

Biologist Works to Prevent Disease and Infections

Research conducted over more than 20 years by Roy Curtiss III, the George William and Irene Koechig Freiberg Professor of Biology in Arts & Sciences, has focused on understanding microbial pathogens that cause disease and how they affect the immune system. He has used genetic engineering techniques to develop vaccines that help an individual induce immune responses against the foreign antigens.

Since the 1970s Curtiss and his research group have sought to define the biochemical bases and genetic controls by which bacterial pathogens cause tooth decay, gastroenteritis, typhoid fever, leprosy, pneumonia, and septicemia (blood-poisoning). Some of their groundbreaking work has now been patented to develop commercial products that will prevent disease in animals and humans.

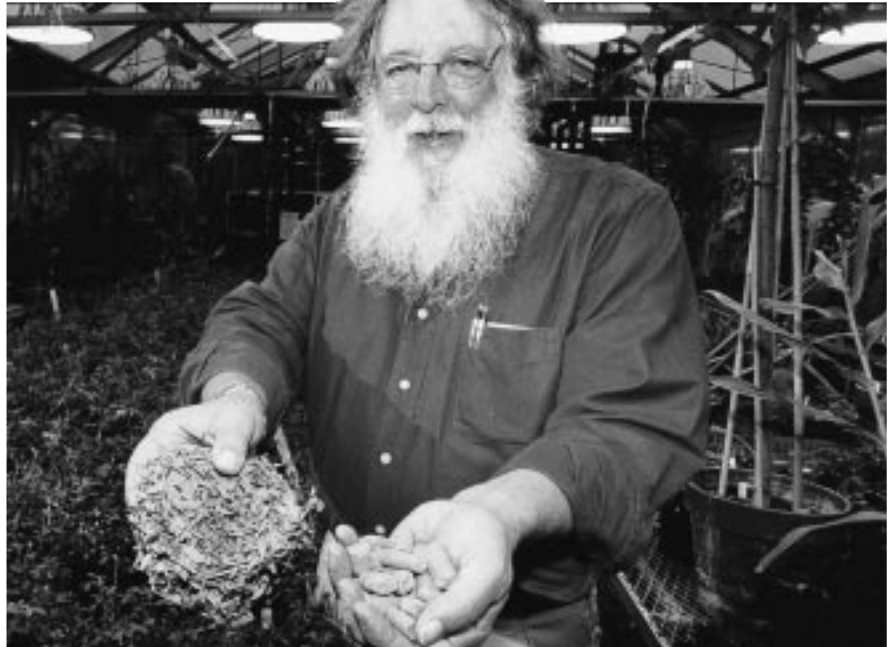
Edible Vaccines Patented

In 1997, Curtiss and Guy Cardineau, a scientist with Mycogen Corporation of San Diego, California, were granted three United States patents on technology they co-invented for using transgenic (or genetically engineered) plants as edible vaccines. Curtiss and Cardineau conceived of the ideas for plant vaccines and initiated their collaborative research in 1985. Curtiss was then a scientific advisor for Sungene Corporation, a California plant biotechnology company, which had employed Cardineau as a plant molecular biologist.

The concept was to endow plants with the genetic ability to synthesize proteins or other antigens normally present on the surface of various disease agents. Upon ingestion of the plant material (leaves, seeds, etc.), an animal or human would recognize the pathogen antigens as foreign and mount an immune response that would protect against infection.

An important feature of edible vaccines is their ability to induce mucosal immunity — the secretion of antibodies in saliva, tears, and milk, and in all the secretions that bathe the mucosal surfaces in the respiratory, gastrointestinal, and genitourinary tracts. The

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Biologist Roy Curtiss III holds plant material (left) and feed made from it (right).

Washington University Prepares for Presidential Debate

The final debate between candidates for the U.S. presidency is scheduled for 8 p.m. Tuesday, October 17, 2000, at Washington University. This marks the third time the university has been selected by the Commission on Presidential Debates as a host. The university hosted the first presidential debate held prior to the 1992 election and had been selected to host a 1996 presidential debate that eventually was canceled.

Chancellor Mark S. Wrighton is excited that St. Louis has been selected for one of four internationally televised debates planned for fall 2000. "The 1992 presidential debate was an extraordinary experience for

Washington University and an educational opportunity for all of our students," he says.

"Students are once again participating in the planning process, as are faculty and other members of the university community."

Art students Rebecca Goldstein and Christy Miller helped design several logos, including the logo reproduced above, to be used for the debate through *Create Studio*, an elective course for senior graphic design majors.



