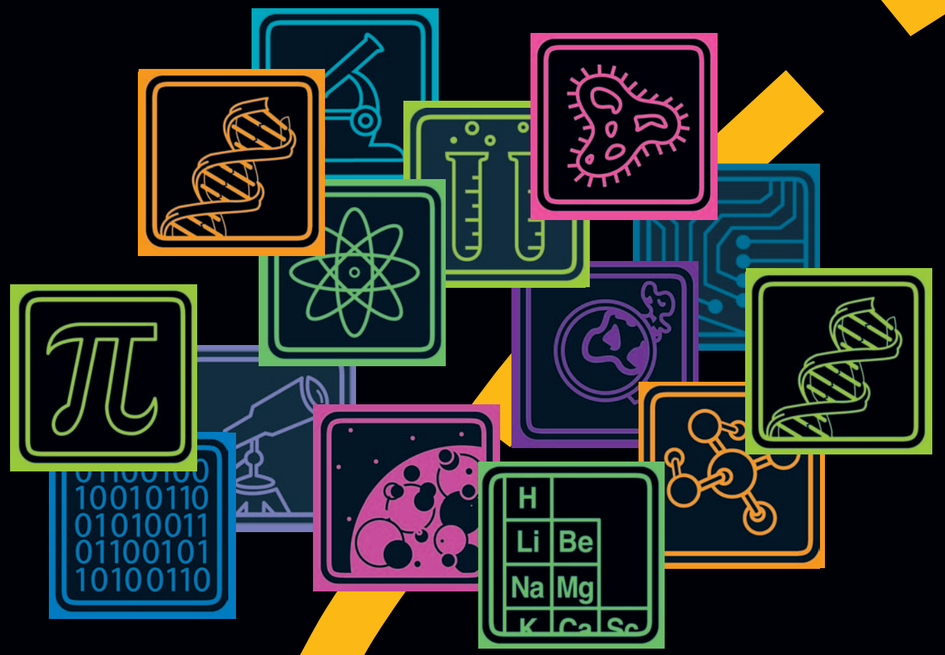
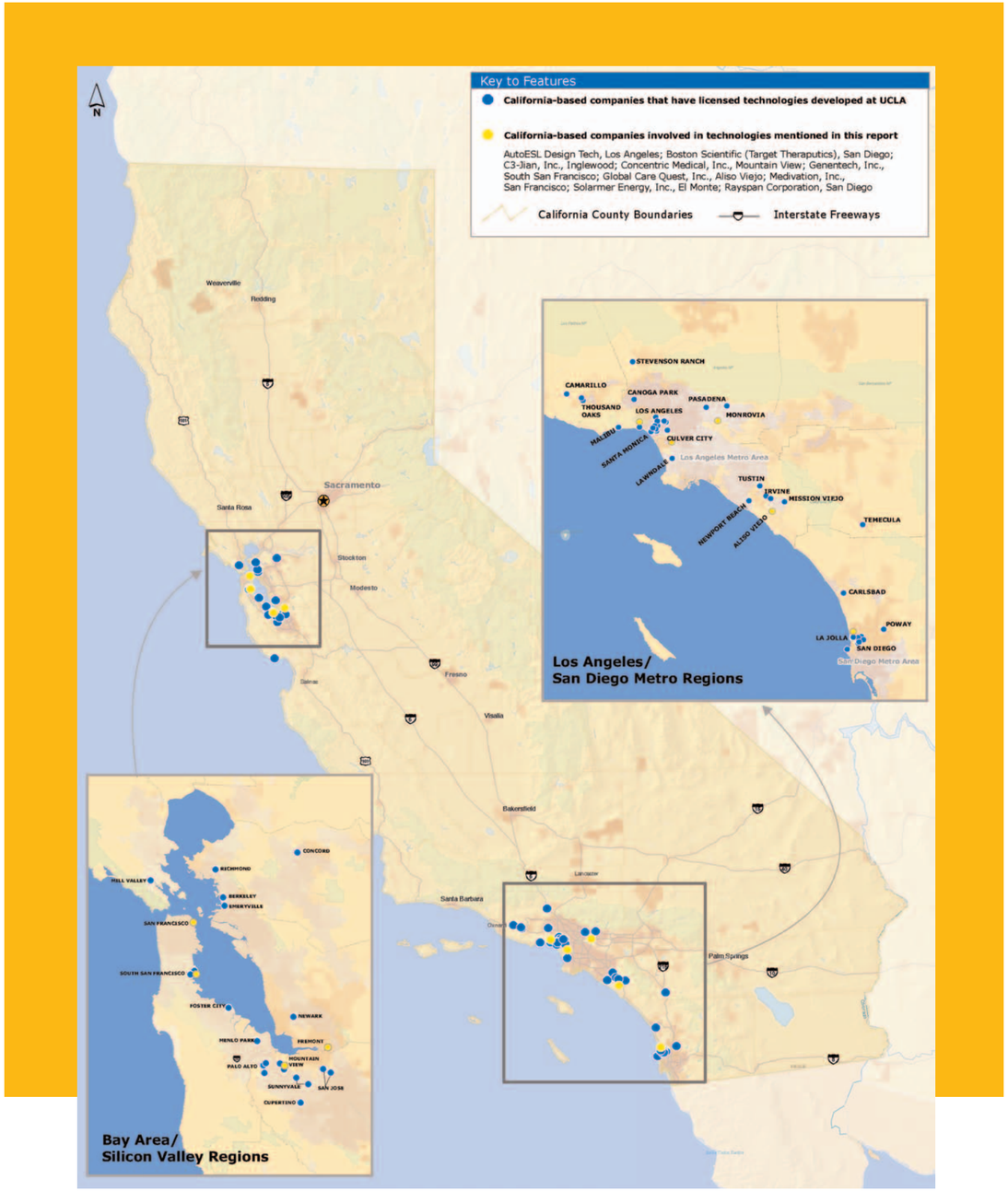
UCLA INVENTS

OFFICE of INTELLECTUAL PROPERTY

Volume II, 2007



DRIVING INNOVATION *TO MARKET*



UCLA OIP
OFFICE OF INTELLECTUAL PROPERTY

CONTENTS

Letter from the Vice Provost

DRIVING INNOVATION TO MARKET

The numbers are in. More patent filings, more new U.S. patents issued, more patent and copyright licenses, more material transfer agreements. These numbers signify the myriad ways that UCLA collaborates with other institutions and companies. Because, as ever, UCLA is home to innovation for faculty, researchers and students who are working on breakthrough developments every day.

The collaborative process extends way beyond the lab and the classroom. Industry plays a vital role in the creative process: industry partners hire our graduates, sponsor research in faculty laboratories, work with faculty entrepreneurs to create successful start-up companies, and transform research discoveries into public goods and marketable products. UCLA's Office of Intellectual Property and Industry Sponsored Research (OIP-ISR) works to help nurture and build these relationships, working hand in hand with our partners in business and finance. It's our role to learn and understand industry needs and interests and then engage those partners in the work being done by our scientists. As you see by the dots on the inside cover map, UCLA's technologies are in 72 companies spanning the State of California. Please read about some of these products on the market and in progress, on the pages of this *UCLAInvents*.

