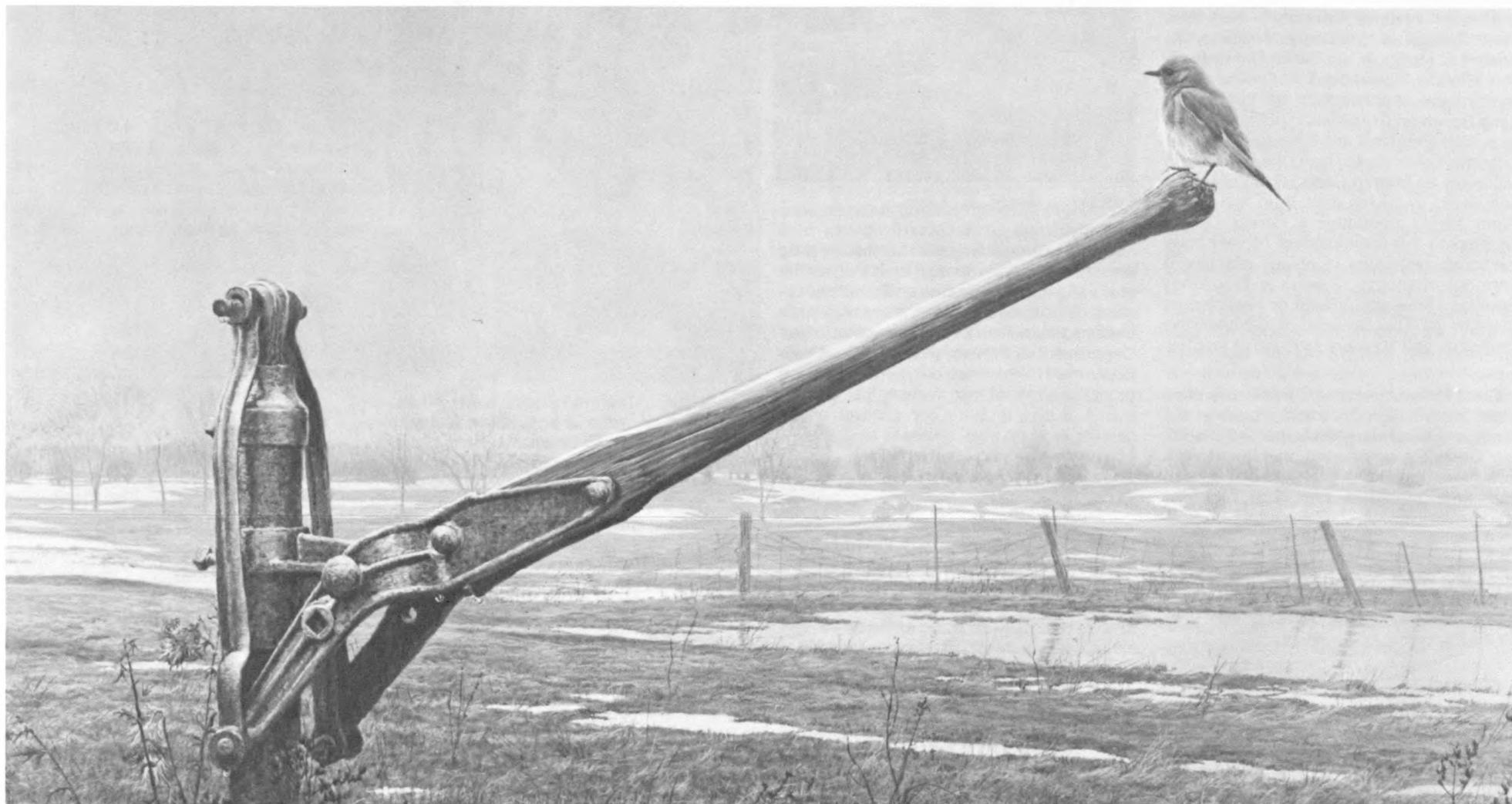


# Veterinary Viewpoints

The New York State College of Veterinary Medicine at Cornell University

Vol. 4, 1984



"Early Spring — Bluebird" by Robert Bateman

## Birds of a Feather

"Winter is icummen in," wrote Ezra Pound\*, and it's early days yet to look for harbingers of spring. Still, our cover print "Early Spring — Bluebird" by the well-know artist, Robert Bateman, is a pleasant reminder that the snow **must** end sometime. Mr. Bateman says he "tried to capture one of those soft, damp days of early spring when the snow patches are retreating and the puddles are advancing" and certainly you can feel the optimism of a season's change when you see his work.

The signed artist's print of "Early Spring" was donated to the Avian Clinic by Mill Pond Press and Mr. Bateman. If you'd like to remember what the world looks like without a layer of ice and snow, this framed reminder will be raffled off during the Annual Conference in January. The price of a raffle ticket will benefit the Avian Clinic and its continued care of wild birds.

By happenstance, just as this issue was going to press, two bluebirds were patients of the Avian Clinic; one with a broken leg, the other with a broken wing. Now rarely seen in the Northeast, the bluebird has lost ground, and nesting sites, to other more aggressive birds such as starlings and house sparrows. The use of pesticides and the loss of their preferred woodlots and fields have also been blamed for their decline. More often than not, the public's only chance to see a bluebird is at the zoo and as soon as health permits one bluebird travels back to its home at the Ross Park Zoo and the second bluebird goes to the Syracuse Burnet Park Zoo. Both birds were raised in captivity and are not adapted for life in the wild.

A baltimore oriole now in the clinic is making a fine recovery after a cat attack. Left with a broken leg and a few frayed

feathers, he'll be ready for rehabilitation soon. A return to the wild life is an eventual possibility for a hummingbird that couldn't fly when admitted. Avian supervisors conjecture that it is really a late summer baby and that with support and encouragement he will learn to fly on his own. A less fortunate cedar waxwing had a badly mauled wing surgically removed and he'll go on to become a permanent guest of an interested zoo or aviary. A mourning dove with her broken wing pinned is now sitting out the fall season and in the cage next door to her, two baby pigeons are being handfed until they're old enough to fend for themselves.

Students care for all the birds in the Avian Clinic, under the supervision of Dr. Lloyd Dillingham. The Clinic is dedicated solely to the treatment of wild birds. From a very modest beginning nearly 7 years ago it has grown to include a permanent faculty super-

visor, 6 student supervisors and nearly 70 student members. Patients are sometimes received from the nearby Laboratory of Ornithology and the Peregrine Fund, and several zoos across the state. In turn, successfully treated birds are frequently rehabilitated and released or adopted by these organizations. Injured wild birds are also brought in by individuals and are admitted through the Small Animal Clinic.

\*Ancient Music, by Ezra Pound.

