

A close-up photograph of a bulldog's face, showing its eyes, nose, and mouth. The bulldog has a white and black coat with some pinkish spots on its face.

# insight

College of Veterinary Medicine and Biomedical Sciences

Fall 2009

Vol. 35 No. 1

Beating the  
odds with  
Miyuki

Colorado State University



Dr. Lance Perryman

## Dear Friends,

In the midst of challenging times, we often feel hard-pressed to find a positive spin on life's challenges. Budget cuts, the economy, wars on two fronts, the national health care debate, global warming, and political divisiveness resonate through the airways and in the newspapers. Rather than join the chorus, we've decided to bring you all the good news from the College of Veterinary Medicine and Biomedical Sciences, and share with you our excitement for what the future holds for our students, faculty and staff members, and our greater University community.

In this edition of *Insight* magazine, you'll meet Dr. Ian Orme and Dr. Wayne McIlwraith. They have both been recognized as University Distinguished Professors, the highest honor bestowed upon a faculty member at Colorado State University. They are world-renowned in their respective fields of tuberculosis and equine orthopaedics, and have garnered more than \$100 million in research grants and, more importantly, influenced hundreds of students who now make important positive contributions to human and animal health around the world. We congratulate them on this recognition and welcome them to the elite cadre of CVMBs professors who came before them to this honor including Drs. Barry Beaty, George Seidel, Patrick Brennan, Edward Hoover, Stephen Withrow, Gordon Niswender, and Mort Elkind.

You'll also read the story of Miyuki, the small dog with a big heart and devoted owners who decided to give her a second chance at life. Miyuki's story is a testament to the excellence and quality of care provided by the Critical Care Unit which usually operates in the background of the CSU Veterinary Teaching Hospital. The faculty and staff are so committed to their patients you can often find them coming back after hours, going the extra mile to be sure each patient is cared for with the utmost professionalism, providing compassionate end-of-life care, and keeping their hopes high against sometimes overwhelming odds with their most critically ill patients.

Learn about our veterinary outreach programs that are bringing modern veterinary care to impoverished communities in Central and South America, as well as our efforts to bring cultural awareness into our Professional Veterinary Medical Program. Drs. Regina Schoenfeld and Lori Kogan are working cooperatively with Dr. Mary Wright, a private practitioner, to better understand how veterinarians can work to improve animal and public health delivery of services in diverse communities. Also, as a special feature in this edition, we have an essay provided by the renowned novelist Sara Gruen, author of *Water for Elephants*, about the experiences of her dog Sophie at the Veterinary Teaching Hospital's Cardiology Service.

On the University front, you may already know that in August we launched the first comprehensive campaign in the University's 139-year history. The Campaign for Colorado State University has a goal of \$500 million by the year 2012, and has already surpassed the \$290 million mark. As a part of the campaign, the goal for the College of Veterinary Medicine and Biomedical Sciences is \$100 million and we have passed \$92 million to date thanks to the generous gifts of so many of our benefactors who gave during the "quiet" phase of the campaign. You'll read more about the Campaign for Colorado State University and also have the opportunity to participate by using the attached pull-out giving envelope. As the University seeks to ensure its future endeavors with secure funding, the campaign will help us to gain sure footing on uneven financial ground.

You'll find more good news in this edition of *Insight* magazine. You also can keep up with us online by visiting our website at [www.cvmb.colostate.edu](http://www.cvmb.colostate.edu), where you'll find the latest news from the College as well as upcoming events, and academic, outreach, and research information. As always, I look forward to hearing your comments, and to seeing you on campus soon.

Best Regards,

Dr. Lance E. Perryman  
Dean, College of Veterinary  
Medicine and Biomedical Sciences

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# insight

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Editor/Writer: Carol Borchert  
 Photographers: John Eisele, Bill Cotton, Joe Mendoza  
 Production Coordinator: Colleen Rodriguez  
 Design: Cathay Zipp  
 Production: Lisa Schmitz

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Address: *Insight*  
 Office of the Dean  
 College of Veterinary Medicine and  
 Biomedical Sciences  
 Colorado State University  
 1601 Campus Delivery  
 Fort Collins, CO 80523-1601  
 E-mail: [carol.borchert@colostate.edu](mailto:carol.borchert@colostate.edu)  
 Website: [www.cvmb.colostate.edu](http://www.cvmb.colostate.edu)



## 2 Diagnostic Medicine Center

Fifteen years in the planning, a victim of on-again, off-again funding, it seemed to some that the Veterinary Diagnostic Laboratory might never get the building they so desperately needed.



## 6 Beating the odds with Miyuki

When Laurelyn Ashley and Frank Deck brought home their new English bulldog, Miyuki, they could not possibly imagine the life-and-death drama that lay ahead.



## 16 Sophie's story

During a routine appointment for our 3-month-old German shepherd puppy, the local veterinarian detected a faint heart murmur.

welcome

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Dedication ceremony of the new Diagnostic Medicine Center.

# Diagnostic Medicine Center open for business



Fifteen years in the planning, a victim of on-again, off-again funding, and facing economic pressures, it seemed to some that the faculty and staff members of the Veterinary Diagnostic Laboratory might never get the building they so desperately needed. But, in September, the campus community came together with public officials, students, the greater Fort Collins community, and veterinarians statewide to celebrate the dedication ceremony of the new Diagnostic Medicine Center. It was a long time coming, but well worth the wait.

“The Diagnostic Medicine Center is not just an incredible facility for Colorado State University, it is a valuable and necessary capital asset for the people of Colorado,” said Dr. Lance Perryman, Dean of the College of Veterinary Medicine and Biomedical Sciences. “This new facility is an important component of the University’s role in keeping animals around the state and nation healthy, as well as preserving public health by monitoring diseases that are transmissible between people and animals. Serving all 64 counties in Colorado, the DMC is a vital component of the diagnostic laboratory network statewide, as well as nationally.”

