



DUKE LEMUR CENTER

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ISSUE 3

1966
2021

CELEBRATING
55 YEARS

THE 100
LEMURS PROJECT

BUILDING
THE FUTURE

DLC SIFAKAS
TRAVEL TO EUROPE

CONTENTS

4
About the Duke Lemur Center

6
Building the Future
Grand opening of the
Anna Borruel Codina Center for
Lemur Medicine and Research

11
Learning from a Loss
An aye-aye's cancer diagnosis brings
together vets, doctors, and scientists

16
In-house Research Scientists
Growth of the DLC's research mission

20
**From Durham to
Madagascar and back Again:**
Andrea Katz retires after 43 years

26
The 100 Lemurs Project
Artist Rachel Hudson celebrates
lemurs' diversity and beauty

38
From Collection to Museum
Fossil division relaunches as
DLC Museum of Natural History

42
And away They Go!
Sifaka conservation breeding
program expands internationally

44
Meet the New Curatorial Team

46
Diversity Initiatives
Enhanced access to internships
and educational programs

48
Here's What's New at the DLC!
Infants of 2020 and 2021

50
How Did Lemurs End up at Duke?

BACK COVER
Me and You and Zoboomafoo
Free online film



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ON THE COVER:

Euphemia, one of eight lemurs who traveled
from the DLC to Europe to expand the
Coquerel's sifaka conservation breeding
program. *Photo by Sara Clark.*

LETTER FROM THE DIRECTOR

55 YEARS AGO a collection of mixed species of primates found its way to Duke University and would serve as the foundation and motivation for some of the most ground-breaking research and conservation programs in the world. The Duke Lemur Center is recognized today as a global center of innovative research, as well as a critical genetic safety net for lemurs—the planet's most endangered group of mammals. This irreplaceable biological treasure and cherished asset of Duke University provides one-of-a-kind research and learning opportunities to students, faculty, and the community. Our mission extends beyond scientific discovery with broader impacts that include on-the-ground conservation efforts in Madagascar and educational programs designed to inspire the next generation of environmental stewards.

Thanks to a significant gift from a Duke alumnus and friend, the Duke Lemur Center has completed construction of a state-of-the art veterinary hospital and research complex that was designed to enhance our animal care and research programs. The improved infrastructure will enable the Lemur Center to pursue cutting-edge research projects and secure more funding while also fortifying its position as the world's leading non-invasive research facility for endangered primates.

All of us at the Duke Lemur Center are proud of our past accomplishments, but it is the future that truly drives us. As we look ahead, we have our sights set on achieving great things that will be possible only with the support and partnership of others who care deeply about discovery, our planet, and, of course, lemurs and their forest homes.

GREG DYE
Executive Director
Duke Lemur Center



ABOUT THE DLC

CELEBRATING 55 YEARS OF LEMUR RESEARCH, CONSERVATION, AND PUBLIC EDUCATION

A world leader in the study, care, and protection of lemurs—Earth’s most threatened group of mammals—the Duke Lemur Center is a hub of scientific discovery on the campus of Duke University in Durham, North Carolina, USA.

LEMUR CARE

What began as a small primate menagerie 55 years ago, has grown to become one of the most precious collections of endangered primates anywhere in the world.

Throughout its history, the Lemur Center has cared for nearly 4,000 animals, including lemurs, lorises, bushbabies, and tarsiers. Today, it houses 215 prosimians across 13 species, including 12 species of lemur—the **most diverse population of lemurs on Earth**, outside their native Madagascar.

The DLC works within a network of other AZA-accredited institutions worldwide to develop and adhere to Species Survival Plans (SSPs). These cooperatively-managed conservation breeding programs are critical to lemur conservation, and the DLC maintains **the world’s largest genetic safety net** for lemurs. We’re proud to have celebrated over **3,285 births** since our founding in 1966.

Our signature Natural Habitat Enclosures enable our lemurs to **roam freely in multi-acre tracts of forest** and live in natural social groups, fostering the same behaviors and social structures seen in the wilds of Madagascar.

The DLC’s daily enrichment program promotes lemurs’ **curiosity, exploration, and mental stimulation** and is a critical component of our animals’ care and welfare.

Positive reinforcement training is used to teach lemurs to sit on a scale,

enter a kennel, and other behaviors that may seem like play to the lemurs but enable us to provide the best care with minimal handling or stress to the animals.

RESEARCH

By studying the variables that most affect lemurs’ health, reproduction, and social dynamics, we learn how to better care for them in captivity and how to most effectively focus our conservation efforts in Madagascar.

The DLC is home to nocturnal, diurnal, and cathemeral animals as well as species that encompass a wide range of social systems, modes of locomotion, and dietary preferences. Such diversity yields a large and diverse research program, and students and researchers from across campus and around the world travel to the DLC to study topics ranging from brain sciences to biomechanics, One Health disease dynamics, aging, paleontology, genomics, and more. The one thing that all DLC research has in common is that is non-invasive. **We do not allow research that will harm our animals in any way.**

The Division of Fossil Primates examines primate extinction and evolution over time and houses over 35,000 fossils, including extinct giant lemurs and one of the world’s largest and most important collections of early anthropoid primates.

CONSERVATION

Lemurs are found in the wild only in Madagascar, where their habitat has

dwindled to a fraction of what it once was: only about 10% of the original vegetation cover remains. At least 17 species of lemur have gone extinct, and the existing lemurs are the most threatened group of mammals on Earth.

For over **35 years**, the DLC has worked on-the-ground in Madagascar to **protect lemurs and their natural habitat**. Most of these activities are community-based, encouraging biodiversity conservation in northeastern Madagascar by supporting the livelihoods of rural people in forest-bordering communities. Many involve partnerships with Duke students and faculty, inspiring the next generation of conservation leaders and environmental stewards.

At the invitation of the Government of Madagascar, the DLC is **assisting Madagascar’s zoos and wildlife parks** in developing a conservation breeding program and establishing best practices in lemur care. In doing so, the DLC has the opportunity to improve the care and welfare of over 600 lemurs representing 20 endangered species housed in 14 licensed zoos across the island.

PUBLIC OUTREACH AND EDUCATION

Our Student Projects Program connects students with **volunteer, work-study, research, and internship opportunities** at the DLC. Our goal is to provide hands-on experiential learning opportunities that allow students to take part in the DLC’s research, education, animal husbandry, and conservation

► Titus, a golden crowned sifaka, in 1995. Today, the critically endangered Coquerel’s sifaka is the sole species of sifaka housed at the DLC.
Photo by David Haring.

programs here on Duke’s campus and in Madagascar.

In 2020, as a result of being forcibly disconnected from in-person visitors due to COVID-19, the DLC forged **new and deeper connections with an international audience**. In addition to developing a new suite of virtual programs, for the first time the DLC offered activities that could be truly participated in by a global audience—including the Stay Away 5K and the virtual gala and video *Me and You and Zoboomafoo*—and developed international partnerships, such as the 100 Lemurs project, to raise awareness of lemurs worldwide. 🌍

4,000+
PRIMATES CARED FOR
SINCE 1966

13
SPECIES CURRENTLY
HOUSED AT DLC

35,000+
FOSSILS HOUSED AT
DIVISION OF FOSSIL PRIMATES



BUILDING THE FUTURE:

A NEW ERA OF STUDYING AND CARING FOR EARTH'S MOST ENDANGERED MAMMALS

By SALLY BORNBUSCH, Ph.D. and SARA CLARK

This fall, the Duke Lemur Center celebrates a transformational moment in its 55-year legacy of studying and caring for lemurs: the grand opening of the Anna Borrueal Codina Center for Lemur Medicine and Research.

Made possible thanks to an \$8M gift by an anonymous Duke alumnus whose family has a passion for lemurs and wildlife protection, the 8,000-square-foot structure provides cutting-edge facilities and technologies tailored to complement the DLC's world-class veterinary and research programs.

◀ The Borrueal Center, just weeks before completion.

“THE LEMUR CENTER’S VETERINARY TEAM HAS BEEN RECOGNIZED AS THE WORLD’S LEADER IN LEMUR MEDICINE. THE BORRUEL CENTER GIVES THEM THE INFRASTRUCTURE THAT COMPLEMENTS THEIR SKILL LEVEL. THEY’RE WORLD-CLASS VETS, AND THEY DESERVE WORLD-CLASS FACILITIES; NOT TO MENTION THEY’RE ALSO SUPPORTING ONE OF THE MOST PROMINENT NON-INVASIVE RESEARCH PROGRAMS IN THE COUNTRY.”

GREG DYE, EXECUTIVE DIRECTOR

By combining veterinary care and research spaces within the new building, the DLC will maximize the outcomes of both programs.

“Not only is the Lemur Center advancing the science of lemur medicine, we’ve also pioneered a research program focused on non-invasive techniques,” says Greg Dye, the Executive Director of the DLC. “These are strategies that yield high-quality scientific data while also maintaining the highest standards of care for the animals.

“The Borrueel Center was designed to house both our veterinary and research programs,” Dye said. “They fit together. They prove that we can be advocates for lemur health and welfare, and at the same time be a leader in research.”

ADVANCING VETERINARY SCIENCE

Since 1966, the Lemur Center’s veterinarians have cared for more than 4,000 lemurs and shared their expertise with zoos and conservation organizations worldwide. With surgery and intensive care suites, dedicated quarantine and recovery spaces, and advanced radiography and microscopy equipment, the Borrueel Center more than triples the size of the DLC’s existing veterinary facilities and will allow the veterinary team to strengthen and expand their already robust teaching programs and high levels of animal care.

“In the past, we’ve always relied on surplus equipment and had to make do with very limited space,” says Cathy Williams, D.V.M., a veterinarian for 26 years at the DLC. “I never thought I’d be here when a new building was



◀ The topics explored by the Lemur Center’s in-house scientists have major implications for how the DLC cares for its colony, including husbandry practices and dietary intervention. “The ability to work side-by-side with researchers in the new building means we can really expand what we know,” says veterinarian Laura Ellsaesser, D.V.M.

Photo by Lydia Greene.

constructed. It opens up so many opportunities.”

“The Lemur Center’s veterinary team has been recognized as the world’s leader in lemur medicine,” says Dye. “The Borrueel Center gives them the infrastructure that complements their skill level. They’re world-class vets, and they deserve world-class facilities.”

ELEVATING RESEARCH

Alongside the new veterinary spaces, the Borrueel Center houses cutting-edge scientific research facilities, including a molecular lab and fully equipped hibernation rooms, called hibernacula.

