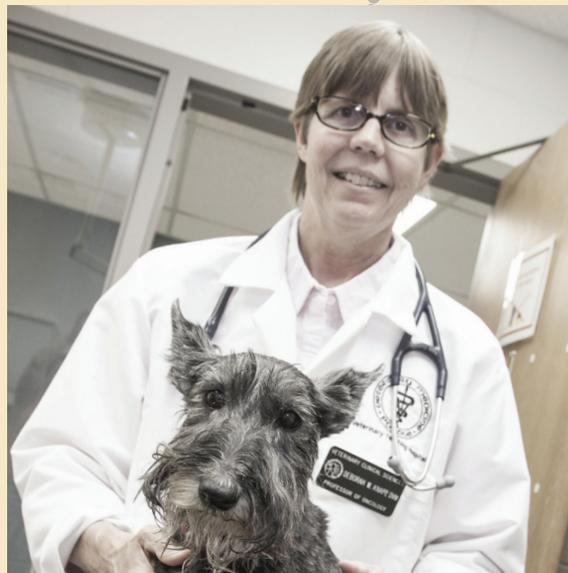
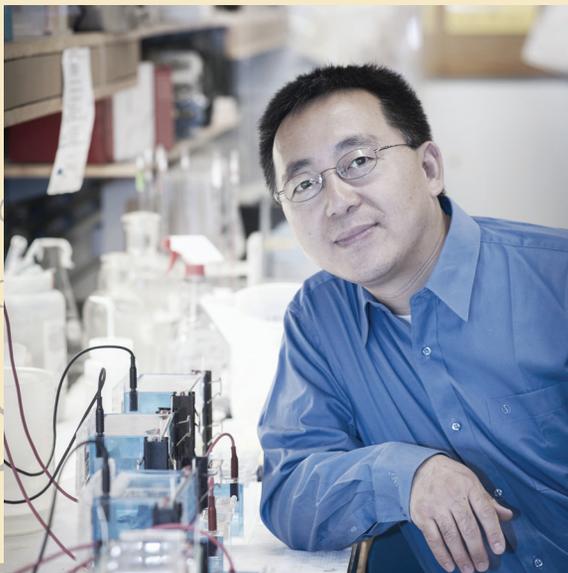




PURDUE UNIVERSITY
CENTER FOR CANCER RESEARCH



MISSION: DISCOVERY

2013

When we hear that a loved one has been diagnosed with cancer, our first question often is, *what kind of treatment will they receive?* In the past, that was often a relatively simple question for physicians to answer, given the one-size-fits-all approach to cancer care.



But increasingly, there are more individualized options for treatment, thanks to the work of researchers like those right here at the Purdue University Center for Cancer Research. As one of seven basic science centers in the United States, we make unique discoveries that help us understand how cancers form, and we partner with clinicians to turn our findings into new diagnostics, monitoring tools and therapies for patients.

Increasing the university's capacity to translate basic research into life-changing treatments is, in fact, one initiative of Purdue Moves, a series of 10 targeted programs designed to enhance research and educational opportunities for students and broaden Purdue's global impact. As part of the initiative, we will be working with leaders of the new Purdue University Center for Drug Discovery to share findings and ensure a unified, efficient progression of research.

At the other end of the cancer research spectrum — prevention — I am pleased to report that members of the International Breast Cancer and Nutrition Project, affiliated with our Breast Cancer Discovery Group, convened in Saumur, France, last fall for an extended think tank meeting. Twenty-five leaders from eight countries came together to detail recommendations for cancer prevention and for the future of international primary cancer prevention research.

Along with these great new collaborations, we are proud of the many honors that our faculty and staff members have received in 2013. Last fall, nine of our researchers were honored at the ninth annual Inventors Recognition Reception sponsored by the Purdue Research Foundation. They were among 45 Purdue University faculty and staff whose discoveries were patented during the 2012-2013 fiscal year. You can read about them on p. 5.

R. Graham Cooks, the Henry Bohn Hass Distinguished Professor of Chemistry, received the 2013 Dreyfus Prize in Chemical Sciences for his innovations in mass spectrometry and analytical chemistry. His research has already led to clinical trials for tumor detection in the operating room.

