After racing or a demanding work-out, many horses will have blood in their airways. Most of the animals show no outward evidence, though some may have blood in their nostrils. For many years it was thought that the condition affected only a small number of horses. It was speculated that the bleeding occurred in the nasal cavities. In the early 1970s a study was published in Britain by Dr. W. R. Cook. He suggested that the blood originated in the lungs. As the flexible fiberoptic endoscope became available to veterinary medicine, the upper airways of horses could be examined. It was discovered that a large number of animals had evidence of bleeding after racing or work-outs. The disorder was named exercise-induced pulmonary hemorrhage (EIPH).

Dr. Corinne R. Sweeney and Dr. Lawrence Soma at the University of Pennsylvania School of Veterinary Medicine have studied EIPH in a large number of horses at Pennsylvania and New Jersey race tracks. The initial studies were conducted in 1980, and 191 Thoroughbred horses were examined within two hours of racing. In 147 horses endoscopic evidence of bleeding was found, 13 of which had blood in the nostrils. An additional 107 horses were examined after training “workouts” and it was found that 41 showed endoscopic evidence of bleeding, while only one horse had blood in the nostrils. The researchers then examined horses after steeplechase, flat turf, and timber races and found that a large number of these animals, too, showed evidence of EIPH. It was found that a relationship existed between the age of the horse and the distance raced. Older horses bled with greater frequency, and as the distance raced increased the likelihood of bleeding was greater.

Dr. Soma indicated that the cause of EIPH is unknown. “It occurs in race horses when high speed is demanded in a short period of time,” he said. “It has not been found in horses which cover long distances, such as 50- or 100-mile endurance races. When maximum performance is demanded by racing, the increase in resistance to the flow of air may contribute to pulmonary hemorrhage. One theory is that in horses with EIPH the small airways which terminate into the minute alveoli (air sacs), which handle the gas exchange in the lung, may be partially obstructed. When the horse is breathing hard during racing, these small terminal airways may collapse during exhalation and not reopen during the next breath. The consequence of this is that the alveoli (air sacs) will not re-expand during this inhalation. Because of this unequal expansion of the lungs, an undue stress may be placed on lung tissues causing small capillaries to break. The higher blood flow through the lungs may also contribute to the capillary rupture.” The bleeding usually subsides and the horse shows no signs of illness. EIPH cannot be detected by listening to the horse’s lungs. Rarely though, there is a horse which will have massive pulmonary hemorrhage and die.

Trainers feel that EIPH does affect the performance of a great number of horses, and they are looking for ways to prevent bleeding.
EIPH in Race Horses
continued from page 1

...are looking for ways to prevent bleeding. In view of the stringent drug regulations at race tracks, only one approved drug can be administered. Drs. Sweeney and Soma have studied a number of bronchodilators to determine whether bleeding could be prevented by reducing resistance to gas flow in the lung. In a small experiment, known bleeder horses were given four different drugs during separate trials. When atropine was administered one hour prior to training, the occurrence of bleeding decreased.

When cromolyn was administered, no change in the incidence of bleeding occurred. Ipratropium was given to two of the horses and stopped the EIPH on almost all occasions.

Ipratropium and cromolyn are bronchodilators. The former drug is injected while the latter is inhaled. Cromolyn is not a bronchodilator: it is believed that it prevents constriction of smooth muscles in the airways. Later the two researchers studied a large number of horses with EIPH to determine the efficacy of furosemide and of hesperidin-citrus bioflavonoids.

In another study Dr. Soma and his associates examined the effects of furosemide on the racing times of horses with EIPH. The horses were confirmed bleeders and were grouped according to three methods used to diagnose EIPH: group one, observation of pulmonary hemorrhage at the nostrils within one hour after a work-out or race; group two, observation of pulmonary hemorrhage only by endoscopic examination after a race or work-out; group three, observation of hemorrhage at the nostrils during a race or immediately after a race. There was a control group of horses, selected randomly from the animals running during the study period. These horses were not bleeders. For the statistical analysis the value of the horses was also taken into account. Horses were studied for five races prior to being admitted to the bleeders program, when they were not given furosemide. They then were given the drug prior to races 6 through 10 based on the rules of racing. The researchers did not find significant differences in the racing times in all groups. However, it was found that the higher valued horses in the group which showed gross evidence of hemorrhage while racing and the horses diagnosed by endoscopic examination had a progressive reduction in racing times during races 1 to 6, followed by an improvement to prior performance during races 6 through 10 when furosemide was administered. The effect of furosemide appears to be more pronounced in the faster horses and in horses in which a reduction in racing times was evident. The researchers also found that

EIPH may be incapacitating in some horses, manifested in reduced racing times. The study revealed that furosemide does not produce an improvement or return to previous performance levels in all horses. nor does EIPH affect all horses uniformly.

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Common Health Problems in Goats and Sheep

Feta and other goat cheeses are "in," goat's milk can be bought in health food stores, and hand knit, woolen sweaters are very much the fashion as are sheepskin coats. It is not surprising that more people are raising sheep and goats, not on the range, but on small farms near urban areas. Between 1978 and 1984 the membership in the American Dairy Goat Association increased by 110 percent.

These small farmers learn, often the hard way, that keeping and raising such animals for profit is not an easy task. Sheep and goats require care, and they have diseases and parasites with which, left untreated, production of milk and wool, but unlike the dairy, or cattle farmer, sheep and goat owners frequently have problems finding proper veterinary care. "Sheep and goats are sort of in between the small and the large animal practice," explained Dr. Wendy Vaala, lecturer in large animal medicine at the University of Pennsylvania School of Veterinary Medicine. "Often neither the large nor the small animal practitioner will call at a sheep or goat farm. Also, it is a matter of economics for the farmer. He cannot afford expensive procedures. Therefore, owners seek veterinary assistance infrequently. Traditions and lore have been handed down and people try to take care of these animals themselves. "In recent years though, students at the School have shown quite an interest in sheep and goats," said Dr. Vaala, "and we do try to expose them to these species as much as possible."

Health problems often begin at birth. "Many lambs are lost due to hypothermia," she explained. "They get chilled, the glucose level is low, they refuse to nurse and die. If something isn't done quickly, they are lost." She said that each January to March, preparations are made in the neonatal unit at New Bolton Center to help owners save these young. "We freeze colostrum and ready the facility to be able to warm up these animals on short notice. Colostrum is vital as it protects the youngsters against infectious diseases during the first weeks of life." She explained that difficult births are common in sheep because of the large number of twins. "Often one of the pair is weak and susceptible to hypothermia." Multiple births are responsible for another disorder, pregnancy toxemia. Late in pregnancy the ewe becomes listless, shows a lack of energy and refuses to eat. She becomes toxic. To save the lambs, the ewe has to be force-fed during the final part of her term and a C-section has to be performed. Goats rarely have pregnancy toxemia.

Newborn lambs and kids are susceptible to infection. "The navel cord has to be dipped in iodine," Dr. Vaala said. "If that is not done shortly after birth, the animal can develop septicaemia and die." Also, it is important to vaccinate the ewe or doe one month prior to delivery against tetanus, clostridial diseases and enterotoxemia. "A lot of people don't want to bother, particularly with the tetanus vaccination," she said. "But to protect the newborns, it is vital that the dam has a high titer against these diseases. It provides the newborns with passive protection for the first weeks of life."

Tetanus protection is needed because at two weeks of age, kids are dehorned and castrated and lambs have their tails docked and are castrated. The tetanus organism is present in the environment and can easily infect the animals through the wounds caused by the procedures. If the dam did not receive a recent booster vaccination, lambs or kids need tetanus antitoxin at the time of dehorning, docking and castration. Kids and goats, like puppies and kittens, need vaccinations. Two sets of vaccinations are given at age four and six weeks and repeated annually.

Some people don't like to dehorn goats at this young age. "Dehorning an older animal is difficult," said Dr. Vaala. "Often one doesn't get all the horns. Also, goats can develop sinuitis when the procedures are done after horns have formed."

Goats and sheep are susceptible to nutritional diseases. Care must be taken that they are fed a proper diet. In this area the ground can be Selenium deficient. "If feed is produced locally or is homemade, it should be supplemented with vitamin E and selenium," Dr. Vaala said. "This is particularly important for pregnant animals." Selenium and vitamin E deficiency in pregnant ewes and does cause white muscle disease in the offspring, occurring at about two to four weeks of age.

The young animals will still and will have difficulty nursing and sudden death can occur due to heart failure. To prevent the disorder, kids and lambs should be given selenium and vitamin E between the ages of two and four weeks. Goats and sheep need access to a salt lick: a sheep salt lick should be provided. A cow salt lick is not feasible as it can cause copper imbalance. The animals need water for drinking. Goats will drink only clean water and in the winter it should be warmed to entice them to drink.

Lambs, after weaning, can develop Enterotoxemia Type D (overeating disease), which is due to a toxin produced by a proliferation of bacteria in the intestines. It most often affects lambs in feedlots. Death is sudden. The disease can be prevented by changing feed gradually. Young animals of both species frequently have gastrointestinal diseases. Coccidiosis is common, particularly in overstocked areas. To minimize it, feed should be kept off the ground so it cannot become contaminated with manure. A number of gastrointestinal disorders are due to clostridial bacteria, thus vaccination is very important to prevent illness. Goats and sheep can become infected with Johne's disease, although it is more common in the goat population. All these diseases weaken the young animals and if left untreated, can affect the growth rate or cause death.

