

Veterinary

V I E W P O I N T S

Number 1, 1990

A Statutory College of the University of New York

Curriculum Reform

Faculty Votes for Structured-Choice



On a fall day, a physiology laboratory ends and the first-year students in the DVM degree program scatter to their next classes. A few students move on to a course in wildlife reproduction, others go to a laboratory on swine anatomy, and some students join a small group in advanced molecular biology. The variety of classes, the individual class size, and the fact that all the students are not taking the same class makes this an unusual veterinary curriculum. Called a structured-choice curriculum, this is a dramatic change from the traditional curriculum, which features a large core of classes taken in sequence by all students. In October 1989 the faculty of the College of Veterinary Medicine at Cornell voted by a majority of 90 percent to adopt a structured-choice curriculum for the DVM-degree program. It will be implemented over the next four years.

▲ *In a laboratory of the General Medicine and Surgery Course second-year students take on the roles of client and veterinarian. Their objective is to arrive at a correct diagnosis by examining the patient, obtaining a complete history from the client and ordering the appropriate diagnostic tests.*

The Challenge

The move toward a new curriculum began in June 1987, when faculty representatives participated in the Ninth Symposium on Veterinary Medical Education, at the University of California, Davis. The symposium was followed by a two-day college retreat in October entitled "Veterinary Education for the 21st Century at Cornell." The retreat was attended by over a hundred faculty members, who produced recommendations on the topics of teaching strategies and evaluation methods, species coverage and tracking, support for instruction, and the competing demands related to the teaching, research, and service commitments of the faculty.

In September 1988 Dean Robert Phemister appointed the eight-member Aca-

demical Planning Committee. He asked them to "give careful consideration to what is happening in the world outside this college that affects us; to examine our education programs critically in light of our strengths and weaknesses, our traditions, values and aspirations, our abilities, and our priorities; and to determine how we prepare our students in the closing years of this century." According to Dr. Cornelia Farnum, chairman of the committee and assistant professor of anatomy, "the challenge would be to introduce substantial flexibility into the curriculum in a nonchaotic manner, and in a way that does not replace our current rigid system with several equally rigid specialized tracks."

Six subpanels of the Academic Planning Committee were formed to focus on pre-professional studies, the basic biomedical sciences, the clinical sciences, post-graduate education, support of teaching, and social issues including the increasing diversity of the student body and the veterinary profession. Over forty faculty members served on these panels.

In addition to guidance from faculty, advice was solicited from members of the Executive Committee of the college's Alumni Association, the College Advisory Council, representatives of the New York State Veterinary Medical Society, and the State Board for Veterinary Medicine. "One of their principal concerns," said Dr. Donald Smith, a member of the Academic Planning Committee, "was that we preserve the fundamentals of a broad comparative education. They did not want the curriculum to become so

oriented toward particular targets—whether they be research, basic sciences, or clinical programs—that we lost sight of the entire picture.” The need for strong identification between students and faculty members was also emphasized. Time and again veterinarians said that the special relationship they developed with a few superb teachers had an enormous impact on their educational experience and subsequently their professional careers. They also cautioned against species tracking, in which veterinary students choose a target species or group of species (such as food animals) in the second or third year of their program and concentrated on that specialty to the exclusion of others. Said Smith, “Our faculty and advisors felt very strongly that we shouldn’t focus people too early in their careers.”

The Approach

With their October 1989 vote, the college’s faculty overwhelmingly endorsed the development of a structured-choice curriculum divided roughly evenly between “foundation courses” and “distribution requirements.”

The foundation courses are the first required courses of each discipline. Taken by all students in the same sequence, foundation courses stress the comparative veterinary aspects of the discipline and provide a firm general knowledge of the subject. As Farnum

explained, “Because foundation-level courses will constitute only 50 percent of the total time a student spends in each discipline, it’s a complete shift from what we do presently. A department can’t create a foundation course just by whittling down what they currently teach. They have to critically ask themselves, ‘What is it that everyone needs to know, whether they become an equine practitioner, a specialist in zoo-animal medicine, or a basic science researcher.’ Foundation courses will be presented within the conceptual framework of a multispecies, comparative approach, which is what makes veterinary medicine fundamentally different from all other biomedical professions.”

Distribution requirements will account for the other 50 percent of the credit hours needed for graduation and will be taken by students throughout all four years of the curriculum. Students will select courses to fulfill distribution requirements in each discipline or across disciplines. The principles covered in distribution courses are just as much “core” as those in foundation courses. The difference is that distribution courses may use the species or topic of greatest interest to the instructor or the students to illustrate principles.