In addition to two DLC research scientists who run extensive in-house research programs, the DLC’s research team accommodates an average of 80-90 external research projects annually. “These new spaces will enable the Lemur Center to take our own research programs to the next level,” explains the

DLC’s Director of Research, Erin Ehmke, Ph.D. “They’ll also increase the scope and diversity of the projects we can accommodate, as well as intensify the level of mentorship we can provide to student researchers.”

Specifically, the new hibernacula will greatly promote research on hibernation, one of the DLC’s primary research focuses. The Lemur Center is home to 30 fat-tailed dwarf lemurs—the world’s only truly hibernating primates. The hibernacula will allow researchers to control aspects of the lemurs’ environment, such as temperature, to mimic the natural conditions that modulate hibernation in the wild.

“Having these new hibernacula, we will be able to replicate, to a degree, the dwarf lemurs’ experiences in Madagascar,” says DLC research scientist Marina Blanco, Ph.D. “We can bring a little bit of Madagascar into the DLC.”

By promoting successful hibernation

▶ The Borrueel Center more than triples the size of the DLC’s existing veterinary facilities. Pictured: The DLC veterinary team delivers a rare blue-eyed black lemur via caesarean section in 2018.

Photo by Sara Clark.



in the DLC’s dwarf lemur colony, Dr. Blanco’s research will not only improve the lemurs’ care and health, but could also inform biomedicine, in the treatment of diabetes and other metabolic disorders, or even understanding mechanisms that delay aging.

FOSTERING COLLABORATION

Beyond contributing updated spaces and equipment, the building serves another invaluable function: It provides the physical infrastructure and a centralized location that will encourage a robust collaboration between the

Lemur Center’s research and veterinary science programs.

“We’re really excited about what this means for making the veterinary team more accessible to researchers, in a collaborative effort,” says DLC veterinarian Laura Ellsaesser, D.V.M. “The topics our research scientists are studying have major implications for how we care for our lemurs. This isn’t just egghead science; there’s true application to it as well.”

“We’re learning a lot, and we obviously have so much more to learn,” says Williams. “What does the microbiome

▼ With classrooms, viewing areas, cameras, and microphones, the new veterinary hospital is designed to aid in the training and mentorship of visiting students, including veterinary students from Madagascar. Having already hosted and trained multiple Malagasy veterinarians, the DLC aims to intensify this program by having Malagasy and U.S. students learn side-by-side in the new center. Pictured: DLC veterinarian Cathy Williams with visiting Malagasy veterinarian Tsiky Rajaonarivelo.

Photo by David Haring.





“WHAT EXCITES ME MOST IS HAVING A CENTRALIZED LOCATION THAT BRINGS SO MANY DIVERSE ASPECTS OF WHAT WE DO, TOGETHER. THE BORRUEL CENTER PROVIDES AN INTEGRATIVE SPACE WHERE WE CAN DO CUTTING-EDGE RESEARCH IN ENDOCRINOLOGY, GENETICS, AND MICROBIOME SCIENCE THAT IS RIGHT DOWN THE HALL FROM A WORLD-CLASS VETERINARY FACILITY.”

LYDIA GREENE, Ph.D., DLC RESEARCH SCIENTIST

look like in a wild lemur versus a lemur here in Durham? How can we maintain these species in captivity in a manner in accordance with what they evolved to do, metabolically?”

The benefits are mutual. For example, not only can the research performed by DLC research scientist Lydia Greene, Ph.D., on the nutritional ecology of lemurs in Durham and in Madagascar inform the diets provisioned to the Lemur Center’s colony, but also the veterinary perspective on lemur physiology and medicine can be applied to better understand the results of Dr. Greene’s studies on lemur gut microbiomes.

Ultimately, by promoting the collaboration and mentorship of scientists and veterinarians that visit the DLC from around the world, the Anna Borrueal Codina Center for Lemur Medicine and Research will lay the groundwork for expanding the DLC’s programs that improve the care and conservation of lemur populations within human care and in their natural habitats in Madagascar. “2021 marks the DLC’s 55th anniversary,” says Dye. “This building really kicks off the foundations we’re putting in place for the next 55 years of groundbreaking lemur research and care.” 🧐

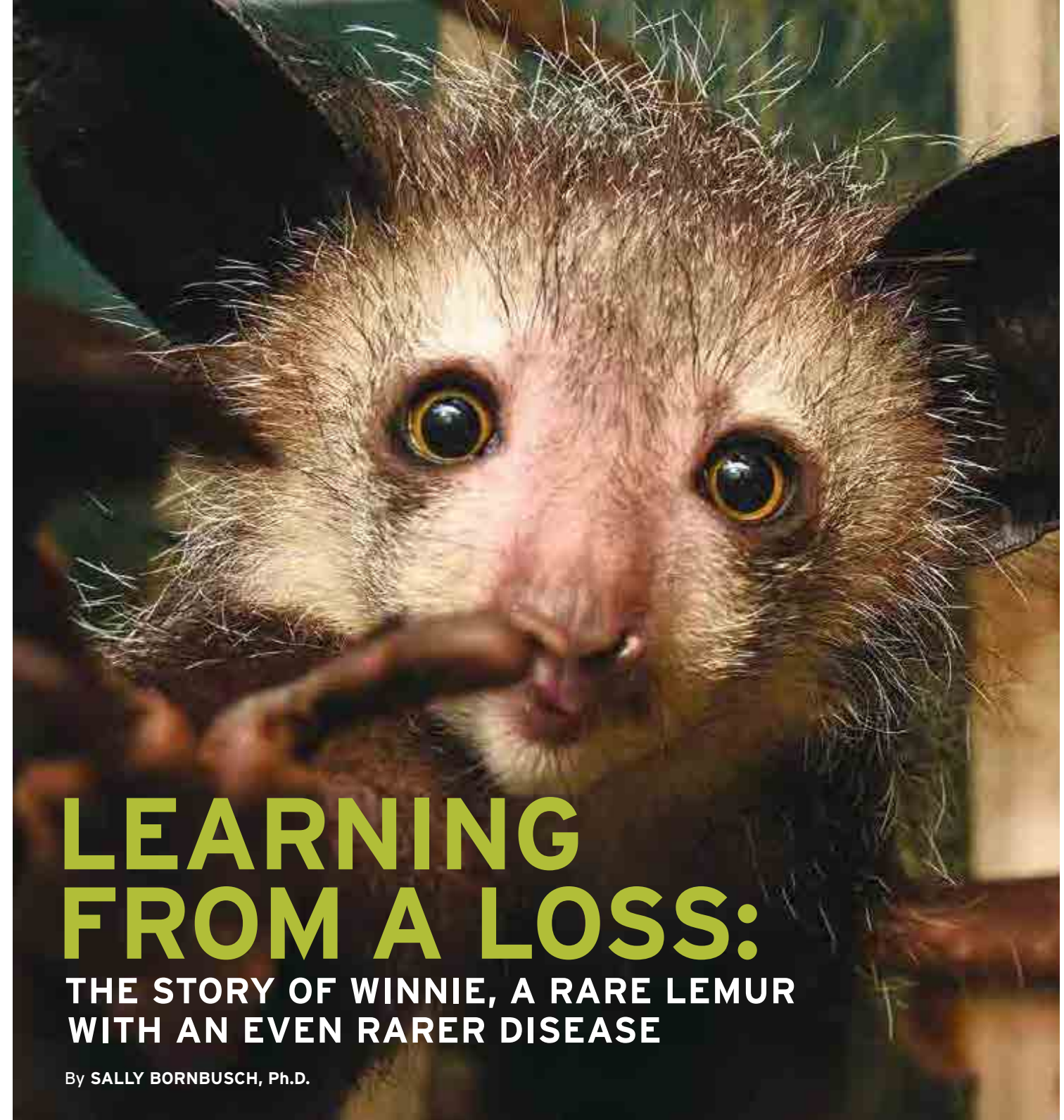
THE DLC IS ONE-OF-A-KIND IN ITS EXPERT CARE OF LEMURS. No other zoo or research center is accredited by both research and animal welfare organizations, including the Association for Assessment of Laboratory Animal Care (AAALAC) and the Association of Zoos and Aquariums (AZA). These accreditations testify that the Duke Lemur Center meets the highest standards of animal care.

THANK YOU, DONORS!

FUNDING FOR the Anna Borrueal Codina Center for Lemur Medicine and Research was generously donated by an anonymous Duke alumnus. If you’re in a position to consider making a similar impact on the future of the DLC’s work studying and protecting lemurs, there are many more ongoing DLC infrastructure projects we would love to discuss with you.

Projects include a new Education and Discovery Center that will be the epicenter of the Lemur Center’s education, conservation, and paleontology programs; a Center for Conservation Breeding; and an expansion of our forested free-ranging enclosures. To discuss how you can help expand the DLC’s legacy, please contact Mary Paisley at mary.paisley@duke.edu or (919) 401-7252.

A complete list of major and principal gift opportunities can be found at [LEMUR.DUKE.EDU/MAJORGIFTS](https://lemur.duke.edu/majorgifts)



LEARNING FROM A LOSS: THE STORY OF WINNIE, A RARE LEMUR WITH AN EVEN RARER DISEASE

By SALLY BORNBUSCH, Ph.D.

On June 24, 2020, the DLC welcomed its eighth infant of the season: a rare baby aye-aye. Named “Winifred” after Bette Midler’s character Winifred Sanderson in *Hocus Pocus*, the infant was born to first-time mom Fady, a five-year-old female on loan from the San Diego Zoo.

Fady arrived at the Lemur Center in September 2019 to join our conservation breeding program, as organized through the Association of Zoos and Aquariums’ (AZA) Species Survival Plan. Aye-ayes are endangered in Madagascar, and there are fewer than 30 individuals within human care in the United States. Of those, 10 live at the Duke Lemur Center, where they help maintain a genetic safety net for aye-ayes in the wild.

As Fady’s first offspring, Winnie’s birth was especially exciting. Her grandsire, Nirina, had been imported from overseas and was unrelated to any other aye-ayes living in North America. Through him, Fady and Winnie introduced a brand-new genetic line into the DLC’s aye-aye population. That infusion of fresh genetic material is essential for the success of any conservation breeding program, as the more genetically diverse a population is, the more resilient and healthy it tends to be.

During her first stage of life, Winnie was a typically active and inquisitive aye-aye infant. She appeared to have inherited her mother’s curiosity, peeping out of the nest at just five weeks old and venturing fully out of the nestbox by two months of age—ready to explore the wider world.

Fady proved to be an excellent mother, and she and Winnie were often seen wrestling and playfully chasing each other around their enclosure.