Parasites are a major cause of illness in young sheep and goats, particularly strongyles, a blood

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A Veterinarian's Observations on the Airline Transport of Dogs

Dr. Walter M. Woolf (V'60), founder of Air Animal Inc., a pet travel agency in Tampa, FL., discussed the intricacies of transporting animals by air.

Since 1969, when Dr. Woolf first began to arrange air transportation for animals, he has reserved "seats" for species ranging from armadillos to worms. The largest number of travelers are family pets belonging to owners who are relocating. Woolf's agency sees to it that pets are safely housed once the family begins the move, that they are placed on the proper plane, and that they reach their destination in the shortest possible time.

Dr. Woolf discussed the different types of aircraft and pointed out where family pets are housed aboard the planes. He explained that animals travel in the bulk bin, a heated, air-conditioned and pressurized space. The animal crates are placed in such a manner that there is plenty of air circulating around them. They are held in place with sandbags and cargo nets.

Nothing is stored atop a crate and this is the reason shipping a dog or a cat is so expensive. One pays for the airspace around the container. Today, USDA rules prescribe the proper size as well as the construction of animal crates. He did recommend that for international trips a crate one size larger than one used for domestic travel should be purchased as the animal will be in transit longer. He recommended that the animal be acclimated to the crate for a few days prior to the trip. He suggested that the dog or cat spend some time each day in the crate to become familiar with it. For bedding during the trip he recommended shredded paper. He felt that foam pillows are not suitable.

He also recommended that the animal receive neither food nor water for four to six hours prior to the trip. "It won't hurt the animal to travel with an empty stomach," he said. "And it will be more comfortable that way. When it reaches its destination it can eat again."

To travel by air, animals need health certificates and current vaccinations. As each state and country has different regulations, it is best to check about the requirements before taking the pet to the veterinarian for vaccinations and a health certificate. If the animal is to be shipped abroad, one should find out about the requirements from the airline or the consulate of the foreign country.

Dr. Woolf is opposed to tranquilizing cats or dogs prior to shipping. "A tranquilizer affects the respiration rate of the dog or cat and serious problems can arise," he said. "An aircraft is pressurized to about 8,000 feet, so what you are doing is taking a relaxed animal and putting it into relative oxygen insufficiency. If it starts to struggle and breathe hard, you will have a prob-

lem." He feels that many deaths of pets during air travel can be attributed to the use of tranquilizers.

He explained that airlines are very careful when handling animals and that they are treated as a priority shipment. "They are the last to board and the first to be unloaded."

He also suggested that when planning to ship a dog which requires a large crate, one should check with the airline whether such a crate can be loaded. "The dimension of cargo doors are different for each airline," he said. "You may be able to send your great Dane to California aboard a Delta 727, but you may not be able to return it aboard a TWA 727 because of the differing dimensions in the cargo doors."

According to Dr. Woolf, air travel for animals is safe and fast. "You can transport horses, cattle, chickens, tigers, dogs, cats, fish, or any other species," he said. "The airlines will accommodate these animals and get them to their destination quickly and safely."
Commonly Encountered Skin Problems in Dogs

Common skin problems were the topic of Dr. Robert Schwartzman. He prefaced the discussion by advising the audience that in many cases skin problems have a genetic basis. "Don't breed those animals which have repeated episodes of skin trouble, you will just continue the problem."

Hot spots (moist eczema) are common, particularly in longer coated breeds. "Usually the underlying cause is fleas or impacted anal glands," he said. "The animal feels uncomfortably and begins to lick the affected area. This constant 'worrying' causes a lesion and in a very short time a weeping over will develop." Treatment involves clipping and cleaning the area, preventing the dog from licking it, and eliminating the underlying cause. In this area, hot spots appear to be seasonal, mostly in the spring and summer.

Sarcoptic mange (scabies) was the next disorder discussed. It is caused by a small mite which lives on the surface of the skin. Dogs with scabies are extremely uncomfortable and scratch continuously, causing lesions. The disease has a very characteristic distribution pattern. Usually it begins around the ears and affects the neck, belly, and sometimes the legs. It is not a difficult disorder to cure, although diagnosis is sometimes difficult. Scabies is contagious to humans, and Dr. Schwartzman said in 30 percent of the cases the owner is also affected.

Cheyletiella is another mite which affects dogs. Animals with this large organism have a lot of flaking, scaly skin and appear to be covered with dandruff. This mite primarily affects young puppies and is contagious to other animals. If a dog has been diagnosed with Cheyletiella it is important to treat the environment to eliminate the mite, which can live in nature for quite a while, reinfecting the dog.

Another disease caused by mites, demodic mange, is quite serious. The mites causing this disease are present on the skin of dogs, cats, man, and other species and normally do not cause any trouble. However, in some dogs they suddenly begin to multiply, causing hair follicles to rupture and allowing bacteria to enter. This begins a cycle of skin infections. "There is a genetic predisposition and animals which have had demodic mange should never be bred." He said that the disease takes two forms, either benign, where small localized patches of hair loss occur which often disappear spontaneously, or as generalized disease. The latter is the more serious form as self-cure does not occur and secondary infection is common. Diagnosis is made by scraping and looking for the mite under the microscope. The disease affects mostly younger dogs. Treatment has improved over the last ten years though it is lengthy. Dogs need baths to kill the mites and antibiotics to clear up infections. Dr. Schwartzman said that products now available are about 70 percent effective.

Seborrhea is another difficult disease to treat in dogs. "It is an internal disease," he said.

National Brands, Generics, and Specialty Dog Foods

Today's pet owner is confronted by a bewildering array of dog foods when shopping in the supermarket. Products range from canned "dinners" to dry or semi-moist foods for puppies, performance dogs and older dogs. Everything is attractively packaged and relentlessly advertised as "the best." The price conscious shopper can forego fancy wrappings and buy store brands or generic dog food. Those who attend dog shows are further confused by an additional selection of special foods, ranging from growth diets to "natural" foods.

Which then is the food for one's dog? "That depends," said Dr. David S. Kronfeld during his discussion. "If Bowser spends his days on the couch, his requirements will be different from those of a dog which hunts, is being shown or which races." He then explained that dog food manufacturers are governed by guidelines issued by the National Research Council. "NRC guidelines used to be the standards manufacturers have to adhere to," he said. "Recently they were changed from 'adequate' to minimum requirements of available nutrients on a caloric basis. The protein requirement, for example, dropped from 22 percent to 10 percent. Whether an animal will thrive on such a diet is another question."

He explained that nutritional scientists and dog breeders look at dog food in different ways. "Scientists have been concerned with minimum nutritional requirements, while breeders want a diet that will enable a dog to reach its maximum potential as a specimen of the breed and as a performer."

The cost of the food also plays a role. If money were no object, dogs could be fed organ and muscle meat as a protein source instead of the cereal based feeds. "Economies dictated the use of grain in dog food," he said. "Cereal proteins are inexpensive and the dog, while basically a flesh eater, has adapted more or less to a grain diet, provided it is carefully supplemented with high quality protein, fat, vitamins and minerals."

"Usually these animals have an underlying problem, like low thyroid values, liver dysfunction, adrenal tumors or other metabolic or hormonal problems." Before the condition can be cured, the dermatologist must identify the underlying causes. Affected animals show excessive scaling of the skin, oily or waxy coats and they often have an odor. Frequently this is a secondary skin infection. Treatment is prolonged and, unless the underlying cause can be identified, often frustrating.

Dr. Schwartzman pointed out that most skin infections in dogs are caused by the Staphylococcal organism and that such infections are quite common. He did mention that skin infections can indicate that an animal is not in top condition, "It is impossible to infect healthy skin, so we must ask why did this happen."

Often the answer remains elusive.

One of the most frequently occurring skin infections is due to flea bite dermatitis. "It is characterized by a disease of the lower back area," he said, "It is seasonal, July to October, though in some cases we see it in other months too." The cause of this disorder is flea bites and an allergy to the saliva, eggs, and feces of the animals. Itches and scratches intensely and bacteria enter the lesions, infection begins. The disease occurs most frequently in dogs five to nine years of age.

To cure it, fleas must be eliminated from the environment. That often is difficult as many products can kill adult fleas but will not affect the eggs or larvae which are in carpets, cracks or bedding. "If you have a dog with flea bite dermatitis, it would be a good investment to have an exterminator treat the house. Do you have chemicals which will kill the eggs and larvae?" Dr. Schwartzman feels that flea collars, shampoos or dips are only of limited value. He did caution the audience to not put any insecticide on a dog that has sores.

During the question-and-answer period he was asked about shampoos for dogs. He recommended baby shampoos and Selun-blue. Asked about flea remedies he said that powders in his view are better than sprays as they have a residual effect. As to the question whether dietary supplements can act as repellents, he felt, despite the publicity for certain vitamins and compounds, that these are of little help.

Dr. Schwartzman is professor of dermatology and Chief, Section of Dermatology.

Even so, the cereal ingredients are not without drawbacks. Some of the plant ingredients utilized in dog foods interfere with absorption of minerals. It is known, for example, that soy products contain goitrogen, which depress thyroid action; they also contain other substances which bind up calcium. To counteract this effect, manufacturers add abundant calcium, which may diminish absorption of copper and zinc or block iodine uptake in the thyroid gland. These interactions are involved in the "generic dog food disease," it has been found that dogs fed generic foods exclusively can grow poorly, develop anemia or skin disease.

Cereal foods have to be cooked to make them digestible for the dog. This partially destroys nutrients. Also, preservatives added to dog food can influence health. Dr. Kronfeld pointed out that certain semi-moist foods contain high amounts of acids and that recently such acids have also been added to dry foods. Another substance, propylene glycol, also a preservative, can damage red blood cells.