Philip S. Low, the Ralph C. Corley Distinguished Professor of Chemistry and inaugural director of the Center for Drug Discovery, was honored with the August M. Watanabe Life Sciences Champion of the Year Award from BioCrossroads. Low has guided the discovery and development of seven drugs that are currently in human clinical trials for imaging and therapy of various cancers.

And **Teasa Thompson** — who launched our ACT (Affecting Cancer Together) program, which encourages prevention and early detection of cancer among targeted communities in Indiana — received a Cancer Control Champion award from the Indiana Cancer Consortium.

Inside are many more success stories of our talented faculty and staff members. Enjoy reading about our progress in the past year, and take pride in knowing you've helped make our discoveries possible.

A handwritten signature in black ink that reads "Timothy L. Ratliff". The signature is written in a cursive, flowing style.

Dr. Timothy L. Ratliff
Robert Wallace Miller Director
Purdue University Center for Cancer Research

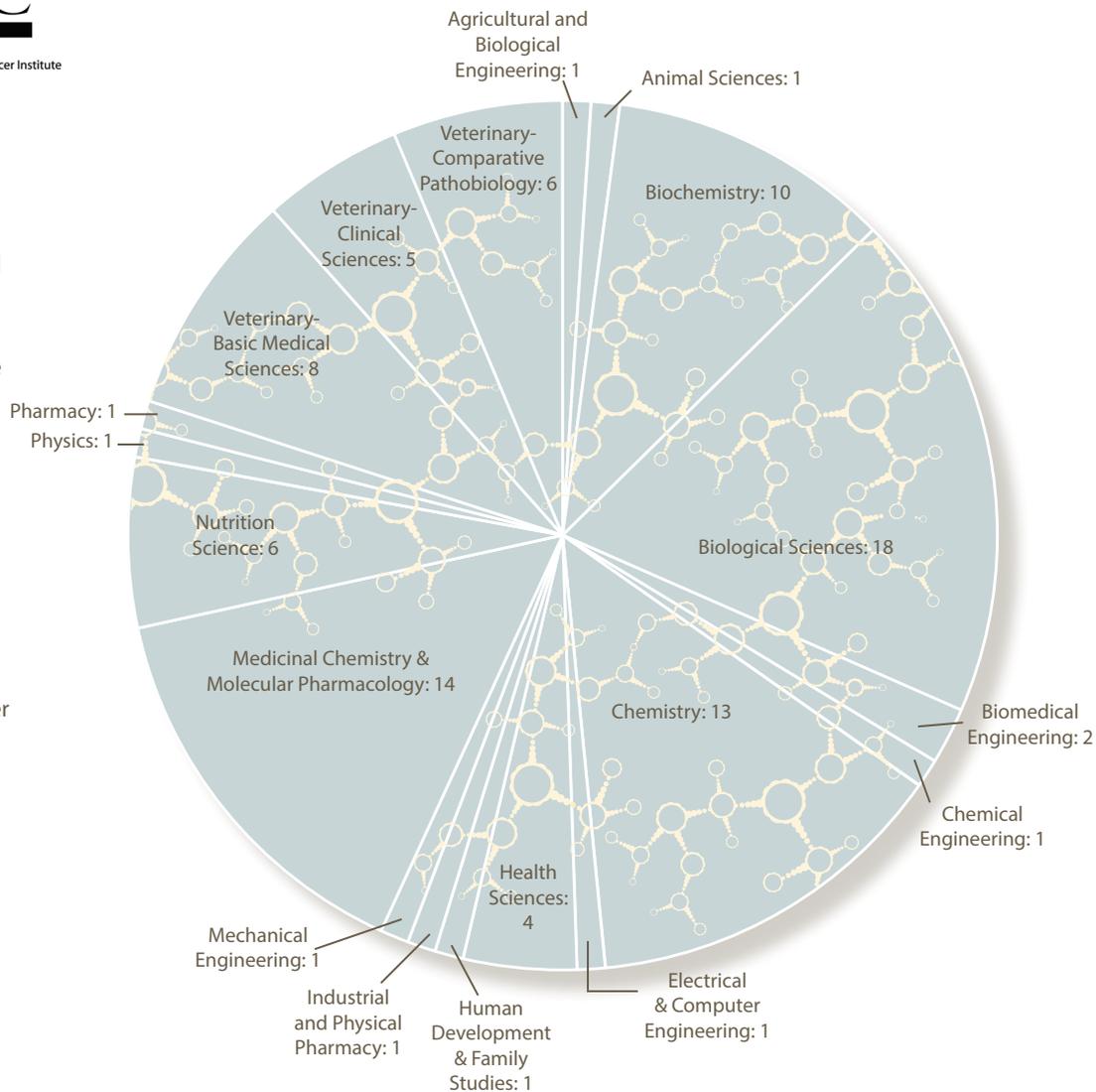
WELCOME

NCI-DESIGNATED CANCER CENTER

NCI-designated cancer centers are characterized by scientific excellence and the capability to integrate a diversity of research approaches to focus on the problem of cancer.

The National Cancer Institute currently has 68 designated cancer centers, seven of which conduct laboratory research only and do not provide patient care, including the Purdue University Center for Cancer Research.