By spring 2021, Winifred had entered the stage, typical of aye-aye infants six months of age and older, where she might alarm human visitors by charging them from across the room in mock attacks.

At that point, however, things began to change. In mid-April, at around 10 months old, Winifred’s keepers noted that she was acting a bit “off,” showing less interest in solid food and spending far less time than she typically did moving around and exploring her room.

Winnie was brought in for an exam, during which the DLC’s veterinarians discovered a large mass in her right arm. The biopsy results came back with bad news: The mass was a cancerous tumor that occurs in bones and soft tissues, known as a sarcoma.

Never before had an aye-aye been diagnosed with cancer.

The prognosis was grim. “Because sarcomas tend to be particularly aggressive in human children,” says DLC veterinarian Laura Ellsaesser, D.V.M., “we knew what we were up against was probably not good.” So the Duke Lemur Center sent out a call for help, reaching out to experts worldwide for assistance in Winnie’s case. After the call went out for consultations and information, the number of responses was simply astonishing.

One of these experts was Tara Harrison, D.V.M., M.P.V.N., a veterinary oncologist and Associate Professor at NC State University’s College of Veterinary Medicine. Dr. Harrison and NCSU have collaborated with the Lemur Center for many years, and both were quick to get involved in determining the diagnosis and potential treatment for Winnie’s case.

Dr. Harrison offered not only her own expertise, but also looped in the Exotic Species Cancer Research Alliance, an extensive network of veterinarians, researchers, and doctors from over 90 animal care facilities. “We all work together on multiple cases to try to help come up with the best outcome for that animal,” says Dr. Harrison. “Through collaborations with human oncologists, we shared Winnie’s case with the top experts of pediatric sarcoma medical oncologists worldwide.”

Once Winnie’s sarcoma was confirmed, the next step was to get a better picture of the extent of the cancer. The DLC and collaborators reached out to the Triangle Veterinary Referral Hospital (TVRH) in Durham, NC, who graciously agreed to provide state-of-the-art veterinary diagnostic tools at no charge to assist with

the case. At TVRH, Winnie underwent a CT scan to map the cancer and an echocardiograph to test her heart function.

But there was one additional test required to confirm those results: Winnie needed a positron emission tomography (PET) scan, the gold standard for imaging scans that test for cancer throughout the body. Because PET scans are rarely used in veterinary medicine, finding one that could work for Winnie was a challenge.

The Duke University Medical Center

“THE MOST INCREDIBLE PART OF THIS CASE WAS HOW HARD EVERYONE WAS WILLING TO FIGHT TO GET US THE INFORMATION WE NEEDED TO MAKE THE BEST DECISION FOR WINNIE. THE WILLINGNESS OF SO MANY PEOPLE TO DIVE IN AND PROVIDE THEIR INPUT AND EXPERTISE, WAS REALLY HUMBLING AND PHENOMENAL.”

LAURA ELLSAESSER, D.V.M., DLC VETERINARIAN



▶ Winifred undergoes a PET scan at Duke University Medical Center’s Positron Imaging Research Lab. Pictured left to right: Thomas Hawk, PET/Radiology, MicroPET, PIRL, Associate in Research; Terence Wong, M.D., Ph.D., Chief, Division of Nuclear Medicine and Radiotheranostics; and Timothy Turkington, PET Facility, Duke Department of Radiology, Positron Imaging Research Lab Director. The sample of the radioactive agent was prepped by Robin Davis, PET/Radiology, PIRL, Associate in Research. Photo by Sara Clark.

“THE ANSWER WE GET FROM WINNIE’S CANCER COULD HAVE GREATER IMPLICATIONS NOT JUST FOR ANIMALS BUT FOR HUMANS TOO. WINNIE HAS THE POTENTIAL TO SAVE MANY OTHERS.”

TARA HARRISON, D.V.M., M.P.V.N., VETERINARY ONCOLOGIST

stepped in, and the Positron Imaging Research Lab in the Duke Department of Radiology immediately began working with the DLC and Duke’s Institutional Animal Care and Use Committee to determine whether its facility could work with animals as unusual as an aye-aye. Access was approved, and just over a week after her diagnosis, Winnie underwent a PET scan.

Sadly, the CT and PET scans revealed that there were cancerous cells in the lymph nodes of Winnie’s arm.

With this new development, the team turned their collective efforts to determining the best treatment options for Winnie. Dr. Cindy Eward, Veterinary Surgeon at TVRH, and Dr. Will Eward, Orthopedic Surgical Oncologist with Duke University Hospital, worked closely with DLC’s veterinarians to determine Winnie’s treatment options.

“A large part of the conversation was about how the various treatments would affect Winnie,” recalls Dr. Cindy Eward. “If relatively minor surgery could remove the mass and cure her, everyone would be on board.” But with the cancer in Winnie’s lymph nodes, it was determined that the most effective treatment would be an aggressive one: the amputation of the limb, including removal of the infected lymph nodes, followed by chemotherapy or radiation treatment. But it was a complete unknown how Winnie would react to these aggressive treatments.

“We needed to consider how she would tolerate recurrent visits to the hospital and whether these treatments would have long-term effects on Winnie’s health and even her future fertility,” says Dr. Cindy Eward.

Because aye-ayes rely on their arms and hands for many aspects of their behavior, including their specialized foraging technique, an arm amputation



would alter Winnie’s behavior and adversely affect her quality of life. In addition, although there are many treatments for cancer, none has ever been tested in aye-ayes and the potential side effects of chemotherapy are unknown.

Lastly, for many sarcomas, it is still unknown whether the cause is heritable; so if Winnie were to have infants of her own, there was a risk that she could pass on a genetic risk of cancer.

Ultimately, with the input of all the experts, it was decided that the consequences of aggressive treatment were too harmful and that the best course of action would be to monitor Winnie over time and to promote her quality of life.

Meanwhile, Winnie herself was remarkably resilient and her personality always

shone through her disease. Winnie’s caretaker, Jenna Browning, recalls that Winnie remained “full of curiosity, spunkiness, and always so playful with her devoted mom, Fady.”

Throughout the case, Jenna and the DLC’s Curator of Behavioral Management and Welfare, Meg Dye, worked with Winnie on monitoring and training. “Using positive reinforcement training, lemurs learn to actively participate in veterinary treatments or exams, making it less stressful for them,” says Jenna.

For example, Winnie learned how to stay in one spot for an extended period and to hang upside down with her arms extended towards the ground. She was also being trained to grab onto a wooden dowel to test her grip strength and range

of motion in the affected arm. “These behaviors,” Jenna explains, “would make it easier for vet staff to examine her arm and mass closely in her own environment, as frequently as needed.”

With the help of Winnie’s caretakers, veterinarians were also monitoring Winnie’s overall quality of life, including her appetite, locomotion, behavior, and any signs of irritation or pain. “We created an in-house animal welfare assessment customized for aye-aye behavior and individualized specifically for Winnie,” says Meg. “These data were shared with the veterinary and husbandry teams on a regular basis and served as an additional tool alongside in-person observations.”

By midsummer, Winnie’s quality of life had begun to decline. Her disease had progressed rapidly and she was showing signs of discomfort. The first week of July 2021, two weeks after Winnie’s first birthday, the decision was made to humanely euthanize her to avoid the suffering she would inevitably have

endured had she continued to live. It was a crushing loss and a devastating decision to make, but it was undoubtedly the right thing to do for Winnie.

Upon her death, DLC veterinarians discovered that, since Winnie’s PET scan three months before, the cancer had metastasized throughout her body, infecting her lungs and other organs.

Despite the sad ending to Winnie’s own story, her legacy will help us care for future generations of lemurs. Upon Winnie’s death, Dr. Harrison was able to take samples of the infected tissue for extensive testing. “We’re growing cell cultures and sequencing the genome of the cancer cells to see where the mutations are and whether they’re heritable,” says Dr. Harrison. “We can then treat those cells in the lab with different chemotherapies to give us some insight as to which potential therapies can be tried if it is diagnosed again.”

Throughout Winnie’s unique case, a vast and dedicated network of veterinarians, doctors, and scientists

came together under the unifying goal of improving the lives of Winnie and other animals like her. All services were donated pro bono, and the entire case will be published in a scientific journal and included in ESCRA’s growing database so that other veterinarians and animal professionals will have access to the knowledge gained throughout this process.

“The answer we get from Winnie’s cancer could have greater implications not just for animals but for humans too,” explains Dr. Harrison. “Winnie has the potential to save many others.”

When asked what they took away from Winnie’s case, everyone on Winnie’s care team shared the same sentiment. As Dr. Ellsaesser puts it, “The most incredible part of this case was how hard everyone was willing to fight to get us the information we needed to make the best decision for Winnie. The willingness of so many people to dive in and provide their input and expertise, was really humbling and phenomenal.” 🙏

WHAT IS CANCER?

CANCER IS a broad term used to describe when the normal cycle of cell birth, growth, and death has gone wrong. Just like humans, lemurs have many millions of cells that die and are replaced every day. Cancer occurs when there is a hiccup in this process. Cancer cells are those that grow too rapidly or spread to the wrong place in the body, known as metastasizing, which causes masses of cancerous cells, or tumors. These tumors can disrupt the function of normal cells throughout the body.

What causes cancer?

Cancer is considered a genetic disease, meaning that the source of the disease is controlled by genes. Genes are the code that tell cells how to function, including when and where to replicate. If there is an error or a mutation in certain genes, it can cause problems in the normal cell cycle.

Sometimes, cancer-causing genes are present in the cells that are passed down from parents to offspring. In these cases, the offspring can inherit the cancer-causing genes, making them more likely to develop the disease. But not all cancers are heritable.

The genetic errors that cause cancer can also come from environmental factors. These cancer-causing factors, known as carcinogens, can damage genes and disrupt their normal function.

Why is cancer so difficult to treat?

Because cancer can be caused by so many different things, it is often difficult to determine the source of the disease. With millions of cells replicating and growing every day, there are millions of opportunities for something to go wrong. When and where these errors occur can sometimes be predictable, but it can also be spontaneous, making it difficult to catch in the early stages.

In cases where a type of cancer is rare or not well understood, it is difficult to predict which treatments will be effective. Because our understanding of cancer comes mainly from studies on humans, it is even more difficult to identify and treat cancers in animals. But veterinary oncologists, those who study cancer in animals, are rapidly gaining more knowledge with the goal of one day having successful cancer treatments for a wide range of animals.

