intake, increase activity levels, and promote weight management.

- ***The Inactivity Physiology Laboratory*** focuses on the independent and additive effects of reducing sedentary time in contrast to the traditional recommendations for brief periods of more intense and structured exercise.

- ***The Louisiana Clinical & Translational Science Center (LA CaTS)*** mission is "to encourage, support and expand clinical and translational research through partnerships both among researchers and with the people we serve" in Louisiana. This Center is a collaborative effort led by Pennington Biomedical and includes Louisiana partners: LSUHSC New Orleans, LSUHSC Shreveport, LSU Health Care Services Division, Tulane University Health Sciences Center, LSU A&M, Research Institute for Children at Children's Hospital and Xavier University of New Orleans.

LA CaTS External Advisory Committee

- ***The Institute for Dementia Research & Prevention (IDRP)*** was established to improve the quality of life for individuals in Louisiana by generating world class research programs focused on dementia prevention, providing local access to the latest clinical trials for the treatment of dementia, and providing educational opportunities for individuals/families affected by dementia. The IDRP is involved in many projects sponsored by pharmaceutical companies engaging participants with early dementia or Alzheimer's disease.

- ***The Body Composition Laboratory*** covers human body composition and energy metabolism as they relate to obesity, sarcopenia, chronic diseases and aspects of health maintenance such as fitness and disease prevention.

- ***The Human Physiology Laboratory*** investigates the impact of weight gain on insulin resistance by looking at the cross-talk between adipose tissue and skeletal muscle, the impact of distribution of adipose tissue (apple vs. pear shape obesity) on the kinetics of fat deposition, and the impact of calorie restriction on metabolic adaptation and healthspan.

- ***The Nutrition Obesity Research Center (NORC)*** has chosen "Nutritional Programming: Environmental and Molecular Interactions" as a central focus based upon emerging discoveries in epigenetic phenomena, such as how events in prenatal and early postnatal life can influence the risk for the development of obesity and metabolic syndrome in later adulthood.

- ***The Energy Expenditure Laboratory*** is the best equipped facility in the world to measure metabolism in people using 11 metabolic carts to measure resting metabolic rate, 4 metabolic chambers to measure sedentary daily metabolism and doubly labeled water to measure total daily energy expenditure including physical activity.

With the recent opening of our Biomedical Imaging Center, one of the major aims in clinical science moving forward will be the development of new methods and operating procedures to help with our obesity, aging and pediatric research. We are planning a state of the art Maternal Infant Phenotyping Core to measure food intake, energy expenditure and body composition in newborns and toddlers.

