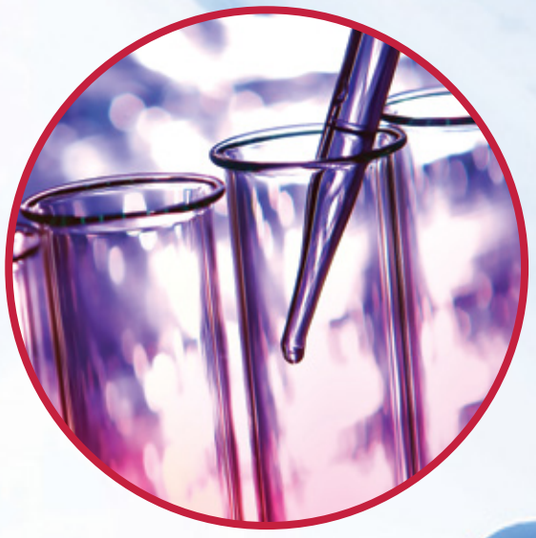
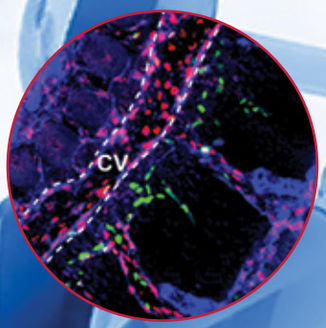
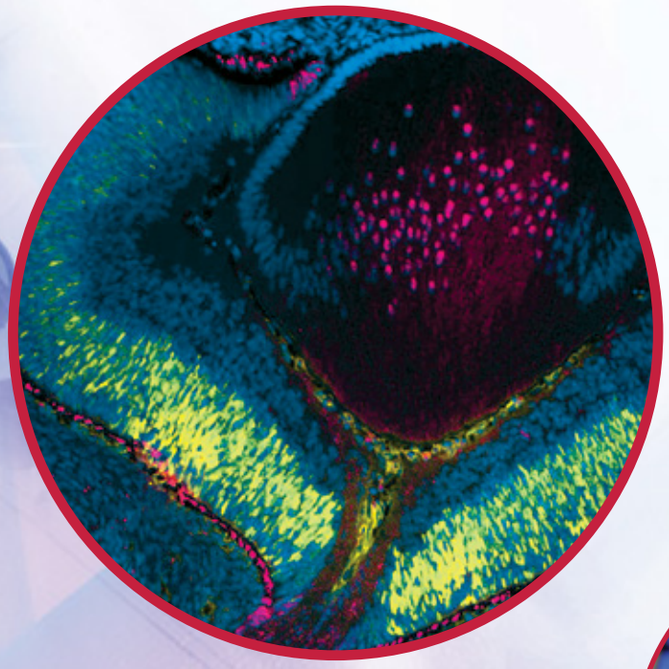
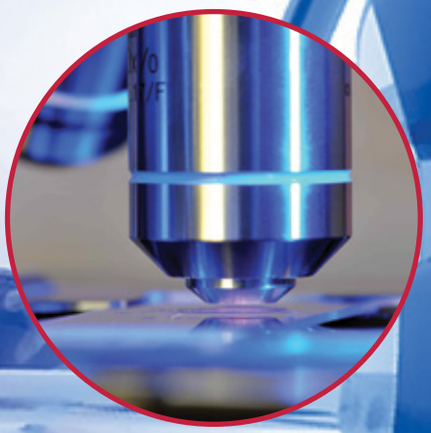


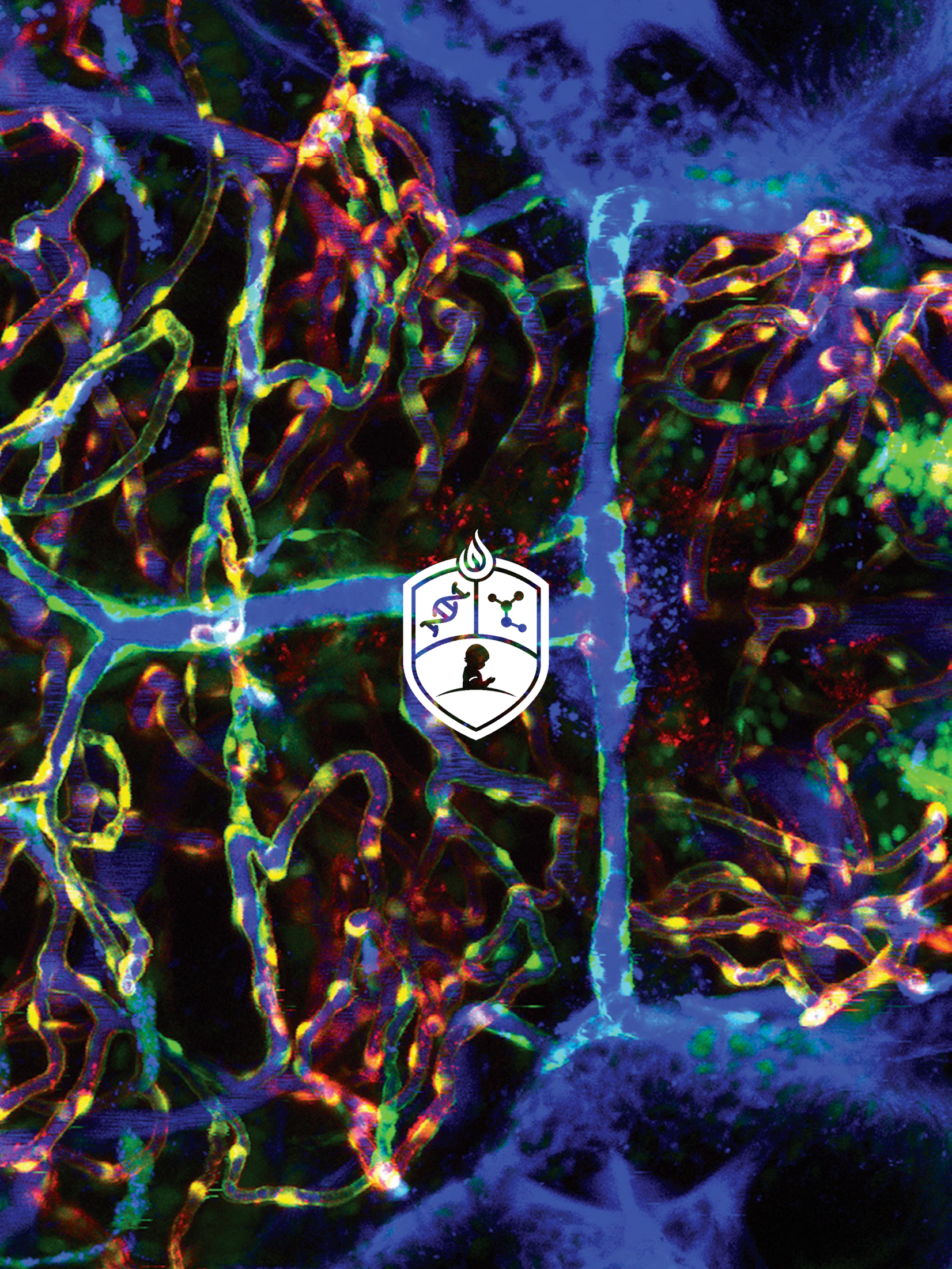




Academic Catalog

St. Jude Children's Research Hospital
Graduate School of Biomedical Sciences

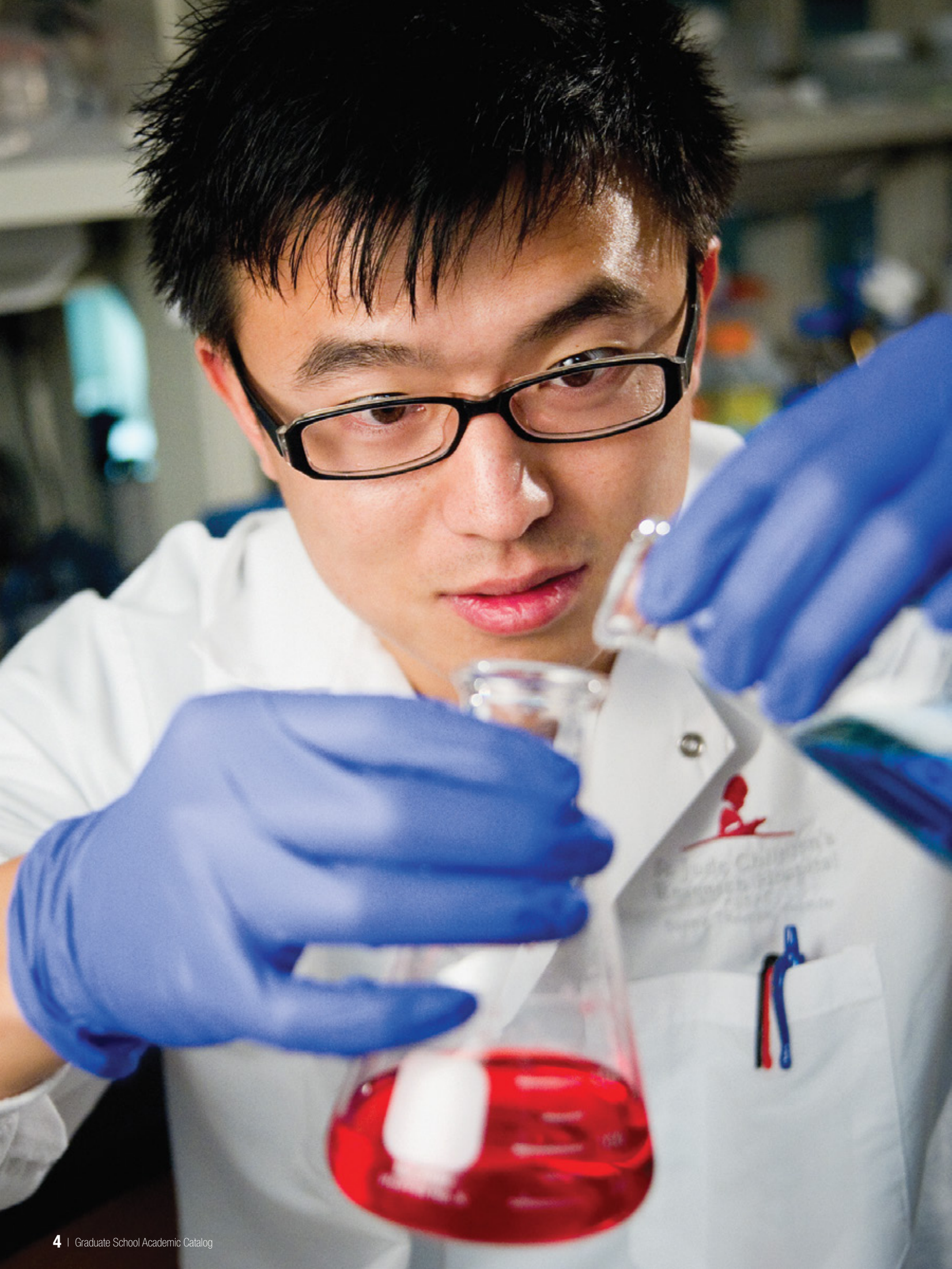




ST. JUDE CHILDREN'S RESEARCH HOSPITAL GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

The St. Jude Graduate School of Biomedical Sciences is authorized by the Tennessee Higher Education Commission. This authorization must be renewed each year and is based on an evaluation of minimum standards concerning quality of education, ethical business practices, health and safety, and fiscal responsibility.

ST. JUDE CHILDREN'S RESEARCH HOSPITAL
GRADUATE SCHOOL OF BIOMEDICAL SCIENCES
262 Danny Thomas Place, Mailstop 1500
Memphis, TN 38105
Phone (901) 595-1500
Fax (901) 595-1510
Email sjgradschool@stjude.org
stjude.org/graduate-school



ST. JUDE CHILDREN'S RESEARCH HOSPITAL
GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

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Message from the Dean

Welcome to the St. Jude Children's Research Hospital Graduate School of Biomedical Sciences!

Are you seeking an innovative biomedical graduate experience? If so, I strongly encourage you to explore the St. Jude PhD Program in Biomedical Sciences. The hospital was founded in 1962 to cure life-threatening childhood diseases through seamless interactions between clinicians and researchers. This uniquely integrated clinical and scientific environment provides unmatched opportunities for scientific graduate training. The first and only National Cancer Institute-designated Comprehensive Cancer Center devoted solely to children, St. Jude is also ranked the No. 1 pediatric cancer hospital by U.S. News & World Report. By advancing the research of the nation's top pediatric cancer hospital, your work here will make a real difference to our patients and to children around the world.

Our reputation for scientific and clinical excellence has been achieved by following a simple formula – hiring the best researchers and providing them with the best facilities. We used the same simple formula to create the Graduate School, which boasts a graduate faculty of internationally renowned investigators. As a graduate student, you will be taught and mentored by more than 100 scientific and clinical investigators working within 22 academic departments.

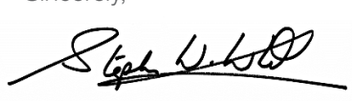
You will join a highly selective cohort of students who will develop into elite biomedical scientists fully prepared to be leaders in research, academia, government and industry. Our resources are unparalleled, with access to state-of-the art core facilities that will speed scientific discovery and expedite your progress to graduation. To foster collaboration and community, our students enjoy a custom-designed space in the Marlo Thomas Center for Global Education and Collaboration. The space encompasses the teaching facility, staff offices, a recreational and discussion area, and private study carrels for your first year in the program.