Colorado State University began construction on the DMC in December 2007 and completed the uniquely designed, publicly funded, \$42 million building in June 2009. The DMC is adjacent to the James L. Voss

Veterinary Teaching Hospital and houses the CSU Veterinary Diagnostic Laboratory, the VTH Clinical Pathology Laboratory, the Animal Population Health Institute, and the Colorado State University Extension veterinarian.

“The new facility enhances these programs and aids in their ability to assist the state and nation in protecting animal and public health by identifying infectious diseases, zoonotic diseases (transmissible between humans and animals), and other conditions affecting animal and human health and well-being,” said Dr. Barbara Powers, Director of the Veterinary Diagnostic Laboratory. “It also serves as a cutting-edge training ground for veterinary students at one of the nation’s top-ranked Professional Veterinary Medical programs.”

The building encloses 100,300 total gross square feet, including the equipment penthouse, in a unique open design around a central atrium with an abundance of natural lighting, terrazzo floors, and art glass walls. A total of 88,000 square feet is dedicated to three stories of modern laboratory and office space, designed to handle the half-million diagnostic tests done annually, along with research and teaching missions. An extensive conventional necropsy area includes 1,200 square feet of Biosafety Level 2 necropsy space. The facility also has an additional 2,000 square feet of Biosafety Level 3 space.



Clinical pathologists at work in the DMC.

“We are proud to partner with the state in providing these essential services to the people of Colorado.”

*Dr. Tony Frank  
President, Colorado  
State University*

diagnostic strategies for ill animals. It also monitors the health of animals across the state and region, helping to detect and prevent diseases in animals and diseases affecting public health. Veterinary students also learn about diagnostic tests through the laboratory. The laboratory processes about 500,000 diagnostic tests, including necropsies, each year and is one of seven labs in the nation selected by the U.S. Department of Agriculture to test for bovine spongiform encephalopathy.

It also is a core laboratory of the National Animal Health Laboratory Network.

The Clinical Pathology Laboratory provides services such as blood, fluid, and urine analysis and cytology to identify diseases and illnesses in animals that are

brought to the Veterinary Teaching Hospital or to veterinarians in the region. The lab also educates veterinary students and residents.

The Animal Population Health Institute encourages collaboration and information and expertise exchange in veterinary epidemiology among scientists at Colorado State, collaborating institutions, and government agencies throughout the world. The institute focuses on multidisciplinary research to improve animal population health, to prevent and control infectious and other important animal diseases, and to contribute to national and international animal disease policies by providing a better understanding of disease epidemiology and pathogenesis.

The University’s Extension veterinarian provides services and education to the state’s animal owners in an effort to protect the health of animals and the economic viability of the state’s animal-driven economy.

“The Diagnostic Medicine Center at Colorado State couldn’t have been built without the strong support of our state leaders who recognized the value of a facility such as this for monitoring, detecting, and preventing diseases that can have a widespread impact on our state’s economy,” said Colorado State President Tony Frank, noting that the project was completely funded through state funds. “We are proud to partner with the state in providing these essential services to the people of Colorado.”

Lynne Shanahan loads a centrifuge.



# Architecture integrates art with science



David Griggs

When laboratory technicians at the Diagnostic Medicine Center examine microbes growing in petri dishes, they see clues to illness. When David Griggs looks at these same petri dishes, he sees art. Now, taken to a grand scale, the colors, shapes, and textures found in unassuming discs of agar have converged to create the artistic backdrop for the DMC.

“One of the more artful techniques used in DMC lab work involves analyzing samples by spreading organic material in petri dishes,” said Griggs, the Denver artist commissioned to design the artwork for the Diagnostic Medicine Center. “This is called ‘streaking plates’ and it results in the growth of bacteria or viruses, sometimes in exotic and beautiful formations.”

Griggs’ association with Colorado State University started when he was selected to create the artwork that would be integrated into the DMC’s architectural design. Art projects in public buildings became law in 1977 when the Colorado General assembly passed the Art in Public Places Act, requiring allocation of 1 percent of capital construction funds for new or renovated state buildings for the acquisition of works of art for the project site. These art acquisitions form the state art collection.

Griggs began his creative process by visiting the Veterinary Diagnostic Laboratory at Colorado State University to gain a better understanding of the work undertaken there. He was captivated immediately by the preparation of samples, swipe patterns in petri dishes, and how these patterns and colors taken to a larger scale become almost celestial in nature. The decision had been made early on to integrate artwork into the building’s structure, in part to extend the budget and art dollar, and Griggs began to interpret his ideas into the mediums of floors, glass, and trellises.

“One of the design considerations for Art in Public Places is to make the art relevant to people working in the facility,” said Griggs. “Here, that relevance is expressed in five main art areas: the atrium terrazzo floor, the interior ‘egg’ glass curtain wall, the exterior link glass, the atrium trellis planters, and the exterior hardscape paving pattern.”

Griggs designed the building’s terrazzo floor first, building a colorful collage of abstract, overlapping petri dishes, with details down to the numbers used to label individual dishes. The overscaling of these images changes the dimensions of the design, suggesting celestial bodies and astronomical phenomena. While vastly different in proportion, Griggs noted, these natural elements share similar patterns of growth. Looking at the floor from the building’s second or third level brings the concept of the design to full realization.