International Advisory Council for Asia to meet in India in 2001

The next meeting for the International Advisory Council for Asia will be held in New Delhi, India, on March 18-20, 2001. On March 20, there will be an academic symposium on plant science with presentations by:

- Ralph Quatrano, the Spencer T. Olin Professor and chair of the Department of Biology in Arts & Sciences;
- Peter Raven, the Engelmann Professor of Botany in the Department of Biology and director of the Missouri Botanical Garden; and
- Roger Beachy, president of the Donald Danforth Plant Science Center.

For information on the seminar, please contact Jeannette Huey at jeannette_huey@aismail.wustl.edu.

News Briefs

Comparative approaches to inheritance: Frances Foster, professor of law, has published "Linking Support and Inheritance: A New Model from China" in 1999 *Wisconsin Law Review* 1199. This was her second comparative study of Chinese and American approaches to inheritance based on her original translations of recent Chinese inheritance cases.

Inaugural global conference on justice education: Clark Cunningham, professor of law, served on the planning committee and led a one-day plenary workshop on justice education at the first Global Alliance for Justice Education (GAJE) conference in India in December 1999. While in Asia, he visited the National University of Singapore and the National University of Nepal, laying groundwork to establish law student exchange programs with both universities. Cunningham's article, "Affirmative Action: India's Example," was published in the official journal of the United States Civil Rights Commission, 4 *Civil Rights Journal* 22 (1999).

New Student Orientation leaders: Meggie Leu and Jane Hsin, both juniors from Taiwan, and Marifel

Moyano, a senior from the Philippines, were selected as three of 10 orientation leaders for Orientation 2000 in August. Orientation leaders play a critical role in helping coordinate orientation programs for new undergraduate students through the Orientation Office. Each leader also recruits, selects, and helps train the 80 orientation assistants, and the leaders supervise a team of eight orientation assistants as well.

Real-time tracking of 3-D objects: In July at the Computer Vision and Pattern Recognition 2000 conference of the Institute of Electrical and Electronics Engineers (IEEE), several software designers unveiled their latest achievements. Stefano Soatto, assistant professor of electrical engineering at Washington University, displayed the first real-time motion-tracking system for 3-D objects. The design is the first of its kind to be run on a personal computer. Soatto's coup was a new algorithm that makes sophisticated tracking possible on a PC.

New book on patenting business methods: Shibata Hidetoshi, M.B.A '98, recently published a book, *Business Method Patent Strategy* (Toyo-Keizai Shinpo-Sha, 2000), regarding the right to patent business methods. Hidetoshi's research field, off-balance assets, includes such topics as intellectual properties, brand assets, and organi-

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secretory antibodies account for about 75 percent of the antibodies the body makes and serve as a first line of defense against pathogens.

The patented technology has been assigned to Washington University, which has granted Mycogen an exclusive license to develop vaccines. Mycogen hopes to begin with edible vaccines in animal feed protecting chickens and pigs from respiratory and intestinal diseases. Vaccines for cows, with their more complex digestive tracts, would come later. The technology also holds promise of helping control food-borne diseases in humans, such as those caused by *E. coli* and *Salmonella* bacteria.

"I am excited that these ideas and discoveries that Guy and I had in the mid-1980s are likely to generate some vaccines, at very reasonable costs, to lessen the likelihood of infectious diseases in both animals and humans," Curtiss said. "This will be particularly important in the developing world. It is also possible that these plant vac-

cines can be used to alleviate allergies or to correct autoimmune diseases. If so, we will have additional reasons to be thankful for plants in improving the environment in which we live, our nourishment, and our health."

Patent granted for genetically engineered antigen delivery system

Professor Roy Curtiss was granted another U.S. patent in March 1999 for a genetically engineered bacterial antigen delivery system he had developed while at the University of Alabama, Birmingham in the late 1970s and early 1980s, and at Washington University since 1983. The two universities will share patent income from any vaccine marketed to combat any bacterial, viral, fungal, or parasitic disease using Curtiss' concept.

The patent covers the composition, manufacture, and use of live attenuated — or weakened — derivatives of disease-causing bacteria genetically engineered to express foreign antigens, or proteins, in a vaccine. The vaccine then targets the lymph tissue of an individual to induce immune responses

against the foreign antigens.

According to Curtiss, securing the patent required that he demonstrate to the patent examiner a number of different advantages in using *Salmonella typhimurium* as the pathogen. *Salmonella* has an ability to express a diversity of antigen genes from various bacteria, viruses, parasites, and fungi. Curtiss' system uses the immunoglobulin (IgA) response in secretions such as breast milk, tears, and saliva as a first line of defense against infection.