In our program, you will experience a curriculum that has been thoughtfully designed to meet the needs of modern biomedical research. St. Jude conducts research in many scientific disciplines including biology, chemistry, physics and computational biology, and our program is flexible for students with a wide variety of interests and backgrounds. Your rigorous scientific training has been designed to allow graduation in five years. You will also receive clinical mentoring to learn how basic science is best applied in patient care, and professional development training essential for a successful career. We are also able to accommodate medical trainees who wish to obtain a PhD. Our challenging curriculum is ideally suited to independent, ambitious and fearless graduate students who enjoy working in teams and sharing creative ideas.

Memphis offers an outstanding quality of life for students and attractions that include a thriving music and arts scene, NBA basketball and AAA baseball, a rich cultural environment, parks and biking trails, world-class dining, and a fun and vibrant nightlife. St. Jude-sponsored housing for our graduate students is available along the beautiful Mississippi River. Our outstanding social and intellectual environment is a major reason why St. Jude is consistently ranked on Fortune magazine's "100 Best Places to Work For."

I encourage you to learn more about the St. Jude Children's Research Hospital Graduate School of Biomedical Sciences and look forward to welcoming you to our remarkable institution.

Sincerely,



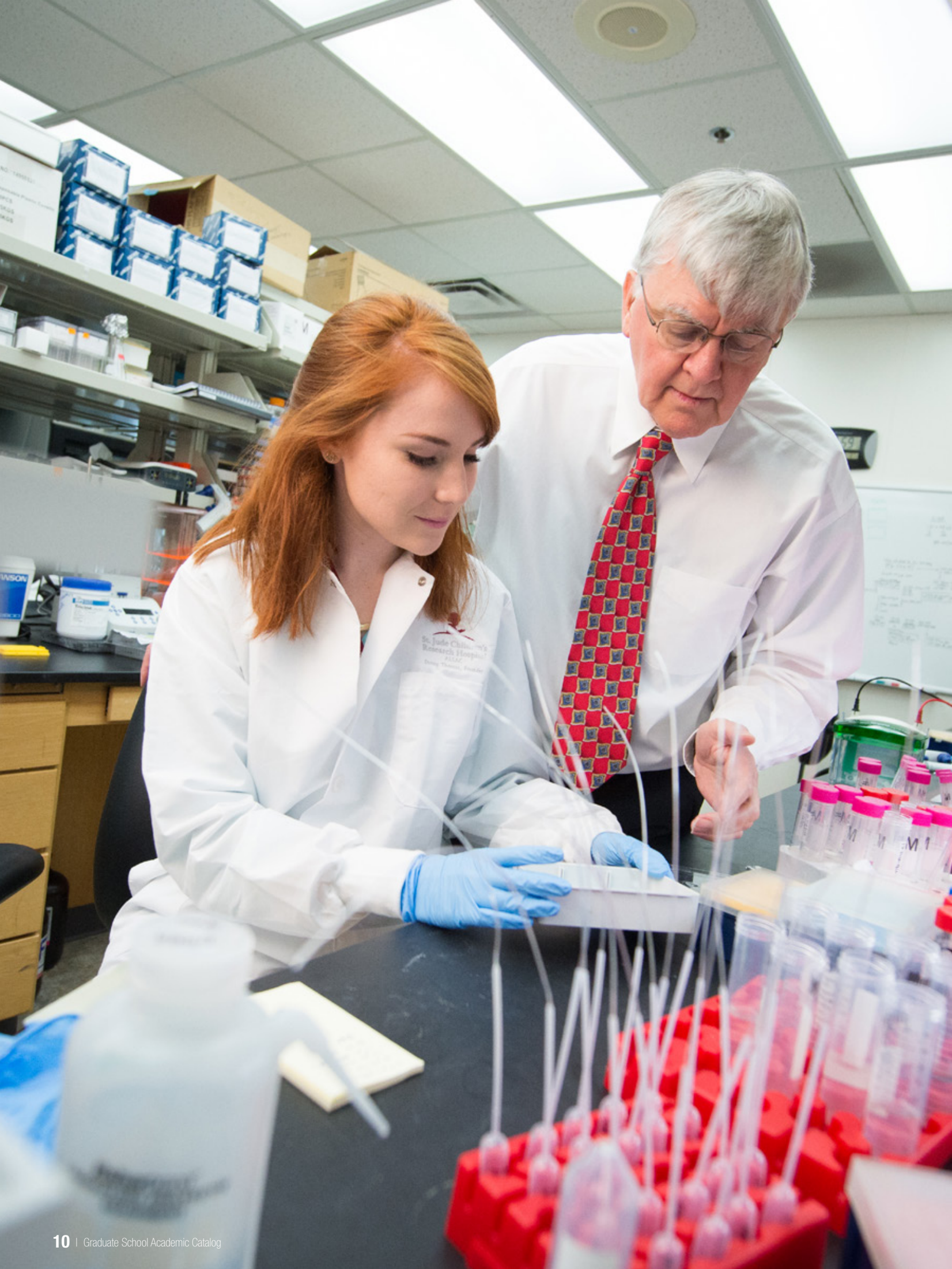
Stephen W. White, DPhil
Dean, St. Jude Graduate School of Biomedical Sciences

St. Jude Campus Map

- Entrance Gate (1–5)
- P Patient Only Parking
- Kay Kafe
- Mail Room
- Dock (1–7)

- Ⓐ Danny Thomas/ALSAC Pavilion
- Ⓑ Patient Care Center
- Ⓒ Richard C. Shadyac ALSAC Tower
- Ⓓ Danny Thomas Research Center
- Ⓔ Integrated Research Center
- Ⓕ Central Energy Plant
- Ⓖ AutoZone Garage 1
- Ⓗ Incinerator/Hazardous Waste

- (I) Chili's Care Center
- (IA) Kay Research & Care Center
- (J) 545 Danny Thomas Place
- (K) 595 Building
- (L) 567 Danny Thomas Place
- (M) 505 Building
- (N) 305 Building
- (O) Tamer-Rashid (ALSAC HQ)
- (P) AutoZone Garage 2
- (Q) Kmart St. Jude Life Center
- (R) Longinotti Building
- (S) Barry Building
- (T) Tri Delta Place
- (U) ALSAC Gift Shop
- (V) St. Jude GMP Facility
- (W) 448 North Second
- (X) 160 Shadyac Avenue
- (Y) Garage 3



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Director, UCSF MD PhD Program

HISTORY OF THE ST. JUDE GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

November 2015 marked the official launch of the St. Jude Children's Research Hospital Graduate School of Biomedical Sciences. This new institution is designed to provide exemplary graduate education for the next generation of biomedical researchers. The school represents a major milestone in the history of St. Jude Children's Research Hospital.

The training of biomedical scientists has always been a key component of the hospital's mission, with approximately 250 postdoctoral fellows, 170 medical students and 45 clinical fellows annually contributing to ongoing patient care and research. Graduate student training has also been an educational priority, historically occurring through affiliations with other schools and colleges.

Ten years ago, St. Jude leadership recognized that the world-class faculty, research and facilities at St. Jude represent the perfect environment for elite graduate training, particularly in the area of translational medicine. This idea continued to evolve, and in June 2015, the hospital's Board approved the school's establishment.

The subsequent development of the school has been rapid. The Tennessee Higher Education Commission officially approved the school in November 2015; the hospital created a Board of Trustees and Advisory Board and recruited a highly experienced staff in 2016. With the infrastructure and curriculum complete, the inaugural class arrived on campus in July 2017.

The mission of the St. Jude Graduate School is to educate and train future generations of scientists who seek to understand the molecular basis of human disease and develop novel therapies based on that understanding. This goal aligns perfectly with the St. Jude mission of finding cures for pediatric catastrophic diseases. The establishment of the Graduate School and the addition of smart, motivated and fearless young researchers to our research enterprise represents a major advance in the continuing development of this exceptional hospital.

HISTORY OF ST. JUDE

More than 50 years ago, Danny Thomas, a struggling young entertainer with $7 in his pocket, got down on his knees in a Detroit church, before a statue of St. Jude Thaddeus, the patron saint of hopeless causes. Danny Thomas asked the saint to "show me my way in life," and pledged to someday build a shrine to the saint. His prayer was answered. Within a few years, Danny Thomas' career prospered. Through films and television, he became a nationally known entertainer, and he remembered his pledge to St. Jude.

When the hospital opened its doors in 1962, a diagnosis of acute lymphoblastic leukemia (ALL) was a death sentence. ALL, the most common form of childhood cancer, had only a 4% survival rate. At that time, the *Handbook of Pediatrics* stated, "There is no cure for leukemia; treatment is directed at prolonging life and relieving symptoms." Pioneering research at St. Jude resulted in patients with ALL having a 50% cure rate only 8 years after the hospital was established. Building on this early success, St. Jude developed protocols that have raised current survival rates for children with ALL to above 90%. The hospital's research findings are shared with doctors and scientists around the world; thus, tens of thousands of children are alive today as a result of the research and clinical trials conducted at St. Jude.

Despite the greater than 90% cure rate, some forms of ALL continue to evade treatment. Today, researchers at St. Jude are using next-generation sequencing to explore the pathogenesis of leukemia and the effects of treatment, with the goal of identifying unique molecular targets for the development of more effective therapies. Several novel targets have been identified as a result of the St. Jude Children's Research Hospital – Washington University Pediatric Cancer Genome Project, which sequenced the complete genomes of more than 600 matched samples of normal cells and cancer cells from patients with the most challenging and severe forms of childhood cancer. As a result of this work, personalized therapies are now being developed. Pharmacogenomic studies are also providing novel insights into inherited differences in drug response, which can further help to individualize treatment.

To date, St. Jude has treated more than 30,000 children from across the United States and from more than 80 countries around the world. All patients are accepted by physician referral for newly diagnosed, untreated, or suspected cancer; HIV infections; or certain hematologic, immunologic, or genetic diseases. Patients are accepted based on their eligibility to enroll in an open St. Jude clinical research protocol. After an initial evaluation, assistance with transportation and local living expenses are also provided. St. Jude patients and their families are never billed for treatment. ALSAC, the fundraising arm of St. Jude, covers all costs beyond those reimbursed by third-party insurers, and when no insurance coverage is available, ALSAC covers all of the patient's costs. Most patients are seen on a continuing outpatient basis, but the hospital maintains 78 beds for patients who require hospitalization during treatment.

Danny Thomas' "little hospital in Memphis"—which now has daily operating costs exceeding $2 million dollars—has dramatically improved health care for children around the world and continues to work on improving treatments for pediatric cancer and other catastrophic childhood diseases. Danny Thomas passed away in 1991, but his children, Marlo, Terre, and Tony, carry on the mission and remain a driving force to ensure that their father's dream endures.


Jude Children's
Research Hospital
Finding cures, saving children.

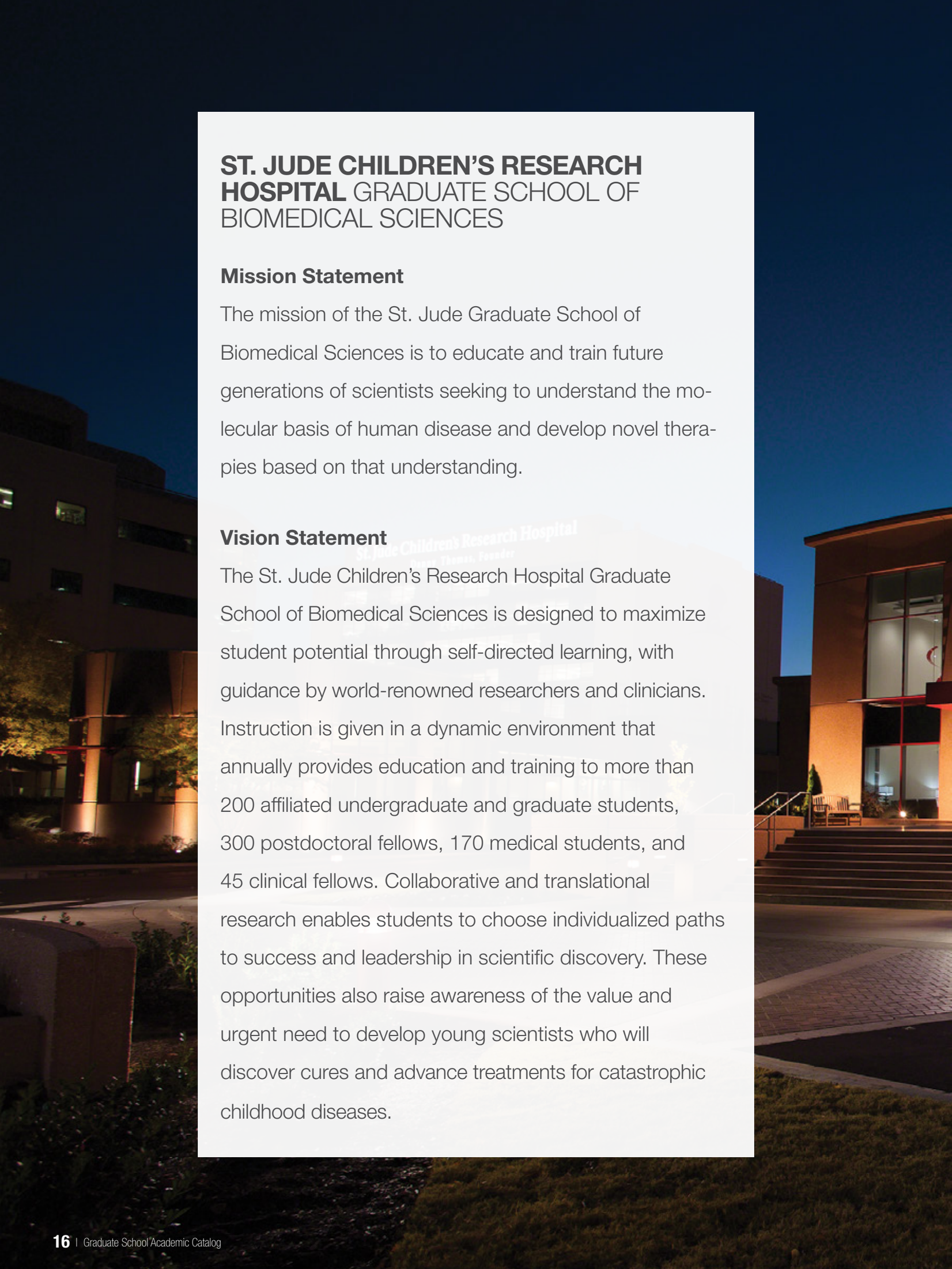
THE MARLO THOMAS CENTER

The St. Jude Graduate School is a custom-designed 4,600 sq ft space located in the Marlo Thomas Center. It contains private study carrels for first-year students, a state-of-the-art teaching facility, and administrative offices. There is also a student lounge equipped with a kitchenette, pool table, and TV. In addition to the Graduate School, the Marlo Thomas Center also contains an auditorium, a lecture hall, meeting rooms, a large atrium, and the Biomedical Library. The library is conveniently located adjacent to the Graduate School, maintains an extensive journal collection, and provides easy access to 4800 electronic journals, 2600 e-books, and several databases. In addition, the library maintains a collection of reference books and journals.