PURDUE UNIVERSITY CENTER FOR CANCER RESEARCH FACULTY MEMBERS BY DEPARTMENT



METRICS

Purdue Research Foundation hosted its ninth annual Inventors Recognition Reception last fall to honor 54 Purdue University faculty and staff whose discoveries were patented during the 2012-2013 fiscal year. Among those Purdue faculty and staff recognized were nine members of the Purdue University Center for Cancer Research. Congratulations to these members for their continuing scientific advances:



Richard F. Borch, Lilly Distinguished Professor and Head, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy

R. Graham Cooks, the Henry B. Hass Distinguished Professor of Chemistry, Department of Chemistry, College of Science



Stanton B. Gelvin, Edwin Umbarger Distinguished Professor of Biology, Department of Biological Sciences, College of Science

Arun K. Ghosh, Ian P. Rothwell Distinguished Professor of Chemistry and Medicinal Chemistry, Department of Chemistry, College of Science, and Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy



Richard A. Gibbs, Associate Dean for Graduate Programs, Professor, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy



Philip S. Low, Ralph C. Corley Distinguished Professor of Chemistry, Department of Chemistry, College of Science; director, Purdue Center for Drug Discovery



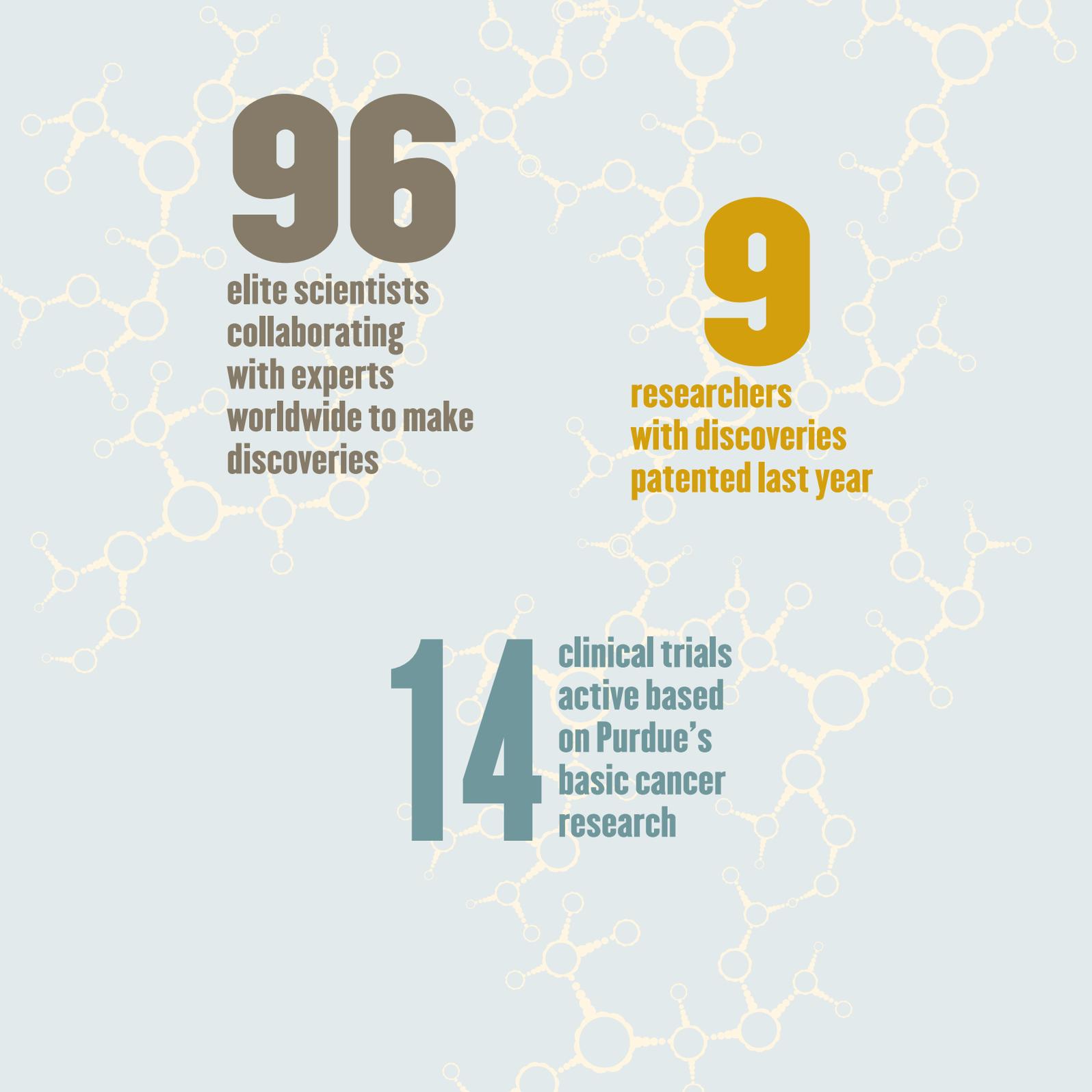
David D. Nolte, Professor, Department of Physics, College of Science