Two philosophies underlay the distribution requirements. First, the student has responsibility for the direction of about 50 percent of his or her program. Second, the student is allowed to follow his or her interests. This is significantly different from the present core-elective curriculum, in which about 90 percent of the courses are “core” and the student chooses the other 10 percent from any of about fifty offerings covering all aspects of veterinary medicine. Explains Farnum, “In the new curriculum, distribution requirements will be chosen from groups defined by the faculty of each discipline. Therefore, structure is built into the choices a student can make, which ensures that all disciplines are both integrated into the curriculum and covered broadly. By structuring the choices students make, we can avoid a species-tracking curriculum. Students will not

be allowed to take, for example, only equine-related distribution courses. The faculty feel strongly that the broad-based comparative aspects of a student’s education are what make veterinary medicine unique.”

The fifty/fifty weighting of foundation and distribution courses eliminates a serious disadvantage of the current curriculum—the difficulty in introducing new courses. Said Farnum, “We have new fields that are emerging, and we can’t incorporate those effectively into our present curriculum because it is so tightly scheduled that to make a change, we have to make a trade-off. So to add a new field such as genetic engineering, we have to say, ‘OK, what are we going to cut.’ Our new approach automatically leaves half of the curriculum flexible at any given time. We can introduce a course as part of one of the distribution requirements.”

The Clinical Program

“the faculty of our college have a long history of truly caring about the quality of teaching”

Changes in the structure of the clinical program will also be made. In the present curriculum, students are in clinical rotations only in their fourth year. In the new curriculum, Foundation clinical rotations in both small and large animal primary care medicine will occur in year three and clinical distribution rotations will be provided for students in the fourth year. Though these clinical rotations will span both third and fourth years, the actual amount of time that a given student spends on clinical rotations will not increase because basic science and clinical science didactic distribution courses will be interspersed in clinical rotations during both years. Interdigitating clinical rotations with basic science courses in pharmacology, nutrition, immunology, genetics, epidemiology, and ethics presented in a new, more clinically ori-

ented format will make it easier for students to integrate their knowledge of basic sciences with their developing clinical experience.

New Teaching Strategies

Teaching methods will need to change with the new curriculum and there will be a movement away from a purely lecture format. “Fortunately,” said Farnum, “the faculty of our college have a long history of truly caring about the quality of teaching, and we are looking forward to experimenting with new teaching approaches.” Teaching strategies will be adopted that stress active learning, application of principles and problem-solving. The approach will better accommodate differing learning styles, degrees of preparation, and career goals of individual students.

The faculty has recommended that a teaching-support structure analogous to the college’s research-support structure be formed. In response, a curriculum committee has been formed to help develop and implement the curriculum. As the newly appointed associate dean for veterinary education, Dr. Donald Smith will soon name a director of educational development. This new director will assist faculty members who want to develop such teaching supports as computer-aided instruction and alternative testing methods. The faculty have been assured that in the transition period there will be adequate support and relief time for them to be able to rethink courses over the next four years.

The Forecast

Dean Phemister, who gave the curriculum reform movement its impetus by supplying both the motivation and the means to change, is enthusiastic about the changes in Cornell’s veterinary curriculum. He said, “My thesis has been that when one combines the best students entering any college of veterinary medicine with a strong faculty in the richest of educational settings, something special should happen. I believe that the proposals developed by the Academic Planning Committee and

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Veterinary VIEWPOINTS

Veterinary Viewpoints is published three times a year for friends and alumni of the College of Veterinary Medicine, a Statutory College of the State of New York. Correspondence may be addressed to: Karen Redmond, Editor, Veterinary Viewpoints, College of Veterinary Medicine, Cornell University, Ithaca, New York 14853.

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Associate Dean for Veterinary Education Appointed

▲ Dr. Donald Smith

Dr. Donald F. Smith has been appointed associate dean for veterinary education at the College of Veterinary Medicine, Cornell University. Prior to his appointment, Smith was chairman of the college's Department of Clinical Sciences. As associate dean, he will oversee the implementation of a new structured-choice curriculum for the DVM degree program. Said Smith, "The advances made in veterinary educational programs are going to be very important in the next decade and the momentum the college is developing comes at the right time." He also noted the need for balance among the college's missions of research, teaching, and service. "While there has been a tremendous increase in the emphasis on research over the last ten to fifteen years, there has not been movement of a similar magnitude in education. I think there is a need for appropriately balancing teaching with the other missions of the college. That's one of the things I hope we can do here."

