This report honors those whose generosity sustains the Institute’s independence and commitment to excellence and the pursuit of truth.
The success of an institution like the Baker Institute is critically dependent on people.

Douglas McGregor
The Baker Institute celebrated its thirty-fifth birthday in 1985 by establishing new records in productivity and by strengthening its firm commitment to research, teaching, and service. For the first time in its history sponsored research surpassed $1 million; the number of published reports by the Institute staff reached an all-time high; and our scientists were invited participants in thirteen international meetings and workshops.

Institute staff members made significant progress in their studies of infectious diseases, arthritis, and reproductive disorders. Much of the work made use of new methods that employ living organisms or their parts in useful ways. Popularly known as biotechnology, those techniques have found utility in many areas of research and as practical aids for diagnosing and treating disease. Considering the power of biotechnology and the opportunities it affords for analyzing and modifying biological processes, it was inevitable that Institute scientists would use those methods to study infectious agents and the diseases they cause and to uncover information about the nature of the immune system and of the osteoarthritic process.

The success of an institution like the Baker Institute is critically dependent on the environment in which the work is conducted and, more important still, on people. The Institute is fortunate in both respects. It has a superbly equipped facility and a dedicated staff of gifted men and women. The Institute also has an outstanding advisory council and a growing number of benefactors, whose generosity and encouragement have provided the margin of excellence in the Institute’s programs. Those are the ingredients of a successful research enterprise. They have served us well for more than three decades and have created a firm foundation for the future.

As the Institute’s programs have grown in size and complexity, so have its needs for personnel, laboratory space, and support facilities. Recognizing those needs, the advisory council endorsed a master plan that calls for the addition of two faculty-level scientists to the permanent research staff, the extension of the Link Building to provide new laboratory and office space, and property improvements to accommodate the Institute’s equine research. The College of Veterinary Medicine and the University have responded to that initiative by providing the funds to support one faculty-level scientist and operating support for two laboratories that offer services to the Cornell community. The additional funds required to implement the master plan will be sought through a three-year capital campaign.

Our satisfaction with the progress made this year and our optimism were tempered by
Our staff contributed in important ways to the college and the University.

Sue Hamlin
the loss of two faithful friends, Priscilla Maxwell Endicott and Dorothy Havemeyer McConville. Both will be remembered for their generous support of our research programs and restoration of the Institute’s buildings.

The Simpson Trusts were named this year as recipients of the Arthur F. North Jr. Canine Service Award. The award was made in recognition of the magnificent support provided by the trusts for our canine parvovirus and osteoarthritis research.

A reception was held in December to mark Charles Bailor’s retirement after thirty-six years of service to Cornell. Bailor was a founding member of the Institute’s staff. His conscientious attention to detail and friendly manner will be greatly missed.

Although the Institute is first and foremost a research institution, its staff members contribute in many ways to the educational activities of the College of Veterinary Medicine and the University. We are particularly proud that Douglas Antczak was promoted this year to associate professor with tenure. Nancy Burton-Wurster and Judith Appleton were advanced to the rank of senior research associate. The promotions were made in recognition of the leadership of the individuals concerned, their outstanding performance in research, and their contributions to the teaching and service programs of the Institute and the college.

I want to acknowledge the splendid efforts of Leland Carmichael and Robin Bell, who served as graduate faculty representatives for the Fields of Veterinary Medicine and Immunology, respectively. Other members of our staff also contributed in important ways to the college and to Cornell programs, binding us still more closely to the University of which we are a part.

Douglas D. McGregor
### Staff of the Baker Institute

#### Administration

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<thead>
<tr>
<th>Name</th>
<th>Title and Education Details</th>
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<tbody>
<tr>
<td>Douglas D. McGregor</td>
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<tr>
<td>Susan H. Hamlin</td>
<td>administrative manager: B.S., Elmira College</td>
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<tr>
<td>Carlene M. Campbell</td>
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<td>Nancy D. Combs</td>
<td>accounts coordinator</td>
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<tr>
<td>Anita S. Hesser</td>
<td>secretary</td>
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<tr>
<td>Florence C. Huth</td>
<td>administrative aide</td>
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<td>Gloria F. Mayer</td>
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<td>Sharon E. Morrow</td>
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<td>Ann W. Signore</td>
<td>administrative aide: Cornell</td>
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#### Laboratories

