Engineering New Cancer Treatments
Stanford’s Multidisciplinary Approach to Medicine

“There is perhaps no sharper illustration of the divide between engineers and physicians than the exaggerated tension between Star Trek’s compassionate Dr. McCoy and the relentlessly logical Mr. Spock. But in frustration, McCoy could stumble on essential truths; engineers do love to change things. And that love of change—or technological innovation, as they might say—has had a profound impact on cancer research and care.

Stanford University possesses what is perhaps the world’s leading program in biomedical engineering. Imaging technologies emerging from Stanford have allowed physicians to precisely diagnose and characterize tumors. Cell diagnostic inventions have enabled biologists to unlock the molecular secrets of cancer, and laid the groundwork for the next generation of more effective and less toxic therapies.

One mission of the Stanford Cancer Institute is to ensure that the tradition of dynamic collaboration between engineers and medical researchers remains a vital aspect of efforts to combat cancer.

SCI News has recently covered some of the major programs led by Institute members. The Summer 2010 edition reported on the combined biological and computational research being done at the Center for Cancer Systems Biology, directed by Sylvia Plevritis, PhD, associate professor of radiology. The leading-edge imaging and cancer detection work of Sam Gambhir, MD, PhD, chair of the department of radiology and director the Molecular Imaging Program, was featured in Winter 2010.

This issue highlights more of the exciting bioengineering projects being conducted by SCI members and their collaborators in the School of Engineering, and beyond.

See New Cancer Treatments, page 3
The lead story for this edition of the Stanford Cancer Institute News focuses on the role of engineering in cancer research. We are highlighting these contributions because the application of new technologies gives biologists unique insights into previously unrecognized characteristics of cancer cells and opens new avenues for treatment. Stanford has one of the world’s most renowned bioengineering faculty. Having developed groundbreaking innovations in cell sorting technology, the use of gene expression arrays, and the ability to image and analyze ever fewer numbers of cells, Stanford stands at the forefront of institutions that are engaged in unraveling the mysteries of the cancer cell.

Showcasing Stanford bioengineers also highlights important changes in cancer research. Participation by scholars not traditionally involved in cancer research is now essential for accelerating the development of the next generation of cancer therapies. The revolutionary advances in biomedical engineering have been enabled by the information technology revolution. Enhanced abilities to acquire and process information are needed not only for developing new insights into the mechanisms underlying cancer, but also for interpreting the dizzying array of data these systems generate. Mathematicians, bioinformaticians, and systems biologists are increasingly needed to support these efforts. We also see chemists and physicists as increasingly important participants in the entire cancer research enterprise.

Among all cancer research centers, the Stanford Cancer Institute is unique in the extent to which it can tap into the broad assets of Stanford University to accelerate cancer research. No other cancer center is co-located with such immense and diverse intellectual resources. A core aspect of our mission is to mobilize all the capabilities of the Stanford School of Medicine and the entire University in the fight against cancer.

Beverly S. Mitchell, MD
Director

Previous editions of SCI News can be viewed online at: cancer.stanford.edu/news/archive.

If you would prefer to receive the electronic version of SCI News via email, please email your request to scinewsletter@stanford.edu.
New Cancer Treatments, continued from page 1

Cellular Mapping of Tumors
Michael Clarke, MD, and Stephen Quake, PhD, have developed novel equipment and techniques to create the most detailed portrait to date of the cellular composition of human cancer tissues. The new technologies enabled the investigators to analyze the gene-expression patterns of individual colon cancer cells and identify their specific subtype. Defining the characteristics of individual cells helped clarify the overall architecture of complex tumor tissues and provided insights into the relationships among the various cell types.

“In using these techniques we have cut a decade off the attempt to understand cellular hierarchy in tissues,” said SCI member Clarke, professor of oncology and the Karel H. and Avice N. Beekhuis Professor in Cancer Biology.

The team also identified chemical markers to help them gauge how dangerous a tumor is likely to be, which should lead to better and more-targeted therapies.

“To finally get all the tools together and produce a biologically important result is very gratifying,” said Quake, the Lee Otterson Professor in the School of Engineering and a professor of bioengineering and of applied physics.

Quake’s lab has spent years developing genomic measurement technologies, and invented the “single-cell PCR microfluidic instrument” used in these experiments to measure the genetic makeup of numerous individual cells.

This innovative project is an ongoing collaboration among medical oncologists, engineers, stem cell biologists and computer scientists.

Teaching Computers to Predict
Computer scientists from the School of Engineering also partnered with School of Medicine pathologists to train computers to calculate patient outcomes from detailed analysis of breast cancer tumors images.

A team led by Daphne Koller, PhD, professor of computer science, created a computer-learning model called Computational Pathologist, or C-Path. To train C-Path, the researchers used an archive of tissue samples from patients whose prognosis was already known. The computers poured over the images, and made predictions based on assessment of 6,642 individual cellular factors. By comparing their results against the known data, the computers continuously refined their methods and gradually figured out which features of the cancerous tissues matter most in predicting patient survival.

“In essence, the computer learns,” said Koller.

Once trained on the first data set, C-Path was given a new set of breast cancer patient data to analyze. Compared against the known outcomes for these patients, the machines yielded predictive results that were significantly better than the human evaluations of the same data.