One of Smith's first actions as the new associate dean will be to conclude the

search for a director of educational development, who will assist the faculty in developing new teaching strategies. The director will report to Smith. Divisions of the college that support its educational mission—the Flower Veterinary Library, the Registrar's Office, and Biomedical Communications—will also

I think there is a need for balancing teaching with the other missions of the college.

be gathered under the umbrella of the Office of Veterinary Education.

Smith explained, "I see a number of facets to my role as associate dean. One will be to work very closely with the newly established Curriculum Committee to provide encouragement, direc-

tion, and administrative support. I also see myself encouraging our faculty to look at the broad face of veterinary medicine, and not just their particular field, as they begin to develop courses for the new curriculum."

Dean Robert Phemister, in announcing Smith's appointment, praised his outstanding record as a teacher, surgeon, research scientist, and academic administrator. Dr. Smith earned a Doctor of Veterinary Medicine degree from the Ontario Veterinary College, University of Guelph, graduating with distinction in 1974. He completed an internship and a residency in large animal surgery at the University of Pennsylvania. Dr. Smith is a member of the American College of Veterinary Surgeons and has received the Norden Award for Excellence in Teaching. As chair of the Department of Clinical Sciences for the last three years and a member of the Academic Planning Committee, he also helped in developing plans for the new curriculum. ■

1990 Continuing Education Schedule

The following College of Veterinary Medicine Continuing Education Programs are offered in 1990:

March 7-8
Food Animal Diagnostics—What Your Diagnostic Laboratory Can Do For You
Veterinary Diagnostic Laboratory

April 24-26
Bovine Production Medicine Workshop
Veterinary Diagnostic Laboratory

June 6-7
2nd Annual Practice Management Short Course - Mr. Dave Gallagher, Department of Clinical Sciences

June 7-9
Cornell Alumni Reunions (Reunion Weekend). In association with the Alumni Association of the Veterinary College

June 17-20
Symposium on Canine Diseases
James A. Baker Institute for Animal Health

June 25-28
International Pain Symposium
Animal Pain and Its Control
In association with Cornell Medical College

August 6-10
Feline Specialist Seminar
Cornell Feline Health Center and the American Association of Feline Practitioners

August 9-11
Collection, Evaluation and Preservation of Equine Semen
Department of Clinical Sciences

August 18-19
Necropsy Diagnosis for Practitioners
Department of Pathology

August 20-24
Olafson Pathology Short Course
Department of Pathology

October 4
7th Annual Equine Practitioner's Workshop and Reception. Department of Clinical Sciences, Veterinary Diagnostic Laboratory and the Equine Practice Committee of the New York State Veterinary Medical Society

October 16-19
Mastitis and Quality Milk Workshop
Veterinary Diagnostic Laboratory,
Department of Clinical Science and the Department of Animal Science (NYSCALS)

November 9-10
9th Biennial Farriers Conference and Contest. In association with the Central New York Farriers Association

December 10-11
Cornell Swine School
Veterinary Diagnostic Laboratory and the Department of Animal Science (NYSCALS)

January 8-10, 1991
83rd Annual Conference for Veterinarians

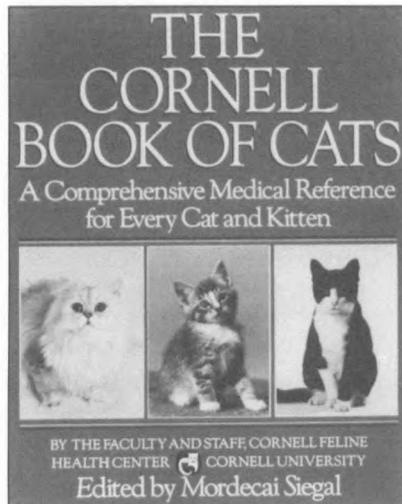
Attention Cornell DVM Alumni

What's new?
Alumni News would like to know. New practice? New address?
New house? Spouse?
New career?
Let us (and your classmates) know.