Fred E. Regnier, John H. Law Distinguished Professor of Chemistry, Emeritus, Department of Chemistry, College of Science



J. Paul Robinson, SVM Professor of Cytomics, Department of Basic Medical Sciences, College of Veterinary Medicine; professor, Weldon School of Biomedical Engineering, College of Engineering

HONORS



96

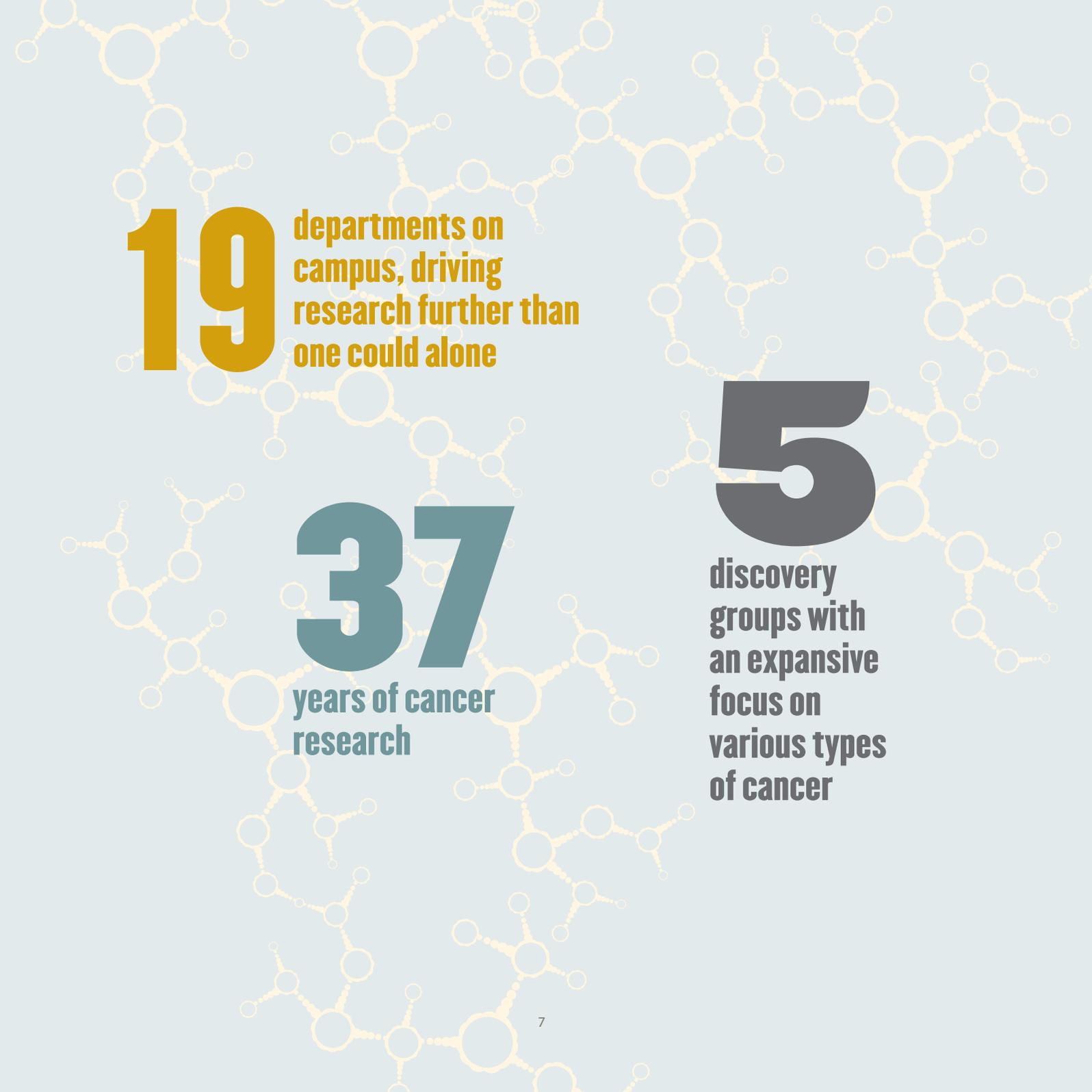
**elite scientists
collaborating
with experts
worldwide to make
discoveries**

9

**researchers
with discoveries
patented last year**

14

**clinical trials
active based
on Purdue's
basic cancer
research**



19 departments on campus, driving research further than one could alone

37 years of cancer research

5 discovery groups with an expansive focus on various types of cancer

How do the chemicals you're exposed to every day in your environment affect your health and your chances of getting cancer? That's the question at the heart of research by Jennifer Freeman.

"I believe this is a very important problem in public health," Freeman says. "There is a great lack of knowledge on if and how the large number of environmental chemicals in which we are exposed everyday may influence cancer and other diseases."

Once Freeman and her team at the Purdue University Center for Cancer Research identify a potential problem with those environmental chemicals, the researchers work to determine the molecular mechanisms by which the adverse health effects are occurring.

"Once we understand the underlying molecular components, we can use our research to identify the best treatment options for patients with various types of cancer," Freeman says.