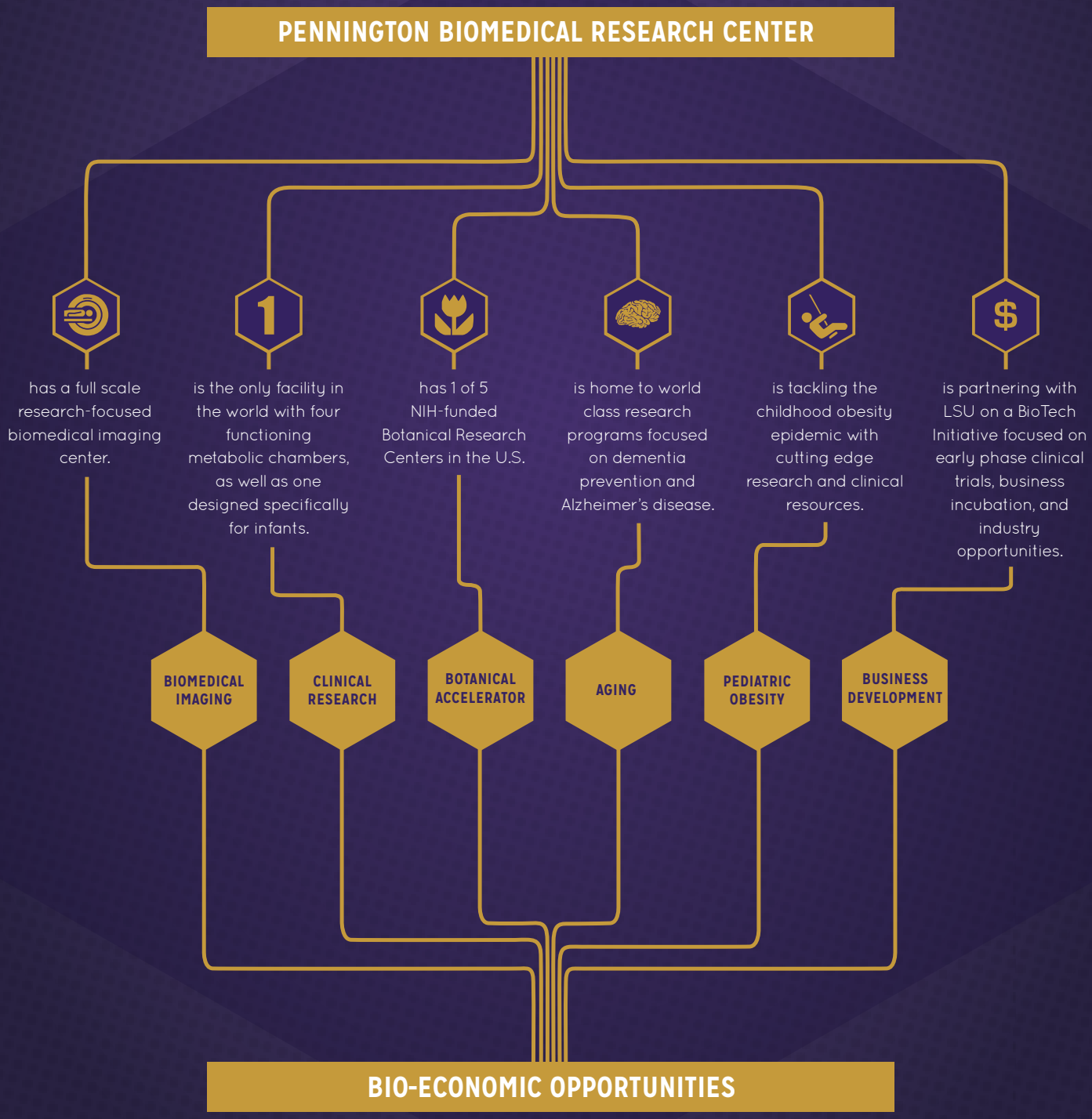
FUTURE DIRECTIONS IN CLINICAL SCIENCE

- Development of new state-wide collaborations between the LA CaTS institutions to leverage our different expertise. This includes opening our Nutrition Obesity Research Center (NORC) pilot and feasibility grants to members, dedicating NORC funds to LA CaTS statistical resources and making our clinical resources available to business partnerships.
- Launch of the Maternal Infant Phenotyping Core to support research efforts in this important area of study, including a first of its kind infant whole-body calorimeter. Since the obesity epidemic is now thought to occur as early as in utero, studies in pregnant women and children from the time of birth are critical.
- Use of the Remote Food Photography Method and the SmartIntake application in clinical interventions, including e-health interventions designed to help patients manage their weight at home.
- Development of a brain functional MRI to investigate the regulation of food intake and the symptoms appearing with dementia.
- Emphasis on translating current patents into products in the market place.
- Development of pragmatic solutions to the problems caused by physical inactivity.
- Identification of the factors most predictive of falls in elderly individuals, and developing interventions focused on these risk factors.
- Development of additional research platforms in the area of brain wellness (prevention) programs as well as care provider focused programs.
- Identification of new strategies for quantifying skeletal muscle mass, composition and function. Development of novel approaches for quantifying human energy expenditure and advanced approaches for evaluating regional and cell energy expenditure in vivo.
- Conduct of new randomized clinical trials to prevent the development of the cardiometabolic syndrome in early menopause.

RESEARCH BUILDS A BIO-ECONOMIC CAPACITY

INVESTING IN CORE INFRASTRUCTURE

Research is a key component in Pennington Biomedical's array of bio-economic opportunities. We are investing in the core resources that will continue to place our research facility at the forefront of health discovery.



POPULATION SCIENCE

The mission of Population and Public Health Science is to improve the health of human populations through research and advocacy on nutrition, physical activity, and the environment as they relate to obesity, chronic disease and other risk factors.

Our scientists are building upon the work being done in basic and clinical science laboratories by translating research findings to health care, community, school and military settings. This translational research expands the influence of discoveries made at Pennington Biomedical into real-world programs that can have a demonstrable public health impact.

80% OF ALL DEATHS WORLDWIDE ARE THE RESULT OF NON-COMMUNICABLE DISEASES (NCDs) SUCH AS DIABETES, OBESITY, AND HEART DISEASE.

SOURCE: WORLD HEALTH ORGANIZATION

50. LOUISIANA
49. MISSISSIPPI
48. ARKANSAS
47. WEST VIRGINIA
46. ALABAMA

LOUISIANA HAS THE NATION'S HIGHEST OBESITY RATE.

SOURCE: CENTERS FOR DISEASE CONTROL (2012)

YIELDING RESULTS

Population and Public Health Science currently includes 17 faculty members and 43 research staff. Our scientists are involved in research, evaluation, education and scientific advocacy activities, all directed at fulfilling our mission.

In collaboration with clinical scientists, our researchers are taking an active leadership role in the new ***Childhood Obesity and Diabetes Research Program*** at Pennington Biomedical. We recently opened the ***Translational Research Clinic for Children (TReCC)*** dedicated to the study of pediatric obesity and diabetes. The TReCC is a 14,150 square foot research facility integrated within the Pennington Biomedical campus which allows for onsite interventions with children and adolescents.

With the addition of this dedicated space in pediatrics, Pennington Biomedical is perfectly situated to design and implement novel, evidenced-based basic, clinical and population-based studies, and interventions that inform prevention and treatment strategies for childhood obesity. This also creates a collaborative environment that engages key stakeholders at all levels to enrich and accelerate the translational ability to move research advancements to medical practice.

In the context of national health care reform, health care providers are expected to be more accountable for the care they deliver from the perspectives of cost, quality and patient satisfaction. ***Louisiana State University's Clinical Outcomes Research Network (LSU ICON)***, led by Pennington Biomedical, represents the joint efforts of several of the LSU academic health science and health care delivery institutions to improve the care of patients in Louisiana.

The ***Heads-Up*** demonstration project, conducted in partnership with the Louisiana Office of Group Benefits (OGB), is testing the effectiveness of three different obesity surgeries compared to intensive medical intervention for weight loss in approximately 1,000 obese adults from six primary care clinics across Louisiana. This work will inform the way that primary care patients living with obesity are treated in the future.

The ***Pennington Biomedical Program Evaluation Unit*** is actively evaluating several public health initiatives. Our faculty and staff serve as external evaluators for projects funded through the Louisiana Department of Health and Hospitals, including the Louisiana Tobacco Control Program, the Community Transformation Grant and the Coordinated Chronic Disease Prevention and Health Promotion Program.

Pennington Biomedical has teamed with Our Lady of the Lake Children's Hospital to implement and evaluate a family-based weight loss program for children. The ***Our Lifestyles, Our Lives*** program has been successfully led since 2012 by OLOL pediatric gastroenterologist, Dr. Patrice Tyson. The 10-week program was held in the TReCC and focused on healthy eating, physical activity, and psychological support for children to achieve a healthy weight.

In the fall of 2011, the Blue Cross and Blue Shield of Louisiana Foundation issued a challenge to communities across the state to help reshape their environments to support healthy living and prevent obesity. ***The Challenge for a Healthier Louisiana*** is ongoing and funded by the Blue Cross Foundation. It is administered through a partnership with Pennington Biomedical. Our team serves as the coordinators and evaluators for the program, which offers matching financial assistance to non-profit organizations for projects that promote healthy eating, active living and environmental change.

Our ***Biostatistics Core*** includes doctoral and master's level biostatisticians and skilled programmers. This group works with collaborators to provide statistical guidance, ensuring efficient and informative experimental design, comprehensive and accurate database management, relevant state-of-the-art and precise statistical analyses, and transparent summaries of research findings.

DID YOU KNOW?

$16 MILLION

Researchers from Population and Public Health Science were awarded $16 million in funding from the U.S. Department of Defense to support optimal nutrition, fitness, combat readiness, warfighter performance, and resilience.

Pennington Biomedical has a long history of conducting research with the ***U.S. Department of Defense*** in military populations. The primary aims of this research are to:

- Provide the scientific evidence basis for developing new, efficient and cost-effective combat rations, food products, dining facility menus, and health promotion policies and programs that ensure a fit military, ready for deployment, and resilient to the stressors of duty.
- Translate evidence-based concepts into a nutrition and fitness tool that soldiers can use to not only improve warfighter health and performance, but the overall health and well-being of their family members.

FUTURE DIRECTIONS IN POPULATION AND PUBLIC HEALTH SCIENCE

On September 19-20, 2011 the United Nations held an historic high-level meeting in New York City to address the growing global burden of Non-communicable Diseases (NCD) and to challenge the world's nations to focus on prevention. The situation is even more acute in North America. An aging population coupled with an increasing prevalence of obesity does not portend well for the health of our population. In addition to individual-level behavior changes, large scale population shifts in normative behavior are required to see real reductions in NCDs and improvements in population health. Population and Public Health Science at Pennington Biomedical is well positioned to make major contributions to seeing these much-needed health improvements to fruition.