Send your alumni news and notes to:
Dr. Ellis Leonard, Editor
Class notes/Alumni News
c/o Office of Public Affairs
G-2 VRT

New Cornell Book of Cats Covers Feline Health From Head to Tail

By Roger Segelken
Cornell News Service



The cat that rubs the side of its head on a person is demonstrating possession as well as affection. Called "bunting," the rubbing deposits glandular secretions from the cat's face that other cats may sense by smell. Cats that twine themselves around the leg of a chair or a person are also transferring odors.

How to resuscitate a cat, how to take its pulse, how to brush its teeth and how to cope with the death of a beloved feline are among the tips in the ultimate handbook of cat care from Cornell University experts.

"The Cornell Book of Cats: A Comprehensive Medical Reference for Every Cat and Kitten" is published by Villard Books of New York. The 608-page book contains detailed cat care information—including nutrition, reproduction, medical disorders, first aid, behavior and misbehavior—as related by more than two dozen veterinarians and scientists who work with the popular pets every day at the Cornell Feline Health Center in the College of Veterinary Medicine at Cornell.

"For years, as we published our scientific bulletins for veterinarians and our newsletters and brochures for cat owners, we recognized the need for a reference book that would draw together the latest information from specialists on the care of a very complex animals," said Dr. Fred W. Scott, a virologist who is the director of the Cornell Feline Health

Center. "We think we have written a reference book that is equally useful to the owners of one or two pet cats, to cat breeders and to cat-health workers,"

Mordecai Siegal, the author and magazine columnist who edited the volume, cautioned that the book "cannot replace professional veterinary care. We've tried to give conscientious cat owners the medical information they need to determine whether their pet should see the veterinarian, and to care for the cat after it has."

A portion of the royalties from the sale of the \$24.95 book will benefit feline research and extension activities at the College.

"The Cornell Book of Cats" contains chapters on acquiring a cat, pediatrics, misbehavior, diseases of dietary origin, sex and reproduction, anatomy and skin disorders, geriatrics, disease and surgery, and medical emergencies. There also is a list of diseases that humans can catch from cats, a glossary of terms, and a list of recommended vaccinations and diagnostic tests. ■

Breeders' Crown Ball Supports Equine Scholarship

The Breeders' Crown Ball, a major social event in the sport of harness racing, drew over four-hundred guests to a black-tie affair at the Boca Raton Hotel and Club on October 2. The ball began a week of festivities leading up to one of the biggest nights of racing at Pompano Harness Track, a night with eight races and a total of \$3 million in purses. In 1989, the ball also honored the memory of one of the sport's leading driver-trainers, Billy Haughton, with proceeds from the event going to the Billy Haughton Memorial Scholarship. The scholarship at Cornell's College of Veterinary Medicine provides aid for veterinary students who wish to become equine practitioners. In total, \$30,500 was raised at the Breeders' Crown Ball for the Haughton Scholarship fund.

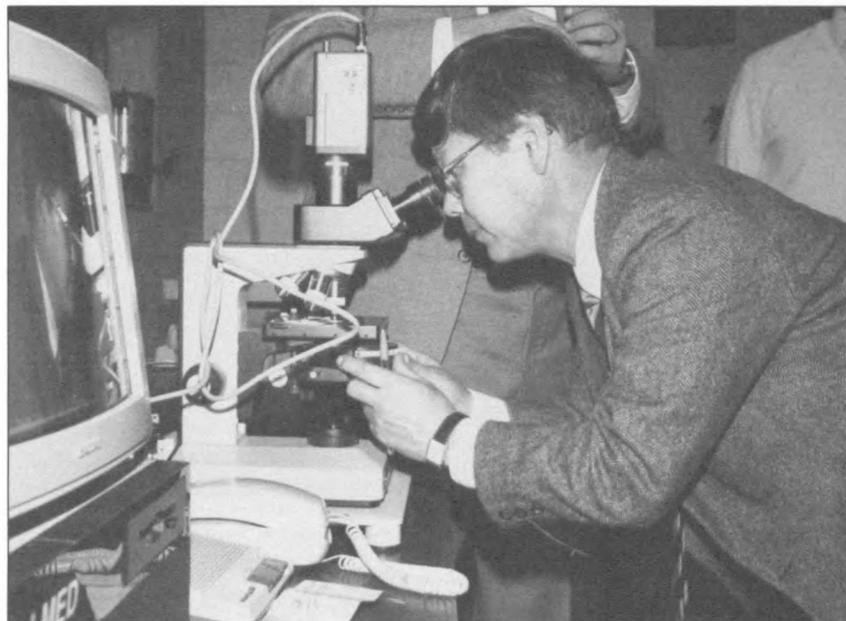
Billy Haughton died in 1986 from injuries suffered in a racing accident. He was one of the directors of the United States Trotting Association and a member of harness racing's Hall of Fame. In his career, he won 4,910 races and \$40.2 million in purses, which placed him fourth among harness drivers in both categories. Billy Haughton had long been a friend of the College of Veterinary Medicine and his volunteer activities included his tenure on the College's Equine Advisory Council, and his role as advisor on the college's equine programs. At the time of his death, friends and relatives who knew of his ties to the college and his concern for the equine industry established the Billy Haughton Memorial Scholarship Fund.

