Fundamental discoveries made in the basic sciences are the starting point for every advance in Medicine. New knowledge leads to exploration of ways to use that knowledge, then to the development of clinical applications, studies to determine their effectiveness and, ultimately, improvements in patient care and in health. For Medicine, basic science is the engine of progress.
A CALL TO ACTION

Rising to the Challenge: The Campaign for Johns Hopkins will raise unprecedented levels of support to attract, sustain, and further empower the people of Johns Hopkins—our students, faculty, and researchers—who through their work improve the lives of millions around the world. Together with our philanthropic partners we will:

ADVANCE DISCOVERY AND CREATIVITY
through support of our exceptional faculty and researchers. Their innovative work drives the development of new knowledge, new forms of expression, and new ways to save lives and improve health, and furthers progress across our core disciplines in science and technology, the humanities and arts, and public health and medicine.

ENRICH THE STUDENT EXPERIENCE
by investing in scholarships and fellowships, inspirational spaces for collaborative learning and social opportunities, and new programs that will enhance student-faculty interactions, ensure diversity on campus, link learning in the classroom to life after graduation, and strengthen connections between our students and our surrounding communities.

SOLVE GLOBAL PROBLEMS AS ONE UNIVERSITY by creating new cross-disciplinary solutions in crucial areas such as sustaining global water resources, revitalizing America’s cities, advancing individualized health, understanding how we learn and teach, and attacking the root causes of global health problems.

The Institute for Basic Biomedical Sciences is committed to playing a key role in the success of the campaign. Please join with us in this important mission.

With innovation as their quest, the basic sciences thrive on creativity, freedom, and collaboration.

Time is also an essential component. We never know when or where we will see the next great discovery—for example, a new insight into a biochemical process, leading to a new treatment for an intractable disease. By elucidating how things work at the most fundamental level, basic scientific discoveries have provided the foundation for virtually every current diagnostic tool and every treatment. They are our hope, too, for clinical breakthroughs in the future.

BASIC SCIENCE: “HIGH-RISK/ HIGH-REWARD” RESEARCH
In the 20th century, basic science discoveries yielded medical breakthroughs. Previously common diseases such as polio and tetanus no longer claim children’s lives. An insight about a common mold (penicillin) has taken the threat out of the vast majority of bacterial infections. Various cancers, such as non-Hodgkin lymphoma and childhood leukemia, can be essentially cured.
The 21st century presents its own host of healthcare challenges. We have little or no effective medical treatment for many daunting and prevalent health concerns—such as advanced cancers, metabolic disorders, and neurodegenerative conditions. We urgently need basic science discoveries that can do, for today’s health problems, what antibiotics and vaccines did for infectious diseases in the last century.

**IT TAKES AN ECOSYSTEM…**

Basic science cannot thrive in a vacuum. Defining the precise alchemy that catalyzes innovation has been a quest at leading institutions. Bell Labs—arguably the world’s most innovative scientific organization—studied the “ingredients” necessary for innovation. The list included: a critical mass of exceptionally talented people, physical proximity of these scientists to one another, busy exchange of ideas, a focus on applying ideas to solve real-world problems, support for creativity, and autonomy.

At Johns Hopkins, we have these key ingredients. To combine them within an effective cauldron for biomedical discovery, we established, in 2001, the Institute for Basic Biomedical Sciences (IBBS).

A formidable Hopkins strength, the IBBS encompasses all nine basic science departments. It coordinates faculty efforts through five IBBS centers which focus on high-potential, complex, research opportunities, ones in which progress can best happen when brilliant scientists with diverse expertise join forces.

IBBS faculty study all of the basic structures and processes underlying health and disease—from proteins to cell movement, from chromosomes to biochemical pathways. Central to our approach is the aim to understand, at an intricate level, how the healthy body functions; from there, we can decipher what goes wrong when disease arises, and devise ways to resolve or prevent those processes. Among the nation’s many institutions devoted to basic science research, what makes the IBBS unique is its sweeping scope, and the collaborative, energized, exciting environment it creates, one in which big ideas can take root and flourish, insights can frequently arise, and new horizons can open.

...**BIG VISIONS, AND A WIDE OPEN MIND.**

The IBBS is designed to support important discovery and innovation. Our faculty think expansively, while focusing ever more closely on detail. Their approach is to narrow in, first, on the precise mechanisms of health and disease, and then to telescope out, so as to apply new understanding to help solve the most pressing, current, healthcare problems.

IBBS faculty work toward long-term discoveries of monumental impact. Ultimately, IBBS research seeks to: halt cancer metastasis, eliminate pain, control inflammation, prevent obesity, reverse heart disease, understand the process of aging, reverse or prevent memory loss, and combat drug addiction.