SCIENTIFIC EDUCATION

Scientific Education administers programs in three major areas: training the next generation of scientists, producing scientific conferences that focus on our research efforts as well as attract world-renowned scientists to the Center, and organizing professional and community educational outreach programs to engage both the citizens of Louisiana and the health care community.

To train the next generation of researchers, Scientific Education directs programs for postdoctoral fellows to help them become productive research scientists capable of establishing independent scientific careers in biomedical research. Many of our fellows are sponsored by NIH Institutional Training Grants.

YIELDING RESULTS

Scientific Education coordinates the placement of dozens of students in Pennington Biomedical laboratories each year from universities and medical schools around the world to provide hands-on experience in research and laboratory skills. Sixty percent of these students come from LSU institutions.

- We partner with the LSUHSC in New Orleans on a NIH summer training grant to address the need for physician scientists.
- We provide organizational guidance on annual public seminars and health fairs including the ***Irene W. Pennington Wellness Day for Women***, ***Men's Health Conference***, ***Parkinson's Conference***, ***Botanical Research Seminar*** and the ***Childhood Obesity Conference***.
- We partner with the LSU AgCenter to produce a web-based Pennington Biomedical Nutrition Series that provides educational materials for use by extension agents, school teachers and the public. ***www.pbrc.edu/pns***
- We have organized several scientific symposia including: Optimal Clinical Management and Treatment of Obesity and Translation to the Public Health Context (October 27-29, 2013); and Botanicals and Translational Medicine (February 7-8, 2013).

FUTURE DIRECTIONS IN SCIENTIFIC EDUCATION

Collaborate with outside educational organizations to promote continuing medical education for health providers.

Help to organize a scientific symposium on the epigenetics of obesity.

Help to coordinate annual community health education events such as Pennington Biomedical's 5K and 1-mile fun run.

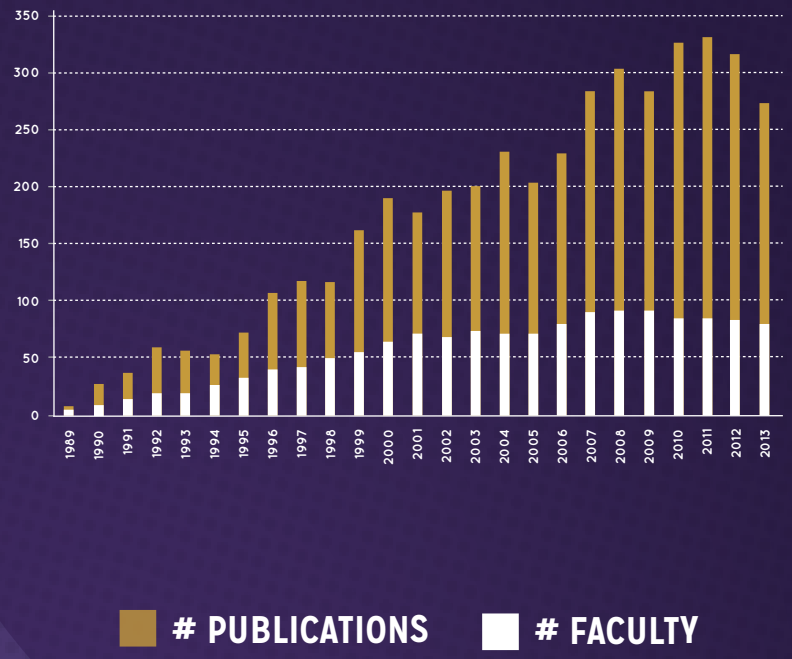
Pennington Biomedical was recognized as one of the highest ranked institutions in ***The Scientist's*** 2012 listing of ***Best Places to Work for Postdocs***. The publication surveyed more than 1,500 postdoctoral fellows globally and ranked Pennington Biomedical number 4 among a prestigious selection of research institutions.

The top 10 U.S. academic institutions recognized:

1. Whitehead Institute for Biomedical Research, Cambridge, MA
2. The J. David Gladstone Institutes, San Francisco, CA
3. Fox Chase Cancer Center, Philadelphia, PA
4. **PENNINGTON BIOMEDICAL RESEARCH CENTER, BATON ROUGE, LA**
5. Oklahoma Medical Research Foundation, Oklahoma City, OK
6. Argonne National Laboratory, Lemont, IL
7. La Jolla Institute for Allergy & Immunology, La Jolla, CA
8. Donald Danforth Plant Science Center, Saint Louis, MO
9. Novartis Institutes for Biomedical Research, Cambridge, MA
10. Stowers Institute for Medical Research, Kansas City, MO

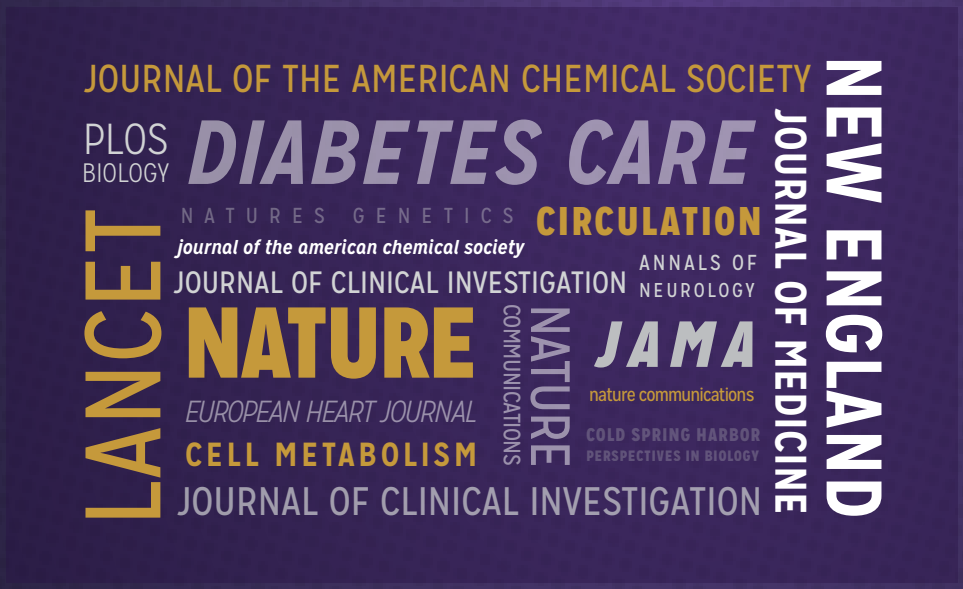
SCHOLARLY PUBLICATIONS...