## Dean Edward C. Melby, Jr. Resigns

After ten years as Dean of the New York State College of Veterinary Medicine, Dr. Edward C. Melby, Jr. announced his resignation, effective November 1. Following a University leave of absence he will join Smith-Kline Beckman Corporation of Philadelphia as a Vice President for Research and Development. Associate Dean Charles Rickard will serve as Interim Dean until a search is completed to fill the post. With this move, Dean Melby continues a career course devoted to the advancement of veterinary medicine, beginning in private practice in Vermont, spanning 12 years at The Johns Hopkins University School of Medicine as Director of The Division of Comparative Medicine, and 10 years as Dean at Cornell.

Dean Melby's years at Cornell have been a decade of unprecedented growth at the College of Veterinary Medicine. In 1974/75, the College's employees numbered 468; now that number has grown to 820 full and part time members plus 139 part-time student employees. The College's budget, \$8.6 million at the beginning of Dean Melby's tenure, now exceeds \$32 million. Over this same period, competitive grants and contracts awarded for current and future years increased tremendously from \$3.8 million to \$21.2 million.

In 1978, a new building for the greatly expanded State Diagnostic Laboratory was opened, and, since then, we have witnessed a growth in services to the State through the Laboratory as well as in the Equine Drug Testing and Research Program. Serving the equine importation industry, the College's Equine Research Park opened the only C.E.M. Quarantine facility in New York State, one of very few in the nation. Within the Veterinary Medical Teaching Hospital services have been continually upgraded, most significantly with the additions of a new, ultra-modern surgical suite and the only large animal isolation facility of its kind in the Northeast.

The James A. Baker Institute for Animal Health formerly the Veterinary Virus Research Institute, has undergone major reorganization and growth. Subsequent renovations and additions have been completed in the physical facilities and staff are actively pursuing critical projects impacting on both animal and human health.

The Department of Avian Diseases expanded its name and role to include Aquatic Animal Medicine. A new Specific Pathogen Free Poultry Facility was built to further research on atherosclerosis, vaccines, Marek's disease and other diseases of chickens or those for which chickens are models for disease in man.



Edward C. Melby, Jr., Dean

Work in epidemiology, minor species drug research, environmental toxicology, the study of parasitic diseases and the development of new tests for laboratory diagnosis became the bailiwick of a newly established Department of Preventive Medicine. A new Department of Pharmacology, formed following reorganization of two pre-clinical departments, is now a center for research at the cellular level on such diseases as diabetes, epilepsy and muscular dystrophy.

A reorganized Department of Physiology became the home for a newly created University-wide Section of Physiology within the Division of Biological Sciences. As such, it is expanding physiology research, teaching and graduate education opportunities throughout the entire University.

The Department of Microbiology, in keeping with its historic mission of concentration on infectious diseases, increased its capabilities in molecular biology by renovating, equipping and staffing laboratories to support modern cell fusion techniques, flow cytometry and protein sequencing.

The Department of Pathology furthered an emphasis on immunologic diseases. Training programs leading to Board Certification and/or advanced degrees in experimental pathology were developed in response to the national demand for veterinary pathologists.

The Department of Anatomy also underwent changes while retaining its time-honored commitment to teaching and scholarly publications. Research in developmental biology has grown and, in cooperation with the Department of Clinical Sciences, the course offerings in applied anatomy include faculty participants from the clinical specialties.

A single Department of Clinical Sciences was formed, subsectioned into the clinical specialties of medicine, surgery, anesthesiology, radiology and nuclear medicine, and reproduction. The number of faculty, including interns and residents, were increased and clinical research grew in both size and complexity.



Computers came of age at the College. More than 125,000 medical records are now on the MUMPS computer program for the teaching hospital, while about 800,000 tests each year are coded for the Diagnostic Laboratory and the Mastitis Control Program. Two members of the faculty have been particularly active in developing computer-aided diagnostic programs for veterinarians and computers are playing an ever increasing role in the College's teaching, research and administration.

Cooperation and collaboration with other health related programs have been strongly evident in recent years. The College's program in laboratory animal medicine is linked with programs at the Cornell University Medical College and Sloan-Kettering Institute in New York City and provides services to the entire Cornell campus through its Center for Research Animal Resources. The cooperative efforts of the College of Veterinary Medicine and the College of Agriculture and Life Sciences is embodied in the newly established Cornell Bovine Research Center, and is most evident in the completion of the Bovine Specific Pathogen Free Facility in 1982. In intercollegiate cooperation, the College participates with the University of Pennsylvania in the Aquavet Program, a training and research program in aquatic veterinary medicine. In 1982, a pilot diagnostic laboratory and investigative program at The Marine Biological Laboratories, Woods Hole, Massachusetts, was expanded into a marine animal diagnostic facility under the direction of Dr. Louis Leibovitz, Professor of Avian and Aquatic Medicine.

Early in Dean Melby's tenure, a college-wide development program was launched, the first in the history of the College. Thanks to the loyalty of its alumni, Cornell now enjoys the highest alumni participation of any college of veterinary medicine in the

nation. Assistance from the alumni has made possible our "margin of excellence".

Dean Edward Melby is a diplomate of the American College of Laboratory Animal Medicine, a member of the American Veterinary Medical Association, the New York Academy of Sciences, the American Association for the Advancement of Science, the New York State Veterinary Medical Society and numerous state and national societies for medical research. He has served as the President of the American Association for Laboratory Animal Science, and on the Animal Resources Advisory Committee, Division of Research Resources, National Institutes of Health, Department of HEW. He is currently the President of the Association for Biomedical Research and former Chairman of the Institute for Laboratory Animal Resources of the National Academy of Sciences — National Research Council. The author of more than 50 scientific papers, he has also edited four major textbooks on laboratory animal science. Dean Melby is a member of the Scientific Advisory Committee, for the New England Regional Primate Research Center at Harvard Medical School. He serves on the editorial boards of *The Cornell Veterinarian*, *The Journal of Primatology* and *The Prostate*. He served as a member of the Board of Directors of the Charles River Breeding Laboratories, and is also on the Scientific Advisory Boards of Biotechnology Research Partners, Ltd, of California Biotechnology and INTECH Systems Corp. Locally, he serves on the Board of Directors of the Tompkins County Trust Company.





Acting Dean Charles G. Rickard (left), Professor Emeritus Ellis P. Leonard (right) and the staff and faculty of the Teaching Hospital recently gathered to congratulate Dr. Robert W. Kirk (center) as the first recipient of the WSAVA International Prize for Scientific Achievement.