The technology is being used to develop recombinant vaccines to prevent or therapeutically treat infections due to *Helicobacter pylori*, which causes ulcers; *Campylobacter jejuni*, which colonizes poultry and—when transmitted—causes diarrhea in humans; *Mycobacterium tuberculosis*, hepatitis B virus, and a number of other pathogens for agricultural animals.

Two vaccines using Curtiss' approaches to attenuate bacteria have been approved by the United States Department of Agriculture and are being marketed for use in preventing *Salmonella* infections in poultry and swine.

zational skill assets. The book is a best-seller in Japan and is being translated into Korean with plans for distribution in Taiwan as well.

Advancing technology for digital still cameras: He Ouyang, a mathematician born in China who received his Ph.D. from Washington University in 1991, and the company he founded, WIS Technologies, is focusing on the development of multimedia compression algorithms in imaging, video, and audio. Ouyang and other engineers in China and the United States hope to introduce digital still camera technology in China based on the JPEG2000 standard. JPEG2000 image compression technology provides many features beyond standard JPEG technology, including higher resolution and several scalability features.

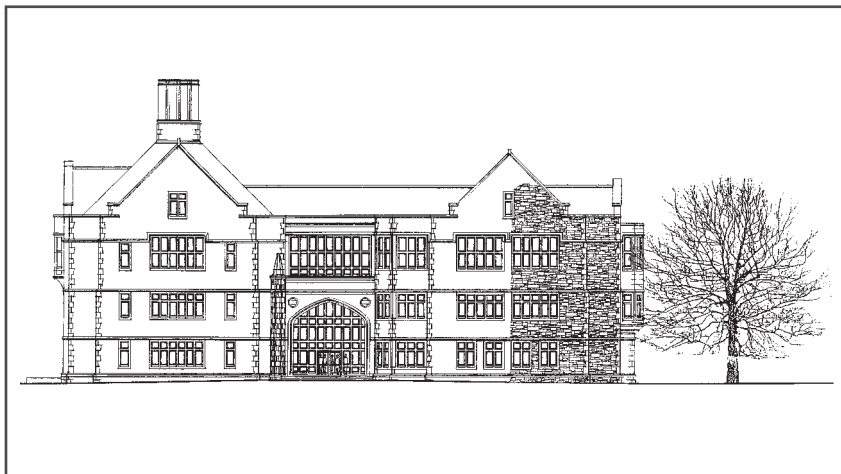
Sulfur emissions in China: In a study published in the fall 1999 issue of *Atmospheric Environment*, Rudolf B.

Husar, professor of mechanical engineering and director of the Center for Air Pollution Impact and Trend Analysis (CAPITA) at Washington University, showed that sulfur emissions have soared in mainland China over the past 20 years. Husar and his colleagues estimated yearly emissions per country based on net fuel production — production plus imports minus exports. “China is an immense country with a growing population, and its coal reserves are massive and predominantly soft coal, which is the dirtiest kind,” Husar says. “China is in the midst of a booming industrialization process. It makes economic sense for them to burn coal because it is so abundant.”

Watari attends Olympic Torch event: When the Olympic Torch traveled underwater at the Great Barrier Reef in June, Shinichiro Watari, chairman of the International Advisory Council for Asia, was in Port Douglas, Australia, to witness the event. Watari, B.A. '72, a Washington University Trustee, and

chairman of Cornes & Co. Ltd. in Hong Kong and Tokyo, had a special reason for being there: “The boat, *Quicksilver*, which carried the torch and other dignitaries to the Reef, and the pontoon, which is on the coral reefs, are owned by my company,” he says. “The lucky young lady who took the torch under the water is also one of my staff.”

Marshall receives Cathay Award: Garland Marshall, professor of biochemistry and molecular biophysics at the School of Medicine and a member of the newly established Center for Computational Biology, was recognized with the Cathay Award at the 6th Chinese Peptide Symposium held in Mt. Huangshan, China, in July. The award is sponsored by the H.H. Liu Educational Foundation of Shanghai. The citation praised Marshall’s “pioneering contributions to peptide science, particularly in molecular design and peptidomimetics.”



The Laboratory Science Building for Arts & Sciences

Campus Construction Update

Exciting changes are taking place at both Washington University's Hilltop Campus and Medical Campus. New buildings are being planned and built to enhance the teaching and learning experiences for students and faculty.