Bacterial growth and laboratory testing mediums were further expanded in the glass that forms one of the walls of the stacked conference rooms located on the eastern side of the building’s atrium. The glasswork continues into the corridor that connects the Diagnostic Medicine Center to the James L. Voss Veterinary Teaching Hospital. The final interior art element is a two-story high structural trellis that replicates in metal upward swipes that form the patterns in growing mediums. Finally, the building’s exterior paving pattern reflects the patterns found within.

“This was an amazing project to work on, with so much support from everyone on the building’s design committee,” said Griggs. “As an artist, watching the transformation take place from design concept to installed artwork is incredibly gratifying.”



Laurelyn Ashley and Frank Deck with their English bulldog Miyuki. Also pictured are Dr Vicki Campbell and Dr. Ryan Bragg.

## Beating the odds with Miyuki

When Laurelyn Ashley and Frank Deck brought home their new English bulldog, Miyuki, they could not possibly imagine the life-and-death drama that lay ahead. Miyuki, whose name means “Beautiful Snow,” was their second bulldog and they looked forward to breeding her with their male dog, Tank. Her rare coloring and sweet disposition held promise for exceptional puppies. Little did they know that, in less than three weeks, 4-month old Miyuki would be fighting for her life.

What started as a simple case of bordatella (or kennel cough) had exploded into primary bacterial pneumonia, a severe form of pneumonia, and Miyuki was given little chance of survival.

“English bulldogs are cute and have great personalities, but they aren’t built to breathe,” said Dr. Ryan Bragg, a first-year Critical Care Resident in the Department of Clinical Sciences and one of the veterinarians who took care of Miyuki. “They have narrow nostrils, a narrow trachea, a long soft palate and a tendency toward everted laryngeal sacculles, further clogging their already narrow airway. When they get a respiratory infection it can go from bad to terrible pretty quickly.”

In February, Ashley and Deck first sought care for Miyuki in Boulder but, due to the severity of her case and need for intense respiratory treatment, including oxygen, she was referred to the CSU Veterinary

Teaching Hospital where the Critical Care Unit could provide her the best shot at life.

“Miyuki came in vomiting and with severe respiratory issues,” said Dr. Vicki Campbell, an Assistant Professor in the Department of Clinical Sciences and part of Miyuki’s veterinary team. “She had an extended neck and elevated temperature, and was in severe distress. We moved her to the isolation ward and over the next 12 hours she continued to worsen. She was just in such severe distress and really struggling to breathe. We had her in the oxygen cage and on strong antibiotics, but her body was about ready to give up. At that point, we knew we had to intervene to stop her suffering.”

Intervention meant euthanasia or putting Miyuki on life support. The team met with Miyuki’s distraught owners and prepared them for the worst. The team detailed the road that lay ahead should Miyuki go on life support, including the financial and emotional commitment required, and gave realistic expectations regarding the outcome.

“I told Frank there was at most a 10 percent chance Miyuki would make it, and really thought he and Laurelyn would decide for euthanasia – they had only had Miyuki for about three weeks – but their bond was already incredibly strong,” said Dr. Bragg. “Frank looked at me and said, ‘10 percent? I’d go to Vegas on those odds.’”

Only a small percentage of veterinary patients ever go on life support, and it is



usually as part of end-of-life care for severe disease processes. Life support is often the last resort and only 20 percent to 30 percent of animals that go on the ventilator ever come off. Ventilators are used most often to give owners a little bit more time with their critically ill pet, and to be able to say goodbye while the animal is still alive, but not suffering. Miyuki, being young and having no other health problems, had a fighting chance and her veterinary team wanted to be sure she got the best ammunition they had.

Miyuki was heavily sedated and placed on a ventilator inserted through her trachea, which relieved her of the incredibly difficult work of breathing. In healthy dogs, noted Dr. Campbell, about 1 percent to 2 percent of basal energy is required to breathe. If an animal is in respiratory distress, that energy requirement goes up to 30 percent and is simply unsustainable in the long term. Miyuki also needed a special trachea tube with an inner sleeve that could be changed to remove mucus and pus being expelled from the lungs to prevent choking. Once on the ventilator, Miyuki received one-on-one, 24-hour nursing care. During her stay at the VTH, more than

25 people were involved with her care. Her care providers monitored her IV nutrition, kept her sedated, administered antibiotics, kept her tubes untangled and in place, and provided supportive care. Other veterinarians from the hospital were brought in to consult. The first seven days were a roller coaster ride for the nurses, doctors, and owners, said Dr. Bragg, not knowing from one moment to the next whether or not Miyuki would make it.

If putting Miyuki on the ventilator was difficult, getting her to breathe again on her own was even more challenging. After six days, the veterinary team began to wean her off life support, but Miyuki was not able to breathe on her own. She was placed back on the ventilator, and the team tried again the next day, this time with success, as they took the next 72 hours to let Miyuki's lungs begin to work on their own, reducing oxygen levels in her oxygen cage. She was more lightly sedated and her oxygen levels were closely monitored.

"Three days off the ventilator, she began to eat on her own and was getting stronger and stronger," said Dr. Bragg. "You could see her personality come out and she was acting like a puppy again, trying to chew on all the medical equipment. We still had to anesthetize her three or four times a day to clear her airway of secretions, but she was also strong enough to cough which was a good sign."

After 17 days in the hospital, including seven days on the ventilator, and \$13,500 in veterinary medical expenses, Miyuki was finally ready to go home. Ashley and Deck, both used to dealing with the respiratory issues of bulldogs, continued her palliative care by administering medications, giving her steam "showers" several times a day, and doing percussion taps on her chest to loosen up mucus in her lungs. It's likely that Miyuki may need to be on medication the rest of her life, and will always be more susceptible to respiratory infections – she had a less severe bout and had to return to the hospital for several days in April – but Ashley and Deck are just happy to have her alive and at home.