State-of-the-art videoconferencing capabilities enable faculty, staff, and students to share ideas, discoveries, and clinical information with experts and colleagues at other institutions. With more than 400 seats, the auditorium features folding desktops and outlets for electronic devices. The lecture hall seats 68 in a semicircle, giving it a stadium feel. The auditorium and lecture hall are powered by technologies that support the hosting of scientific conferences, academic lectures, institutional seminars, meetings, and symposia.

Seating areas are interspersed throughout the Marlo Thomas Center to foster idea-sharing. Inviting colors and comfortable couches encourage small, informal gatherings. Additionally, huddle rooms and meeting rooms, which are distributed throughout the Center, are custom designed to support informal and impromptu brainstorming sessions and discussions. These rooms contain high-definition monitors, cameras, and wall-mounted interface panels that allow users to control the technology settings and interact with remote participants.

The Marlo Thomas Center was opened in October 2014 and was designed to promote institutional interactions and to host national meetings. As St. Jude continues to chart new frontiers of discovery, the Center will support these efforts by encouraging and facilitating collaboration and innovation–two core principles central to the pursuit of contemporary research. With modern technology, attractive interior design, and emphasis on social interactions, students will find this space ideal for learning.



ST. JUDE CHILDREN'S RESEARCH HOSPITAL GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

Mission Statement

The mission of the St. Jude Graduate School of Biomedical Sciences is to educate and train future generations of scientists seeking to understand the molecular basis of human disease and develop novel therapies based on that understanding.

Vision Statement

The St. Jude Children's Research Hospital Graduate School of Biomedical Sciences is designed to maximize student potential through self-directed learning, with guidance by world-renowned researchers and clinicians. Instruction is given in a dynamic environment that annually provides education and training to more than 200 affiliated undergraduate and graduate students, 300 postdoctoral fellows, 170 medical students, and 45 clinical fellows. Collaborative and translational research enables students to choose individualized paths to success and leadership in scientific discovery. These opportunities also raise awareness of the value and urgent need to develop young scientists who will discover cures and advance treatments for catastrophic childhood diseases.

GRADUATE SCHOOL OBJECTIVES

- Support the St. Jude mission to advance cures, and means of prevention, for pediatric catastrophic diseases through research and treatment.
- Educate and train the next generations of researchers in pediatric catastrophic diseases.
- Afford students the opportunity to study in a unique environment of excellence in clinical and laboratory research that emphasizes collaborative translational research.
- Provide outstanding training through a learning paradigm that is based on self-directed study and mentorship from world-renowned scientists working in unparalleled facilities.
- Produce graduates of distinction who will conduct cutting-edge research.

ACADEMIC CALENDAR **2017—2018**

First-Year Students: Fall Semester (July – Dec) 2017	
Fall Registration	**May 1 – July 1**
Orientation	**Jul 31 – Aug 4**
Core Course I Module I: Genes to Proteins	**Aug 7 – Sep 11**
LAB ROTATION I	**Sept 12 – Oct 24**
Core Course I Module II: Cell Biology	**Oct 25 – Nov 15**
Core Course I Module III: Developmental Biology	**Nov 17 – Dec 15**
WINTER BREAK	**Dec 18 – Jan 1**
First-Year Students: Spring Semester 2018	
Last Day to Confirm Registration	**Jan 2**
LAB ROTATION II	**Jan 2 – Feb 13**
Topics in Clinical and Translational Research Program	**Feb 14 – Apr 30**
Core Facilities Program	**Feb 14 – Apr 30**
Core Course 2 Module IV: Hematology	**Feb 14 – Feb 21**
Core Course 2 Module V: Cancer	**Feb 23 – Mar 26**
SPRING BREAK	**Mar 12 – Mar 16**
Core Course 2 Module VI: Immunology & Infectious Diseases	**Mar 28 – Apr 13**
Core Course 2 Module VII: Pharmacology & Chemical Biology	**Apr 16 – Apr 30**
LAB ROTATION III	**May 1 – Jun 12**
Permanent Laboratory Assignment	**Jun 18**

***All Students*:**
break schedules are the same for all students.
All students will observe St. Jude holidays as follows:

New Year's Day (January 1)

Martin Luther King Jr. Day (third Monday in January)

Memorial Day (last Monday in May)

Independence Day (July 4)

Labor Day (first Monday in September)

Thanksgiving (fourth Thursday in November)

Day After Thanksgiving (fourth Friday in November)

Christmas Day (December 25)

Day After Christmas Day (December 26)

If a holiday falls on a Saturday or Sunday, the St. Jude Graduate School will observe the holiday on the same day that the state or federal government observes it. Generally, a holiday that falls on Saturday will be observed the preceding Friday, and a holiday that falls on a Sunday will be observed the following Monday.

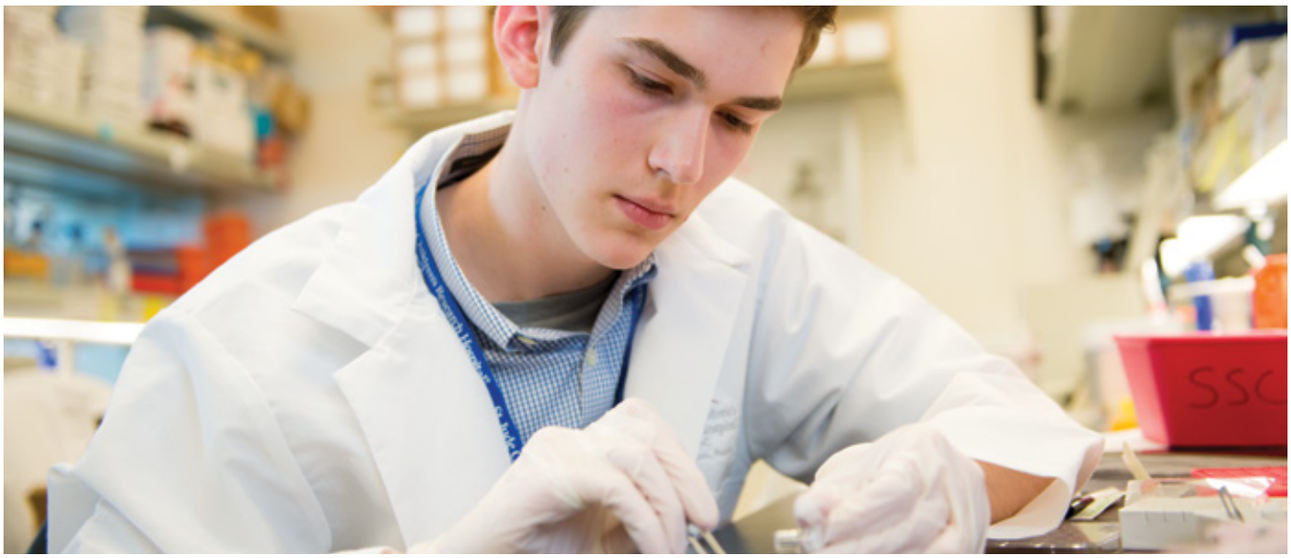
ACADEMIC CALENDAR **2018—2019**

First-Year Students: Fall Semester (July – Dec) 2018	
Fall Registration	**May 2 – July 2**
Orientation	**Jul 30 – Aug 3**
Core Course I Module I: Genes to Proteins	**Aug 6 – Sep 10**
LAB ROTATION I	**Sept 11 – Oct 23**
Core Course I Module II: Cell Biology	**Oct 24 – Nov 14**
Core Course I Module III: Developmental Biology	**Nov 16 – Dec 14**
WINTER BREAK	**Dec 17 – Jan 1**
First-Year Students: Spring Semester 2019	
Last Day to Confirm Registration	**Jan 1**
Topics in Clinical and Translational Research Program	**Jan 2 – Mar 14**
Core Facilities Program	**Jan 2 – Mar 14**
Core Course 2 Module IV: Hematology	**Jan 2 – Jan 9**
Core Course 2 Module V: Cancer	**Jan 11 – Feb 4**
LAB ROTATION II	**Feb 5 – Mar 26**
SPRING BREAK	**Mar 11 – Mar 15**
Core Course 2 Module VI: Immunology & Infectious Diseases	**Mar 27 – Apr 8**
Core Course 2 Module VII: Pharmacology & Chemical Biology	**Apr 10 – Apr 22**
LAB ROTATION III	**Apr 23 – Jun 11, 19**
Permanent Laboratory Assignment	**Jun 17**

ACADEMIC CALENDAR **2019—2020**

First-Year Students: Fall Semester (July – Dec) 2019	
Fall Registration	**May 1 – July 1**
Orientation	**Jul 29 – Aug 2**
Core Course I Module I: Genes to Proteins	**Aug 5 – Sep 9**
LAB ROTATION I	**Sept 10 – Oct 22**
Core Course I Module II: Cell Biology	**Oct 23 – Nov 13**
Core Course I Module III: Developmental Biology	**Nov 15 – Dec 13**
WINTER BREAK	**Dec 16 – Jan 1**
First-Year Students: Spring Semester 2020	
Last Day to Confirm Registration	**Jan 2**
Topics in Clinical and Translational Research Program	**Jan 2 – Mar 12**
Core Facilities Program	**Jan 2 – Mar 12**
Core Course 2 Module IV: Hematology	**Jan 3 – Jan 10**
Core Course 2 Module V: Cancer	**Jan 13 – Feb 5**
LAB ROTATION II	**Feb 6 – Mar 24**
SPRING BREAK	**Mar 12 – Mar 16**
Core Course 2 Module VI: Immunology & Infectious Diseases	**Mar 25 – Apr 13**
Core Course 2 Module VII: Pharmacology & Chemical Biology	**Apr 15 – Apr 27**
LAB ROTATION III	**Apr 28 – Jun 9**
Permanent Laboratory Assignment	**Jun 15_**

Admissions



The application information for the St. Jude Graduate School of Biomedical Sciences will be available at *stjude.org/graduate-school*. Applicants must complete the entire application and attach the seven required supporting documents (listed below). Applicants must have at least an undergraduate degree (i.e., BA, BS, or equivalent); those with an advanced clinical degree (i.e., MD, DO, PharmD, DVM, or DDS) will also be considered. Degrees should be awarded by a U.S.-accredited institution, but applicants (U.S. citizens or permanent residents) who received their degrees from institutions outside of the U.S. also will be considered. At the present time, the St. Jude Graduate School cannot accept applications from international students.

Undergraduate-Degree Applicants

Applicants should hold an undergraduate degree in biology, chemistry, physics, mathematics, or a similar science discipline. Additional advanced training in areas such as biochemistry, microbiology, organic chemistry, genetics, physiology, pharmacology, computational biology, and cell and developmental biology is preferred.

Advanced-Degree Applicants

The Admissions Committee will consider applicants with advanced degrees on an individual basis. Undergraduate degree(s), research experience, and career goals are important admission criteria. Although applicants are required to complete the full number of course credits (90 hours, including the core course), other elements of training may be adjusted, depending on the student's prior experience.

Required Supporting Documents

1. A curriculum vitae that describes in full detail the applicant's academic background, including degrees, research experience, awards, publications, presentations, and other achievements.

2. Official transcripts of academic records.

3. Letters of reference from three mentors, professors, or program directors (advanced-degree applicants). The letters must describe the student's academic successes, background in research, potential for achievement at the graduate level, and capacity for creative, self-directed study.

4. Previous exposure to laboratory research is required. Applicants are required to submit a brief summary of their prior research experience.

5. A one-page summary that describes the applicant's most important contribution to research. Published work should not be sent. Instead, the applicant should explain, in lay terms, his or her best

research experience, how that effort contributed to the overall project, and how the experience demonstrates the applicant's suitability for graduate studies.

6. A two-page personal statement that outlines the applicant's reasons for pursuing a graduate degree in biomedical sciences, the applicant's career goals, and how the applicant determined that the St. Jude Graduate School is the best program through which to attain those goals.

7. Undergraduate-degree applicants are required to submit Graduate Record Examination (GRE) scores (ETS code 7888). Advanced-degree applicants are required to submit scores from the Medical College Admission Test (MCAT) or equivalent examination. Scores should be sent directly to the St. Jude Graduate School.

Late Enrollment

Late enrollment is only available at the Dean's sole discretion.

English Language Proficiency

All students must be proficient in English because all instruction will be given in English.