## WSAVA Honors Dr. Kirk

Robert W. Kirk, DVM and Director of the Veterinary Teaching Hospital at the New York State College of Veterinary Medicine at Cornell, has been selected as the first recipient of the World Small Animal Veterinary Association's **International Prize for Scientific Achievement**. The prize is given for "outstanding contributions as a veterinarian which have had a significant impact on the advancement of knowledge concerning the cause, detection, and cure and/or control of disorders of companion animals. Recipients are chosen on the basis of contributions published in scientific journals or books, and/or information presented at veterinary congresses." The International Prize for Scientific Achievement was awarded to Dr. Kirk during the WSAVA's 9th World Congress in Hamburg, Germany.

Dr. Kirk is the author of "Current Veterinary Therapy", "Small Animal Dermatology",

the "Handbook of Veterinary Procedures and Emergency Treatment", and "First Aid For Pets". Named Director of the Veterinary Medical Teaching Hospital in 1983, Dr. Kirk has been a member of the faculty of the New York State College of Veterinary Medicine for 31 years. During that time, he has established an international reputation in veterinary medicine, especially in the field of veterinary dermatology. He was named Gaines-AAHA Veterinarian of the Year in 1964, and the New York State Veterinarian of the Year in 1971. He is past President of the American Board of Veterinary Practitioners, a past President and diplomate of the American College of Veterinary Internal Medicine, a diplomate and Secretary of the American College of Veterinary Dermatology, and a member of the Academy of Veterinary Allergy. He also served on the AVMA's Council of Education and the Board of Directors of the Seeing Eye Association.

### Veterinary Viewpoints

Veterinary Viewpoints is published four times a year for friends and alumni of the New York State College of Veterinary Medicine, a Statutory College of the State University of New York. Correspondence may be addressed to Karen Redmond, Editor, Schurman Hall, New York State College of Veterinary Medicine, Cornell University, Ithaca, New York 14853. Telephone: 607/256-5454.

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## Physiology Fogarty Fellowships

Drs. Klaus W. Beyenbach and Ellis R. Loew, both associate professors in the Department of Physiology at the New York State College of Veterinary Medicine and the Division of Biological Sciences at Cornell have been awarded Fogarty Senior International Fellowships. Given under the Senior International Fellowship Program of the Fogarty International Center, the awards provide opportunities for study or research in a foreign institution by scientists who have established themselves in their chosen career in the U.S. and whose professional stature is well recognized by their peers and nominating institutions. Recipients of the award must have been nominated by their deans.

Under this Fellowship, Ellis R. Loew, Ph.D. plans to spend four months at the University of Bristol, England pursuing a project involving the evolution of color vision as it relates to color enhancement. Dr. Loew's previous work has dealt with the physiology of the eye and he is currently the director of the Electro-ophthalmological Diagnostic Service at the New York State College of Veterinary Medicine. He is also a member of the British Photobiological Association, the American Association for the Advancement of Science, the Marine

Biological Association of the United Kingdom, and the Institute of Electrical and Electronic Engineers.

Klaus W. Beyenbach, Ph.D., will spend his sabbatic year in the laboratory of Dr. Eberhard Fromter of the Goethe University in Frankfurt, West Germany. The laboratory investigations of Dr. Beyenbach will focus on the regulation of membrane channels in the kidney using patch-clamp techniques. Dr. Beyenbach's previous work has been primarily in the area of renal physiology. He is a member of the American Society of Nephrology, the Biophysical Society, the National Kidney Foundation, the Tri-Beta Biological Honor Society, the American Association for the Advancement of Science and the American Physiological Society. He is also trustee of the Mr. Desert Island Biological Laboratory at Salisbury Cove, Maine.

The Fogarty Senior International Fellowships are intended to enhance the exchange of ideas and advances in the health sciences by permitting participation by U.S. scientists in research abroad. It is hoped that such an exchange will also improve the research, educational and clinical potential of the U.S. nominating institution.

## Grants & Research

**Douglas D. McGregor**, Professor of Immunology and Director of the James A. Baker Institute for Animal Health, together with Research Associate **Judith A. Appleton** have been given \$91,242 by the National Institute of Allergy and Infectious Diseases to study the "Immunity to Parasitic Infection" over the next 12 month period. This project carries forward studies of acquired resistance to *T. spiralis* in a model system using rats. Inquiry will focus on the resistance to *T. spiralis* that is transferred passively from a specifically immunized mother to her young. The researchers will seek to substantiate the finding that the immunity in newborn rat pups is expressed in a response that is similar, if not identical to, the rapid expulsion response in *T. spiralis* infected adult rats; to identify the mediators of the response in infant rats, and to trace these mediators from their origin in intestinal associated lymphoid tissue through the blood to mammary tissue and from there into the colostrum and milk. Also under investigation are the vehicles conferring immunity and how these mechanisms operate in rats of different ages.

**Leland E. Carmichael**, Professor of Virology and **Colin R. Parrish**, Assistant Professor of Experimental Virology at the James A. Baker Institute for Animal Health, Cornell were awarded \$60,378 by the National Institute of Allergy and Infectious Diseases to study the "Structure and Function of Parvoviruses". Dr. Carmichael and his colleagues at the Baker Institute are responsible for the development of the first living vaccine against canine parvovirus. The research continues to focus on the relationships between the parvovirus structure and a variety of phenotypic characteristics, including the antigenic structure of the viruses, the hemagglutination (HA) characteristics and structural difference in DNA's. In concert with DNA sequencing studies, peptide mapping methods will be used to precisely define changes in the structural proteins of viruses selected by monoclonal antibodies. The goal of these studies is to determine viral structural properties associated with the different host ranges of the canine, feline and mink parvoviruses.

## Selenium & Vitamin E: Which One Makes A Difference?

Selenium and vitamin E appear almost inseparable, at least in nutrition texts and certainly in metabolism. It's even acceptable practice to write the two as one, as in "selenium/vitamin E". That close relationship of vitamin and mineral, although on the surface balanced, may not be as equal as once thought. A recent study at the New York State College of Veterinary Medicine suggests that selenium may play a more dominant role in the metabolic relationship than at first supposed.

Dr. Francis Kallfelz, the Mark L. Morris Professor of Clinical Nutrition, studied four groups of veal calves and their response to differing levels of selenium and vitamin E in their diets. The four groups consisted of a control group, animals given sufficient vitamin E and no selenium, calves given sufficient selenium and no vitamin E, and a final group given neither vitamin E nor selenium.