"When we brought her home, I couldn't wipe the smile off my face," said Ashley, who recently became engaged to Deck. "For us, this was an emotional investment and we simply had to give Miyuki her chance at life."

# University Distinguished Professor

**Dr. C. Wayne McIlwraith,** a Professor in the Department of Clinical Sciences and Director of the Orthopaedic Research Center in the College of Veterinary Medicine and Biomedical Sciences, has been named a University Distinguished Professor, the highest academic honor bestowed upon faculty members at Colorado State University. Dr. McIlwraith's history of accomplishment as a researcher, clinician, and educator, and his international reputation as an equine orthopaedic surgeon are reflected in this prestigious award.

Originally from New Zealand, Dr. McIlwraith's early ambition was to be a country veterinarian, reflecting his experiences with practitioners visiting his aunt's high country sheep station. He studied at the University of Otago in Dunedin, New Zealand, where his interest in alpine climbing also was born. He then attended veterinary school at Massey University, graduating with distinction. He settled into a mixed practice in New Zealand, where he spent two years treating large and small animals before leaving to lead a climbing expedition in the Andes. After some locums in veterinary practices in South Wales and London, Dr. McIlwraith set off to climb in Europe for three months, before taking the next step in his veterinary journey.

Wanting to pursue a career in equine surgery, he applied for an internship at the University of Guelph in Ontario, Canada. He followed his internship with a residency and doctorate program at Purdue University where his research in arthritis in the horse coincided with advancements in arthroscopic diagnostics and surgery.

"I had read about arthroscopy in diagnostic medicine and thought it would be a cool way to monitor inflammation in the joint," said Dr. McIlwraith. "I joined about 100 MDs in a course to learn how to arthroscope the human knee for diagnostics, and then started to use the technology back at Purdue in horses."

In 1979, Dr. McIlwraith joined Colorado State University where he brought his expertise in diagnostic arthroscopy, then began to realize the greater potential of using the technology to do minimally invasive surgery. The orthopaedic team began to grow and they were encouraged to expand their research programs, as well as clinical work in the hospital setting, nationally and internationally. In 1994, Dr. McIlwraith took over as Director of the Equine Science Program, and in 2001 became full-time director of the Orthopaedic Research Center.

"In the last 15 years, we have seen huge strides forward in the effective treatment of joint disease in horses," said Dr. McIlwraith. "It has been especially rewarding because we've also trained residents and graduate students and they are continuing [continued on Page 13]"





## The Campaign for Colorado State University

Colorado State University has launched its first-ever comprehensive campaign in the 139-year history of the University. The Campaign for Colorado State University seeks to complete a \$500 million fundraising effort in the next three years. The campaign focuses on scholarships, endowed chairs and professorships, college initiatives, improved learning facilities, and programs to advance teaching, research, and outreach. The campaign will build a strong cornerstone of private support for Colorado State – an important part of a sustainable financial foundation.

The Campaign for Colorado State University has already surpassed the halfway mark with approximately \$290 million toward the \$500 million goal over the past four years during the campaign's quiet phase. University officials announced the public launch of the campaign at CSU's premier Denver alumni event, the Green and Gold Gala, held in August 2009, at Invesco Field at Mile High Stadium. The

campaign is scheduled to end in 2012. Goals for the Universitywide-campaign are threefold:

- Academic Excellence – Increase funding for scholarships and fellowships, including need- and merit-based scholarships, in addition to graduate scholarships, fellowships, endowed chairs, professorships, and enhanced learning opportunities such as Study Abroad, Honors program, and experiential learning programs.
- Research and Outreach Programs to Solve Universal Challenges – Increase funding for library and technology advancement, learning outside the classroom, and economic development, outreach, and research.
- New and Renovated Facilities for a 21st-Century University – Increase funding for world-class research facilities and laboratories, classrooms that expand and improve the learning experiences for all students, and athletics facilities that offer student-athletes improved opportunities to excel on and off the field or court.

As part of the overall campaign, the goal for the College of Veterinary Medicine and Biomedical Sciences is to raise \$100 million of the University's \$500 million goal. To date, the College has achieved more than 92 percent of its goal.

"During the quiet phase of the campaign, the College benefited from the generosity of its donors, both large and small, who have continued to support our programs despite economically challenging times," said Dr. Lance Perryman, Dean of the College of Veterinary Medicine and Biomedical Sciences. "During the next three years, we will focus on meeting the remainder of our \$100 million goal. With continued support from our donors, I have no doubt that we will succeed."

Within the College of Veterinary Medicine and Biomedical Sciences, the Campaign for Colorado State University will:

- Enable CVMBS to attract and retain highly qualified faculty members who help heal animals and humans, who teach and inspire entire generations of students, and whose research expands the boundaries of knowledge.
- Fund new construction and renovation so that CVMBS facilities will be better able to support the important work done within them.
- Expand endowed scholarships to strengthen the College's ability to attract the best students and create the next generation

of veterinary and biomedical professionals.

- Provide additional support for College faculty members to continue to successfully compete for research grants and conduct clinical research that improves the lives of humans and animals today and in the future.

"The campaign will build a strong cornerstone of private support for Colorado State – part of a sustainable financial foundation that will serve our future alumni for generations to come," said Dr. Tony Frank, President of Colorado State University.

"With this campaign, we're asking all those who believe in CSU's mission to help build a stable, sustainable future for Colorado's state university. Together, we can ensure that our children and grandchildren have the same access to the finest education in the world that public education offered us."

To make a gift, use the attached envelope. For more information about the Campaign for Colorado State University visit [www.campaign.colostate.edu](http://www.campaign.colostate.edu).

