

# Zweig

From the Harry M. Zweig  
Memorial Fund for Equine  
Research at Cornell University  
College of Veterinary Medicine



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Photo: Unsplash

## Machine learning could be inside track to preventing racing breakdowns

By Lauren Cahoon Roberts

When Dr. Parminder Basran, associate research professor of oncology, arrived at the Cornell University College of Veterinary Medicine (CVM), he brought a totally new type of expertise to the college. As a radiation physicist, Basran uses artificial intelligence to analyze radiology images — a field known as radiomics. Prior to Cornell, Basran used radiomics to help human cancer patients. At CVM, he was eager to apply his tool to new fields. “I had this hammer and was looking for some new nails,” says Basran. “It’s really important for me to apply my knowledge to real clinical problems with practical applications.”

Now, Basran’s brand-new expertise has launched a promising new technique that could help prevent a serious issue in racehorse health.

### A new home for radiomics

Basran found his ‘nail’ after meeting and talking with Heidi Reesink, Ph.D. ’16, large

animal surgeon and Harry M. Zweig Assistant Professor in Equine Health, who is tackling a crucial problem in racehorses: catastrophic breakdowns due to fractures in the sesamoid bones of the fetlock. These fractures occur mostly in thoroughbred racehorses and commonly result in euthanasia. “In any sport, there are going to be sporadic injuries and accidents, but these catastrophic fractures are tragic and too common,” says Reesink. “Significant research and regulatory efforts are being dedicated to both understand and minimize these tragic injuries.”

As part of her previous research, Reesink captured hundreds of microscopic CT scans (micro-CTs) of the sesamoid bones, paired bones in the fetlock joints of horse cadavers. These scans included those from horses that had suffered catastrophic fracture (the case samples), and scans from horses that had died of other causes (the control samples). Reesink used conventional software to decipher differences between the case and control bones, finding that case samples had denser, narrower sesamoid bones within the fetlock.

Basran applied his radiomics algorithms to her images to see what they might find. In radiomics, the software computes hundreds of features from the images and then runs statistical tests to see whether features in the case and control groups are significantly different. “I was getting some really crazy, interesting results,” he says.





Heidi Reesink, Ph.D. '16, large animal surgeon and Harry M. Zweig Assistant Professor in Equine Health. Photo: Darcy Rose/ Cornell Vet

### Finding the unseen

Basran and Reesink decided to investigate further, applying radiomics to all micro-CTs Reesink had obtained in her previous research. Basran's artificial intelligence system was able to identify the same differences that Reesink had previously identified — proving that radiomics could reproduce the same results found by human-driven analysis. However, what stood out most was “the sheer volume of differences that could be detected between cases and controls that were not perceptible to the naked eye,” says Reesink.

The power of artificial intelligence picked up physiological qualities that were invisible to human researchers.

“Humans can only see so many differences between cases and controls,” says Basran. “The radiomics platform showed us many more features that we hadn't been seen before.”

Furthermore, these ‘invisible’ features were more significantly different between case and control samples than the ones researchers could see. “It may be that those new differences have more profound impacts on the horse's overall bone health than other known features,” says Basran.

### Getting clinical

The next step for the project will attempt to translate the features from the experimental realm to the clinical realm. “Micro-CT scans have incredibly high resolution and can pick out microscopic features, but they cannot be performed in a clinical setting,” says Reesink. “We now want to apply similar radiomics approaches to clinical CT imaging.”

Clinical CTs capture images of living patients at lower resolutions. “We're now trying to bridge this gap between the microscopic to the macroscopic level,” says Basran. To do this, the researchers are comparing clinical bone scans with microscopic bone scans to see if they can pick out the same visual features.

If they can find a reliable set of radiomic markers at the macroscopic level, Basran could then build a machine learning model that, along with complimentary modalities, could catch the warning signs of fracture risk in particular patients.

“The ultimate goal would be to identify rapid, inexpensive and, ideally, patient-side tests to identify at-risk horses,” says Reesink. “This would ultimately reduce fatalities and promote race-horse welfare.”