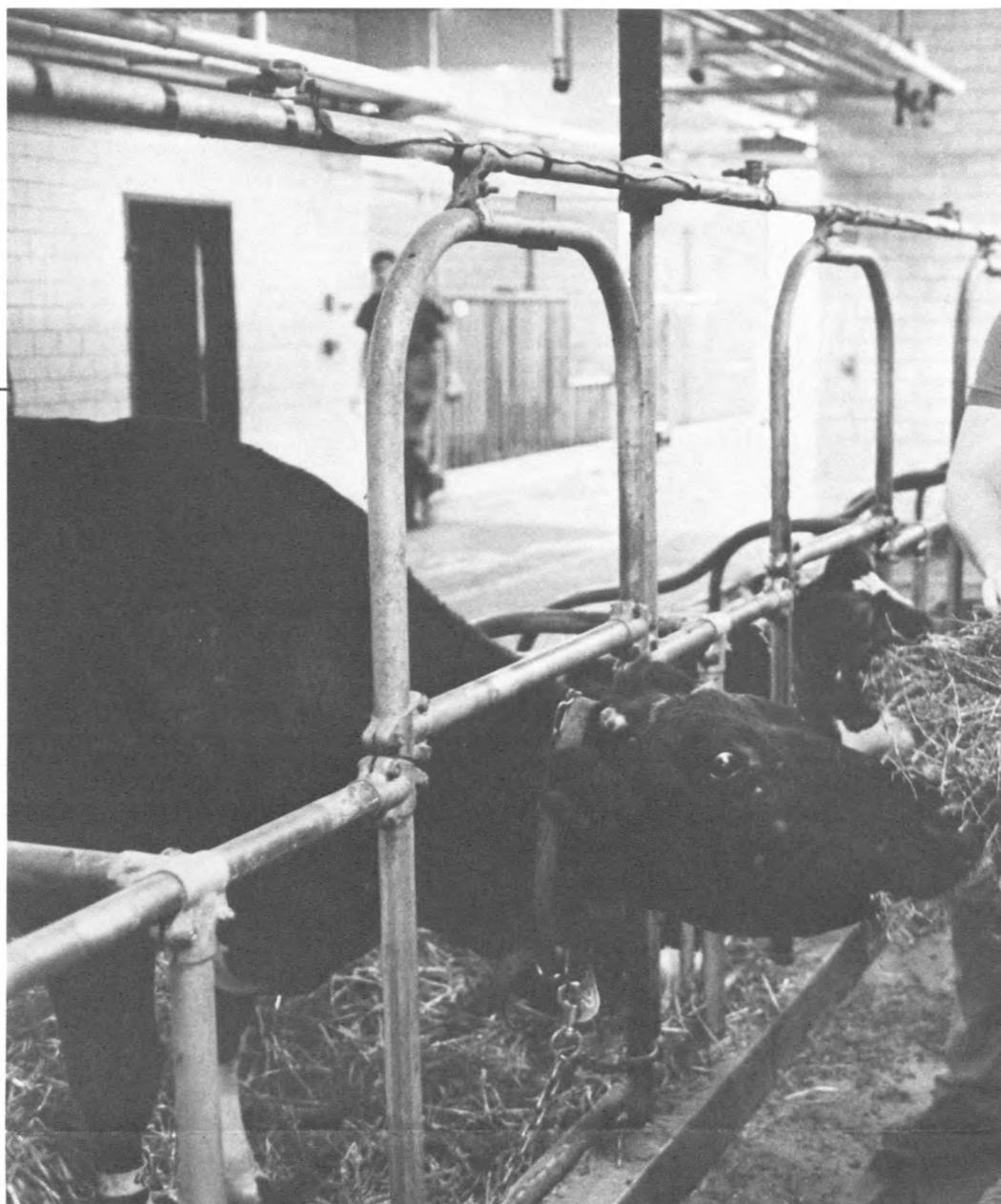
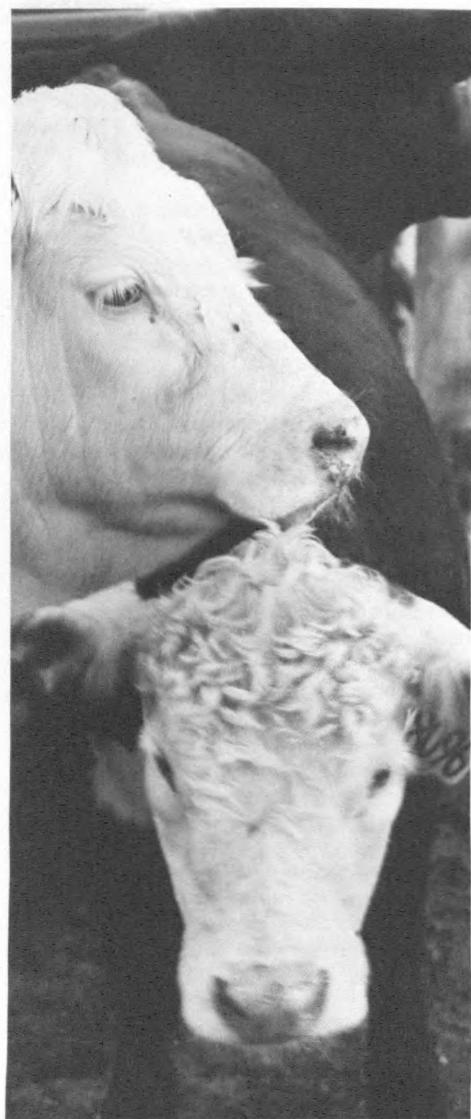
Not surprisingly, the calves given neither selenium nor vitamin E developed white muscle disease (WMD), a myopathy that occurs in young ruminants. (The disease gets its name "white muscle disease" from a lightening in the color of affected muscles.) Because animals with frank WMD were deficient in both vitamin E and selenium, either vitamin E or selenium protected the calves against WMD. An unexpected finding was that the animals given selenium grew faster—irrespective of vitamin E status.

Selenium in the calves' diet caused a small growth difference of approximately 10 lbs. (a 0.1 lb./day gain for 15 weeks) when compared to the calves from the other groups deficient in selenium. But the small difference could be a very important difference to a veal raiser. Since this growth only occurs if adequate amounts of selenium are present in the diet, a veal calf raiser interested in producing a larger animal would be certain his animals were selenium replete. On an economics basis, additional pounds translate into dollars and cents at market time.

Increasing the levels of selenium over and above the "adequate" may or may not make the calves grow that much better. In this study, only one level of selenium was used—the recommended level—and it is Dr. Kallfelz's feeling that inflated levels of selenium would not cause corresponding growth. As long as the calves have adequate levels of selenium they will grow optimally and increasing intake will not make them grow any faster. Such increases may, in fact, produce selenium toxicity.

Based on this study, how important is vitamin E to nutrition? True, it protects the calves against WMD, but selenium accomplishes that and produces optimal growth in the calves. At first glance then, only selenium should be necessary in the diet. In actuality, vitamin E plays a very important role; vitamin E prevents oxidation of lipids while selenium, in glutathione peroxidase, acts to remove the toxic endproducts of the lipids' oxidation.