C-Path is not intended to take the place of human pathologists, but it should improve the accuracy and consistency of prognoses for cancer patients. In theory, the computers could be trained to predict the efficacy of drugs or other targeted treatments. They may also improve the screening of precancerous cells and predict whether they will become malignant.

Cancer-evaluating computers might one day deliver world-class pathology to underserved areas where people don’t have access to medical specialists.

Building a Better Protein
A team led by Jennifer Cochran, PhD, assistant professor of bioengineering and SCI member, has created a new, more effective way to cut off the blood supply to cancer cells, thereby inhibiting tumor growth. Cochran’s group engineered a novel “duel-action” protein that targets two types of chemical receptors that regulate capillary creation.

All cells, including cancer cells, need blood to survive and have mechanisms that initiate the formation of new capillaries—a process called angiogenesis. Several existing cancer treatments block the activity of one such mechanism, called a cell surface receptor. However, angiogenesis is often controlled by two or more receptors working together.

Cochran and her colleagues identified pairs of “collaborating receptors,” and sought to build a single protein to block both. First, the team selected a large, stable protein that bonds with one of the targeted receptors. They then attached a section of another protein known to bond with the target’s collaborator, without altering the original function or structure of the larger protein.

“Samples treated with our dual-action protein have minimal blood vessel formation, similar to a sample in which angiogenic factors are absent,” Cochran said. “Importantly, this engineered protein more strongly inhibits angiogenic processes compared to single-receptor blockers.”

Less-invasive Drug Monitoring
Another example comes from the prolific labs of SCI members Dean Felsher, MD, PhD, associate professor of oncology, pathology and molecular imaging, and instructor of oncology Alice Fan, MD. They are currently refining the use of a new instrument called a nano-immunoassay (NIA) to assess and predict patients’ response to targeted drug therapy in ways not feasible with current methods.

NIA technology represents a significant advance because it can accurately measure specific cancer protein activity related to the drug treatment in as few as 25 tumor cells. Such small samples can be derived before and during therapy in minimally invasive ways, like a fine needle aspiration or a blood draw. To get enough cells with standard
In Profile

Mark Pegram, MD

Breast Cancer Program Lands Renowned Leader

The Stanford Cancer Institute welcomes Mark Pegram, MD, as the first director of the Breast Cancer Oncology Program at the Stanford Women’s Cancer Center. Pegram brings stellar experience in translational medicine and will help Stanford School of Medicine researchers expedite the development of new breast cancer therapies.

“Our goal is to extend the quality and quantity of life for breast cancer patients,” said SCI Director, Beverly Mitchell, MD. “Mark is going to help accomplish this by bringing together excellent clinical care and new approaches to the diagnosis and treatment of breast cancer.”

From Discovery To Treatment

“Stanford delivers world-class research and patient care,” Pegram said. “My job is to help bring them together for people with breast cancer. It’s an amazing opportunity.”

Pegram joins Stanford after five years at the University of Miami Miller School of Medicine, where he was a Sylvester Chair professor of medicine in the Braman Family Breast Cancer Institute, and associate director for clinical research in the University’s Sylvester Comprehensive Cancer Center.

He earned his undergraduate and medical degrees from the University of North Carolina, and joined the faculty of UCLA in 1993. While there Pegram played a major role in developing the drug Herceptin as a treatment for “HER2-positive” breast cancer, which contributes to about 20 percent of all cases.

His laboratory experiments demonstrated that combining Herceptin with chemotherapy effectively killed cancer cells that overproduced the growth factor HER2. Pegram and others then conducted clinical trials showing Herceptin improved survival rates and even cured some breast cancer patients. This remains one of the premier examples of bench-to-bedside translational research.

Pegram’s current research efforts include a continued focus on the cancer-associated gene (or oncogene) that encodes HER2, and developing new ways to target cancer cells expressing this marker. He is also pursuing strategies to target estrogen receptors, implicated in some 70 percent of all breast cancer cases.

He noted that Stanford is renowned for pioneering gene expression profiling technology and establishing the first defined subtypes of breast cancer. These critical advances led to breast cancer being understood as a collection of diseases, each potentially vulnerable to targeted therapeutics.

“Stanford is a very special place,” said Pegram. “The Medical School combines world-class clinicians, fantastic basic scientists and a tradition of innovative work in breast cancer.”

Collaborative Mindset

Pegram will also serve as co-leader of the Molecular Therapeutics Program, along with SCI member Amato Giaccia, PhD, professor of radiation oncology. The program brings together chemists, biologists, statisticians and translational and clinical researchers interested in developing new molecular diagnostics and cancer therapies.

“Just as with treating patients, research collaborations are more important than ever,” Pegram said. “You cannot conduct research anymore as a solo artist isolated in your laboratory; you will fail.”

Pegram emphasized the opportunities for partnerships beyond the School of Medicine, including with engineering, computer science and informatics experts. He further noted SCI’s support of core facilities and other shared resources to meet the needs of cancer investigators across multiple disciplines.

“There is a depth of in-house expertise in statistics, cancer modeling, oncogenomics and more,” Pegram said.

In addition to his program leadership responsibilities, Pegram will direct his own research lab and provide care for breast cancer patients through the Women’s Cancer Center.