Intellectual property rights have been a hot topic throughout the decade, and patent reform is ongoing in Washington DC. OIP-ISR has expanded its staffing and services to meet the growing need to move quickly to protect IP and allow faculty and students to publish. Our office helps faculty and university researchers protect their rights as they develop ideas and work through the many processes required to get to the marketplace. We educate faculty and students on intellectual property protection. Students participate in our internships to understand how to manage and market innovative technology.

Here at OIP, we look forward to a new year of building bridges. This annual report, our second, illustrates some of the many campus successes in technology transfer. We hope that it will inspire you to look for new opportunities. We stand ready to support those efforts.

OIP AT A GLANCE

UCLA's three-part mission is research, teaching and service. OIP strives to support UCLA professors and researchers by helping them connect with industry and investors. In FY2006, UCLA inventors earned $6,281,000 from their successful technologies. Overall royalty and fee income for UCLA during that year was $18,880,000.

"Lots of institutions dispense existing knowledge. The mission of a research university is more: to produce new knowledge."

—Paul Boyer, UCLA Emeritus Professor in Chemistry

IP PROTECTION, TECHNOLOGY TRANSFER AND RESEARCH ACTIVITIES FOR FY2006

Invention Disclosures	264
New U.S. Patent Filings	181
Secondary Filings	133
Issued U.S. Patents	35
First Foreign Filings	89
License and Option Agreements	41
Confidentiality Agreements	140
Letter Agreements	20
Inter-Institutional Agreements	20
Material Transfer Agreement (case related)	19
Material Transfer Agreement (non-case related)	663
TOTAL	**1605**

TOP 10 REVENUE-PRODUCING TECHNOLOGIES FOR 2006

1. Medical device for aneurysm treatment
2. Biodegradable medical device for aneurysm treatment
3. Glycosylated Chinese hamster ovary cells (CHO cells) for research and drug discovery
4. Nicotine Patch - Smoking Cessation
5. Diagnostic test for gastrointenstinal diseases (Crohn's and IBD)
6. Diagnostics and Therapies for Diabetes
7. High-resolution gamma ray detector for Micro-PET imaging
8. Glycosyl transferase enzymes for research and drug discovery
9. Non-invasive outpatient fat reduction technology
10. 4H2 antibody-based research reagents

"Rayspan and UCLA enjoy an ideal partnership that includes close collaboration and which has opened an exciting career path at Rayspan for UCLA alumnae wishing to join the private sector."

—Franz Birkner, Rayspan Corporation

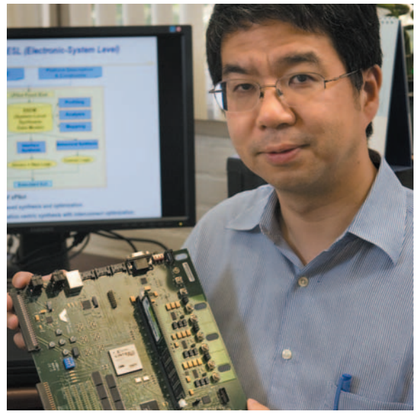
"Without exception, the professionals at OIP have been great to work with. They have been superb partners who have played a very significant role in our company's development."

—Jonathan G. Lasch, ORFID Corporation

OIP OVERVIEW

Total Invention Portfolio	1,293
Total Active U.S. Patents	460
Total Active Foreign Patents	529
Total Active License Agreements	156

COPYRIGHT



Jason Cong, Ph.D.

DESIGNING MORE, BETTER, FASTER—WITH LESS

Different types of innovation require different types of protection. Copyright protects intellectual property rights to software and the arts, such as literature, pictures, film, television and music. Such protection is important when a need is acute and the solution is challenging.

"No one can design these circuits by hand today. They all use some kind of automated tools," says Cong, professor and chair of the Department of Computer Science at the Henry Samueli School of Engineering and Applied Science at UCLA.

"But all of the existing approaches have one limitation: They require the programmer to write a very detailed, cycle-accurate description of what he or she wants to achieve using specialized hardware-description language, or HDL," Cong says. "Some systems require up to a million lines of code, a process that's very tedious and very difficult to manage."

In contrast, Cong's xPilot electronic system level (ESL) tool allows designers to create integrated circuits and systems using C and C++, computer languages widely used by software programmers. As a result, new programs will not have to rely on detailed descriptions.

"While coding, you don't have to explain how a process will be done and why it will be done; you just have to specify what you are going to accomplish," Cong says.

The software improves design efficiency by a factor of 10 to 12. For example, video coding requires just 5,000 lines of code to accomplish what used to take 57,000.

"Designers can write code with greater efficiency and precision, and the program will also run simulations much faster during testing," Cong says.

"Designers can write code with greater efficiency and precision."

The xPilot software copyright is licensed to AutoESL Design Technologies Inc. Cong co-founded the Los Angeles-based start-up with a group of former UCLA students and serves as its chief technology adviser.

AutoESL is the latest in a string of start-ups to spring from the world-class research program in circuit design at UCLA's engineering school.

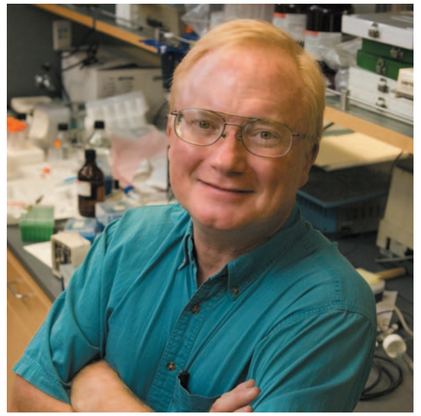
Operating since 2006, AutoESL not only brings xPilot software to market, but also provides consulting and training for chip design. In addition to its Los Angeles headquarters, the company has a research and development center in Beijing, China. ■

Technicians designed and assembled the first integrated circuits by hand, wiring up a handful of transistors and perhaps a capacitor and resistor or two on a circuit board – enough circuitry to operate a static-filled AM pocket radio.

Fifty years later, microprocessors for powerful personal computers – the multifunctional icons of the Digital Age – have as many as 1 billion transistors situated on a tiny silicon chip. The complexity requires designers to write hundreds of thousands of lines of computer code in technical software languages to specify system, behavior and functional design. The process is laborious and rife with opportunities for error.

Working to rein in the process while meeting demands for faster and smaller chips, Jason Cong, Ph.D., and his research team at the UCLA VLSI CAD Lab have developed and copyrighted cutting-edge electronic-design-automation software called xPilot.

TRANSFER AGREEMENTS



Erik Schweitzer, M.D., Ph.D.

BATTLING AGAINST DEADLY DISEASE

What do you get when you cut and paste genetic material from an insect, a jellyfish and a human into a rat cell?

In the case of Erik Schweitzer, M.D., Ph.D, this complex genetic collage yielded powerful cell lines capable of assessing the potential benefits of countless medications and substances in battling Huntington's disease.

The rare but deadly neurodegenerative disorder is caused by a mutation in a gene that codes for a protein called huntingtin. The normal version of the protein performs helpful cellular housekeeping chores. The mutant version kills.