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<tr>
<td>Giralda Laboratory for Canine Infectious Diseases</td>
<td>Leland E. Carmichael, John M. Olin Professor of Virology: A.B., D.V.M., University of California; Ph.D., Cornell</td>
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<td>Jean C. Joubert, research support specialist</td>
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<tr>
<td>Virology Laboratory</td>
<td>Colin R. Parrish, assistant professor of virology: B.Sc., Massey University; Ph.D., Cornell</td>
</tr>
<tr>
<td>Hadley C. Stephenson Laboratory for the Study of Canine Diseases</td>
<td>Max J. G. Appel, professor of virology: Dr.med.vet., University of Hannover; Ph.D., Cornell</td>
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<td></td>
<td>Jamie E. Levis, laboratory technician: B.S., Cornell</td>
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<td>Mary Beth Matychak, research technician: University of Evansville</td>
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<td></td>
<td>Susan E. Pearce-Kelling, laboratory technician: B.S., Cornell</td>
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<tr>
<td>John M. Olin Laboratory for the Study of Canine Bone and Joint Diseases</td>
<td>George Lust, professor of physiological chemistry: B.S., University of Massachusetts; Ph.D., Cornell</td>
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<td>Nancy Burton-Wurster, senior research associate: B.A., M.S., Ph.D., New York University</td>
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<td>Harry R. Leipold, graduate research assistant: B.S., Cornell</td>
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<td>Susan J. Harter, laboratory technician: B.S., Lock Haven State College</td>
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<td>Elizabeth Magri, laboratory technician: B.S., University of Vermont</td>
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<td></td>
<td>Alma J. Williams, laboratory technician: B.A., University of Pennsylvania; M.S., Cornell; AALAS accreditation</td>
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<tr>
<td>Immunology Laboratory</td>
<td>Robin G. Bell, associate professor of immunochemistry: B.Sc., Australian National University; Ph.D., John Curtin School of Medical Research</td>
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<td>Masataka Korenaga, postdoctoral associate: B.S., M.S., Kyushu University; Ph.D., Kumamoto University</td>
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<td>Ching-hua Wang, graduate research assistant: M.D., Peking Medical School</td>
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<td>Duzhang Zhu, graduate research assistant: M.D., Anhui Medical College</td>
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<td>Lincoln S. Adams, research technician: B.S., Hobart College; AALAS accreditation</td>
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<td>Jennifer A. Grigg, laboratory technician: B.R.T.C., Canberra Technical College</td>
</tr>
</tbody>
</table>
# Equine Genetics Center

**Douglas F. Antczak**, associate professor of immunology: B.A., Cornell; V.M.D., University of Pennsylvania; Ph.D., Cambridge University  
**Anne L. Crump**, graduate research assistant: B.A., Mount Holyoke College  
**Christopher J. Davies**, graduate research assistant: B.S., D.V.M., Cornell  
**Christopher V. Horton**, research assistant: B.S., Cornell  
**Jane M. Miller**, laboratory technician: B.S., Cornell  
**Laura M. Stenzler**, laboratory technician: A.A.S., State University of New York Agricultural and Technical College, Delhi; B.S., Cornell

# Donnelley Laboratory of Immunochemistry

**Judith A. Appleton**, senior research associate: B.S., Indiana University; M.S., Ph.D., University of Georgia  
**Melissa Chen Woan**, research associate: B.Ed., Taiwan Normal University; M.S., Ph.D., University of Illinois  
**Patricia E. Kennedy**, laboratory technician: B.S., Cornell  
**Susan K. Noonan**, laboratory technician: B.S., Cornell  
**Lisa R. Schain**, laboratory technician: B.S., Cornell

# Cell Fusion Laboratory

**Jeannette C. Poleman**, laboratory technician: B.A., Cornell

# Flow Cytometry Laboratory

**William V. Harris**, research support specialist: B.S., Ohio State University; M.S., Cornell

# Glassware

**Jeannette R. Carney**, laboratory attendant  
**Hazel M. Givens**, laboratory attendant: A.A.S., Tompkins-Cortland Community College

# Animal Care

**Roy L. Barriere**, vivarium supervisor: AALAS accreditation  
**Charles B. Bailor**, animal technician  
**Bernard L. Clark**, animal technician  
**Raymond M. Combs**, animal technician  
**Raymond J. Corey**, animal technician: A.A.S., State University of New York Agricultural and Technical College, Delhi; AALAS accreditation  
**Kevin T. Draiss**, animal technician: B.S., Cornell  
**James C. Hardy**, animal technician: B.S., Cornell; AALAS accreditation  
**Laura A. Michel**, animal technician: A.A.S., State University of New York Agricultural and Technical College, Farmingdale; B.S., Cornell; AALAS accreditation  
**Anastasia E. Newell**, animal technician

# Maintenance

**Edson Wheeler, Jr.**, maintenance supervisor  
**Arthur D. Howser**, maintenance mechanic  
**Gerald G. Rice**, vehicle mechanic
Each of us lives in a germ-filled world, and so do our dogs.
Each of us lives in a germ-filled world, and so do our dogs. Fortunately most organisms do not cause disease, and some are even beneficial. Infectious diseases that plague human beings and other animals can be expected to continue, for the evolution of disease-causing agents through adaptation to new hosts is a fundamental process of life. The circumstances that prompted the emergence of canine parvovirus (CPV-2) in the dog population are almost as mysterious now as when the disease was first recognized in the summer of 1978. Nevertheless, significant progress has been made by Colin R. Parrish in characterizing natural isolates of CPV-2 and in locating on the viral genomes the regions that seem most important in the evolution of parvoviruses.

Our research continues to address the natural history of canine infectious diseases. We are concerned with the biology of CPV-2, with the problems of vaccination, and with the occurrence of parvoviral disease in well-managed kennels. As reported last year, factors that influence immunization success have been identified: different amounts of virus are required to immunize with different vaccinal strains; adult dogs have more variable antibody responses than do pups to certain vaccinal strains; and vaccines often fail to immunize pups that have low levels of maternal antibodies but that are nevertheless susceptible to infection with virulent CPV-2. Most field outbreaks in kennels appear to result from the latter phenomenon. No vaccine has been shown to reliably immunize pups that have low levels of maternal antibodies.

Canine brucellosis is still a major portion of our research and service activities. We have provided assistance to veterinarians and breeders who have obtained equivocal results using routine diagnostic tests. We have provided diagnostic assistance in more than 5,700 cases. Most requests were for help in differentiating infected from "false-positive" animals. During the past year several outbreaks of brucellosis occurred in large kennels of breeding dogs and in working animals. In one outbreak involving valuable hunting dogs we provided diagnostic assistance and, with the collaboration of University of Florida scientists, instituted a treatment regimen that proved successful in curing dogs that had been infected for less than a month. It was demonstrated that infected dogs could be successfully treated and returned to service as working animals if the treatment was instituted early. Breeding of such animals was not recommended.