Admissions Procedure

Applications and supporting documents will be accepted **through December 1** for admission to the following academic year. The application and seven required supporting documents must be received by **close of business (5:00 PM, Central Standard Time) December 1** for consideration. The Dean may waive this deadline only under exceptional circumstances and at his discretion. (The Admissions Committee will review all applications), and the top applicants will be invited to visit the St. Jude campus. During this visit, the students will interview with the Dean and graduate faculty members, tour the campus and facilities, and experience greater Memphis and its attractions. The projected number of students accepted each year will be 12.

Environment of Diversity and Equal Opportunity

St. Jude Children's Research Hospital and the St. Jude Graduate School of Biomedical Sciences encourage diversity on campus and do not discriminate on the basis of race, national origin, sex, genetic information, sexual orientation, age, religion, disability, veteran's status, disabled veteran's status, or any other status protected by federal or Tennessee law. The St. Jude Graduate School of Biomedical Sciences is committed to creating an inclusive learning environment that provides cultural and ethnic diversity. Underrepresented minorities are encouraged to apply to the program.

Academic Program

The mission of St. Jude Children's Research Hospital is to advance cures, and means of prevention, for pediatric catastrophic diseases through research and treatment. How does St. Jude find cures and means of prevention? Simple, through world-class research. The Graduate School aligns with the St. Jude institutional mission and focuses on learning basic scientific principles and connecting them to current scientific research. The Graduate School is designed to train and educate generations of researchers to respond to this mission. Both basic science and clinical graduate faculty teach the curriculum, which emphasizes translational research in cancer biology, infectious diseases, and genetic disorders. The first year of the program has been designed to provide students with the essential background knowledge for their subsequent research, introduce them to clinical research, and familiarize them with the research opportunities at St. Jude.

During their first week, students will receive an extensive orientation to the St. Jude campus and resources, be introduced to the faculty and their research, and complete the required training in human subjects' protection. During the remainder of the year, students will attend core courses, as well as the course "Bioinformatics, Computation Boiology and Biostatistics." Rather than formal lecture series, these team-taught courses will emphasize current research, self-directed learning, and group discussions. In addition, a "Core Facilities Program" course will introduce students to the shared resources at St. Jude and the "Topics in Clinical and Translational Research Program" will expose students to the institutional clinical and translational research. Finally, three laboratory rotations are scheduled independently of course assignments. This will allow students to concentrate solely on coursework when in class and on research projects during the laboratory rotations. At the end of the first year, students will select permanent laboratories and projects for their thesis research.

CORE CURRICULUM

Weeks	Mon	Tue	Wed	Thu	Fri
1	Orientation				
2 - 6	Genes to Proteins	Bioinformatics & Biostatistics Topics in Clin & Transl Research Prog	Genes to Proteins	Core Facilities Program	Genes to Proteins
7 - 12	Lab Rotation 1				
13 - 16	Cell Biology	Bioinformatics & Biostatistics	Cell Biology	Core Facilities Program	Cell Biology
17 - 20	Developmental Biology	Topics in Clin & Transl Research Prog	Developmental Biology		Developmental Biology
21 - 23	Winter Break				

Weeks	Mon	Tue	Wed	Thu	Fri
1 - 6	Lab Rotation 2				
7 - 8	Hematology	Topics in Clinical & Translational Research Program	Hematology	Core Facilities Program	Hematology
9 - 12 Spring Break Week 11	Cancer		Cancer		Cancer
13 - 15	Immunology & Infectious Diseases		Immunology & Infectious Diseases		Immunology & Infectious Diseases
16 - 17	Pharmacology & Chemical Biology		Pharmacology & Chemical Biology		Pharmacology & Chemical Biology
18 - 23	Lab Rotation 3				

Dissertation Research

Students are introduced to the graduate faculty at orientation, during the first week of the program. During the first year, each student completes three laboratory rotations based on the student's research interests and appropriate laboratory matches. At the end of the first year and after completing a minimum of three laboratory rotations, the student and faculty will agree on a permanent laboratory assignment for the student's dissertation research. If an appropriate laboratory assignment cannot be made after three rotations, one additional rotation may be arranged with the Dean's approval.

From the beginning of the second year to degree completion, the student will conduct laboratory research and participate in relevant clinical experiences. Clinical experience facilitates the student's understanding of the clinical applications of their basic science research. To complete the doctoral program, the student must conduct original research in his/her assigned laboratory, analyze and compile the research, complete an approved dissertation that reports the results and significance of the work, and orally defend the dissertation. Prior to scheduling the dissertation defense, the student must have at least two publications based on the student's original research.

Throughout the dissertation phase of the program, students are provided opportunities to attend seminars, lectures, journal clubs, and scientific meetings. The Doctoral Advisory Committees will guide students through the dissertation process and in their choice of enhanced learning opportunities.

The Doctoral Advisory Committee is composed of five faculty members chosen by the student and approved by the Dean. One member of the Committee must be a member of the Clinical Graduate Faculty. The committee is responsible for evaluating and monitoring the student's dissertation research and must officially approve the student's dissertation defense and degree completion. The Doctoral Advisory Committee meets at least twice a year to assess the student's progress and guide him/her to dissertation completion.

Normal Progress Toward a PhD Degree

Requirements for completing the St. Jude PhD in Biomedical Sciences are outlined in the **PhD Requirements** (described previously). However, the following milestones reflect satisfactory progress toward that degree:

- During the first year, the student will complete the mandatory courses. Grades will be based on examinations of the presented material, level of the student's participation in the class discussions, and performance on assignments. An overall grade of A+ (98-100), A (93-97), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), F (0-69)will be issued at the conclusion of each course, but performance will be continually assessed and discussed with the student throughout the course.

- Maintain at least a B grade point average (GPA); GPA minimum, 3.0 on a 4.0 scale.

- Satisfactory participation and completion of assignments in the associated Core Facilities and Topics in Clinical and Translational Research programs. Clinical advisors and research advisors will jointly assess the student's participation and completion.

- During the first year, complete three laboratory rotations and present summaries of the assigned projects.

- By the beginning of the second year, select a research laboratory and research faculty advisor to begin dissertation research.

- During the early part of the second year, select a dissertation research topic and Dissertation Advisory Committee in consultation with the research faculty advisor and the Dean.

- By the end of the second year, write and submit a grant application to support the research.
- At the end of the second year, pass the Candidacy Qualifying Examination.

- Organize semiannual meetings with the Dissertation Advisory Committee.

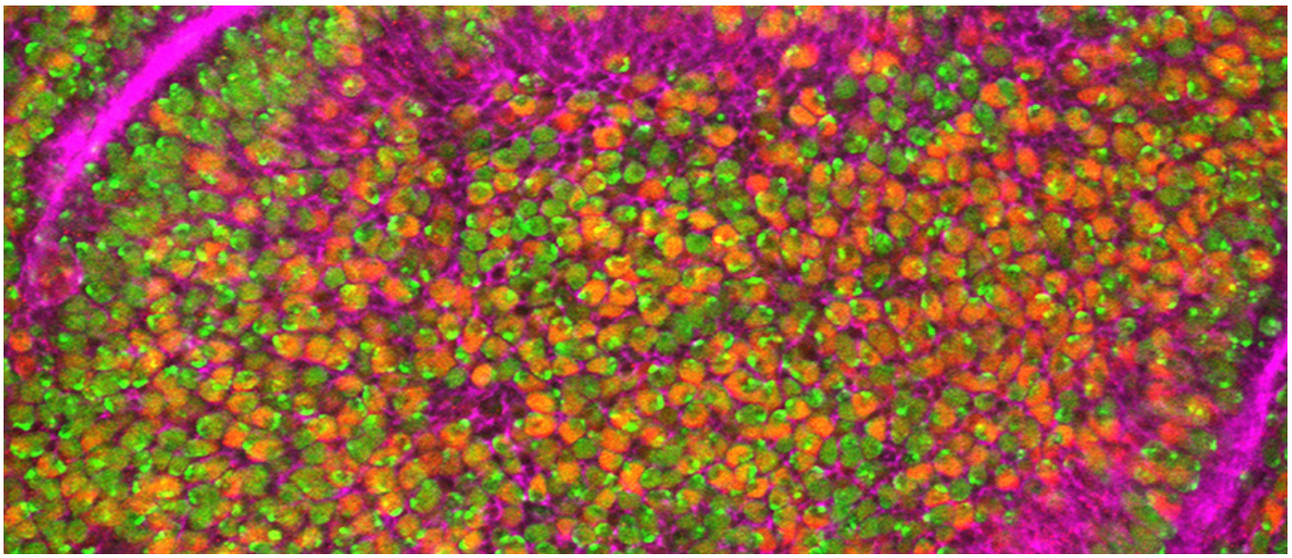
- While conducting your independent research, publish or have accepted for publication at least two manuscripts.

- By the end of the fifth year, successfully prepare the dissertation, conduct the oral defense, and complete all degree requirements.

SEMESTER CREDIT HOURS

Classes	Semester	Weeks	Meeting Day	Contact Hours	Semester Credit Hours per Year				
					1	2	3	4	5
Core Course 1 (Modules I-III)	Fall	2-6, 13-20	MWF	10	10				
Computational Biology & Biostatistics	Fall	2-6, 13-20	T	2	2				
Topics in Clinical & Translational Research Program I	Fall	2-20	T	1	1				
Core Facilities Program	Fall	2-6, 13-20	R	1	1				
Dissertation Reseach	Fall	1-20	MTWRF	40	3	9	9	9	9
Total Fall Semester Credit Hours					17	9	9	9	9
Core Course 2 (Modules IV-VII)	Spring	7-17	MWF	9	9				
Topics in Clinical & Translational Research Program II	Spring	7-17	T	1	1				
Core Facilities Program	Spring	7-17	R	1	1				
Dissertation Research	Spring	1-23	MTWRF	40	6	9	9	9	9
Total Spring Semester Credit Hours					17	9	9	9	9
Total Semester Credit Hours					**34**	**18**	**18**	**18**	**18**
Total Degree Credit Hours									**106**

Research Environment



St. Jude provides a unique environment for translational research. The campus is compact and highly integrated, with basic scientists and clinicians interacting on a daily basis. Studies are typically coordinated through multidisciplinary teams that strive to understand the causes of diseases at the cellular and molecular level and to translate this knowledge into novel therapeutics. Much of the research is conducted under the umbrella of the St. Jude Comprehensive Cancer Center and its partner organization, the Children's Infection Defense Center, which seeks to eliminate infectious diseases in children. This highly interactive approach defines translational research at St. Jude. The infrastructure drives cutting-edge basic science research, therapeutic drug development, disease modeling and preclinical testing, and the design and implementation of sophisticated pediatric clinical trials.

St. Jude is a world-renowned institution for pediatric cancer treatment. By remaining at the cutting-edge of research and being able to rapidly exploit emerging technologies and scientific advances, St. Jude is widely regarded as a dynamic and pioneering leader in translational cancer research. Pediatric patients with cancer who are immunocompromised are particularly vulnerable to infectious agents. Thus, in addition to being a leader in pediatric cancer research and treatment, St. Jude was driven to become a global leader in studies of infectious diseases. Nonmalignant pediatric blood diseases represent another prominent area of research at St. Jude. These disorders include sickle cell disease, hemophilia, and bone marrow–failure syndromes.

Faculty members are organized into departments according to their scientific and clinical expertise. Within their departments, faculty members have the necessary office space, administrative support, laboratories, and facilities that are required for their individual research and clinical activities. Each department is equipped with shared cold rooms, tissue culture rooms, conference rooms, and equipment. Individual laboratories are superbly equipped with standard instruments for biochemistry, molecular biology, protein purification, cell biology, microbiology, and chemistry, according to the needs of each researcher. St. Jude's superb Shared Resources (described in the following section) provide access to a multitude of key technologies that support the multidisciplinary research environment.

Graduate Training and the St. Jude Research Environment

The world-class faculty and research environment at St. Jude provide unique opportunities for graduate education and training. Graduate students will have the opportunity to participate in all of the research programs and to become involved in the full spectrum of studies from basic science, through therapeutic development, and ultimately to clinical trials. Participation in multidisciplinary research teams also extends the mentoring that students receive, beyond that of their thesis advisors and laboratories, and exposes students to a wide array of basic science methods. These include, but are not limited to, in vivo imaging; cellular and subcellular imaging using multiphoton and super-resolution microscopy, as well as 3D electron microscopy; structural and dynamic analyses of macromolecules using light and electron microscopy, nuclear magnetic resonance, and X-ray diffraction; screening of small-molecule libraries using biochemical, biophysical, and cell biological approaches; medicinal and synthetic organic chemistry; drug interactions assessed by pharmacokinetics, pharmacodynamics, and pharmacogenetics; neurobiology; developmental biology; genomics and proteomics; computational biology and bioinformatics; genome engineering and editing; and the full spectrum of immunologic approaches. Thus, students graduating from the St. Jude Graduate School of Biomedical Sciences will have acquired an enviable array of cutting-edge scientific and clinical skills and will be fully prepared to pursue an independent career in translational research.

Academic Regulations

Academic Integrity

The St. Jude Graduate School defines academic integrity as the pursuit of scholarly activity in an open, honest, and responsible manner. All students shall act with personal integrity; respect other students' dignity, rights, and property; and help create and maintain an environment in which all can succeed through the fruits of their efforts. Dishonesty of any kind will not be tolerated. Dishonesty includes, but is not limited to, cheating, plagiarism, and fabricating or falsifying information or citations; facilitating acts of academic dishonesty by others; having unauthorized possession of examinations; submitting work of another person or work previously used without informing the instructor; and tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the St. Jude Graduate School Administration for possible further disciplinary sanctions, up to and including expulsion.