We are committed to sharing our research with the global scientific community. Full access to research study results found in the world's published scientific literature encourages scientific discovery, breakthroughs and economic growth. Our researchers are dependent on this access to complete their work; at the same time, by publishing their own research findings, our scientists communicate their work with the rest of the world and receive important feedback to further develop that research.



The Pennington Biomedical Library and Information Center provides access to this literature through a specialized print and electronic resource collection concentrated in the medical field. A multitude of other information resources are offered to support and develop the learning, teaching and research done at the Center. Faculty, staff and students are also offered traditional library services including reference, information searches, interlibrary loan processing and bibliographic instruction. The local community is offered access to these resources as appropriate. A major component of the library's services includes tracking faculty publications and monitoring scientists' compliance with the NIH Access Policy Mandate requirement to make the results of all federally funded research studies publicly available.

...IN SOME OF THE WORLD'S MOST PRESTIGIOUS JOURNALS

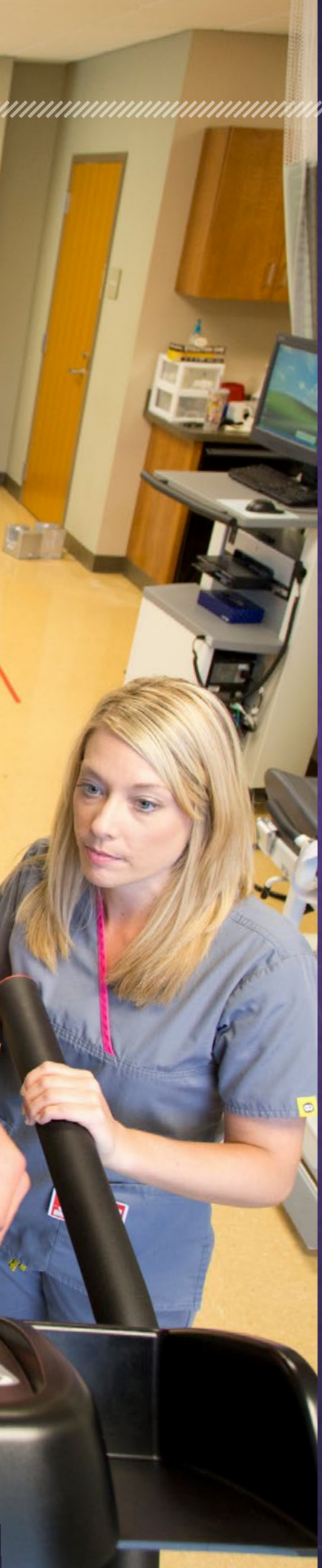


Over the last 20 years more than ***4,600 publications*** have been attributed to Pennington Biomedical scientists.

Impressively, our publications have been cited in the scientific literature by other authors and experts more than ***116,000 times*** and have garnered an ***Institutional H-index = 138***.

As further evidence of impact, our current top 10 cited scientists ***average a citation rate of 26,400*** and an ***H-index = 76.7***.

SCIENTIFIC RESOURCES

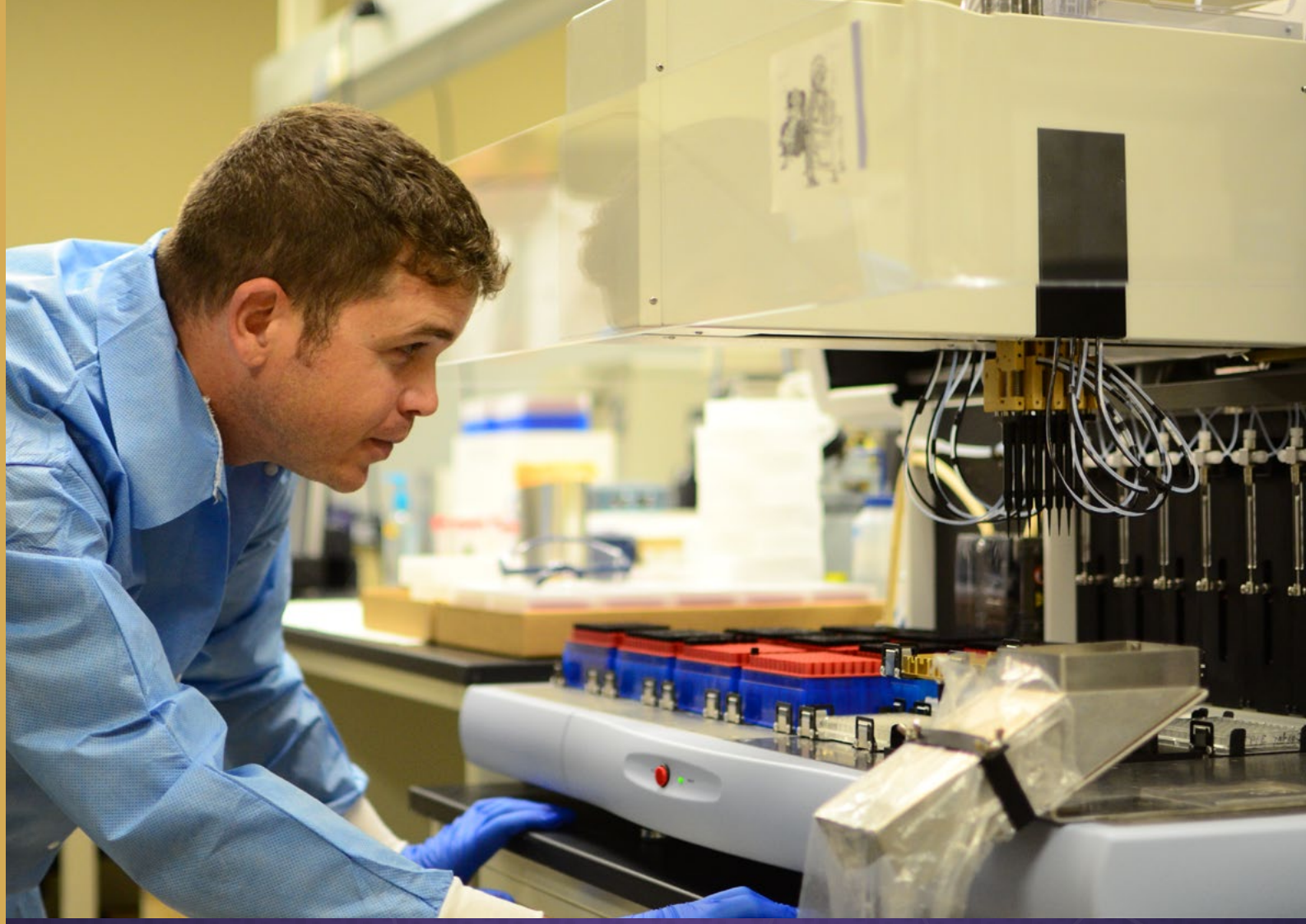


Pennington Biomedical provides researchers with state-of-the-art basic and clinical scientific resources - also known as core services - designed to improve the efficiency, timeliness, and precision of vital technical procedures needed across research boundaries.