*"With this campaign, we're asking all those who believe in CSU's mission to help build a stable, sustainable future for Colorado's state university."*



## Dr. Ian Orme

In the early 1980s, Dr. Ian Orme was hard at work at the Trudeau Institute in Saranac Lake, New York, N.Y., investigating intracellular bacteria including *Mycobacterium tuberculosis*. Not vogue by the standards of the time, and not considered a real health threat anymore in the United States (though worldwide this was not the case), tuberculosis was getting ready to re-emerge on the national health stage.

Dr. Orme found himself in the right place, at the right time, and studying the right organism when tuberculosis rates began to rise in the mid-1980s, in concert with the as-yet-unidentified human immunodeficiency virus. The increase in infection rates was coupled with the appearance of multidrug-resistant forms of tuberculosis. The disease once considered conquerable was back with a vengeance and would shape the course of Dr. Orme's career for years to come.

Adopted by a working-class couple in England, Dr. Orme's father was a bricklayer and his mother worked at a grocery store. His father died when he was 12 and times were not easy. After graduating from high school, he worked at a soda factory and then got a job at the Children's Hospital in London where he trained as an entry-level laboratory

technician. However, his main ambition was to become a professional soccer player.

"I flunked out at that, and needed a better plan so I started to go to night school to get a technical degree," said Dr. Orme. "The head of the department where I worked was a world-class immunologist, a fledgling science at the time, and he would patiently answer my questions and show me things in the laboratory that I was curious about. He encouraged me to continue my education and I began attending the University of London in 1974."

Because of his night schooling and laboratory work, Dr. Orme had a leg up on other students and graduated with a First Class Honors Degree in physiology. One of his professors recommended him for a prestigious scholarship at the Burroughs Wellcome pharmaceutical company, where he completed his doctorate degree in immunology. Dr. Orme decided to move to the United States to pursue his scientific endeavors, obtaining a post-doctoral position at the Trudeau Institute, where he began to write a series of papers on the host immune response to *M. tuberculosis*. When he accepted a position as an assistant professor in 1986 at Colorado State University, research programs in tuberculosis were on the upswing.

Dr. Orme partnered with Dr. Patrick Brennan to create the Mycobacteria Research Laboratories in the Department of Microbiology, Immunology and Pathology. Dr. Brennan was interested in the bacteria itself while Dr. Orme was focused on host response, resulting in a highly successful partnership. In 1992, the laboratory received a tuberculosis vaccines material contract followed by a TB drug screening contract in 1993. Both contracts are still active. During his 23 years at Colorado State University, he has received more than \$80 million in extramural funding, from the NIH and, more recently, from the Gates Foundation.

"We continue to try to define the host response, but also have come up with a couple of interesting vaccine candidates as well as new drugs with the potential to greatly improve the outcomes of TB treatment protocols," said Dr. Orme. "We have taken the existing models and really pushed forward to improve our understanding of how the TB bacterium functions in the lung. We are expanding our studies with a guinea pig TB model, which is similar to human TB, and proving important in TB drug and vaccine testing."

Dr. Orme said that though the battle against TB has been long and arduous, he has hope that a post-exposure vaccine will be developed and given along with a combination of potent new drugs to help in the fight against the increasing incidence of multidrug-resistant tuberculosis.

"We partner with institutions around the world in tuberculosis research, especially big epicenters like southern Africa," said Dr. Orme. "Even though rates of tuberculosis are on the decline again in the United States, the disease is on the increase in India and China where HIV rates of infection are increasing as well."

In addition to his extensive work in tuberculosis, with some 280 papers published in scientific journals, Dr. Orme has had more than 40 people come through his laboratory for training and graduate work. Approximately 50 percent of those individuals now serve as assistant professors or higher in peer academic institutions. He has been nominated as Best Teacher and was honored with a Scholarship Impact Award from Colorado State University in 2004. He was elected to Fellowship of the American Academy of Microbiology in 2002, and most recently received the University's highest honor, selected as University Distinguished Professor in 2009.

"I am most proud of the incredible individuals who have come through my laboratory," said Dr. Orme. "It is very gratifying to know that when I am gone, they will be here to carry on this important work. My research work has been fulfilling and productive, but it is the people who I have met and worked with through the years who have made this endeavor ultimately so rewarding."

## Dr. C. Wayne McIlwraith

[continued from page 9]

with their work, positively impacting the health of the horse even more. All the research we've done has been to address specific clinical problems in the horse, but it's also exciting that we have contributed to the improvement of human orthopedic medicine as well."

Dr. McIlwraith said he has never seen himself as a full-time researcher – his clinical practice is important to staying grounded in the issues owners and the horse industry are facing, from preventing catastrophic injuries to the use of potentially performance-enhancing drugs in racehorses. New research threads in gene therapy and stem cells, as well as computer modeling and blood tests that are predictive of fractures, mean the advances from the Orthopaedic Research Center are sure to continue.

Dr. McIlwraith noted that if not for private support of the Orthopaedic Research Center, much of the research, necessary facilities, and new faculty positions would not have been funded and the program could not have accomplished what it has, nor be as internationally renowned for its expertise.

"We continue to validate the best treatment and the best diagnostic techniques, with the health of the horse foremost in everything we do," said Dr. McIlwraith. "We keep setting new goals for ourselves, and are enthusiastic about the possibilities that lie ahead as new technologies and techniques develop to improve the equine quality of life."

Dr. McIlwraith has received numerous awards during his career at Colorado State. He holds the Barbara Cox Anthony University Endowed Chair; received the Scholarship Impact Award in 2007, one of Colorado State University's top annual honors for research accomplishments; received the Founder's Award for Career Achievement from the American College of Veterinary Surgeons in 2007; was inducted into the University of Kentucky Research Hall of Fame in 2005; received the John Hickman Award for Equine Orthopaedics from the British Equine Veterinary Association and Equine Veterinary Journal in 1997; and has received Honorary Doctorates from the University of Vienna, the University of Turin, Massey University, and Purdue University.