IBBS research is, by nature, as broad and varied as are the discoveries we intend to make. To protect the openness that encourages innovation, our overarching purposes are to:

1. Train scientists who are capable of productive research, discovery, and innovation
2. Sustain our aggregation of outstanding talent, the “Brain Trust”
3. Define the cutting edge of scientific inquiry, and press it ever outward.

**TRAINING TOMORROW’S SCIENTISTS**

The opening of Johns Hopkins School of Medicine in 1893 ushered in a new era in medical education defined by highly selective entrance requirements, a curriculum emphasizing scientific method, and incorporation of bedside teaching and laboratory research. In 1910, the Carnegie Endowment’s seminal Flexner Report named Johns Hopkins as the model for medical education; since that historical juncture, Hopkins has remained the national standard bearer for graduate medical and biomedical education.

Improvements in technology and academic methods have led to new possibilities for strengthening education in the basic sciences. No longer is the traditional lecture format the only, or the best, way to sow the seeds of innovation. To prime young scientists for discovery, we can now employ more engaging, creative, challenging, and provocative methods.

The IBBS is redesigning the graduate student experience to feature hands-on learning, smaller classes, mentoring, teamwork, and opportunities to try and do in the lab. We are leveraging educational technologies to enhance face-to-face and experiential learning. And we are helping students develop the critical skills they will need to formulate good scientific questions—the starting point for discovery.
The real strength of the IBBS resides in what we call our “Brain Trust.” By this, we mean our bank of exceptional talent—our faculty.

SUSTAINING THE BRAIN TRUST

The real strength of the IBBS resides in what we call our “Brain Trust.” By this, we mean our bank of exceptional talent—our faculty whose genius leads them to new insights and ideas, who perform ground-breaking research, who teach and train new scientists to understand, imagine, and innovate using rigorous methods, who translate their research into improvements in healthcare, and who present their progress to diverse audiences including the scientific community and the public.

SHORING UP A SOLID FOUNDATION

ENDOWED FACULTY CHAIRS. Basic research is an essentially creative process. The unrestricted support provided to faculty who hold endowed chairs allows these outstanding individuals the freedom to pursue new discoveries, to imagine, envision, and explore. These investments made in key faculty reap unpredictable and sometimes exponential returns, in the form of scientific breakthroughs and new knowledge leading to new healthcare methods and health improvements.

The most creative or novel scientific ideas often do not fare well in grant review, where expert panels may give more weight to preliminary data than to innovation.

Endowed chairs also enable us to recruit the best minds to Hopkins, and to provide sufficient support to keep them here.

IBBS BRIDGE FUNDING AWARD. The most creative or novel scientific ideas often do not fare well in grant review, where expert panels may give more weight to preliminary data than to innovation. The IBBS Bridge Fund assists young investigators and established scientists in launching especially promising new research agendas, and helps them cover transitions or temporary shortfalls in research funding. These funds allow investigators to sustain their research focus and to continue their progress while they work to secure long-term funding. Nearly all IBBS faculty members who have received bridge funds have raised the external support they needed within eight months of the award.

RESEARCH CORES. Essential research tools are a critical ingredient of innovation, but are often too costly for an individual faculty member. Core research facilities enable all of our faculty to conduct research at the cutting edge of their field. Urgent needs are for deep imaging resources and mouse facilities:

Deep imaging. Imaging technology—microscopes and the software that allows researchers to capture and analyze images—has improved dramatically over the last ten years. Now, by watching vital processes in living cells, we can uncover the basic biology underlying disease processes such as malignancy, metastasis, and respiratory illness. We plan to build a Deep Imaging Suite that both improves upon latest imaging technologies and provides tools for new discoveries. For example, the ability to observe cells functioning in real time opens the possibility that, someday, scientists will be able to pinpoint the moment at which a normal cell takes the fatal step that transforms it into a cancerous one.

Mouse “models.” Research in mice is the first step to understanding how basic principles and processes affect an entire organism. The mouse is our bridge from the petri dish to the clinic. To improve our ability to build “mouse models” that speed progress from bench to bedside, we plan to build a facility that will support a large number of interdisciplinary preclinical studies.

Respiratory illness. We plan to build a Deep Imaging Suite that both improves upon latest imaging technologies and provides tools for new discoveries. For example, the ability to observe cells functioning in real time opens the possibility that, someday, scientists will be able to pinpoint the moment at which a normal cell takes the fatal step that transforms it into a cancerous one.
or to move from one area of the body to another, as when a cancer metastasizes. These functions require tens of thousands of biochemical reactions every second. IBBS researchers are creating new technologies such as biosensors, microscopes, and computer programs that help visualize how cells divide and move—the starting point for control of cell behavior.

Metabolism and Obesity. Two of the most urgent global health problems are obesity and diabetes. Researchers are uncovering how cells use sugar and fat to ensure survival; how cells regulate energy; and how the body regulates hormones and other chemicals in response to available nutrients.