IN-HOUSE RESEARCH SCIENTISTS

GROWTH OF THE DLC'S RESEARCH MISSION

By **MARINA BLANCO, Ph.D.**; **ERIN EHMKE, Ph.D.**; and **LYDIA GREENE, Ph.D.**

By studying wild lemurs in Madagascar and their peers at the DLC, we have the potential to answer age-old and emerging questions across scientific disciplines.

Lemur research can simultaneously inform conservation and husbandry strategies, train the next generation of American and Malagasy scientists, inspire curiosity and engage the general public, and promote international collaborations rooted in teamwork.

While the Duke Lemur Center supports a broad range of projects from visiting researchers, we have two research themes that are the focus of our staff scientists: hibernation and nutrition and microbiome science.

For 55 years, the Lemur Center has served as a world-renowned research center, primarily as a resource for external researchers.

Our research mission expanded in 2019, when Director of Research Erin Ehmke, Ph.D., committed to broadening our research focuses to include internal as well as external projects. This, says Erin, creates real momentum for growth and truly utilizes the Lemur Center to its full capacity—not just accommodating

others' research, but leading the field in lemur biology.

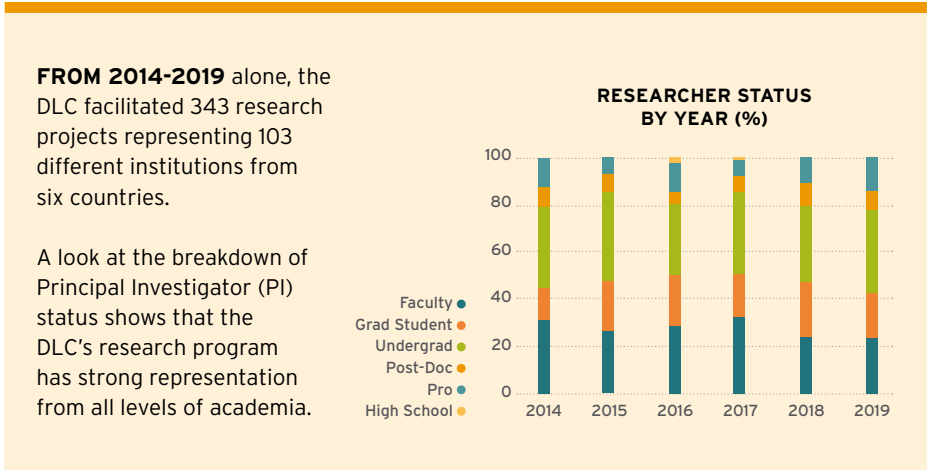
Under her leadership, the DLC took the critical step of hiring its first in-house research scientists: Marina Blanco, Ph.D. (dwarf lemur hibernation) and Lydia Greene, Ph.D. (microbiome and nutritional science).

Having two on-staff scientists enables the Lemur Center to ask our own questions and to mentor students through the process as we do so.

The goal for the DLC Research Scientist program is to show success using two broad metrics: (1) an increase in scientific publications, collaborations, and educational outreach and

mentorship activities; and (2) an increase in grant proposal submission and, ultimately, grant funding. This targeted funding would be used, in part, to improve infrastructure for the lemur colony, staff, and research program and to build inventory of equipment and supplies that will be made available to all researchers.

Although this initial program focuses on two fields of study (microbiome science and hibernation), the goal is to continue expanding the DLC Research Scientist program in several additional fields, such as genomics, brain science, cognition, biomechanics, and behavioral ecology.



ERIN EHMKE, Ph.D. *Director of Research*

After surviving years in the remote jungles of Suriname, South America (not to mention the even more treacherous life of a graduate student), followed by years teaching college courses in Primate Biology and Behavior, Erin now serves as the Director of Research at the Duke Lemur Center.

From her first experience working with primates at a sanctuary that rescues abused or unwanted monkeys from the pet and entertainment industries to her eventual fieldwork studying their wild counterparts, Erin's path has always revolved around our closest, slightly more hairy, relatives.

A primatologist whose previous work focused on social support and stress in wild capuchin monkeys, Erin became fascinated with how different lemurs are from the rest of the Primate order. She was especially thrilled to learn about the DLC's non-invasive research policy and how beneficial such a program is, often enriching the lemurs' physical and psychological well-being as well as helping us to learn a lot more about them, and often about ourselves.

As Director of Research, Erin's vision is to help make the Lemur Center even more accessible to the larger research community, particularly undergraduates, and to promote the DLC as a leader in the scientific community.

"NOW THAT THE DUKE LEMUR CENTER HAS OUR OWN RESEARCH SCIENTISTS, WE'RE NO LONGER PASSIVELY ACCOMMODATING RESEARCH AND SCIENCE. WE'RE NOW LEADING THE FIELD. WE'RE ASKING OUR OWN QUESTIONS WE KNOW THE ANIMALS BEST. WE KNOW WHAT QUESTIONS HAVEN'T BEEN ASKED, AND WE KNOW HOW TO BEST STUDY THEM."

ERIN EHMKE, PH.D.

MARINA BLANCO, Ph.D.

In-house Research Scientist

Marina originally studied biological anthropology at the Universidad Nacional de La Plata, Argentina, where she conducted research on prehistoric human populations. Ready for change, she obtained a M.A. degree and a Ph.D. from the University of Massachusetts, Amherst, USA under the mentorship of Dr. Laurie R. Godfrey, who instilled in her a lifelong passion for lemurs and Madagascar.

During her Ph.D., Marina studied the reproductive biology of eastern mouse lemurs and, while searching for these tiny nocturnal creatures in the rainforests, she became curious about their hibernating cousins, the dwarf lemurs. Marina has been working at the DLC since 2012, and has been affiliated with Anne Yoder's lab in Duke University's Biology Department since 2019.

Marina has more than 15 years' experience conducting research in Madagascar. Her current projects are focused on the ecology of hibernation in dwarf lemurs on the island and the physiology of hibernation of dwarf lemurs at the DLC, though her interest in mouse lemurs remains unwavering.



LYDIA GREENE, Ph.D.

In-house Research Scientist

Lydia is fascinated by the diversity of lemurs in Madagascar, and especially by the proliferation of leaf-eaters. Her scientific work is broadly centered on the microbial, molecular, and morphological adaptations that enable folivory (leaf eating) as a feeding strategy, with the gut microbiome being her primary research focus.

Lydia has been part of the DLC family since 2007, when she first began working as an educational docent, animal technician, and student researcher. In 2011, she graduated *summa cum laude* from Duke University with a B.S. in Evolutionary Anthropology after writing her senior thesis on olfactory signaling in DLC sifakas. In 2019, Lydia earned her Ph.D. from Duke University's Program in Ecology under the mentorship of Christine M. Drea. Her dissertation research was on the gut microbiome of Madagascar's folivores.

Lydia joined the DLC as a staff scientist in 2019 and is currently sponsored by the National Science Foundation via a Postdoctoral Fellowship in Biology. She is also affiliated with Anne Yoder's lab in Duke University's Biology Department.

Lydia enjoys working via transdisciplinary and international collaborations, mentoring American and Malagasy students, and engaging with the general public through science-based communication and storytelling. To follow along with her research and travels, check out Lydia's professional Instagram account @lemurscientist. 🐶



ALL OF THE DUKE LEMUR CENTER'S RESEARCH PROJECTS HAVE ONE THING IN COMMON: A NON-INVASIVE APPROACH. WE DO NOT ALLOW RESEARCH THAT WILL HARM OUR ANIMALS IN ANY WAY.

"THESE ARE ALL ENDANGERED SPECIES," SAYS ERIN. "THEIR CARE AND WELL-BEING ARE OUR UTMOST PRIORITY, BOTH AS A SPECIES AND AS INDIVIDUALS."

COMING SOON!

Research Station in Anjajavy, Madagascar

By **MARINA BLANCO, PH.D.** and **LYDIA GREENE, PH.D.**

AS THE SUN SETS and the forest's bright colors darken to shadow, tiny reflections scamper rapidly in the treetops. A close-up shows a fat-tailed dwarf lemur in a fruit-feeding frenzy. The Anjajavy forest, a coastal dry deciduous forest in northwestern Madagascar, is a gem for tourists and researchers alike. It is home to many familiar faces from the DLC, including Coquerel's sifakas, aye-ayes, and fat-tailed dwarf lemurs.

Contrary to their DLC peers, fat-tailed dwarf lemurs at Anjajavy begin to fatten for hibernation in March, the time at which the DLC's dwarf lemurs emerge from torpor. For fat-tailed dwarf lemur researchers, these opposing schedules are ideal when you plan to study hibernation year-round.

By studying hibernation in Anjajavy's dwarf lemurs, we learn "how it is done" in nature, which helps us fine-tune the "optimal" recipe for hibernation in the DLC colony. The new research station will bring together these geographically separated dwarf lemur colonies for hibernation studies, as well as serve as a training site for students and scientists and expand our collaborative initiatives in Madagascar.

Thank you to Bob and Sue Knox for funding the construction of this brand-new field station!





FROM DURHAM *to* MADAGASCAR *and* BACK AGAIN:

CONSERVATIONIST AND CURATOR
ANDREA KATZ RETIRES AFTER 43 YEARS

By ROBIN SMITH, Ph.D.

To most of us, a lemur's life looks fairly simple. Bask in the sun. Nibble some leaves. Groom with your group. Nap in the trees. But ask longtime DLC staffer Andrea Katz what it takes to oversee their day-to-day care, either in their native Madagascar or for the more than 200 lemurs that have an adoptive home at Duke, and the logistics become daunting fast.

There are budgets to manage, permits to obtain, staff needs to consider. Weather to contend with. Care guidelines and protocols to write.

In the highlights reel of her four decades-long career as an animal curator and conservationist, Andrea might be busy preparing for a bumper crop of mouse lemur babies. Or filling out reams of paperwork to transfer blue-eyed black lemurs between countries to bolster their breeding programs.

It's as if she keeps a giant Gantt chart in her head: Always anticipating which animals would get along well enough to share a habitat; and which might be breeding or weaning soon, or needed for teaching or research, or transferred to another zoo.

"When a curator makes decisions, they always need to be thinking ahead," Andrea said.

But when she first came to Duke in 1975, to study zoology as a transfer student from Colby College in Maine, the future of the then nine-year-old Duke University Primate Center as it was called was far from certain.

The center's founding director, John Buettner-Janusch, had left. Duke's provost announced plans to shut down the facility, along with the forestry school, citing maintenance costs and a university-wide "\$3.5 million deficit."



◀ Andrea with Dr. Elwyn Simons and Parc Ivoloïna staff, at Ivoloïna.