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Dog Foods

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The picture is further complicated by the fact that the formula for dog foods changes, depend-
ing on the availability of the ingredients, in an effort to keep the cost low. “You may be buying
the same brand, but the ingredients are different in each part of the country and the dog must
adjust.”

Discussing the minimum protein content of 10 percent established by the new NRC guide-
lines, Dr. Kronfeld pointed out that many studies have shown that dogs need 25 to 30 percent
protein in their diet to grow properly. An even greater amount is required to cope with stress.

What can the consumer do to ensure that his dog eats the proper diet? According to Dr.
Kronfeld, he first should look at the animal to ascertain whether it is in prime condition. Is the
coat glossy and dense, is the animal alert? Is the coat dark and dense? Large amounts of stool,
foamy, pale or in the color of the food, indicate poor digestion. The consumer should also look at
the list of ingredients to find out the amount of protein. “When comparing foods and quanti-
ties, keep in mind that the expanded foods contain a large amount of air and are bulkier than
kibbled foods.” He also mentioned that breeds with a predisposition to bloat should not be fed
expanded food dry, that is, it should be soaked to minimize the amount of air ingested.

The nutritional value of most expanded dog foods can be enhanced by the addition of meat
or eggs and milk. “Eggs and milk provide the right amino acids to improve protein quantity, as
well as trace minerals and vitamins. If you want to add this, introduce it slowly to give the
dog’s system time to adjust.” Another alternative is to feed a fixed formula diet. These are more
expensive but denser, and dogs generally eat less.

He was asked about vitamin supplementation and responded that the national brands of
dog food contain adequate amounts, making supple-
tmentation superfluous. He warned against supple-
tmentation with minerals, especially calcium, explaining that this would do more harm
than good.

In closing Dr. Kronfeld mentioned that the consumer dictates what is offered for sale by
the feed companies. “A few years ago, a very high quality food based on our sled dog studies was
test-marketed. It did not sell and was with-
drawn. People perceive the current products as adequate.”

Dr. David S. Kronfeld is Elizabeth and
William Whitney Clark Professor of Nutrition
at the School.

Update on Blood Diseases

Dr. W. Jean Dodds provided an update on
blood diseases. She discussed three groups of
disorders, acquired and inherited bleeding dis-
orders, and immune-mediated blood diseases.

Two disease states that produce bleeding dis-
corders in all mammals are poisoning by rodenti-
cides and liver disease. Dr. Dodds explained
that the problems are caused by the ingestion of new substances. These rodenticides are 20 to 100 times more toxic per unit ingested than the previously used compounds. Effects are longer lasting. The half life is up to six to eight weeks compared to 24 hours with the older poisons.

This means that treatment to save an affected animal must be continued for a long period of
20 years, after the first 10 generations. A quarter of your stock will still carry it. Dominant
genes can be eliminated quickly. But if you breed animals which show the trait it will be eliminated in one generation. Incompletely
Drosophila melanogaster is a better model than humans because of its short reproductive cycle. The experiments are performed with an unbiased statistical design, which is not possible in humans.

Dr. Dodds then discussed inherited bleeding
disorders. drill, the most dangerous serious problem.” she said. “The animals can be fine
for years and then suddenly have an episode
of hemophilia.

Expression of VWD varies in severity. “It is a disease with high morbidity and relatively low
mortality,” she said. “The animals can be fine
for weeks and then suddenly have an episode
of hemophilia.” She also mentioned that VWD and the condition have recently been seen
in cats.

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Dr. Dodds then discussed inherited bleeding
disorders. Animals, like man, can have hemo-
philia and von Willebrand’s disease. Hemoph-
ilia A, a clotting factor VIII deficiency, is
found in most breeds of dogs and it is an
X-chromosomal-linked recessive trait. Manifesta-
tions of hemophilia occur primarily in males.

Females carry the trait and transmit it, on aver-
age, to half of their sons, while half of their
daughters will carry it. The disease varies in
severity from mild to severe. Generally, the
larger the species or animal, the more severe the
manifestations. Hemophilia A has a very high
frequency in certain breeds, particularly in rare
breeds or in those where much inbreeding or
linebreeding to a few individuals has taken
place. Two disease states that produce bleeding dis-
corders in all mammals are poisoning by rodenti-
cides and liver disease. Dr. Dodds explained
that rodents have evolved a genetic resistance to compounds. Now that the new generation of rodenticides is being distributed to veterinar-
yans nationwide to acquaint them with the
changes in the nature and effect of these rodenti-
cides already widely used by exterminators.

Rodenticides affect production by the liver of
vitamin K-dependent clotting factors. However,
there are other diseases which can interfere with
the clotting factor production of that organ. If
the liver is diseased or inflamed, clotting factor production can be inhibited, causing bleeding
disorders. Also, if the animal has hepatitis, the
blood vessels in the liver can thrombose (actively clot), thereby utilizing these factors
which then will be in short supply in other parts of the body.

Clotting factors are also affected by drugs.
“Most abused drug, aspirin, is a potent
inhibitor of platelet function,” she said. “The
standard human adult dose of two aspirins
every few hours can inhibit platelet function for
to five days. If you give aspirin to a dog
with bleeding tendencies you can cause a more
serious problem.”

Other drugs which are potent inhibitors of
platelet function are phenylbutazone (Butazoli-
din), promazine tranquilizers: estron, either as a drug or as naturally produced excess estrogen: nutrofurazones (Furadantin, furacins), sulfon-
amides (Tribrissen, Diamit) and certain penic-
lin drugs. None of these drugs should be admin-
istered without veterinary supervision as severe
problems can result for animals with bleeding
tendencies.

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larger the species or animal, the more severe the
manifestations. Hemophilia A has a very high
frequency in certain breeds, particularly in rare
breeds or in those where much inbreeding or
linebreeding to a few individuals has taken
place. This result, called the “founder effect”,
occur when breeders overutilize one particular
size that happens also to carry the undesirable
gene in question. The gene pool that becomes
relatively fixed and permits mutation and expression of recessive genes with greater fre-
quency. Prevalence of the undesirable gene can thus spread rapidly. Dr. Dodds explained that a recessive gene is difficult to eliminate. "Even if you don't want it, it is here," he said, after ten generations. 25 percent of your stock will still carry it. Dominant
genes can be eliminated quickly. Don't breed animals which show the trait and it will be eliminated in one generation. Incompletely
Drosophila melanogaster is a better model than humans because of its short reproductive cycle. The experiments are performed with an unbiased statistical design, which is not possible in humans.

Concentration on a particular, she has had serious effects in the German shepherd breed, today-one-third of the cases of hemophilia A seen world-wide occur in that breed. She stated that if one was contemplating acquiring a German shepherd from overseas or from a
German breeding stock here, animals of both
sexes should be tested prior to breeding. The
females would be assessed for the carrier state of hemophilia and the males for presence of the disease.

Hemophilia B, a clotting factor IX deficiency has also been identified in dogs and cats, though it is not as common as Hemophilia A. Tests to identify carriers for both diseases are available free of charge from Dr. Dodd’s laboratory.

Hemophilia affects an animal in various ways. There can be intermittent bleeding into
the joints, resulting in immobility, prolonged
bleeding when teething, and the most dangerous of all, bleeding into the body cavities or the
central nervous system. If one has a dog with hemophilia one should never use it at stud as
every daughter will be an obligatory carrier.

Dr. Jean Dodds discussed inherited bleeding
disorders. “Von Willebrand’s disease (VWD) is the
most commonly inherited bleeding disorder in the
dog. In Scottish terriers, Chesapeake Bay
retrievers, and German shorthaired pointers, the
disease is inherited as an autosomal recessive.
In this case, only those homozygous for the
gene (having two carrier parents) show clinical signs. Both sexes can have the disease and both sexes can be carriers. In all other breeds it is inherited as an autosomal incompletely dominant trait, whereby homozygosity is lethal and heterozy-
gotes can either express the gene or disease to a
varying degree or be asymptomatic carriers. To
date, VWD has been recognized to have
VWD and the condition has recently been seen
in cats.

Expression of VWD varies in severity. “It is a disease with high morbidity and relatively low
mortality,” she said. “The animals can be fine
for weeks and then suddenly have an episode
of hemophilia.” She also mentioned that VWD and the condition have recently been seen
in cats.
However, a testing program with rigorous selection against carriers and affected animals can reduce the incidence of the breed, as demonstrated in Scottish terriers. Here the incidence once was 44 percent. It has been reduced to about 10 percent through testing and removal of affected animals and carriers from the breeding stock. Specialized tests that measure the plasma level of von Willebrand's factor are required to diagnose VWD. Routine clotting tests are not diagnostic. Dr. Dodds' laboratory provides VWD testing free of charge.

VWD disease is difficult to deal with. Animals may have chronic mucosal bleeding into the bowel, manifested by bloody diarrhea. Also, such animals are quite susceptible to the effects of parvovirus infections. Animals with mild bleeding tendencies often succumb to or show more severe signs of the disease. Studies have shown that there is a high mortality rate due to parvovirus disease in Doberman pinchers and Rottweilers, breeds with a higher incidence of VWD. The disease also manifests itself early in breeds which need cropping and docking, in some cases posing severe problems. Dr. Dodds pointed out that simple not breeding those puppies who bled profusely during these procedures will not help. The whole litter must be tested to identify carriers.