Responsible Conduct of Research Training

Students are required to attend St. Jude's Responsible Conduct of Research (RCR) Training Program. This training is based on a formal, comprehensive series of didactic lectures and discussion groups led by senior faculty and administrators. RCR training opportunities are currently provided monthly, with each session lasting one hour. Each student is required to obtain a minimum of eight hours of RCR training at face to-face lectures and discussions.

The St. Jude RCR curriculum is complemented by the Collaborative Institutional Training Initiative (CITI) online courses on the protection of human participants and RCR; all students will complete this course as part of orientation. In addition, the CITI RCR Training Program in Biomedical or Social & Behavioral Research provides a detailed overview of 10 core areas involved in RCR, which students are expected to complete within the first four months of the program.

St. Jude Graduate School Code of Conduct

The St. Jude Graduate School Code of Conduct outlines the principles for how we conduct ourselves and perform our duties. This Code applies to all researchers, physicians, students, employees, volunteers, board members, and anyone who is conducting work on behalf of the St. Jude Graduate School. Following this Code ensures that we pursue the St. Jude Graduate School mission with the highest standards of integrity and that we continually earn and maintain the trust of those who look to us as a world leader in the academic community.

Ethical behavior is essential to the St. Jude Graduate School mission. We are only as strong as our reputations as individuals and as an institution, which includes a commitment to respect ethnic, cultural, religious, and lifestyle differences of patients, their families, colleagues, students, and supporters. It also includes a commitment to ensure a culture of excellence, innovation, and creativity in research, scholarship, and everything we do.

- A drive and sense of urgency to succeed
- Honesty, integrity, and accountability in actions and decisions
- A culture of trust and teamwork
- Respect for employees and students under our supervision
- A commitment to the continuous development of our employees and students
- A commitment to diversity
- A commitment to local, state, national, and global social responsibility and institutional citizenship

This Code supplements policies and procedures that provide more detailed guidance and documents and fosters our commitment to ethical conduct and compliance throughout the institution.

Attendance Policy

The St. Jude PhD in Biomedical Sciences degree program is a full-time, in-residency program. Students are expected to fully attend all of the mandatory first-year courses, the Core Facilities Program, and the Topics in Clinical and Translational Research Program. They are also expected to complete three laboratory rotations during the first year. Students will have adequate holidays and breaks during this period. Absences will require approval of the student's research faculty advisor. All lectures and symposia will be recorded; students are required to view these if absent for any reason. Unapproved absences are subject to review by the Dean of the St. Jude Graduate School and possible disciplinary action. Attendance will be monitored and excessive absences or late arrivals, as determined by the Dean based on accepted academic standards, may be grounds for dismissal from the program.

Personal leave time beyond the published holiday and break schedules requires approval from the student's research and clinical advisors and the Dean.

Experiential Credit

The Experiential credit policy for the St. Jude Children's Research Hospital Graduate School of Biomedical Sciences (Graduate School) will address the following:

- Formal request by the student
- Evaluation of the student's request
- Application of the experiential credit to the student's academic record/transcript
- Appeal of the evaluation decision

Formal Request by the Student:
A graduate student enrolled in the doctoral program in the Graduate School may submit a request for experiential credit detailing the nature of the prior learning, substantiating the quality of the learning as it relates to the required curriculum, and demonstrating the mastery of the related material. It is strongly recommended that the graduate student include how the learned material has furthered their understanding and knowledge base.

Evaluation of the Student's Request:
The formal request will be reviewed and evaluated by the Senior Vice President and Associate Dean. The result of the evaluation is to determine what credit, if any, may be awarded to the graduate student in lieu of enrolling in the course itself. The evaluation is required to confirm that the student has demonstrated knowledge and mastery of the subject matter. The graduate student may be required to provide additional evidence in support of their request including the ability to thoroughly explain the concept and what can be done with the knowledge.

Application of the Experiential Credit to the Student's Academic Record/Transcript:
The Senior Vice President and Associate Dean will provide a written evaluation (email or typewritten letter) of the graduate student's request to the graduate student, the student's oversight team (SOT), and the Registrar. If experiential credit is awarded, the Registrar will update the student's academic record and transcript to reflect the experiential credit approved and will add the written evaluation to the student's academic file. If no experiential credit is awarded, the Registrar will simply add the written evaluation to the student's academic file.

Appeal of the Evaluation Decision:
The graduate student may appeal the evaluation of the experiential credit to the Dean of the Graduate School within five (5) business days from the date of the initial decision. The Dean may meet with the student, and/or review the case file, and/or discuss the initial decision with the Senior Vice President and Associate Dean. The Dean will render a written decision on the appeal within ten (10) business days from the date of the receipt of the appeal. The Dean's written decision will be communicated and filed in the same manner as the initial evaluation decision. The Dean's decision will be the final decision on the matter.

Transfer Credits

All coursework and research must be completed at St. Jude. The program offers no transfer credit for prior experiential learning or academic accomplishments. Students with advanced degrees in other areas are expected to complete the entire curriculum for this program. An exception to this policy requires approval from the Dean of the St. Jude Graduate School and the Curriculum Committee.

Transferability of Credit to other Institutions

The St. Jude Graduate School of Biomedical Sciences is licensed by the Tennessee Higher Education Commission to confer Masters and Doctorate degrees, and will apply for accreditation by the Southern Association of Colleges and Schools Commission on Colleges, an accrediting agency recognized by the United States Department of Education. However, another school does not automatically accept academic credits earned from a school that is licensed and accredited. In the U.S. higher education system, the receiving institution, taking into account such factors as course content, grades, accreditation, and licensing, determines transferability of credit.

The mission of the Graduate School is to help the student prepare for entry-level employment in the student's chosen field of study. The value of this degree program is its deliberate focus on marketable skills. The credits earned are not intended as a stepping-stone for transfer to another institution. For this reason, it is unlikely that the academic credits you earn at the Graduate School will transfer to another school. You should contact any educational institutions that you may want to transfer credits earned at the Graduate School to determine if the institutions will accept the credits you have earned.

St. Jude Graduate School of Biomedical Sciences does not imply, promise, or guarantee that credits earned will transfer to other institutions, since those determinations are made according to the policies of the receiving institution.

Dismissal from the Program

A student can be dismissed from the St. Jude Graduate School for a number of reasons, including but not limited to, failure to pass the Candidacy Qualifying Examination; consistently poor performance as evidenced by grades, work-in-progress reports, and failure to attend required core course modules, journal clubs, and laboratory meetings; inappropriate and unprofessional behavior; ethical research violations, as well as professional misconduct, as defined in the St. Jude Code of Conduct. Dismissal requires approval by the Dean in consultation with the Graduate Education Oversight Committee and appropriate St. Jude officials.

Conditions for Readmission

A student who has been dismissed from the St. Jude Graduate School will not be readmitted under any conditions.

Student Grievances

The St. Jude Graduate School administration and faculty intend to provide the best-possible learning environment for students. In that spirit, student's are encouraged to seek assistance about a grievance from the student's Scholastic Oversight Team (first year), research advisor, teaching faculty, and/or Doctoral Advisory Committee at the earliest opportunity. Every effort will be made to reach a resolution at this level. If after a thorough review and discussion, the student still feels the complaint has not been adequately addressed, the student should submit the complaint in writing, with a summary of discussion to date, to the Dean. The Dean will then review the complaint, obtain other information needed to complete a comprehensive review of the concern, and recommend a resolution. In most circumstances, this process will take less than 30 days to complete.

If for any reason the complaint involves either the student's research advisor or the Dean of the St. Jude Graduate School, the student may submit the complaint in writing to the Chair of the Graduate Education Oversight Committee (the name, office location, and phone number of the current chair is available on the St. Jude Graduate School website link *stjude.org/graduate-school*.) The Graduate Education Oversight Committee will meet to resolve the complaint within 10 business days of receiving the complaint, or earlier if required by either the Code of Conduct regulations or other policy.
Complaints that allege discrimination, sexual harassment, or any other form of harassment should be reported immediately to the Associate Dean of the St. Jude Graduate School who serves as the St. Jude Graduate School Equity and Diversity Officer. The Associate Dean will guide the student through the appropriate process, as outlined in the St. Jude Children's Research Hospital Institutional Policies and Procedures and adopted by the St. Jude Graduate School. Should the complaint involve the Associate Dean, the student should contact the Dean for assistance.

The decision/resolution of the Graduate Education Oversight Committee is final. However, students in the state of Tennessee may appeal a decision to the Tennessee Higher Education Commission licensure staff at 404 James Robertson Parkway, Suite 1900, Nashville, TN 37243; phone: (615) 741-5293, if the student does not feel that the issue has been adequately addressed.

Grade appeals for final course grades follow the process above and must be submitted before the end of the following semester. Any grade standing beyond that period is not available for review and will remain on the transcript. Students are advised to discuss concerns about grades and academic progress with their advisors at the earliest possible time.

Incomplete Grades

With the Dean's approval incomplete grades may be issued when the semester ends and a student's work is academically acceptable, but for a valid reason the student has been unable to complete all required work. To remove and incomplete grade, the student is expected to complete all uncompleted work by the time agreed upon with his/her advisor, or by the end of the next semester at the latest.

Incomplete grades are indicated on a student's transcript as an "I," which will be replaced with the appropriate grade and credit awarded when the student completes the work, as approved by the course faculty or research faculty advisor, as appropriate. If the grade has not been changed by the end of the following semester, the "I" will be replaced with an "F," which will be calculated into the student's GPA. Reversal of the "F" grade may be possible, if the work is subsequently completed and reversal is recommended by the student's advisor. This option would be granted only in extraordinary circumstances and with the Dean's approval.

Leaves of Absence

A student is not eligible for a leave of absence until he/she has completed the first semester of the core course. After the first semester, the student may submit a leave of absence request in writing to the Dean and meet with his/her Scholastic Oversight Team. During subsequent years, the student may submit a leave of absence request in writing to the faculty research advisor, which will be followed by a meeting with the Doctoral Advisory Committee to review the request. If the request is justified and approved, the student must then submit the signed, approved request to the Dean for final approval. Normally, leaves of absence are for one semester only. If the student does not return at the end of the approved leave, he/she will be withdrawn from the program and must reapply through the entering students' application process. Exceptions to this policy require the written approval of the student's advisor and the Dean.

A first-year student who requests a leave of absence will receive a grade of "I" for incomplete coursework. The student must complete the coursework within one semester of returning to the program, or the "I" will become an "F," and the student will be dismissed from the program. Time taken on an approved leave of absence will not be included in the time limit for degree completion.

Cancellation and Withdrawal Policy

Class may be canceled up to two weeks before the start date. If an entire session of classes is cancelled prior to commencement of the semester, you will be given opportunity to reschedule classes to completion.

Should an unavoidable event such as epidemic, natural disaster, civil unrest, or threat of terrorist activity result in partial or complete cancellation, an appropriate evaluation of the academic credit you attained will follow.

A student may withdraw from the Graduate School at any time. If a student is not certain about withdrawing from the entire program or even a semester, alternatives are available ***with the Dean's approval***.

Withdrawal Process

A student in the St. Jude Graduate School who wishes to withdraw from the program for any reason must first meet with the research advisor to discuss the withdrawal request, and then meet with the Dean to finalize the written and signed withdrawal notice. First-year students will also meet with their Scholastic Oversight Team. The student's research data must be stored on the network drive; laboratory notebooks must be complete; and St. Jude Graduate School property, including the assigned laptop computer, must be returned before the Dean approves withdrawal. With approval from the Dean, the student will meet with the Registrar to formally enter the withdrawal into the student information system. The student's transcript will indicate a "W" for the student's currently enrolled courses. "Withdrawal from the Program" and the date of the withdrawal will be noted on the transcript following the last term's grades. The effective date of withdrawal is the date the Registrar receives the written withdrawal notice.

A student who formally withdraws in good standing from the program and later wishes to be reinstated must reapply through the same application process as all entering applicants, unless prior arrangements have been made with the student's advisor and approved by the Dean.

Placement Assistance

The "next step" for students who successfully complete a PhD in Biomedical Sciences is intended to be a postdoctoral fellowship, industry position, or teaching. Although there is no formal placement office in the St. Jude Graduate School, the best-possible placement assistance for postdoctoral fellowships is through faculty advisors and other mentors in the program. Their support in placing graduates into premier fellowships is invaluable. An extensive network of former St. Jude postdoctoral fellows are another resource to find placements in academia and industry.

Refund Policy

Each student will receive a Graduate School or departmental tuition scholarship or waiver that covers the entire cost of the program and, therefore, is not eligible for a tuition refund.

Master's Degree - Transitional

All students who successfully defind their Master's thesis will be awarded a transtional master's degree and will advance to candidacy.

Master's Degree - Terminal

If a student fails to complete his/her PhD studies, he/she may apply to the Dean for a terminal Master's degree in Biomedical Sciences. To be considered for Master's candidacy, the student must:

- Complete the first-year core curriculum, and
- Pass all core curriculum examinations, and
- Complete at least one year of full-time research, and
- Accumulate sufficient research data to support a Master's thesis.

Once the Dean, in his/her sole discretion, approves the request for a terminal Master's degree, the student will write and submit a Master's thesis and defend it during an oral examination administered by his/her committee. The student's Doctoral Advisory Committee and the Dean will make final judgment on the amount and quality of the student's work, whether or not it rises to a Master's level of research and academic accomplishment, and a terminal master's degree is awarded.