These resources support basic research efforts and provide scientists with access to cutting edge technology and focused technical procedures to further their research interests. Services include microscopy and imaging of cells and tissues, cell culture facilities, comparative biology, animal metabolism and behavior, genomics, and transgenics.

Resources also support clinical activities, clinical research studies and trials from protocol development and Institutional Review Board submission along with budgeting and contract assistance. Clinical services include recruitment of research volunteers, phlebotomy, biological specimen collection, processing and analysis, exercise testing, dietary assessment and psychological assessment.

Pennington Biomedical offers both inpatient and outpatient options for trials we perform. Additional clinical services include: preparation of meals by the metabolic kitchen, medical record data collection and storage, medication preparation in the pharmacy, ingestive behavior assessments, imaging procedures using both MRI and DEXA, and assessments of metabolism in the metabolic chambers.



Pennington Biomedical has invested in our genomics, bioimaging and clinical imaging cores with the purchase of new equipment to further our scientific mission. In genomics, we are focused on the analysis of gut flora and its relationship to human health. The alteration of gut bacteria may provide insight into new therapeutic strategies for obesity and diabetes. In bioimaging, the core is able to classify adipose (fat) tissue into either brown or white fat using immunofluorescent staining, digital slide scanning, and automated classification with CellProfiler software. Brown fat's main function is to generate body heat and there is some evidence that brown fat plays a role in weight regulation. In clinical imaging, we purchased a wide bore 3T MRI that allows us to conduct high performance imaging of the brain and body.

Learn more about our core services:
www.pbrc.edu/cores

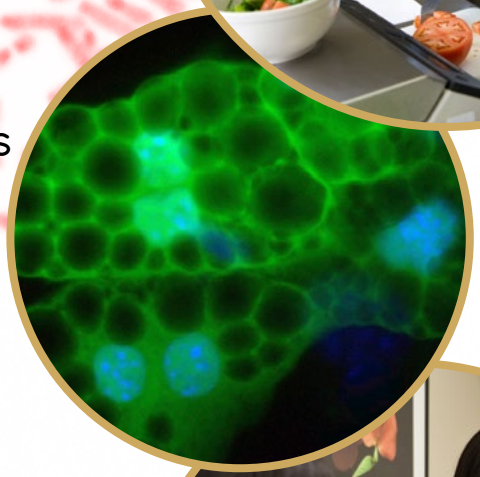
FUTURE DIRECTIONS FOR SCIENTIFIC RESOURCES

With additional functional MRI capabilities, we are able to measure and map brain activity in response to stimuli or during the performance of a task. These capabilities allow us to understand how a healthy brain works and how that function is altered in a disease state.

OUR SCIENTIFIC RESOURCES CONTAIN STATE-OF-THE-ART CORE LABORATORIES THAT MAKE UP A

SOPHISTICATED RESEARCH INFRASTRUCTURE

- CELL BIOLOGY, IMAGING AND CELL CULTURE
- DATA MANAGEMENT
- CLINICAL CHEMISTRY
- DIETARY ASSESSMENT
- IMAGING AND SPECTROSCOPY
- INPATIENT AND METABOLIC CHAMBERS
- GENOMICS
- STABLE ISOTOPES AND ENERGY EXPENDITURE
- OUTPATIENT CLINIC
- RECRUITING
- PHARMACY
- EXERCISE BIOLOGY
- RESEARCH KITCHEN
- COMPARATIVE BIOLOGY
- ANIMAL METABOLISM AND BEHAVIOR
- TRANSGENICS



ADMINISTRATION

Pennington Biomedical's research is supported by an array of administrative services. The operating model for administrative units is centered on a common goal of easing the administrative burden for our scientists so that they can remain focused on their research and stay competitive and productive.

ADMINISTRATIVE SERVICES INCLUDE:

- *Communications*
- *Computing Services*
- *Facilities Management*
- *Fiscal Operations*
- *Human Resources*
- *Intellectual Property and Business Development*
- *Legal and Regulatory Affairs*
- *Sponsored Projects Services*