“There is a lot to be done in cancer research, particularly in women’s cancers,” he said, “and Stanford is just the place to do it.”
New ‘Broad Spectrum’ Designation for Sunscreens

The U.S. Food and Drug Administration (FDA) has adopted new requirements for over-the-counter sunscreens. By the summer of 2012 all sunscreen products sold in the U.S. must undergo more rigorous testing, and employ labeling that accurately reflects their level of “broad spectrum” protection.

Currently, sunscreen SPF values are determined by measuring protection against sunburn caused only by ultraviolet B (UVB) radiation. However, sunlight and artificial light—like that used by indoor tanning beds—contains two types of potentially harmful radiation, UVB and UVA. The new FDA-mandated test will measure sunscreen’s protection against UVA and UVB radiation, and products that block both will be allowed to use a “broad spectrum SPF” value in their labeling and advertising.

For more insight, SCI News queried Institute member Christina Clarke, PhD, a senior research epidemiologist at the Cancer Prevention Institute of California. Clarke co-authored a recent study that found rising melanoma rates among Californian girls and young women. The study’s findings were referenced in SCI News Fall 2011 edition’s feature story, “Targeting Melanoma.”

**Q: Can the new FDA regulations help decrease the incidence of skin cancer, including melanoma?**
**A:** They raise attention to the harmful effects of overexposure to all kinds of UV, not just UVB, so they may make people think twice about how much sun they are getting, and how much protective clothing and sunscreen they should wear. The change in behavior, not the renumbering of the SPF, is what I would hope could help us turn the tide here.

**Q: How prevalent, and how harmful, is ultraviolet A (UVA) radiation?**
**A:** UVA rays are just part of the natural spectrum of light emitted from the sun, so they are everywhere! Tanning beds actually concentrate these rays, and are more likely to induce skin changes that result in tanning or burning. Everyone’s skin reacts differently to the sun, so to those of us with pale, Northern European skin, UVA can really make us burn. But some UV exposure is important for vitamin D production, so the appropriate healthy level of exposure really depends on skin type.

**Q: What else do consumers need to know about sunscreen, including products offering broad spectrum protection?**
**A:** Use it! They can also wear protective clothing, like broad-brimmed hats, long-sleeved shirts, or swim shirts and rash guards at the beach. It’s a practical way to help protect against burning—especially wiggly little kids for whom it is difficult to apply and maintain a good sunscreen coating all day long. We think that a lot of the sunburn that leads to melanoma happens under age 18, so managing healthy UV exposure is important for kids and their parents.

Focus on Survivorship: Upcoming Post-treatment Events

CancerCare’s 10th Annual Survivorship Workshop Series
Practical information for post-treatment issues. All workshops are from 10:30 am to 1:30 pm via telephone or live internet streaming.
- **April 24** Using Mind/Body Techniques to Cope with Stress
- **May 15** Recapturing Joy and Finding Meaning
- **June 19** Changing Roles and Responsibilities for Caregivers
- **July 17** Managing Post-Treatment Neuropathy

Workshops are free—no phone charges apply. Pre-registration required. For more information: www.cancercare.org/connect

The Ernest Rosenbaum Cancer Survivorship Lecture Series
Physical, emotional and practical issues of treatment and survivorship.
- **April 18** Impact of Cancer Treatments on Memory, Thinking and Attention
- **May 9** Fear of Recurrence and Late Effects: Living with Uncertainty
- **June 20** Cancer in the Family

All lectures are from 6:30 pm to 8:00 pm. Francis C. Arrillaga Alumni Center 326 Galvez Street, Stanford
Call 650.725.9456 to register. Space is limited.

Living Well Beyond Cancer – A Post-Treatment Conference in Honor of National Cancer Survivor Week
**June 9** Topics include: medical, legal, financial, employment, sexuality and intimacy, stress management, self-care, psychosocial and family issues.
Open to patients and families. $25 per person, including lunch and coffee. Advance registration recommended.
La Ki Shing Center for Learning 291 Campus Drive, Stanford
For more information or to register: 650.724.5235 or http://livingwellbeyondcancer2012.eventbrite.com
In Research

Important Recent Advances in Cancer Research

**Researchers Boost Potency, Reduce Side Effects of IL-2 protein**

In the 1980’s the immune-system-boosting protein interleukin-2, or IL-2, was anticipated to be a cancer wonder drug. However, clinical use revealed side effects that limited its broad therapeutic application. Now, a Stanford scientist has generated a modified version of IL-2 that is less toxic and more potent than the original.

IL-2 acts as a growth factor for certain kinds of immune system cells, including T cells, which can recognize and attack pathogens or tumors. It is effective in the treatment of various cancers, including kidney and advanced metastatic melanoma. However, its use is restricted because it can cause severe side effects, such as breathing difficulty due to pulmonary edema, or swelling of the lungs caused by fluid buildup.

A team led by Institute member Christopher Garcia, PhD, set out to modify IL-2’s structure in order to lessen its toxicity while retaining its ability to stimulate the immune system. They produced and compared many altered versions of the protein, ultimately identifying one with reduced side effects that is also several times as potent in slowing tumor growth as naturally occurring IL-2.

While Stanford pursues a patent on the protein Garcia dubbed “Super-2,” a group of IL-2 experts at the National Institutes of Health is testing it in tumor models that may be predictive of therapeutic efficacy, in the hope of fast-tracking its development as a new cancer treatment.