During the past year we developed an improved diagnostic antigen for *Brucellosis canis*. We took advantage of differences in cell wall antigens between a variant (M-) *B. canis* strain and the wild-type (M+) organism. The variant is less cross-reactive with related bacteria and has reduced the rate of false-positive reactions. The use of the M- variant as antigen in a rapid slide agglutination test (RSAT) reduced the rate of false-positive reactions in a panel of selected sera 15 to 50 percent. Like the original RSAT, the RSAT using the variant requires 2-mercaptoethanol for accurate results. The
The evolution of disease-causing agents is a fundamental process of life.

Jean Joubert
accuracy of the RSAT was therefore significantly enhanced without sacrifice in specificity. In preliminary studies the M—bacterium detected infection one to two weeks earlier than the RSAT employing B. ovis as antigen. In conjunction with a highly specific test that employs internal (cytoplasmic protein) antigens in agar gel immunodiffusion (AGID) tests, the serodiagnosis of canine brucellosis has been markedly improved. Especially during the first four to eight weeks of infection, blood cultures are essential for the definitive diagnosis, as most animals develop a bacteremia within a week of exposure.

As reported last year, Jean Joubert prepared a library of monoclonal antibodies against purified cell wall antigens of M+ B. canis cells, but all were cross-reactive. A different strategy was then employed, using cell wall extracts of the M—variant as antigen, and specific B. canis monoclonal antibodies were obtained. They are being utilized in attempts to purify specific antigens that may prove useful in diagnostic tests.

In another study Laura Jones examined protein antigens of B. canis. Such antigens are used in our laboratory because of their high specificity for members of the genus Brucella. Unfortunately they have proved useful only in AGID tests; residual cross-reacting cell wall materials (lipopolysaccharide) have plagued our efforts to exploit those antigens in more simplified procedures, such as a latex agglutination test, that could be used in a veterinarian’s office. Using immunoprecipitation of radio-labeled B. canis proteins and polyacrylamide gel electrophoresis, we identified four to six major immunogenic proteins from the more than thirty proteins in bacterial cell extracts. We observed that early sera (less than a month after infection) contained antibodies that reacted strongly with a 31 kD and a >200 kD protein; in contrast, late sera (more than two months after infection) all had strong reactions with a 66–69 kD protein and weak reactions to a 51 kD protein. In chronically infected animals re-

actions to the 31 kD and >200 kD proteins were faint or absent, suggesting that it might be possible to estimate the infection status of an animal by the pattern of antibody reactivities with the cytoplasmic antigens. In field sera, where the time of infection could not be determined, there was considerable heterogeneity in the immunoprecipitation patterns.

Those preliminary studies have provided definition of the molecular weights of the cytoplasmic antigens and identified those that are most strongly immunogenic in infected dogs. Further research is in progress to define the nature of the antigens, their location in the bacterial cell, and the patterns of dog responses to them. Another goal of future research is to utilize recombinant DNA methods to clone the desired genes for defined antigens into a bacterial host that lacks cross-reacting antigens. We have developed methods to accomplish those goals, and monoclonal antibodies for certain B. canis surface antigens are now available.

Leland E. Carnichael

Nancy Combs
Why do viruses infect one animal species and not another?
Why do viruses infect one animal species but not another? What happens to viruses over time? Do they stay the same or change? We are seeking answers to those questions in our studies of canine parvovirus (CPV-2). CPV-2 was first recognized in 1978 as the cause of a new disease of dogs. Soon thereafter it was recognized in many other countries throughout the world. Although a new virus, it is similar to previously known paroviruses that cause disease in cats and mink.

A popular hypothesis is that CPV-2 arose as a variant of either the cat or the mink parovirus. If CPV-2 is such a variant, it must have acquired the ability to infect and cause disease in dogs, as the cat and mink viruses do not grow well in dogs or in dog cells. We have been examining relationships between those paroviruses to pinpoint changes that might have given rise to CPV-2. One approach has been to construct variant strains of the dog and cat viruses to determine their characteristics and host range. Such variants are hybrids consisting of spliced segments of the two viruses. Individual variants constructed in that way differ from one another in the particular segment of the viral genome that codes for the coat protein of the virus. The differences are associated with alterations in both the surface properties of the virus particles and their capacity to infect dog and cat cells.

The results of our research suggest that only a few small changes are necessary to create a host-range difference between the paroviruses of cats and dogs. As only a few changes allow the cat virus to replicate efficiently in dogs, we do not yet know the circumstances that could have brought those changes about. One way we have addressed the problem has been to determine whether the paroviruses we are studying vary in nature—whether there are several forms of each virus or only one of each that infects cats, dogs, or mink. It appears that the viruses are relatively stable but that changes in them do occur. For example, two forms of the mink virus have been identified. Both have been infecting mink for many years, although recently one of the two forms has become much more common. Among the dog viruses the situation is more complex. We have shown that the strain of CPV-2 that first emerged in dogs and caused the initial outbreaks of disease in 1978 was replaced in 1980 by a second type of virus. While the two isolates differ only slightly, the newer type has apparently replaced the older form as the cause of CPV-2 in dogs.