PhD

The St. Jude Graduate School of Biomedical Sciences will award the PhD degree upon the successful completion of the following requirements:

- First-year courses and accompanying examinations (two semesters)
- Laboratory rotations and clinical assignments
- Satisfactory attendance and participation in the required journal clubs, seminars, and laboratory meetings
- Candidacy Qualifying Examination (end of the second year)
- Grant application
- Two research publications
- Dissertation research
- Dissertation thesis
- Oral defense of thesis

Students are expected to complete all coursework, three laboratory rotations, and clinical assignments during the first year. The second year is devoted to research and enhanced preparation for the Candidacy Qualifying Examination. At the end of the second year, students must have passed all requirements to take the Candidacy

Qualifying Examination to attain doctoral degree candidacy status. Each student will be assigned a Scholastic Oversight Team at the beginning of the first year to assist with the coursework. Each student will then, in consultation with the Dean, select a five-member Doctoral Advisory Committee at the beginning of the second year. Both committees must include at least one member of the Clinical Graduate Faculty. The Doctoral Advisory Committee will include the primary thesis advisor and will meet with the student at least twice a year, evaluate the Candidacy Qualifying Examination, and generally work with and guide the student toward timely completion of the required research. This committee will also oversee the preparation and oral defense of the dissertation and recommend pass/fail. Students who fail the Candidacy Qualifying Examination and/or the oral defense of their thesis will be able to repeat them once. During both examinations, a member of the Doctoral Advisory Committee who is not the candidate's primary mentor, will be appointed as Chair.

Intent to Graduate

An Intent to Graduate form must be submitted to the Graduate School at the beginning of the semester in which the student expects to graduate.

Degree Completion Time Limit

Students are expected to complete the doctoral degree in five years, with six years as the maximum time allowed. If a student has officially been approved to withdraw from the program and then re-enters, the period of withdrawal will not be included as part of the time to degree. Any exceptions to this policy require the approval of the Dean.


Fisherbrand
KIMTECH
Centrifuge 5417R

Student Support

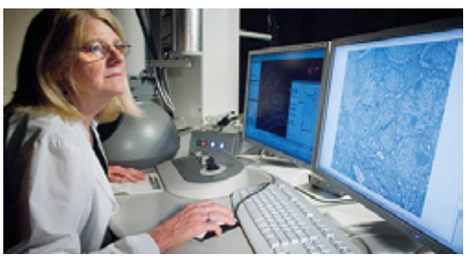
The St. Jude Graduate School is committed to identifying and enrolling talented students who have excelled in their undergraduate programs. To provide an exemplary environment for this, St. Jude offers the following comprehensive support package to all students accepted into the program.

- Competitive stipend—currently $35,000 annually
- Full tuition waiver
- Medical benefits for students and dependents
- Professional development allowances to fund travel to scientific meetings
- Laptop computer for the duration of studies at St. Jude
- Supply allowances to support laboratory research
- Holidays and approved breaks
- Medical and personal leave with required approvals
- English as a second language training, if needed
- Exposure to internationally recognized speakers
- Access to an on-campus Fitness and Wellness Center
- Free on-campus parking
- Opportunities to volunteer in programs supporting St. Jude Children's Research Hospital patients

Shared Resources

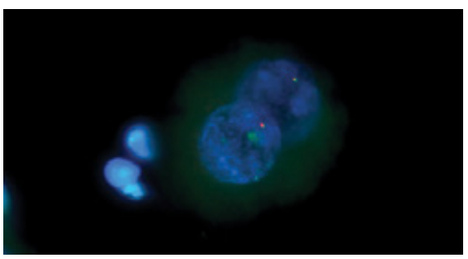
St. Jude and its Cancer Center Support Grant provide an impressive array of shared resources and core facilities to support all research programs on campus. More than 40 facilities provide St. Jude investigators with access to cutting-edge technologies. Expert technologists staff these facilities that provide access to sophisticated instrumentation not readily available in each laboratory.

SCIENCE

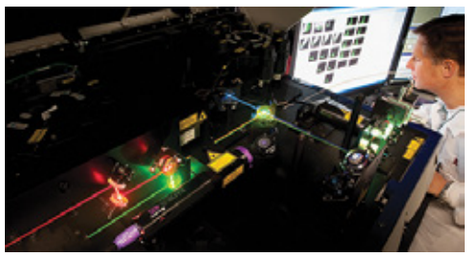


Cell and Tissue Imaging Center - Electron Microscopy is a highly-specialized resource utilizing advanced techniques in electron microscopy imaging.

Cell and Tissue Imaging Center - Light Microscopy assists scientists on design and execution of the imaging experiment; assists with image acquisition, analysis, quantification, presentation, and publication; and educates on the theory and practice of the resident technologies.

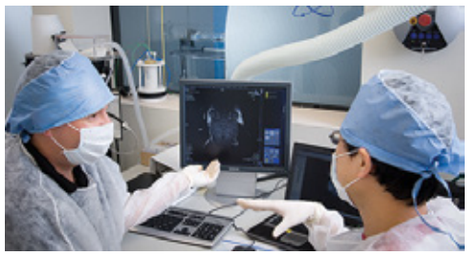


Cytogenetics provides a large diversity of cytogenetic services, including standard G-band karyotyping, spectral karyotyping, FISH analysis, and FISH probe design and development.

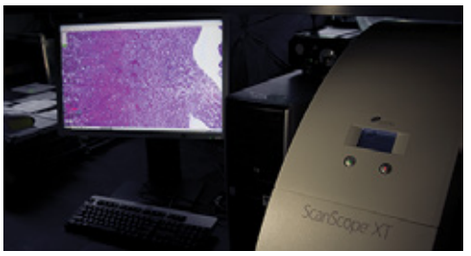


Flow Cytometry and Cell Sorting provides investigators with access to expertise in all aspects of flow cytometry and cell sorting.

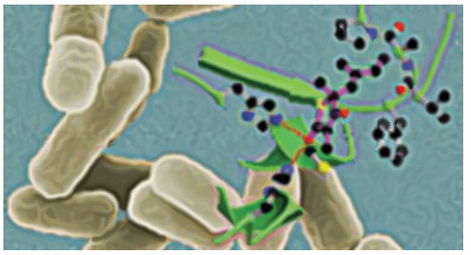
Molecular Interaction Analysis provides research investigators with state-of-the-art technologies for the quantitative characterization of proteins and protein interactions on surfaces and in solution.



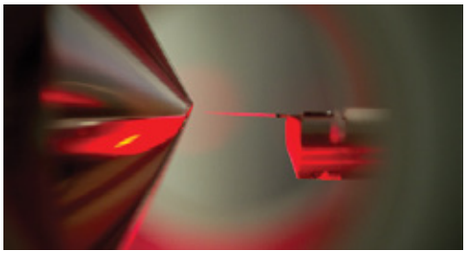
Preclinical Imaging Core facilitates the use of cutting-edge imaging technology to complement investigators' research efforts, including magnetic resonance imaging (MRI), bioluminescence imaging, and high-resolution ultrasound.



Preclinical Pathology Core supports and advances translational research by providing the highest quality laboratory services utilizing state-of-the-art equipment, accurate laboratory methods, and personnel with expertise in comparative pathology.

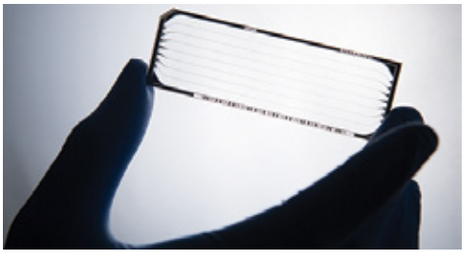


The Protein Production Facility provides a large-scale protein expression and purification service to support the translation of discoveries in molecular and cellular biology to chemical and structural biology.



Proteomics and Mass Spectrometry Facility provides mass spectrometry–based protein analysis services to investigators, including simple protein characterization, posttranslational modification analysis, and comprehensive profiling of the proteome and phosphoproteome.

Transgenic Core Unit incorporates the latest in genome-editing technologies to rapidly produce genetically modified models and provides gene-targeting services, stem cell lines for gene-targeting experiments, selectable marker plasmids for construction of gene-targeting vectors, and training in stem cell culture.



Hartwell Center for Bioinformatics and Biotechnology provides expertise and research support in several high-throughput biotechnologies, including Functional Genomics, Genome Sequencing, Genotyping Analysis, High-Throughput DNA Sequencing, and Macromolecular Synthesis.

INFORMATICS

Bioinformatics & Research Computing provides investigators with access to sophisticated bioinformatics resources that exist in their own departments and also within a shared resource closely aligned with the Comprehensive Cancer Center and the Pediatric Cancer Genome project.

Biostatistics promotes clinical, translational, and laboratory investigations through the further development and creative application of statistical science, including interfaces with biology, medicine, and information technology.

High-Performance Computing Facility is part of St. Jude Information Sciences and provides principal investigators and their research groups with access to on-campus scientific computing facilities through a variety of computing platforms.

CLINICAL AND TRANSLATIONAL

Clinical Pharmacokinetics facilitates and centralizes high-quality, competitively funded, peer-reviewed pharmacokinetic/pharmacodynamic research in clinical models.

Good Manufacturing Practice Facility/Therapeutics Production and Quality provides investigators the ability to develop and produce innovative therapeutics that may not find an initial investment by a major pharmaceutical company. The facility also supports the manufacture of products for use in preclinical studies.

Human Applications Laboratory provides expertise in hematopoietic stem cell processing, gene transduction, flow cytometric analysis and sorting, primary human tissue culture, and cellular vaccine preparation.

Preclinical Pharmacokinetics supports pharmacokinetic and pharmacodynamic investigations executed in the preclinical setting by way of bioanalytical methods development and validation, preclinical study design, and pharmacometric analyses.

OTHER SHARED RESOURCES

Biomedical Communications supports the internal and external initiatives of the medical, scientific, and administrative communities by providing comprehensive visual communications solutions, including photography, digital imaging, broadcast video, illustration, graphic design, and print production.

Biomedical Engineering blends traditional engineering and medicine to advance health care through the creation of innovative devices and service procedures.

Biomedical Library provides resources 24 hours a day, seven days a week and can be accessed during normal business hours, after hours, or through the Biomedical Library intranet site.

Office of Technology Licensing assists with patenting and licensing inventions and exchanging research materials, facilitates interaction with investigators from other academic institutions and companies, and reviews consulting agreements.

Scientific Editing provides editing, copyediting, and proofreading of scientific documents and also presents workshops on writing, publication strategy, and good grantsmanship.

MORE SHARED RESOURCES

Biorepository

Central Protocal and Data Monitoring Office

Clinical Research Budgeting and Billing Office

Clinical Trials - Scientific Review Committe

Diagnostic Biomarkers

Environmental Health and Safety

Grant and Contract Management

Hartwell Center for Bioinformatics and Biotechnology

Health Information Management

Information Sciences

Laboratory Services

Office of Academic Programs

Office of Clinical Research Education

Protocol-Specific Research Support

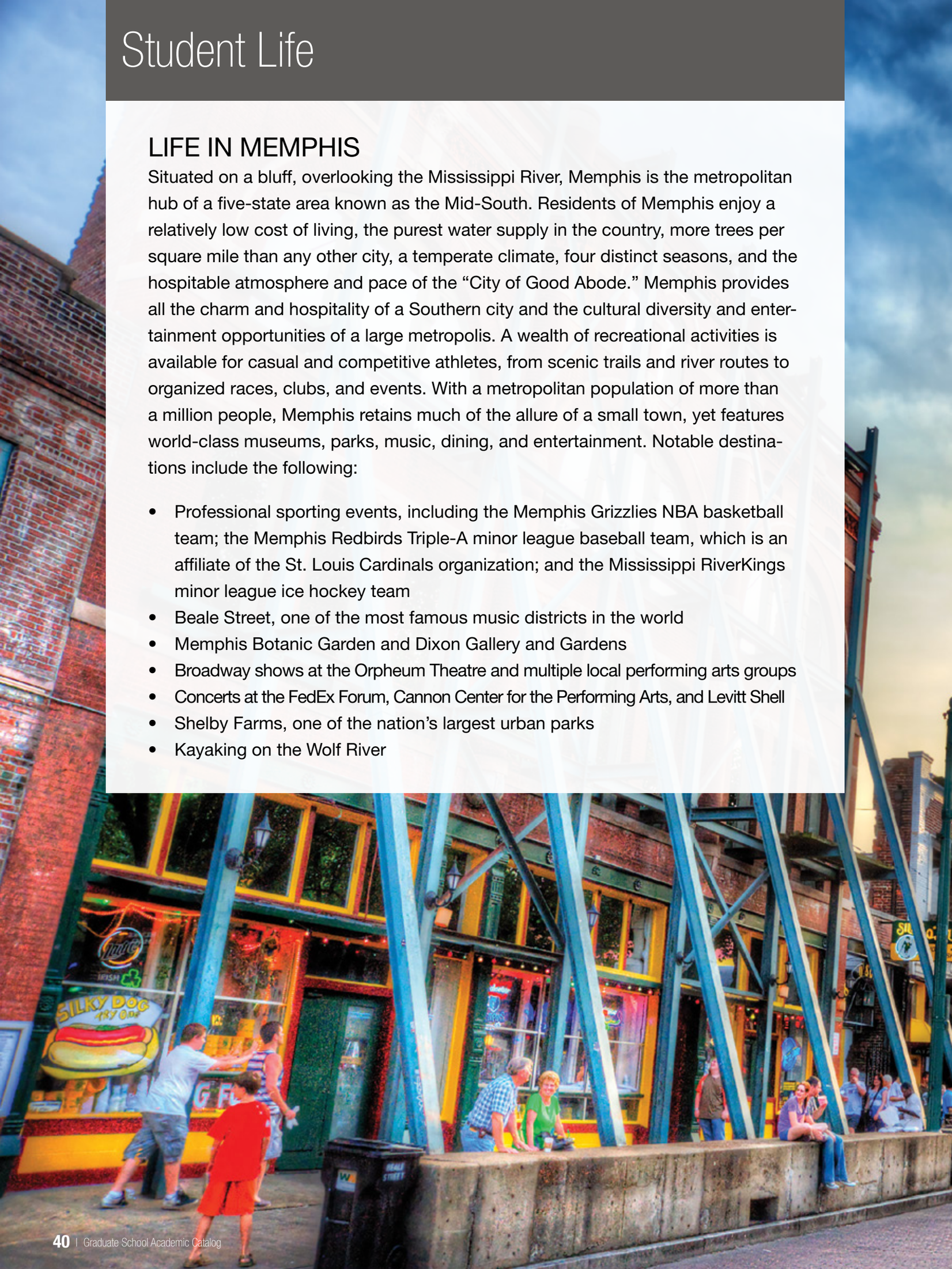
Translational Trials Unit

Vector Development and Production

LIFE IN MEMPHIS

Situated on a bluff, overlooking the Mississippi River, Memphis is the metropolitan hub of a five-state area known as the Mid-South. Residents of Memphis enjoy a relatively low cost of living, the purest water supply in the country, more trees per square mile than any other city, a temperate climate, four distinct seasons, and the hospitable atmosphere and pace of the "City of Good Abode." Memphis provides all the charm and hospitality of a Southern city and the cultural diversity and entertainment opportunities of a large metropolis. A wealth of recreational activities is available for casual and competitive athletes, from scenic trails and river routes to organized races, clubs, and events. With a metropolitan population of more than a million people, Memphis retains much of the allure of a small town, yet features world-class museums, parks, music, dining, and entertainment. Notable destinations include the following:

- Professional sporting events, including the Memphis Grizzlies NBA basketball team; the Memphis Redbirds Triple-A minor league baseball team, which is an affiliate of the St. Louis Cardinals organization; and the Mississippi RiverKings minor league ice hockey team
- Beale Street, one of the most famous music districts in the world
- Memphis Botanic Garden and Dixon Gallery and Gardens
- Broadway shows at the Orpheum Theatre and multiple local performing arts groups
- Concerts at the FedEx Forum, Cannon Center for the Performing Arts, and Levitt Shell
- Shelby Farms, one of the nation's largest urban parks
- Kayaking on the Wolf River



HOUSING

A wide variety of affordable housing exists to suit almost any lifestyle. Choices range from high-rise apartments and renovated downtown lofts overlooking the river to a seemingly endless array of single-family homes in the area's numerous metropolitan, suburban, and rural neighborhoods. One of the most popular places to live in Memphis is Mud Island. Located on the Mississippi River and only 1.5 miles from the St. Jude campus, Mud Island provides a central location with a true community feel. A lighted walking/jogging path borders a park along the riverfront. With six apartment complexes and hundreds of single-family homes, a small retail district, and striking views of the river, it is no wonder that many St. Jude postdoctoral fellows, faculty, and staff have chosen to call Mud Island their home. Other popular housing areas include multiple historic neighborhoods in Midtown, the South Main arts district, and South Bluffs. Whether you prefer an older, established family neighborhood or an arts area with proximity to trendy restaurants and nightlife, these diverse neighborhoods have much to offer and are only a short distance from the St. Jude campus.

Whatever your interests, the greater Memphis area offers something for everyone!

Administration, Faculty and Staff

ADMINISTRATION

Steve White, D Fhil
Dean

Brian Walton, MBA
Assciate Dean

Racquel Collins, MBA, PhD
Assistant Dean

Tiffany Young-Polk, MA
Registrar

Dayna Baker
Coordinator

Marsh McGhee
Senior Counsel

Josh Burnwatt
Sr Applications Analyst I

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Stan Pounds, PhD

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Stacey K. Ogden, PhD
Joseph T. Opferman, PhD
Malia B. Potts, PhD
Ryan Potts, PhD
J. Paul Taylor, MD, PhD (Dept. Chair)

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Naoaki Fujii, PhD
Richard E. Lee, PhD
Fatima Rivas, PhD
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Developmental Neurobiology
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Xinwei Cao, PhD
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Paul Northcott, PhD
Jamy C. Peng, PhD
David J. Solecki, PhD
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Myriam Labelle, PhD

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Scott Snyder, PhD

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Shannon McKinney-Freeman, PhD
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Benjamin A. Youngblood, PhD

Infectious Diseases
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Julia L. Hurwitz, PhD
Suzanne Jackowski, PhD
Jason W. Rosch, PhD
Charles J. Russell, PhD
Stacey Schultz-Cherry, PhD
Elaine I. Tuomanen, MD (Dept. Chair)
Richard J. Webby, PhD
Peter J. Murray, PhD
Amber Smith PhD

Oncology
Mark E. Hatley, MD, PhD
Charles W.M. Roberts, MD, PhD
Kevin W. Freeman, PhD

Pathology
Terrence L. Geiger, MD, PhD
Jeffrey M. Klco, MD, PhD
Mondira Kundu, MD, PhD
Michael M. Meagher, PhD
Charles G. Mullighan, MD
Janet F. Partridge, PhD
Gerard P. Zambetti, PhD

Pharmaceutical Sciences
Mary V. Relling, PharmD (Dept. Chair)
William E. Evans, PharmD
Daniel D. Savic, PhD
Erin G. Schuetz, PhD
John D. Schuetz, PhD
Clinton F. Stewart, PharmD
Jun J. Yang, PhD
Liqin Zhu, PhD

Structural Biology
Eric Enemark, PhD
Richard W. Kriwacki, PhD
Tanja Mittag, PhD
Tudor Moldoveanu, PhD
Junmin Peng, PhD
Stephen W. White, DPhil
Brenda Schulman PhD

Surgery
Andrew M. Davidoff, MD (Dept. Chair)

Tumor Cell Biology
Linda M. Hendershot, PhD
Martine F. Roussel, PhD

Clinical Faculty

Bone Marrow Transplant
Brandon M. Triplett, MD

Diagnostic Imaging
Julie H. Harreld, MD
Mary E. (Beth) McCarville, MD

Epidemiology and Cancer Control
Gregory T. Armstrong, MD, MSCE
Daniel M. Green, MD

Hematology
Jeremie H. Estepp, MD
Jane S. Hankins, MD, MS
Ulrike M. Reiss, MD

Infectious Diseases
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Aditya H. Gaur, MD, MBBS
Joshua Wolf, MBBS

Oncology
Justin N. Baker, MD
Rachel C. Brennan, MD
Sara M. Federico, MD
Hiroto Inaba, MD, PhD
Monika L. Metzger, MD, MSc
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Kim E. Nichols, MD
Alberto S. Pappo, MD
Raul C. Ribeiro, MD
Giles W. Robinson, MD
John T. Sandlund, MD
Elizabeth A. Stewart, MD
Sara M. Federico, MD

Pathology
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John K. Choi, MD, PhD

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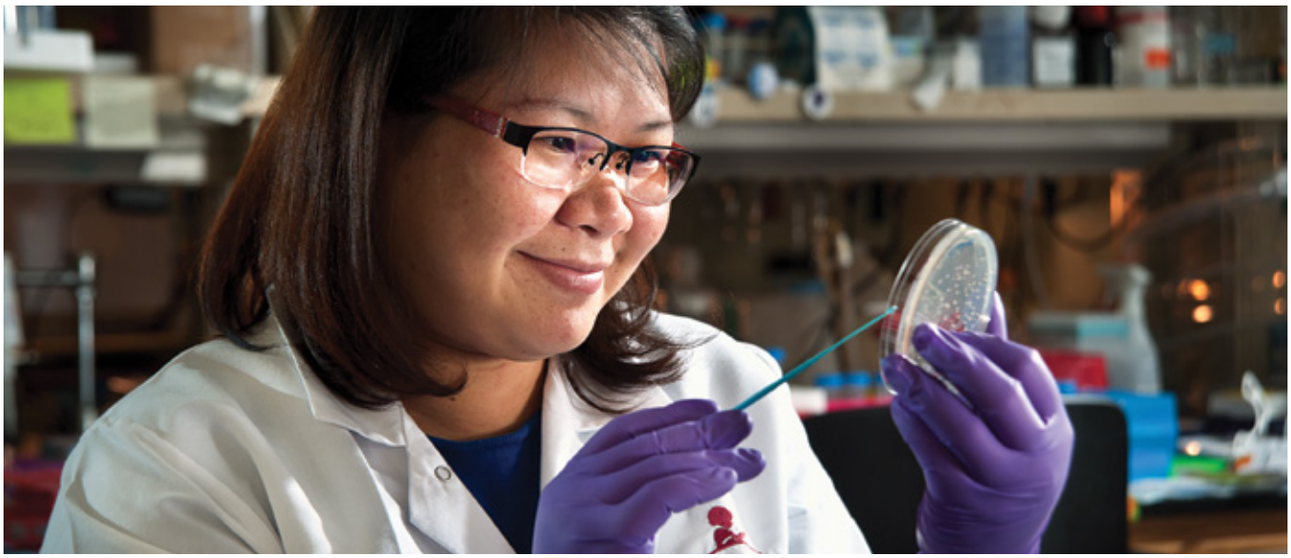
Wassim Chemaitilly, MD
Belinda N. Mandrell, PhD, RN, PNP
R. Ray Morrison, MD

Psychology
Heather M. Conklin, PhD
Valerie M. Crabtree, PhD
Sean Phipps, PhD

Radiation Oncology
Thomas E. Merchant, DO, PhD

Core Course and Program Descriptions



New Student Orientation
ORN 8000 **0 credits**

The new student orientation course is designed to assist new students in their academic and social perparation for success in the program. This course will assist in the completion of all materials, the student's adjustment to the St. Jude campus and resoucers, and the faculty and their research.

Journal Club
SJG 8000 **0 credits**

Students are required to read and critique papers chosen to complement the classroom lectures. Both seminal papers and current research are reviewed. The directed nature of the readings enhances the student's appreciation and understanding of the formal lectures. Students lead the presentation of the journal articles. Students will gain experience and expertise in preparing and orally presenting.

Core Course 1 – Fundamental Topics in Biology

Genes to Proteins
BMS 8101 **4 credits**

This module will cover fundamental topics in biology at the molecular level and provide a molecular foundation for the subsequent core course. We will build upon the central "genes to proteins" dogma of molecular biology by discussing how genes are organized and packaged in the cell, how genes are regulated, and the determinants of gene transcription, gene silencing, and epigenetics. We will continue by discussing how proteins are generated, modified, and function in the cell. During this section, the Core Facilities Program will showcase state-of-the-art methods in gene sequencing and protein analysis and will illustrate the power of these approaches to differentiate disease states.

Cell Biology
BMS 8101 **3 credits**

This module will cover fundamental topics in biology at the cell and organelle level and provide a molecular foundation for the subsequent core courses. We will build upon the foundation of Module I and focus on how cellular organelles contribute to normal and disease biology in Part 1. Part 2 will focus on how organelle systems collaborate to regulate cellular biological processes including energy production, receive and transmit signals with the outside environment, regulate homeostasis, and regulate movement. During this section, the Core Facilities Program will showcase state-of-the-art methods in cellular imaging from both electron microscopy and light microscopy and illustrate the power of these techniques to assess normal and disease biology.

Developmental Biology
BMS 8201 **3 credits**

This module will cover fundamental topics in developmental biology and will consist of three parts. Part 1 will include a basic introduction to model organisms, including major invertebrate and vertebrate models; major stages of vertebrate embryonic development and their molecular regulation; and an introduction to modern evolutionary concepts and the construction of phylogenies. Part 2 will cover the basic

definition of a stem cell, describe biologically important and clinically relevant examples of stem cells, and explain the transcriptional mechanisms by which stem cells are maintained and differentiate. Part 3 will discuss fundamental topics in developmental neurobiology and cover the structure, function, development, and dysfunction of the central and peripheral nervous systems. These three parts will be highly complementary; for example, Part 3 will complement Parts 1 and 2, with a focus on neural induction, genesis, migration, and neural crest cells. The Core Facilities Program will highlight state-of-the-art methods in transgenesis, stem cells, gene editing, and veterinary pathology and will illustrate the power of these methods to model diseases, establish platforms for drug studies and genetic analysis, and achieve the long-term goal of directed differentiation of therapeutically useful cell types.

Core Course 2 – Biological Insights into Disease and Therapy

Hematology
BMS 8602 **2 credits**

This module will present the fundamental and newest discoveries relating to the biology of the hematopoietic system. We will review topics of broad scientific interest, including stem cell biology and transplantation, molecular control of cellular proliferation and differentiation, epigenetic and transcriptional regulation of gene expression, and molecular defects that underlie common malignant and nonmalignant disorders of the hematopoietic system. We will review and discuss the latest scientific advances, both in the basic understanding of hematopoiesis and in new approaches for treating hematologic disorders. For example, we will discuss recent discoveries in the molecular control of hemoglobin gene switching, the molecular mechanisms of leukemogenesis, and the treatment of hematologic disorders by gene therapy and genome editing. The lectures in this module are designed to highlight recent advances and future directions in hematology research and prepare students to understand and critically assess the current literature and latest discoveries in hematology.

Cancer
BMS 8702 **3 credits**

This module will cover essential concepts in cancer pathogenesis, highlighting fundamental cellular regulatory processes that are subverted in cancer. We will build upon previous discussions of genome organization and apply these to understand the genomic abnormalities that drive cancer development, how they are identified, and new insights into disease classification driven by identification of molecular signatures. We will include historical examples of how oncogenes and tumor-suppressor genes were identified, integrated with discussion and analysis of current literature highlighting different model systems for cutting-edge analysis of the mechanistic consequences of cancer-associated mutations and signaling pathways of central importance in cancer. During this section, the Core Facilities Program will showcase state-of-the-art methods in monitoring tumor development in the Preclinical Imaging Core. Students will also engage in the clinical shadowing during this section.