Defining the Cutting Edge
The IBBS brings brilliant scientists together around intriguing problems, provides them with the facilities and resources for sophisticated experimentation, and gives them the freedom to explore novel approaches and ideas—to think outside, way outside, “the box.”

Prioritized Areas of IBBS Development Are:
Telomeres and Age-Related Disease. Telomeres are enzymes that maintain the length and integrity of chromosome ends; their shortening through repeated cell division limits the cell’s lifespan and may be a root cause of age-related disease, and of aging itself. Research will seek to understand the process of telomere shortening, and to apply this knowledge to a host of age-related conditions.

High-Throughput Biology. Advanced technologies now enable researchers to conduct complex, large-scale experiments, testing or examining hundreds—even thousands—of samples at one time. High-throughput biology is truly “big science.” IBBS researchers will build and alter genomes, test massive numbers of human genes simultaneously, develop new equipment and methodologies, and derive information that shines light on the genetic bases of health and disease.

Epigenetics. Epigenetics studies modifications of gene expression, and the inheritance of altered characteristics, which occur without change in the DNA sequence. Experts in biochemistry, genetics, medicine, and biostatistics are collaborating to explore how cells establish and maintain control of genes, and what happens when cells lose that control. Research seeks to impact neurobehavioral diseases, cancer, development, most chronic diseases, and environmental effects on health.

Sensory Biology. Sensory input is processed by intricately specialized systems. Interestingly, similar molecules and biochemical pathways are involved in functions that seem very different, for example, detecting light, seeing color, tasting, hearing, and feeling pain. IBBS scientists are exploring the possibility that this versatility can be exploited to restore sensory function, for example, to develop new approaches for overcoming blindness, hearing loss, and chronic pain.

Cell Dynamics. Living cells possess a complex ability to retain their shape, thus providing structure to tissues such as skin, to change their shape, or to move from one area of the body to another, as when a cancer metastasizes. These functions require tens of thousands of biochemical reactions every second. IBBS researchers are creating new technologies such as biosensors, microscopes, and computer programs that help visualize how cells divide and move—the starting point for control of cell behavior.

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The IBBS is the Nation’s Best Place for Major Discoveries in Health
Johns Hopkins University is a powerhouse of genius in the basic sciences. This strength alone makes Hopkins the best place to pursue fundamental new knowledge—knowledge that sheds light on diseases affecting millions of Americans, such as heart disease, diabetes, mental illness, cancer, and lung disease.

Above: David Turck, PhD, Member, Advisory Council, Institute for Basic Biomedical Sciences

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situates within the School of Medicine, adjacent to Johns Hopkins Hospital, ranked #1 hospital in the country 21 years in a row, and at the convergence of multiple clinical specialties, disciplines, and departments at Hopkins, the IBBS is uniquely positioned to collaboratively tackle and resolve major challenges to health and wellness. The IBBS is an Exceptional Philanthropic Investment Supporting the IBBS, through philanthropic contribution, is supporting the best of the best. For philanthropists seeking to make a difference, providing funds—large or small—to support the IBBS simply makes good sense. Philanthropic funding can help the IBBS sustain a culture of innovation, and an environment that fosters it. Discovery takes time. Progress in the basic sciences is not linear; it entails successes and failures, changes of course, new inspirations and directions, lulls and leaps. Throughout this unpredictable trajectory, our investigators need a steady source of research funding. Providing both flexibility and continuity, philanthropic support is an ideal match for the needs of basic scientists. Gifts to underwrite the creative work of our basic scientists have, in the past, reaped tremendous benefits. With the health challenges now confronting individuals and society, philanthropic support has never been more essential than it is today, nor has the potential return on investment been more dramatic. At Hopkins, the Johns Hopkins Institute for Basic Biomedical Sciences, have the technologies, ideas, momentum, and people necessary for innovation—to overcome medical diseases and disorders.

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### INSTITUTE FOR BASIC BIOMEDICAL SCIENCES

#### WHAT WILL IT TAKE?

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<tr>
<th>PRIORITY</th>
<th>SPECIFIC FUNDING NEEDS</th>
<th>CURRENT USE</th>
<th>ENDOWMENT</th>
<th>FUNDS NEEDED</th>
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<td>IBBS infrastructure</td>
<td>Named endowment of Institute</td>
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<td>Training tomorrow’s scientists</td>
<td>IBBS Scholars Program: funds 5 graduate students per year in basic science labs</td>
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<td>Senior Faculty Endowments, one per department (biomedical engineering, biophysics and biophysical chemistry, comparative and molecular pathobiology, cell biology, molecular biology and genetics, neuroscience, pharmacology and molecular sciences, physiology)</td>
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<td>IBBS Faculty Bridge Awards</td>
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<td>Transgenic Mouse Facility</td>
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<td>Deep Imaging Suite</td>
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Rising to the Challenge:
The Campaign for Johns Hopkins Institute for Basic Biomedical Sciences
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