Hilltop Campus: The *Charles F. Knight Executive Education Center* for the John M. Olin School of Business

continues to move toward its anticipated completion in May 2001. Construction has begun on the new *Laboratory Science Building for Arts & Sciences*, which will provide additional laboratory space to the Department of Chemistry. Also under construction are four *Small Group Housing* units, which will provide on-campus living/learning space for undergraduate students. Completion is scheduled for summer 2001.

Groundbreaking will take place on October 2, 2000, for the *Uncas A. Whitaker Hall for Biomedical Engineering*, which will house biomedical engineering research and teaching. The new building and programs in biomedical engineering will be funded in part by a \$13 million grant from the Whitaker Foundation.

In the planning stages are a new building for *Earth and Planetary Sciences* in Arts & Sciences, a *Visual Arts and Design Center* to be added to the existing complex of art and architecture buildings, and a *University Center*.

Medical Campus: The *McDonnell Pediatric Research Building* is nearing completion in the School of Medicine's research complex. A dedication ceremony has been scheduled for September 13, 2000.

The Washington University Medical Center's new *Ambulatory Care Center* moved closer to completion, celebrated with a "topping off" ceremony last spring. Housed in the center will be the *Alvin J. Siteman Cancer Center*, supported by a \$35 million gift to the Washington University School of Medicine and Barnes-Jewish Hospital from Ruth and Alvin Siteman. The gift will support the cancer center's priorities of patient care, research, and education.

Admissions Update

As students around the world head back to class in the fall, Julie Shimabukuro from the Office of Undergraduate Admissions heads to Asia to spread the word about the educational opportunities available to undergraduates at Washington University in St. Louis.

Shimabukuro ventures to Asia in September, spending more than two weeks meeting with prospective students and Alumni and Parents Admission Program (APAP) members in Japan, Korea, Hong Kong, Taiwan, and Singapore.

"I'm looking forward to the opportunity to meet with talented students who may or may not yet know much about Washington University and to share with them the distinctive features of the University," Shimabukuro says. "And it is always uplifting to meet with our special friends—alumni and parents—who serve

as partners in our effort to recruit outstanding students."

Alumni, parents, and friends of the University often help identify students who may be interested in applying to Washington University. Refer names and addresses of talented prospective students to:

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Coordinator of International
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Washington University in St. Louis
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St. Louis, MO 63130-4899
U.S.A.
Telephone: (314) 935-4893
E-mail:
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Scientists gathered in Washington to celebrate completion of the human genome's working draft. Standing on the White House steps are (from left) James Watson, (Cold Spring Harbor Laboratory), Eric Lander (Massachusetts Institute of Technology), Richard Gibbs (Baylor College of Medicine), and Washington University's Robert H. Waterston and Richard K. Wilson.

"Working draft" of human genome:

On June 26, three School of Medicine researchers went to the White House to help announce the assembly of a working draft of the human genome — 3 billion DNA letters that make the blueprint for the human body. The sequencing center at the medical school has contributed about one-fourth of the DNA sequence generated by the Human Genome Project. Joining scientists from across the nation were Robert H. Waterston, the James S. McDonnell Professor of Genetics, head of the Department of Genetics, and director of the Genome Sequencing Center; Richard K. Wilson, associate professor of genetics and center co-director; and Mundeep Sekon, a lab supervisor. The international Human Genome Sequencing consortium includes scientists at 16 institutions in France, Germany, Japan, China, Great Britain, and the United States.

Alumni and Parents Admission Program in Asia

The Alumni and Parents Admission Program (APAP) exists to involve Washington University alumni and parents of current undergraduate students in recruiting, selecting, and enrolling students at Washington University in St. Louis. Our alumni and parents do this by offering interviews to applicants, staffing college fairs, and hosting Admitted Student Receptions and Summer Send-Offs — special gatherings for students prior to their fall semester at Washington University.

Our APAP efforts in Asia consist of: staffing college fairs, offering alumni interviews (Hong Kong Singapore, Taipei, and Tokyo), receiving referrals from University friends, and hosting student receptions.

APAP committee chairs in Asia include:

Hong Kong
Edward Shing, BS '87

Singapore
Jimmy Leong, BS '91

Taipei
Mark S.Y. Chan, BA '77

Tokyo
Kaz Naoki, BS '96

Please contact the APAP office at apap@wustl.edu or (314) 935-4826 if you are interested in getting involved in the efforts to recruit, admit, and enroll talented undergraduate students.

Alumni Clubs in Asia

Washington University's 11 Alumni Clubs in Asia offer alumni and parents of current and former students a way to stay connected with the University. The clubs sponsor activities and assist with admissions activities during the year. If you would like to get involved, contact:

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