Gifts to launch the Billy Haughton Memorial Scholarship Fund were contributed by Haughton's family and a number of his friends, with major support from Mrs. Marjorie Strong Wehle. Appropriately, the scholarship commemorates Haughton's love of horses and his desire to encourage young people in their pursuit of careers in equine medicine.

The college has a long history of serving the equine industry in New York State. Research and clinical programs are aimed at improving equine health. Also, many of the state's equine practitioners are graduates of the Doctor of Veterinary Medicine degree program at Cornell. The Billy Haughton Memorial Scholar-

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Satellite Laboratory Opens in Geneseo



▲ *Dr. Sang Shin, director of the microbiology laboratory in the Diagnostic Laboratory, demonstrates the telecommunications system that will link the new Geneseo branch with the Cornell laboratory.*

■ Breeder's Crown (continued)

ship Fund will help make a veterinary degree affordable for many future students who wish to become equine veterinarians. Students eligible for the scholarship must be enrolled in the Doctor of Veterinary Medicine degree program at the College of Veterinary Medicine at Cornell, demonstrate financial need, and have a strong interest in a career in equine medicine.

Gifts to the Billy Haughton Memorial Scholarship are welcome; for more information on this and other scholarships at the College of Veterinary Medicine, contact Elizabeth Fontana at 607/253-3744. ■

Veterinarians in western New York State have a new direct line to the college's Diagnostic Laboratory. A satellite laboratory has been opened in Geneseo, New York, that will perform the primary bacteriology for dairy herds visited by veterinarians from the Quality Milk Promotion Service. There are plans to tie the satellite's facilities into the Diagnostic Laboratory's 3-Disease program that certifies herds free from Johne's Disease, leukosis, and blue-tongue. Eventually the satellite will provide general diagnostic services for all species, not just dairy cattle. The Geneseo laboratory will also serve as a temporary headquarters for extension veterinarians.

For tests that the satellite is unequipped to handle, a courier service will supply direct daily contact with the main laboratory at Cornell. Thanks to this extended service, specimens from veterinary practitioners in the area will arrive at the Cornell laboratory the same day they are delivered to the Geneseo satellite. The offices are already connected by computer with the billing records and files of the Mastitis Control Program, and there are plans to update that system further. According to Dr. Donald Lein, director of the Diagnostic Laboratory, the next step in linking the two laboratories will be the addition of a telecommunications system that will be able to

send and receive camera images of slides under the microscopes at each laboratory along with voice communications. Says Lein, "The system will put people at the Geneseo laboratory in direct contact with Dr. Sang Shin's bacteriology laboratory. We'll be able to look at a microscopic image of an organism and its staining or at a specimen or culture plate and talk to the people at the Geneseo laboratory, discuss what they should be doing with it, and determine what kind of testing should be done. It's a way to bring the slide or the specimen to the expert without sending the expert out into the field, or shipping the specimen to the main laboratory. It's an educational tool, too, because we will be able to share with the Geneseo laboratory anything different or unique that Dr. Shin or his colleagues are looking at. In essence, Dr. Shin and his people can help train people at the Geneseo laboratory."

According to Dr. Lein, the idea of a Geneseo laboratory started almost three years ago with a look at the western New York State area. Said Lein, "Our idea was to find a centralized point with good roads near the dairy area. But we also wanted to use the opportunity to try a new concept in laboratories—one that would be open to general diagnostic use for all species and provide a courier services from that area back to the diag-

nostic lab and the central mastitis lab. Geneseo was selected because it is central to the animal industry in the area, it's within a good highway complex, and it is just outside the snowbelt, which was a big consideration."