While the practical applications of this work are still in the future, the technique represents a brave new world for veterinary medicine. “This is really new to the veterinary community,” says Reesink. “No one has used it to detect equine fractures before, and this is just the first step. Cornell is positioned to be a leader in this new frontier of diagnostics.” ■

## Zweig research fund pivots during COVID-19 pandemic, holds virtual seminar events

While the COVID-19 pandemic has changed many things, the Harry M. Zweig Memorial Fund for Equine Research has continued to maintain some of its time-honored events.

The annual Zweig Trot, held on Aug. 21, was broadcasted digitally this year and was preceded by a special virtual seminar on equine health. Dr. Elaine Claffey, former assistant clinical professor at Cornell Ruffian Equine Specialists, gave a presentation titled “Upper airway function, dysfunction and surgical solutions in horses.” Dr. Claffey's presentation can be accessed online at: [vet.cornell.edu/research/research-office/zweig-memorial-fund/zweig-virtual-presentations](http://vet.cornell.edu/research/research-office/zweig-memorial-fund/zweig-virtual-presentations).

The annual Zweig faculty and trainee presentations were also held virtually on Nov. 18. The webinar featured the following four presentations:

- “Mucosal immunity against equine herpesvirus type-1,” presented by Dr. Bettina Wagner, professor and chair for the Department of Population Medicine and Diagnostic Sciences.
- “Equine hepatitis viruses: Where are we now?” presented by Joy Tomlinson '06, D.V.M. '10, research associate in the Van de Walle Lab at the Baker Institute for Animal Health.
- “Agreement of stall-side and laboratory major crossmatch tests with the reference standard method in horses,” presented by Melissa Fenn, D.V.M. '15, equine internal medicine specialist at the Park Equine Hospital in Lexington, Kentucky (former large animal internal medicine resident at the Cornell University Equine and Nemo Farm Animal Hospital).
- “Horse safety — multi-modal screening to identify Thoroughbred racehorses at increased risk for catastrophic injury of the fetlock joint,” presented by John Pigott D.V.M. '09, associate clinical professor at Cornell Ruffian Equine Specialists.

The presentations can be accessed online at: [vet.cornell.edu/research/research-office/zweig-memorial-fund/zweig-virtual-presentations](http://vet.cornell.edu/research/research-office/zweig-memorial-fund/zweig-virtual-presentations). ■

## Pioneer of equine medicine awarded the college's highest alumni honor

By Melanie Greaver Cordova

The Cornell College of Veterinary Medicine (CVM) has had its fair share of luminaries — in everything from basic scientific research to clinical care and standout educators. This year's recipient of the college's highest alumni honor has pushed the equine medical field forward in each of these ways: John Lowe, D.V.M. '59, M.S. '63.

Lowe, known as “Jack” by friends and family, is the 34th recipient of the prestigious award. “I had no expectations, of course, and no way of knowing I had been nominated,” he says. “It's been a wonderful surprise.”

The Daniel Elmer Salmon Award for Distinguished Alumni Service honors veterinary graduates who have distinguished themselves in service to the profession, their communities or to the college. It was established by the CVM Alumni Association in 1986 and named in honor of Cornell's — and the country's — first D.V.M. graduate. Salmon is best remembered for his pioneering work in controlling contagious animal diseases in the early 20th century, and the bacteria salmonella was named in his honor.

“Jack has spent his entire professional career at the Cornell College of Veterinary Medicine enthusiastically contributing to the teaching, research and service missions of the college for many generations of veterinarians and horse owners,” says Dr. Susan Fubini, associate dean for academic affairs and one of Lowe's nominators.

### Equine medicine marvel

Lowe first studied at Rutgers University for his bachelor's in dairy science before coming to Cornell, where he earned a D.V.M. in 1959 and an M.S. in veterinary pathology in 1963. He went on to complete an internship and residency in surgery at CVM before becoming assistant professor in 1963.