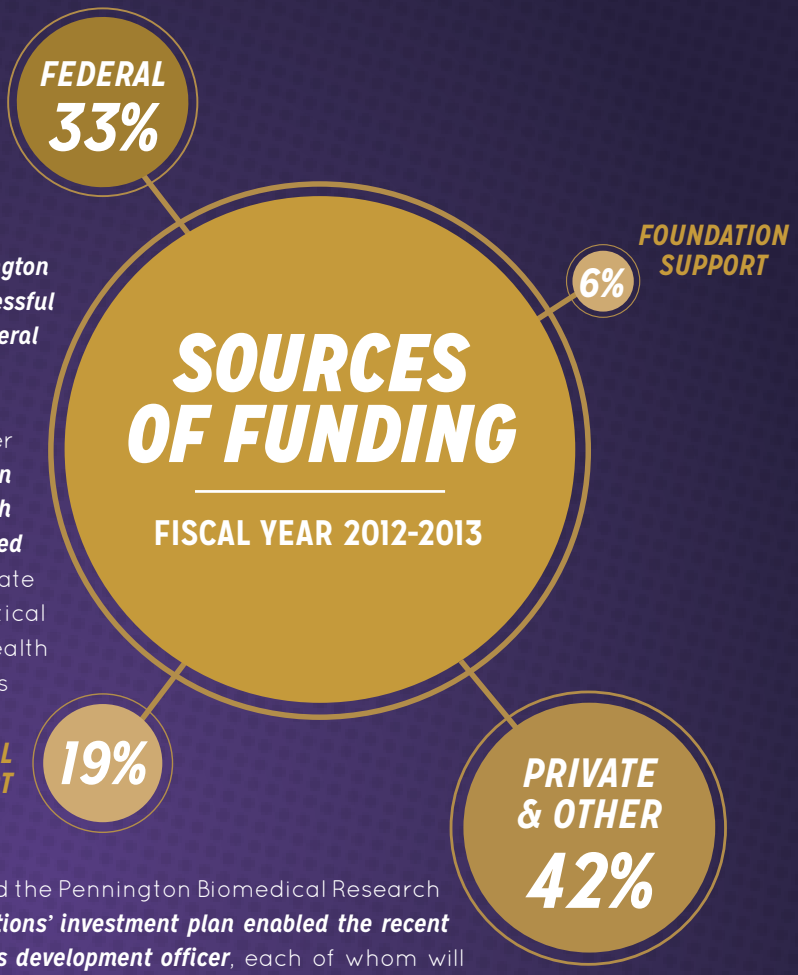
YIELDING RESULTS

- The ***Communications Department*** provides strategic, proactive and directed expertise for outreach related to media and public relations for the Center and the science therein.
- ***Computing Services*** works to improve efficiency and enhancement for the Center's research activities, identifies researchers' information technology needs and implements solutions.
- ***Facilities Management*** directs operation and maintenance services, security, environmental controls and grounds maintenance; as well as construction project design supervision and monitoring.
- ***Fiscal Operations*** provides fiscal management services, ensures compliance with all related laws and regulations, enables timely procurement and delivery of goods and services, and oversees business-related functions and services.
- ***Human Resources*** provides services for recruitment, employment, benefits, immigration, reporting, retention and reward of faculty and staff, and ensures compliance with all applicable employment laws.
- ***Intellectual Property and Business Development*** engages in activities involving economic development and commercialization of research, new inventions and discoveries, patents and copyrights, and licensing of technologies.
- ***Legal and Regulatory Affairs*** oversees legal, regulatory and compliance functions for the Center and serves as the liaison to other regulatory offices and programs. The department is responsible for HIPAA compliance and works closely with the Institutional Review Board (IRB) and other Pennington Biomedical compliance components.
- ***Sponsored Projects Services*** provides proposal review support including budget development, contract preparation and negotiation, reporting, sub-recipient monitoring, post award modifications and interpretation of sponsor regulations and requirements.

INVESTING STRATEGICALLY

- The Center's research funding has increased for fiscal years 2011-2012 and 2012-2013, with 80% of the total funding coming from non-state appropriated funds. Federal funding has increased modestly and remains in the $20M range. Much of this funding comes from NIH grants through a highly competitive review process. ***Pennington Biomedical's research scientists are extremely successful in competing with the country's top researchers for federal dollars.***

- Long recognized by private industry as a premier clinical and basic research institute ***Pennington Biomedical continues to diversify its funding sources with more private grants and contracts, which have increased more than 35% in the last two years.*** Sources for private grants and contracts are primarily pharmaceutical companies, the food industry, and non-profit health organizations such as the American Diabetes Association, the American Heart Association, the American Cancer Society, and other businesses and entities.



- Support from the Pennington Medical Foundation and the Pennington Biomedical Research Foundation has also remained strong. The ***foundations' investment plan enabled the recent hiring of a communications director and a chief business development officer***, each of whom will assemble staff teams and programs to support the Center's growth initiatives.

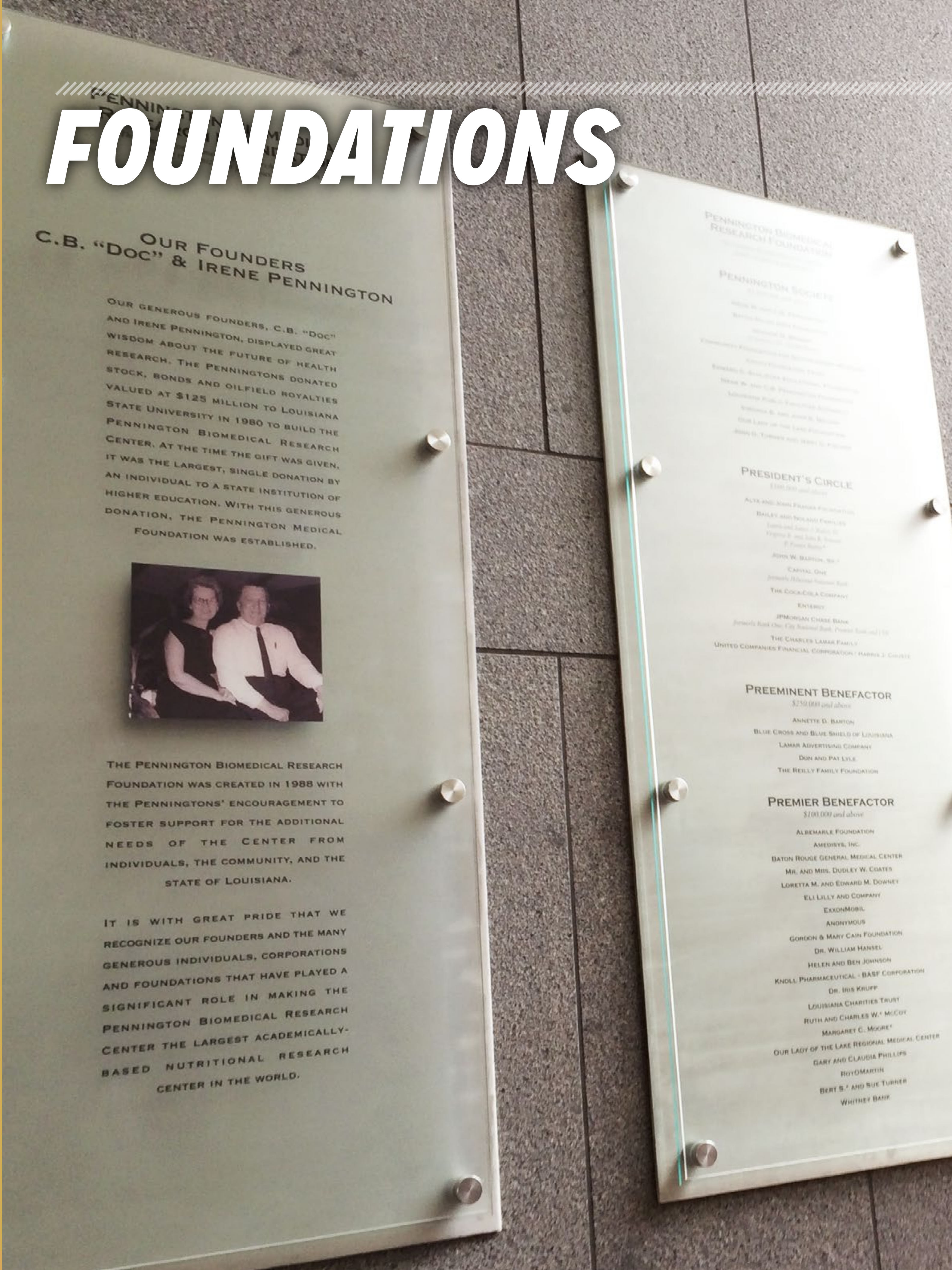
- Pennington Biomedical uses unrestricted state dollars to fund pilot studies in promising research programs that will result in new grants and contracts. The recruitment of new research faculty and the addition of new research programs are also a priority. ***Louisiana receives a return on this investment*** through an inflow of research dollars from sources outside of the state while also creating new jobs and new wealth within the state.

DID YOU KNOW?

Pennington Biomedical recently inaugurated The Translational Research Clinic for Children (TReCC) - an in-house facility designed to study pediatric obesity and diabetes with the aim of translating research from the laboratory to the community. Louisiana's governor and a host of dignitaries joined us for the dedication ceremony.