The Geneseo satellite is a modular unit under the direction of the Quality Milk Promotion Service at Cornell University. Dr. Hal Schulte is the field veterinarian in charge. The 24- by 50-foot building contains a bacteriology laboratory, a kitchen for making media and sterilizing, a storage area, a reception area, and two offices—one of which is used as a conference room. Said Lein, "This is low budget but it gives us a very adequate facility. The money we save on renting facilities we can invest in personnel, equipment and services."

The accessibility of the Geneseo laboratory will initially help the dairy industry in the area, but diagnostic testing for specimens from companion animals as well as horses is a possibility in the future. As Lein observed, "The availability of bacteriological testing at the facility would be especially valuable for equine breeders who may need the results of endometrial cultures as soon as possible."

Said Lein, "Having a laboratory in the field just makes sense. It extends our service into an area where we should be, and it responds to local needs in a more direct way. And with the telecommunications and the computer communications that can be set up, we should have a good situation in which people at the Geneseo laboratory can be involved with the local management of health problems. Opening testing to all species also makes sense, because you're using a facility for more than one species or disease complex." ■

Centennial Celebration Begins

By Julie Lawton

Executive Director, New York State Veterinary Medical Society



▲ The faculty members receiving Centennial Commendations: Donald H. Lein, DVM '57; Leland E. Carmichael, DVM (son Daniel '90 accepted); Charles E. Short, DVM; Robert B. Hillman, DVM '55; (Dr. Kenneth J. Rotondo, DVM '75, presenting) Robert W. Kirk, DVM '46; Alexander deLahunta, DVM '58; James H. Gillespie, VMD; Harold Hintz, Ph.D.; John M. King, DVM (on sabbatic).

As the New York State Veterinary Medical Society celebrates its 100th anniversary in 1990, it will present gold Centennial Medallions to individuals and groups in recognition of significant contributions in one of more of the following areas: veterinary medicine; human-animal bond; food and work animal production; animal welfare.

The inaugural presentation of gold Centennial Medallions during 1990 was made in January at the College's Annual Conference for Veterinarians. Awarded

a gold Centennial Medallion were: Robert B. McClelland, DVM '34, for his outstanding contributions of time and talent to the New York State Veterinary Medical Society and veterinary profession; Mr. Henry J. Muller, who transformed the role of the New York State Veterinary Medical Society executive director with his innovative ideas, enthusiasm and vision; Harold E. Nadler, DVM '39, who as director of the New York State Division of Animal Industry, was instrumental in the fight to control and eradicate diseases in food animals;

and Mr. Bernard W. Potter, who was influential in the development of the 20-year old New York State Veterinary Medical Society exhibit of live surgeries at the New York State Fair and who is a member of the College's Advisory Council.

Nine faculty members of the College of Veterinary Medicine at Cornell were presented Centennial Commendations "in recognition of outstanding professional contributions to the practice of veterinary medicine." Honored were: Leland E. Carmichael, DVM; Alexander deLahunta, DVM '58; James H. Gillespie, VMD; Robert B. Hillman, DVM '55; Harold Hintz, Ph.D.; John M. King, DVM; Robert W. Kirk, DVM '46; Donald H. Lein, DVM '57; and Charles E. Short, DVM.

New York State Veterinary Medical Society Centennial Medallions will be awarded throughout 1990 at specially planned regional and public events. The society extends its appreciation to Cornell's College of Veterinary Medicine for its cooperation in allowing the first of our 1990 presentations to occur during Cornell Conference. ■

Equine Research Receives \$432,500 from Racing Industry

Through the Harry M. Zweig Memorial Fund, the racing industry will support equine research at Cornell's College of Veterinary Medicine in 1990. The Zweig Fund receives two percent of all monies accruing to the Agriculture and New York State Horse Breeding

Development Fund and the New York State Thoroughbred Breeding and Development Fund from the state's tracks and off-track betting. In 1990 sixteen projects have been selected to receive a total of \$432,500.

Immunogenetic studies of the horse will continue under the direction of Dr. Douglas Antczak. In the area of equine infectious diseases, Dr. Judith Appleton will analyze the equine immune response to the influenza virus and Dr. John Timoney will work on the synthesis of an artificial peptide vaccine against strangles that could be used as an intranasal spray.

In reproductive studies, Dr. Barry Ball continues his investigations of equine embryonic loss; Dr. Joanne Fortune is

studying the regulation of ovarian follicular development and function in mares; and Dr. Robert Hillman and Dr. Claire Card are examining the control of the transition from pregnancy to labor in the mare and delivery of the foal.