Colin R. Parrish
We are seeking ways to avoid postvaccinal encephalitis by developing a new type of distemper vaccine.
Although canine distemper has been controlled by vaccination for more than twenty years, vaccinated dogs sometimes develop an inflammatory reaction in the brain. That reaction, called postvaccinal encephalitis, seems to occur most frequently when live modified canine distemper vaccine and canine parvovirus vaccine are administered simultaneously. We are seeking ways to avoid encephalitis by developing a new type of distemper vaccine that is both safe and effective. In collaboration with Dr. Erling Norrby of the Karolinska Institute in Sweden, we have identified the portions of the canine distemper virus coat (the F and H proteins) that can immunize dogs against a challenge infection with virulent distemper virus. We now want to isolate the viral genetic information required for the production of the F and H proteins. That segment of the genome would then be inserted into vaccinia virus, an innocuous agent that has been used for many years to immunize humans against smallpox. The recombinant vaccine would be tested for its capacity to protect dogs against distemper.

Zoo animals such as red pandas, kinkajous, and black-footed ferrets can develop encephalitis when given vaccines containing live modified distemper virus. To avoid that complication, we have prepared special vaccines containing inactivated distemper virus for the vaccination of animals at the National Zoo in Washington, D.C., the Buffalo Zoological Gardens, the Baltimore Zoo, the Game and Fish Department of Cheyenne, Wyoming, and the University of California, Berkeley.

On a related front, we are studying how distemper virus infects brain cells. Persistent infection is associated with the loss of myelin, the sheathing material of nerve fibers. As demyelination is the hallmark of diseases like multiple sclerosis, it may be that those diseases are caused by viruses. Using the electron microscope, Dr. Brian Summers of the Department of Veterinary Pathology is studying demyelination in the brain tissue of dogs infected with distemper. He and Sue Pierce-Kelling are also using brain cell cultures to study the infection itself. Their investigations have shown that distemper virus strains that differ in their pathogenicity for dogs also differ in their capacity to infect and persist in brain cells.

A laboratory test that would detect demyelination would be a valuable diagnostic aid in both human and veterinary medicine. In collaboration with Dr. John Whittaker of the University of Alabama, we are exploring the possibility of developing such a test, based on our capacity to detect myelin fragments in the cerebral spinal fluid of distemper-infected dogs.

Still another aspect of our research on persistent viral infections involves the development of methods for detecting virus or viral constituents when they are present in vanishingly small amounts in infected cells. Jeff Mitchell has been addressing the problem in distemper-infected dogs. The results obtained so far are encouraging and will be extended this year in efforts to detect viral nucleic acid in brain cells after the virus can no longer be cultured from the brain.

Max J. G. Appel
Osteoarthritis is the principal cause of the pain and immobility associated with hip dysplasia.
Osteoarthritis is a common debilitating disease of many species. It often occurs in dogs with hip dysplasia and is the principal cause of the pain and immobility associated with that disease. Our research is concerned with the underlying process. We are studying how changes in protein elements of cartilage relate to the progression of osteoarthritis, whether those changes can be modified to arrest the disease, and whether a conspicuous increase in a particular protein, fibronectin, can be detected in synovial fluid or blood, thereby providing the basis of a diagnostic test.

Cartilage is rich in proteoglycans. Those large molecules give that tissue its normal resiliency. It has long been known that proteoglycans are diminished in the cartilage of osteoarthritic joints. Initially we thought that the observed increase in fibronectin in diseased cartilage was related to the loss of proteoglycans. But our most recent results indicate that that is not the case. Fibronectin increases early in the disease process, before proteoglycans are lost. We are now focusing on the questions of whether fibronectin is produced locally by cartilage cells and whether local accumulation of that protein is related to the progression of disease.

The accumulation of fibronectin in cartilage seems to be a general feature of the osteoarthritic process. It occurs not only in dogs but also in rabbits and human beings. In the latter two species the increase occurs in the absence of hip dysplasia. That finding implies that although hip dysplasia may promote the observed changes in the protein composition of cartilage, the changes are an independent expression of the osteoarthritic process.

We used biochemical and immunological methods to measure the accumulation of fibronectin in the cartilage of osteoarthritic joints. The procedure involves staining frozen sections of cartilage with antibodies to fibronectin and examining the stained tissue under the microscope. Those studies showed that fibronectin does not accumulate in isolated foci but is distributed uniformly throughout the cartilage. In collaboration with CIBA-GEIGY Corporation, we evaluated the ability of several new antiarthritic drugs to modify the level of fibronectin in the articular cartilage of rabbits and dogs with osteoarthritis. Such studies may be useful in selecting drugs for the treatment of that disease.

In a related area we confirmed that the fibronectin of synovial fluid differs in biochemical composition from the fibronectin of blood. Our intention is to prepare a monoclonal antibody that is specific for the synovial fluid protein. If we are successful, we will ascertain whether that antibody can detect trace amounts of synovial fluid fibronectin in blood. A test based on that finding might be a useful adjuvant for the diagnosis of osteoarthritis and a means for identifying dogs that will develop hip dysplasia.

George Lust
Nancy Burton-Wurster
We want to understand how parasites suppress the host's immune system.
Our research is concerned with immunity to parasites, organisms that cause disease in all animal species, including human beings. Parasites are an astonishingly diverse and complex group of organisms that live in every site in the body. We have been studying nematodes (roundworms), a group of parasites that reside for the most part in the intestine. Such worms represent a formidable challenge to the host, not only because of their size but also because many have developed mechanisms for evading the host’s immune defenses. For example, some parasitic worms impede the development of antibodies or protective cells that might otherwise promote rejection of the intruder. Others alter their antigenic characteristics as they grow and mature, thereby escaping recognition by antibodies that were formed against earlier stages in their development. For those, and possibly other, reasons many worms survive in their animal hosts for months or years. In doing so, they interfere with normal body functions and injure the tissues that harbor them.