*Mycobacterium tuberculosis* culture





Children bring their puppies to a well-animal clinic in San Vicente, Nayarit, Mexico.

## Bringing vet care to diverse communities

Students graduating from veterinary schools across the United States are facing a changing demographic landscape as they prepare to enter practice. Language barriers, cultural disparities, and socioeconomic status all contribute to the challenges veterinarians confront in providing animal health care in diverse communities. The Professional Veterinary Medical Program in the College of Veterinary Medicine and Biomedical Sciences is addressing these challenges by providing students with classroom-based instruction, including “Spanish for Veterinarians,” and experiential learning opportunities at home and abroad.

“One of the questions we ask ourselves is how do we prepare our students to best meet the needs of all families, regardless of their race, ethnicity, income, or education,” said Dr. Regina Schoenfeld, Coordinator of Instructional Design and Assistant Professor in the Department of Clinical Sciences. “We first have to understand how the human-animal bond is different in different cultures, then help our students navigate through these cultural

paradigms through cultural awareness and language skills, and also give them opportunities to work in diverse settings to experience firsthand how geography, culture, and social norms affect attitudes toward animal care.”

According to the latest Census data from 2000, the Hispanic population in the United States was at 12.5 percent (35.3 million) of the total population. By 2050, that number is projected to increase to 24.5 percent (102.6 million) of the total U.S. population. Veterinarians, said Dr. Schoenfeld, need to understand how demographic shifts will affect their practices, and develop the tools necessary to meet both animal and public health needs of a changing population.

Dr. Schoenfeld, along with Dr. Lori Kogan, Coordinator of Outcomes Assessment and Associate Professor in the Department of Clinical Sciences, and Dr. Mary L. Wright, a private practitioner, have been conducting a multidisciplinary investigation of the human-animal bond in Hispanic culture both in the United States and Mexico, with funding

from Colorado State University and from the Banfield Charitable Trust. Through a series of clinics in Colorado, California, and diverse locations in Mexico in 2008 and 2009, pets obtained preventive care and owners were interviewed to determine the animal’s role in the family along with other data sets including medical, animal and human demographics, and background information.

Veterinary students involved in the clinics also gained practical experience working in novel settings (such as in the town square in Monteon, Mexico). Pets were given general exams, tested and treated for common parasites including *Ehrlichia* and *Anaplasma*, and examined for transmissible venereal tumors.

“When we look at veterinary medicine on a global basis, even if people don’t have much income they are still attached to their pets and want their pets to be healthy,” said Dr. Wright. “But there are different attitudes. In the villages where we held our clinics, people couldn’t imagine putting their dogs on a leash; they would consider that cruel. If they want their dogs to walk somewhere, they pick up the dog’s front legs and walk them on their hind legs. The dogs are amazingly patient with this practice.

“Far fewer animals are spayed or neutered, again for perceived implications on the animal’s happiness, but overall spaying is far more socially acceptable. Probably the greatest differences we see are in the roles of the animals in agricultural as compared to more urban communities.”

In the agricultural community of Monteon, animals are much more likely to be viewed as valuable working animals, herding cattle or guarding buildings, rather than family companions. In San Vicente, a blue-collar working community close to Puerto Vallarta, most pets are kept for their value as companions. The average lifespan for most of the dogs was 5 to 7 years, with the most likely causes of death being chronic infection and disease. Veterinarians practicing in these communities don’t likely see the problems associated with geriatric pets, including arthritis and dental disease. The values in San Vicente, said Dr. Schoenfeld, are closer to those individuals most likely to immigrate to the United States, while

views of the Monteon residents are more representative of indigenous Mexican culture.

“Especially in rural communities, we can do so much more through education and accessibility,” said Dr. Schoenfeld. “People are much more open to spaying female dogs when they understand the benefits. Young mothers want family pets to be free of parasites, not only for the animal’s health but for the health of their children. The educational piece is that animals need care and, when they get care, they thrive and do better.”

*(A paper with study results from the Human-Animal Bond in Hispanic Culture has been completed and submitted to the Journal of the American Veterinary Medical Association. Findings also were incorporated into the “Spanish for Veterinarians” curriculum in the Professional Veterinary Medical Program at Colorado State University.)*



Drs. Regina Schoenfeld, left, and Mary Wright help a child with his puppy at the San Vicente clinic.



## Sophie's story

By Sara Gruen (Author of the bestselling novel, *Water for Elephants*)

During a routine appointment for our 3-month-old German shepherd puppy, the local veterinarian detected a faint heart murmur. This was Sophie's third set of puppy shots and her fifth well-puppy visit, and no one had heard anything before. The vet called in a colleague to confirm, but neither was terribly concerned (Sophie's heart murmur was a one on a scale of six). Nonetheless, we scheduled an ultrasound for 10 days later to make sure everything was okay.

It wasn't. I had returned from a business trip the day before with full-blown flu, so my husband took Sophie in by himself. When he came home, I heard just one set of footsteps. I called out, "Where's the puppy?" just as he came around the corner in tears, carrying a heavily sedated Sophie.

In just 10 days, her murmur had progressed to a five. The ultrasound showed that her tricuspid valve was nonfunctioning and that the right side of her heart was four times the size of the left. Our vet told us that her condition was fatal. She might survive a few more weeks or maybe even a couple of months, but she would not see her first birthday.