"Other people have tried to establish similar cell lines to find a successful treatment or cure for Huntington's disease, but they didn't appreciate the complexities," says Schweitzer, an associate research neuroscientist with the Jane and Terry Semel Institute for Neuroscience and Human Behavior and the Brain Research Institute at UCLA.

"Our biggest challenge was developing a line with cells that were vulnerable to the disease without killing off the very cells that mimic the disease," Schweitzer says. "What we created was a cell line that accurately imitates the disease – but does it on demand. The scientist is in control."

Using brain cells from rats, Schweitzer engineered one cell line to express the normal form of the huntingtin protein and another that expresses the toxic form that causes the disease. Rodent cells are used because they are easier to manipulate than human cells.

He then spliced in a piece of a jellyfish gene responsible for the fluorescent green hue of the sea creatures. The jellyfish gene plays an important role in the cell line production process by marking target cells with a green glow, allowing them to be harvested by hand.

Finally, he spliced in an insect gene involved in metamorphosis. The insect gene provides the switch that research scientists activate with insect hormones to express either of the two forms of the huntingtin protein.

Schweitzer's cell lines have been shared via material transfer agreements with dozens of research laboratories investigating Huntington's disease These kinds of agreements bestow non-exclusive rights to use tangible biomedical or chemical

"What we created was a cell line that accurately imitates the disease — but does it on demand."

materials in research. And Schweitzer has an endless supply of the material.

"Now that we've established this stable, clonal cell line for Huntington's disease research, it's immortal. It can live forever as long as we keep feeding it," he says. "We can freeze and ship it to a laboratory, and they can thaw it out and do their own experiments."

While pleased with his role in furthering Huntington's disease research, Schweitzer notes that the disease is very rare, affecting five in 100,000 individuals. He hopes one day to apply the process to another neurodegenerative menace.

"You can't fly before you can walk," Schweitzer says, "and part of the impetus for developing this cell line was to conduct a test run of the strategy in hopes of applying it to a much larger problem – Alzheimer's disease." ■

LICENSING

STROKE CENTER INNOVATORS BUY TIME, SAVE BRAIN

Twenty years ago, most emergency room doctors considered stroke victims as candidates for rehabilitation, not treatment. And that's if they survived.

Ischemic stroke, or blocked blood flow that starves brain cells of oxygen, was untreatable. Hemorrhagic stroke, or bleeding that causes damaging or deadly pressure on the brain, was treatable only with invasive surgery.

"Stroke was not even treated as an emergency. We just took these patients and assigned them to the back of the E.R.," recalls Jeffrey Saver, M.D., co-director of the UCLA Stroke Center and director of stroke neurology and the stroke unit at UCLA Medical Center. "It was incredibly frustrating and sad. You really couldn't do anything for them."

Jeffrey Saver, M.D.

Today, stroke is the third leading cause of death in the United States and the leading cause of disability among adults. Two-thirds of stroke victims are older than 65, and as the population ages, the number of strokes per year is expected to double by 2050.

The need is acute, but the UCLA Stroke Center team has emerged as a leader in the effort to address that need. Home to one of only seven acute stroke research centers funded by the National Institutes of Health, UCLA offers the latest approaches to prevention, diagnosis and treatment of both ischemic and hemorrhagic stroke, complemented by a long history of innovation and invention in the field.

"UCLA Medical Center houses one of the world's most powerful multidisciplinary stroke programs – a program without walls that draws on the expertise of neurologists, surgeons, radiologists, nurses and basic scientists," says Saver, a professor of neurology at the David Geffen School of Medicine at UCLA. "In terms of the simultaneous breadth and depth of the program, we are unique in the country."

CLEARING THE CLOG In 1996, the Food and Drug Administration (FDA) approved the first clot-busting medication designed for treating ischemic stroke – recombinant tissue plasminogen activator, or rt-PA. This major breakthrough has been tempered, however, by a narrow three-hour treatment window. By the time most patients recognize the problem, arrive at a hospital and receive a diagnosis, the window of opportunity has slammed shut.

Seeking a faster solution with a more forgiving treatment window, a UCLA research team led by Y. Pierre Gobin, now a professor at Weill Cornell Medical College, set about creating a mechanical device that could quickly and safely pull clots from blocked arteries in the brain. Ultimately, the team introduced the Mechanical Embolus Removal in Cerebral Ischemia (MERCI) Retriever.

"The MERCI clot-retrieval device is not only the first device to obtain approval for use in acute stroke, it can be used beyond the three-hour limitation of rt-PA," says Gary Duckwiler, M.D., a professor of interventional neuroradiology at the David Geffen School of Medicine and part of the original UCLA development team. "This additional option for acute stroke therapy has saved lives and reversed many disabling strokes."

Made of a flexible titanium alloy, the MERCI Retrieval System is inserted via a catheter through the femoral artery in the upper thigh and guided to the clot location via angiography, or X-ray. When deployed, the helical corkscrew at the end of the system gently dislodges and removes the clot the way a plumber's snake might pull a clog from a drain.

The FDA approved the device in 2004 for use within eight hours after the onset of stroke. Licensed and marketed by Mountain View, California-based Concentric Medical Inc., the device is now used by at least 200 centers throughout the United States.

"Time lost is brain loss in acute stroke," Duckwiler says. "And now we have an option that allows us to treat a wide segment of patients acutely and maximize recovery."

Gary Duckwiler, M.D.

PREVENTIVE MAINTENANCE Hemorrhagic strokes occur when abnormalities in blood vessels rupture, and the resulting blood flow causes damaging or deadly pressure on the brain. Intracranial aneurysm, a ballooning of a brain artery caused by a weakened vascular wall, is a common cause.

For many years, preventive repair required an invasive craniotomy and manual clipping, or sealing, of the aneurysm to ease pressure on the weak spot in the artery. Such surgery is often risky or impossible due to other health issues or the aneurysm's location.

In the early 1990s, UCLA stroke center doctors became the first to develop a minimally invasive treatment solution: the Guglielmi Detachable Coil (GDC).

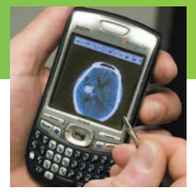
"The impact of the GDC was absolutely revolutionary," says Fernando Vinuela, M.D., co-director of the UCLA Stroke Center and UCLA professor of radiological sciences. "This technology was safe, predictable and within three years became the gold standard." The team included Vinuela, Guido Guglielmi, M.D., now with the University of Rome (Italy) Medical School, and Ivan Lepetska, a mechanical engineer from Target Therapeutics Inc.

Approved by the FDA in 1995, the soft, platinum micro-coil is delivered through a narrow vascular catheter and detached inside the aneurysm using a low-voltage electrical current to dissolve the connection between the wire and the coil. Once in place, the GDC coil creates a dam that isolates the weakened vascular wall from blood flow, reducing the likelihood of a rupture and hemorrhagic stroke.

Licensed initially by Target Therapeutics, which was purchased by Fremont, Calif.-based Boston Scientific Corp., the GDC has been installed in more than 400,000 patients since 1991, and today the device is used to treat up to 55 percent of all hemorrhagic stroke victims in the United States and 95 percent in Europe.