In the body, unsaturated lipids tend to become peroxidized and create free radicals—highly active molecules—which results in WMD. Vitamin E blocks the peroxidation by protecting the free radical sites, blocking the formation of free radicals or lipid peroxides. If these lipid peroxides still manage to form, then selenium as glutathione peroxidase, detoxifies those peroxides by removing them. Even with adequate vitamin E you're going to have some peroxides formed but with no vitamin E you'll have even more created. Adequate selenium in the diet will remove the peroxides,



Dr. Francis A. Kallfelz and Bob Wallace, Research Support Specialist check hay quality.

but with a lack of selenium, or selenium and vitamin E, signs of deficiency will soon appear in the animal.

A herd with selenium/vitamin E deficiency might show increased incidences of retained placenta. Poor reproductive performance including silent heats in cows and repeat breeders might in some cases be related to selenium/vitamin E deficiency. White muscle disease, the most common indicator of a deficiency is often seen in young, growing animals, rarely in older animals. First calf heifers low in selenium/vitamin E may not show signs of deficiency until their calves are born with WMD. Calves not born with WMD but deficient in either nutrient, may develop stiffness in their muscles and experience difficulty in rising. It is thought that tying up in horses, and extreme stiffness in the leg muscles during or after exercise, may also be due to insufficient vitamin E/selenium.

In most animals the results of deficiency can be controlled by supplying adequate amounts of selenium/vitamin E either through feed additives or, in difficult cases, by injection.

How does the farmer or veterinarian know if the herd receives adequate levels of

vitamin E and selenium? You can analyse feed for selenium, but that's relatively expensive. According to Dr. Kallfelz, the best way to determine levels is to run blood tests for selenium and plasma vitamin E levels. The blood test for selenium should either be for whole blood selenium or red cell glutathione peroxidase levels.

The Toxicology Division of New York State Diagnostic Laboratory will analyze selenium in whole blood from domestic animals using an automated Perkin-Elmer Zeeman-5000 flameless atomic absorption spectrometer to analyze selenium concentrations down to 10 ppb (µg/dl) levels. In problem animals, vitamin E levels can be determined on a special request basis. Dr. Kallfelz will run glutathione peroxidase assays in his own laboratory. The glutathione peroxidase assay, actually an analysis of one part of the whole blood—the red blood cells—is practical because there is a close positive relationship between whole blood selenium and the glutathione peroxidase level. He prefers this glutathione peroxidase assay because multiple assays can be performed rapidly and inexpensively (he charges \$5 per sample for the test). The cost of the Diagnostic Laboratory's service is \$10.00 per sample or 6 samples for \$50.00



terms of their selenium status because they have been on a selenium-containing feed for the longest period of time.

The Northeast United States is a low selenium area and most of the naturally occurring forages in the Northeast United States contain approximately .03 ppm selenium. If this forage is the only source of selenium, WMD will be seen in herds, especially in very young animals. To correct this situation you can feed up to 0.1 ppm supplemental selenium on a total ration dry matter basis, irrespective of what naturally occurs in the feed.

But that's the limit in feed. Selenium was known initially as a toxic substance, and there was concern that selenium fed to food producing animals would work its way into the food chain. In the last ten years however, the FDA has allowed the feeding of selenium to food-producing animals first in turkeys and pigs and then dairy cows. The legally permitted 0.1 ppm. of supplemental selenium will usually supply the necessary requirements, even in exercising or stressed animals.

But sometimes, despite supplementation, some herds still have low blood selenium levels and low blood glutathione peroxidase levels. In these cases, researchers feel there is some sort of impediment to the absorption and/or utilization of the selenium. Sulfur—in feed or water—may be one reason and may interfere somehow with the action of selenium and vitamin E in metabolism.

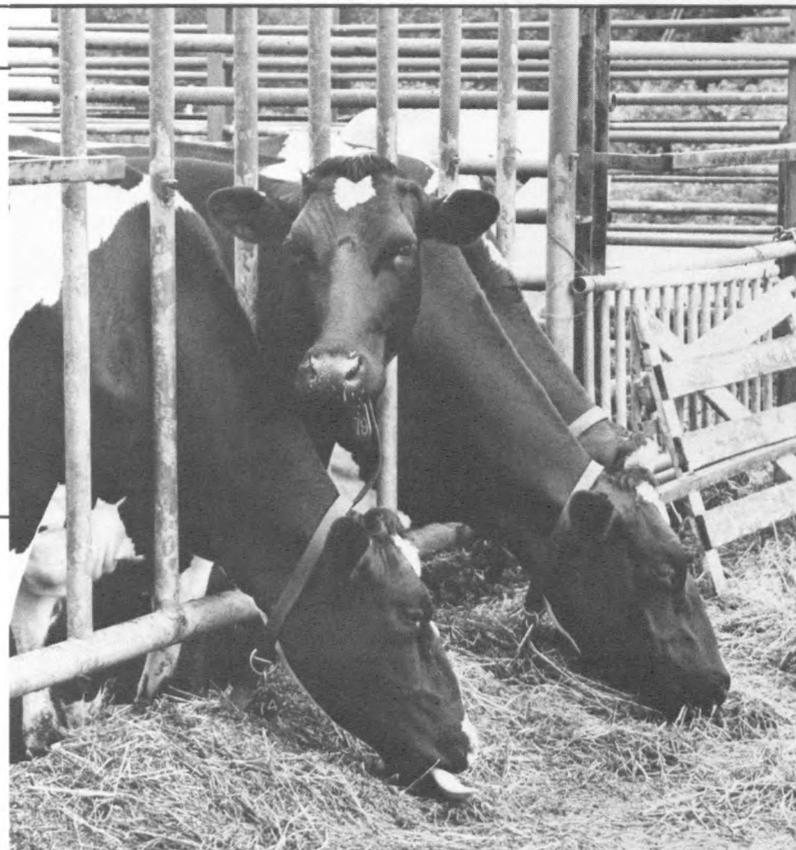
Under these circumstances, selenium by injection is a recourse. Dr. Kallfelz recommends that a veterinarian give a deficient dairy cow a single injection of between 25–50 mg of selenium in the middle of the dry period. If that proves insufficient, then two injections may be necessary—one at the beginning of the dry period and one two weeks before calving.

In marginally deficient areas such as New York State, Dr. Robert Hillman of the Department of Theriogenology, recommends that all horses receive selenium supplementation in their feed. Additionally, on farms experiencing problems due to selenium deficiency, he recommends an injection of selenium to newborn foals.

Veterinarians suspecting selenium deficiency in a herd may send blood samples either to Dr. Francis Kallfelz in the College's Large Animal Clinic or to the Toxicology Division of the Diagnostic Laboratory which conducts selenium analyses in whole blood from domestic animals.