In other studies related to the health and performance of the horse, Dr. John Cummings and Dr. Susan Hackett are investigating "roaring"; Dr. John Hermanson is conducting an in-depth anatomical analysis of the shoulder and arm muscles and soft tissues of the muscle morphology & motor control of the normal equine forelimb; Dr. George Lust is developing a diagnostic test for osteoarthritis in horses to aid diagnosis and improve prognosis; Dr. Alan Nixon is looking at the use of artificial cartilage to repair damaged cartilage in horses.

Dr. Katherine Houpt will determine the effect furosemide may have on salt intake in horses; Dr. Dwight Bowman has undertaken to isolate and identify the cause of Equine Protozoal Myeloencephalitis; Dr. Harold Hintz and Dr. Laurie Lawrence are studying the effect of carbohydrate feeding prior to exercise on metabolism and athlete performance; Dr. David Slauson and Dr. P. Bochsler will seek to define the mechanisms of neutrophil-mediated microvascular injury and its modulation by endotoxin and anti-inflammatory drugs.

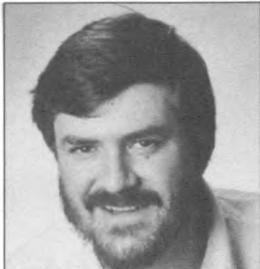
In addition Zweig fund monies will help support a symposium on the control of animal pain under the direction of Dr. Charles Short, and funds will provide for the addition of a research associate in equine sports medicine. ■

Parasite Research

By Metta Winter



Dr. Judith Appleton



Dr. Stephen Barr



Dr. Robin Bell



Dr. Dwight Bowman

Of the six infectious diseases that affect well over half the world's human population, five are caused by parasites.¹ The pathogen that causes sixty-five percent of all AIDS patients in the United States to die is an obscure opportunistic parasite, *Pneumocystis carinii*. And it is parasites that are the principal cause of death and illness in young animals—both wild and domestic—around the globe.

Yet little is known about how human beings and animals defend themselves against these powerful invaders, according to Dr. Robin G. Bell, associate professor of immunology. Bell, along with three of his colleagues in Cornell's College of Veterinary Medicine—Drs. Judith A. Appleton, Dwight D. Bowman, and Stephen C. Barr—are working to learn more.

The scope of the four researchers' efforts ranges from fundamental inquiries into how host animals respond to the presence of parasitic infestations, to the final stages of testing anthelmintic drugs specific to hookworms, roundworms, and tapeworms.

The thrust of Robin Bell's work is to understand the basics of how human beings and animals react when infected with gastrointestinal parasites.

To determine how the host controls the numbers of parasites, rejects them, or kills them, Bell uses the nematode *Trichinella spiralis* as a tool for examining intestinal immune responses. "Although the gut is the initial point of contact for a very high proportion of all infectious agents, in terms of its protective mechanisms it is one of the least understood elements of the mammalian body," Bell said.

One reason for that, he noted, is that the intestinal immune system's function is largely distinct from the immune system in the rest of the body. Another is its complexity. Bell cited three separate but interrelated host protective factors, whose functions are still largely unknown.

"The first, and probably most important factor, is the presence of unusual populations of lymphocytes, some of which express a gamma delta T-cell surface receptor while others express the RGL marker," he said. "The second is an IGA antibody molecule that functions primarily in the gut and related organs, and the third is a separate set of mast cells that are clearly related in some way to intestinal immune responses."

Bell's primary focus is on the cellular aspects of this diverse immune system. Still in its early stages, his work could eventually lead to the development of vaccines that are effective against parasites that reside in the gut.

Dr. Judith Appleton, assistant professor of immunology, also uses *Trichinella spiralis* to examine a different aspect of the intestine's immune system, the role of antibody. Her work is in collaboration with that of Dr. Douglas D. McGregor, professor of immunology and the director of the James A. Baker Institute for Animal Health.

"An initial discovery about *T. spiralis* was that an infected mother rat would protect her offspring from these parasites by way of her milk," said Appleton. "In my early work I identified the protective factor as an antibody. Now my interest is in determining how that antibody affects the parasite, what it does that makes the parasite unable to stay in the gut."

In addition to conducting an on-going investigation of the role that mucus plays in the expulsion of the *T. spiralis* larvae, Appleton has also found that the antibody affects the parasite in the epithelial cells of the intestine, where it lives. "There is something about the interaction between the parasite and the epithelial cell—something the parasite needs to do to stay in the cell—that the antibody interferes with," said Appleton. "This is what we're investigating now."