**New Breast Cancer Drugs Show Promise**

Two new medicines have been shown to significantly delay the progression of advanced breast cancer.

In a large international study, an experimental drug from Genentech called pertuzumab halted the spread of breast cancer for six months longer than standard treatment. Pertuzumab is effective against so-called “HER2-positive” breast cancers, which account for about 20 percent of all cases. It also appeared to potentially improve overall survival, although longer follow-up is needed to definitively assess that outcome.

“It’s an impressive result; likely to be practice-changing,” said Stanford’s Mark Pegram, MD, the Breast Cancer Oncology Program director. Pegram participated in one of the original human trials of pertuzumab (in ovarian cancer patients) and noted that it specifically targets cancer cells, and not normal tissues, so it has few side effects.

The drug everolimus (commercial name Afinitor) has long been used in organ transplants, but a new study showed that it kept cancer in check for a median of seven months in women whose disease was also being treated with hormone-blocking drugs. A group receiving only hormonal medicine had just a three-month delay in disease progression.

The new drugs are among the first major developments in advanced breast cancer treatment since Herceptin was approved by the U.S. Food and Drug Administration in 1998. However, they are likely to be expensive treatments, and so far have not proved to be cures. Additional studies will test both drugs in women with early-stage cancers, rather than the advanced cases reported in these two studies.

**New Center Treats Rare Complex Cancers**

A multidisciplinary group of Stanford physicians has established a Clinical Neurogenetics Oncology Program designed to treat patients with multi-organ cancers that simultaneously affect numerous body systems. The program is among a select few worldwide that have the expertise and experience to treat these enormously difficult cases.

Steven Chang, MD, a neurosurgeon at Stanford Hospital & Clinics, leads 12 specialists from fields including neurosurgery, epilepsy, neuro-ophthalmology, neuro-oncology, neuro-interventional radiology and general surgery. The team administers state-of-the-art care for extremely rare and complex conditions like Knodell’s, neurofibromatosis 2, Sturge Weber syndrome and others.
To do so they built an integrated system to coordinate all treatments and check-ups, and to provide in each visit all the exams and procedures necessary to address the multiple medical issues characteristic of these disorders.

“These patients have recurring issues,” said Chang. “We want to take the burden off them.”

New Hope for Blood Cancer Patients

Stanford researchers took part in a multi-site, randomized, double-blind and placebo-controlled trial which showed that people with myelofibrosis—blood cancer—benefited from the drug ruxolitinib.

Myelofibrosis is a type of chronic leukemia that affects the bone marrow and disrupts normal production of blood cells. It affects roughly 30,000 people in the United States, and in advanced cases causes reduced blood counts, spleen enlargement and other sporadic symptoms such as fever, night sweats and muscle and bone pain.

Approximately 46 percent of trial patients who received ruxolitinib reported experiencing a 50 percent or greater improvement in their myelofibrosis symptoms. Five percent of patients receiving placebo reported the similar improvement.

Stanford, with 15 participating patients, was the single largest recruiting site in the 300-patient, 89-site trial. Jason Gotlib, MD, an associate professor of medicine and SCI member, managed the Stanford effort.

“Ruxolitinib doesn’t cure the disease, but the degree of benefit is clinically meaningful and substantial, and allows many patients to re-engage in their daily activities,” said Gotlib.

Ruxolitinib blocks a protein that is both mutated and unusually active in 50 to 60 percent of myelofibrosis patients. It is the first FDA-approved therapy for the disease.

Results of the study were published in The New England Journal of Medicine.

Protein Complex Helps Suppress Pancreatic Tumors

Stanford researchers discovered that a protein complex called SWI/SNF contributes to preventing pancreatic cancer.

A “protein complex” is an arrangement of multiple partial protein strands, or “subunits,” structured in a specific way to perform one or more biological functions. Associate professor of pathology and Institute member, Jonathan Pollack, MD, PhD, and colleagues discovered that inhibiting the growth of pancreatic cancer cells is among the functions of the SWI/SNF complex.

New screening technologies enable researchers to analyze smaller segments of DNA, and more precisely pinpoint where the DNA of cancer cells differs from that of normal cells. These variations help identify the genes involved in cells becoming malignant.

Pollack’s group used these techniques to show that when mutated, the genes responsible for encoding—or building—any of five SWI/SNF subunits could damage the complex enough to allow cancer to form. Alterations to any one of the genes were associated with only 5 to 10 percent of the pancreatic cancers they examined, but taken together, the SWI/SNF complex-related changes accounted for about a third of all cases.

“This is really strong genetic evidence that this complex plays a role in pancreatic cancer,” said Pollack. “What we’d like to learn now is specifically how altering this particular complex affects cancer progression.”

The research was published in the Proceedings of the National Academy of Sciences.

Polyp Removal Reduces Colorectal Cancer Deaths

A new study provides long-term confirmation that removing polyps by colonoscopy prevents colorectal cancer, and reduces deaths from the disease. Patients in the study were evaluated for up to 23 years after having the procedure.

“Our findings provide strong reassurance that there is a long-term benefit to removing these polyps, and support continued recommendations of screening colonoscopy in people over age 50,” said the study’s lead author Ann Zauber, a biostatistician at Memorial Sloan-Kettering Cancer Center.