Among Lowe's many notable roles was as director of the Cornell Equine Park for 13 years. Photo: Cornell Vet

Since then, Lowe's contributions to veterinary medicine are countless. He developed many milestone techniques still in use today. He worked for over 20 years with Herbert Schryver, D.V.M. '54, and Harold “Skip” Hintz, M.S. '61, Ph.D. '64, who was inducted into the Equine Research Hall of Fame in 1990. With Schryver, Hintz and other collaborators, Lowe published many technical and research articles during his prolific career. These include numerous publications on intestinal motility in horses and the association with colic, the effect of hypothyroidism on physiologic changes in mares, including pregnancy, and the confirmation of black walnut toxicity as a cause of laminitis.

“Jack has published landmark discoveries, and he was the go-to surgeon for many owners of horses and farm animals,” says Fubini.

Lowe has been a member of numerous veterinary associations, and

for most he also dedicated time as either an executive board member or president. Among these groups is the American Horse Shows Association (AHSA). He served on the AHSA's drug control committee for over 40 years, nine of which as chairman. In this role he helped develop many of the drug control policies for the horse show industry. He also originated and continues to work on the United States Equestrian Federation Equine Health Research Fund. His pioneering work has garnered him many honors, including Horseperson of the Year Award from the New York State Horse Council.

Lowe's commitment to animal health was evidenced by this longstanding involvement with the racing industry and horse shows. “He was frequently the veterinarian for many top hunter jumper horse shows, providing emergency care and serving as an ambassador for the college,” says Fubini. “Jack represented Cornell at some of the largest events in the Northeast.”

## Leading by example

While at Cornell, Lowe taught surgical techniques to veterinary students and house officers who went on to be leaders in the profession, both in practice and academia. He initiated the large animal survival surgery course and was its solo instructor for five years. He lectured in the large animal surgery lab, the equine course in animal science, was an instructor in the necropsy room and initiated the equine lameness course, which he taught for 10 years, among many other extension teaching sessions and courses at Cornell and around the state.

Among his many notable roles was director of the Cornell Equine Park. "With lots of help from many fine people, I was lucky to develop the park and its annex from the ground up," notes Lowe, who worked as director for 13 years.

The park originally started in 1974 as a research facility for equine nutrition, drug testing, reproduction and infectious disease. Its first herd of horses came from a donor, who gifted the college a stallion and 20 mares. "It grew from there," says Lowe. "People continued to donate their horses. This made the park a great place for equine research and a great place for teaching, too."

Park-based projects fundamentally changed equine health and husbandry; groundbreaking nutritional research conducted by Lowe and his colleagues Schryver and Hintz yielded vast improvements in equine health and nutritional requirements now used by the United States Department of Agriculture.

The Cornell Equine Park still flourishes today, housing teaching and research animals and a respected reproduction program with several standing stallions and breeding and foaling services. It is a critical resource for the medicine, surgery and theriogenology sections of the Cornell University Hospital for Animals. Many hands-on equine laboratories take place there.



Before Cornell, Lowe (far left) was in the 102nd New Jersey National Guard Cavalry Mechanized Unit's youth program until he graduated high school. Photo provided.

## "Jack" of all trades

Although best known for his equine work, Lowe's expertise is versatile. He pioneered techniques like the right paramedian abomasopexy for left displaced abomasum in dairy cattle, a procedure adapted at Cornell and other farm animal practices. "It is still in wide use today," noted Fubini, "which is a testament to the impact Jack has had in large animal surgery."

After his retirement in 1991, upon which he was granted emeritus status by the college, Lowe continued to advance animal health in other capacities, including his continued work as the official veterinarian at horse shows and routine work at his son and daughter-in-law's public stable. Notably, Lowe was one of the American veterinarians who assisted the United Kingdom during its foot and mouth disease crisis of 2001. He became a temporary member of the Royal College of Veterinary Surgeons to assist with the outbreak, which cost the country's agriculture and outdoor industries billions of dollars. In recognition for this work, Lowe earned the Group Honor Award for Excellence from the United States Department of Agriculture in 2002.