But leave it to UCLA to improve on the gold standard of care.

In 2004, the FDA approved the Matrix Detachable Coil, a product developed by a UCLA-Boston Scientific team led by Vinuela and Yuichi Murayama, UCLA adjunct associate professor of radiological sciences. The three-dimensional Matrix coil seats more securely within the aneurysm sac when deployed, and is coated with a bioabsorbable polymer that encourages the growth of protective connective tissues within and across the neck of the aneurysm.



New software lets doctors review up-to-date patient data on handheld devices.

THE RIGHT INFORMATION, THE RIGHT DECISION Whether the treatment window is three hours or eight, up-to-date information about the patient's condition is critical. Time lost gathering lab results, X-rays, or nurse's notes or reviewing the information can cause critical delays in care.

"The ability to speed a neurologist's review of a stroke patient's CT scan remotely can save 45 minutes of a three hour window. That's enough time to get the patient the rt-PA if it is indicated," says Neil Martin, M.D., UCLA professor and chief of the Division of Neurosurgery.

"UCLA Medical Center houses one of the world's most powerful multidisciplinary stroke programs – a program without walls that draws on the expertise of neurologists, surgeons, radiologists, nurses and basic scientists."

A team of three UCLA professionals with extensive backgrounds in clinical medicine, intensive care, software development, and medical-information technology came up with a better way to deliver the right patient data where and when the doctor needs it. Led by Martin and working with Val Nenov, Ph.D., and Farzad Buxey, the team developed a system that enables doctors to instantly get the right information for each patient's condition on their cell phone or other handheld device.

"If we can guide doctors to the patients who need attention at 10 p.m. to prevent a 2 a.m. emergency call, both the doctor and the patient win," Martin says.

Global Care Quest Inc. licensed the technology and creates software that lets clinicians get at the patient data in the way they need it, when they need it, wherever they are.

"It's tremendously exciting and rewarding to practice with a team capable of making a significant difference in the lives of so many of our patients here at UCLA and around the world," Saver says. ■

BUILDING BRIDGES TO FIND NEW TREATMENTS FOR CANCER

Judith Gasson, Ph.D.

Dennis Slamon, M.D., Ph.D.

More than 35 years after President Richard Nixon declared war on cancer, the disease remains virulent.

One out of two men and one of three women alive today will face a cancer diagnosis in their lifetime. Half a million Americans die of cancer each year, and the disease is the top killer of Americans under age 85.

Yet while the need remains acute, the tide of battle appears to be turning.

The sequencing of the human genome a decade ago has given researchers the tools to identify and strategically attack specific disease mechanisms at a molecular level. And unique partnerships with basic scientists and industry are propelling the pace of discovery and invention.

The interdisciplinary research team at UCLA's Jonsson Comprehensive Cancer Center (JCCC) and their industry partners stand among the leaders of this counteroffensive.

"I would say that we are making progress in every area, from cancer prevention to early detection to targeted therapies," says Judith Gasson, Ph.D., JCCC director and professor of medicine and biological chemistry at the David Geffen School of Medicine at UCLA.

"We are rapidly headed toward an era of personalized cancer therapies," Gasson says. "As our knowledge base expands, we will be able to identify diseased tissue, remove a piece for both pathological diagnosis and molecular analysis, and then choose one or more targeted therapies that will attack the disease without disturbing healthy tissue or organs."

UCLA'S PLACE AT THE RESEARCH TABLE As the birthplace of the breakthrough breast cancer medication Herceptin, the first cancer drug to successfully treat a specific genetic alteration, UCLA has enjoyed a leading role in the cancer research revolution since day one.

Back in 1987, Dennis Slamon, M.D., Ph.D., and his colleagues at UCLA began investigating the role of the HER-2/neu gene in producing a protein found on a cell's surface that acts like an antenna, receiving signals to grow. An overabundance of the gene means wild growth, and that translates into an aggressive cancer that grows and spreads quickly. Up to 30 percent of breast cancers are linked to over-expression of this protein.

Jointly developed by the UCLA team and South San Francisco-based Genentech Inc., Herceptin binds to the protein "antenna," preventing the cells from receiving and/or transmitting a growth signal. Slamon, a professor of medicine at the David Geffen School of Medicine at UCLA, went on to become director of clinical/translational research at the Jonsson Cancer Center.

The lessons of HER-2 and Herceptin are apparent in another Slamon discovery recently licensed by another major biotechnology firm. Slamon and colleagues are investigating the role of a protein that appears to be expressed at high levels in subsets of head and neck, lung and breast cancer.

"We learned a lot of lessons from HER-2," Slamon says. "It provided the framework for a lot of successful molecular targeting of relevant genes and pathways in cancer, and they've made a big difference in the outcome for some patients."

A CULTURE OF COLLABORATION The unique research culture at UCLA has proved fertile ground for the kind of interdisciplinary collaboration necessary to capitalize on a rapidly expanding knowledge base.

"UCLA has a culture that is different from many institutions," Gasson says. "Part of the reason is that the medical school is very young. It's only 55 years old. The barriers that prevent people from collaborating, sharing and working together at other institutions historically don't really exist here. That culture has provided a very fertile ground for the cancer program."

Biologist Charles Sawyers, M.D., and organic chemist Michael E. Jung, Ph.D., began a conversation several years ago and continued talking until they had created a compound that addresses hormone-refractory prostate cancer.

Androgens, or sex hormones such as testosterone, can stimulate the growth of prostate cancer cells. Anti-androgen therapy, in which the body is starved of androgen, is standard treatment with severe limitations. While androgen suppression can reverse or slow development of prostate cancer for a time, the disease typically develops a resistance over months or years, and the therapeutic effects can reverse, spurring new cancer growth instead.

Sawyers, who recently moved from UCLA to chair the Human Oncology and Pathogenesis Program at Memorial Sloan-Kettering Cancer Center in New York, discovered the molecular mechanism behind the therapeutic conundrum.

Jung, a UCLA professor of chemistry and biochemistry, designed and synthesized an organic molecule to address the molecular breakdown. Subsequent testing in Sawyers' lab showed exciting results.

"Then we had a decision to make – what to do with this novel finding," recalls Jung. "We talked with various venture capitalists and groups about the potential of forming a company, but decided we preferred life as academics."

So in stepped San Francisco-based Medivation Inc., which licensed the UCLA team's prostate-cancer-fighting compound and calls it MDV3100. Preliminary results from a combined Phase 1-2 clinical trials are promising, and final results are expected in 2008.

"We can make discoveries and we can even work with our colleagues in chemistry, like Dr. Jung, to find molecules that could be the precursors to drugs, but it's not our mission to develop drugs," Gasson says. "Industry manages the development pipeline but increasingly relies on academia for proven, rigorous testing techniques to determine which compounds should move forward into early phase clinical trials."

THE GROWING ROLE OF INDUSTRY The biotech and pharmaceutical industries have partnered with academia for decades, but rapid advances in medical research and dwindling federal research dollars have made these collaborations imperative.