Thrombin function plays an important role in VWD. "If the animal is hypothyroid, the disease will be more severe," she said. "Thrombin dysfunction affects clotting by producing reduced numbers of platelets and less von Willebrand's factor. Thus, a thyroid imbalance will promote the expression of VWD. We are now seeing it again with increasing frequency in Scotties and goldens, because of their increase in hypothyroidism.

Dr. Dodds briefly discussed inherited platelet function defects in otterhounds and basket hounds. These are two different disorders and the carrier status of breeding animals can be determined through specialized tests.

To eliminate or at least reduce the incidence of these bleeding disorders, those working in breeds with VWD should submit a breeding program and a list of carriers to the veterinarian. A program like this would be of great help for the treatment of foals.

EIPH in Race Horses

Continued from page 2

Currently furosemide is the only permitted race day medication for EIPH in 19 of the 22 states that have Thoroughbred racing. Pennsylvania, New Jersey, Delaware, and Maryland are among those states that permit other drugs. This is submitted to a bleeder program and must adhere to specific criteria established by the state. The drug is administered four hours prior to racing, and the horse is supervised in a detention barn until its start.

This is a cumbersome and expensive procedure, and Dr. Soma is looking for alternatives to prevent EIPH. Currently, he is working with a number of bronchodilators to determine in the experimental horse their effects on lung resistance and other respiratory parameters. "It is difficult to get substances deep into the airways when a nebulizer is used," he said. "We use an old method to make the horse breathe deeply. A tube is affixed to the breathing mask, causing the animal to inhale its own carbon dioxide. After about one minute it will breathe deeply and we administer the bronchodilator over a three-minute period." The researchers are determining effects, dose ranges and the most suitable compound. The next step is to determine whether it will lower the incidence of EIPH in affected animals.

Dr. Soma is also investigating the use of a transportator. The transportator delivers completely humidified, warm air to a face mask and the horse inhales this for two hours a day for two or three days prior to a race. "Horses don't object to it at all," he said, "they doze and stand contentedly, breathing the warm moist air." This treatment helps the animal clear foreign material from its air passages.

Another study by Drs. Sweeney and Soma has shown that most horses, at the racetrack have signs of chronic bronchitis, which could potentially be helped by the humidified air. Research has been preliminary data encouraging, some horses stop bleeding and improve their performance. "These horses spend a great deal of time indoors, in dusty barns, inhaling all kinds of material which can set up an irritation," he said. "The transportator facilitates the removal of this material and better breathing. It helps the horse to clear its lungs."

EIPH testing free of charge. Dr. Dodds' laboratory provides VWD testing free of charge. Dr. Soma and Sweeney feel that this device might be valuable as an adjunctive treatment of animals with respiratory disease and that it could be a great help for the treatment of foals with respiratory problems.

The most promising aspect of much of the research is the Pennsylvania State Horse Racing Commission, which is one of the first, and one of the few. Racing Commissions which sponsor research in the Thoroughbred. In addition to the EIPH research, Dr. Soma in collaboration with Dr. Peter Fehrbach, a clinical immunologist, has developed a new technique to detect drugs in blood and urine. The basis is the use of antibodies to detect the presence of drugs and is a system which uses a color change to determine if a drug is present. So far only one has been developed for one specific drug. He hopes that this work will lead to a quick method of screening.

Lawrence R. Soma, V.M.D., is Professor of Anesthesia and Clinical Pharmacology at New Bolton Center, and Corinne R. Sweeney, D.V.M., is a Lecturer in Large Animal Medicine at New Bolton Center.
Dear Friend of the Veterinary School,

You have been our faithful ally, as either a Friend of New Bolton Center, the Small Animal Hospital, or perhaps both.

Your gifts have helped save and protect thousands of large and small animal patients from life threatening disease or injury. As owners, we have all reaped the benefits of your compassion. You have responded enthusiastically and unselfishly to our requests for support. We know that those of you who have given recently will understand our need for additional support and will accept our thanks for your previous giving.

But if you haven’t given recently, why not now?

At this time of the year the phenomena of new animal life at New Bolton and the Small Animal Hospital are a fascinating and happy counterpart to the work of healing.

But accompanying this spate of life beginnings is an increase in injuries. Warm weather always means more activity. All of us feel a little friskier.

And both our hospitals experience an upsurge in cases. Your dogs and cats begin spending more time out of doors and are vulnerable to a multitude of major and minor hazards to their health: paw injury, automobile, poisoning, botulism, Fleas. Even a fight. Routine visits for testing for such serious afflictions as heartworm and Rocky Mountain Fever account for a significant increase in the Small Animal Hospital’s caseload.

Spring also brings renewed anxieties to farmers who may face a devastating year if disease runs unchecked. The latest outbreak of avian flu this past fall continues to haunt the Pennsylvania and regional agriculture economies.

New Bolton Center has been working hard on this major threat. Our researchers are under enormous pressures to accelerate efforts to halt the problem.

Spring is, of course, the time for horse owners to reeducate the pleasures of the track, field, or ring. But here, too, renewed activity brings painful reminders of fragilities in animals of all ages and sizes.

It seems like only yesterday we remember when beloved and celebrated horses were put down for injuries as heartbreaking simple in humans as bone fractures.

But today, orthopedic rehabilitation, surgical techniques developed at New Bolton have largely eliminated the need for such drastic measures.

Yet always new perils arise. The spring of 1986, for instance, marks the beginning of another warm weather cycle we must face with Potomac Horse Fever looming ahead and no proven antidotes to this mysterious killer in sight.

Spring is indeed, a mixed blessing for New Bolton Center and the Small Animal Hospital.

Perhaps you have brought your animal to us at this time last year or maybe the year before. In the two years since then our case load has increased by over 3,000!

No wonder our clinical, teaching, and research resources are pushed to the breaking point.

We need your help.

For our part we pledged that your gifts would be used directly to treat and protect the animals you have entrusted to our care.

But sadly, in accord with this pledge, we will soon have to suspend mailing Belvether to you if you have not contributed to either Friends program in 1985-86.

We would love to continue sending you every issue of Belvether, but due to its popularity the mailing list has grown huge. Printing and postage costs have risen so steeply as a consequence that we cannot afford to send you Belvether, unless we have your continuing support.

Please take a few moments right now and write a check to Friends of New Bolton Center or Friends of the Small Animal Hospital. You will find a return envelope secured in the centerfold of Belvether.

You may be an equestrian, cat fancier, dairy farmer, dog breeder, birdwatcher, first time puppy owner, or elder with a trusted animal companion, but as a Friend of the Veterinary School we think you’ll agree that there are no places quite like New Bolton and the Small Animal Hospital.

Your steadfast support will ensure the continued effectiveness of these unique enterprises dedicated to your animals’ health.

Thank you very much.

Sincerely,

Richard A. McFeers, V.M.D.
Associate Dean For New Bolton and Hospital Director
Barr J. Supine
Director
Small Animal Hospital

Scholarships

The Pennsylvania Society for the Prevention of Cruelty to Animals recently made a contribution of $10,000 to the student loan fund for the 1985-86 academic year.

A donation to the scholarship fund was received from the Chester Valley Kennel Club.

Wayne Johnson and Evelyn Crish, both third-year students, are the recipients of a scholarship from the Plainfield Kennel Club.

Martin McGuire, a fourth-year student, is the recipient of a scholarship from the Mid Susquehanna Valley Kennel Club.

Beth Ann Ferry, a fourth-year student, received the Dr. Samuel F. Scheidy Memorial Scholarship from the Pennsylvania Veterinary Foundation. The Dr. Samuel B. Guss Memorial Scholarship, made available by the same organization, was awarded to Steven A. Stake, a fourth-year student.

Steven Wilson, a second-year student, received a scholarship from the Burlington County Kennel Club.

Carolyn M. Glass, a second-year student, was awarded a scholarship offered by the Auxiliary to the Massachusetts Veterinary Medical Association.

A Salsbury Scholarship in the amount of $1,000 each was awarded to five senior students: Joseflyn L. Bezner, Margaret N. Bliss, Doris A. Cappiello, Giancarla Chieffo, Bonita E. Conrad.
Thank You

During the past 18 months many clubs have provided generous financial support to the School and to VHUP. These funds have enabled us to purchase much needed equipment, provide financial aid to our students, study specific diseases, and help many of our small animal patients.