A multi-institute group of researchers evaluated data from 2,602 patients enrolled in the National Polyp Study who had precancerous polyps removed during colonoscopy. They found that the detection and removal of these lesions resulted in a 53 percent reduction in colorectal cancer mortality. Patients who had adenomatous polyps removed also had the same low death rate from colorectal cancer for up to 10 years after the procedure compared to a control group of people in which no such polyps were detected.

The study was published in The New England Journal of Medicine.
In Conversation
Susie Brain and Joan Venticinque
Partnering to Advance Breast Cancer Research

It is unlikely that Susie Brain and Joan Venticinque would ever have met were it not for their individual battles with breast cancer. Both were diagnosed six years ago and endured the rigors of treatment, recovery and active survivorship. Then they both felt the need to do more.

A chance discussion at a cancer survivors exercise class revealed their parallel paths: volunteering to assist newly diagnosed patients, attending many of the same conferences and developing a penchant for advocacy. Breast cancer advocacy takes many forms—from fundraising walks to lobbying Congress—but passion for research led Susie and Joan to each pursue the specialized training needed to participate in the research process. Together with other advocates, they are working to ensure that patients have a substantive role in the search for a cure.

Joan and Susie recently shared their perspectives on the importance of research advocacy.

Q: What got you involved in breast cancer advocacy?
JOAN: I have been diagnosed twice with breast cancer. After my second diagnosis, and a year of treatment and multiple surgeries, I realized cancer had changed my life. What was I going to do with this new life? I looked deep within myself and found more strength than I thought I had. I was ready to use that strength to help other people and promote the cause of fighting this terrible disease.

SUSIE: After my treatment I came to realize that I had been very fortunate with my care. As I met more patients in support groups and heard stories through the grapevine, I saw that many women did not have access to quality health care. I became interested in helping the medically underserved: women without insurance, or who feel they can’t afford a doctor, and often don’t seek treatment until the late stage of their disease when their prognosis is poorer. These issues seemed extremely unfair and, as clichéd as it may sound, I wanted to make a difference.

Q: What attracted you to advocate on behalf of research?
J: It was a natural progression from personal advocacy for myself, to advocacy for my community at Stanford and the Breast Cancer Connections (BCC) organization in Palo Alto, to political advocacy and lobbying in Washington, DC, and then to deeper involvement in the research.

S: I have a biology degree, so the opportunity to work with researchers attracted me. I enjoy networking and making connections, and that is another way we assist the research effort: building partnerships and community collaborations.

Q: What kind of advocacy training have you done?
J: I understood that to be at the table with researchers and work collaboratively as a partner, I needed education. I attended courses offered by the National Breast Cancer Coalition for advocates in the science of breast cancer, clinical trials and issues of quality care. I keep updated on the latest research by attending national meetings that offer advocate programs, such as the American Society of Clinical Oncology Breast Cancer Symposium.

S: In addition to the training Joan mentioned, I have also attended the Susan G. Komen Advocate in Science program and the Research Advocacy Network’s Advocate Institute. Recently, I was accepted to the Scientist-Survivor Program supported by the American Association for Cancer Research.

Q: How important is training for advocates?
J: Training is essential if you want to sit on review committees, because you are asked to comment on complex research proposals. It is important to learn about how cancer works, about the research process, clinical trial design, and the funding mechanisms for research.

S: You come out of the training knowing that if you are at the table with clinicians or scientists, you have some understanding of the topics and what pertinent questions to ask. We take every opportunity to apply for scholarships and training programs that will expand our knowledge.

Q: In what ways can advocates influence research?
J: As patient advocates we bring a sense of urgency and context to the work of the researchers. We are the voice of the patient in studies and in clinical trial design. We have firsthand experience living with cancer and its treatments, so we are able to offer them perspectives they may not otherwise hear.
Q: What work have you done on behalf of the Stanford community?
S: We helped establish the BCC Survivorship and Advocacy Task Force, and have worked with Stanford scientists who successfully received funding from the California Breast Cancer Research Program and the Department of Defense (DOD). During this recent funding cycle 10 scientists presented their grant proposals to our team of advocates. We provided input on their research plans and wrote letters of support for their proposals.

J: We also serve as community members on the SCI’s Scientific Review Committee that reviews and approves clinical trials, and we’re on the Stanford Survivorship Working Group that is helping develop a dedicated survivorship program.

Q: Do advocates help shape individual studies?
J: Yes! We’ve had researchers change their proposals based on our comments. Bringing our patient experience to their research helps keep the focus on benefitting the patient and their doctor.

S: Individual advocates may be less likely to provide rigorous feedback, whereas the BCC Task Force takes a committee approach, which allows for lively debate and interactions with the scientists. These meetings are a “win-win” situation: scientists often improve their proposals, and we are helping future patients while learning more about the science.

Q: Do advocates also impact research through lobbying?
J: For years we have lobbied to increase research funding for the National Cancer Institute (NCI) and the DoD, and because we have, we’ve built relationships with those organizations. We urge them to collaborate more and to create a coherent research plan focused on patient needs.

S: We’ve had an impact. We pushed to be more involved from the beginning of projects, and now the DoD requires big, multi-center grants to include dedicated advocates. Joan and I are currently on a multi-team award studying immunotherapy and breast cancer.