"We can also apply our research to cancer prevention, to help people avoid exposure to chemicals that may contribute to cancer development."



But Freeman and her team aren't just interested in studying the effects of those chemicals on adults. They want to understand the impacts the chemicals have on children and work to cut down the risk of cancer later in life.

"Most of our studies are focused on early developmental exposures since this is one of the most sensitive life stages," Freeman says.

"We study the immediate effects of the developmental exposure and the potential impacts from this developmental exposure later in life."

"There is a great lack of knowledge on if and how the large number of environmental chemicals in which we are exposed everyday may influence cancer and other diseases."

JENNIFER FREEMAN

Cancer steals loved ones away — not only our family members and friends but our companion animals, too. Dr. Debbie Knapp wants to save both as co-director of the Purdue University College of Veterinary Medicine's Comparative Oncology Program.



“In my job, I get to help the dogs, help the dogs’ families and learn something that helps people,” says Knapp, a veterinary medical oncologist and the Dolores L. McCall Professor of Comparative Oncology. “That is a tremendously exciting thing to do.”

Consider, for instance, a particular kind of bladder cancer known as invasive transitional cell carcinoma (InvTCC), which kills more than 14,000 people and an estimated 20,000 dogs annually in the United States. Because canine

“In my job, I get to help the dogs, help the dogs’ families and learn something that helps people. That is a tremendously exciting thing to do.”