It was a prognosis I could not accept. Sophie became a family member the moment I took her into my arms as a tiny puppy and it was



inconceivable that we would just wait for her to die. The only thing standing between Sophie and a perfectly normal life was one floppy valve. I began a frantic search for answers that led me to the CSU Veterinary Teaching Hospital, and, specifically, cardiac surgeon Christopher Orton, a pioneer of valve replacement surgery in dogs.

Sophie deteriorated very quickly, going into heart failure well before her planned surgery. We all scrambled: Dr. Orton assembled his team, and I traveled from North Carolina to Fort Collins with a puppy who appeared perfectly normal but whose chest contained a ticking time bomb. On April 7, Sophie underwent open heart surgery to replace her faulty tricuspid valve with a porcine bioprosthesis.

The change was astonishing. Within days Sophie's heart began to reshape itself, and less than a week after her surgery she was able to come stay with me at a hotel, with once daily visits to the hospital. Less than three weeks later, we were on our way home.

Sophie is now a healthy, happy, active 10-month-old puppy (in the words of her cardiologist in North Carolina, she's "a life-force on a leash"). We are immensely grateful to the CSU Veterinary Teaching Hospital, and all the wonderful people who showed her such love and compassion, and who literally gave Sophie a second chance at life.

This particular happy ending could have not happened anywhere else.

# Improving cardiac health

Scientists have long known that the monoamine neurotransmitter serotonin has multiple roles in the body, including helping to regulate appetite, mood, sleep, muscle contractions, and cognitive functions. Now, a researcher at the CSU Veterinary Teaching Hospital, has made a provocative connection between serotonin and mitral valve disease in dogs, giving rise to possible innovative ways to treat or prevent the disease.

Dr. Chris Orton, a Professor in the Department of Clinical Sciences and Director of the hospital's Cardiology Service, has been investigating the role of serotonin in heart valve disease. Studies have shown that drugs that enhance serotonin production in humans – such as appetite suppressants, migraine medications, and antidepressants – also can cause drug-induced heart valve disease. It turns out that naturally occurring heart valve disease, known as degenerative myxomatous heart valve disease, is virtually identical in dogs and humans. Dr. Orton's group has discovered that cells in diseased heart valves of both dogs and humans produce serotonin locally, and this may be driving the disease process.

"Serotonin is made in the brain and in cells in the gut. We previously thought those were the only places it was made before it is circulated in the blood," said Dr. Orton. "But we found the local creation of serotonin in diseased heart valves. We think that drug-induced and naturally occurring heart valve disease share the same mechanism for creating the disease – the production of serotonin. The valve is making serotonin, which causes its own disease. Serotonin is directly linked to pathologic changes in the valve which cause the malfunction of the mitral valve."

Serotonin is made in the gut by an enzyme called TPH1. Serotonin then goes into the bloodstream where it is picked up by platelets which are involved in blood clotting. Dr. Orton's group has shown that TPH1 is present in high levels in abnormal mitral valves in both dogs and humans.

"Like all diseases, mitral valve disease is mediated by cells," Dr. Orton said. "If we can understand the mechanism in cells that triggers the disease, we can slow, treat, or prevent the disease process in new ways."

Dr. Orton's group is working to discover what triggers the enzyme in the valve that makes serotonin and he would like to launch a clinical trial on dogs to look at the impact of a drug that inhibits the enzyme that produces serotonin in the heart. Mitral valve disease impacts one of two valves on the left side of the heart. The valve becomes deformed and begins to leak.

The Cardiology Service, which is widely known for its open-heart surgery successes, is focusing research and clinical efforts on medical cardiology where thousands of dogs stand to benefit from treatment advances. Of dogs that develop heart disease, 40 percent develop mitral valve disease, and the disease is the eventual cause of about 70 percent of all heart failures in dogs. Dr. Orton heads up Project CARE, which focuses on researching the causes of and development of new treatments for mitral valve disease in dogs. The project is supported through private funding. To learn more, visit [www.csuvets.colostate.edu/heartcenter/research/mvd/index.shtml](http://www.csuvets.colostate.edu/heartcenter/research/mvd/index.shtml).



Dr. Chris Orton



## Focusing on global health



Dr. Bill Hanneman

Approaching its first anniversary, the Center for Environmental Medicine, based in the Department of Environmental and Radiological Health Sciences, with missions in research, teaching, and global outreach,

continues to build its programs and attract international interest for partnerships.

“The Center focuses on research that seeks to understand the complexity of certain systems and the impact they have on human and animal health,” said Dr. William Hanneman, Director of the Center for Environmental Medicine and an Associate Professor in the Department of Environmental and Radiological Health Sciences. “Networks and complex

systems have been the subject of a great deal of recent research in multiple disciplines including business, physics, and engineering.

“We study environmental toxicology and infectious disease at the network or systems level. Contamination of global food and water supplies with pesticides, heavy metals, pharmaceutical agents, agriculture waste, and pathogenic bacteria are all examples of these complex systems.”

The Center was formally announced during Colorado Governor Bill Ritter’s trade mission to Asia in November 2008, when the University signed rare research and education partnership agreements with Japan’s National Institute of Radiological Sciences, Japan’s equivalent of the National Institutes of Health, and Gifu University’s School of Medicine. It was through Dr. Hanneman’s long-term research and connections in

Japan that major steps were taken toward a successful signing of memoranda of understanding with NIRS and Gifu.

While global in mission, the Center began work immediately looking at environmental health issues related to commerce in Asia. The Center’s partnership with Japan allows it access to products manufactured there and in other countries with high exports. For example, along with the United States, Japan is one of China’s largest importers of goods, although many products from both countries are exported globally.