J: Another example is that all clinical trials are now on the NCI web site. I believe that is due to the hue and cry of the advocates.

Q: Why is the DoD so active in breast cancer research?
J: They invest in any disease that affects soldiers, so they fund breast cancer and many other types of medical research. And the DoD will support highly innovative ideas that the NCI won’t, so they have an important place in the research effort.

Q: How has your work in advocacy changed you?
S: I came into it with a certain naiveté, but now I see that change is a very slow process. I’m learning to be patient, but I still get very frustrated. Even though there are more people than ever surviving cancer, too many are still dying from this devastating disease.

J: I feel like we’re just beginning to understand cancer, but the more we learn, the more we realize how complex it is. It is not one disease but many. With so little funding available, I would like to see more collaboration and transparency in research. My surgical scars remind me everyday why I am an advocate and why working in research is important.

More of Susie’s and Joan’s conversation on patient support, the importance of exercise and what’s wrong with clinical trials can be found by clicking here.

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Breast Cancer Advocacy Resources

Stanford Women’s Cancer Center
650.498.6004
cancer.stanford.edu/womenscenter

Breast Cancer Connections
Local educational and support services
650.326.6686
www.bccconnections.org

National Breast Cancer Coalition
Grassroots advocacy organization
www.stopbreastcancer.org

Dr. Susan Love Research Foundation
Information and advocacy organization
www.dslrf.org

What Others Say

“Survivor advocates are agents of understanding and change, linking the health care and patient communities.”

David Spiegel, MD
Jack, Lulu and Sam Willson Professor in the School of Medicine
Associate Chair of Psychiatry & Behavioral Sciences
Stanford University School of Medicine

“Cancer survivor advocates are individuals who have moved beyond their own cancer experience enough to publicly support those who follow in their footsteps.”

Kelly Bugos, MS, NP
Cancer Survivorship Program Manager
Nurse Practitioner
Stanford Clinical Cancer Center

“Joan, Susie and the BCC Task Force helped us to frame and develop our project, and to focus our research on high-priority questions for patients.”

Allison W. Kurian, MD, MSc
Assistant Professor of Medicine and of Health Research and Policy
Divisions of Oncology and Epidemiology
Stanford University School of Medicine
methods would require patients endure several invasive surgical biopsies.

“By employing nanotechnology, we may allow more precise measurement and prognosis of the efficacy of treatments, and do so with less impact on patients,” said Fan.

Loo and Maxim then contacted SLAC to identify collaborators who could help validate the concept and potentially develop a working design. They learned that Sami Tantawi, PhD, associate professor of particle physics and astrophysics, was developing ultra-compact accelerator technology that could generate the required beams in a practical space, and that he was contemplating potential medical applications.

The Stanford and SLAC collaborators immediately assembled a team and began testing the accuracy of their computer simulations. They ran experiments using a synthetic tissue substitute made of specially designed layers of polystyrene with sheets of radiation-sensitive film sandwiched in between. The researchers targeted the sheets with a very high-energy electron beam at SLAC, irradiating specific locations as predicted in the computer simulations.

“It is a great example of the sort of innovative, high-social-value research that SLAC and Stanford are capable of,” said Eric Colby, PhD, director of accelerator research, and part of the research collaboration.

The team ran its initial “proof of concept” experiments in January, and is seeking National Institute of Health support for further studies, including tests on human cell lines.

Billy W. Loo, MD, PhD, a radiation oncologist and Institute member, began exploring the potential advantages of very high-energy electrons, rather than X-rays, for cancer radiation therapy. He recognized that this change—along with the right system to produce and steer the beam—could reduce the typical length of a radiation treatment from the current 15 – 60 minutes down to less than a second for a wide range of tumors.

Loo fleshed out the idea with his colleague, medical physicist Peter Maxim, PhD, and then enlisted radiation oncology instructor Magdalena Bazalova, PhD, to run computer simulations of the proposed method. Her results indicated that high-energy electrons should provide more targeted treatment than X-ray radiation.

Revolutionizing Radiation Therapy

Stanford cancer specialists and physicists at the Stanford Linear Accelerator Center (SLAC) are working on a new technology that could dramatically reduce the time needed for cancer radiation treatment.

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Stay Tuned

Star Trek’s Dr. McCoy may have been continually frustrated by technologists, but he never hesitated to use their 23rd century innovations to treat patients. The hope for achieving 21st century progress in cancer research depends on a constellation of talented engineers, physicists, computer scientists and other technology developers.

With its renowned medical and engineering schools, Stanford is a proven incubator of bioengineering discoveries. SCI is working to ensure that Stanford remains in the vanguard of innovation by providing early investment in cancer research, funding for state-of-the-art technologies that are too big for individual laboratories and fostering multidisciplinary collaborations throughout the university.

As the interface between engineering and medicine continues to unravel the causes and mechanisms of cancer—and to translate discoveries into improved patient care—you will be able to follow it in the pages of SCI News.
Development

Two Families Collaborate to Endow a Professorship

Susy Yuan-Huey Hung spent most of her life in the San Francisco Bay Area but never dreamed she would be remembered in perpetuity at Stanford University. It took the next generation of her family, generous collaborators and extraordinary circumstances to bring that about.

