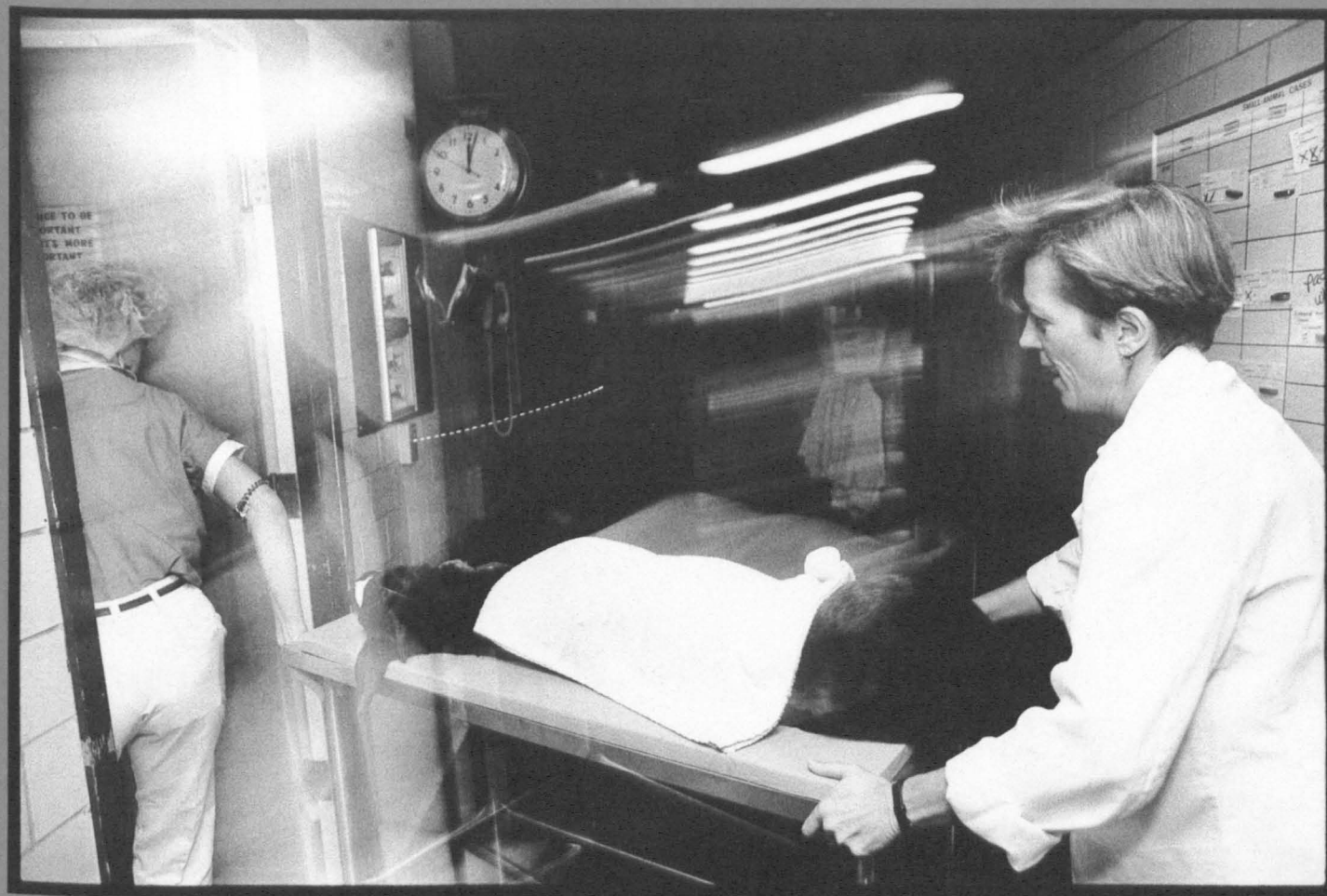


COLLEGE OF VETERINARY MEDICINE



Annual Report

1989-1990

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VETERINARY MEDICINE

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The College of Veterinary Medicine at
Cornell University in Ithaca, New York

The college's mission is to advance
animal and human health through
education, research, and public service.

This report is a summary of the activi-
ties during the 1989-90 year of the
students, faculty, and staff who worked
to accomplish that mission.



1989-1990

College of Veterinary Medicine

Cornell University



A statutory college of the
State University of New York

Cornell University, Ithaca,
New York

Ninety-third Annual Report

July 1, 1989-June 30, 1990

Legislative document
number 88

Office of the Dean

College of Veterinary Medicine
A statutory college of the State University
of New York at Cornell

September 4, 1990

Frank H. T. Rhodes
President
Cornell University

Dear President Rhodes:

Pursuant to the requirements of the laws of New York State, I present herewith a report on the activities and the accomplishments of the faculty and staff of the College of Veterinary Medicine for the year ending June 30, 1990, this being the ninety-third annual report of this college.

Respectfully submitted,



Robert D. Phemister
Dean

Office of the President

Cornell University
Ithaca, New York


October 1, 1990

The Board of Trustees of Cornell University, the Chancellor and Board of Trustees of the State University of New York, and the Governor of the state of New York

Ladies and Gentlemen:

In accordance with the requirements of Section 5711 of Article 115 of the State Education Law, I am pleased to submit on behalf of Cornell University the report of the College of Veterinary Medicine for the year beginning July 1, 1989, and ending June 30, 1990.

Sincerely yours,



Frank H. T. Rhodes
President

Office of the Chancellor

State University of New York
Albany, New York

October 15, 1990

The Board of Regents, the Governor, and the Legislature of the state of New York

Ladies and Gentlemen:

Pursuant to the law, the 1989-1990 Annual Report of the College of Veterinary Medicine at Cornell University is herewith submitted.

Very respectfully yours,



D. Bruce Johnstone
Chancellor

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We felt a new vitality in the college during 1989–90 as major new projects became better defined in shape and substance.

Capping off two years of intensive study and planning, the faculty voted overwhelmingly in October to adopt fundamental changes in the curriculum for the doctor of veterinary medicine degree. These changes are designed to take full advantage of the outstanding abilities of our students by giving them greater opportunities to work closely with the faculty in the most stimulating educational setting we can create. The new academic program will introduce considerable flexibility into what has been a lock-step curriculum, while avoiding what we see as the limitations of narrow tracking along species or other lines. Our objective is to provide the best possible veterinary education for our students, one that will give them a solid foundation in the principles and comparative aspects of veterinary medicine, experience in the clinical aspects of veterinary medicine, and greater opportunities to become confident, self-motivated, independent learners for the rest of their professional lives. The implementation of the new program, which will occur over a four-year period, will be closely supervised by a restructured curriculum committee and the new associate dean for veterinary education, Dr. Donald F. Smith. A complete explanation of the new curriculum is given later in this report.

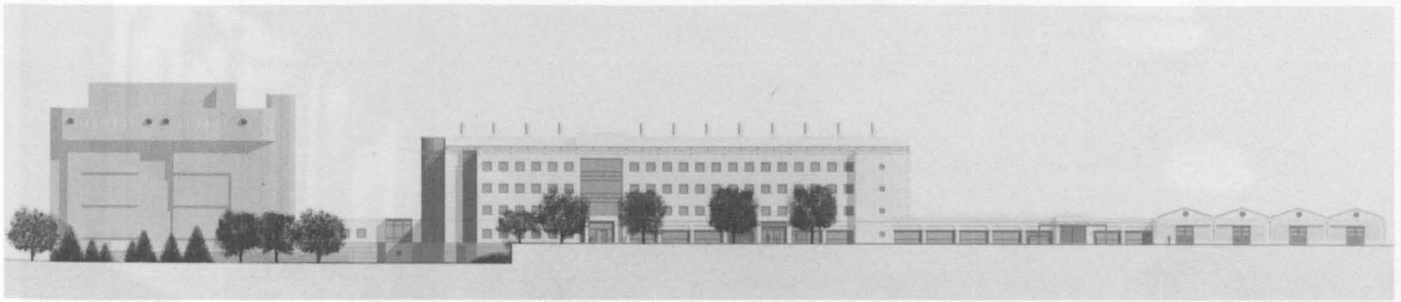
After nearly five years of planning, we are at the threshold of a major expansion of our facilities. These building plans go far toward addressing our current problems of crowding and obsolescence. With a magnificent commitment from the state, we broke ground in June for facilities that should satisfy the educational, research, and service needs of the college well into the next century. The buildings, as visualized by the architects and approved by the state, will provide nearly a 70 percent increase in total college space at a cost of \$82 million. We are adding a two-story primary teaching center and a hospital/research building with new small and large animal clinics and three floors of research and office space. Construction of the planned facilities is expected to proceed over the next four to five years.

In 1989, we officially opened the Equine Performance Testing Clinic. The clinic's Respiratory Function Testing Unit currently operates at full capacity and the Lameness and Gait Analysis Unit recently became operational. The Diagnostic Laboratory opened a satellite laboratory in Geneseo, New York, which will provide expanded services to veterinarians in western New York State and give them a direct line to the college's diagnostic resources.

Our students continue to feel the financial pressures caused in part by the decreased availability of government loans. Fortunately, we have been successful in expanding other forms of aid for students in need. Within the last year, the number of scholarships and grants administered by the college increased significantly. Through the



More than 300 alumni, friends, and faculty and staff members gathered for ground breaking ceremonies at the College of Veterinary Medicine. Assisting, left to right, were Dr. Susan Dougherty (with dog), Dr. Kathy Beck (with cat), Elwin Stevens of the State University Construction Fund (retired), President Frank H. T. Rhodes, Dean Robert Phemister, Mary Flynn (with Clydesdale), Dr. Bruce Calnek, Colleen Clemett (with Bassett Hound), Dr. Elizabeth Sanders (with cat), Karen O'Brien '91 (with goat), and Mark Meddleton '91 (with cow).



The architect's drawing of the planned facilities at Cornell's College of Veterinary Medicine shows, far left, the existing Veterinary Research Tower (VRT). The two-story Primary Teaching Center links the VRT with the college's main buildings and, center, the new Hospital/Research Building.

generosity of alumni and friends, fifteen new scholarships were created.

We continue to attract an increasing number of minority students to the veterinary profession. Twenty-one percent of the class of 1994 and 15 percent of the total student body are minorities. These figures have increased substantially in recent years, representing our commitment to achieving a student body that is more representative of the society we serve. The number of state-supported fellowships available to minorities has more than doubled, substantially aiding our recruitment and retention of minorities.

Aware of our obligation to meet the continuing education needs of veterinarians throughout the Northeast, we are expanding the college's continuing education programs under the direction of Dr. John E. Saidla. Included in continuing education efforts this past year were programs on food animal diagnostics, bovine production medicine, practice management, canine diseases, and rabies. A five-day feline seminar and workshop was attended by more than 180 veterinarians from twenty-six states and three foreign countries. In June, the college hosted an international symposium on animal

pain. The symposium, organized by Dr. Charles E. Short, former director of continuing education, was sponsored jointly with the Cornell Medical College.