We thank the following clubs:

Airdale Terrier Club of Greater Philadelphia, PA.
Airedale Terrier Club of Philadelphia, PA.
American Irish Setter Foundation.
American Shetland Sheepdog Association.
Bayside Companion Dog Club, NJ.
Belgian Sheepdog Club of America.
Berks County Kennel Club, PA.
Bryn Mawr Kennel Club, PA.
Bucks County Kennel Club, PA.
Chesapeake Kennel Club, MD.
Chester Valley Kennel Club, PA.
Cheoegoland Shetland Sheepdog Club, IL.
Clarksville Kennel Club, TN.
Collie Club of America.
Collie Club of Northern New Jersey.
Dandie Dinmont Terrier Club of America.
Delaware County Kennel Club, PA.
Delaware Valley Terrier Club, PA.
Devon Dog Show Association, PA.
District Area Sighthound Association, DC.
Doberman Pinscher Club of Connecticut.
Doberman Pinscher Club of Greater Denver, CO.
Central Illinois Shetland Sheepdog Club, IL.
Central Penn Collie Club, PA.
Chocopee Kennel Club, FL.
Clarinda Kennel Club, IA.
Collie Club of Greater Miami, FL.
Collie Club of New Jersey.
Dandie Dinmont Terrier Club of America.
Delaware County Kennel Club, PA.
Delaware Valley Terrier Club, PA.
Devon Dog Show Association, PA.
District Area Sighthound Association, DC.
Doberman Pinscher Club of Connecticut.
Old English Sheepdog Club of America.
Garden State Siberian Husky Club, NJ.
Giant Schnauzer Club of America.
Great Britain Shetland Sheepdog Club, CT.
Greater New York Schnauzer Club, PA.
Great Milwaukee Shetland Sheepdog Club, WI.
Greater Philadelphia Dog Fanciers Association, PA.
Greater Venice Florida Dog Club, FL.
Greyhound Club of America.
Harrisburg Kennel Club, PA.
Hyattsville Dog Training Club, MD.
Interlocking Shetland Sheepdog Club, IL.
Irish Wolfhound Club of Delaware Valley, PA.
Irish Wolfhound Club of Greater New York.
Jack Russell Terrier Club of America.
Kanadasea Kennel Club, CA.
Kenne1 Club of Beverly Hills, CA.
Kenne1 Club of Buffalo, NY.
Kenne1 Club of Philadelphia, PA.
Kenne1 Club of Texarkana, TX.
Lancaster Kennel Club, PA.
Langley Kennel Club, VA.
Laurel Highlands Kennel Association, PA.
Lehigh Valley Kennel Club, PA.
Liberty Trail Cat Fanciers, NJ.
Lochland Shetland Sheepdog Club, MN.
Long Island Kennel Club, NY.
Longshore Southern California Kennel Club, CT.
Lower Bucks County Dog Training Club, PA.
Luzerne Dog Training Club, PA.
Maltese Club of Greater Miami, FL.
Manatee Kennel Club, FL.
Maryland Cocker Spaniel Club.
Meadowbrook Cocker Spaniel Club, CT.
Mid-Hudson Kennel Club, NY.
Mid-Susquehanna Valley Kennel Club, PA.
Mississippi Kennel Club, DE.
National Capital Kennel Club, DC.
New Jersey Boxer Club.
New-Penn Newfoundland Club.
Newfoundland Club of America.
Norwich and Norfolk Terrier Club.
Nova Scotia Collie and Shetland Sheepdog Club.
Oakland County Kennel Club, MI.
Penn Ridge Kennel Club, PA.
Pensacola Dog Fanciers, FL.
Penn Treaty Kennel Club, PA.
Plainfield Kennel Club, NJ.
Potomac Valley Standard Schnauzer Club, MD.
Rhodesian Ridgeback Club of the USA.
Rockland County Kennel Club, NY.
Salisbury Maryland Kennel Club, MD.
Sand and Sea Kennel Club, NJ.
Sara Bay Kennel Club, Inc., FL.
Schooley's Mountain Kennel Club, NJ.
Shetland Sheepdog Club of Des Moines, IA.
Shetland Sheepdog Club of Georgia.
Shetland Sheepdog Club of Houston, TX.
Shetland Sheepdog Club of Miami, FL.
Shetland Sheepdog Club of Palm Beach, FL.
Shetland Sheepdog Club of PA/NJ/DE.
Shetland Sheepdog Club of St. Louis, MO.
Shetland Sheepdog Club of Southern California.
Shi Tzu Fanciers of Greater Miami, FL.
Siberian Husky Club of Delaware Valley, PA.
Shoreline Shetland Sheepdog Club, TX.
Somerset County Dog Obedience Club, NJ.
South Shore Shetland Sheepdog Club of the Southern New Jersey Branch.
Suburban Dog Training Club, PA.
Tampa Bay Area Shetland Sheepdog Club, FL.
Tidewater Kennel Club of Virginia.
Union County Kennel Club, NJ.
Upper Marlboro Kennel Club, MD.
Virginia Beach Kennel Club, VA.
Wallkill Kennel Club, NY.
Washington County Poodle Club, NJ.
Waterland Retriever Club, PA.
Western Michigan Shetland Sheepdog Club, MI.
Wilmingon Kennel Club, DE.

Study of Caudal Cervical Spondylomyelopathy Using the CT Scan

A number of dog breeds are affected by Caudal Spondylomyelopathy, commonly called "Wobbler Syndrome." The disorder is most frequently seen in Doberman pinschers and great Danes. Two surgeons here at the University of Pennsylvania School of Veterinary Medicine are conducting a pilot study to determine the value of Computed Tomography (CT) scans to increase our understanding of this disorder. Dr. Nicholas J. H. Sharp, a visiting surgeon from the University of Liverpool, England, and Dr. Gail K. Smith, Assistant Professor of Orthopedic Surgery here at the School, have received a small internal grant to help conduct the investigation. The funds will enable us to study five Doberman pinschers before and after they undergo surgery for the condition, said Dr. Sharp. The disease commonly affects middle-aged Dobermans between four and eight years of age, and males appear slightly more susceptible. Dr. Sharp explained that in affected animals the spinal cord is compressed in the neck as a consequence of unstable vertebrae. "Most of these dogs at first show only slight signs," he said. "Their gait may be slightly different, but as the disease progresses, they will become increasingly more uncoordinated. Most dogs are not in pain, although they may become suddenly paralyzed. This is frequently seen when a disc gives way, prolapsing into the neural canal and damaging the spinal cord." "Treatment is the stabilization of the affected bones in the neck," said Dr. Sharp. "There are many techniques but none are considered ideal." In this study the two surgeons will evaluate the animal by doing a myelogram, this being an x-ray taken where the spinal cord has been outlined with an opaque dye. In addition, a CT scan will be performed which permits a view of the affected vertebrae in cross-section, showing the compression of the spinal cord more clearly than the radiograph. After these two tests, one of the standard surgeries will be performed. "Generally we decompress the disk and then fuse the vertebrae to stabilize the area." The animal will be examined later in the recovery period again employing a myelogram and a CT scan.

"By looking at the condition prior to and after surgical treatment, we hope to ascertain whether the procedure accomplished the goal of reducing the pressure on the cord and stabilizing the affected area of the neck," Dr. Sharp said. "The CT scan allows us a really close and detailed look in a way we were unable to do before in this condition and very rarely at all in the dog's spine."

Both surgeons would like to see Doberman pinschers with Caudal Cervical Spondylomyelopathy for this study. There will be no charge for the CT Scan, and it is hoped to be able to obtain more funding to extend the study beyond the present limit of five dogs. Information about the project can be obtained by contacting Dr. Smith or Dr. Sharp at the School of Veterinary Medicine, University of Pennsylvania, 3850 Spruce Street, Philadelphia, PA 19104-6008.

Dedication

The cottage adjacent to the Allam House at New Bolton Center was dedicated as Hill Cottage on December 6, 1985, in memory of John J. Hill, III.

Mr. Hill, a dedicated horseman, was master of Nantural Horse Farm, a member of the Walnut Hunt, and vice president of the Devon Horse Show. He was a member of the Philadelphia Society for Promoting Agriculture and the Quaker City Farmers, and a great friend of the School, particularly New Bolton Center.

Mrs. John J. Hill, III, Mrs. D. Bruce MacDonald, and Mr. John J. Hill, IV, at the dedication of Hill Cottage at the New Bolton Center.

Spring 1986
Heartworms

Heartworm infection occurs in the dog throughout the United States and parts of Canada, particularly in warm, mosquito-infected areas. Infective heartworm larvae develop in mosquitoes and are deposited in the skin of the dog following the bite of an infected mosquito. After several months of development, immature worms enter the bloodstream. Adult worms, which may reach a length of five to twelve inches, are found in the heart and lungs. Infected dogs may tire easily, have a chronic cough and lose weight. Diagnosis is made by detecting the microscopic larvae (microfilariae) in the circulating blood and by blood tests to detect antibodies or worm protein.

There is a nonpathogenic nematode, Dipetalonema retonditum, which also produces circulating microfilariae. These must be differentiated from the microfilariae of the heartworm, Dipetalonema repens. Microfilariae are not always found in the blood of heartworm-infected dogs—there are seasonal and diurnal variations—so a negative test should be repeated if heartworm disease is suspected. Most dogs with heavy heartworm infections have changes in the heart and lungs which may be detected radiographically.

Dogs infected with heartworm may be treated with drugs to destroy the adult worms. Infections may be prevented by daily treatment with a drug that prevents larvae introduced by the mosquito from developing into adult worms. Diethylcarbamazine (DEC) is available in several forms: tablets, liquids and powders. Treatment should be started at the beginning of the mosquito season and continue for several weeks after. In warmer climates, it should be given year-round. The drug must be given daily as it has no residual activity. A drug under study by the FDA, Ivermectin, appears to be effective as a prophylactic agent when given at monthly intervals. However, there have been severe reactions to this drug in some breeds, including death. It cannot be recommended without this warning. At the present time, it is not approved for use in dogs but is FDA-approved for horses. It is important that preventive treatment with DEC should not be given to dogs which have circulating microfilariae as this may produce severe anaphylactic (i.e., allergic) shock. Have a blood sample checked before beginning treatment, even if the dog was on DEC the previous year.

Your Cat's Teeth

The cat has 30 permanent teeth and 26 deciduous ("baby") teeth. Because the jaw bones of the cat are rather short, the number of premolars and molars is reduced when compared with the dog. (The dog has a total of 42 permanent teeth.) The cat has six incisors (front) teeth in the upper and lower jaw, used for biting and gnawing. Four large canine teeth ("fangs") for seizing and tearing food; six premolars in the upper jaw and two in the lower jaw. The molars are used for shearing soft tissue and bones.

The deciduous teeth erupt at about three weeks of age and are replaced by the permanent teeth at about six months of age.