"These kinds of partnerships are mutually beneficial for the academic collaborator, for the industry collaborator and for the public, if we can identify new drugs and get them to the public faster," Slamon says.

With that goal in mind, U.K.-based GlaxoSmithKline PLC recently forged a set of unique partnerships with UCLA cancer researchers and a handful of other premier centers.

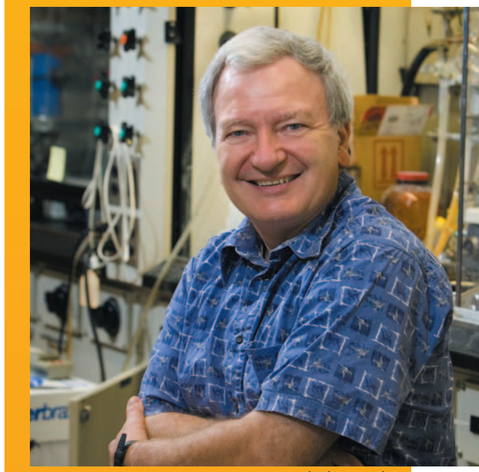
Through the partnership, GSK sets aside research dollars into a special account managed by representatives of the company and UCLA. The steering committee that controls the account is able to apply money directly to projects with promise for both academic and industry payoff.

"The program gives UCLA scientists access to significant compounds – their lead compounds and early compounds in their pipeline – before anyone aside from GSK scientists," Slamon says. "We have a lot of molecular targets of interest and they have drugs designed around a number of those targets."

These forward-thinking relationships are important to speeding new therapies from bench to bedside.

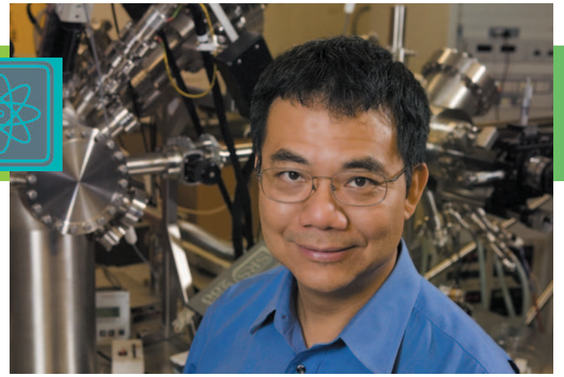
"Both the public and private research communities feel enormous pressure to work more quickly, because there are so many individuals, tragically, for whom no targeted therapy is available," Gasson says. "It always comes back to the patients and their families." ■

CENTER SHOWCASE



Michael E. Jung, Ph.D.

"We are making progress in every area, from cancer prevention to early detection to targeted therapies."



Yang Yang, Ph.D.

INCREASING ENERGY EFFICIENCY THROUGH INNOVATION

Imagine limitless portable energy fueling your latest electronic gadget; lightweight power plants supporting mobile military outposts; or semi-transparent window coverings that cool your home by day while storing power to light your living room after dark.

El Monte, Calif.-based Solarmer Energy Inc. is commercializing these and other solar power technologies that were discovered in the lab of Yang Yang, Ph.D., professor of materials science and engineering at the Henry Samueli School of Engineering and Applied Sciences at UCLA. Yang's research into lightweight plastic solar cells may prove to have a number of practical applications.

"As energy prices soar, solar energy is once again becoming a very important, hot technology," Yang says. "We began our work back in 2001, before the latest surge in prices, so we're positioned at the leading edge of the current solar power research curve."

"As energy prices soar, solar energy is once again becoming a very important, hot technology."

Solar power has been recognized as a clean, unlimited source of energy, and the commonly used silicon has semiconductor properties that make it ideal for solar cells. However, the material is too expensive and unwieldy for many applications, which has prevented the industry from growing beyond a bit player in the global energy market.

The solution to these challenges may lie in polymers, the lightweight, low-cost plastics used in thousands of packaging applications and simple, inexpensive products such as insulators, pipes, household products and even toys. Plastic solar cells are made up of a thin sheet of plastic separating two conductive electrodes. Simple and nondescript, they look like black plastic trash bags, Yang says.

The key to commercial success for polymer solar cells lies in boosting efficiency and durability while controlling cost. Traditional silicon solar cells convert 14 percent to 18 percent of solar energy they absorb to useable power. Yang has pushed his plastic solar cells close to the 5 percent mark, with a goal of 15 percent to 20 percent useable power-conversion efficiency at as little as one-tenth the cost of silicon-based solar cells.

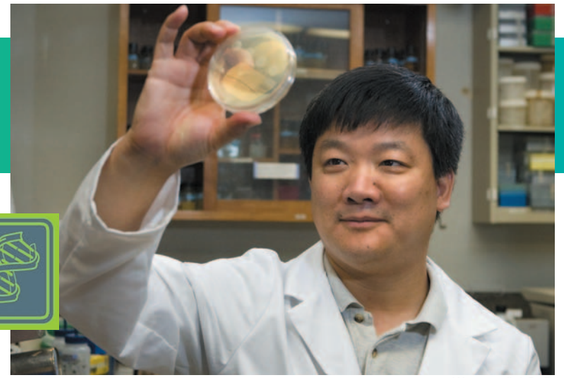
Semi-transparent polymer solar cell technology is another research interest that holds promise for a range of new applications. The team has achieved 85 percent transparency with power conversion efficiency of 2.8 percent.

Since May 2006, Solarmer Energy Inc. has optioned seven polymer solar cell patents registered by Yang's lab and is in the process of licensing several other key patents based on his research. Former doctoral students Gang Li and Vishal Shrotriya, who both worked on polymer solar cell technology as part of Yang's research group at UCLA, now lead product development at Solarmer Energy.

The start-up firm also provides partial financial support for continuing research both on the UCLA campus and at the company's new 6,000-square-foot in-house research and development facility. Support from a UC Discovery grant, the Office of Naval Research and the Air Force Office of Scientific Research (AFOSR) also are contributing fundamental and applied discoveries on polymer use in solar technology.

Yang expects commercial applications of his work to appear first in the consumer electronics industry and later in applications used to power homes, offices, factories and military equipment in the field.

"If we can generate electricity from solar energy at 10 percent efficiency and 10 percent of the cost, than we have the capability of turning every single household in the United States into a little power generator," Yang says. ■



Wenyuan Shi, Ph.D.

STAMPING OUT TOOTH DECAY

For decades, Americans have applied "scorched-earth" tactics in the fight against tooth decay and periodontal disease.

In order to eliminate a handful of disease-causing mouth bacteria, we now spend $80 billion a year on products and services that also destroy some 700 benign and even helpful oral varieties.

And despite the dollars and hours spent brushing, flossing and rinsing, 79 percent of U.S. children still experience at least one bout with tooth decay before age 19.

Seeking an alternative to this expensive, time-consuming and often ineffective approach to oral hygiene, UCLA biologist Wenyuan Shi, Ph.D., and C3-Jian Inc., his Inglewood, California-based start-up firm, have opened up a new front in the war against cavities and gingivitis.

Seventy-nine percent of U.S. children still experience at least one bout with tooth decay before age 19.

Comparing oral hygiene to lawn care, Shi suggests a "weed and feed" approach.