An international outreach effort continues to enrich and enliven the college. Included in a long list of distinguished foreign visitors were two particularly notable appointments. Through Cornell's Program for Professors-at-Large, we hosted our first Andrew Dickson White Professor, Dr. Peter M. Biggs, C.B.E., F.R.C.V.S., F.R.S., from Cambridge, England. Professor Biggs recently retired as director of the Institute for Animal Health and is currently president of the Institute of Biology in Great Britain and chair of the scientific advisory board of the Animal Health Trust. In May, Dr. William A. Snowden visited the campus as the college's 1990 George C. Poppensiek Visiting Professor in International Veterinary Medicine. Dr. Snowden is the former chief of Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO), Australian Animal Health Laboratory.

Closer to home, several faculty members were singled out for praise by statewide organizations. The New York State Veterinary Medical Society, celebrating its 100th anniversary, honored nine faculty members for "outstanding professional contributions to the practice of veterinary medicine." The New York State Humane Association awarded Dr. David Robertshaw, professor and chair of the Department of Physiology, a certificate of appreciation in recognition of the outstanding service he has performed on behalf of animals. Dr. Robertshaw has been responsible

for coordinating the course in veterinary ethics, initiated in 1988 for students in the doctor of veterinary medicine program.

During the year we experienced with sadness the deaths of two distinguished faculty members: Dr. A. Gordon Danks '33 and Dr. Emmett N. Bergman. Dr. Danks, professor emeritus of veterinary surgery, died July 1, 1989, at the age of eighty-two. Just as he remembered so well his many students and colleagues from more than thirty years as an active faculty member, so will he be well remembered by all of us who knew him. Dr. Bergman, a professor of veterinary physiology at the college since 1961, died October 11, 1989, after a short illness. He was sixty years old. Dr. Bergman was actively involved in teaching in the professional veterinary curriculum, and his research on the intermediary metabolism of ruminants gained him national and international recognition. Memorial funds have been established in the name of each of these distinguished colleagues.

The following pages of this annual report describe some of the individuals and ongoing work in our academic departments and major service units and conclude with statistical information about the college. I hope you enjoy this look at the college during 1989-90 and share our enthusiasm as we look to the future.

Robert D. Phemister
Dean



Curriculum Reform

Faculty Votes for Structured-Choice Curriculum

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 D.V.M. degree program. A dramatic change from the traditional program, the new curriculum will be implemented over the next four years.

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 in October by a two-day college retreat entitled "Veterinary Education for the Twenty-first Century at Cornell." The retreat was attended by more than 100 faculty members, who produced recommendations on the following topics: teaching strategies and evaluation methods; species coverage and tracking; support for instruction; and the competing demands of the teaching, research, and service commitments of the faculty.

In September 1988, Dean Robert Phemister appointed the eight-member Academic 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 can prepare our students in the closing years of this century."

Six subpanels of the Academic Planning Committee were formed to focus on preprofessional studies, basic biomedical sciences, clinical sciences, postgraduate education, teaching

support, and social issues, including the increasing diversity of the student body and the veterinary profession. More than forty faculty members served on these panels.

In addition, advice was solicited from members of the Executive Committee of the college's Alumni Association and the College Advisory Council and from representatives of the New York State Veterinary Medical Society and the State Board for Veterinary Medicine. One of their principal concerns was that the fundamentals of a broad comparative education be preserved. They also cautioned against species tracking, in which veterinary students choose in the second or third year of their program a target species or group of species (such as food animals) and concentrate on that specialty to the exclusion of others.

The Approach

Foundation courses are the first required courses of each discipline in the veterinary college. 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. In the new curriculum, foundation courses will constitute only 50 percent of the total time a student spends in each discipline. They will be presented within the conceptual framework of a multispecies, comparative approach.

Distribution requirements will account for the other 50 percent of 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 fundamental 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 the principles.

Two philosophies underlie the distribution requirements. First, the students are responsible for the direction of about 50 percent of their individual programs. Second, the students are allowed to follow their individual interests. This approach is significantly different from that of the present core-elective curriculum, in which about 90 percent of the courses are "core" and the students choose the other 10 percent from about fifty course offerings covering all aspects of veterinary medicine.

"Structure is built into the choices a student can make, which ensures that all disciplines are both integrated into the curriculum and covered broadly," explains Dr. Cornelia Farnum, chair of the Academic Planning Committee. "By structuring the choices, we can avoid a species tracking curriculum."

The fifty-fifty weighting of foundation and distribution courses eliminates a serious disadvantage of the current curriculum—the difficulty in introducing new courses. The new approach leaves half of the curriculum flexible at any given time. A new course can be introduced as part of one of the distribution requirements.

In the present curriculum, students are in clinical rotations only in their fourth year. In the new curriculum, foundation clinical rotations will occur in the third year and distribution clinical rotations will be provided for students in the fourth year. Basic courses in pharmacology, nutrition, immunology, genetics, epidemiology, and ethics will be interspersed with clinical rotations during both years. This format will make it easier for students to integrate their knowledge of the basic sciences with their developing clinical experience.

New Teaching Strategies

There will be a movement away from a pure lecture format in the new curriculum. Teaching strategies will stress active learning, the application of principles, and problem solving. The approach will better accommodate the different learning styles, degrees of preparation, and career goals of individual students.

A curriculum committee has been formed to help develop and implement the curriculum, and an associate dean for veterinary education, Dr. Donald Smith, has been appointed. A director of educational development will also be named. The new director will assist faculty members who want to develop teaching supports such as computer-aided instruction and alternative testing methods.

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. "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," he says. "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, and to learn concepts and principles more than facts. Our graduates will be veterinarians who are able to change in response to future needs and opportunities and who are motivated and prepared to continue to learn throughout their careers."

The ongoing work of individuals in our academic departments and major service units are described in the following pages. Although the projects are diverse, their common denominator may be their potential to improve significantly animal and, in some instances, human health.

Dr. John Cummings

Anatomy

B.S. '58, D.V.M. '62, M.S. '63, Ph.D. '66,
Cornell University

Dr. John Cummings first began looking for animal models for human diseases during his doctoral training with Dr. Alexander deLahunta. "We wanted to find a project where the results would benefit both human and animal health," Dr. Cummings says. "We thought if we found diseases in animals that were spontaneous, not induced, we could study them as models for the treatment or prevention of human disease."

The area Dr. Cummings has chosen to investigate is comparative neurology. Why? "Diseases of the nervous system are the most devastating," he explains. "They also are often the most dehumanizing, and they have the worst prognosis in humans and animals."

In the last year, Dr. Cummings has had the opportunity to examine histologically and under an electron microscope samples from ten horses suffering from slowly evolving weakness and muscle wasting. The horses, all from different backgrounds and genetic pools, eventually became so debilitated they died or were euthanized. "Initially, it was thought to be some type of spinal root disease," Dr. Cummings says. "But later we focused on the spinal motor neurons when we noted the damage was largely in ventral or motor roots."

Drs. Cummings and deLahunta and a group of pathologists, which included Drs. Beth Valentine, Catherine George, Brian Summers, Barry Cooper, and Clive Huxtable, then reviewed ten cases with clinical histories of progressive weakness and marked weight loss. They were able to identify primary changes



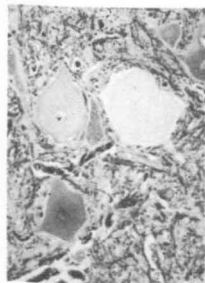
Animal models for human disease can help researchers learn more about the disease's cause, course, and possible treatments. "A number of papers have been published on animal models for ALS, but most of the models proposed don't precisely duplicate the disease," Dr. John Cummings says. "Most cases of ALS are what they call the sporadic variety, where there is no inherited pathogenesis. If M.D.'s look at our findings and say, 'Hey! This is very similar to what we see in humans with ALS,' then our work may be very worthwhile in providing clues to the cause of the human disease."

in the motor nerve cells in the spinal cord and the brain stem.

These changes, Dr. Cummings believes, are very similar to those found in amyotrophic lateral sclerosis, or ALS, the disease that killed Lou Gehrig. Their findings were published in the *Cornell Veterinarian* in October, and now Dr. Cummings is circulating the preliminary findings to medical doctors. "As far as I can tell from reading the literature on ALS, we're talking about very similar clinical and pathological descriptions," Dr. Cummings says.

Diseases that resemble ALS occur in animals, but they are all inherited conditions. Dr. Cummings' equine disease model is an acquired disorder, which is important because in humans the sporadic form of ALS is much more prevalent than the inherited form.

Drs. Cummings and deLahunta continue to watch for signs of motor neuron disease in equine cases presented to the college's teaching hospital. Dr. Hussni Mohammed is conducting epidemiological studies to see if environmental factors can be implicated in the incidence of the condition. In the meantime, Dr. Cummings is sharing his findings with medical institutions around the country and investigating this equine disease as a model for ALS.



Pale, swollen, ghost-like neurons undergoing degeneration in the spinal cord of an affected horse

Dr. Cornelia E. Farnum**Anatomy**

B.A. '64, Stanford University

D.V.M. '80, University of Minnesota

Ph.D. '85, University of Wisconsin

If you say a child is springing up like a weed, Dr. Cornelia Farnum knows exactly what you mean. She is looking at what causes rapid growth in long bones at the cellular level. Making the analogy of "springing up like a weed" more striking, recently published findings* show that the same cellular mechanisms for rapid growth may operate in the long bones of humans and in plants.

It has been assumed that the major controller for the rate of growth in bones is the rate of cellular proliferation in the cartilaginous growth plates. But in fact, bone growth may be more influenced by how cells maintain their normal cellular content and change their shape while growing larger in a process known as hypertrophy. "My research is showing that growth plates control growth not by changing the rates at which cells divide, but by controlling the extent of cellular hypertrophy," Dr. Farnum says. "The bigger the cartilage cells grow, the faster the bones are growing. The amount of hypertrophy is directly proportional to the rate of growth."

Another factor in bone growth is the matrix, which provides structural support for the cartilage cells in the growth plate. Increasing the amount of matrix surrounding the cells causes bone

growth. "If you look at what's known about how plants achieve rapid growth," Dr. Farnum explains, "you'll see they do it by the same swelling of cells within a matrix. The matrix directs their swelling, so that as the cells swell, they don't balloon out, but instead become tall and thin. In fact, this mechanism of matrix-directed cellular swelling might be identical in corn stalks and long bones."

Dr. Farnum is now looking at how different rates of growth occur in different growth plates. Typically, each end of the same long bone grows at different rates, and any interference with this controlled growth may result in angular limb deformities. "We think there are systemic controls over the overall rate of proliferation," Dr. Farnum explains, "and the proliferating cells might produce a local factor that controls the actual amount of hypertrophy." Studying this interaction between cellular proliferation and cellular hypertrophy may give Dr. Farnum important information about the maintenance of normal bone growth rates.

There are many more questions to answer about bone growth. Some growth plate disorders—osteochondrosis and several chondrodysplasias, for example—are characterized by abnormal cellular hypertrophy. It's known that in these conditions cells are not maintaining their proper shape as they hypertrophy, but the defect in the process hasn't been identified. For Dr. Farnum, a major key to understanding long bone growth and its abnormalities will lie in further study of the control of cellular hypertrophy.

*J. A. Buckwalter and R. D. Sjolund, 1989. Growth of cornstalks and long bones. *The Iowa Orthopaedic Journal* 9:25-31.



Dr. Cornelia Farnum entered veterinary medicine by a circuitous route, which included time after college as a high school teacher and three years in the Peace Corps in Tonga, where she taught and conducted a rodent control program. At the college, Dr. Farnum teaches anatomy to first-year veterinary students. "I consider teaching the main link I have with the veterinary profession," she says. "Through teaching you have the possibility of capturing someone's imagination and giving them the confidence to continue learning outside the classroom. We should take teaching very seriously, and we should have a curriculum that allows us to make this the most exciting, relevant education of a student's life."