A dynamic immigrant from Taiwan, Hung was a successful realtor, property manager, and investor; an accomplished gardener and cook; and an enthusiastic traveler. Born in Zhejiang, China, Hung graduated from the prestigious Taiwan Provincial Taipei Second Girls’ High School and from National Taiwan University. In 1964, she moved to the United States, making Northern California her new home.

The executor of Hung’s estate is her niece, Yie-Hsin Hung, who lives with her husband and children in New York City.

“Aunt Susy was an energetic businesswoman,” says Yie-Hsin Hung. “Particularly growing up in China and then coming to the States, what she was able to accomplish was impressive.”

After Susy Hung passed away in September 2010, Yie-Hsin Hung sought to fulfill the terms of her aunt’s will, providing for a charitable bequest to fund research in cancer and gynecological problems. Considering Bay Area organizations as potential recipients, Yie-Hsin Hung discovered there was a timely opportunity at Stanford.

The School of Medicine was seeking a world-class leader as the first director of the Breast Cancer Oncology Program at the Stanford Women’s Cancer Center. This support will help the Center spearhead pilot projects, recruit and retain investigators, and train research staff.

The generosity of the Hung family and the Freidenriches is a prime example of how the community is actively engaged with the research mission of the Stanford Women’s Cancer Center. This support will help the Center spearhead pilot projects, recruit and retain investigators, and train research staff.

Yie-Hsin Hung is pleased to have facilitated part of that support, and by realizing her aunt’s vision they both are helping make it possible for women to live longer, healthier lives.

With an anonymous couple offering to fund half the cost of the chair—a very unusual opportunity—Yie-Hsin Hung was delighted to provide the other half through her aunt’s bequest. Jill and John Freidenrich, the formerly unnamed donors, agreed to the collaboration and offered that the professorship be named exclusively for Susy Yuan-Huey Hung.

“I understand that this is a very significant effort on Stanford’s part. It’s exciting to come in early in the process, when the professorship is just being established.” — Yie-Hsin Hung

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September 29
Cyclists ride to raise $1 million for SCIT’s cancer programs.

The Challenge offers fully supported 50-kilometer, 75-kilometer, 100-kilometer and 100-mile rides.

www.canarychallenge.com

Photo courtesy of Yie-Hsin Hung
Thank you for accessing this expanded edition of In Conversation, a new feature for the on-line version of SCI News. We look forward to provided more unique and interactive content to future on-line issues. Your feedback is always welcome and appreciated.

The print version of our Q & A with Susie and Joan focused on their roles as trained breast cancer research advocates, but our wide-ranging discussion touched upon a number of other topics we hope readers will also find interesting and informative.

—Michael Claeys, Sr. Communications Manager

**Q: You both got started as volunteers helping other breast cancer patients. What prompted you?**

**J:** For me it arose out of a need to make sense of what I went through and help change the future for other patients. I started volunteering at the Stanford Clinical Cancer Center as a patient navigator. I also started volunteering at Breast Cancer Connections (BCC) as a “Helpliner”—someone trained to answer questions on the phone and when people walk in. We are the first face and the first voice they talk to.

**S:** For similar reasons, I started volunteering at BCC as a “Buddy,” or peer mentor, and then I was trained as a Helpline volunteer, working a four-hour shift every week.

**Q: Do you feel it is important that the first person a new patient sees is a survivor?**

**S:** Yes, very much so.

**J:** When a patient sees Susie or I, or any of the “Helpliners,” the disease gets a little more normalized for them. Just hearing how we got through it seems to help them. It’s like a sigh of relief goes through them, and they think, “Ok, maybe I can do this…”

**Q: What do you say to someone who is recently diagnosed?**

**J:** I tell them that in most cases breast cancer is not an emergency, and that they have time to make their decisions. When they ask me what they should do, I tell them that no two people are the same and neither is breast cancer treatment. To make the right decisions for themselves they need information. With that information they can sit down with their doctors and together make decisions on what the best course of treatment is for them.

**S:** It can be overwhelming, so patients need to know that they are not alone, and that there are resources to help them. Of course, each patient is different. Some immediately want to be “warriors in action,” while others need to take it more slowly.

One program that I feel truly helps patients is the BCC’s weekly Q & A Session. A clinician is there for ninety minutes and people can ask their questions in a safe, relaxed setting.

**J:** A therapist and a Helpliner are also always there for support.

**Q: What was the next step on your advocacy journey?**

**J:** We see a lot of newly diagnosed women, so we hear a lot of stories. The more stories I heard, the more resolved I was to help do something. For me the next step was realizing that to help people I also needed to be involved in research, and that involved a lot of personal education.

**S:** Like Joan, I pursued more of the training opportunities that are available within the breast cancer movement. We’ve done training in science, clinical trials, quality care, and other topics so that we can understand more of the science and help move the research agenda forward toward a cure.

**Q: As survivors who work so closely with patients, do you find it encouraging (or discouraging?) to hear researchers’ and clinicians’ candid views on cancer research and care?**

**S:** It is extremely encouraging, and highly motivating. We see that we play an important role, because many scientists don’t fully understand what an advocate is. They are often at their benches, working diligently on a research project that they hope is going to lead to a cure, yet they have very little interaction with actual patients—again we bring that “face” to their research efforts.