"You have the good grass, and you've got the weeds. The problem with brushing or mouthwash is you kill the weeds and grass at the same time," explains the professor and chair of oral biology at the UCLA School of Dentistry. "We are generating a weed-killer that isn't tough on the grass. We allow the grass to grow thicker and healthier and prevent the weeds from ever coming back."

Shi sees the secret to a healthy mouth in a class of novel therapeutics known as "selectively targeted antimicrobial peptides" (STAMPs), discovered in his lab. A peptide is a hormone, antibiotic or other chemical compound made up of a chain of at least two amino acids. Numerous peptides have been developed as drugs by the biotech industry.

In order to selectively track down and destroy the bad bacteria without harming the good, Shi and his research team identified bacteria-fighting STAMPs and fused them with signaling peptides that attract streptococcus mutans, the bacteria primarily responsible for tooth decay.

"Think of it as a 'Fatal Attraction,'" Shi says with a laugh.

Shi believes the technology also can be harnessed to target harmful nasal, ear, vaginal, skin and other body bacteria without harming helpful varieties in natural microbial colonies.

A lunchtime conversation with a Delta Dental insurance executive eight years ago led to the initial funding for Shi's research and the startup company that was spun out of UCLA to commercialize STAMPs. Shi founded C3-Jian in 2005 and is completing pre-clinical studies in his lab and preparing for human clinical trials with financial support from Delta Dental, a National Institutes of Health small-business grant and contracts with two pharmaceutical companies.

Randal Eckert, a former UCLA Office of Intellectual Property intern, conducted the early studies at UCLA and is now research manager at C3-Jian.

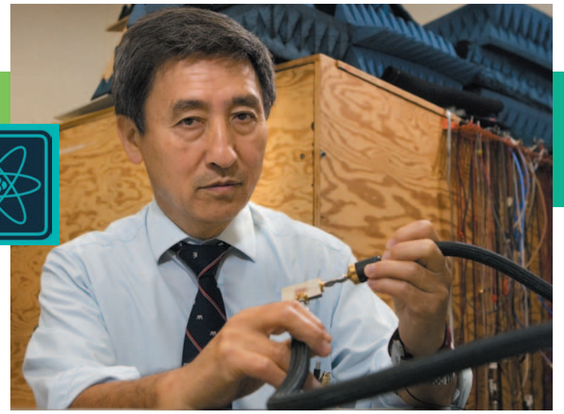
While running the peptide findings through the lengthy research, testing and approval process, the C3-Jian team also pursued a second line of inquiry – one that has already brought a product to market.

Drawing on his Chinese heritage, Shi and his team investigated hundreds of traditional herbal medications and discovered a formula that disables harmful streptococcus mutans mouth bacteria.

Ironically, they've packaged the product in the form of the dentist's sworn enemy: a lollipop. But no worries, it's sugar free.

"For sheer simplicity, it's hard to beat a lollipop," Shi says with a smile. ■

STARTUPS



Tatsuo Itoh, Ph.D.

TEXTBOOK DISCOVERY YIELDS TINY ANTENNAS WITH BIG CAPABILITIES

Inventor Thomas A. Edison famously defined genius as 1 percent inspiration and 99 percent perspiration. Yet the source of that tiny but necessary spark can be elusive and sometimes surprising.

Tatsuo Itoh, Ph.D., experienced a "eureka" moment while flipping through the third edition of "Fields and Waves in Communication Electronics," an undergraduate textbook, and lingering over a section on "backward waves." He now finds himself at the forefront of wireless-antenna technology.

"Inspiration rarely happens by accident. Most discovery involves extrapolation from available research," says Itoh, professor of electrical engineering and Northrop Grumman Chair in Microwave & Millimeter Wave Electronics at the Henry Samueli School of Engineering and Applied Science at UCLA. "In this instance, I was forced to think," he says with a laugh.

"We've only scratched the surface on making microwave components with unique capabilities. I'm looking for the next big thing!"

Itoh built his career on applied electromagnetics, calculating the behavior and investigating the structure of microwave components and circuits. Most recently, he has made a name for himself with metamaterials research.

Metamaterials are manmade composites with electromagnetic properties not found in nature. These properties occur across only a very narrow bandwidth.

"Given the specific shape and dimension, theoretically you have only one frequency to work with. From a microwave-application standpoint, this kind of structure is very difficult to use," Itoh says.

Inspired by that textbook passage, Itoh set about the task of broadening the functional bandwidth. He eventually hit upon a composite of natural and manmade materials that offers big capabilities from tiny components across multiple radio frequencies.

San Diego-based Rayspan Corp. heard about Itoh's innovative work, and called him on the phone one afternoon to learn more about this amazing hybrid material and the implications for antenna technology.

Company representatives were so impressed, they not only licensed the invention but helped secure additional research funding so Itoh can continue his work in this area.

"It's a very healthy relationship. They are very good scientists as well," Itoh says.

On the strength of Itoh's findings, the company has developed an antenna measuring up to one-tenth the size of the industry standard but with competitive performance capabilities. Immediate commercial applications include cell phones and local area network (LAN) wireless systems. Military applications exist as well.

So if a textbook can provide the inspiration, what drives Itoh to invest his sweat equity?

"The excitement of discovering something new," he says. "And we've only scratched the surface on making microwave components with unique capabilities. I'm looking for the next big thing!" ■

"It's almost impossible to develop medical applications without a doctor on board. You need someone guiding you to identify workable technologies."

PROFILES

COLLABORATION LEADS TO A WHOLE GREATER THAN THE SUM OF ITS PARTS

Greg Carman, Ph.D., discovered a method for making ultra-thin sheets of nickel titanium alloy, but the materials engineer had difficulty applying his discovery to medicine. He shifted his focus to military and industrial applications.

Dan Levi, M.D., wanted to save young patients with defective heart valves from the trauma and discomfort of open heart surgery, but the pediatric cardiologist couldn't find the right material for artificial valves to install and deploy via arterial catheter.

Here's the story about when Carman met Levi.

"Light bulbs just started going off in his head," recalls Carman, professor of mechanical and aerospace engineering at the Henry Samueli School of Engineering and Applied Science at UCLA. "He could imagine so many applications, but the most intriguing was pediatric heart valves."

"This particular alloy has a lot of advantages for the design of devices that are delivered through catheters," explains Levi, assistant professor of pediatrics at the David Geffen School of Medicine at UCLA. "It has super-elastic memory properties, it's strong, and it's very biocompatible. It doesn't calcify or encourage the formation of blood clots."

In bulk, nickel titanium alloy, or nitinol, has been a key component of myriad medical devices over the past decade. But Carman's Active Materials Lab is one of a handful worldwide that broadened the menu of potential applications by processing ultra-pure "thin film" nitinol.

Greg Carman, Ph.D.

Using a process called hot target sputter deposition, Carman's lab produces high-quality nitinol measuring 7 microns thick – less than one-seventh the width of a human hair.

The process involves dislodging nitinol atoms using an ionized gas and spreading them across a silicon substrate in a vacuum. The nitinol atoms reconnect on the silicon and are heated so that they crystallize into a uniform structure. The finished product looks like very thin aluminum foil.