ION REIS

Dr. Paul Bowser

Avian and Aquatic Animal Medicine
B.S. '70, Cornell University
M.S. '72, Iowa State University
Ph.D. '78, Auburn University

Fish in local lakes and rivers are more than good sport for fishermen. Dr. Paul Bowser is collecting walleyes, highly prized sport fish in New York State, from Oneida Lake and looking at a number of tumor conditions that occur. He has unique access to these fish, thanks to the cooperation of the New York State Department of Environmental Conservation's Fish Hatchery and the Cornell University Biological Field Station, both on Oneida Lake. His interest is in one tumor—the dermal sarcoma—which is actually a benign fibroma-type tumor. This tumor does not pose any serious threat to the health of the fish, other than making it look unsightly. Microbiologists at the college have determined the tumor is caused by a retrovirus, and researchers have been able to transmit the tumor in the laboratory.

The dermal sarcoma is of interest because it appears to have a seasonal occurrence. There is a high prevalence of the tumor in the spring, little evidence of the tumor in the summer, and again a high prevalence in the fall. "A change in temperature may be affecting the interaction between the fish, as a cold-blooded animal, and the virus, resulting in the development and the regression of the tumors," Dr. Bowser says. "One must also consider

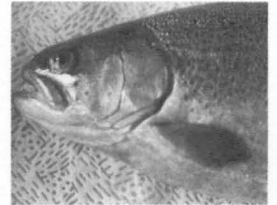
Veterinarians will be seeing more tropical fish cases in practice, according to Dr. Paul Bowser. "Someone with a fifty-gallon tank may have an investment of \$300 to \$500, and it's important to them to keep their fish alive," he says. "Veterinarians can do that if they have specific training in that area."

At the college, Dr. Bowser teaches courses on the diseases of both aquarium fish and fish maintained in intensive aquaculture production systems. "We try to give students a very firm foundation in the management aspects of an aquarium or aquaculture facility and in some of the requirements of the animals," he says. "Then we go into diseases and give the students a lot of practical experience working up cases."

the changing physiology of the fish with each season. We're interested in determining the mechanism of the seasonal development and regression of this tumor."

Dr. Bowser also directs the activities of the Fish Diagnostic Laboratory, a service laboratory within the Department of Avian and Aquatic Animal Medicine. This laboratory provides diagnostic assistance to commercial aquaculturists as well as to researchers using fish as their experimental animal. In addition to its service function, the laboratory provides access to teaching materials and serves as a window to the disease problems experienced by New York State's aquaculture community.

If he's not in the laboratory, Dr. Bowser is in the classroom. In addition to teaching courses in aquatic animal medicine at the college, Dr. Bowser, who is also associate director of the Aquavet Program at Woods Hole, teaches two courses in aquatic animal medicine during the summer, Aquavet I and II. This year, the emphasis in Aquavet II was on comparative pathology in fish and invertebrates. "The thrust of the course was to provide students with training in those animals that are becoming very important for biomedical researchers," Dr. Bowser explains. "I think scientists in the animal health sciences need to take an active role in evaluating the use of lower vertebrate and invertebrate animals in cancer research and as monitors for environmental toxicity."



Dr. Karel Schat

Avian and Aquatic Animal Medicine

B.S. '65, D.V.M. '70, University of Utrecht, The Netherlands

Ph.D. '78, Cornell University

Over the last ten years, Dr. Karel Schat's work has focused on the only cancer for which there is a vaccine—Marek's disease. "We are studying the factors involved in the development of tumors in chickens infected by the herpes virus that causes Marek's disease," Dr. Schat says. His work is directed toward understanding which parts of the virus genome cause the tumors and which genes are important for the immunity induced by vaccination.

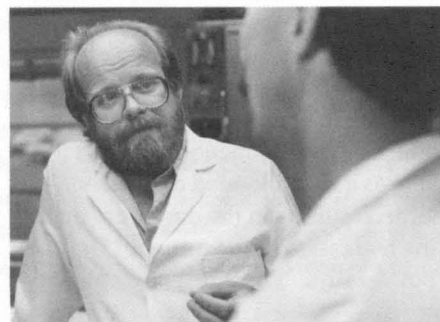
To answer these questions, Dr. Schat and his graduate students are developing an avian cell line in which they can examine the expression of the foreign genes they insert. Once developed, the cell line could be used to characterize the gene expression of any avian pathogen, including the Newcastle disease virus and the avian influenza virus, or to pinpoint the genes of interest for the cell-mediated immune response. The latter will be important as work is considered on recombinant vaccines.

Another area of Dr. Schat's research developed while he was working with rotaviruses—a major cause of mortality in children and a serious problem in any intensive bioindustry, but not the cause of disease in chickens. Dr. Schat

and his students used the rotavirus to test the hypothesis that it could become a pathogen in chickens when antibody production is suppressed. They began by exposing chickens that had no ability to produce antibodies or were immunosuppressed to rotavirus. They found that the birds did not become sick even though rotavirus-specific antibodies were absent in the intestinal tract and serum. Concluding that some other protective mechanism must be at work, they looked and found natural killer cells against viral infection in the intestine. Dr. Schat and his students have since become one of the few groups in the United States working on cell-mediated immunity in the intestinal tracts of birds.

According to Dr. Schat, "If we can understand how cell-mediated immunity works in the intestinal tract, perhaps we can develop techniques to increase this response. We can also look at classic breeding techniques and select for birds that have a better immune response." The benefits to the poultry industry would be substantial if birds could be bred, or induced to become, naturally resistant to intestinal diseases.

"The major attraction of working in a university is the opportunity to work with students," Dr. Karel Schat says. "Training graduate students is of major interest to me. I find it very rewarding to see young colleagues develop into scientists and to help them in this process. One of the major contributions we make as professors is that our students come out of our laboratories able to continue and build on research careers."

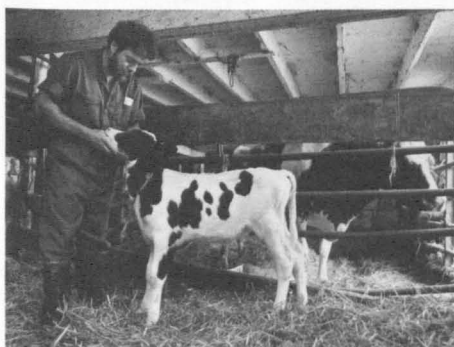


Dr. Charles Guard

Clinical Sciences

Ph.D. '75, Case Western Reserve University

D.V.M. '80, Cornell University



Dr. Charles Guard's family has run a dairy farm in Ohio since the 1800s, but neither farming nor veterinary medicine was his first career choice. He acquired a degree in engineering and a Ph.D. degree in physiology and spent three years in the Antarctic investigating heat exchange in birds before he found his ideal profession, veterinary medicine.

Recently the assessment of herd health has centered around regular reproductive examinations. As an ambulatory clinician, Dr. Charles Guard is critical of that concept. He wants to offer a more encompassing service, in which the veterinarian is a troubleshooter and a management consultant who looks at nutrition, housing, ventilation, equipment, crops, and feeding programs, among many other activities.

All these activities lead to the accumulation of data. "Inevitably, when you start talking about all the different aspects of a farming unit, there are data," Dr. Guard explains. "We've looked at what data are relevant and important. We've collected data. We've analyzed data. We've learned how to generate recommendations based on it. A computer makes all this possible. If a dairy has 500 cows, you quickly run out of the time or the patience to make judgments based on pages and pages of individual cow information."

A lot of Dr. Guard's efforts go into evaluating the productivity and the cost-effectiveness of a dairy operation, an approach now called production medicine. "The idea underlying production medicine," Dr. Guard says, "is that financial considerations are motivating factors for decisions and actions. How often do problems occur, such as a stepped-on teat or a retained placenta? They each have a certain sig-

nificance in their cost." Data collection systems put isolated events in context. The farmer can then decide rationally to expend resources to prevent the problem.

Dr. Guard passes on the skills today's practitioners will need in a revised dairy herd health management course for veterinary students. "It has turned out to be a fairly intensive course, not on cows but in computer skills and data manipulation," Dr. Guard says. "We discuss why certain information is important, how to deal with that information, and how to get it back to the dairy operator and use it as the basis for management changes."

The number of practitioners asking for and attending short courses in data evaluation convinced Dr. Guard the shift in emphasis was necessary. "We aren't doing a good enough job of producing practitioners for the food animal industry in the Northeast," Dr. Guard says. "Veterinarians have to treat sick animals and they have to do that well, but they also need the tools to do something with the information they acquire. The dairy farmers of the next century, the smart, sharp business people, already want that kind of experience. It's a marvelous opportunity, and if the veterinarian doesn't provide the management services, then somebody else is going to fill that niche."

Dr. Sydney Moise wanted to be a veterinarian from the time she was six years old, but, she says, "I was always going to be an equine veterinarian." It wasn't until her senior year in veterinary college that she changed her emphasis to small animals. She entered private practice, but returned to Cornell a few years later for a residency in internal medicine. A master's degree program got her interested in cardiology. She went on to earn her board certification not only in internal medicine but in cardiology as well.

Dr. N. Sydney Moise

Clinical Sciences

B.S. '76, D.V.M. '77, Texas A&M University

M.S. '85, Cornell University

It all began when a breeder of German Shepherds brought a dog to Dr. Sydney Moise, a veterinary cardiologist in the Small Animal Clinic. The dog was from a litter in which three of four dogs had died in their sleep. Dr. Moise examined the dog, and she remembers, "While we were doing the echocardiogram, the dog fell asleep and developed a very rapid ventricular tachycardia." Soon after, Dr. Moise received two calls, one from a veterinarian in Syracuse, New York, and the other from a veterinarian-breeder in Illinois, concerning two dogs with ventricular arrhythmias. Pedigree analysis revealed that all three dogs were related to a single male dog.

Dr. Moise was able to conduct electrocardiographic examinations on twenty-one puppies from affected litters sired by this dog, beginning from the time they were three weeks old. "It was just like clockwork," Dr. Moise says. "At four months of age, they started having arrhythmias, and they usually died between five and eight months of age."

The ventricular arrhythmias were exacerbated by slow sinus heart rates and were therefore bradycardic dependent. "Structurally, their hearts were normal," Dr. Moise explains, "so we suspect there was something wrong with the maturation of the electrical system of the heart or the innervation of the heart."

The arrhythmias in the dogs showed some similarities to a disease in children known as *torsades de pointes*,

which is also an inherited problem. A severe rapid ventricular tachycardia is present, and patients are at high risk for sudden cardiac death.

Electrophysiological studies of affected dogs continue in collaboration with Dr. Robert Gilmour, an electrophysiologist. "Our aim is to see if there is something abnormal with the electrical conduction in the heart," Dr. Moise explains. "We're also looking at whether or not we can electrically induce the arrhythmia or affect it with drug intervention. This study will help us determine the mechanism of the arrhythmias."

Drs. Moise and Gilmour are also looking at the risk factor of sudden death, because some affected dogs do not die. "It's very exciting to me and, I think, to a lot of people who are looking for an animal model of cardiac arrhythmia," Dr. Moise says. "This is one example of a spontaneous disease that we have recognized in veterinary medicine. We need to follow up on animal diseases that occur spontaneously, to help not only animals, but people as well. The animal can serve as a valuable model."