Dr. Kallfelz' own work would be hampered without the multiple-run testing which is possible with the glutathione peroxidase assay because he frequently performs metabolic profiles on large numbers of animals, typically 21 animals per herd. He takes samples from 7 animals that are in peak lactation, 7 animals that are in mid-lactation, and 7 dry cows and runs a whole battery of clinical chemistries on these samples. Understandably, he wants a test that is fairly rapid and relatively repeatable. The glutathione peroxidase assay is amenable to that with minimal expense.

If a veterinarian suspects a vitamin E/selenium deficiency in a dairy herd, Dr. Kallfelz generally recommends that he be sent three of four samples from peak lactation cows, mid-lactation cows, dry cows and also from growing heifers. This range of samples anticipates selenium supplementation done through the addition of concentrates to the grain mix. Generally, dry cows and growing heifers aren't fed any grain, so they won't receive supplementation. Their selenium status tends to fall during this period. When they calve, they are fed grain again, but it takes awhile for the glutathione peroxidase levels to reach normal levels. Ordinarily it is the mid-lactation cows that are in the best shape in



## Feeding for Selenium: An Unexpected Alternative

In 1979, a study\* was made of the relative effectiveness of including various feed supplements or selenium injections to increase the blood levels of selenium in cows. Ten treatment groups each composed of four pregnant Holsteins received different selenium supplementation. The methods employed included (1) single or (2) successive injections of sodium selenite and Vitamin E (3) sodium selenite added to grain—1mg./day (4) brewers dried grain (5) wheat bran (6) wheat middlings (7) fly ash—4% by weight based on 22.7 kg. daily cattle ration (8) a control for all of the preceding rations, (9) clover grown on fly ash containing 0.4 ppm of selenium based on a 22.7 kg daily dietary intake (10) a second control group fed locally grown clover containing 0.02 ppm of selenium. Brewers grains have been reported to be relatively high in selenium since they are typically grown on soils in western states containing higher available selenium. This is also true of Western grown wheat. Plants growing on soft coal fly ash have been shown to absorb greatly elevated concentrations of selenium which is available in soluble form in such fly ashes.

The basic ration for all cows included grass silage in the winter and corn silage in the spring, a mixed alfalfa-timothy hay, and grain containing corn meal (60%), crushed oats (15%), soybean meal (20%), molasses (4.5%) and salt (0.5%). Brewers grain or wheat bran or middlings were substituted for grain in the basic ration in three of the treatment groups. The grains, except for the soybean meal, silage and hay crops were all grown locally near Ithaca, New York. Soils in the Northeastern United States and therefore the crops grown on them are known to be generally low in selenium.

The fly ash used was obtained as freshly produced material from New York State Electric and Gas Corporation's Milliken Station near Ithaca, NY. This power plant burns soft coal mined mainly in Pennsylvania and the fly ash is collected in the top of the stacks by electrostatic precipitators. The fly ash was air-dried on plastic, mixed

and incorporated 20% by weight into the grain ration.

At 4% of the ration, fly ash treatment raised blood selenium more rapidly and to a higher maximum than the other treatments. Since the fly ash contained about 8 ppm selenium this would represent about 0.3 ppm selenium in the total diet. Presumably selenium is present in fly ash as soluble selenate and selenite. This would amount to about 7 mg. selenium per day based on a 22.7 kg. daily ration. Levels were about one-third higher than the levels produced by the addition of 1 mg. per day of selenium as sodium selenite. Based on blood concentrations, the now legally permitted addition of 0.1 ppm of selenium as sodium selenite to cattle rations should be adequate since this amounts to about 2 mg. per day of selenium.

This study indicates that selenium may be increased in bovine blood by employing fly ash, sodium selenite or crops containing selenium as dietary supplements or by injections. Since fly ash is usually available at no cost, its use as a selenium feed supplement would appear to be favorable. Selenium in blood and animal tissues is highly unstable, therefore regardless of the method chosen to increase selenium above a deficiency level in cattle, the treatment would probably have to be continued indefinitely at a dosage such that absorption can balance continual excretion.

\*Condensed from "Increasing Selenium in Bovine Blood by Feed Supplements or Selenium Injections", by Donald H. Lein, and George A. Maylin, both of the New York State Diagnostic Laboratory, Darwin G. Braund of Agway, Inc. in Syracuse, Walter H. Gutenmann and Donald J. Lisk of the Pesticide Residue Laboratory in the Department of Food Science, and Larry E. Chase of the Department of Animal Science, College of Agriculture and Life Sciences at Cornell. Published in the *Cornell Veterinarian*, 1980, 70:113-124.

## Shaping a Curriculum for the '90s

On October 5, 1984 the faculty of the New York State College of Veterinary Medicine voted to change the way veterinary medicine is taught. The first move toward change came last March with the formation of the Task Force for Curriculum Evaluation—a committee of faculty members charged to "examine and evaluate thoroughly and systematically the present curriculum of the College of Veterinary Medicine; to recommend a curriculum suitable for the next decade, to identify past impediments to curricular reform and incorporate in their proposal specific means whereby such impediments could be overcome in the future; to propose an effective means of implementing the recommended course of action; and to recommend changes in the objectives and composition of the curriculum committee". This Committee's report, hammered out over a long and exhaustive eight months of meetings, research and discussion, has now altered the four years of professional training for a DVM degree.

### The Problem

The Committee began by acknowledging that veterinary medical information has grown dramatically in the last decade, and that it will continue to grow at an ever increasing rate as research in all fields progresses. New techniques, equipment, diagnostic tools, vaccines, drugs, even new viruses and diseases challenge today's veterinarians. How can our Veterinary College ensure that its graduates are prepared to meet this challenge as competent and critical practitioners?

Before making any recommendations, the Committee surveyed the classes of 1981-1985, and reviewed a similar survey of the classes of 1977 and 1979 taken in 1979. Two hundred ninety-seven completed questionnaires were tabulated. These included opinions about the relative emphasis on various subjects, species and categories; responses to a number of statements about the nature of veterinary education; and free-text comments. Almost one hundred employers of recent graduates were asked to comment on the overall preparation of our students and their strengths or weaknesses. The Task Force also met with the State Board of Veterinary Examiners to ask their opinion on our students' overall preparation.

### The Conclusions

Several conclusions were drawn from the Committee's research.

1. The overall preparation of our students is good.
2. There is a need for much better coordination among courses.
3. The clinical applications of the basic



4. Examinations in general and the recall of isolated facts in particular are over-emphasized.
5. The education is too passive, requiring too little hands-on experience, outside reading and critical analysis.
6. The workload is imbalanced; too many courses are given simultaneously in all years, with too much course material receiving too little attention.
7. A sound elective program is needed to round out our students' education and complement the core curriculum by providing additional training in certain fields. However, the core-elective curriculum will be effective only if electives are considered an integral part of the teaching program. Elective courses must be specifically designed to augment the core, adequate time must be reserved for elective study, and there must be increased emphasis and recognition for teaching in both the elective and core curriculum.