A major objective of our research is to understand how parasites suppress the host’s immune system. To make progress in that endeavor, we must first know how antibodies or cells of the immune system impede the growth and development of parasites or promote their expulsion. The infection caused by *Trichinella spiralis*, the causal agent of trichinosis, has been instructive in that connection. Over the last several years we examined how immunity to *T. spiralis* develops in mice and rats. Those studies showed that immune responses develop against antigens that are expressed by the parasite at different stages in its life cycle. Immunity results in failure of the parasites’ larvae to establish themselves in the intestine, in development of a weakened adult worm that has a diminished reproductive potential, and in premature expulsion of the worm from its intestinal niche. A related aspect of our research has been to identify host genes that dictate the success or failure of those antiparasite responses. In recent experiments using mice we showed that two major genes control the rate at which *T. spiralis* worms are expelled.

During the last year we discovered that lymph draining the intestine of rats infected with *T. spiralis* carries a population of lymphocytes that can protect normal rats against a challenge infection with that parasite. The cells that mediate the observed protection are added to the lymph three to four days after infection. Many are actively dividing. They enter the blood by way of the thoracic duct but rapidly leave the circulatory system and accumulate in the intestine, at the very site where worm rejection occurs. Using antibodies that detect surface antigens on some but not all lymphocytes, we intend to characterize the cells concerned. We also want to pinpoint the location of the cells in the intestine and to determine how they realize their protective function. Our analysis is expected to shed light on an important but poorly understood aspect of intestinal immunity and to pave the way for an investigation of how the parasite impedes the host’s immune defenses.

Robin G. Bell
Our most important work involved the transfer of embryos between donkeys and horses.
Research in the Equine Genetics Center is currently directed toward three areas: fundamental investigation of immunogenetic systems of the horse, study of immunological aspects of pregnancy in mares, and study of equine influenza virus involving the use of monoclonal antibodies. The latter research, conducted by Judy Appleton, is described elsewhere in this report.

Studies of the equine major histocompatibility complex, called ELA, for equine lymphocyte antigen, have been under way at the Institute since 1979. The work has resulted in the discovery and characterization of over twenty new genetic markers of the horse. The markers have utility as improved methods of horse blood typing. They are also being used in studies of equine pregnancy.

The most important work undertaken at the whole-animal level this year involved the transfer of embryos between donkeys and horses. Members of the horse family (horses, donkeys, and zebras) have the rare ability to hybridize between species, producing viable, but nearly always sterile, offspring, including the well-known mule and less-known hybrids such as the zebbronkey. It is also possible after successful embryo transfer for donkey mothers to carry horse foals to term, and horses, zebra foals.

The donkey-in-horse pregnancy established by embryo transfer is the only type of embryo transfer between member species of the horse family that usually ends in abortion. The pregnancy loss often occurs between days 80 and 95 of gestation. The abortion is thought to result from the failure of formation of endometrial cups, small ulcerlike structures of placental origin that are found in the uterus of mares between 40 and 120 days of pregnancy.

It is expected that donkey-in-horse pregnancies will help scientists determine the functions of the endometrial cups, especially their role in regulating maternal antifetal immune responses. One approach to the problem has been an attempt to develop treatments that will permit mares to carry transferred donkey conceptuses to term. The work is being done in close collaboration with Dr. W. R. Allen, director of the Equine Fertility Unit of the British Thoroughbred Breeders’ Association, in Cambridge, England. The most promising avenues explored thus far involve immunotherapy based on either transfer of serum from mares carrying normal horse fetuses to mares carrying donkeys or immunization of mares with white blood cells from the genetic parents of the donkey embryo that was transferred to each recipient. The mechanism by which those treatments protect donkey-in-horse pregnancies is not known, and the treatments do not always work. Nevertheless the results are encouraging.

In the laboratory cultures of endometrial cup cells have been established that permit study of hormone production by cup cells and investigation of interactions between maternal lymphocytes and placental tissues. In addition a panel of monoclonal antibodies with specificity for endometrial cup cells has been produced in the Institute’s Cell Fusion Laboratory. Those antibodies are being used to identify functionally important molecules of the endometrial cups.

Two important meetings were organized by the Equine Genetics Center in cooperation with the Havemeyer Foundation. The First International Symposium on Equine Embryo Transfer was held in Ithaca in late 1984. Over fifty veterinary scientists attended the meeting, which resulted in the publication of an extensive volume of proceedings as a supplement to the Equine Veterinary Journal in March 1985. The Fourth Workshop on Lymphocyte Alloantigens of the Horse, held in Lexington, Kentucky, in October 1985, drew participants from four countries and resulted in the identification and recognition of six new antigens of the equine major histocompatibility complex.

Douglas F. Antczak
Influenza viruses are known for their tendency to drift.
We continued our research aimed at improving methods of vaccination against equine influenza. We have been studying antigenic drift, the gradual change that occurs in the surface proteins of certain viruses. Influenza viruses are known for their tendency to drift, but the process has not been studied closely in the equine virus. We are particularly interested in one protein of that virus, the hemagglutinin, because antigenic drift in the hemagglutinin of human influenza viruses accounts in large measure for the capacity of those viruses to evade the host's immune defenses and of the disease to spread through a population.