DEBBIE KNAPP

and human versions of InvTCC have very similar cellular and molecular features, biologic behaviors, and responses to therapy, breakthroughs in treating pets with InvTCC could benefit humans as well.

Most deaths from InvTCC are caused by tumors that can’t be removed. One of the new drugs which could offer hope is tubulysin B, but only if it can destroy cancer cells

without damaging healthy ones in the process.

Knapp and her team are collaborating with Phillip Low, Purdue’s Ralph C. Corley Distinguished Professor of Chemistry, whose laboratory has pioneered the use of folate in targeted cancer treatment. Certain cancers can take up much more folate than normal cells, and folate can guide drugs into the cancer, while not harming other organs. Knapp’s team is evaluating tubulysin paired to folate in dogs with naturally occurring InvTCC to see if the drug will attack the tumors with sufficient force while leaving healthy cells intact.

“We want to determine ‘Does it work? Is it safe? And what dosages appear appropriate?’ to help guide the application in people,” says Knapp. As the work could set the stage for human clinical trials, Knapp hopes to extend the lives of beloved pets as well.

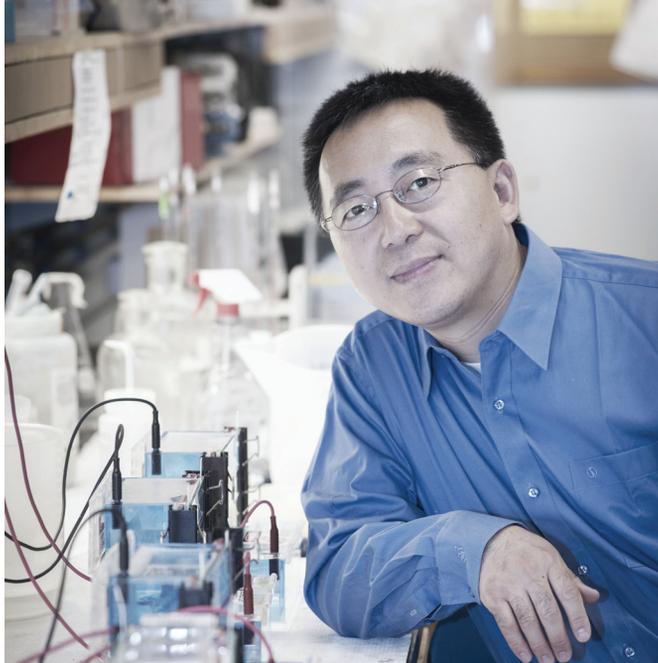
Peering into the microscope, Xiaoqi Liu is drawn into the rhythmic motions of the cells — how they grow, how they divide, how their signal pathways are modified by the presence of something new.

But gazing out the windows of the Hansen Life Sciences Research building, he is also drawn to the people passing by. “You try to do something good for society,” says Liu, an associate professor of biochemistry. “Cancer biology is one way.”

Liu is setting his sights on prostate cancer, the most common cancer among men in the United States, next to skin cancer. For several years now, his laboratory has focused on the function of a gene called Polo-like kinase (Plk1), which regulates cell cycles but can also mutate and cause cancer.

Liu and his team have discovered that later-stage prostate cancer cells are missing Pten, a tumor-suppressor gene. When Pten is diminished, the cells become stressed. To compensate, they increase production of Plk1, which causes rapid cell division.

This particular type of later-stage prostate cancer is troublesome because the cells don’t respond to drugs aimed at stopping cell division and metastatic cancers spread to other areas. When Pten is missing, Liu says, those drugs actually increase the production of more Plk1. This means that Plk1 inhibitors could be good drugs for treatment of the disease.



Now, Liu is collaborating with other researchers on campus to test potential Plk1 inhibitors. That, he says, requires an essential understanding of the gene’s regulation and function, particularly in the context of the cancer cell.

Using a combination of biochemistry, cell biology and mouse genetics, Liu’s lab is investigating how cells respond when compounds that inhibit

Plk1 are introduced. Ultimately, findings could lead to more promising therapies for the difficult-to-treat later stages of prostate cancer.