Immunology and Infectious Diseases
BMS 8902 **2 credits**

This module will cover fundamental topics in immunology and infectious diseases. We will begin by examining the cellular components of the innate and adaptive arms of the immune system, which will include a discussion of how these cellular subsets develop, become activated, and differentiate. We will continue by discussing how the immune response is carefully orchestrated to eliminate foreign pathogens without destroying healthy cells. We will also examine how the immune response can be manipulated to enhance protection against pathogens, prevent autoimmunity, and eliminate tumors. Following the immunology portion, we will cover topics associated with microbes in health and disease and therapeutic strategies. We will build upon the preceding sections by discussing how microbes affect basic cellular/immunologic processes, how these lead to particular syndromes/diseases, including cancer, how the host can affect microbes, and the concept of “good” microbes. We will also delve into cutting-edge therapies through the use of systems biology, while moving the students toward a “big picture” understanding of the molecular mechanisms of disease, with a focus on the immunocompromised host. During this section, the Core Facilities Program will showcase state-of-the-art methods in flow cytometry and cell sorting.

Pharmacology and Chemical Biology
BMS 8902 **2 credits**

This module will introduce fundamental concepts important to the science of drug action and target identification. The course will build upon our understanding of the initial rationale for and ultimately

the successful implementation of novel drug therapies at St Jude. The course will describe and discuss features of the host, the target cell, and the biochemical targets that affect drug action. The course will also discuss modern approaches to screening for new drugs and the identification of drug targets. This course will be complemented by journal clubs, as well as core visits.

Topics in Clinical and Translational Research Program
BMS 8501
BMS 8502 **1 credit each**

The Topics in Clinical and Translational Research Program is led by a multidisciplinary team comprising a basic scientist, a translational researcher, and a clinical researcher. To participate in this program, students will need to complete mandatory human subjects' protection training by using the online Collaborative Institutional Training Initiative (CITI) platform provided through St. Jude Children's Research Hospital. There will be six modules (one week each) during the first year, and each module will be taught concurrently with the basic science curriculum and other topics. Each module will have an experiential component and a conceptual component. In addition to the six modules, each student will be assigned a patient at the beginning of their first year of graduate school. The clinical and basic research faculty will identify suitable patients to be followed throughout the year.

Computational Biology
BMS 8301 **1 credits**

This course covers the algorithmic and machine learning foundations of computational biology, combining theory with practice. We cover both foundational topics in computational biology and current research frontiers. We study fundamental techniques, recent advances in the field, and work directly with current large-scale biological datasets.

Biostatistics Course
BMS 8302 **1 credits**

Biomedical research is becoming increasingly data intensive and data driven, and St. Jude has an outstanding interdisciplinary program with innovative biostatistic and bioinformatic tools for accessing, managing, analyzing, and integrating such complex data. The Bioinformatics & Biostatistics course will be taught in two sections during the Fall semester: Section I, Biostatistical Methods; and Section II, Introduction to Research and Clinical Genomics. This course is designed to provide students with a rigorous statistical and computational education, coupled with exposure to a broad range of biomedical research applications. This course will also prepare students to be part of an interdisciplinary team for conducting biomedical research.

Core Facilities Program
BMS 8401
BMS 8402 **1 credit each**

The Core Facilities Program is designed and will be scheduled to complement the basic science topics under discussion during the core courses. Students will participate in structured visits to the institutional and departmental research core facilities to observe how the available technologies work and learn about our onsite capabilities.

Reading and Research
BMS 8991 BMS 8992
BMS 9301 BMS 9302
BMS 9401 BMS 9402
BMS 9501 BMS 9502 9 credits each

Research is a requisite part of the curriculum and will be undertaken as three distinct lab rotations during the first year or, with previous academic credit earned, as an enrollment in Reading and Research in year one and continuous enrollment in subsequent Reading and Research courses until the student's dissertation defense. This course enables the student to function as a member of a research team in a laboratory setting while also furthering their independent dissertation research. The student's primary advisor will continuously evaluate their progress in accordance with the student's qualifying exam proposal. The student and primary advisor will meet at least once per term with the student's dissertation committee and to submit an evaluation by the end of each term to the Dean. It is expected that the student will author a minimum of two papers related to their independent research for submission to a journal(s) for publication.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About St. Jude

St. Jude Children's Research Hospital (St. Jude), located in Memphis, Tennessee, is a private nonprofit biomedical research institute where scientists strive to understand the molecular, genetic, and chemical bases of catastrophic childhood diseases. Research is focused on pediatric cancers, acquired and inherited immunodeficiencies, genetic disorders, and infectious diseases, as well as normal cellular processes. St. Jude's goal is to develop cures for these diseases and promote their prevention.

The St. Jude campus is situated north of downtown Memphis, on the bluffs of the Mississippi River. The campus consists of hospital and research buildings; ALSAC fundraising headquarters; and a Good Manufacturing Practice (GMP) facility, which produces clinical-grade therapeutics. The research staff consists of basic science faculty, clinical faculty, postdoctoral fellows, clinical fellows, and graduate students from around the world.

St. Jude offers opportunities for postdoctoral and graduate training, which is available in a wide variety of research areas in the basic and clinical sciences. The proximity of laboratory and clinical activities provides an ideal setting for collaborative and translational research and facilitates interactions among investigators working in different disciplines.

Current Research

The current basic and clinical research at St. Jude includes work in angiogenesis, apoptosis, cancer biology, cell cycle regulation, chemical biology and therapeutics, computational biology, developmental biology, epidemiology and cancer control, experimental hematology, gene therapy, genomics, immunology, infectious diseases, molecular genetics, molecular therapeutics, neurobiology, pathology, pharmaceutical sciences, proteomics, radiological sciences, signal transduction, stem cell transplantation, structural biology, virology, pediatric AIDS, and psychological effects of catastrophic illnesses. St. Jude also conducts long-term biomedical evaluations of its patients and is the only pediatric research hospital supported by a National Cancer Institute Comprehensive Cancer Center support grant. Research highlights from the previous year can be found in the annual Scientific Report, which is available online at *stjude.org/sci-rpt.*

Nobel Prize

In 1996, Peter C. Doherty, PhD, who holds the Michael F. Tamer Endowed Chair in Immunology, was awarded the Nobel Prize for Medicine. This award recognized Dr. Doherty for key discoveries on how T cells identify and eliminate infected cells.

Faculty in the National Academy of Sciences

Four members of the St. Jude faculty have been elected to the National Academy of Sciences: Charles J. Sherr, MD, PhD (1995); Peter C. Doherty, PhD (1998); Robert G. Webster, PhD (1998); and Brenda A. Schulman, PhD (2014).

Faculty in the National Academy of Sciences Institute of Medicine

Six members of the St. Jude faculty have been elected to the Institute of Medicine (IOM), a prestigious branch of the National Academy of Sciences. The hospital's IOM members include Peter C. Doherty, PhD, Immunology; President and CEO James R. Downing, MD; William E. Evans, PharmD, Pharmaceutical Sciences; Arthur W. Nienhuis, MD, Hematology; Mary V. Relling, PharmD, Chair of Pharmaceutical Sciences; and Charles J. Sherr, MD, PhD, Chair of Tumor Cell Biology.

Howard Hughes Medical Institute

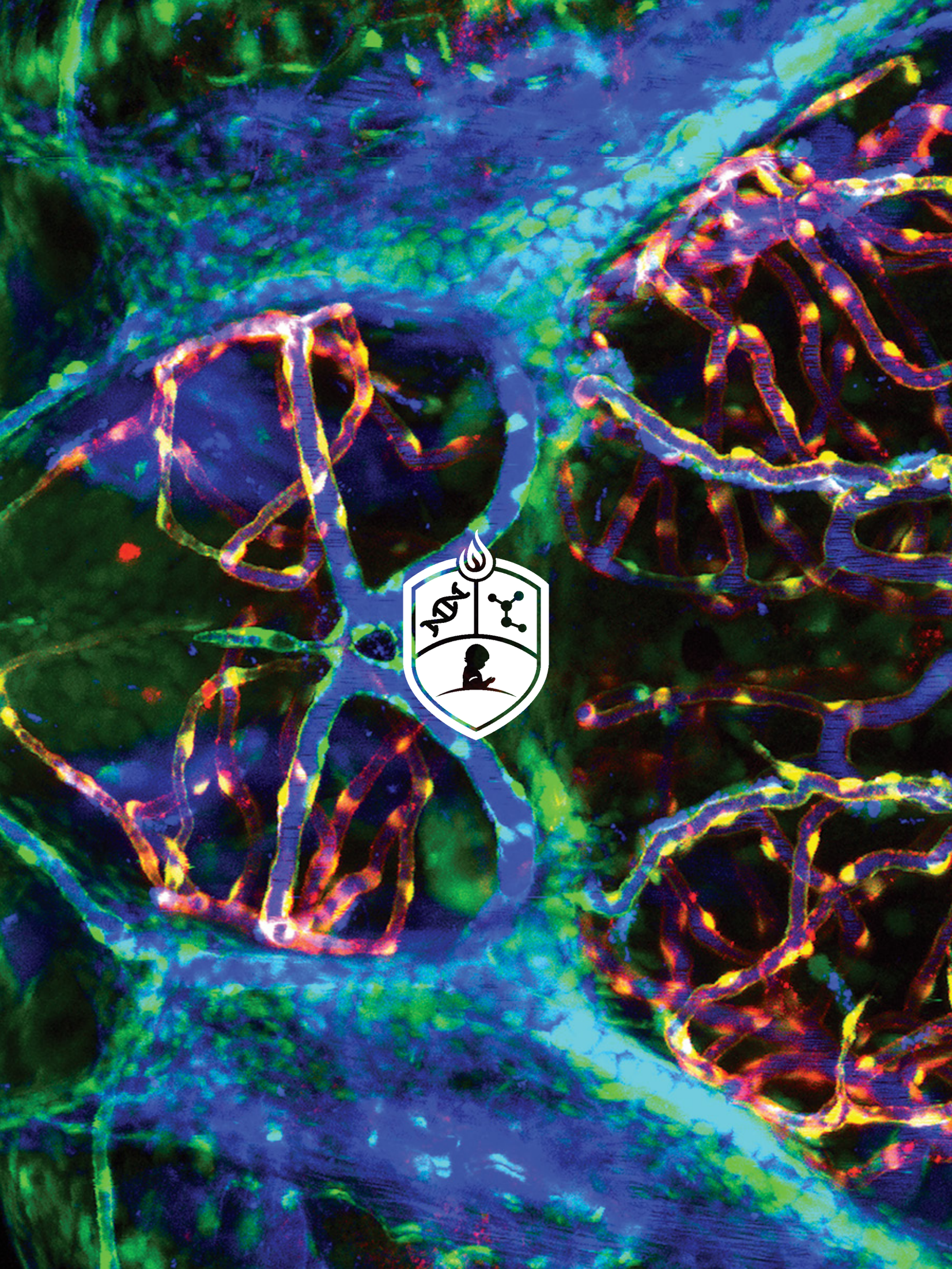
Four St. Jude faculty members are Howard Hughes Medical Institute (HHMI) investigators; Michael A. Dyer, PhD, Developmental Neurobiology; Brenda A. Schulman, PhD, Structural Biology and Tumor Cell Biology; Charles J. Sherr, MD, PhD, Chair of Tumor Cell Biology; and J. Paul Taylor, MD, PhD, Chair of Cell & Molecular Biology. An HHMI award offers not only generous funding but also freedom and flexibility. "The Hughes awards have provided me complete freedom and support to do what I want. The key is that Hughes is not project oriented but people oriented," says Dr. Sherr, whose HHMI grant has been renewed three times.

St. Jude Office of Academic Programs

The vision of St. Jude Children's Research Hospital emphasizes the importance of educating health care and research professionals. In keeping with this vision, the goal of the Office of Academic Programs is to be a world leader in attracting the best basic and translational scientists and to provide superior educational and academic opportunities for them to become national and international leaders in advancing the research, prevention, and treatment of catastrophic diseases in children. To support this vision, Academic Programs assists in recruiting and onboarding postdoctoral fellows at St. Jude, provides a comprehensive Fellows Professional Development Program, and offers the opportunity for mentoring training. All students, including those enrolled in the St. Jude Graduate School of Biomedical Sciences, are also encouraged to participate in the seminars, symposia, social functions, and professional development programs provided by Academic Programs. Approximately 200 undergraduate and graduate students choose to study at St. Jude each year. Of these students, 60 to 70 are here to pursue their entire doctoral research project and thesis preparation under the affiliation agreements that St. Jude has with many universities – both domestic and international. Academic review of these proposed projects and continued review of students here for this purpose are under the domain of the Graduate Education Oversight Committee. The responsibilities of the Graduate Education Oversight Committee also include responding to student challenges or grievances as outlined in the Student Grievance Policy.

Outreach

Close interactions with the neighboring University of Tennessee Health Science Center and Le Bonheur Children's Hospital provide a rich extended research environment in Memphis. The St. Jude mission is not restricted to Memphis and the Mid-South; St. Jude currently has seven affiliate hospitals in the U.S., where pediatric patients can be treated on St. Jude protocols. These affiliates are located in Peoria, Illinois; Shreveport, Louisiana; Baton Rouge, Louisiana; Johnson City, Tennessee; Huntsville, Alabama; Springfield, Missouri; and Charlotte, North Carolina. In addition, through the International Outreach Program, St. Jude provides education, training, and support to 21 medical institutions that are official partner sites in 15 countries to treat children with cancer and other catastrophic diseases.



St. Jude Children's Research Hospital
Graduate School of Biomedical Sciences

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