The equine influenza vaccine now in use was prepared from a virus isolated in 1963. The question therefore arises whether the equine virus has drifted sufficiently since then to reduce the effectiveness of the vaccine. To address that question, we produced a panel of ten mouse monoclonal antibodies specific for the hemagglutinin of the equine virus. Using those antibodies, we found that the hemagglutinin on recent virus isolates has changed considerably from the hemagglutinin on the vaccine virus. The change seems to have occurred at only one of three demonstrable sites on the hemagglutinin molecule; the other two sites have been preserved. The equine virus hemagglutinin is apparently changing much more slowly than its counterpart on the human viruses. However, we found that variants of equine viruses exist in numbers similar to those of human viruses. Thus the equine virus is similar in its ability to change, but it probably has fewer opportunities to replicate in the relatively small horse population. The findings suggest that more recently isolated viruses should be incorporated into vaccines, even though less frequent vaccine changes are required for equine viruses than for human viruses.

We are also analyzing the immunity conferred on suckling animals by their mothers' milk. In our work we have employed *Trichinella spiralis*, a parasite that initiates its life cycle in the gastrointestinal tract of a susceptible animal. That characteristic of the parasite makes it an excellent model for the study of other intestinal parasites, intestinal cancer, and neonatal diarrhea.

When female rats are infected with *T. spiralis*, their suckling offspring are protected from challenge with the parasite. We showed previously that antibody in the dam's milk mediates that protection and that the antibody is induced by larvae encysted in her muscles. The immunity is specific in that it is directed at infectious larvae when they first enter the pup's intestine. The immunity is similar to the phenomenon of "rapid expulsion" in adult rats. Rapid expulsion can cause the rejection of as many as 99 percent of a dose of challenge worms within twenty-four hours. To better understand how antibody mediates expulsion, we developed sensitive binding assays using monoclonal anti-immunoglobulin reagents to detect parasite-specific antibodies of each of several subclasses. We showed that the mechanism of action of the antibody is not likely to involve mast cells and that the antibody mediator is not of a class traditionally associated with immunity at mucosal surfaces. Protection is associated with a subclass of IgG, an immunoglobulin found in the blood.

We have begun to characterize the parasite components that are the targets of the antibody. We have collected proteins larger than thirty thousand daltons that the target muscle larva release into protein-free medium during culture in vitro. That preparation contains only a few of the parasite's proteins. We found that a single dose of as little as twenty-five micrograms of this protein can stimulate immunity as strong as that induced during a natural infection. We are continuing our studies of those proteins, their function and how antibodies interact with them to inhibit larvae from establishing themselves in the intestine.

Judith A. Appleton
Cornell has given high priority to its service activities.
The Institute operates two research service laboratories, one for the production of antibodies and another that uses computer-controlled laser methods to analyze and separate cells. The Cell Fusion Laboratory was established in 1977. Its principal function is to produce molecularly homogeneous antibodies. Such monoclonal antibodies are used in the Institute’s own research programs and by investigators in other departments and divisions of the University.

Although the Flow Cytometry Laboratory has operated for only two years, it too provides a wide range of services to Institute staff and other Cornell investigators. The mainstay of the facility is a fluorescence-activated cell sorter, which can analyze and separate individual cells at high rates (about five thousand cells per second). The cells pass through a laser beam in a fluid stream, one at a time, allowing several properties of the cells to be measured, such as their light-scattering characteristics, size, and fluorescence. The information is analyzed by a computer and can be displayed in useful ways. Cells that can be distinguished in those ways can also be isolated for further study.

Cornell has given high priority to those service activities and has provided operating support for them. Similar facilities will be established on the main campus in 1988. They will be integrated with our own to provide a wide range of services and training opportunities for faculty members and students. That arrangement will benefit the Institute in several ways. It will foster collaboration between our staff and the faculty of other departments, and it will provide new opportunities to utilize contemporary methods of biotechnology in our animal health research.

William V. Harris
Publications

Publications listed as in press in last year’s report are repeated this year, with their original numbers, to record their full bibliographic details.


The Institute operates at the forefront of veterinary medicine.
Thirty-five years ago the Baker Institute was established as a permanent research facility for the study of animal diseases. Its main component was the Cornell Research Laboratory for Diseases of Dogs. Research undertaken in that facility was initially concerned with the study of distemper, hepatitis, and other infectious diseases. That work has continued in studies of canine parvovirus, distemper, and brucellosis. But the investigations have broadened to include research on canine hip dysplasia and osteoarthritis. Much has been learned about those diseases, including methods for their diagnosis, treatment, and control.

That new knowledge in itself has justified the initial investment in the Institute, for the investment has been amply rewarded in the greatly improved health that dogs now enjoy. However, research undertaken at the Institute has further significance that touches on our own health. Knowledge gained about distemper or canine parvovirus has increased our understanding of other viruses—their relationships to one another, how they evolve in nature, and, most important, how they can be controlled. Likewise, studies of canine hip dysplasia have encouraged investigations into the nature of osteoarthritis, a disease that affects virtually every species and is the cause of much suffering and economic loss.

Canine health continues to be the major concern of the Institute. In the last few years, however, the Equine Genetics Center was established as a second division of the Institute. Like the Research Laboratory for Diseases of Dogs, it coordinates research on health problems of horses. Reproductive failure and equine influenza are the major concerns at this time. Although the programs are new, they have already attracted considerable support and interest because of the information they are providing about practical problems of disease in horses.

From a modest beginning, the Institute has grown into a research enterprise that operates at the forefront of veterinary medicine. Its success is largely due to the support it has received from dog clubs, foundations, veterinarians, and a growing number of concerned individuals. That interest will sustain the Institute in the years ahead and will ensure its capacity to respond rapidly to health problems that concern us all.