Dr. Moise tells of a conversation with a medical doctor involved in cardiac research: "He said, 'You know, we spend millions of dollars trying to create models of disease, and you already have a dog that has this problem.' That's what's important about veterinary medicine. We have so much to offer."



Dr. Edward J. Dubovi

Diagnostic Laboratory
B.A. '67, University of Pennsylvania
M.S. '68, Purdue University
Ph.D. '75, University of Pittsburgh

In the Diagnostic Laboratory the phone rings daily with questions about diseases, requests for help in curbing or preventing disease outbreaks, or calls for diagnostic tests and vaccines. The animal industry turns to the Diagnostic Laboratory for problem solving. For example, when viral equine arteritis surfaced in Kentucky in 1984, threatening the thoroughbred breeding season, Dr. Edward Dubovi approached the spread of this disease as a diagnostic problem. "We knew that if we were to provide better service to the animal industry," Dr. Dubovi says, "we had to learn more about the virus and come up with improved diagnostic procedures."

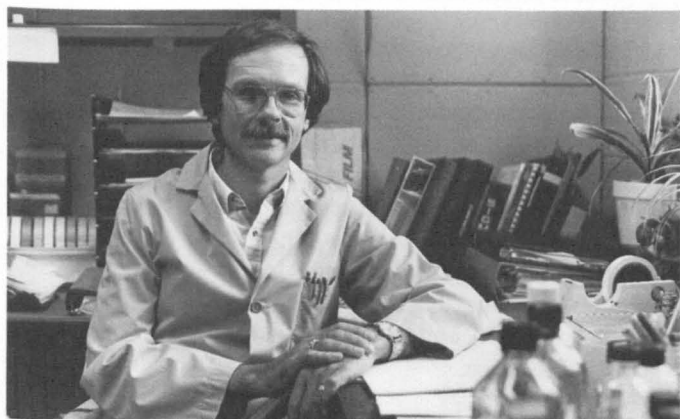
The Diagnostic Laboratory is working on the development of monoclonal antibodies to equine arteritis virus as well as the determination of the nucleic acid sequences of the key antigens. Progress in these areas of

research will result in better diagnostic tests and much-needed information regarding strain differences that exist in the virus.

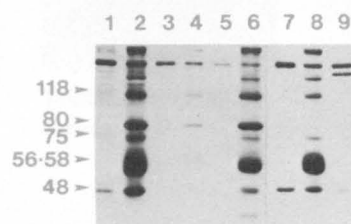
Dr. Dubovi took a similar approach to bovine viral diarrhea (BVD). He says they struggled daily to learn more about the virus, knowing that only until they had more information could they diagnose it. He is now working on the basic question of how the BVD virus produces disease in animals and whether different isolates of the BVD virus produce different disease syndromes.

Dr. Dubovi and his graduate students are also looking at the transmission of bovine leukemia, the virus that causes bovine leukemia. "I doubt whether there will ever be an accepted vaccine for bovine leukemia," Dr. Dubovi says. "The way to get rid of it is to identify the positive cows in a herd and eventually eliminate them from the population." So far, New York State is the only state in the country with a program in place to identify infected animals. The program, offered through the Diagnostic Laboratory, also includes the identification of paratuberculosis and bluetongue. The focus of Dr. Dubovi's research will be to develop techniques from this program that can be used to detect infected animals sooner than the conventional ones.

"There are still a lot of viruses out there and a lot of infectious diseases in exotic and wild animals that we really don't know about or appreciate," Dr. Dubovi says. To gain this knowledge, the Diagnostic Laboratory takes an integrated approach to solving disease problems—present or future. "It's what makes this place unique—that we attack various problems at different levels," Dr. Dubovi says. "Basically, we are here to provide a diagnostic service, and I think everyone recognizes that's what has to be done. But the reason we're at Cornell is that there's the opportunity for research, and in whatever disease problem we approach, we can provide significant research and contribute to the knowledge base."



"When I first came to Cornell, I worked on the bovine respiratory syncytial virus," Dr. Edward Dubovi says. But he had been studying long-term respiratory disease long before joining the Diagnostic Laboratory. "I had been working on respiratory syncytial virus—in children—as part of an epidemiological study at a day care facility," he says. "We cultured viruses in children beginning at six months of age and up through grade school. Of course cows have practically the identical virus."



Autoradiograph showing analysis of BVD monoclonal antibodies

Dr. Patrick McDonough

Diagnostic Laboratory
B.S. '73, Albright College
M.S. '76, Ph.D. '85, Cornell University



JON REIS

Dr. Patrick McDonough is no stranger to Cornell. Between 1975 and 1979, he was a microbiologist and supervisor of the Section of Bacteriology/Mycology in the Diagnostic Laboratory. Then he went on to earn his master's and Ph.D. degrees at Cornell. "I kind of grew up with the Diagnostic Laboratory," Dr. McDonough says. "I was with the lab when it was very small, and I was here when the new building was built."

Dr. McDonough acknowledges with pride the growth of the laboratory and the evolution of its program since then, and he is enthusiastic about the ongoing work. "It's a very stimulating environment," he says. "There's a team spirit here for our goals and resources. There is also a strong sense of tradition and excitement for the future."

Most of Dr. Patrick McDonough's work is diagnostic, as he tries to establish what part bacteria play in almost any disease in any species—from fish to elephants. "Many times our work is driven by current problems," Dr. McDonough says. As an example, he cites recent concern about *Salmonella enteritis* in eggs.

"Salmonella infection has always been a problem in New York State and elsewhere," Dr. McDonough explains. "Right now, because of the reports of infection in eggs, it's in the forefront. In fact, there are very few documented cases of contamination of an actual egg. A lot of the problem has been the mishandling of eggs after they are laid—they're not refrigerated, or when they're prepared the product is not cooked. Industry is trying to control the problem, and we're developing a better test to diagnose infection in chickens serologically."

Salmonella infection may also be a problem in the emerging dairy beef industry in New York State. "Back in 1988, *Salmonella dublin*, a serotype new to the East, appeared in dairy calves raised for beef in New York," Dr. McDonough says. "It's a very severe infection, causing problems in calves and abortions in cows. Adult cattle that

are infected remain carriers for life and a continuing source of infection to both animals and humans."

The only test for infection with *Salmonella dublin* is a fecal culture. Unfortunately, the bacteria may be shed intermittently, so the animal may culture negative one day but positive the next. Dr. McDonough and his coworkers hope to develop more sensitive serological tests to detect infections.

Although he works mainly on salmonella, Dr. McDonough is also interested in other enteric diseases. "*E. coli*, clostridia, and campylobacter are all equally important because they probably cause as much morbidity and mortality as salmonella," he says. Dr. McDonough is especially interested in antibiotic resistance that occurs in salmonella and *E. coli*, and he is looking at trends of resistance.

Dr. Judith A. Appleton

Microbiology, Immunology and Parasitology
James A. Baker Institute for Animal Health
B.S. '75, Indiana University
M.S. '77, Ph.D. '80, University of Georgia

In her laboratory at the James A. Baker Institute for Animal Health, Dr. Judith Appleton's attention is on an influenza virus of horses and on trichinella, the parasitic nematode that causes trichinosis. Although her research interests may seem poles apart, the two are connected, she explains, by a common thread—immunity. "I'm interested in pathogenesis, and as a result of that interest, I became interested in how the immune system interferes with the ability of a pathogen, such as an influenza virus or a parasite, to establish itself," Dr. Appleton says.

In her equine research, Appleton studies how horse lymphocytes respond to the influenza virus and the important viral antigens associated with immunity against influenza. "Influenza virus is very interesting because it has the capability to mutate to avoid immunity," Dr. Appleton explains. "When a population becomes immune to a particular strain of influenza, a new variant of the virus will arise that is able to infect that population. Although vaccine failure is a problem, we've looked at antigenic variation in equine influenza viruses and found that there isn't really very much variation at all. It's not the cause of vaccine failures, because the vaccine and the viruses causing disease today just aren't that different from one another. Ongoing studies suggest that the weak response of the

vaccine may be due to an immune response that turns off too quickly."

Appleton calls trichinella the equal opportunity parasite. "It infects any animal that consumes contaminated meat. It's been a very useful parasite for studying immunity against intestinal parasites in general."

As trichinella travels through the body, first through the intestine, then in the blood, then into muscle, the body mounts different immune responses. Appleton is interested in the development of this immunity as well as the pathogenesis of the parasitic disease. The parasite is able to take over a muscle cell for its own benefit, but no one knows how that works. Larvae in the intestine also have the ability to alter epithelial cells to support themselves. Somehow the body's immune response interferes with this ability, but the exact mechanism is not known.

"Years ago a certain amount was understood about the immune response to trichinella," Dr. Appleton explains. "But now the tools are more sophisticated and the approaches are different. We know there are different kinds of cells and antibodies involved. The questions being asked now are about how the body gets those particular antibodies and cells and where they go and what they do. It's not as if the problems haven't been studied before. It's just that they are being studied at a different level now."



Trichinella spiralis
larvae



Dr. Judith Appleton was drawn to the sciences in the seventh grade when, for a science project, she had her dog sniff a petri dish full of homemade agar and then she cultured the bacteria. These days her tools are more sophisticated. "We're using flow cytometry, monoclonal antibodies, radiolabeling, immunoprecipitation, and recombinant DNA," Dr. Appleton says. "We can purify proteins and obtain amino acid sequences from Cornell's Biotechnology Laboratory. On the other hand, some of our work is simple parasitology, counting worms visually. So the tools we use depend on what we're trying to accomplish. You don't need a space shuttle to get from Ithaca to Syracuse; an automobile is more efficient!"

"I never planned a career in science," Dr. James Casey says, "I simply followed my interests." At one point in his career, Dr. Casey was working as a research technician at the University of Chicago. There he became interested in nucleic acid biochemistry and met his future mentor and friend Dr. Murray Rabinowitz, who headed the laboratory where Dr. Casey worked.

"He had been something of a child prodigy, graduating from medical school when he was twenty and getting his Ph.D. a year later," Dr. Casey says. "He developed muscular dystrophy, and by the time I met him he was unable to run experiments by himself. But his enthusiasm for science was so infectious. He's the person who convinced me to go on to graduate school."



Dr. James Casey

Microbiology, Immunology and Parasitology
B.S. '66, Wayne State University
Ph.D. '73, University of Chicago

Dr. James Casey received his early training in biology and biochemistry at the University of Chicago, then was a postdoctoral fellow at the California Institute of Technology. Commenting on his work at Cal Tech, Dr. Casey says: "I changed from a person interested in biology to someone interested in chemistry, specifically the chemistry of nucleic acids. We were looking for model systems to study nucleic acids, and retroviruses were perfect. They not only hand you a piece of genetic information from the cells they infect, but also convert that information into DNA, and that DNA is integrated into the genome of the organism forever. The utility of these agents to study virus-host interactions is comparable to phage-bacterial systems. They're wonderful reagents to use to probe the mechanisms of oncogenesis as well as to understand eukaryotic gene regulation."

According to Dr. Casey, when he began working on retroviruses, "the thought was that if you understood the mechanism of tumorigenesis, or cancer induction, by animal retroviruses, then perhaps some information about how cancer is caused in humans might be gained." In fact, most oncogenes being studied were derived from retroviruses.