## Persistence and a bit of luck

Lowe recalls his life as a student at Cornell with fondness. He mentions one subject in particular that was a challenge for him: bacteriology. "It was a very dry subject for me," he says. "Of course I tried to pay attention, but sometimes I dozed off." Luckily, Lowe succeeded in the lab portion of the course. "That really saved me from

getting into a heap of trouble!" Even before he arrived at Cornell, Lowe had a history of working with animals. He was in the 102nd New Jersey National Guard Cavalry Mechanized Unit's youth program, the Junior Essex Troop, until he graduated high school, and although he didn't start out with much love for horses, that time in his life helped him grow into the veterinarian he is today: "I went from being afraid of riding horses to serving as squadron major. I learned a lot about animals that way, and a lot about leadership," he says.

Luck has played a large part in his life, too. He advises students to make the most of it when they can. "You can push your way past bad luck, but if you don't take advantage of the good luck that comes your way you won't progress as you like," he says. Most importantly, he says to students, "Never give up. Never, ever give up! Persistence and energy are extremely important. And it doesn't hurt to have common sense on top of that."

## Funding the future

By educating veterinarians, future veterinarians and horse owners across the country, Lowe has inspired others in his dedication to animal health. In fact, the Jack Lowe Equine Health Fund, established in 1998, was created by an anonymous client and friend of Lowe who wanted to honor him and his work. It was an endowed fund created to benefit horses, and Lowe was given direction to recommend projects for the fund's use, in consultation with members of the equine section of the college.

"The fund has supported a variety of activities," he says. "I'm gratified and grateful for that."

So far, it has raised considerable funds for equipment at the Cornell Equine and Nemo Farm Animal Hospitals, and at Cornell Ruffian Equine Specialists — Cornell's satellite hospital in Elmont, New York. These include a shock wave unit, dynamic endoscope, stocks for working on draft horse feet, a surgical trocar, regenerative laser, a horse trailer, farrier shop items and many more.

"This support is invaluable to so many programs," says Fubini.

The fund has also acted as a starter grant for many equine research projects, including some that garnered further funding from the National Institutes of Health to investigate important horse problems like equine motor neuron disease.

"You have to know the animal. That is crucial when you are making a diagnosis," says Lowe.

Additionally, Lowe himself is involved with several fundraising projects at CVM that advance the animal health, service and education missions of the college.

## Take-home truths

When Lowe was a student, the veterinary student body was primarily comprised of men, but now women make up most classes at CVM, at approximately 70%. Just as he has seen this and other momentous changes in veterinary medicine over his career, Lowe says that there's still much on the horizon for the field at large.

"Some diseases have been in place for a long time without adequate safety nets. And viruses are adaptable," he says, noting the similarities between veterinary and human medicine, and how the fields will work together to get through today's challenges.

Even so, the biggest take-home truth for veterinarians in our digital age is deceptively simple, says Lowe. "Know the animal," he says. "You have to know the animal. That is crucial when you are making a diagnosis. An accurate physical diagnosis can save the