### The Guidelines

Certain principles were identified and accepted as guidelines for professional education. First, the overriding emphasis in every course should be for the student to be able to use the subject matter. There was no wish to turn out students proficient merely at recalling quiz answers—they should be required to demonstrate their ability to explain and apply the subject to practical problems in veterinary medicine.

The second goal was to provide opportunities for students to work with course material in ways other than just attending lectures. Students must be able to integrate and interpret information. Teaching formats that encourage thought, reasoning and discussion will need to be developed.

Third, the volume of material and the time available for using it must be in balance. Class schedules should be planned so that lectures are interspersed with labor-

atories, discussions, and other instructional methods. Four back-to-back lectures ruin the concentration and interest of even the most dedicated student. With that in mind, course descriptions and schedules ought to accurately communicate the nature of the course to other faculty—rather than be lumped into the "lecture" or "laboratory" category. Alternatives to straight lectures including discussions, case studies and seminars should be encouraged.

Finally, independent study should receive increasing emphasis over the four years of the professional curriculum. Students must take the responsibility to think, question and read for themselves, acquiring those habits which will make them better students and professionals. Teaching methods which more actively involve the student in his or her education must be employed in all years, but should be given special emphasis in the third and fourth year. Outside reading, as practiced by conscientious veterinarians in the field, should become a habit while students are in school.

Because examinations have a profound effect on the way students study and what they learn, an Ad Hoc Committee on Examinations was formed. This committee is charged to review the nature of examinations now given in the College and to explore ways to make them more effective.

### The Proposed Curriculum

The Curriculum Task Force endorsed the concept that the College continue to provide a broad-based veterinary education, but recommended that students have the opportunity to gain additional knowledge and skills in one or more areas of interest.

Specific changes in the curriculum included assuming no semester or University calendar constraints, allowing variable course lengths, and using all or part of the January break for instruction.

Better sequencing and coordination can be achieved by not requiring all courses to run a full semester. For example, in the first year, first semester, a five-week block on Cytology is given at the beginning of the year to form the basis for a 10-week block of Cellular Physiology, while Foundations of Clinical Sciences runs the full 28 weeks. This staggering also reduces the number of courses students must take simultaneously allowing more concentration on each subject.

All lectures will be 50 minutes in length with 10 minute periods between lectures. Classes end by 4:30 to allow students to attend college rounds and University lectures.



Formerly, electives were completely optional. Now two credit hours of selective study are required in the first year and four in the second and third years. As at present, four credits (weeks) of selective rotations will be required in the fourth year. Seniors will be encouraged to spend part or all of these elective rotations in externships in private practices or other institutions (see below).

The period from 8:00-10:00 a.m. on Mondays is reserved for examinations. In weeks in which no examination is scheduled, this period will be used for special topics. In general, the 8:00 a.m. periods on Tuesdays, Wednesdays and Thursdays and 2:30-5:00 p.m. on Wednesday afternoon are reserved for selectives. The first three weeks in January can be, but do not have to be, used for selective study. The use of the January break for selective study is viewed with special enthusiasm since it will make it possible to bring outside speakers to Cornell to offer courses in fields in which we lack expertise or personnel. It also opens the possibility of alumni participation in these courses—which would benefit students, faculty and practitioners alike.

The most significant changes are in the introduction of first year students to the "clinical track"; they'll begin to acquire the manual and mental skills they'll need throughout their education. Emphasis will be on relating basic anatomy and physiology to physical examination. Animal genetics and basic nutrition (for those students without sufficient background) will also be added.

In the second year, the "clinical track" will continue to stress the interdependence of clinical and basic sciences. General surgical techniques will be incorporated into the general medicine course to give students exposure to these skills before they begin third year surgery. There will also be increased instruction in clinical pathology, coordinating with special pathology and general medicine. Courses covering bacterial, viral, and mycotic diseases of domestic animals including zoonoses and foreign animal diseases will be combined



for the first time and taught as a comprehensive course in infectious disease.

In the third year, radiographic techniques will be taught as a separate short course, with radiographic interpretation integrated into the medicine and surgery courses. Large animal medicine and surgery will be taught as an integrated unit to coordinate discussions of the medical and surgical management of the diseases of each organ system.

The fourth year remains 28 weeks of required clinical rotations with 4-8 weeks of elective rotations. Students will be strongly encouraged in the future to take externships as necessary exposure to real-life practice. The Fourth Year SubCommittee, with suggestions from the State Board of Veterinary Examiners, is compiling a list of competencies that all senior students will be expected to acquire before graduation.

### Selectives

Selectives, or required elective credits, will be specifically designed to augment the core curriculum. Since there is more known in each discipline than can, or should be, covered in the core curriculum, these selectives will offer students the opportunity to acquire additional in-depth knowledge. For example, selectives may include: Veterinary Animal Behavior, Acid-Base Relations, Wildlife Pathology, Embryo Transfer, Management and Diseases of Goats, Dairy Herd Health, Pet Bird Medicine, Advanced Gastroenterology and Oncology.

Some curriculum changes will be phased-in beginning in the Spring of 1985 and, with minor exceptions, the new curriculum will be in place for the Fall semester of 1985. By Fall 1986, all changes should be in effect. The new direction our curriculum takes is part of a continuous process of educational review and revision designed to adapt our teaching to evolving needs and make our students the best prepared veterinarians in an ever more competitive world. Any questions on the new curriculum should be directed to the Standing Curriculum Committee, New York State College of Veterinary Medicine, Cornell University, Ithaca, New York 14853.

### Zehnder The Cat

Zehnder The Cat is either very lucky—or he has nine lives—for the simple reason that he's survived misfortunes other cats would have found fatal. Luck or longevity, his start in life was anything but propitious. He was eight weeks old when a cow stepped on his leg and cut short his career as a barnyard mouser. The farmer couldn't use a three-legged cat but as luck would have it, a student, Linda Jorgesen, was willing to adopt the kitten.

Seven years passed. Linda Jorgesen, the student, became Dr. Jorgesen, the veterinarian, and Zehnder grew up to be an affectionate, intelligent and remarkably mobile cat. Unfortunately, Zehnder's happily-ever-after life suffered a plot change the day Dr. Jorgesen noticed her cat's abdomen was swollen. Palpating the area, she discovered Zehnder's kidneys were enlarged. Ominously, there was blood in his urine and he had stopped eating. In a non-surgical procedure, Dr. Jorgesen inserted a sterile needle through the body wall and into the kidneys, removing a minute sample of tissue for examination. Biopsy revealed that Zehnder was in the advanced stages of lymphosarcoma or cancer of the kidneys. The worst of the bad news was that his kidneys were already failing; Zehnder's prognosis was poor.