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In appreciation for their exceptional interest in the Institute, we should like to express our gratitude to the American Kennel Club, Mrs. Warren Bicknell, Jr., Mr. Warren Bicknell III, Miss Wendy H. Bicknell, Mr. and Mrs. Louis G. Bissell, Jr., Mr. and Mrs. Robert S. Boas, Mr. and Mrs. Albert C. Bostwick, Jr., Mr. Atherton Bristol, Mr. and Mrs. Gaylord Donnelley, Mrs. Ellen Frenkel, Mrs. Gordon H. Gillis, Mr. and Mrs. B. Douglas Gordon, Mrs. Dona E. Hausman, Mr. and Mrs. Clifford P. Hickok, Mrs. Gilbert W. Humphrey, Miss Kate Ireland, Mr. and Mrs. R. L. Ireland III, Mr. John P. Kendall, Mr. and Mrs. H. Peter Kriendler, Mr. and Mrs. David J. McFadden, Mr. John Morgan, Dr. Seeley W. Mudd II, Mrs. Adelaide C. Riggs, Mr. J. B. Robinson, Dr. Ben E. Sheffy, Mrs. Clare E. Thaw, Mr. Jack B. Ward, Mr. and Mrs. Harwood Warriner, Mr. Gilbert H. Wehmann, Mr. Robert Winthrop, Mr. Robert Winthrop II, Mr. and Mrs. C. Martin Wood III, and Ms. Shirley E. Wright.
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Mr. and Mrs. Robert Romans (in memory of
Mrs. Margaret Roginski
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Mr. and Mrs. William Rosenberger
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Springville Animal Hospital
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Stanton Veterinary Hospital
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Dr. Edward F. Steinfeldt
Dr. Lawrence E. Sterlett
Dr. Gary E. Stevens
Dr. Edward W. Stewart
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Dr. Raymond W. Stock
Dr. Renee Stock
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Dr. Lester Storms
Dr. Sidney Storozum
Stow Animal Hospital
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Dr. Robin T. Stronk
Dr. Hugh P. Studdert
Dr. Jeffrey Stuppler
Suffield Veterinary Hospital
Sunbury Animal Hospital
Dr. Ronald A. Swanson
Dr. William D. Swartz
Dr. Paul R. Swenson
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*Gave $100–$499 since January 1, 1985.
†Gave $500–$999 since January 1, 1985.
‡Gave $1,000 or more since January 1, 1985.

Giant Schnauzer Club of America
Glendale All Breed Obedience Club
Glendale Beagle Club
Golden Gate Labrador Retriever Club
Great Dane Club of America* 
Greater Philadelphia Dog Fanciers Association* 
Great Lakes English Springer Spaniel Breeders Association
Great Western Flat-Coated Retriever Club (in honor of Dr. Raymond A. Weitkamp)
Hamilton-Middletown Beagle Club
Harrisburg Kennel Club‡
Homestead Beagle Club
Hudson Valley German Shorthaired Pointer Club
Hudson Valley Golden Retriever Club
Irish Setter Club of Greater Davenport
Islip Dog Fanciers
Ithaca Dog Training Club* 
Jupiter-Tequesta Dog Club* 
Kalamazoo Dog Training Club
Kanadasaga Kennel Club* 
Kankakee Kennel Club‡
Kenilworth Kennel Club of Connecticut
Lizard Butte Kennel Club* 
Longshore Southport Kennel Club* 
Los Angeles Poodle Obedience Club
Luzerne Dog Training Club* 
McKean County Beagle Club
Meadowbrook Cocker Spaniel Club
Medina Kennel Club†
Middle Atlantic States Komondor Club* 
Milwaukee Bulldog Club
Miniature Pinscher Club of Greater Los Angeles* 
Minnesota Field Trial Association
Mohawk Beagle Club
Mohawk-Hudson German Shepherd Dog Club
Monticello New York Kennel Club†
(special in honor of Dr. James Cane, George Hahn, Lawrence Mauer, Allen Wachter, and Chris Aylesworth and in memory of William Sachs and Albert Lenchner)
Myrtle Beach Kennel Club†
Nassau Dog Training Club
National Beagle Club* 
Newfoundland Club of America* 
New Jersey Beagle Club
New-Penn-Del Newfoundland Club
Niagara River Beagle Club
Northern Ohio Beagle Club
North Penn Field and Conservation Club
Norwich and Norfolk Terrier Club* 
Obedience Dog Training Club of Waterbury
Obedience Training Club of Hawaii* 
Ohio Britanny Club
Old Pueblo Dog Training Club†
Olean Kennel Club
Olen-Angie Beagle Club
Olympic Kennel Club* 
Ox Ridge Kennel Club‡
Pembroke Welsh Corgi Club of America* 
Penn Ridge Kennel Club‡
Perkiomen Valley Kennel Club* 
Pioneer Valley Kennel Club* 
Pittstown Beagle Club
Poodle Club of Southern California
Puerto Rico Kennel Club
Puli Club of Connecticut
Richmond Dog Obedience Club* 
Rombout Hunt
Saint Bernard Club of Puget Sound
Saint Lawrence Valley Dog Club* 
Saluki Club of America* 
Saratoga Kennel Club (in honor of Dr. Elmer Robinson)
Saw Mill River Kennel Club
Scottish Terrier Club of Michigan* 
(special in memory of Senator Anthony Stamm)
Seneca Siberian Husky Club (in memory of Art Englel)
Shih Tzu Fanciers of Southern California
Siberian Husky Club of America* 
Silver Bay Kennel Club of San Diego‡
Somerset County Dog Obedience Club* 
Southeastern Brittany Club
Southern California Alaskan Malamute Club
Scotch Side All Breed Dog Training Club
South Texas Obedience Club* 
Spartanburg Kennel Club‡
Start Beagle Club Auxiliary* 
Steel City Kennel Club* 
Steel Valley Airedale Terrier Association
Suburban Dog Training Club
Tidewater Kennel Club of Virginia* 
Tioga County Kennel Club
Tri-State Hunting Dog Association
Tri-State Kennel Club†
Twin Colonies Old English Sheepdog Club (in honor of Dr. James Dorse and Dr. Debra Fiorito)
Two Cities Kennel Club*
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<th>Companies</th>
<th>Foundations and Trusts</th>
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<td>Mr. Robert Woodruff</td>
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**Associations**
- American Kennel Club
- California Handlers Advanced Obedience School (in honor of Dr. Raymond A. Weitkamp)
- Humane Society of Huron Valley (in memory of Toby)
- Women’s Auxiliary to the Long Island Veterinary Medical Association
- Waterloo Kennel Club (in memory of Dr. Corinne Harper)
- Weimaraner Club of Washington, D.C. Area*
- Western Lakes Training Club of Buffalo
- West Highland White Terrier Club of Western Pennsylvania
- Westminster Kennel Club‡
- Winnegamie Dog Club*
- Wolverine Dog Training Club (in memory of Baron)