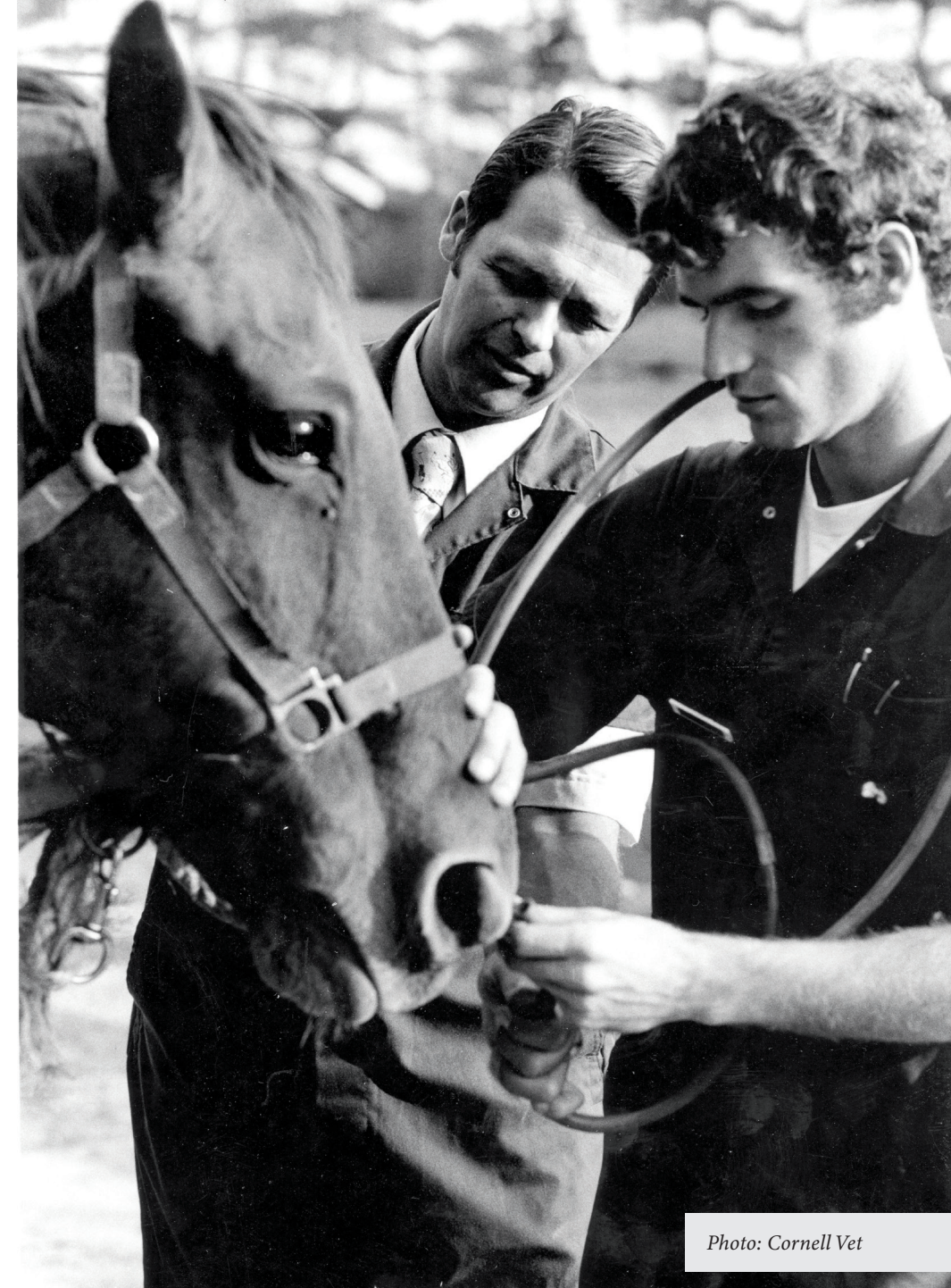


Photo: Cornell Vet

individual animal but it can also save the owner thousands of dollars (even if euthanasia is the conclusion)."

He's not all business all the time, however; Lowe spends much of his personal time cooking, these days on a smoker/slow cooker, which is mounted on a trailer his son built for him many years ago. The idea originated from D.J.'s Cowboy Barbeque, which Lowe enjoyed while working at the Erie County Fair and Horse Show. It can smoke/slow cook two fresh turkeys, 10 pounds of boned prime rib, one hind quarter of venison and one loin of pork at the same time. He does this

each year for the Ithaca City Club Annual Summer Picnic at Taughannock State Park. Between 60-70 members and guests attend, though not this year because of the coronavirus. He has a new "Oklahoma Joe's" smoker/cooker (high-tech as it is) at home, which he has great fun using to cook for family and friends. He is also an avid hunter, fisherman and gardener.