Cancer therapy for animals is very similar to human cancer therapy. The dosages of cancer-fighting drugs administered to animals are lower than those given to humans, allowing for differences in size and physiology, but the chemotherapy drugs are essentially the same. Dr. Jorgesen chose to begin Zehnder simultaneously on pills and intravenous injections of vincristine sulfate and cyclophosphamide.

Shortly afterward, Dr. Linda Jorgesen began an internship and then a residency in medicine at the New York State College of Veterinary Medicine's Small Animal Clinic and Zehnder's treatments continued here.

Although Zehnder's return to health was of first importance, there was concern about possible side-effects from the chemotherapy. Normally, cats on this type of medication do not have many side-effects, and Zehnder responded to therapy by regaining his lively disposition and appetite. But to his obvious mortification, Zehnder's beautiful black fur fell out in patches. This is an unusual side-effect in cats, who may lose their whiskers and the guard hairs from their coats but rarely all of their hair. Despite this cosmetic setback, check-ups and blood tests every month confirmed

progress. The cancer, although in an advanced stage, went into remission during the first month of treatment but, to prevent recurrence, chemotherapy continued for a year with treatments every two to three weeks on an out-patient basis.

Zehnder's chemotherapy treatments ended nearly five months ago, and today the cancer remains in total remission. His whiskers and fur have grown back and, except for a new dislike of blood tests, Zehnder seems as good as new. In the end, he is a lucky cat who owes his recovery, not to a magnanimous fate, but to the love and perseverance of his veterinarian-owner and the first-rate veterinary care he received.

### Grants & Research at the College

**Emmett N. Bergman**, Professor of Physiology in the Department of Physiology, New York State College of Veterinary Medicine and the Section of Physiology, Division of Biological Sciences, has received a grant of \$199,979 for the next 12 month period from the National Institute of Arthritis, Diabetes, Digestive & Kidney Diseases. His project concerns carbohydrate and ketone body metabolism. Over the next year, he and his associate, Dr. Joseph P. McCann, will continue to investigate branched-chain amino acid metabolism in the sheep and the effect of insulin on these processes. The differences between lean

and obese animals in leucine turnover and insulin responses is also under investigation. Drs. Bergman and McCann plan to calculate the oxidation and conversions of the amino acids, glycine and serine, for the whole body, gut, liver, hindquarters and kidneys.

**Joanne E. Fortune**, Assistant Professor of Physiology, receives \$96,432 in the second year of a 4 year grant from the National Institute of Child Health and Human Development to study the "Regulation of Ovarian Follicular Estradiol Production". Dr. Fortune will identify factors and conditions that regulate estradiol synthesis in ovarian follicles. Estradiol is the dominant steroid product of developing preovulatory follicles and continued estradiol secretion is essential for follicles to reach ovulatory status. Recent investigations in several species have led to formulation of a two cell, two gonadotropin model of the regulation of estradiol production. According to this model, LH stimulates theca cells to produce androgen and FSH stimulates granulosa cells to aromatize androgen to estradiol.

This proposal is designed to investigate further interactions between gonadotropins and follicle cells and interaction between theca and granulosa cells that promote follicular androgen and estrogen production.

**George Lust**, Professor of Physiological Chemistry at the James A. Baker Institute for Animal Health, and Research Associate **Nancy B. Wurster** have received \$72,916 from the National Institute of Arthritis, Diabetes, Digestive & Kidney Diseases to study "Collagen Metabolism in Osteoarthritis". Their research will document changes associated with the early state of osteoarthritis in dogs and identify factors which modify the disease. They will also examine collagen metabolism and focus on the accumulation of fibronectin, a major noncollagenous protein, in focal areas of fibrillated cartilage. The origin of this protein will be investigated and also why it accumulates. Another, but related, aim is to establish whether explant cultures of normal cartilage alone or in co-culture with synovium, can be induced to mimic the osteoarthritic state.

## CALENDAR

### 1984

December 8 — Cornell College of Veterinary Medicine Alumni Gathering in Fort Lauderdale

December 11 — National Board Examination

### 1985

January 15-17 — Annual Conference for Veterinarians at Cornell

1st Week of February — Applicant Interview Notices Mailed

## International Seminar Reports on Equine E.T.

An *International Seminar on Equine Embryo Transfer* was held at Cornell from October 8-10, 1984. Conducted by the Dorothy Russell Havemeyer Foundation, Inc., the seminar was organized jointly by Dr. D. F. Antczak of the James A. Baker Institute for Animal Health at Cornell's College of Veterinary Medicine and Dr. W. R. Allen, Director of the Thoroughbred Breeders' Association Equine Fertility Unit, Animal Research Station, in Cambridge, England.

The Seminar was the first meeting devoted exclusively to embryo transfer in horses and marked 10 years of progress in the use of this important technique. Over sixty research scientists, veterinarians, and physicians from 8 countries attended the 3-day meeting, including representatives from universities, research institutes, zoological parks, private veterinary practices, and commercial embryo transfer units. Director of the San Diego Zoological Society, Dr. Kurt Benirschke, delivered the keynote address on the first day of the seminar. Dr. Benirschke has a long-standing interest in the genetics of the horse family, which includes zebras and the endangered Przewalski's horse.

Highlights of the Havemeyer Foundation Seminar included reports of new methods for the hormonal preparation of embryo recipients and advances in non-surgical transfer methods. These new methods should decrease the cost of embryo transfer in the horse and thereby increase its commercial application.

Research presented during the seminar supported growing hopes that embryo transfer will find increased application in horse breeding in the future. E.T. is already an important research tool in reproductive physiology; however, the lack of cost-effective techniques for superovulation, such as are available for embryo transfer in cattle, means that equine embryo transfer is a laborious, expensive process. Continuing improvements in embryo transfer and the high value of certain donor mares are convincing many horse breeders that the procedure is worth the effort and expense in many cases.

Of particular significance were reports of births of zebra and Przewalski's horse from surrogate domestic horse mothers which had received transferred embryos. These births followed pioneering work in cross-species embryo transfer by Dr. Allen in Cambridge. Cross-species embryo transfer of this type is a valuable research tool for investigation of maternal-fetal interactions and also has practical application in the preservation of endangered wild species.

The Proceedings of the Seminar will be published in early 1985 in book form as a supplement to the *Equine Veterinary Journal*. The Embryo Transfer Seminar was the fourth in a continuing series of small conferences on selected aspects of equine medicine organized on a yearly basis by the Havemeyer Foundation.



Between June 5 and August 12, two Thoroughbreds and one donkey were born at Cornell to three mule surrogate mothers which received transplanted embryos between June and August of 1983. The donkey, Barbarito, is the first to be born to a mule mother using embryo transfer techniques.

Veterinary  
Viewpoints

The New York State College of Veterinary Medicine  
Cornell University  
Ithaca, New York 14853

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