▼ Conducting lemur surveys in Betampona Natural Reserve. Pictured left to right: Malagasy graduate student Bernadette, Duke graduate student Beth, Andrea, Parc Ivoloïna Manager Roger, and guide Tsirindahy.

Andrea recalls the headlines in the student newspaper, reporting that Duke’s roughly 225 lemurs, lorises, and galagos “may soon be homeless.”

Not one to be deterred, she tracked down facility supervisor and part-time musician David Anderson at the Cat’s Cradle nightclub in Chapel Hill one night when he was playing drums onstage, marched up to him and said, “I transferred here because of the lemur center. And now I hear it’s closing down. Can I come volunteer?”

From that point on, she says, “I spent all my time at the lemur center.”

Andrea put in hours each week shoveling poop and hauling buckets of food, first as a volunteer and then as a work-study student. She swapped out regularly scheduled courses for independent study credits with Duke professors Matt Cartmill and Peter Klopfer, studying the shrieks and howls of ruffed lemurs and other animal behavior.

By the time she graduated in 1977, there were glimmers of hope for the center. A three-year, \$300,000 grant from the Cordelia S. May Family Trust had given the embattled facility a new lease on life. She started working there full-time, steadily climbing her way from animal care technician to supervisor.

In that time a new director, Elwyn Simons, had taken over. In the early 1980s, he was granted permission from the Malagasy government to bring wild lemurs from Madagascar to North Carolina, as “a second line of defense against extinction.” One of the people he tapped to join those missions was Andrea.

Madagascar had been closed to foreign scientists for a decade or more, and few Westerners understood how imperiled the island’s plants and animals were by forest

loss and poaching.

“Nobody was talking about endangered species,” Andrea said. “It wasn’t a big thing. I mean, maybe with flagship animals, but certainly not with lemurs.”

In 1986, when Malagasy government officials asked for Elwyn’s help in rebuilding a zoo on the island’s east coast, Parc Ivoloïna, which had been badly damaged by a cyclone, once again he dispatched Andrea.

When she first visited Ivoloïna in 1987, for a two-month site visit with her husband Charlie Welch, the zoo’s lemur pens and cages were smashed, and “giant trees were down,” Andrea said. “After the cyclone the Malagasy government had no funds for repairs.”

Fast forward two years, and by 1989 the couple was living at Ivoloïna nearly year-round, in a small wooden house without power or plumbing.

“We were thrilled because we thought we were going to be living in a tent,” Andrea said.

They collected rain from the roof for drinking, and hung a five-gallon camp shower bag for bathing. Andrea had handed over her campus curator duties and dropped down to half pay, and Welch was along as a volunteer.

“We didn’t think about money,” Andrea said. “We were thrilled to have the opportunity.”

They lived and worked in Madagascar for the next 15 years. For Andrea, a Pennsylvania native whose only significant travel outside the U.S. was a summer in Norway, expat life in the tropics came with a learning curve. There was the ever-present mud and humidity, the steep terrain, the constant threat of jiggers and other parasites.

“I just hated leeches,” Andrea said.



Instead of using a computer screen, she wrote her annual reports on a manual typewriter.

“The international phone lines didn’t work,” Andrea said. “I would send my parents a postcard, and they wouldn’t get it until a month later.”

“We never thought we were going to be there so long,” Andrea said. “But you know we loved it there, and loved the work too.”

They learned to get by in French.

Grew fond of rice. Eventually they had a daughter and decided to move to nearby Tamatave (now Toamasina), Madagascar’s second-largest city, for the comforts of electricity and running water.

“And that’s where she grew up and went to school,” Andrea said. “She spent the first 11 years of her life in Madagascar.”

Over time, they and the dozens of Malagasy staff they trained at Ivoloïna took what had been a crumbling former forestry station and government holding facility for confiscated lemurs and ex-pets, and transformed it into a 700-acre zoo and environmental education center, its dozens of lemurs and other native wildlife attracting as many as 20,000 visitors a year.

The couple soon realized they needed to do more than just care for lemurs in captivity if they wanted to have an impact on conservation. By the late-1980s, Duke’s primate center had been remarkably successful at breeding and building up the numbers of endangered lemurs in the United States, growing its collection in Durham from 200-250 animals to at one point more than 700.

So Andrea and Charlie suggested a next step: Could they send some of the center’s lemurs, born in captivity, back into the wild? And by reducing threats to their

survival in their native habitat, protect other species at the same time?

It was a risky experiment. Similar programs had partially restored wild populations of other species on the verge of extinction, such as the bald eagle, Plains bison and the Galapagos tortoise, but success with primates was elusive.

Would the transplants have the skills to fend for themselves in unfamiliar surroundings? They would need to learn how to find food, avoid danger, and infuse some new genes into the local population to bring it back from the brink.

For a site Andrea and Charlie proposed a 5,500-acre patch of lowland rainforest 25 miles from Parc Ivoloïna called Betampona

Reserve. Their initial surveys in 1991 and 1992 revealed that there were only 30 to 35 ruffed lemurs left in the area, a number so small that a single storm or bout of disease could wipe them out.

After seven years of research and planning, a total of 13 captive-bred black and white ruffed lemurs were released into Betampona Reserve between 1997 and 2001 as part of a first-of-its-kind reintroduction program coordinated by the DLC and the Madagascar Fauna and Flora Group.

Andrea remembers the awe she felt when the first group to be released, three males and two females nicknamed the “Carolina Five,” finally made it to

Madagascar after months of “lemur boot camp” training in Duke Forest, extensive medical exams, and 72 hours of travel.

“I’ll never forget seeing the Duke animals arrive at our house in Tamatave in their kennels,” Andrea said.

The releases were not without problems. In the first five years of the program, one reintroduced lemur disappeared from the reserve, one died from malnutrition, and five others fell prey to a fossa, a cousin of the mongoose about the size of a bobcat.

A decade after the initial release, three of the 13 captive-bred lemurs were still alive, and four had reproduced with wild mates. But what she’s most proud of, she says, is that as a result of the introductions, Betampona Reserve was saved from destruction.

▶ Andrea, then pregnant, with a group of Malagasy school children at Parc Ivoloïna. Her daughter spent the first 11 years of her life in Madagascar.

“It has been continuously managed and protected by the Madagascar Fauna and Flora Group and Madagascar National Parks and is one of [the country’s] most important conservation research sites,” Andrea said.

Eventually, years of splitting their lives between two countries some 9,000 miles apart began to take its toll. Madagascar’s simmering political crises had begun to heat up again after the disputed 2001 presidential elections. By that point, operations at Parc Ivoloïna and Betampona Reserve were running well and in good local hands. They had been considering a return to the U.S. for their daughter’s education, so in 2004 they reluctantly decided to head home.

In recognition of their work, Andrea and Charlie were “knighted” by the Malagasy government that summer. Andrea remembers the thrill of sitting in the stands as guests of honor during Madagascar’s Independence Day celebrations—watching the parades of fire trucks and school groups march by, and getting their medals pinned on by the president of the province.

Not long after the couple’s return to North Carolina, the Duke Lemur Center’s then-incoming director Anne Yoder persuaded Andrea to reprise her role as curator. Andrea managed the Duke colony from 2006 to 2018, before finally shifting her focus back to conservation partnerships with Madagascar.

She has another return trip to Madagascar planned. This time it’s to deliver hard copies of a 76-page lemur care manual she developed, in French and with Malagasy collaborators, setting national standards for Madagascar’s 14 zoos and animal parks, but the trip has been on hold due to the pandemic.

In the meantime, Andrea says she doesn’t want any fuss or fanfare for her retirement.

“Let’s just get Miller Lite and Enzo’s pizza and I’ll be happy.” 🍕



STAY AWAY 5K

HEARTFELT THANKS to everyone who participated in the DLC’s second annual Stay Away 5K this April!

This fully virtual, offsite event raised nearly \$77,000 and enlisted 2,189 participants from around the world, including Australia, Canada, Germany, the United Kingdom, Tanzania, and the Netherlands! Together we ran, walked, hiked, swam, and even rode horses to raise awareness of lemurs and to benefit lemur care and conservation at the DLC.

The money raised helped offset revenue lost due to the COVID-related closure of our tour programs, with 100% of the donations raised going directly to the DLC’s lemur care and conservation initiatives.

We’re so grateful for your care and support!

PLANS FOR NEXT YEAR

Please mark your calendar for next year’s virtual race on Earth Day weekend—

APRIL 23-24, 2022!

Registration will open in March 2022 via the DLC website.



▶ Stay Away 5K participant Mallory Bailey, who completed the race with her horse, Apollo. Photo by Bob Karp.

THE



LEMURS PROJECT

Illustrations: **RACHEL HUDSON**

Text: **FAYE GOODWIN, LYDIA GREENE, Ph.D., ANNA LEE, ALANNA MARRON, MEGAN MCGRATH**

Lemurs are an exceptionally diverse group of primates, spanning 15 genera and more than 100 species. The 100 Lemurs project, launched in 2020 in partnership with award-winning wildlife illustrator Rachel Hudson, aimed to educate the public about lemur diversity and why lemurs—the most endangered group of mammals on Earth—are so special, and so urgently in need of our protection.

Throughout the project, Rachel illustrated one lemur species every day for 100 days, partnered with text written by Duke Lemur Center staff and researchers.

In April 2021, 100 Lemurs was recognized by the Education Advisors of the AZA's Prosimian Taxon Advisory Group in a column highlighting essential education messages and the organizations that have conveyed them most effectively:

“Creating accessible conservation messaging for the public during the pandemic can be challenging, especially as many zoological institutions have been closed to guests and other key audiences. We wanted to celebrate Duke Lemur Center’s innovative approach and artistic collaboration that celebrates the incredible diversity of prosimians in an entirely virtual capacity.”

Here, we’re thrilled to share 20 of our favorite illustrations with you.

AYE-AYE

Daubentonia madagascariensis



THIS SPECIES is so dear to us that it's featured in the DLC's official logo: the aye-aye!

In the late 1980s, the DLC established the aye-aye conservation breeding program in North America and was one of the first places in the world to house this mysterious and, at the time, little-studied primate.

Aye-ayes are **percussive foragers** and use their delicate, skeletal-looking middle fingers to tap rapidly on wood, cupping their huge ears forward and listening for the movement of tasty insects lurking beneath the surface.

When its prey is located, the aye-aye tears off chunks of bark with its strong, continuously-growing front teeth. The aye-aye then inserts its slender and highly flexible third finger into the hole, using the tip of the finger to "hook" and extract the insect for the aye-aye to eat.