Says Lowe, "I'm looking forward to seeing what new changes the future brings. Life is never dull, even at 85 years of age." ■

### Dr. Amanda (Mandi) de Mestre

Amanda (Mandi) de Mestre, reader (associate professor) in Reproductive Immunology, The Royal Veterinary College, United Kingdom



Dr. Mandi de Mestre.  
Photo: provided

**Q: What Zweig-funded projects did you work on while you were at Cornell University, and who was/were your PI(s) for those projects?**

In summer 2005, I worked as a postdoctoral researcher with Dr. Doug Antczak '69 at the Baker Institute for Animal Health on two projects. The first project characterised genes that regulate the development of the early equine placenta. The second project investigated the mechanisms that prevent pregnant mares from making damag-

ing immune responses against their fetuses. Both of these projects relied on new information about the genome of the horse that had been discovered in research supported by the Zweig Fund.

**Q: How did your Zweig-funded research shape or direct your future research?**

When I joined the Antczak laboratory, it held two Zweig grants that supported the Horse Genome Project. As part of these funding initiatives, I worked with Dr. Antczak and colleagues to identify key transcription factors that are expressed in different compartments of the early equine placenta. We also characterized the immune cells at the maternal-fetal interface, providing the first description of immunosuppressive regulatory T cells at the site of the placenta.

Working in a world-leading laboratory alongside one of the best in the field and supported by a great breadth of excellent scientists provided a perfect foundation to move to the next phase of my career. My first major grant from the Wellcome Trust as a newly appointed faculty member at the Royal Veterinary College was a direct follow up of my work with Dr. Antczak on the characterisation of transcription factors in the early equine placenta.

In a wider context, my research at Cornell influences much of what we do today. Our current work is more and more moving towards the genetic basis of reproductive pathologies so we are regularly accessing key genome resources and molecular tools developed as part of the Horse Genome project.

Finally, at Cornell there were many examples of veterinary scientists who were successful at securing grants from the U.S. National Institutes of Health for their research on diseases of domestic animals. Support from the Zweig Fund for

pilot projects has led to many such successes. This is a model I have tried to follow in my own research and remain very grateful to Zweig for supporting equine research at Cornell and providing me with the chance to be part of it.

**Q: Are there any stand-out memories from your time doing research at Cornell?**

There are many, but certainly one that comes straight to mind is the summer of 2006 when sequencing of the Horse Genome was initiated using blood from a mare in Dr. Antczak's herd. This moment marked a significant change in equine research. With the whole genome sequence at our fingertips, we could suddenly start to interrogate equine diseases like never before.

The other thing that stands out is the energy of research at Cornell, which I found infectious! The excellent facilities were only exceeded by the talented scientists I met and worked with, all inspiring from the junior level right up to senior PIs such as Dr. Antczak.

**Q: What is your current position, and what research are you working on?**

I am a reader in reproductive immunology (equivalent of associate professor in the US) and head of the Equine Pregnancy Laboratory at the Royal Veterinary College. Our goal is to further understand the mechanisms that regulate the growth and survival of the equine embryo/fetus through studies of both normal and failing pregnancies. Ultimately, we hope to use these discoveries to improve equine reproductive health, efficiency and welfare.

**Q: What advice would you give to young academics doing equine research these days?**

Everyone's journey is unique, but three things jump out that I have found personally valuable in my career in academic research. Firstly, I have been incredibly lucky to have some wonderful and supportive mentors starting from my early academic career and people I still go to for advice and counsel today. In my experience, mentors both internal and external to your institution can bring important differing perspectives. Secondly, I am a believer that for your research to thrive, your job as a PI is to commit time providing the best environment for those around you to shine. I was lucky enough to work with people during my training who took this approach and I really enjoy having the opportunity to pay it forward. Finally, always keep in touch with your stakeholders. I learnt this from my time in Dr Antczak's lab at Cornell and continue to find it instrumental to how we think about our work and the direction it follows. Oh, I nearly forgot, also remember to have fun, isn't that why we all do research?! ■

### Ashlee Watts, Ph.D. '12

Ashlee Watts, Ph.D. '12, associate professor of equine orthopedics at Texas A&M University, the Linda and Dennis H. Clark '68 Endowed Chair of Equine Clinical Studies