**Companies**
- Advanced Genetics Research Institute
- ALPO Petfoods
- Animal Inn
- Ciba-Geigy Corporation
- Cottonwood Kennels
- Daryl Laboratories
- IBM Corporation
- Illinois Bell
- Ingersoll-Rand
- Jay-Edd Trim Shop
- Johnson and Johnson
- Marshall Farms
- Nabisco Brands
- Richardson-Vicks
- Advanced Genetics Research Institute
- ALPO Petfoods
- Animal Inn
- Ciba-Geigy Corporation
- Cottonwood Kennels
- Daryl Laboratories
- IBM Corporation
- Illinois Bell
- Ingersoll-Rand
- Jay-Edd Trim Shop
- Johnson and Johnson
- Marshall Farms
- Nabisco Brands
- Richardson-Vicks

**Foundations and Trusts**
- Argonaut Charitable Foundation
- AZTec Fund
- C.A.L. Foundation
- Corning Glass Works Foundation
- Geraldine Rockefeller Dodge Foundation
- Gaylord Donnelley Foundation
- Firman Fund
- Bruce A. Gimbel Foundation
- Harmon Foundation (in memory of Pepper Harmon and Pan Jackson)
- Gilbert W. and Louise Ireland Foundation
- Humphrey Foundation
- Ireland Foundation
- Henry P. Kendall Foundation
- James A. Macdonald Foundation
- Milwaukee Foundation
- MONY Trust
- Morgan Guaranty Trust Company of New York
- Shepard Foundation
- Marilyn M. Simpson Charitable Trusts
- Surdna Foundation
- Trebor Foundation
- Westminster Kennel Foundation
- Robert Winthrop Trust
- Xerox Foundation

**In Memoriam**
- Ms. Louise Beltrano
- Mr. Nathan Bergen
- Mr. John Bono
- Dr. J. Roland Clanton
- Mrs. Jeanne L. D'Oyen
- Mrs. Priscilla Maxwell Endicott
- Mr. Art Englent
- Mrs. Helen Rowland Grosvenor
- Dr. Corinne Harper
- Mr. Albert Krull
- Miss Frances Lambert
- Mr. Albert Lechner
- Mr. Joseph Lessack
- Mrs. Dorothy Havemeyer
- McConvile
- Mrs. Janet C. McGrane
- Mrs. Bertha Neville
- Mr. Robert Newman
- Mrs. Sophie Rankin
- Ms. Mary Lou Roberts
- Mr. William Sachs
- Mrs. Marie W. Sanville
- Mrs. George F. Savage
- Miss Eleanor Tessendorf
- Mr. Dale Vereecken
- Mr. Robert Woodruff
There are many ways you can give to advance our work.
Ways of Giving

In establishing the Institute, of which the Cornell Research Laboratory for Diseases of Dogs is an important part, the Cornell University Board of Trustees authorized the Treasurer’s Office of Cornell to be custodian of all funds given in support of the Institute. You are thus assured your gift will have the maximum benefit.

There are many ways you can give to advance the work of the Institute. Some of these opportunities offer substantial income tax and estate tax benefits.

**Checks.** All checks should be made payable to Cornell University and mailed to Office of the Director James A. Baker Institute for Animal Health Cornell University Ithaca, New York 14853-6401 for the uses and purposes of the Cornell Research Laboratory for Diseases of Dogs.

**Appreciated stocks.** Selling appreciated stocks is almost certain to increase your taxes, but if you give the stocks to Cornell outright and deduct their full current market value as a charitable contribution, you can avoid capital gains tax. To complete the transaction with maximum speed and at lowest cost—

1. take the certificate to your bank or broker;
2. inform your bank or broker that you want to make a gift of these shares or securities to Cornell University for the Institute;
3. instruct your bank or broker to telephone the Office of University Investments, at 607/277-0022;
4. write a note to the Director, James A. Baker Institute for Animal Health, Cornell University, Ithaca, New York 14853-6401, including the name of your bank or broker and the form and size of your gift.

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