Not only does Appleton's work, like Bell's, point the way to a greater general understanding of how human and animal immune systems operate, but her study

of maternal immunity is of particular significance to veterinary medicine. Domestic animals are born without any of their own or their mother's protective antibodies. Maternal immunity is critical to the young's survival, because they can only become protected by acquiring the antibody by suckling.

Dr. Dwight Bowman, assistant professor of parasitology, is conducting several research projects on the biology, immunology, and prevention of parasitic infections. One project involves *in vitro* studies of the way that the nematode *Toxocara canis* (the canine roundworm) reacts to various chemical and physical stimuli. "When people eat the larva of *T. canis* it migrates to the liver, brain, and sometime the eye where its presence is often misdiagnosed as a tumor and the eye is removed," Bowman said. "I'm trying to figure out the cues that tell the nematode where to go after it enters the human body."

Another of Bowman's projects uses the parasite *Toxoplasma gondii* as a means of learning about the immune response of cats. Of foremost concern to him is how the cat deals with an infection of *T. gondii*. But Bowman is also studying the effects of *T. gondii* in cats infected with immunodeficiency virus—work that he hopes could contribute to the understanding of mixed infection in AIDS patients. "Some people believe that AIDS alone doesn't cause any disease, that the person's immune system must be assaulted by something else first," Bowman said. "One such possibility is toxoplasmosis." *T. gondii* is a parasite that infects many persons, but usually there is no disease associated with the infection; the disease can, however, be quite serious in persons or animals suffering from some form of immunosuppression.

Work is also under way on the development of an immunodiagnostic test for *Parelaphostrongylus tenuis* in llamas. *P. tenuis* is a worm that usually lives in the brain of white-tailed deer without causing disease, but causes paralysis and death when it infects llamas. Also, for the last two years, he has tested the

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1. Of the six major infectious diseases designated by the World Health Organization as major disease entities, schistosomiasis, filariasis, malaria, trypanosomiasis, and leishmaniasis are caused by parasites; leprosy is caused by a bacteria.

Parasites

(continued from page 7)

efficacy and safety of anthelmintic drugs for cats and dogs specific to a variety of parasites including hookworms, roundworms, and tapeworms. This has led to a study of the immune response of the canine host to hookworm infections and Bowman hopes to develop nonchemotherapeutic methods of hookworm control and prevention.

The work of Dr. Stephen Barr, assistant professor of medicine, aims to better understand a single parasite, *Trypanosoma cruzi*, the cause of Chagas disease. His ultimate goal is to determine the cause of the chronic cardiomyopathy that eventually kills people who have the disease. Nearly twenty million people, primarily from Central and South America, have contracted Chagas disease. At present there is neither a cure nor a vaccine.

Barr may be the only researcher outside of South America to have developed a model in dogs of this human disease. He has been able to do so because dogs

infected with *Trypanosoma cruzi* develop heart disease that is similar to the cardiomyopathy that occurs in human beings with Chagas disease.

"I am currently looking at several aspects of the pathophysiology of the heart disease, including the biochemistry of the heart's beta adrenergic receptors and calcium channels and the immune response to infection," said Barr.

Although much of the work done by the three researchers is still in the preliminary stages, their results will ultimately lead to the mitigation of suffering in both the human and animal worlds through the detection and prevention of parasite-caused diseases. ■

Curriculum Reform

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overwhelmingly approved by the faculty as a whole will help to ensure that our graduates are, indeed, special." The new associate dean for veterinary education is also optimistic. "It's going to be a curriculum that will take four to five years to implement. Some courses will be successful and others will not; it will require creativity and adventurism. I would especially view the Foundation courses as an opportunity for excellent teachers to stretch creatively and develop superb courses which will be prestigiously on par with major research programs at the College. There is a lot more opportunity for flexibility with the new curriculum and I will encourage faculty to take risks and be innovative."

Dean Phemister summed up the program this way: "This new approach to veterinary education has many advantages, but the proof will be in our graduates. The Cornell structured-choice curriculum will provide students with an excellent, broadly based education and

greatly enhanced opportunities to learn how to access information efficiently and reliably, to solve problems and critically interpret medical information, to learn concepts and principles more than to learn facts. Our graduates will be veterinarians who are able to change in response to future needs and opportunities, and who will be motivated and prepared to continue to learn throughout their careers." ■

Veterinary
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