NORTHERN GIANT MOUSE LEMUR

Mirza zaza

"GIANT" AND "MOUSE"

may sound like an oxymoron, but northern giant mouse lemurs are three times larger than other mouse lemurs!

While their bodies are small, weighing around 11 ounces, the males of this species have the largest testes-to-body ratio of all primates. Way to go, boys!

Females mate with multiple males and, unlike other lemurs, mate throughout the year rather than seasonally.

Although northern giant mouse lemurs forage alone at night, they sleep in communal nests during the day. They have also been recorded working together to harass and chase off snakes that could prey on these small nocturnal primates.



Become a "lemur parent"! Species marked with this symbol can be symbolically adopted through the DLC's Adopt a Lemur Program! Not only will you receive photos and quarterly updates about your adopted lemur, you'll support lemurs' care at the DLC and their conservation in Madagascar.

LEARN MORE AT
LEMUR.DUKE.EDU/ADOPT

MADAME BERTHE'S MOUSE LEMUR

Microcebus berthae

WHEREAS THE previous illustration highlights the biggest of the mouse lemurs, this one features the smallest of the small! At only 30 grams (one ounce), Madame Berthe's mouse lemur is the world's smallest primate.

Their range is a small section of deciduous forest in western Madagascar, where they coexist with gray mouse lemurs who are twice their size.

Fortunately, the feeding strategies of these species are different enough that they don't appear to be major competitors with one another. Madame Berthe's mouse lemurs specialize on insect secretions with some insect prey as well. Gray mouse lemurs are more opportunistic, eating fruit, flowers, and tree gums as well as insects.



MEET THE ARTIST

RACHEL IS an award-winning illustrator based in Hampshire in the UK, creating lively and characterful images inspired by her love of nature. She regularly works with many of the UK's leading nature conservation organizations to illustrate magazines, displays, and identification guides, and her work has appeared in *BBC Wildlife* magazine and in discovery centers and nature reserves throughout the country. Her first illustrated children's book, *100 Endangered Species*, was published in the U.S. in August 2021.

"Lemurs are such a fascinating and varied group of animals to illustrate. From the aye-aye to the Verreaux's sifaka, they come in all shapes, sizes, and colors. This makes my job particularly interesting to try to capture the unique characteristics of each species. Some were easier than others!

As a wildlife illustrator, I am especially driven to highlight species under threat. There is an increasing amount of research that demonstrates that people are more likely to respond to science and conservation messages where those messages are expressed through arts- and culture-based approaches. I hope that 100 Lemurs has helped to strengthen people's love of lemurs and their desire to protect them."



BORAHHA MOUSE LEMUR

Microcebus boraha

THE TINY, NOCTURNAL Boraha mouse lemur hails from Nosy Boraha, a small tropical island off the eastern coast of Madagascar.

Also known as Ile Sainte-Marie, Nosy Boraha is famous as the “Island of Pirates” and was the off-season home to an estimated 1,000 pirates in the 17th and 18th centuries.

Among its residents were the legendary Captain William Kidd, the ruthless Olivier Levasseur, and Henry Every, “The King of Pirates.” One pirate, Thomas White, reportedly married a Malagasy princess.

Today all that remains is the world’s only pirate cemetery, although it’s rumored that Captain Kidd’s treasure is still buried, undiscovered, somewhere offshore. Instead of pirates, the Boraha mouse lemur now shares its home with tourists who flock there to see lemurs, humpback whales, and some of Madagascar’s most beautiful beaches.



SIBREE’S DWARF LEMUR

Cheirogaleus sibreei

MEET THIS CRITICALLY endangered resident of Madagascar’s cold, high-altitude rainforests!

Sibree’s dwarf lemur was once believed to live in only one forest area in eastern Madagascar. When this forest was destroyed, scientists believed Sibree’s dwarf lemur to be extinct in the wild. Fortunately, with more surveys, other populations of this dwarf lemur have since been found—though only in high-altitude rainforests, which are rare and increasingly fragmented.

Sibree’s dwarf lemur sleeps inside tree holes while active, but hibernates underground to avoid freezing ambient conditions, for up to seven months a year! They are considered the “ancestral” dwarf lemurs and are critically endangered, partly because of their specialization to living in cold environments.



HAIRY-EARED DWARF LEMUR

Allocebus trichotis

THIS SMALL, nocturnal lemur earns its name from the long, wavy hairs that extend from its short, round ears and are thought to help with gathering sensory information.

Commonly known as “allocebus,” these are among the most elusive of all lemurs. For many lemur scientists and enthusiasts, merely seeing an allocebus is a lifetime goal.



HUBBARD’S SPORTIVE LEMUR

Lepilemur hubbardorum

QUESTION: What sport does a sportive lemur play?
Answer: none!

Sportive lemurs are true folivores (leaf eaters) and consume lots of tough plant fiber and toxins. This means that they don’t get much available energy from their food, and need to spend ample time resting and digesting.

In general, folivory makes sense as a strategy in bigger animals that (a) can energetically afford to spend time digesting, and (b) probably couldn’t catch enough insects to make it worth their while. Smaller animals, by contrast, tend to rely on nutritious bugs that enable them to maintain the energetic demands of their high metabolism. Weighing less than 1kg, sportive lemurs are at the very low end of the weight spectrum for a folivore.

But sportive lemurs are also too big to torpor or hibernate, which are energy-saving strategies used by the tiny mouse lemurs and dwarf lemurs. Sportive lemurs just can’t catch a break! Eating leaves but unable to torpor, sportive lemurs instead seem to rely on having very, very low resting metabolic rates— the lowest recorded among mammalian leaf eaters. This means that while they’re inactive, sportive lemurs spend very little energy to maintain basic body function.

In summary, we’d say sportive lemurs could win in eating and sleeping competitions, but marathons are probably not their strongest suit!

CROWNED LEMUR

Eulemur coronatus



CROWNED LEMURS are named after the males’ vivid black and orange “crowns” on their foreheads. Whereas males’ fur is a rich chestnut brown, females’ fur is soft gray with a light orange “tiara” on the forehead.

Crowned lemurs are endangered due to habitat loss, including deforestation caused by sapphire mining—often done illegally in protected reserves.

How can you help? Before purchasing a sapphire, ask where your stone was mined and buy only from jewelers who are committed to ethical sourcing. Or consider heirloom or antique stones: vintage jewels can be reset to make a modern necklace or ring, and don’t perpetuate current unlawful mining operations.



NORTHARCTUS

(extinct)

HERE WE TRAVEL back 50 million years to the jungles of Wyoming, USA to spot Notharctus!

Notharctus was an adapoid, an extinct family of primates closely related to strepsirrhines, the suborder of primates that includes lemurs, lorises, and galagos. Adapoids really got around. Their fossils have been found in North America, Asia, Europe, and Africa.

Notharctus was one of the first leaf-eating primates. Leaves are tough to slice and digest. This adaptation unlocked a whole new menu for primates.

Notharctus is evidence that primates were once a key part of North America’s ecosystems, but primate diversity on the continent crashed 33 million years ago when glaciers and plate tectonics triggered global climate changes that shrank North American forests.

Studying the extinction of lemur-like primates in North America may help us figure out how to stop lemur extinctions in Madagascar. Learn more about the DLC’s fossil division at lemur.duke.edu/fossil.



BLUE-EYED BLACK LEMUR

Eulemur flavifrons



BLUE-EYED BLACK lemurs are one of the Lemur Center’s signature species, and the DLC works within a network of other AZA-accredited institutions worldwide to develop and adhere to Species Survival Plans (SSPs). The blue-eyed black lemur SSP uses carefully managed conservation breeding programs to create a “genetic safety net” for this critically endangered species.

Hailing from the tropical subhumid forests of northwestern Madagascar, these critically endangered lemurs are among the most threatened primates on Earth.

Although male and female blue-eyed black lemurs are dramatically different colors as adults, male infants are born with the same orange-brown coloration as their mothers. This helps camouflage the infants during their first weeks of life, which they spend clinging tightly to mom’s belly or back fur.

Whereas female infants retain their orange-brown coloration into adulthood, males begin to turn black around five weeks of age. As adults, males are completely black with bright blue eyes. This momma is carrying an older male infant, who has lost his orange fur and now sports his “big boy” coloration!

RING-TAILED LEMUR

Lemur catta



THE ICONIC ring-tailed lemur, named after its long black and white “ringed” tail, is one of the most recognizable lemur species.

Ring-tailed lemurs are naturally social. They live in big groups (up to 30 individuals) of multiple adult females and males and offspring of various ages. In such a large group, clear social structure helps things run smoothly.

In ring-tailed lemur societies, **female dominance** is the natural law of the land! All females outrank all males. It’s not uncommon for females to shove males out of their way and steal their food or nap spots. If males don’t follow suit, the females aren’t afraid to get physical.

Females also physically compete for dominance among themselves. In general, the higher your dominance rank, the more food you get, which promotes your health and reproductive success.

That said, ring-tailed lemurs also have a gentler side and engage in “nice” behaviors that promote social bonding, including grooming, hanging out, huddling, and play.



Love this illustration? Find it on shirts in the DLC gift shop!



HOW DOES SHE DO IT?

- ON DAY 32** of the 100 Lemurs project, Rachel took us behind the scenes by sharing some of her process drawings and textures. Here’s how each of those lovely illustrations was created:
- 1 Each illustration started with research. Rachel’s bedside reading throughout the project: Conservation International’s *Lemurs of Madagascar*.
 - 2 She then made lots of scruffy pencil sketches to try to capture the characteristic shape, movement, and behavior of each species.
 - 3 Rachel then switched to her messy workbench to create prints, paintings, and inky marks for the underlying textures (for fur, tree bark, etc.) to add depth and interest to each illustration.
 - 4 Lastly, she used a scanner, her personal computer, and a drawing tablet to bring everything together and edit the illustration.
- Pictured: In Madagascar, **common black lemurs (*Eulemur macaco*)**—like this female pictured here—will gently bite toxic millipedes to provoke them into releasing their toxins. The lemurs will then rub the millipedes all over their fur. The toxins produced by the millipedes are insect repellent!

GREATER BAMBOO LEMUR

Prolemur simus

TRUE TO ITS NAME, the small, snub-nosed greater bamboo lemur feeds almost exclusively on bamboo, with up to 95% of its diet consisting of the shoots, leaves, and pith of the native *Cathariostachys madagascariensis* (Madagascar giant bamboo).

In 2013, it was estimated that as few as 60 greater bamboo lemurs are left in the wild, and no more than 150, making them among the most critically endangered primates on Earth.