Learn more: pediatrics.pbrc.edu/about

FOUNDATIONS



Philanthropy continues to be vital to the future of Pennington Biomedical.

Established through the original act of donation in trust in early 1980 by C.B. "Doc" and Irene W. Pennington, the Center is recognized today as a world leader in nutrition, obesity and diabetes research. After twenty-five years, the spirit of philanthropy carries on through individuals, corporations and foundations that have shown thier steadfast committment to the Center's mission.

GIFTS ARE RAPIDLY DEPLOYED TO:

- ***Fuel pilot projects***
- ***Support the recruitment and retention of the best scientific minds***
- ***Advance frontiers in new technology and enterprise***
- ***Endow chairs and professorships***
- ***Invest in the health and well-being of citizens***

PENNINGTON BIOMEDICAL RESEARCH FOUNDATION

Pennington Biomedical has always understood the importance of philanthropy. It was a transformational gift from C.B. "Doc" and Irene W. Pennington that created what is today one of the foremost research institutions focused on the significant health issues of our time.

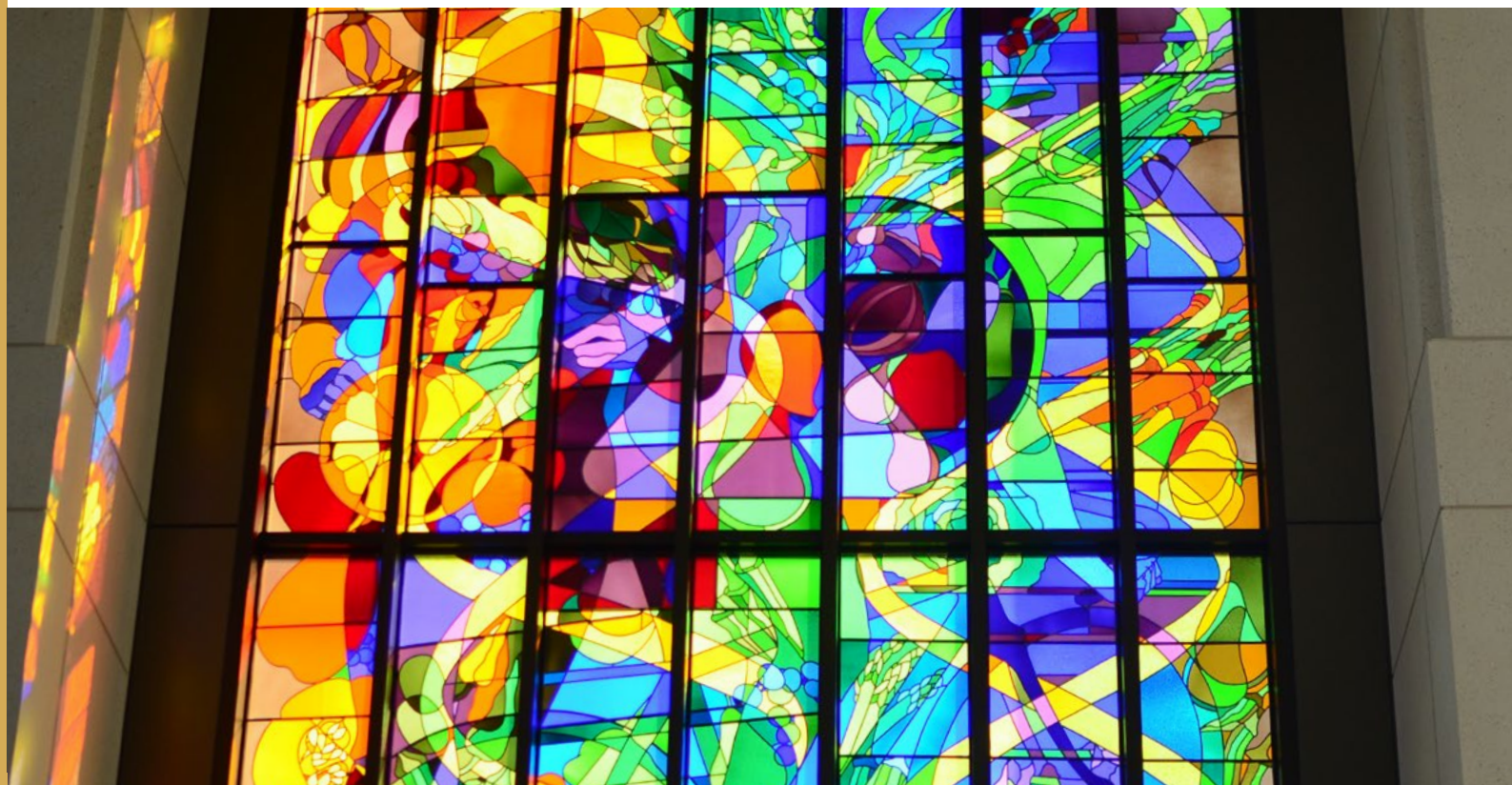
Individuals, companies, and foundations from Louisiana and beyond continue to advance the generosity of Doc and Irene by supporting and recognizing the importance of investing in Pennington Biomedical's research.

These philanthropic investments have provided significant return. Pennington Biomedical's impact has been felt across the globe, advancing our understanding of today's chronic diseases. From the many drug therapies we have tested to treat obesity and diabetes, to diet and behavior interventions that improve health, Pennington Biomedical is making a difference. We are also meeting nutritional needs for our military and working to prevent diseases across the lifespan from childhood obesity to dementia.

Pennington Biomedical Research Foundation is a nonprofit 501(c)(3) organization and is affiliated with Pennington Biomedical to accept, manage and steward private philanthropy through unrestricted, restricted and endowed gifts from individuals, corporations and foundations. ***J. Gerard "Jerry" Jolly*** serves as chairman.

Beginning in 2012, the Pennington Biomedical Research Foundation devised and promoted an investment plan to seize and leverage the moment by prioritizing investments in three major areas:

1. ***Priority research programs*** that will address the urgent scientific needs of our research enterprise, including programs such as Reproductive Endocrinology and Women's Health, Ingestive Behavior Laboratory, Neurosignaling, Central Leptin Signaling, Behavior Technology Laboratory Minority Health and Physical Activity, and Nutrient Sensing and Adipocyte Signaling.
2. Deploy proactive business development and enhanced philanthropy teams, charged with ***revenue generation*** to provide long-term financial stability and health.
3. Position Pennington Biomedical as the world leader in obesity and chronic disease through a targeted ***communications and branding*** initiative.



AS OF DECEMBER 31, 2013 (UNAUDITED):

$31.5 MILLION

Total assets up from $2.9 million in 1990.