Dan Levi, M.D.

Levi recognized the material's potential during his first visit to Carman's lab.

Surgeons already were testing the catheter installation of a new generation of collapsible artificial heart valves in adults, but existing valve options were too large to safely navigate a child-sized vascular system. A minimally invasive approach to valve replacement is especially important in children, since the artificial valves need to be replaced two or three times as the young patients grow.

With the help of Carman and UCLA researcher Lenka Stepan, Levi designed a strong yet flexible butterfly-shaped valve from thin film nitinol that collapses for the trip through a narrow catheter before deploying inside the heart. Initial testing is under way.

In addition, Carman and Levi have teamed up with Fernando Vinuela, M.D., director of neurointerventional radiology at the UCLA Stroke Center, to develop nitinol-coated vascular stents used to prop open clogged arteries. The nitinol coating is expected to help prevent post-surgical complications. Clinical trials are ongoing.

The Air Force Office of Scientific Research and the Defense Advanced Research Projects Agency supported the initial development of thin film nitinol for defense applications. The National Institutes of Child Health and Human Development, the Society of Cardiac Angiography and Interventions and Cordis Corp. have supported the medical research. Other funders include the Stein Oppenheimer Foundation, the Dylan Foundation, actor Jamie Kennedy and PayPal Inc. founder Peter Theil.

As the research progresses, Carman and Levi credit the power of multidisciplinary partnership. ▶▶

"Diversity and variation increase the likelihood of finding a compound that will impact disease."

"It's almost impossible to develop medical applications without a doctor on board. You need someone guiding you to identify workable technologies," Carman says. "Dan identifies all of the medical applications for us and conducts the testing. He also aids in the engineering and design of the device itself."

And Levi is thrilled to have found Carman and his team: "Greg was working on military applications for his 'memory metal,' and now he's helping to save lives."

NEW METHODS FOR SYNTHESIZING SMALL MOLECULES YIELD BIG RESULTS

Put away your crystal ball. If you want a sneak peek at the future of organic chemistry and pharmaceutical development, simply visit the UCLA lab of Ohyun Kwon, Ph.D.

Kwon, a professor of organic chemistry and biochemistry, along with leading UCLA biologists, are using the latest methodology – diversity oriented synthesis, or DOS – to speed the discovery of disease-fighting small organic molecules.


Ohyun Kwon, Ph.D.

These cutting-edge collaborations are yielding unique, early stage drug leads for the treatment of cancer and cardiovascular disease.

"DOS focuses on quality and complexity, not quantity, when developing small molecules with the potential for acting on cellular disease mechanisms," says Kwon. "With DOS, organic chemists can produce a diverse collection of complex small molecules faster than ever. Diversity and variation increase the likelihood of finding a compound that will impact disease."

Small molecule drugs typically inhibit disease-causing malfunctions of specific proteins, offering maximum defense against disease with minimum side effects. The development process, however, is slow. Scientists thus far have successfully targeted only a small fraction of the 100,000 proteins expressed in the human body.

"Structurally similar small molecules tend to target the same protein target," Kwon says. "Therefore, to discover small molecule protein-function modulators targeting the huge number of different proteins, scientists must produce a large number of small molecules with distinctive unforeseen structures."

Kwon's work represents the latest advance in the development process.

Low throughput synthesis (LTS) was once the lifeblood of the biological pharmaceutical industry. Chemical compounds were tested "one reaction and one product at a time," in hopes of finding an effective disease-fighting molecule, Kwon explained. The process was painstaking. Results were minimal.

The advent of high throughput synthesis (HTS) allowed scientists to quickly generate a large collection of compounds – but without regard for complexity or diversity. While production is high, the number of compounds with the potential to act on disease is small. In contrast, DOS produces a smaller but more robust collection of compounds, a library rich in three-dimensionally distinctive structures. Typical HTS hit rates range from 0.25 percent to 1 percent. With DOS, Kwon and her colleagues have achieved a hit rate of 3 percent to 5 percent.

Working in collaboration with leading UCLA biologist Fuyuhiko Tamanoi, Ph.D., professor of microbiology, immunology and molecular genetics, Kwon's lab has used DOS to synthesize potent variations of a small molecule that inhibits geranylgeranyltransferase-I (GGTI), a protein implicated in cancer.

The team is ready to test the best candidates in mouse models for the suppression of pancreatic cancer, the deadliest variety. The compound also is being tested in leukemia and breast cancer cell lines.

And partnering with UCLA biologist Jau-Nian Chen, Ph.D., an assistant professor of molecular, cellular and developmental biology, Kwon's lab has synthesized a compound that suppresses cardiac fibrillation and restores rhythmic synchronized contraction in zebrafish models.

"We're excited because we've been able to link critical imaging and treatment steps into a single therapy."

The findings hold implications for treatment of human cardiac fibrillation, or irregular heartbeat, the cause of death for 50 percent of heart failure patients. The molecular and cellular causes of this heart disease are not well understood, and effective treatments are limited.

SEEK-AND-DESTROY GENE THERAPY TARGETS PROSTATE CANCER

Lily Wu, M.D., Ph.D., is investigating a minimally invasive method of tracking and treating the stealthy and often deadly migration of prostate cancer.

Called two-step transcriptional amplification (TSTA), the method converts a common cold virus into a vehicle for delivering a genetic payload with a powerful one-two punch. Instead of delivering chills and itchy eyes, the virus transports an intricately engineered gene called sr39tk through the lymphatic system on a molecular seek-and-destroy mission.

In an extensive array of mouse studies, the gene successfully located migrating prostate cancer cells by their signature PSA protein expressions and made them visible to positron emission tomography (PET) imaging. At the same time, the sr39tk gene activated a destroy function in these cells that makes them vulnerable to medication.

"Current options for tracking prostate cancer are often ineffective until large amounts of cancer cells have spread through the lymphatic system to critical areas such as the bones, and treatments become futile," says Wu, an associate professor in the departments of Urology and Molecular & Medical Pharmacology at UCLA.

"We're excited because we've been able to link critical imaging and treatment steps into a single therapy," Wu adds. "By its ability to pinpoint disseminated prostate cancer cells using established PET imaging, our method could be combined with traditional radiation therapy to kill only the disseminated cancer cells."

According to the Prostate Cancer Foundation, one in six men will be diagnosed with the disease in their lifetime, and approximately 30,000 die each year from the disease, making it the leading cause of cancer deaths among men.

These grim statistics and the power of Wu's research helped her win a Rapid Access to Intervention Development (RAID) award from the National Cancer Institute as part of a National Institutes of Health program designed to advance promising medical research.

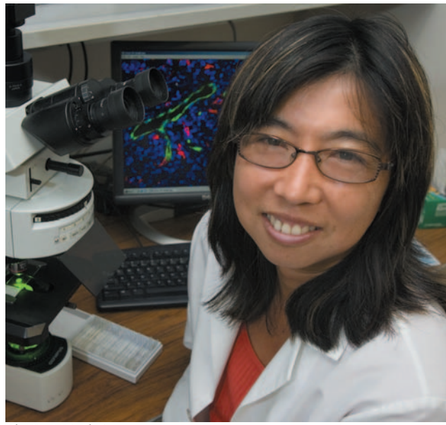
RAID researchers are working to synthesize large quantities of clinical-grade material and conduct extensive pharmacological testing before Wu can move forward with human clinical trials. The rigorous manufacturing and testing conditions required by the Food and Drug Administration are too costly for academic institutions to undertake.