For the past ten years, Dr. Casey has focused his research efforts on identify-

ing retrovirally encoded or induced functions that determine the pathological severity of disease following infection. Included in these investigations are studies on the modes of oncogenesis of both the feline leukemia virus and the bovine leukemia virus and, more recently, on the mechanism of disease induction by the equine infectious anemia virus, a lentivirus.

Since coming to Cornell in 1988, Dr. Casey has begun a study of spumaviruses, a class of retroviruses. "Spumaviruses," Dr. Casey says, "have been virtually ignored. Although they have been identified in humans, cats, monkeys, raccoons, and cows, there have been no intense research efforts to associate these agents with disease. In fact, we have learned more about the molecular biology of spumaviruses than we have learned about their disease-inducing potential."

Dr. Casey's laboratory has cloned the bovine spumavirus and is now studying the complicated gene regulatory scheme that this virus employs. "Understanding the function of viral regulatory genes will provide insight into the pathogenic potential of these viruses," Dr. Casey says. "In addition, we now have probes to assess the presence of viral genetic information in samples from clinical diseases such as bovine lymphoma."

Dr. Maja Suter

Pathology

Dipl. Med. Vet. (D.V.M. equivalent) '74, Dr. Med. Vet. (doctoral thesis) '77, University of Zurich, Switzerland

Ph.D. '88, Cornell University

"I was in kindergarten when I told my teacher I wanted to be a veterinarian when I grew up," Dr. Maja Suter says. When she finally started veterinary school in Zurich, Switzerland, she wanted to be a bovine practitioner. "Like 99 percent of the students, I was convinced that I would go into practice," she says. Along the way, however, she became interested in the pathogenesis of disease, and after graduation she did a pathology residency to further her training. "My interest in pathology grew and grew," Dr. Suter says, "and after two years I didn't want to go back into the clinics."

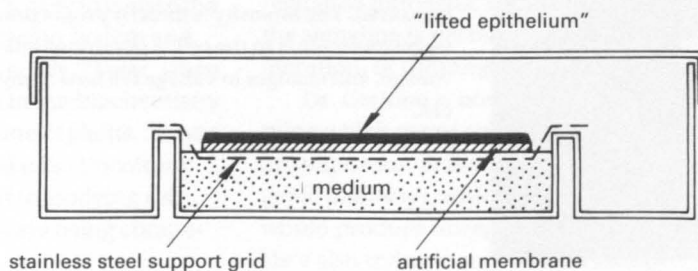


In her laboratory, Dr. Maja Suter is growing stratified squamous epithelial cells on artificial membranes. She is growing the tissue to study pemphigus, an auto-immune skin disease that occurs in humans and animals, and its pathogenetic mechanisms.

Patients with pemphigus produce antibodies against their own skin cells. "These autoantibodies bind to the cells' surfaces and then the cells cannot adhere to each other," Dr. Suter explains. "As a consequence, the cells fall apart and huge blisters and erosions occur within the layers of the skin."

The skin Dr. Suter grows in the laboratory is stratified, or differentiated into nicely organized cell layers, similar to normal human skin. This is important to her study because certain forms of pemphigus affect exact locations in these layers. The most severe form, pemphigus vulgaris, affects cells just above the first layer of basal cells and causes blistering. A less severe form causes blisters near the skin's surface where dead cells scale off. Researchers have noted that the structures to which the antibodies bind are different in each form of pemphigus.

A culture system for artificial skin



Work in human medicine suggests that the adhesion points between cells are disturbed by antibodies binding to antigen. Work by Dr. Suter and others has demonstrated another possibility: the autoantibodies bind to the cells and activate the cells to secrete enzymes that degrade the intercellular contact.

To test this hypothesis, Dr. Suter is measuring intracellular calcium as an indicator of cell activation. She proposes that an increase in calcium indicates the cells are being activated, which leads to the production and secretion of an activator of protein-degrading enzymes. She will then look at differences in the genetic expression of this enzyme activator in normal skin cultures and in skin cultures incubated with pemphigus. "We want to know if the binding of the antibodies really induces an increased production of activator," Dr. Suter explains.

Dr. Suter recently received a biotechnology grant which will enable her to clone the gene of the pemphigus antigen. "Then we can look at how the antigen is built," Dr. Suter says, "and find out what part of the molecule is responsible for the cells adhering or for cell activation. We may even be able to alter it and make it functionally inactive."

Dr. Suter's study may result in a specific treatment for pemphigus. It may also reveal how cells cohere in normal skin tissue.

Dr. Andrew Yen

Pathology

B.A. '69, Haverford College

M.S. '70, University of Washington

Ph.D. '76, Cornell University

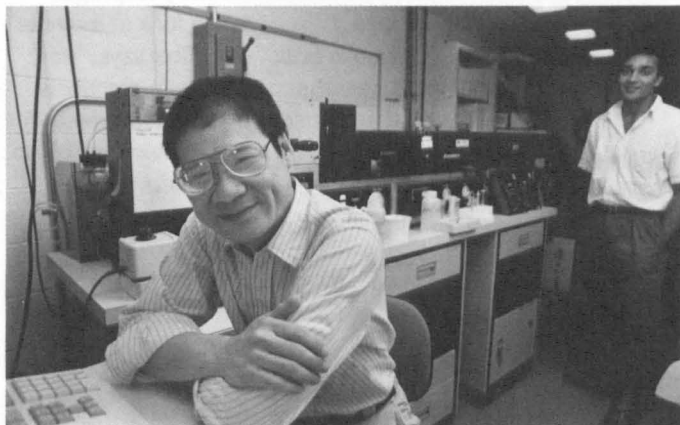
Historically, pathology has been the discipline that characterizes the disease process, or what goes wrong in an organism. Dr. Andrew Yen is seeking to identify the disease process in cancer—in the cellular regulatory processes that are deranged when the cell undergoes neoplastic transformation. To this end, he is studying a class of genes called tumor suppressor genes, as well as oncogenes, which play a regulatory role in cell growth and differentiation.

"Most body cells are proliferatively quiescent," Dr. Yen explains. "They have a finite life after which they replace themselves. We are currently looking at how tumor suppressor genes and oncogenes are regulated as cells are induced to either cease proliferating or to display a differentiated phenotype." To date, biomedical researchers have been able to isolate only one tumor suppressor gene. Loss of function of this gene confers susceptibility to retinoblastoma.

Dr. Yen's primary interest is in leukemia, especially the forms of this cancer that affect children. In his research, he uses a cultured human promyelocytic leukemia cell, a tumor-derived cell that is proliferatively active and differentially immature. One of the superficial hallmarks of a cancerous

cell, Dr. Yen adds, is that the cell usually expresses an immature phenotype compared to the tissue of origin. This particular leukemia cell is special because it can be grown in a bottle, yet still retains the capability to differentiate. Using this cell line, Dr. Yen can initiate cell differentiation and then characterize the sequence of events that occurs. "We can look at how genes are regulated in this process," Dr. Yen says. "We can also look at causality because we can make disruptions at certain times and then see the consequences at the cellular level."

Understanding the basic biology of cell differentiation may help scientists devise new ways to treat cancer. Dr. Yen is developing ideas for a form of cancer therapy known as differentiation induction therapy. "If you could convert each tumor cell to a cell that expresses the differentiated phenotype and is no longer proliferating," Dr. Yen says, "then you would restore most of the cell function to the host and invoke the automatic clearing of the tumor cell. Rather than kill the tumor cell population with chemotherapy, one can try to convert it to something that is innocuous, and that in essence is what we're doing in vitro right now."



Dr. Andrew Yen uses flow cytometry to evaluate the expression of genes that have a regulatory role in cell growth and differentiation. Flow cytometry is a biophysical, optical technique in which target molecules in a cell are tagged with a fluorescent marker. When a laser irradiates the cell, the intensity of light, or fluorescence, is measured. The intensity is directly proportional to how much of the target molecule is in the cell. A photomultiplier converts the light to voltage, and changes in voltage tell how many molecules are in the cell.



JON REIS

Dr. Richard Cerione majored in chemical engineering as an undergraduate, but switched to biochemistry in his senior year. He went on to graduate school almost as a whim. "In college," Dr. Cerione says, "the last thing I wanted to do was take a laboratory course with 200 students who were all trying to use the same piece of equipment. But it was very different when I got into a research laboratory in graduate school. Suddenly I was doing what truly interested me. I knew instantly that this was what I wanted to do."

Dr. Richard Cerione

Pharmacology
B.A. '73, Rutgers College
Ph.D. '79, Rutgers University

Dr. Richard Cerione began his research by wondering about the molecular mechanisms underlying vertebrate vision. "My research interests were not aimed at curing diseases of the eye," he explains. "My major aim was to understand how a receptor protein, in this case the light receptor rhodopsin, is able to initiate a signaling pathway that culminates in a biological event such as vision."

He and others have found that the signaling components that act in vision are very similar to the protein components and the molecular interactions that regulate other biological activities, such as cardiac function, muscle contraction, and cell growth and differentiation. In fact, the vertebrate vision system represents an excellent model to study receptor-coupled signaling because it's relatively easy to isolate the components of the vision system and study them biochemically. "Later, when I became interested in the biochemistry of cancer," Dr. Cerione explains, "it was relatively easy to make the transition from studying vision to studying cell growth—where cells are using compo-

nents and interactions similar to those that help you see."

How does cancer occur? Dr. Cerione, with many investigators in the field, believes it's the result of mutations in genes that code for receptors and other proteins operating in normal cell growth. Normally, cells grow to a point and then stop growing, or they differentiate into a particular tissue. "If a mutation occurs—and genes can mutate as a result of ultraviolet radiation, radioactivity, chemicals, or any number of viruses—then the altered gene produces an altered protein," Dr. Cerione explains. "The altered protein doesn't work in a regulated manner. It gets inserted into a normal pathway, but instead of acting normally and then stopping when it's supposed to, it keeps acting. Thus, instead of a very tightly regulated mitogenic signaling pathway, the signaling is persistent, and cell proliferation, or tumorigenesis, occurs."

Dr. Cerione is now trying to determine which genes and which proteins are important in the cell's normal mitogenic pathways, which when altered would produce unregulated growth. He's also trying to understand exactly

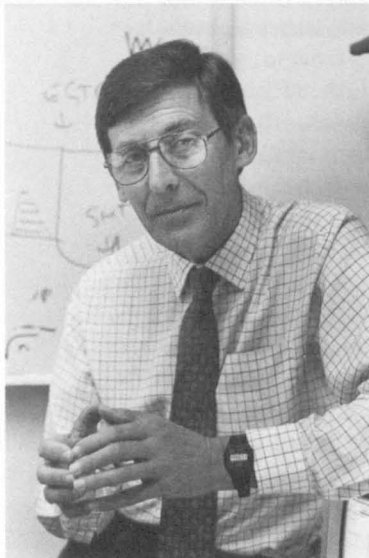
what kinds of mutations are necessary to produce a cancer. "Most investigators view biomedical research as a mystery to be solved," he says. "They hope that they will see for the first time how a particular protein works and what might happen to a cell growth pathway when the protein is mutated. It's as if the answer is behind a door, and when you finally open the door you can see how it works."