6.1%

Annualized endowed investment return since 2003.

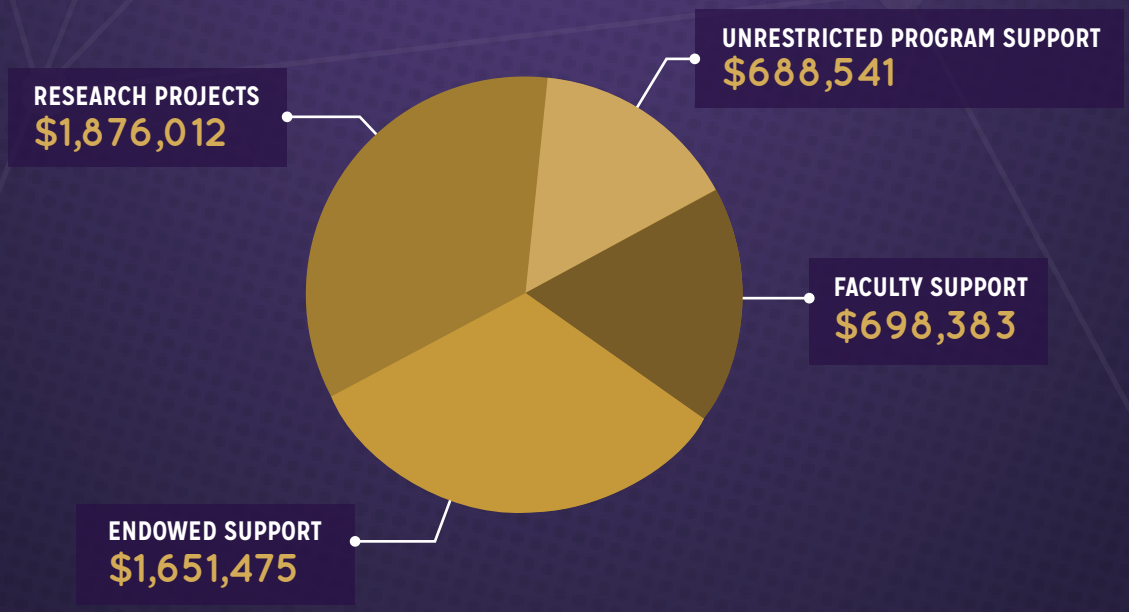
$12.7 MILLION

Has been committed to create 16 endowed chairs and professorships, including more than $5 million from the Louisiana Educational Quality Support Fund, a program of the Louisiana Board of Regents. To date, this program has provided $7.5 million in research support to Pennington Biomedical.

$10.5 MILLION

Total revenues for 2012 and 2013, which represents the largest annual amount since inception.

2012 AND 2013 TOTAL PROGRAM SUPPORT FOR PENNINGTON BIOMEDICAL = $4,914,411



PENNINGTON MEDICAL FOUNDATION

The Pennington Medical Foundation was created in 1980 to administer the trust established by C. B. "Doc" Pennington and Irene W. Pennington. The foundation provides capital and seed funding, equipment, salary supplements and other related research expenditures for the benefit of Pennington Biomedical. ***Paula Pennington de la Bretonne*** is the current chairperson of the Foundation.

CURRENT ACTIVITIES UNDERWAY:

Capital support for Basic Science and Population Science buildings

Historically the Pennington Medical Foundation's (PMF) primary focus has been to provide world class research facilities, equipment, and research operating support for Pennington Biomedical. To date, the foundation has provided in excess of $165 million in these areas. The foundation currently provides approximately $1.3M annually in debt service and related support for the Basic Science Building and Population Science Building.

Salary supplements for physicians

Recruiting and retaining MD/PhD researchers is key to Pennington Biomedical's success. PMF provides salary supplements to physician researchers to overcome state funding restrictions that would otherwise prevent employing these highly sought after scientists.

Bridge funding for productive faculty

Currently PMF provides bridge and seed funding for aspiring scientists who will utilize this critical funding to leverage additional externally funded grants and contracts.

Discretionary funds for director

The executive director of Pennington Biomedical must be able to respond quickly to both opportunities and threats. PMF provides a pool of discretionary funds that allow the executive director a greater degree of financial flexibility and responsiveness in the recruitment and retention of scientists.

Support business development activities

Proof of concept funding and financial support for potential commercially viable ideas is vitally important to the Center as it seeks to diversify its funding base. PMF invests in and supports opportunities for the Center's faculty to interface with the business venture capital community.

Provide governmental relations

PMF provides support for the engagement of two professional governmental relations firms in Washington, DC. These firms maintain and develop ongoing relationships with those individuals and institutions in our nation's capital with influence over the disposition of the Center's requests.

Finance External Advisory Board

Balancing on the leading edge of excellence requires periodic critical programmatic reviews of the Center's research. PMF underwrites the cost of bringing a team of the world's best scientists to Pennington Biomedical to advise on the strengths, weaknesses and scientific direction of the Center.

Publish a scientific report

The Center publishes its accomplishments in a biennial report aimed at communicating with a broad population of scientific and lay audiences. The goal of the report is to make the Center accessible to all interested groups.

Executive advisory support

PMF provides executive counsel to the Center with foundation personnel participating in strategic planning, financial management, operations and related areas as requested.

PMF ASSETS AND SUPPORT AS OF DECEMBER 31, 2013:

$67.7 MILLION
total assets

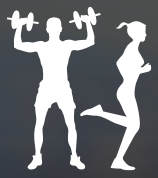
$6,065,243
total program support
2012 and 2013

A LEGACY OF DISCOVERY

1988-2013

Discovered a new protein that influences how fat is deposited in the liver and other organs to produce insulin resistance and metabolic syndrome. This data is currently being used to develop novel interventions for Type 2 diabetes.

Discovered that when normal weight adults are placed on calorie restricted diets, markers indicating a potential longer lifespan all improve - lowered metabolic rate, body temperature, blood level of insulin, and blood tests indicating inflammation.



Discovered that combining aerobic exercise with strength training improves diabetic blood glucose control to a greater extent than either activity alone, a finding that has major treatment implications.

Demonstrated that changes in the school environment can improve physical activity and eating habits among elementary school children and reduce the risk for obesity.

Discovered that excessive time spent sitting is an important independent risk factor for chronic disease and premature mortality.

Developed and evaluated a new replacement for Meals-Ready-to-Eat (MREs) and produced the now widely used U.S. Military First Strike Ration.

Established the amount of dietary protein needed when soldiers experience high activity and low caloric intake during military operations.

Discovered that a novel lytic peptide targets cancer cells, providing the ground work for human studies.

www.pbrc.edu instagram.com/penningtonbiomed twitter.com/pbrcnews facebook.com/penningtonbiomedical