Wu began her research five years ago with an interdisciplinary grant from the Jonsson Comprehensive Cancer Center at UCLA and support from the California Cancer Research Program. She has continued the work with financial assistance from the National Cancer Institute, the Department of Defense Prostate Cancer Research Program and the Prostate Cancer Foundation. Wu expects human clinical trials to begin in about two years.

"We are very encouraged by the support of RAID with the manufacturing step. We're hoping to pull in support from the commercial sector to bring this technology to the patients," Wu says.

Meanwhile, as the long march toward human clinical trials continues, Wu is making her two-pronged gene therapy available to man's best friend.

"Like humans, dogs develop spontaneous prostate cancer," Wu notes. "We are recruiting Los Angeles veterinarians to help us bring this imaging and treatment models to pets to improve their odds of recovery from the disease." ■


Lily Wu, M.D., Ph.D.

OIP INTERNS FUTURE DIRECTIONS

INTELLECTUAL PROPERTY INTERN EXPERIENCE OFFERS GIVE AND TAKE

Sandy Auyoung credits her career in biotech business development to her time on the opposite side of the table as a UCLA Office of Intellectual Property (OIP) intern.

Aaron Ward, a third year law student at UCLA who once worked for the U.S. Patent Office, discovered the thrill of discovery working on the front end of the technology transfer process as an OIP intern.

And Michael Su, M.D., hopes to parlay his OIP intern experience, along with his UCLA MBA, into a successful career as a venture capitalist.

"The internship experience at UCLA is as diverse as the interns themselves," says Kathryn Atchison, vice provost, Intellectual Property and Industry Relations. "Our program of paid and volunteer internships enables students to combine their science or technical background with training and hands-on experience in the field of academic technology transfer – a complex amalgam of technology valuation, patenting, marketing, licensing and policy."

"At OIP, I would see things that were right out of the laboratory. Some of the technologies I hadn't even dreamed about."

For Auyoung, a senior patent and licensing associate for a Malibu-based biotech firm, both her internship and later her full-time position as a marketing analyst with OIP was a chance to learn her profession from the inside out.

"When I was with UCLA, I marketed the technologies to the companies," she says. "Now I evaluate technologies from universities like UCLA."

The young professional immersed herself in lab work as a UCLA undergraduate, majoring in microbiology and molecular genetics. As a graduate student at Keck Graduate Institute in Claremont, Calif., she received interdisciplinary training in project management, bioethics, marketing, computational biology and law. Joining OIP upon graduation, she finally got a chance to experience the intricacies of technology transfer first hand.

"It was a big learning curve at first, but working in the trenches at UCLA gave me invaluable experience and proved to be an important career stepping-stone," Auyoung says. "The OIP officers were wonderful mentors and coaches."

A third-year student at the UCLA School of Law with an undergraduate degree in electrical engineering, Ward arrived at OIP with hands-on experience in patent law at a Washington, D.C.-area law firm and the U.S. Patent Office. But Ward credits his work experience as an OIP intern with introducing him to the joy of discovery.

"It was a big learning curve at first, but working in the trenches at UCLA gave me invaluable experience and proved to be an important career stepping-stone."

"At the law firm, I would manage patent applications for products that might already be on the market and going through the process of getting patented. I recognized them or could imagine them in my mind," says Ward, who plans to practice patent law. "At OIP, I would see things that were right out of the laboratory. Some of the technologies I hadn't even dreamed about."

Su is already an established entrepreneur. In addition to pursuing his MBA at UCLA's Anderson School of Business, he practices internal medicine at Kaiser Permanente, runs a clinic and a physician-recruiting service and is putting together another small business that will contract out ultrasound services. His OIP internship proved a perfect addition to his beefy resume.

"My primary interests in medicine are the science and business sides," says Su, who in addition to venture capital has a keen interest in the business of pharmaceuticals and biotech. "What I really enjoyed about my internship was the opportunity to meet people in venture capital and to see how the whole licensing process develops. Given my background, I knew a lot about the science but knew very little about the commercialization process."

More information about the OIP intern program is available online at **http://www.research.ucla.edu/oipa/interns**.

UCLA OIP
OFFICE OF INTELLECTUAL PROPERTY

KATHRYN ATCHISON
Vice Provost of Intellectual Property and Industry Relations
310-794-0212
katchison@conet.ucla.edu

EMILY W. LOUGHRAN, *Director of Licensing*
310-794-0558
eloughran@research.ucla.edu

CLAIRE T. WAKE, *Assistant Director of Licensing & Material Transfer Agreements*
310-794-3576
cwake@research.ucla.edu

EARL WEINSTEIN, *Assistant Director Business Development & Licensing*
310-794-0214
eweinstein@research.ucla.edu

KATHERINE L. FIBIGER, *Copyright Officer*
310-794-0205
kfibiger@research.ucla.edu

BERNADETTE MCCAFFERTY, *Technology Transfer Officer*
310-794-8088
bmccafferty@research.ucla.edu

YASHWANT N. VAISHNAV, *Technology Transfer Officer*
310-794-0204
yvaishnav@research.ucla.edu

SUNG-WEI CHEN, *Technology Transfer Officer*
310-794-3135
schen@research.ucla.edu

CHERYL SILVERMAN, *Patent Prosecution Manager*
310-794-0561
csilverman@research.ucla.edu

KENNETH J. POLASKO, *Director Industry Sponsored Research Technology Transfer Officer*
310-794-8087
kpolasko@research.ucla.edu

JEANNE DE PASS, *Senior Industry Sponsored Research Officer*
310-794-3385
jdepass@research.ucla.edu

LILLIAN L. LAI, *Industry Contract Officer*
310-794-0562
llai@research.ucla.edu

LORI C. BIEN-WILLNER, *Industry Contract Officer*
310-794-3385
lbien-willner@research.ucla.edu

MARY J. GIBSON, *Senior Industry Sponsored Research Officer*
310-794-0193
mgibson@research.ucla.edu

KATHLEEN WROBEL, *Material Transfer Agreement Manager*
310-794-0401
kwrobel@research.ucla.edu

BOB NIDEVER, *Marketing Manager*
310-794-0607
bnidever@research.ucla.edu

HELEN LIU, *Marketing Analyst*
310-794-7481
hliu@research.ucla.edu

www.research.ucla.edu/oip

11000 Kinross Ave., Suite 200, Los Angeles, CA 90095-1406

UCLA OIP

OFFICE OF INTELLECTUAL PROPERTY

Many of this university's most successful
innovations are the direct result of
removing traditional department fences,
inviting fresh perspectives
and new ways to wonder.

UCLA puts knowledge to work.

As one of the nation's leading research
universities—public or private—UCLA has become
the engine for real time, real world
accomplishments that enrich our
community, our nation,
our world on a daily basis.