**J:** I think it’s a little of both. I feel encourage with how much they have discovered about cancer and discouraged that it’s a lot more complicated than anyone ever realized. They’ve cured a lot of mice with cancer, but we need to translate those advances to people. I sometimes feel like putting on ears and a tail…(laughs)

Also, I would like to see more research on prevention and screening so we don’t have to resort to the use of cytotoxic chemotherapies.

**Q: What is your view on the health of our current system of clinical trails?**

**S:** We feel that system is not working very well and that a new, faster approach is needed. Great advances have been made, but progress is VERY slow. We know patient accrual is low and that many trials are just not appealing to patients.

Another reason it’s important for patients to be on the review committees is to include the patient’s perspective on side effects. Sometimes you read the all side effects and say, “Oh my goodness! Is this really improving quality of life?”
J: The current clinical trial system has to change. There are just not enough patients to do the large trials. We need smarter trial designs where biomarkers and drug development are done at the same time.

Q: Are you talking about shortcomings of individual trials or big picture, systemic issues?
S & J: Big picture!

J: The way most clinical trials have been done in the past is no longer feasible given the increasing costs and declining research budgets. The National Cancer Institute and others are pushing for more collaboration among research institutions because individual institutions can no longer afford to do as many trials by themselves.

S: With all the advances in cancer genomics and molecular biology, many trial participants can be selected based on their sub-type of breast cancer to test drugs targeting that specific tumor sub-type. This way you can have fewer participants and still achieve scientifically significant results.

J: There also have to be smarter clinical trials, including use of what’s called ‘adaptive design,’ where surrogate markers are used to determine sooner if the drug is showing efficacy. It’s a whole new way of thinking.

S: If you do a clinical trial without doing the genomics and molecular biology for all the patients, you probably won’t know why a particular group of patients responded or didn’t respond. So you’re not really learning enough anyway.

J: It’s like the drug Avastin, which the U.S. Food & Drug Administration recently discontinued for breast cancer treatment. Avastin does work for some patients, but the trials weren’t done to find out why it worked for those women.

Q: Why do you think the breast cancer advocacy movement has been so effective?
S: I’d like to thank the early advocates—many of whom have now passed on—who so effectively mobilized patients, lobbied Congress and gave a voice to the movement. I feel we are continually building on what they did and the foundation they provided us.

J: It wasn’t that long ago where you couldn’t say the word “cancer” out loud, let alone the word “breast.” Following the lead of AIDS activists, breast cancer advocates raised awareness of the disease, lobbied Congress to secure funds for research and asked to be at the research table. This has led to dramatic changes where doctors and patients work together to change treatment for this once stigmatizing disease.

Q: How much time do you spend on advocacy?
J: For projects we’re apart of, we spend hours reading, commenting, and sometimes helping to rewrite the proposals. If our project gets funded, then it’s conference calls, meetings and travel.

On a review panel we can spend eight hours or more reviewing and providing written comments on each proposal. It is a large commitment, and it pretty much takes over your life, but is very rewarding.

S: I essentially volunteer full time at the moment—and feel fortunate I am able to—so I am very driven. But I realize I need to be more selective in the projects that I take on, so that I make sure I have time to keep exercising and looking after my health.

Q: Would you say you have an “advocate-like” personality?
J: Yes, I think it’s in my DNA. I grew up under the shadow of Stanford University and marched against the Vietnam War on the Stanford campus. It’s no surprise to me that I took my experience with cancer and turned it into a cause to fight for.

S: My nature is very much to question and challenge things. And like Joni, when I was at university in Britain I was demonstrating against the Vietnam War and involved in sit-ins. (Both laugh.)

Q: How did the two of you meet?
J: We met in a “Living Strong, Living Well” exercise class put on by the Stanford Prevention Research Center. It’s a conditioning program for cancer patients. We started chatting and realized that we shared an interest in advocacy, and had done a lot of parallel training.

Q: Is exercise important in cancer recovery and survivorship?
J: It’s everything! Many studies have shown that it is the most important thing you can do. Observational evidence suggests that women who are physically active after breast cancer diagnosis have a thirty to fifty percent lower risk of breast cancer recurrence, breast cancer death, and overall death compared with sedentary individuals.

Q: How much exercise?
S: They recommend thirty minutes a day. But whatever you do, even ten minutes, is going to help. The main thing is to do it, and keep doing it.

J: I think of the hormonal drugs that Susie and I had to take. They had terrible side effects, and were devastating on lifestyle issues. And what did they give us? An 8 or 10 percent decrease in recurrence risk? No pill is going to give you a fifty percent reduction. So get out there and exercise!
Over $1 Million Raised Under One Umbrella

Entertainer Sheryl Crow lent her star power to the third annual Under One Umbrella luncheon in November, which garnered more than $1 million to benefit the Stanford Women’s Cancer Center. Since her own diagnosis of breast cancer in 2006, the multi-talented singer, songwriter, producer and actress has been a passionate advocate for prevention, early detection and diagnosis.

The Under One Umbrella benefit was launched in 2009 by a group of community volunteers with the vision of creating a patient care program specifically for women with breast and gynecologic cancers. Part of SCI, the Stanford Women’s Cancer Center provides comprehensive cancer services to women, conducts superior research and translates that research into improved therapies for patients.