Although once widespread across Madagascar, it now lives in tiny fragmented populations along the island's eastern coast, occupying only 1-4% of its former range.

With the assistance of a local guide, greater bamboo lemurs can be seen in Ranomafana National Park, where they live alongside the golden bamboo lemur—another of the world's rarest and most endangered primates.

LAC ALAOTRA BAMBOO LEMUR

Hapalemur alaotrensis

FOUND ONLY along the reedy shores of Lake Alaotra in northeastern Madagascar, the Alaotra bamboo lemur is the poster child for niche specialization.

This critically endangered lemur is the only wetland-dwelling primate species in the world, and feeds primarily on the papyrus, reeds, and grasses that grow around the lake.



Unfortunately, this extreme specialization begets vulnerability to habitat destruction. Lake Alaotra wetlands are being drained and converted to rice fields, and unsustainable hunting and fishing practices contribute directly to population decline.

DIADEMED SIFAKA

Propithecus diadema

ONE OF THE MOST beautiful primates in the world, the diademed sifaka is the most colorful of sifakas. This species sports orange arms and legs, black hands and feet, and an ombre effect from the top of its black head down to its white tail. A full crown (or diadem) of fluffy white fur surrounds its face, hence its name.

Diademed sifakas inhabit the eastern rainforests of central Madagascar and are famously known from the Andasibe-Mantadia National Park. In the Tsinjoarivo Protected Area, mistletoe is an important food source for sifakas during the lean seasons and when living in fragmented habitats.

Like all sifakas, especially rainforest sifakas, this critically endangered species is exceedingly hard to keep healthy under human care.



COQUEREL'S SIFAKA

Propithecus coquereli



WE'RE THRILLED to introduce you to one of the DLC's flagship species, the Coquerel's sifaka!

The critically endangered Coquerel's sifaka is perhaps the most famous of all sifakas. Known from the beloved TV show Zoboomafoo, a large population of Coquerel's sifakas is maintained under human care by the Duke Lemur Center, which pioneered the successful husbandry program for this species.

In Madagascar, Coquerel's sifakas are best known from Ankarafantsika National Park, although they inhabit many dry deciduous forests in the northwest. The name "sifaka" is an onomatopoeia from a vocalization they make, which sounds like "sh-frrrr-k!"

VERREAUX'S SIFAKA

Propithecus verreauxi

HAVE YOU noticed that some sifakas have a brown greasy stain on their chests? If not, you will now!

Sifaka males, but not females, have a scent gland on their chests that secretes a dark, viscous brown goo. Dominant males scent mark more often than subordinate males do, and their glands produce more goo, too. This means that dominant males have bigger chest stains, which also function as a visual badge of their social rank.

Scent marking is an important communication method for all lemurs, including sifakas. The lemurs' wet noses and vomeronasal organs help them sniff out and interpret information in odors.



INDRI

Indri indri

THE INDRI is one of Madagascar’s most famous lemurs. They are also the largest living lemur, weighing an impressive 13-20 pounds in adulthood.

Among the most unique and spectacular characteristics of the indri is its song: a high, mournful wail that can be heard by humans over one mile away.

The indri is one of the few primate genera that cannot survive within human care; hence this critically endangered lemur can be found only in Madagascar’s eastern rainforests above the Mangoro River. Neither the lemur nor the song exists anywhere outside these tropical moist lowland and montane forests.

As trailblazing lemur researcher Alison Jolly wrote, “Indri sing the song of the forest as whales sing the song of the sea.”



MASOALA FORK-MARKED LEMUR

Phaner furcifer

FORK-MARKED LEMURS don’t use scent marking to define territories the way other lemur species do. How do they let other lemurs know to stay away? By screaming!

On average, a male fork-marked lemur will make a loud call 30 times every hour! The most vocal activity happens as these nocturnal lemurs wake up at dusk, and just before they retire to their sleeping nests at dawn.

Even though the four species of fork-marked lemur look visually similar (and were thought to be a single species until 2001), research has shown that an individual will respond only to the vocalizations of its own species.



BLACK AND WHITE RUFFED LEMUR

Varecia variegata



THE BLACK AND WHITE ruffed lemur is critically endangered in Madagascar, primarily due to hunting and habitat loss and fragmentation.

In 1997, the Duke Lemur Center, as part of a consortium of zoos and conservation groups known as the MFG (Madagascar Fauna and Flora Group), released five black and white ruffed lemurs into the Betampona Reserve in eastern Madagascar to restock the natural population there. The introduced lemurs had been born, and had lived their entire lives, in the forested Natural Habitat Enclosures of the DLC.

Later, two more groups of U.S.-born lemurs were released into the Reserve. All of these lemurs had attended “lemur boot camp” free-ranging in forested enclosures at the DLC, and the more such experience they had, the more adept they seemed to be at facing the challenges presented by the wilds of Madagascar. Of the 12 animals released, as many as six successfully bred in the wild, providing a much-needed infusion of fresh genetic material into the wild population.

British comedian John Cleese produced a documentary titled *Into the Wild* about the American-born ruffed lemurs’ release into Betampona Reserve, and funds from the U.K. premiere of *Fierce Creatures*, a follow-up film to Cleese’s *A Fish Called Wanda*, provided critical support for the reintroduction project. 🐶

BEMARAHA WOOLLY LEMUR

Avahi cleesei

ALSO KNOWN as Cleese’s woolly lemur, this densely furred, nocturnal lemur was named in recognition of Monty Python actor John Cleese’s passion for lemurs and his work to save them in the wild.

John Cleese has assisted the Duke Lemur Center with conservation projects in Madagascar, and even recorded a commercial for the DLC’s Adopt a Lemur program. Watch it and learn more about John Cleese’s long history of lemur love at lemur.duke.edu/cleese.



From COLLECTION to MUSEUM

By MATT BORTHS, Ph.D.



▲ Elwyn Simons in the mid-1980s with *Aegyptopithecus*, one of the oldest monkey-like primates.

In 1977, Dr. Elwyn Simons, a paleontologist on a mission to piece together primate evolution, left Yale University and arrived in Durham. Elwyn was ready to start work as the director of the 11-year-old Duke University Primate Center, as the DLC was then known. The quest to unravel the earliest chapters of the human story was a hot topic—and getting hotter—as paleontologists announced the discovery of Lucy, and Jane Goodall’s research on chimpanzee behavior entered mainstream culture. While his colleagues searched for evidence of our chimp-like ancestors, Elwyn wanted to climb further down the family tree, looking for fossils that revealed the root of all primates.

The quest for ancient primate fossils took Elwyn to Wyoming, where he collected the fragments of lemur-like primates that scrambled through the ancient jungles of North America 55 million years ago; and to Egypt, where he and a team of Egyptian and American paleontologists discovered 30-million-year-old monkeys. Some of these fossils were brought back to Duke, becoming the seeds of the DLC fossil collection.

To better understand the biology of ancient primates, Elwyn looked beyond the bones, combining his work on fossils with research conducted at the DLC with living lemurs. The human and lemur

lineages split from each other a few million years after the dinosaurs went extinct. Both have changed a lot over the millennia, but lemurs still preserve many traits found in fossilized primates, like long snouts and relatively small brains. The lemurs at the DLC model how the common ancestors of all primates might have searched for food, lived in groups, and moved through the forest.

The addition of the fossil collection transformed the DLC into a unique research facility where insights normally learned either at a zoo or in a museum can be learned at the same place. Over the decades, the fossil collection expanded through expeditions organized by Elwyn and DLC researcher Prithijit Chatrath. Eventually it expanded so much that it needed a new building. With donor support, Elwyn purchased the current home of the DLC’s Division of Fossil Primates (DFP) on Broad Street near East Campus. Unfortunately, nestled within the

► (From top, clockwise): The Bridger Basin is the ancient home of lemur-like primates that lived in lush forests that are now preserved in much drier badlands; A fraction of the DLC fossil collection: The DLC Museum has over 35,000 specimens in the collection from the last 66 million years of Earth History that were collected during 75 field expeditions; Stars of the DLC fossil collection.



► (From top): DLC Museum exhibit in process; The skull of *Megaladapis*, an extinct giant lemur approximately the size of a female gorilla. At least 17 species of lemur have gone extinct, virtually all of them larger than any of the living lemurs.



LEARN MORE ABOUT THE DLC'S FOSSIL COLLECTION AT LEMUR.DUKE.EDU/FOSSILS

Most museums have two sections with distinct missions: the public-facing exhibits designed for a wide audience, and the behind-the-scenes collection used by researchers as a library of specimens. The DFP has always functioned as a research museum where beautiful skulls of ancient monkeys are stored alongside scrappy fragments that need a bit of expertise to make heads or tails (or tooth) of. The curator and staff are happy to give tours, but we don't have public visiting hours.

Now, with plans to launch as the DLC Museum, we are hard at work on a small exhibit that will introduce the general public to the fossil collection. There will also be tours led by DLC volunteers and students, which will take visitors into the research collection, revealing specimens we don't have room for in display cases. The exhibit and tour is a collaboration between the fossil team and the education and outreach team, especially Fossil Preparator and Graphic Designer Karie Whitman and Tour Designer and

DLC organization, the DFP was difficult to discover if you didn't have direct connections to the place—or to Elwyn.

In 2011, Elwyn retired and Dr. Gregg Gunnell joined the DLC as the Curator of the DFP. Gregg wanted to expand the impact of the collections, making it easier for researchers to discover the trove of fossil history hiding at the Lemur Center. He worked with Dr. Rich Kay in Evolutionary Anthropology to bring Kay's South American fossil collection to the DLC. This expansion allowed researchers to compare primate radiations in South America with radiations in Africa and Madagascar. Gregg also worked with Dr. Doug Boyer in Evolutionary Anthropology to expand the Wyoming collections and to share fossils as 3D models on the website MorphoSource.

By the time I arrived in 2018 to start as the new Curator of Fossils, it was clear that the lab-based research collection that Elwyn started had grown far beyond the name "Division of Fossil Primates." The DLC has more than fossils—we have a large collection of bones from modern primates and other creatures and important research archives—and more than primates—we collect the remains of the plants and animals that shaped primate evolution. Calling ourselves the "Division of Fossil Primates" was a barrier for many researchers who didn't realize how much the DLC has in its collection.

Fortunately, there is a simple way to describe this invaluable resource at the DLC: Museum of Natural History. After discussions with Duke leadership, we started the process of changing our name to the Duke Lemur Center Museum of Natural History (DLC Museum for short).