“As a basic cell biologist, I don’t develop new compounds by myself. But I can use my expertise to understand how cells modify or their signals change in response to different drugs,” he says. “The cancer center has created an ideal environment for me to learn a lot from my colleagues and for me to contribute to their work.”

“You try to do something good for society. Cancer biology is one way. I can use my expertise to understand how cells modify or their signals change in response to different drugs.”

XIAOQI LIU

Beer. Wine. Cancer research. Mark Hall and other scientists at the Purdue University Center for Cancer Research are studying baker's yeast, which is used to make bread, beer and wine, as a model to understand the basic principles of cell division control that are often defective in cancer.



“Amazingly, the process of cell division is mostly the same in species as different as humans and fungi,” Hall says. “Yeast are easy to grow and to manipulate genetically and much of what we know about human cell division has come from pioneering studies using yeast.”

Hall says his research is a perfect fit with one of the primary missions of the Center for Cancer Research — to understand the biological basis for cancer formation.

“I hope to one day be able to say that I made an important contribution to our understanding of cancer, either through the discoveries in my lab or indirectly through the students that I mentored.”

MARK HALL

“That essentially describes what my lab is interested in,” he says. “We look at what enzymes and cellular processes can contribute to cancer formation by destabilizing the genome when they become defective.”

Hall’s work can be applied to several areas of cancer detection and treatment, including the identification of diagnostic cancer biomarkers and

therapeutic agents. For instance, his team has been studying ways to inhibit certain enzymes to sensitize cancer cells to certain chemotherapies.

Hall, who watched his father-in-law struggle and eventually pass away during a fight with pancreatic cancer, says he hopes to help other patients who are fighting similar health battles.

“I hope to one day be able to say that I made an important contribution to our understanding of cancer, either through the discoveries in my lab or indirectly through the students that I mentored,” Hall says.

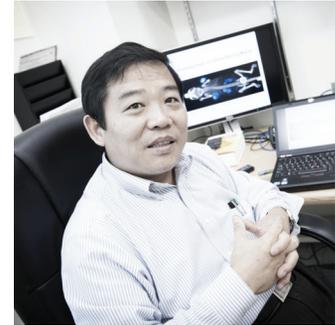
The Challenge 5K run/walk celebrated another successful year in 2013. The annual race began in 2008 as a way to raise awareness and funds for research and has grown to over 2,000 participants and volunteers. Head football coach, Darrell Hazell welcomed the crowd and encouraged the participants to give it their all. He expressed how cancer touches the lives of many and encouraged participants by explaining that when we are united together as a team, we can make a difference.

With the help of generous and dedicated sponsors and individual participants, the Challenge raised over \$70,500 for cancer research at Purdue. Funds from the Challenge are awarded annually to a researcher who is exploring new or innovative research.

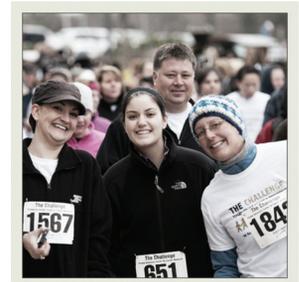
Many participants of the Challenge stepped up and challenged their friends and family to support them further by volunteer fundraising. Awards were given to the teams or individuals who raised the most money. The Community Team Challenge Award went to Sisters for Life (team captain, Lorraine Hubert). The Leroy Keyes Faculty/Staff Team Challenge Award was won by Purple Power (team captain, Michelle Liratni). The individual who earned

the highest amount raised was Doc Leonard with nearly \$3,000! We are so grateful to all who participated in this new adventure.

Many times, funding from the Challenge grant allows researchers to pursue unproven ideas, allowing them to collect preliminary data required for larger grant opportunities. By providing these startup funds, we are helping to advance the life-saving research of faculty members such as **Shuang Liu**, who was awarded the 2012-2013 Challenge Award Grant.