Tooth care should begin at an early age. Chewing on hard toys helps keep the deciduous teeth clean. The cat's teeth should be checked at about six months. If a baby tooth does not fall out, your veterinarian can pull the tooth to allow permanent teeth to grow in normally. When a cat is fed only soft foods, it will not chew enough to clean its teeth. Feeding dry food most of the time will help prevent gum disease. Periodontal disease is a major cause of bad breath and loss of teeth in cats. If there is a yellow build-up, this is an indication that dental cleaning is necessary. This is best done under general anesthesia and in some animals it should be repeated yearly.

When the teeth have been cleaned (calculus and plaque removed), your veterinarian may recommend "brushing" the teeth once or twice a week—ideally daily! Wrap a finger with a soft washcloth and brush from gum line to tip of tooth. If you do this gently and follow the procedure with praise and a treat, the cat will become accustomed to oral care. Do not use human toothpaste. Start with plain water or water with a bit of salt added. Your veterinarian may recommend using a medicated brushing solution if gum disease is present.

Don't let gum disease get out of control. Check your cat's mouth frequently. If the gums are ignored, bad breath may set in, the gums swell and bleed; the breath becomes almost unbearable, the teeth loosen, and eating and self-grooming become painful. This can be avoided by keeping the mouth clean. Gum disease in cats can cause severe problems, more so than in dogs. Two major sources of the pain associated with gum disease are "neck lesions" (erosion of part of the tooth at the gum line, which exposes sensitive dentin) and spreading soft-tissue ulcers that can cause pain when the mouth is opened.

Cost is always a factor when considering professional treatment. If the teeth are kept clean by brushing and the cat has something hard to chew, periodontal disease may be avoided. Because some cats refuse to eat or drink due to severe gum disease, and because severe gum disease is much more difficult to treat in cats than in dogs, gum disease in cats is the subject of a current research project at VHUP. Headed by Dr. Colin E. Harvey, Professor of Surgery, the project includes progressive clinical and radiological examinations, detailed bacteriological and virological examinations (performed at the University of Pennsylvania Dental School).

In 1984 the AKC awarded 688 F Ch. titles (Amateur and Open), and there were 114,204 starters (dogs entered) for the year. For comparison, that year 15,553 conformation titles were awarded, with 1,133,084 dogs competing at all-breed and specialty shows. It takes much time and patience before a dog is ready for the field. "I train with Thomas Getler of New Egypt, N.J.," she said, "It is better to work with a professional when beginning to train a dog as one can sometimes teach it incorrectly. Then considerable time has to be spent to undo the mistakes."

Field trials usually are two- and three-day affairs. Dogs are entered in different stakes, as the classes are called, depending on their age and ability. At field trials Gordon setters, a hunting breed, must exhibit a desire to hunt, be bold and independent, yet obey every signal.
and the University of Liverpool in England, respectively) and treatment.

This project is supported by grants from the Winn Foundation for Cat Research, IBM Corporation, H. Schein, Inc., and a private donor. Appointments for examination of cats with oral or dental disease at VHUP may be made by calling 215-898-4680.

Miscellaneous Class

At AKC shows, there are eight breeds which may be shown in the Miscellaneous Class. These breeds are represented by an active parent club maintaining a breed registry, with serious and expanding breeding activity over a wide geographic area. Breeds in the Miscellaneous Class are not eligible for championship points. They must have an ILP (Indefinite Listing Privilege) number issued by AKC.

When the AKC’s Board of Directors is satisfied that the breed is continuing a healthy, dynamic growth, it may be admitted to the Stud Book and be able to compete in regular classes at dog shows. At the present time, there are 29 breeds eligible to compete for championship points.

The Chinese Crested, a hairless breed tracing back to at least the 16th Century, is the latest breed made eligible to compete in the Miscellaneous Class at dog shows, obedience trials, and tracking events. This breed is characterized by a hairless body with a crest of hair on top of the head and a plumed tail. Some Chinese Cresteds have a fluffy haircoat and are known as “Powderpuffs.” Both hairless and powderpuff varieties may appear in the same litter.

The seven other breeds presently eligible to compete in the Miscellaneous Class are: Australian Kelpies, Border Collies, Cavalier King Charles Spaniels, Finnish Spitz, Miniature Bull Terriers, Spinoni Italiani and the Greater Swiss Mountain Dog.

V.M.D. or D.V.M.?

There are 27 Colleges of Veterinary Medicine in the United States accredited by the American Veterinary Medical Association, Wisconsin will graduate its first class in 1987. The University of Pennsylvania grants a V.M.D. (Veterinariae Medicinae Doctoris) degree, probably because of the close association of the Veterinary and Medical Departments. Graduates of all the other Schools receive the D.V.M. degree.

University of Pennsylvania graduates can be recognized by their degree. The V.M.D. has been awarded to 4,064 graduates, beginning with the first class in 1887. The requirements for V.M.D. and D.V.M. are essentially the same. It might be pointed out that if “Dr.” is used before a name, the academic degrees are not included after the surname. To be grammatically correct, the name should be John Doe, V.M.D. or Dr. John Doe, V.M.D.

The American Kennel Club, 1884-1984

This important book for all those interested in dog shows is edited by Charles A. T. O’Neill and the Staff of the American Kennel Club. ($17.95, Howell Book House, 230 Park Ave., New York, NY 10069).

The American Kennel Club was founded on September 17, 1884, when 12 dedicated sportsmen met in Philadelphia, Pennsylvania. All were delegates of clubs which had been holding dog shows or field trials. The new “Club of Clubs” would undertake to consider “all dog matters concerning bench shows and field trials.” In 1887, AKC took over the The American Kennel Stud Book—with one number being the English Setter, Adonis, whelped in 1875. The first issue of The American Kennel Gazette appeared in January 1889.

Championship requirements at early shows were three first place wins in the Open Class. In 1900, the point schedule was based on the total number of dogs at the show—I point at all-breed shows under 250 dogs up to 5 points at all-breed shows with 1,000 dogs or over. Later, requirements were based on competition within the breeds. Unfortunately, the point schedule did not change much.

The Dog’s Sense of Smell

The dog has a phenomenal sense of smell, and may be trained to assist man in many ways. Their work in detecting narcotics is well-known. They can be trained to detect gas leaks and explosives. Less well-known is their ability to detect cows in estrus. A cow may show no signs of estrus, and the period during which she should be bred is very short (usually less than twenty-four hours). Dogs may prove to be useful in the dairy and beef industries.

There have been reports recently about dogs trained to sniff out termites. It is said that their acute sense of smell and hearing alerts the dogs to where the termites are.

All of this special work requires training for dog and handler.

Anosmia is loss of the sense of smell. This can occur after some diseases, including Canine Distemper. Techniques are being developed to measure olfactory activity. Possibly this might be useful in grading hunting dogs.

Foundation Grant

The Robert J. Kleberg, Jr. and Helen C. Kleberg Foundation of San Antonio, TX, has contributed $300,000 toward the construction of the Robert J. Kleberg, Jr. Animal Genetics Laboratory. The new facility, to be located in the Old Quadrangle will expand the space of the laboratory of Reproductive Physiology. The additional space is needed to enable Dr. Ralph L. Brinster, Richard King Mellon Professor of Reproductive Physiology, and his associates to explore fully the potential of their gene transfer work. Through the development and use of the technique for gene transfer in animals, Dr. Brinster and his associates have contributed enormously to the understanding of gene regulation, growth control, development and tumorigenesis.

The Robert J. Kleberg, Jr. Animal Genetics Laboratory will enable the School to retain its pre-eminent position in transgenic research.
Students, staff, and faculty donated 97 pints of blood to the American Red Cross during the fall blood donation drive. This was an increase of 23 pints over the spring drive.

Dr. Lawrence T. Glickman (V'72), associate professor of epidemiology and chief, Section of Epidemiology, has been awarded a $426,149 grant for three years from the National Institute of Allergy and Infectious Disease for a study entitled "Canine Model of Selective IgA Deficiency." The grant, awarded jointly to Dr. Glickman and Dr. Peter J. Felsburg (V'69), University of Illinois College of Veterinary Medicine, will permit the two researchers to investigate many of the important clinical manifestations of IgA deficiency in the dog, to begin to characterize the role of IgA in the gut, and to study the mechanisms of inheritance.

Dr. Amy R. Marder (V'79), the first resident in animal behavior at the School, has been appointed to the staff of Tufts University School of Veterinary Medicine.

Dr. Robert C. Hammond (V'48) has stepped down as Associate Dean-Maryland Campus of the Virginia-Maryland Regional College of Veterinary Medicine. Dr. Hammond and his wife have built a retirement home in Earlysville, VA, and he plans to continue his rehabilitative work with the eastern bluebird.

Dr. Mattie J. Hendrick (V'78) has been appointed assistant professor of pathology in the Department of Pathobiology. Dr. Michael Kotikoff (V'81) has been appointed assistant professor of pharmacology in animal biology. Recently Dr. Kotikoff received a grant from the University of Pennsylvania Research Foundation for his proposal "Airway Smooth Muscle Biology." Mr. Kotikoff has been appointed assistant professor of surgery in Clinical Studies (New Bolton Center). Dr. Thomas J. Van Winkle (V'75) has been appointed assistant professor of pathology in the Department of Pathobiology.

Dr. Michael S. Miller (V'79) was awarded diplomas in Veterinary Medicine in the American Board of Veterinary Practitioners. He is a staff consultant in electrocardiography and vice president of Clinical Affairs for the Cardiopet division of ANIMED, Inc., Roslyn, NY. Recently he has authored or co-authored chapters on the treatment of cardiac arrhythmias or conduction disturbance in the Manual of Small Animal Cardiology. Current Veterinary Therapy Nine, and a chapter on avian electrocardiography in Avian Medicine and Surgery, a Clinical Approach.