Ashlee Watts, Ph.D. '12.  
Photo: provided

**Q: What Zweig-funded projects did you work on while you were at Cornell University, and who was/were your PI(s) for those projects?**

- Targeted stem cell delivery for pro-inflammatory cytokine suppression in OA joints; PI: Dr. Alan Nixon
- Targeting platelets as a new treatment strategy for endotoxemia; PI: Dr. Thomas Divers
- Indices of intra-abdominal fibrinolysis in colic foals: pathogenesis and prognosis; PI: Dr. Susan Fubini

**Q: How did your Zweig-funded research shape or direct your future research?**

Horses are amazing. They make us better humans in every capacity. Zweig's focus on the horse through funding equine research projects, funding equine research training and promoting all things horse is a large part of why Cornell is such a powerhouse in equine veterinary medicine.

**Q: Are there any stand-out memories from your time doing research at Cornell?**

Cornell is amazing and every day I am grateful that somehow I ended up there. To pick one memory about my time doing research at Cornell is impossible! Overall, I remember feeling inspired, excited, frustrated... research is hard and not for the faint of heart. But the feeling after answering a research question that impacts clinical decision making in some positive way, making horses' lives better, is incredible. I learned that at Cornell. I would not have had the repeated opportunities to learn that lesson (and I needed the repetition!) without Zweig.



Photo: provided

**Q: What is your current position, and what research are you working on?**

Broadly, we are working on regenerative medicine approaches in orthopedics. Our current focus is to better understand MSC therapy including non-self-recognition, laboratory preparation techniques and mechanisms of improved repair. We also have a randomized clinical trial funded by the AQHA Foundation that is enrolling patients for MSC therapy in osteoarthritis.

**Q: What advice would you give to young academics doing equine research these days?**

It is amazing how much understanding one seemingly tiny thing to the 'nth' degree affects your understanding of everything. Be curious, ask why – about everything – but focus! ■

The Harry M. Zweig Committee is established for the purpose of administering the fund and is composed of individuals in specified state agencies and equine industry positions and others who represent equine breeders, owners, trainers and veterinarians.

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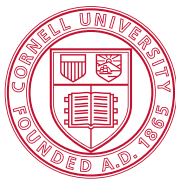
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### New Zweig Committee Member Spotlight: Richard Schosberg '84

Richard Schosberg '84, born in White Plains, New York, was introduced to horse racing by his parents, Jane and Paul, who own Pine Lane Farm in Westchester County.

Schosberg graduated from Cornell University in 1984 with a degree in applied economics concentrating on animal science and equine studies. After working with show horses and at the Middleburg Training Center in Virginia, he returned to New York and served as assistant trainer to Sid Watters Jr. and Tom Skiffington before



*Richard Schosberg. Photo provided.*

going out on his own in 1988. He won with his very first starter, Three Chopt Road, at Belmont Park that September. The conditioner of champion Maria's Mon and multiple Grade I winner Affirmed Success, he limits his stable to 20 to 30 horses, and races exclusively in New York.

Schosberg served his first term on the NYTHA Board starting in 2011 and was re-elected to a second term in 2014. He is the Chair of the Aftercare Committee, and currently the Chair on the backstretch safety committee as well as the bylaws committee. In 2019, he was nominated and confirmed to the board of the Thoroughbred After-care Alliance.

He currently serves as President of the Take2/Take The Lead Thoroughbred Retirement Program ([www.take2tbreds.com](http://www.take2tbreds.com)) which finds new homes for the horses retiring from NYRA tracks.

Schosberg joined the Zweig Committee in 2020. ■

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[bit.ly/zweigfundcornell](http://bit.ly/zweigfundcornell)

Our site provides information on the projects and publications resulting from the Zweig Memorial Fund and demonstrates the objectives of the fund in promoting equine health in the racing industry. The Zweig News Capsule is published twice a year. Please encourage other equine enthusiasts to visit the site.

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