Dr. Geoffrey Sharp

Pharmacology

B.Pharm. '49, Ph.D. '59, University of Nottingham, England

D.Sc. '72, University of London, England



JON REIS

Dr. Geoffrey Sharp's research career nearly ended before it began. After graduating from college at the age of nineteen, he was appointed an instructor in the pharmacy school at the University of Nottingham. Shortly after he started work, he was called into the Royal Navy. He emerged two years later fluent in Russian and resumed his position at the university. "It was rough because I was young and I had no training in research," Dr. Sharp says. "Regulations stated that faculty members could do Ph.D.'s without advisers, so I slowly put my research together and did a Ph.D. on my own."

A peptide discovered barely five years ago has opened up a new area of investigation for Dr. Geoffrey Sharp, and it has taken him to Nice, France, on a year-long research project. Dr. Sharp is studying the peptide galanin and its effect on insulin secretion. "I essentially started a new topic," he says. "For me, finding out galanin's mode of action is where all the fun is in research." The peptide was also being studied by a colleague at an INSERM unit, the French equivalent of the National Institutes of Health, at the medical school in Nice. It was natural for them to combine forces.

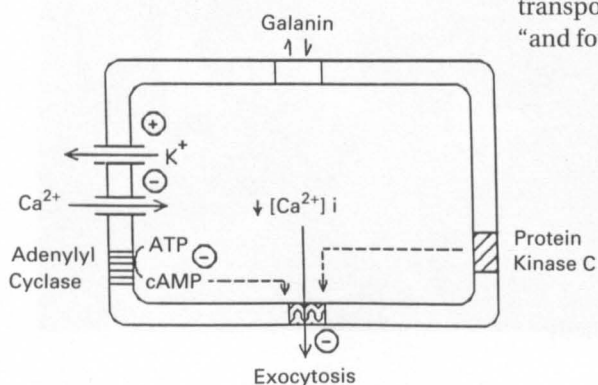
Back in his Ithaca laboratory after a year's work in France, Dr. Sharp expects work on galanin to be one of the major activities of his laboratory for the next four to five years. The peptide, which appears to be fairly widely distributed in the body, may play a role in both insulin secretion and intestinal ion transport, the two major areas of Dr. Sharp's ongoing research. "We set out to see if galanin was influencing ion transport in the intestine," he says, "and found that it strongly stimulates

sodium chloride absorption in the intestine."

Dr. Sharp has done extensive research on the control of ion transport in intestinal and other tissues. While in Nice, he acquired an important probe for sodium-hydrogen exchangers, one of which plays a crucial role in the control of sodium chloride absorption. The probe enables researchers to find and characterize the exchanger from the intestinal cells involved in transport.

The study of galanin may also increase understanding of the process in which insulin-containing granules fuse with the cell's plasma membrane, resulting in the release of insulin. Little is known about this phase in insulin release, but galanin seems to be involved in both the early and the late steps in the control of release. "Galanin appears to have many functions, and clearly we're going to find it's an important peptide in the brain and in many other tissues," Dr. Sharp says. "It's opened up a whole new area of research."

Galanin's actions on the insulin-secreting cell



Dr. Robert Gilmour

Physiology

B.A. '73, Bowdoin College

Ph.D. '77, Upstate Medical Center

Dr. Robert Gilmour is interested in cardiac arrhythmias, or disorders in the rhythm of the heart. While he was at the Krannert Institute of Cardiology in Indiana, he wondered why unstable electrical activity developed when someone experienced a heart attack. "It is usually the unstable electrical activity that kills people," he explains. "So we looked at experimental models and asked what could be done to stop the abnormal electrical activity. This got me interested in arrhythmias."

In his research, Dr. Gilmour looks at the heart not as individual cells—and the ion channels for each cell, and the proteins in each ion channel—but as a system. "I've drawn on some work people have done with other complex systems, such as the economy, the weather, and population ecology," Dr. Gilmour says. "I treat whatever I'm looking at as a black box and make few assumptions about it. I feed it input and analyze the output. This has turned out to be, at least for me, a very interesting and fruitful method."

There appear to be basic principles that span different complex systems. "For example," Dr. Gilmour explains, "if a cardiac arrhythmia behaves like an oscillator, you should be able to deliver an electrical pulse at exactly the right time to stop the oscillator, or the heart, in its arrhythmia. Rather than using

large paddles and delivering a huge shock to a person's chest, it may be possible to plant a wire in the heart, hook that wire to a small computer, analyze the rhythm, and decide when and into what part of the heart it should deliver a small shock."

In a curious collaboration, Dr. Gilmour is studying arrhythmias with applied mathematicians at Cornell and at the SUNY Health Science Center in Syracuse. "The approach of mathematicians to cardiac arrhythmias often involves applying principles of nonlinear dynamics that have been developed to solve problems in mechanical and electrical systems," Dr. Gilmour says. "For example, how do you predict when electrical circuits or airplane wings will oscillate uncontrollably? This approach has been surprisingly useful."

In a more typical collaboration, Dr. Gilmour works with Dr. Sydney Moise, a veterinary cardiologist in the Small Animal Clinic. "Dr. Moise has established in German Shepherd dogs a very interesting animal model for sudden cardiac death," Dr. Gilmour says. "We want to find out what's causing the arrhythmias. I hope that the evolution of these arrhythmias in dogs will have some relationship to the development of arrhythmias in patients who experience sudden death."



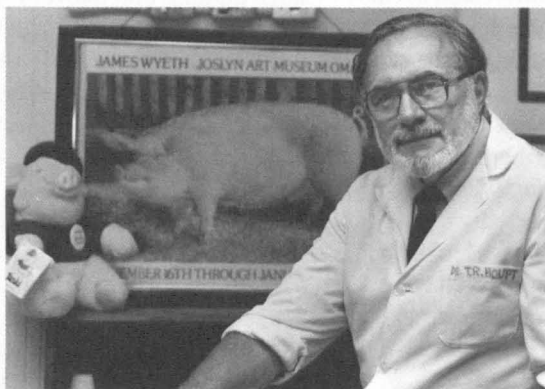
Dr. Robert Gilmour discovered electrophysiology through a summer job. Rather than mow lawns one summer, he took a job at the Masonic Medical Research Laboratory in Utica, New York. "At that time, I wanted to go to medical school and be a surgeon, and this seemed like a reasonable summer occupation," Dr. Gilmour says. "The lab was directed by Gordon Moe, who was a world famous electrophysiologist, and I worked with Dick Tuttle, one of the senior people there. Anyway I liked it, and it seemed like a lot of fun, so I ended up going to graduate school in Syracuse and then on to Indianapolis, Indiana, where I learned about electrophysiology."

Dr. T. Richard Houpt

Physiology

V.M.D. '50, Ph.D. '58, University of Pennsylvania

M.S. '53, University of Illinois



What makes us eat? Or stop eating? And why do we drink at meals? Dr. T. Richard Houpt is studying the control systems and mechanisms that determine food and water intake. He began by looking at food intake alone—when does an animal eat and when does it stop. “If the animal starts to eat a meal and there isn’t some mechanism, some signal, to tell it when to stop eating—and the signal must be fast—it will overeat” Dr. Houpt explains. He has studied gastric distention to see if pressure in the stomach rises when an animal eats a meal and if eating stops at a certain pressure. Preliminary results show gastric pressure does rise, which may mean it’s the needed signal.

Dr. Houpt also found that an animal’s ability to stop eating when the right amount of nutrients has been consumed could be linked to the release of cholecystokinin, or CCK. CCK is released by the lining of the small intestine as fats and proteins are digested. It stimulates the gall bladder to contract, it stimulates the pancreas to produce enzymes, and it influences food intake. Major drug companies are attempting to synthesize compounds that resemble CCK to market as natural appetite suppressants.

Dr. Houpt explains the importance of CCK: “A very nutritious meal might not distend the stomach very much, but

Dr. T. Richard Houpt is one of a notable line of physiologists/psychologists who have studied food and water intake. In the late 1890s, W. B. Cannon, who is considered the father of American physiology, became interested in the controls of food intake while he was a medical student at Harvard. “And then, there was a man in Russia named Pavlov,” Dr. Houpt says. “One of my trick questions is, Why did Pavlov get the Nobel Prize? And people usually answer, For his work on conditioned reflexes. Not so. It was for his work in gastrointestinal physiology.”

the nutrients get into the small intestine very quickly, within a minute. Among other things, the food particles cause the release of CCK, which inhibits food intake.”

Learning more about what prompts food intake could also help our aging population. “Many older people don’t eat enough,” Dr. Houpt says. “The elderly may also become dehydrated because their body’s controls for fluid intake fail. Perhaps we could learn to stimulate food and water intake.”

Dr. Houpt is now looking at why animals drink at meals. He has determined that food and water intake are very closely related. “In fact,” he says, “most of the water animals drink is taken in with meals, so in some mysterious way food and water are tied together physiologically in the brain.” But the generally proposed reasons for fluid intake—either plasma hypertonicity or hypovolemia—do not seem to stimulate drinking under spontaneous conditions.

“What you might think is happening doesn’t seem to be happening at all,” Dr. Houpt says. “We’ve got to look elsewhere to find the cause.” The answers may lead to an understanding not only of why animals drink but also of diseases where fluid is lost, including gastrointestinal diseases with vomiting or diarrhea.

Dr. Richard P. Hackett

Veterinary Medical Teaching Hospital
D.V.M. '73, Ohio State University
M.S. '76, Colorado State University



Drs. Hackett and Ducharme study laryngeal movement on the video monitor as the horse exercises on the treadmill.

When researchers in the Equine Performance Testing Clinic refer to the furious pace of their work, they're not thinking in clichés. The horses involved in their work are literally pacing, trotting, galloping, and walking almost nonstop on the clinic's high-speed treadmill. Dr. Richard Hackett heads the Respiratory Function Testing Unit, the first of the clinic's units to become operational. The two other units in the clinic are the Gait Analysis Unit and the Fitness and Performance Testing Unit.

The Equine Performance Testing Clinic was made possible through support from the alumni of the College of Veterinary Medicine at Cornell, the Mrs. Cheever Porter Foundation, the Harry M. Zweig Memorial Fund, and the Finger Lakes Division of the Horsemen's Benevolent and Protective Association. The New York Division of the Horsemen's Benevolent and Protective Association provided generous support to staff and equip the Respiratory Function Testing Unit.

The first year of the clinic's existence was spent equipping the Respiratory Function Testing Unit and developing basic techniques for gathering, recording, and analyzing data from the treadmill and the horses. All research projects conducted on the treadmill rely on the accuracy and validation of data collection and analysis. "We are developing techniques for looking at respiratory function, and we carefully validate the

measurements we obtain from the horses," Dr. Hackett explains. "It has been a lengthy process, but now we have a number of parameters that we feel quite comfortable with. We're also comparing different exercise protocols to see which test is most appropriate for the data we want to collect."

Many research projects calling for the evaluation of exercising horses depend upon the clinic's treadmill. Dr. Normand Ducharme, who has an interest in the treatment of roaring, or laryngeal hemiplegia, uses the treadmill to evaluate affected horses. In a study of equine pulmonary hemorrhage, Drs. Alan Dobson and Robin Gleed measure bronchial artery flow in exercising horses. Dr. Katherine Houpt is studying salt and water consumption in horses given Lasix. Drs. Harold Hintz and Lori Laurence are investigating the effects of carbohydrate loading on performance using the treadmill to regularly exercise and monitor the horses. Dr. Hintz, with a grant from Agway, has even put donkeys on the treadmill in a study of draft power intended to help Third World agriculture.