Dr. E. Neil Moore, professor of physiology, has been invited to serve on a committee to review computer grant proposals from different schools within the University.

Dean Robert R. Marshak has been named vice chairman of the newly formed Pennsylvania Friends of Agriculture. He also was appointed to serve on the faculty of the School of Arts and Sciences for the academic year 1985-86.

Dr. William A. Moyer, associate professor of sports medicine, was one of the principal speakers at an equine laminitis symposium, held in January in Lexington, KY.

The January 1986 American Kennel Gazette contained an article about a specialty veterinary practice. Featured was a four-specialist practice in Gaithersburg, MD, co-founded by Dr. H. Steven Steinberg (V'73), whose specialty is neurology. Dr. David K. Saylor (V'76) is also a member of the practice, as specialist in soft tissue surgery. Another member, Dr. Ann Chiappella, the internal medicine specialist, also has ties to Penn; she was a resident here.

Dr. Charles J. Driben (V'65), Mooresville, NJ, was honored by the Congregation Beth El, Cherry Hill, for his service to the synagogue, to the Jewish community, and to the people of Israel. He was presented the Lion of Judah Award.

Dr. Robert J. Rutman, professor of biochemistry, has been appointed chairman of the board of the Ile-Ife Center for the Arts and Humanities in Philadelphia. In February Dr. Rutman participated in a symposium on Vietnam at Gettysburg College. He discussed the "Ecological Effects of the Vietnam War." In March he gave a seminar at the Howard Uni-

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Bovine Leukemia Research

Bovine leukemia (lymphosarcoma, malignant lymphoma) is the most common neoplastic disease of cattle, affecting animals of both sexes and all breeds. It occurs most frequently in dairy cattle.

The most significant pathological feature of bovine leukemia is the malignant or neoplastic transformation of lymphoid cells. The neoplastic lymphoid cells multiply in an uncontrolled fashion, invading various tissues and organs either diffuse or forming tumor masses. The disease is always fatal. Affected animals die within weeks, or at the most, months after appearance of clinical signs.

Early in the 1960s research on bovine leukemia was initiated at New Bolton Center under the direction of Dr. Robert R. Marshak, and since 1969 this work is continued in the Comparative Leukemia Studies Unit under Dr. Jorge F. Ferrer. Under Dr. Ferrer the unit has made some outstanding breakthroughs, not only in the area of bovine leukemia, but also in the field of basic viral oncology. Research during the period 1971-1972 established conclusively the existence and identity of a virus as the causative agent of the disease. Since that time Dr. Ferrer’s group has contributed a number of important findings about the virus, now known as the bovine leukemia virus (BLV). The virus is a member of the C retrovirus group, the same group to which all mammalian leukemogenic viruses belong. This group includes HTLV-I, the virus responsible for T-cell lymphomas in humans.

Soon after identifying BLV, it was found that it differs in certain important immunological, biochemical and biological properties from the other known C-type retroviruses. For example, it was found that cattle continuously infected with the virus have antibodies against the major internal BLV protein. This finding established the fact that BLV is an exogenous virus, and further studies have confirmed this. It is now known that BLV is transmitted horizontally, almost always after birth. For several years the significance of these and other differences shown by the BLV system was not appreciated by other authorities in viral oncology. However, in 1980 HTLV-I, the first C-type human leukemia virus was discovered, and it was soon found that it shares all of the differential characteristics of BLV. It is now clear that BLV is the prototype of a special family of C-type retroviruses. The unique relationship with HTLV-I is one of the main reasons why BLV is now considered as one of the most important animal models to study viral leukemogenesis.

Once an animal becomes infected with BLV it remains infected for life, regardless of whether or not it develops leukemia. It is estimated that probably no more than 5 percent, and certainly less than 10 percent, of cattle infected with the virus ever develop leukemia. Thus, 90 percent or more of BLV infected cattle are asymptomatic virus carriers. BLV carriers can serve as a source of infection for other cattle, and they may have subtle abnormalities that are important. For example, they may have immunodeficiencies that, although not clinically apparent, favor the development of other infectious processes.

The fact that only a small proportion of BLV infected cattle develop leukemia indicates that, in addition to the virus, other factors are involved in the development of leukemia. Studies in the Comparative Leukemia Studies Unit have shown that one of these factors, probably the most important, is the host's genetic
X-ray view boxes in some of the VHUP examination rooms. Dr. Biery and Dr. Gail K. Smith (V74) received a grant from the Morris Animal Foundation for their project "Hip Dysplasia—Biomechanical and Radiographic Correlations."

Dr. Mark W. Allam (V32), former dean, and professor emeritus of surgery, was awarded the Thomas L. Holmes Community Service Award, the top community award given by media, PA.

Dr. William S. Chalupa, professor of nutrition, contributed to a National Research Council Report on "Ruminant Nitrogen Usage."

Dr. Robert E. Davies, Benjamin Franklin and University Professor of Molecular Biology, taught a course "Are We Alone in the Universe" in the University's Gifted Program.

Dr. Roy D. Hoffman (V31) was named "Veterinarian of the Year" at the Pennsylvania Veterinary Medical Association meeting in October. Recently Dr. Hoffman was named Bedford Elk's Citizen of the Year. Dr. Hoffman lives in Bedford, PA, and has practiced veterinary medicine for 55 years.

Dr. James S. Reid (V62), Vienna, VA, received the American Animal Hospital Association's Regional Practitioner of the Year Award.

Dr. Elizabeth Atwood Lawrence (V56) has written `<Chemicals and Society: Studies of Human-Horse Interactions;` published by the Indiana University Press.

Dr. William Medway, professor of clinical laboratory medicine, completed a three-year term as a member of the Marine Mammal Commission's Committee of scientific Advisors on Marine Mammals.

Dr. Charles W. Raker (V42) has been named The Lawrence Baker Sheppard Professor Emeritus of Surgery.

Dr. Dudley E. Johnston, professor of surgery, taught a post-graduate refresher course on "Soft Tissue Surgery of Dogs and Cats" and two Soft Tissue Workshops at the University of Sydney, Australia, in February.

Biomedical Research Support Grants were awarded to Dr. Urs Giger for "Canine Phosphofructokinase Deficiency." An Animal Model for Gigtcdmg in work was named "Type VII," Dr. Joan Hendricks (V79), assistant professor of medicine, for "Sleep-disordered Breatliing in Pups and Adult Dogs with Upper Airway Obstruction;" Dr. Gert Nieder, assistant professor of surgery, for "Immune Reactivity in Canine Cruciate Ligament Rupture."

Dr. Gerhard A. Schad, professor of parasitology, has been appointed to a three-year term as a member of the Graduate Group in Biology. Recently Dr. Schad made a presentation on parasite biology at the Park City meeting of the MacArthur Consortium on the Biology of Parasitic Diseases.

Dr. James B. Lok, assistant professor of parasitology, has been appointed a member of the NIH-NIAID Ad Hoc Study Section for Tropical Medicine and Parasitology.

Dr. Alan M. Beck, adjunct associate professor of animal ecology, was interviewed by Italian television for "Italia Sera," a national talk show, and he discussed the studies conducted here by the Center for the Interaction of Animals and Society. Dr. Beck also participated in the conference "Zoonoses in New England: A Conference for Veterinarians and Physicians;" at the University of Massachusetts. Dr. Beck spoke on the human-animal bond.

Jamie Quackenbush, the social worker at VHUP, and Denise Graveen, former editor of Pet Care Reports, have just completed a book, "When Your Pet Dies: How to Cope with Your Feelings." The volume is published by Simon and Schuster.
Continuing Education
Brief
1986 Penn Annual Conference
Neither sleet, nor snow, nor freezing tempera­tures prevented 600 veterinarians from attend­ing the School’s 1986 Penn Annual Conference. Alumni support for the Conference has been increasing every year, and the 1986 attendance equaled our record Centennial Year Penn Annual Conference.

The Conference Directors, Dr. Tom Divers and Dr. Charles Newton, are working toward increasing the number of speakers brought in from other institutions. Please drop a note to either Dr. Divers (Large Animal Topics) or Dr. Newton (Small Animal Topics and Basic Science Topics) with speakers and/or topics you would like to hear.

The 1987 PENN ANNUAL CONFERENCE WILL BE HELD ON WEDNESDAY, JANUARY 28, AND THURSDAY, JANUARY 29, AT THE ADAM’S MARK HOTEL IN PHILADELPHIA.

1986 Reunion Year Class Agents
1936—Earl Cook 1961—Paul Evans
1946—Seibert Berlin 1971—Gerald Pietsch
1951—Clarence Bryer 1976—Britan Kolbome

Common Health Problems in Goats and Sheep
continued from page 3

sucking intestinal worm. The animals become anemic and develop diarrhea. If they are not treated promptly, they can die. To prevent heavy worm infestation, manure samples should be checked frequently and the whole herd should be wormed at regular intervals. Also, when turning sheep out to pasture, every effort should be made to use a meadow which has been dormant from October to March and thus has a reduced parasite burden. Weaned lambs should go to clean pastures and not those used by ewes. Dairy goats which are kept inside are not so prone to parasites.

However, they have other problems. Sheep and goats are quite susceptible to respiratory ailments. Slowly progressive pneumonia occurs more in sheep. Ovine progressive pneumonia (OPP) is the most common viral pneumonia.