A professor of health sciences, Liu combines CT scans with radioactive compounds to visualize tiny tumors that are difficult to see. That's especially important with such cancers as gliomas, tumors in the brain. Removal of the complete brain glioma is difficult because it extends

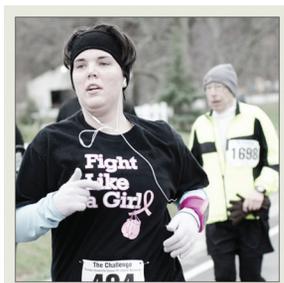


THE CHALLENGE

far into the brain, and so recurrence is common, often along the margins from the original surgery. The larger the recurring tumors are upon detection, the fewer options physicians have for treating them. Radioactive tracers, however, could allow physicians to detect glioma recurrence sooner than what is currently possible. Liu is testing this idea by injecting mice with small radioactive molecules that seek out tumor cells. The tumors then appear as bright, colorful spots on scans.

The technique could also be helpful in helping surgeons visualize arteries. “The first priority in cancer treatment is still the physician’s knife,” he says. “But for metastatic lung cancer, the lesions are often very close to major arteries and veins. You can’t remove them.” Instead, physicians can use radiation therapy, then monitor treatment with radioactive tracers to see when the tumor has shrunk far enough away from the artery that it’s safe to operate.

All of these approaches are part of a future of personalized medicine, in which more precise diagnostic and monitoring techniques could allow physicians to tune each therapeutic regimen to the individual patient, says Liu: “That’s the promise of a new life.”



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The Purdue University Center for Cancer Research saw a great year in 2012-1013 in our development/fundraising efforts. We were fortunate to share the hopeful news of the center with many audiences this past year through events that we participated in or hosted. These include:

- **Marti Schmidt**, Director's Advisory board member, hosted a group of friends in her home for a "Sleep in for The Challenge" brunch. Participants were encouraged to make a donation and gather in support of the research being done at the center.

- **Terry Bowen and Mary Beth Gadus** hosted a gathering at the Tobias House in Indianapolis in collaboration with the IU Simon Cancer Center where friends, patients, and alumni gathered to learn about the unique collaboration between Purdue and IU and how the partnership is moving discoveries to the clinic and making a difference in patients' lives.

- **Andy Mesecar** made a presentation to the Indiana Elks at the State Convention in Indianapolis to share highlights of the center.

- **Ms. Sam Walker** hosted a lecture and lunch at The Cincinnati Woman's Club where Dr. Timothy Ratliff gave an update on research happening at Purdue and Prof. Ji Xin Cheng shared exciting information about the relationship of cholesterol and cancer – and by knowing this relationship we can block cancer from forming in certain cells.

- Think Pink party, breast cancer fundraising event, was hosted by **Tara Greene**.

- Hammer Down Cancer Luncheon sponsored and hosted by **McGraw's Steak Chop and Fish House and Purdue Women's Club 20|30**.

- The West Lafayette Sagamore Lions hosted a lecture by **Victoria Seewaldt**, M.D. Professor of Medicine, Duke University. "Loss of KCN9 Imprinting during the initiation and progression of aggressive triple-negative breast cancers in African American women."

Thanks to the generosity from our loyal and generous donors like you, we were able to award grants for innovative research and help move many research discoveries forward.



Tim Ratliff, Sam Walker, Ji-Xin Cheng and Jenny McManus

Private philanthropy is especially important because it can help make our researcher's discoveries more valuable scientifically and, in turn, help to move research from discovery to the clinic more quickly. Our focus is to support our scientists by providing them with resources necessary to advance their research. High-end scientific research is often limited by limited funding. By providing the researchers with funding from your gifts, they can spend more time making discoveries rather than processing grant applications.

You are a partner in our mission and goal. You play an important role as a benefactor and help to move research from discovery to life-saving detection and treatment methods. Your partnership also helps us uncover ways to prevent cancer. The Purdue University Center for Cancer Research is a leader in cancer research and your support is a key component of our success.

Please visit www.cancerresearch.purdue.edu to learn more about the discoveries and innovative research happening here. Or give us a call: 765-494-1109. We look forward to a continued partnership with you. Our mission is discovery. Our goal is to cure cancer.

To make a gift, please call 765-494-1109 or visit www.cancerresearch.purdue.edu/donate.

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PURDUE UNIVERSITY CENTER FOR CANCER RESEARCH
Hansen Life Sciences Research Building, Room 141
201 S. University Street
West Lafayette, Indiana 47907-2064
765-494-9129; Fax: 765-494-9193
cancerresearch@purdue.edu
EA/EOU