The Center anticipates early projects in Asia to include research and educational efforts into issues such as melamine in food products; heavy metal levels in water sources for agricultural products that are distributed globally including soybeans; and the quality and purity of vitamin C. About 90 percent of the world’s vitamin C is produced in China. Neither China nor Japan has the equivalent of the Environmental Protection Agency, and Center officials expect to play an international role in education and team building between countries.

“This partnership is unique in that the memoranda of understanding very specifically lay out cooperative activities that Japan and CSU have agreed upon to enhance research, education and public health in both countries,” said Dr. Hanneman. “We are engaging countries as consumers and producers of goods. We’re taking a hard look at the products we exchange and the environments in which they were created, and, which they create. We also are

establishing partnerships with agricultural producers to develop and standardize testing technology to increase efficiency and safety of food distribution and quality.”

In addition to global research and outreach, the Center provides national and international educational opportunities, particularly through its professional master’s program. By educating international students who then return to their home countries with an understanding of complex systems, Dr. Hanneman said partnerships between Colorado State University and institutions like NIRS can grow even stronger.

“Collaborative research projects, visiting scientist programs, and student exchanges will begin to build a bridge between cultures and enable us to better address the global problems that affect us all,” Dr. Hanneman said. “As the world grows smaller, problems are no longer isolated to certain geographical areas. Industrial pollutants, agricultural chemicals, lack of quality controls in processing and so many other systems know no borders – another country’s challenges rapidly become our challenges. It’s up to us to work together to find solutions.”

Additional faculty members affiliated with the Center for Environmental Medicine include Drs. Marie Legare, Ron Tjalkens, Richard Slayden, and Greg Dooley. Makoto Matsuura is on the staff as Special Assistant to the Director for Business and Student Relations. To learn more about the Center, visit its website at [www.cvmb.colostate.edu/cem/](http://www.cvmb.colostate.edu/cem/).





# Grant tracking cells, training scientists

Climate change, new energy resources, sustainable agriculture, and emerging infectious diseases are just some of the global challenges that require the best and brightest minds. The

“We’re all recognizing the fact that 21st-century science requires interdisciplinary collaboration. The CSU environment helps promote that collaboration.”

National Science Foundation, recognizing the importance of creating a strong national bank of students in science and engineering, is investing in programs designed to encourage students who wish to pursue these degrees. This summer, as part of those efforts, Colorado State University scientists received a \$2.7 million National Science Foundation grant to train graduate students on cutting-edge research while also preparing them to share their knowledge with K-12 teachers and industry.

The grant will help the United States stay competitive globally by boosting shrinking science and engineering enrollments and giving emerging scientists more tools to work with in their communities, the scientists said. In addition to research and education, the grant

enables scientists and students at Colorado State University to work with nanotechnology and data analysis companies, such as ADInstruments, Avago Technologies, and Leeds Precision Instruments. By including an industry component, students refine the research from a translational perspective.

On the scientific side of the grant, graduate students test new theories about how cells behave using advanced engineering methods in microelectronics and electrochemistry – research led by co-principal investigators Dr. Stuart Tobet, a Professor in the Department of Biomedical Sciences, College of Veterinary Medicine and Biomedical Sciences; and Dr. Thomas Chen, a Professor in the Department of Electrical and Computer Engineering, College of Engineering.

Dr. Michael A. De Miranda, a Professor in the College of Applied Human Sciences and another co-principal investigator of the grant, will work with students on the next step: Taking what they’ve learned and sharing it with K-12 teachers across the region. Participating are the Poudre, Thompson Valley, Greeley, and Weld RE-9 school districts in Northern Colorado.

The goal to infuse K-12 students with excitement for careers in science, technology, engineering, and mathematics, comes at an opportune time – when fewer students are

pursuing STEM careers. According to the Board of Engineering Education-National Research Council, the nation faces a declining number of engineering graduates – the annual graduation rate in engineering has decreased by roughly 20 percent in the last decade – while the number of engineering jobs is expected to grow 25 percent to 30 percent by the end of the century. Graduate students, like those visiting an anatomy class at Rocky Mountain High School in Fort Collins, Colo., take cutting-edge science into the classroom to instruct teachers, mentor students, and create partnerships between higher education and K-12 science programs.

“We’re all recognizing the fact that 21st-century science requires interdisciplinary collaboration,” Dr. Tobet said. “The CSU environment helps promote that collaboration.”

Dr. Tobet’s research focuses on how the brain develops – how cells define a growing and maturing brain. Dr. Chen’s research focuses on developing nanosystems in electrical engineering. Biosensors created by Dr. Chen and his students will help “track” molecular movements for Dr. Tobet who studies molecules that influence cell movements in the brain, ovaries, and pituitary glands. Using electrochemistry as a detection method, cells are spread over a layer of electrodes that are one to two microns wide – about one one-hundredths of the diameter of a human hair. These studies also are strongly supported by Dr. Chuck Henry, a Professor in the Department of Chemistry, College of Natural Sciences, who has significant expertise in the area of electrochemistry.

“There’s a region of the brain where we can look at particular chemical communications between cells,” Dr. Tobet said. “We don’t know what happens as those chemicals known as neurotransmitters are released – where do they go and how do they get used or absorbed? The team also will be able to utilize mathematical modeling to help understand the complexities of the biological process with the support of Dr. Vakhtrang Putkaradze from the Department of Mathematics, College of Natural Sciences.”

Ultimately, biosensors could help predict when patients will experience an epileptic attack or help pinpoint and understand chronic pain, Dr. Tobet said.

“The problems we’re trying to solve require a very broad range of expertise,” Dr. Chen said. “We can have a wide impact. The overall goal of the proposal is to train scientists in a new way.”



Dr. Stuart Tobet



An evening of fun and music as the Veterinary Teaching Hospital sponsors the Aug. 12, 2009, Lagoon Concert at Colorado State University.