“‘There is no cure,’ said Dr. Vaala. ‘One can only treat it supportively.’” Goats and sheep also develop bacterial pneumonia; this can be treated with drugs. “They have to be kept in a clean, dry, well ventilated environment to pre­vent respiratory diseases,” she said. “There is a problem treating dairy goats with drugs; we don’t quite know the period of time for which milk from treated animals should be withheld from market.”

Goats frequently develop arthritis. The joints swell and there is pain. The most common form, Caprine Arthritis-Encephalitis Syndrome (CAEV) is caused by a retrovirus. It is thought that it is passed through the colostrum. The virus is latent and many animals will not be affected until older. Some infected goats may show no signs while others become depressed and have weight loss. If CAEV is present in a herd, kids can show signs of neurological dis­ease between the ages of one to four months. These animals frequently have an ascending spinal cord infection and the prognosis is poor. Arthritis in goats can also be bacterial in origin. These forms are treatable with antibiotics. Diet can play a role; if goats are fed too much alfalfa, they may develop arthritis.

Goats and sheep suffer from coccidiosis infections, a disease affecting about 8% of the herd. It is caused by Cryptosporidium per primarum (ovis). Animals with the disease are not permitted to leave the state, as the illness is highly contagious. The infection causes abcesses. In sheep these occur most commonly at shearing laceration sites. Goats appear to contract the infection through inges­tion; they often develop internal abscesses. These may involve internal lymph nodes in the thoracic (chest) and abdominal cavities and may involve organs such as the liver, lung or spleen. Chronic weight loss is often the most common complaint associated with internal abscesses. External abscesses can be excised or lanced and drained. Affected animals should be isolated from the rest of the herd/flock until all drainage has stopped. Internal abscesses are very dif­ficult to diagnose and treat. Antibiotic therapy and surgical removal have been tried but often treatment is not successful and the affected animal is culled. In ewes and goats these
toward smaller group workshops in the after­noon, highly practitioner-oriented.

The lectures will emphasize principles of radiographic interpretation of the chest and abdomen. The workshop will be handled as a laboratory with teams of two to three people assigned to a viewbox with the Radiology faculty circulating to assist in radiographic interpretation of the presented cases. The lab­oratory will concentrate on recognition of normal and abnormal radiographic findings of the chest and abdomen with specific emphasis on differential diagnosis. Dr. Darryl Biery, Professor of Radiology Dr. Sydney Evans, Instructor in Radiology Dr. W. Harker Rhodes, Professor of Radiology Dr. Mark Saunders, Resident in Radiology

Dr. Jeffrey Wortman, Assistant Professor of Radiology

THIS COURSE IS LIMITED TO 30 PARTICIPANTS

For further information please contact Ashra Markowitz, University of Pennsylvania School of Veterinary Medicine, 3800 Spruce Street, Philadelphia, PA 19104—(215) 898-1882.

Dr. Roger Smith (V57), President-elect of the Pennsylvania Veterinary Medical Association (L) and Dr. Stewart Rockwell (Cor’S0), President of the Pennsylvania Veterinary Medical Association (R). Drs. Rockwell and Smith are members of the Veterinary School’s Alumni Society Executive Board.

Mrs. Frederick Rode (L) and Mary Ann Tuschak (R), Member of the Wilmington Financial Group. Ms. Tuschak has generously offered to co-sponsor publication of the 1986-1987 Student Directory.

Animal Health Technician Conference

Harcum Junior College will sponsor an Animal Health Technician Conference on June 7 at the college in Bryn Mawr.

Topics include “Rapid Techniques in Microbial Identification,” “Veterinary Dentistry: The Role of the AHT,” “The Application of Accupuncture, Infrared Laser, and Electromagnetic Field Therapies in Equine Medical Practice” and “Diagnostic Ultrasound: Principles and Application.”

Participating conference faculty members are Ruth Dougherty, RVT, of Walmridge Equine Clinic; Dr. Colin Harvey, professor of surgery, University of Pennsylvania School of Veterinary Medicine; Dr. Joseph Haines of the Fairhill Equine Veterinary Clinic; and Dr. Mark Saunders, resident in radiology, University of Pennsylvania School of Veterinary Medicine. The fee for the conference is $20 and four Continuing Education Units will be awarded. For further information, call (215) 525-3554.

abcesses can spread into the mammary tissues, resulting in poor milk production.

Foot problems are common in sheep and goats if the animals are not properly taken care of. “The feet should be trimmed and shaped periodically,” said Dr. Vaala. “Otherwise sites exist for bacteria to flourish.” This causes foot rot, a highly contagious disease. Animals can be protected against it by frequent vaccination, proper foot care and a clean, dry environment.

Skin problems, too, can be a big headache for the sheep and goat farmer. Both species are good hosts for various parasites, and goats in particular are prone to lice in the winter and fall. A dipping program will help eliminate these pests. Also, the goat is the only food animal prone to ear mite infection. Ears should not be sold for human consumption or for cheese production as some of the organisms pose a threat to human health. Dairy goat owners should check their animals for evidence of mastitis by examining the milk in the strip cup prior to milking out the udder. Also, once a month, a California Mastitis Test should be performed. Mastitis seriously affects milk production and it is responsible for economic losses. Prevention includes clean milking equipment, washing of udder and teats and the milker’s hands prior to milking, and dipping the teats after milking. It is very important that the animals are milked regularly and that the udder is emptied each time. If mastitis is suspected, a culture should be done to determine the causative organism and the proper antibiotic. If drugs are used to combat the infection, the bovine withdrawal time for the particular drug should be used as a guide, though it was found that drugs can be in evidence in goat’s milk after the minimum withdrawal time indicated for bovines. This is particularly important if penicillin is used, a residue of this drug in milk can be fatal to people with an allergy to the drug. Sheep and goat owners must protect their animals from accidental poisoning and confine them to a safe pasture. Goats in particular are very curious and, according to Dr. Vaala, are nibblers. “They will eat anything in sight,” she said. “They love ornamentals and are not able to distinguish between harmless and poisonous plants. Also, fertilizers, herbicides and pesticides should be stored where they cannot reach them.” Goats should not be allowed to roam. Particularly if the property is planted with azaleas, rhododendrons, yews and other ornamental shrubs as these can be lethal. Dr. Vaala also pointed out that goats and sheep should not be staked in an open area as they can be attacked by roaming dogs. If they must be staked, it should be in a protected enclosure.

Goats generally make better “pets” than sheep. “They follow one around like a puppy,” she said. “They can be taught to walk on a leash and they are fun to watch. The African Pygmy goat is quite popular as a pet.” According to Dr. Vaala, veterinarians are becoming more interested in these species. “But much more research is needed before we fully understand the requirements of these animals and their diseases.”

—H.W.
New Overseers

The University Trustees approved the appointment of four new members to the School's Board of Overseers.

Miss Henrietta K. Alexander, Coatesville, recently returned to Pennsylvania to become more actively involved in her family's cattle and Thoroughbred breeding interests. Her grandfather, the late Robert J. Kleberg, Jr., developed the Santa Gertrudis cattle breed.

Mrs. Ann Eldredge, Middleburg, VA, breeds and shows English cocker spaniels. Together with her husband, the late E. Irving Eldredge, she bred and raised an outstanding line of Irish setters and exotic cattle at their Tivelda Farm in Virginia. Mrs. Eldredge has been a member of the Ladies Committee of the Small Animal Hospital since 1980.

C. Taylor Marshall, Oakmont, PA, is chairman and president of the Edgewater Corporation. He is Master of Foxhounds of the Sewickly Hunt Club and serves as a director of the American Foxhound Association and the Master of Foxhounds Association of America.

Mrs. Anne F. Thorington is a breeder of Thoroughbred horses. Recently she has begun to show dogs, and her new Pembroke Welsh corgi finished its champion title while still under one year of age.

New Field Service Building

The Field Service at New Bolton Center moved into its new quarters in February. The new building is of modular construction and contains five individual offices and a reception area. There is also a conference room. The basement is used as storage space for old medical records and other documents.

Pennsylvania's Oldest Bequest

"In the name of God Amen. I John Keble of the City of Philadelphia Gentleman being of sound mind memory and understanding praised be the Lord for the same and all other his mercies do hereby make my last Will and Testament."

So begins a document dated September 24, 1807, in the files of the University of Pennsylvania. In his Will, Keble directed that his estate be divided among charitable institutions after bequests to his friends, his church, and a hospital.

Search Committee

University of Pennsylvania Provost Thomas Ehrlich announced the make-up of the search committee to recommend a successor to Dean Robert Marshak, whose term will be completed as of June 1987.

The committee is chaired by Dr. Mark E. Haskins (V'69), associate professor of pathology, pathobiology, at the School. Other School faculty members on the committee are: Dr. Lawrence T. Glickman (V'72), associate professor and Chief, Section of Epidemiology; Dr. Adrian R. Morrison, professor of anatomy; Dr. David M. Nunamaker (V'68), Jacques Jenny Professor of Orthopaedic Surgery, Chief, Large Animal Surgery. Ms. Lynn M. Walker, Class of '87, and Ms. Tania D. Woerner, Class of '89, are the two student members.

In addition to the representatives from the Veterinary School, the committee has four other members. They are: Dean Jan Lindhe, School of Dental Medicine; Dr. Stephen Roth, chair, Department of Biology, professor of biology; Dr. Roy D. Schmickel, professor and chair, Human Genetics, School of Medicine; Dr. Rosemary A. Stevens, professor of history and sociology of science.

Bellwether

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