"The use of the treadmill for research is constant," Dr. Hackett says, "and that's certainly one of its major advantages—you can work horses year-round. We have an excellent physical facility plus a very active program. The question now is not whether we can do things, but what things can we commit ourselves to do. We're still evolving."



Dr. Richard Hackett has worked with horses nearly all his life. His father was a harness horse trainer and driver in central Ohio, and Dr. Hackett was young when he started out in the family business. "I started hot-walking horses when I was six or seven years old," he says. "I lived at the racetrack every summer from the time I was about eight until I finished veterinary school."

Dr. Lauren Trepanier

Veterinary Medical Teaching Hospital/Community Practice Service
B.S. '81, College of William and Mary
D.V.M. '86, Cornell University



Dr. Lauren Trepanier didn't always expect veterinary medicine to be her chosen field. "When I went to college," she says, "I was initially an art major. I liked science and I found medicine fascinating, but I thought the premed students were too competitive." After spending a summer working for a veterinarian, she decided to make veterinary medicine her profession. Now a medicine clinician, she enjoys the "puzzle aspect" of her job. "I like the idea of figuring out what's wrong with things," Dr. Trepanier says.

Dr. Lauren Trepanier heads the Community Practice Service (CPS) in the Small Animal Clinic. "On the service, I have time to talk to people and to get on a first-name basis with them," Dr. Trepanier says. "I find out more about them than that they have a sick animal. When I went into veterinary medicine, I thought I was going to be dealing mostly with animals, but it's really a people job. I find I like that."

The CPS sees emergencies and provides routine care for patients every day, Monday through Friday. A vaccination clinic is held on Friday afternoons. Clients come from the Ithaca community and nearby cities and towns. Dr. Trepanier estimates that more than 75 percent of the CPS's clients are people who have been to the clinic before and are coming in for routine care for their animals.

The CPS is designed to expose veterinary students to the care and management of routine cases. Every student spends one week of a four-week rotation in medicine on the service. "On the medicine rotation, students see a lot of unusual cases and they learn a lot, but in practice, they may see those unusual cases just a few times a year," Dr. Trepanier says. "What prepares them for having a practice is seeing abscesses and doing vaccinations and answering people's questions. It may not be as

exciting, but it's what they do when they get out."

Like many private practices, the Community Practice Service is seeing an increasing number of exotic patients. Most are rodents, rabbits, reptiles, and birds. Dr. Trepanier believes the exposure to exotic or unfamiliar animals is good for students. "It teaches them to be flexible and say, 'OK, I don't know anything about this species, but I'm going to use my common sense and look things up,'" she says. "That's the way you learn. It's always a challenge, it's never routine."

Following graduation from Cornell with a D.V.M. degree, Dr. Trepanier did an internship then a two-year residency in medicine at the Animal Medical Center in New York City. She returned to Cornell with a two-year appointment as head of the CPS. Of the future, Dr. Trepanier says, "I hope to be board certified in internal medicine next year. Then I'd like to stay in academics."

For 125 years, Cornell University has grown and flourished with a unique combination of support from the public and private sectors. Established in 1894 as the first statutory college at Cornell, the College of Veterinary Medicine has a long history of academic independence and achievements, made possible by continued funding from New York State and gifts from individuals, corporations, foundations, and other organizations concerned about animal health.

Public Sector Support

An annual appropriation from the New York State legislature provides approximately one-third of the operating budget for the College of Veterinary Medicine. This funding, along with income from tuition and fees, is used to meet expenses for most faculty and staff salaries, facilities and maintenance, and basic equipment for the teaching hospital, classrooms, and research laboratories.

Grants and contracts, awarded on a competitive basis by state and federal agencies, fund many of the research studies that have important implications for the health of food animals and people. Cornell's College of Veterinary Medicine ranks first among veterinary schools in the United States in total research activity and funding. In 1989-90, income from these sources made up approximately 33 percent of the college budget.

At Cornell's Reunion Weekend in June 1990, the College of Veterinary Medicine broke ground for a major expansion project, which will add new

teaching, research, and hospital facilities to our campus. New York State, through the sale of bonds, will provide funding for the planning and execution of this construction project. Thanks to this extraordinary commitment, when the project is completed in 1995, Cornell's veterinary college will have the most modern facilities of any veterinary school in the world.

At the same time that we are planning a substantial expansion of our facilities, fiscal belt tightening at the state level has required reductions in the annual allocation for our operating budget. And although college faculty continue to compete successfully for federal research grants, the available funding has not increased at a rate to keep pace with inflation or the actual costs of research. These two trends are certain to continue and will have an increasingly significant impact on college operations in the future.

Private Sector Support

In 1897, former Governor Roswell P. Flower gave the new College of Veterinary Medicine at Cornell its first major gift to endow the library that now bears his name. Today Flower Veterinary Library is second only to the Library of Congress in its holdings of current and archival veterinary medical publications. For more than a century, a tradition of gifts from friends, alumni, and others concerned about animal health has been integral in maintaining the college's margin of excellence in teaching, research, and public service.

In the face of shrinking state and federal funding, we face a critical challenge to remain on the forefront of

Each year we learn more about the prevention and cure of companion animal diseases.



CHRIS HILDRETH

veterinary medicine. Although private support makes up a relatively small percentage of the college's current annual budget, these gifts are vital in providing the necessary funds to initiate and develop new programs. In many cases, such funding is the seed money that can move a pilot project in the classroom or research laboratory to the point where ongoing support can be justifiably budgeted. Important advances in companion animal medicine are made possible largely by gifts from individuals and organizations interested in improved health for dogs, cats, and other pets. Unrestricted gifts provide the greatest flexibility, allowing the dean and the faculty to apply the funds in areas throughout the college where the need is currently greatest.

1989-90 Highlights

Over the years, college alumni have been among our most loyal and generous donors of unrestricted gifts, as well as supporters of the library, the teaching hospital and research centers, scholarships, and animal health funds. In the 1989-90 fiscal year, 38 percent of our alumni made gifts to the College of Veterinary Medicine. Contributions to the Veterinary College Annual Fund totaled more than \$320,000, an increase of 25 percent over the previous year's total.

One of the college's most important priorities continues to be securing new support for scholarships and other forms of financial assistance for our students. In 1989-90, fifteen new scholarships were established with contributions from alumni and friends, including five that were funded with reunion gifts from the veterinary alumni classes of 1945, 1950, 1960, 1965, and 1970. New scholarships will also be created in the next few years with the proceeds of bequests from the estates of Mary Jane Brandt, Iris de la Torre Bueno, Sheila Grummick, and Dita Koppstein.

Many individuals have had the foresight to provide an ultimate gift for

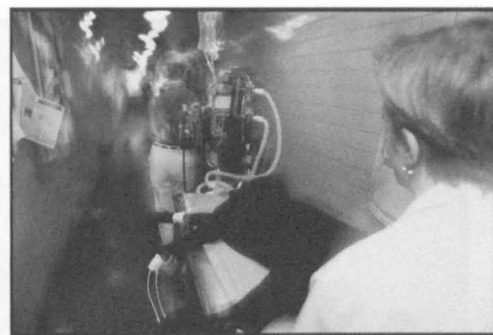
the college in their estate plans. This year we received several very generous bequests, including unrestricted gifts from the estates of Dr. A. Gordon Danks '33 and Dr. Warren M. Hoag '27 and a major gift for the James A. Baker Institute for Animal Health from the estate of Mrs. Frances Rowles Van Brunt.

In November 1989, the college opened its new Equine Performance Testing Clinic. The facility is equipped with a high-speed treadmill and sophisticated computer and video diagnostic equipment, funded with major support from the Finger Lakes Division of the Horsemen's Benevolent and Protective Association, the Mrs. Cheever Porter Foundation, the Harry M. Zweig Memorial Fund, and the Alumni Unrestricted Gifts Fund. The New York Division of the Horsemen's Benevolent and Protective Association provided generous support to staff and equip the Respiratory Function Testing Unit.

Major Donors and Sponsors in 1989-90

Support from donors and sponsors at every level is vital to our work in fostering improved animal health. Unfortunately, space in this publication does not permit a complete listing of all the contributors who made gifts to the College of Veterinary Medicine in 1989-90. We recognize below those alumni, friends, corporations, foundations, organizations, and public agencies who have provided support in the past year at a level of \$500 or more.

For further information regarding gifts to the College of Veterinary Medicine at Cornell and opportunities for the support of its many programs, please contact the Office of Public Affairs, G-2 Veterinary Research Tower (telephone: 607-253-3744).



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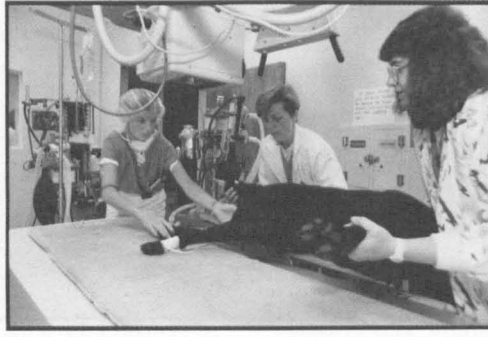
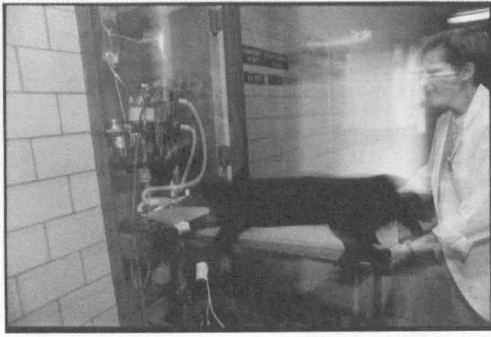
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New York State Racing and Wagering Board
New York State Sea Grant Institute

Table 1. Library Holdings, 1989-90

Bound volumes at beginning of year	77,026
Acquisitions	+1,343
Less withdrawals	- 110
Total bound volumes	78,259
Audiovisual items	32,574
Periodicals and annuals	1,343
CD-ROM titles	7
Microcomputer software titles	65

Table 2. Qualifications of Accepted Applicants, Class of 1994

	Number of Students	Percentage of Class
Amount of preveterinary preparation		
Three years of college	6	7.50
Four years of college	50	62.50
More than four years of college (graduate level)	24	30.00
Institution previously attended		
Cornell University	31	38.75
Other	49	61.25
Field of preparatory study		
Animal science (or related)	28	35.00
Biological sciences (or related)	43	53.75
Other	9	11.25

Table 3. Geographic Distribution of Accepted Applicants, Class of 1994

Legal Residence	Number
New York	59
Contract states	
Connecticut	2
Delaware	2
Maine	1
Maryland	2
New Hampshire	1
New Jersey	6
Other states	6
Total	80

Table 4. Admission Summary, Class of 1994

Area	Applicants	Accepted
New York	213	59
Contract states	111	14
Other	123	7
Total	447	80

Table 5. Degrees Awarded, 1989-90

D.V.M. (with distinction: 4)	76
M.S.	5
Ph.D.	22

Table 6. Student Enrollment, 1989-90

Candidates for the D.V.M. degree	
Class of 1990	77
Class of 1991	81
Class of 1992	79
Class of 1993	81
Total	318
Cornell undergraduates taking courses in the college (average annual full-time equivalents)	72.1

Table 7. Graduate Students at the College of Veterinary Medicine, 1989-90

Candidates for the Ph.D. degree	95
Candidates for the M.S. degree	14

Table 8. Interns and Residents, 1989-90*

Teaching Hospital	
Interns	11
Residents	18
Pathology	
Residents	9
Diagnostic Laboratory	
Residents (joint appointment with Pathology)	2
Total	40

* As of August 15, 1990

Table 9. Clinical Patients and Diagnostic Examinations, 1989-1990

	Horses	Cattle	Sheep and Goats	Swine	Dogs	Cats	Birds	Others	Total
Medical and surgical patients	1,668	572	97	25	7,746	3,185	480	435	14,208
Ambulatory clinic patients	1,919	36,135	2,864					47	40,965
Clinical pathology specimens	6,998	3,306	374	33	13,399	3,580	189	2,242	30,121
Diagnostic Laboratory tests	29,318	257,058*	10,585	3,900	28,289	11,522	2,629	10,024	353,325
Necropsies	307	423	138	67	385	206	95	463	2,084
Surgical pathology specimens	627	511	97	42	4,099	1,030	70	231	6,707
Laboratory animal examinations			35		196	154	25	1,437	1,847
Fish Diagnostic Laboratory								117	117
Poultry Diagnostic Services									4,135
Ithaca (498 accessions)							3,035		
Eastport (262 accessions)							1,100		
Quality Milk Promotion Services		136,256	530					539	137,325

*Cattle test numbers decreased because of a reduction in the Federal-State Brucellosis Surveillance Testing Program.

Table 10. Summary of Grant, Contract, and Gift Expenditures by Source of Funding

<i>Source</i>	<i>1989-90</i>	<i>1988-89</i>
Federal		
Department of Defense		
Grants and contracts	\$0	\$4,789
Cornell Biotechnology Institute	391,358	383,831
Department of Education	15,900	0
Environmental Protection Agency	6,621	86,359
National Institutes of Health	5,304,907	4,722,815
National Science Foundation	253,706	335,530
Department of Agriculture		
Grants and contracts	367,305	554,279
Federal appropriations	386,340	318,952
Total, federal grants and contracts	<u>\$6,726,137</u>	<u>\$6,406,555</u>
State		
Cornell Biotechnology Institute	\$90,161	\$232,467
Department of Environmental Conservation	86,155	103,220
Harry M. Zweig Memorial Fund	479,067	388,330
New York State Agriculture and Markets contracts	3,976,334	4,415,520
New York State Racing and Wagering Board	3,308,272	3,099,894
New York State Sea Grant Institute	32,430	18,959
Other state agencies	641	343
Total, state grants and contracts	<u>\$7,973,060</u>	<u>\$8,258,733</u>
Total, federal and state grants and contracts	<u>\$14,699,197</u>	<u>\$14,665,288</u>
Private Support		
Industry		
Grants and contracts	\$1,008,633	\$1,028,246
Cornell Biotechnology Institute	9,617	50,752
Foundations	197,395	318,812
Alumni, friends, associations, nonprofit organizations	495,182	514,687
Endowments	228,379	184,477
Total, private support	<u>\$1,939,206</u>	<u>\$2,096,974</u>
Grand total, grants, contracts, and gifts	<u>\$16,638,403</u>	<u>\$16,762,262</u>

Table 10 is a summary of grant, contract, and gift expenditures of the College of Veterinary Medicine at Cornell for the fiscal years July 1, 1988, through June 30, 1989, and July 1, 1989, through June 30, 1990. The amounts reported exclude expenditures for indirect costs. Previous annual reports have titled the Private Support section "Industry, foundations, gifts."

Table 11. Sources of Funds (in Thousands)

	1989-90	1988-89
State appropriation	\$16,172	\$14,888
Federal and state grants and contracts	14,699	14,665
Private support	1,939	2,097
College income*	11,006	9,961
Total	\$43,816	\$41,611

* College income includes indirect cost recovery on grants and contracts, tuition, unrestricted gifts from private sources, and other income from college programs.

Table 12. Uses of Funds (in Thousands)

	1989-90	1988-89
Instruction and departmental research	\$ 6,295	\$ 5,896
Teaching Hospital	6,125	5,906
Organized research	17,046	17,025
Extension and public service	8,911	7,612
Academic support	686	720
Student services	377	349
Institutional support	2,854	2,859
Plant maintenance and operation	932	792
Student aid	590	452
Total	\$43,816	\$41,611

Tables 11 and 12 are summaries of the income and expenditures of the College of Veterinary Medicine for fiscal years July 1, 1988, through June 30, 1989, and July 1, 1989, through June 30, 1990. These figures do not include expenditures for fringe benefits, estimated for 1989-90 at \$5,800,330, and general support services provided by the university. In previous years, private support was included in grants and contracts in table 11.

New Appointments

Yung-Fu Chang, assistant professor
Peter F. Daels, assistant professor
Thomas J. Divers, associate professor
Patrick L. McDonough, senior research
associate
Vicki N. Meyers-Wallen, assistant
professor
Larry J. Thompson, director of bio-
safety, Diagnostic Laboratory
David J. Wilson, senior extension
associate I

Promotions and Title Changes

Richard A. Cerione, associate professor
(from assistant professor)
Dennis R. Downing, director of labora-
tory operations I (from research
support specialist III)
Edward J. Dubovi, associate director,
Diagnostic Laboratory
Cornelia E. Farnum, associate professor
(from assistant professor)
Tracy W. French, associate professor
(from assistant professor)
Richard Hackett, chief, Surgery Section
H. Jay Harvey, head, Small Animal
Clinic
Alan Nixon, associate professor (from
assistant professor)
William Rebhun, professor (from
associate professor)
John E. Saidla, director, Continuing
Education
Janet Scarlett, chief, Epidemiology
Section, and associate professor
(from assistant professor)



Donald Smith, associate dean for
veterinary education
(from chair, Department of Clinical
Sciences)
Maurice White, chief, Medicine Section

Resignations

Jeffrey Barlough, assistant professor
Roger Dinsmore, senior extension
associate
Gary H. Dunny, associate professor
David O. Slauson, professor

Retirements

John C. Thompson, associate professor
Leo Adolf Wuori, senior extension
associate

Deaths

Emmett Bergman, professor
A. Gordon Danks, professor emeritus



ADMINISTRATORS AND ADVISERS

Cornell University

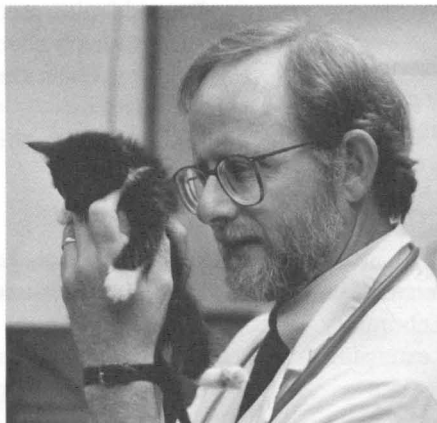
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Malden C. Nesheim, provost
G. Tom Shires, provost for medical affairs
James E. Morley Jr., senior vice president
Norman Scott, vice president for research and advanced studies
John F. Burness, vice president for university relations
William D. Gurowitz, vice president for campus affairs
M. Stuart Lynn, vice president for information technologies
Larry I. Palmer, vice president for academic programs
Richard M. Ramin, vice president for public affairs
Walter J. Relihan Jr., university counsel and secretary of the corporation
James A. Sanderson, chief investment officer
Joycelyn R. Hart, associate vice president for human relations
Walter R. Lynn, dean of the University Faculty

State University of New York

Administration

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Jerome B. Komisar, executive vice chancellor and president of the Research Foundation
William H. Anslow, vice chancellor for finance and business and director of budgets
Joseph C. Burke, provost and vice chancellor for academic programs
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Herbert B. Gordon, vice chancellor for governmental and university relations
Sanford Levine, university counsel and vice chancellor for legal affairs
Martha J. Downey, secretary of the university
Harry K. Spindler, senior vice chancellor



College of Veterinary Medicine

Administration

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Douglas D. McGregor, associate dean for research and graduate education
Donald Smith, associate dean for veterinary education
Eugenia G. Kelman, assistant dean for student affairs
John A. Lambert, assistant dean for administration
John C. Semmler, assistant dean for public affairs
Neil L. Norcross, secretary of the college

Sandra P. Berry, director, Biomedical Communications
S. Gordon Campbell, director, International Programs
Gloria S. Crissey, registrar and director, Financial Aid
Elizabeth A. Fontana, director, Development
Rita W. Harris, director, Personnel
H. Donald Hinman, director, Biomedical Electronics
John M. Lewkowicz, director, Computing Facility
Charles Pearson, director, Financial Services
Fred W. Quimby, director, Center for Research Animal Resources
Karen E. Redmond, director, Public Information

John E. Saidla, director, Continuing Education
Robert Webster, director, Facilities Administration
Susanne K. Whitaker, librarian, Flower Veterinary Library

Department Chairs and Directors

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Bruce W. Calnek, chair, Department of Avian and Aquatic Animal Medicine
Alexander deLahunta, chair, Department of Anatomy
Brian R. H. Farrow, chair, Department of Clinical Sciences
Francis A. Kallfelz, interim director, Veterinary Medical Teaching Hospital
Donald H. Lein, director, Diagnostic Laboratory
Douglas D. McGregor, director, James A. Baker Institute for Animal Health
Bendicht U. Pauli, chair, Department of Pathology
David Robertshaw, chair, Department of Physiology
Geoffrey W. G. Sharp, chair, Department of Pharmacology

Advisory Council 1990-91

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Donald R. Davidsen, D.V.M. '59
Stephen J. Ettinger, D.V.M. '64
Ralph W. F. Hardy
Patricia T. Herr, D.V.M. '60
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Stephen J. Kleinschuster
Robert E. Malouf
John L. Mara, D.V.M. '51
John W. McCann, D.V.M. '46
Bernard W. Potter
Kenneth J. Rotondo, D.V.M. '75
James L. Seward
Richard J. Sheehan, D.V.M. '63
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Bruce Widger, D.V.M. '51
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Stephen H. Weiss

FURTHER INFORMATION

All college offices can be reached by dialing directly.

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College information: 253-3000

An operator is on duty from 8:00 a.m. to 5:00 p.m. Monday through Friday, except holidays.



General Inquiries

Direct general inquiries to
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College of Veterinary Medicine
Cornell University
Ithaca, New York 14853-6401
Telephone: 607-253-3740

Laboratory Locations in New York State

Avian Disease Laboratories:

Ithaca
Eastport

Quality Milk Promotion Program, Regional Laboratories:

Kingston (eastern region)
Geneseo (western region)
Canton (northern region)
Earlville (central region)

Equine Drug Testing and Research

Program, Track Locations:

Standardbred Tracks:

Batavia Downs, Batavia
Buffalo Raceway, Hamburg
Midstate Raceway, Vernon
Downs, Vernon
Monticello Raceway, Monticello
Saratoga Raceway, Saratoga
Springs
Yonkers Raceway, Yonkers

Thoroughbred Tracks:

Aqueduct Racetrack, Ozone Park
Belmont Racetrack, Elmont
Finger Lakes Racetrack, Canandaigua
Saratoga Racecourse, Saratoga
Springs

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