MEET OUR FOSSIL CELEBRITIES AT THE DLC

Illustrations by **KARIE WHITMAN**



The DLC has one of the most complete skeletons of **NOTHARCTUS**, a 55-million-year-old lemur relative that lived in North America.



PALAEOPROPITHECUS, a giant sloth lemur, went extinct only a few centuries ago and may still survive in Malagasy folktales. In these stories, it is called the *tre-tre-tre*, which might be one of its calls!



PLESIOPITHECUS, the oldest relative of aye-ayes, was discovered in 37-million-year-old rocks in Africa, evidence that aye-ayes may have traveled to Madagascar at a different time than the rest of lemurs.



AEGYPTOPITHECUS might be the most studied species in the collection. This relative of all Old World monkeys and apes lived in Egypt 32 million years ago and has been featured in textbooks, documentaries, and research studies.

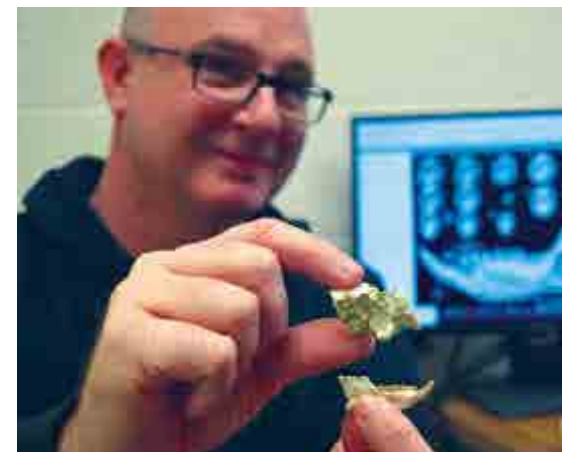
Education Specialist Alanna Marron.

We also need to help researchers, educators, and students discover the full potential of the research collections at the DLC Museum. With the support of two separate federal grants, the fossil team, led by Collections Manager Catherine Riddle, is putting our entire collection catalogue online, so researchers have access to our specimen data all over the world. Tomographer Steven Heritage is leading the effort to scan our most important and fragile specimens, using the microCT scanner at Duke to create digital models that can be uploaded to the museum's digital collection on MorphoSource and downloaded by people—for free—from anywhere in the world.

Ongoing paleontological expeditions to the Rocky Mountain region of the United States, Madagascar, Egypt, and Peru continue to expand our physical and digital collections and we are quickly outgrowing our small building on Broad Street. The world of early

primate evolution only becomes hotter and more fascinating as new tools, like ancient genetic studies, stable isotopes, and speedy computers make new discoveries possible at an amazing clip, and the specimens at the DLC Museum are at the center of many new revelations. We want to share the fascinating story of ancient primates with anyone who is curious about where lemurs, monkeys, and humans came from. Becoming the DLC Museum of Natural History makes it easier for everyone to get as excited about ancient primates as Elwyn was. 🙋

► (From top): Steven Heritage holds a fossil of *Plesiopithecus*. Steven Heritage is the DLC's tomographer, a scientist who uses x-rays and cameras to create highly detailed digital models of specimens that can be shared and downloaded.; Karie Whitman adds the museum name to the mural outside the DFP. In addition to her skills as a graphic designer, Karie is the DLC's fossil preparator, a scientist who removes fossils from rock, stabilizes fossils for research, and makes casts for researchers.





AND AWAY THEY GO!

COQUEREL'S SIFAKA CONSERVATION BREEDING PROGRAM EXPANDS INTERNATIONALLY

By SARA CLARK and DAVID HARING

Photo by Steve Coombs.



In the late 1980s, the DLC established its conservation breeding program for the highly endangered Coquerel's sifaka. The program has since grown into the most successful breeding program in the world of any species of sifaka, and for years the Lemur Center has been working with partner zoos in the U.K. and Germany to expand this breeding program into Europe.

This summer, a half-decade of planning finally came to fruition: Three separate shipments of sifakas, departing from Atlanta's Hartsfield Jackson airport over a period of four months, delivered four pairs of DLC sifakas to three European zoos.

Beatrice and Elliot, the first pair of Europe-bound sifakas, were driven by DLC staff to Atlanta on May 19, where they boarded a direct flight to Heathrow airport in London with a final destination of the Chester Zoo in Cheshire, England. After 4,000 miles of travel, they became the first members of their species ever to set foot on European soil.

The pair was followed two weeks later by Sigismund and Justa, traveling from the DLC to Cologne Zoo; and by Euphemia and Hostilian, leaving Durham for Tierpark in Berlin.

Finally on September 24, the DLC-to-Atlanta-airport sifaka shuttle service made its final trip down I-85, and DLC staff delivered Isabella and Wenceslaus to the airport's animal shipment staff, who were by now very familiar with sifakas (and DLC staff!). Later that day the pair departed for Berlin, and soon after their arrival, on to the Tierpark Zoo.

The goal? To use carefully planned conservation breeding programs to expand the genetic safety net for this increasingly threatened species.

"Coquerel's sifakas are critically endangered," says Mike Jordan, Animal and Plant Director at Chester Zoo. "What we aim to do now is to establish a 'safety net' population in Europe's top zoos, and to help prevent their extinction and preserve options for future conservation." 🐼



- 1 **Isabella** - Berlin, Germany
- 2 **Elliot** - Cheshire, England
- 3 **Wenceslaus** - Berlin, Germany
- 4 **Euphemia** - Berlin, Germany
- 5 **Beatrice** - Cheshire, England
- 6 **Justa** - Cologne, Germany
- 7 **Sigismund** - Cologne, Germany
- 8 **Hostilian** - Berlin, Germany

Photos by David Haring and Sara Clark.



MEET THE NEW CURATORIAL TEAM

By MANDY MATSON

The DLC’s curatorial team is responsible for our lemurs’ care and welfare, including overseeing our conservation breeding programs and supervising the husbandry team. While others within the zoological community have been discussing moving from individual curators to multi-member curatorial teams, the DLC is among the first major organizations to manage its animals using this new configuration. According to the Lemur Center’s Executive Director, Greg Dye, much of the credit goes to former curator Cathy Williams, D.V.M. “She had the vision that this was the way, and she got us there. It’s a passing of the baton.”



MEG DYE *Curator of Behavioral Management and Welfare*

Under Meg’s guidance, the DLC’s training and enrichment programs have grown increasingly robust and are an essential aspect of a holistic approach to providing enriching opportunities for each individual in the colony. In addition to her roles in training and enrichment, Meg oversees the implementation of a variety of behavioral-based welfare assessments. “Traditionally, welfare assessments were solely resource-based: does the animal have water, heat, proper ventilation? While the correct provision of resources clearly continues to be critical to good animal care, behavior-based assessments look at how the animal is responding to those resources,” explains Meg. “It’s the individual’s way of telling us if we are providing the optimal environment specifically for them.” When opportunities for improvement are identified, the curatorial team works together to identify a path forward through assessment of current practices, inter-department collaboration, implementing a change, and reassessing the impact on the individual.

BRITT KEITH *Curator of Living Collection*

Britt (pictured on the right with Andrea Katz in Madagascar) was most recently our Assistant Curator. In her new role, she’ll continue to oversee the overall composition of the colony—such as which lemurs arrive or depart for breeding loans—as well as its day-to-day operations. Britt will also be working with conservationist Andrea Katz and the Malagasy government to develop a lemur conservation breeding program for Madagascar’s 14 licensed zoos and wildlife parks. Britt is the Coquerel’s sifaka Species Survival Plan (SSP) coordinator in the U.S., and has already developed a studbook for Coquerel’s sifakas living within human care in Madagascar. “Britt will be spending a lot of time in Madagascar, taking on parts of the program Andrea spent a better part of her career building, and developing relationships with our partners there,” says Greg.



KRISTIN CLARK *Assistant Curator*

Formerly the husbandry curator at the NC Aquarium on Roanoke Island, Kristin joined the Lemur Center staff in 2020. Although her background as an aquarist seems far removed from working with lemurs, Greg recalls that what he learned from his own transition from working with marine animals to lemurs is that much of what one learns about animal care translates between radically different species. He sees Kristin’s skills complementing those of Britt and Meg. “This position speaks to Kristin’s strengths,” says Greg. “Just like the DLC, aquariums are small and people wear different hats. Kristin works well with different personalities, and she’s so energetic and enthusiastic. She views our program from a different perspective that’s going to allow us to grow.”



Diversity INITIATIVES

By ERIN HECHT

Students have played a central role in lemur care and research since the DLC's inception in 1966. Duke undergraduate and graduate students mentored by co-founder Peter Klopfer, Ph.D. were the first to conduct research on lemur behavioral ecology with the colony, and students assisting co-founder John Buettner-Janusch, Ph.D. were responsible for the bulk of animal husbandry. Since those early days, students from Duke, other local universities, and from all over the world come to the Lemur Center to learn and to contribute toward our mission.

I stepped into the role of Student Program Coordinator in early 2020, shortly before the DLC closed to the public, students, and non-essential staff and volunteers due to COVID-19. That unexpected pause in programming allowed for a reevaluation of our existing student opportunities and departmental priorities.

Although interest in the DLC's student opportunities continues to grow, the lack of diversity among the individuals we engage is a concerning trend. This observation is consistent with low diversity

across STEM fields more generally. To dig deeper into this and to begin to tackle inequities in DLC programming, last year we established a Diversity Task Force focused on identifying and eliminating barriers to participation as we seek to build a more diverse community of visitors, students, volunteers, and staff at the DLC.

The Task Force has spent the last 12 months making connections and engaging virtually with faculty, staff, and student organizations at local historically black colleges and universities (HBCUs) and community colleges, as well as seeking out funding for existing DLC student programs and new initiatives that would broaden our reach in the Triangle community and beyond.

A primary target for funding is the DLC summer internship program, which has hosted 159 undergraduates as summer interns since its inception in 2012. Internship opportunities span most of the DLC's departments, including Research, Fossil Primates, Husbandry, Education, Communications, and Animal Welfare.

Even though the summer intern program is unpaid and each intern is

responsible for housing, meals, transportation, and onboarding costs, the DLC receives more than 100 applications each year for approximately 20 internship positions. Yet despite its popularity, we know that the unpaid status of the internship is a barrier to inclusive student participation. Students who need steady income during the summer, don't have personal transport, or don't already have housing in the area face significant, and often insurmountable, hurdles to participating in DLC internships.

With support from Duke's Office of Institutional Equity, we recently submitted a grant through the National Science Foundation for the DLC to become a Research for Undergraduates (REU) Site for our field research, functional morphology, and paleontology summer internships. If the DLC receives this three-year grant, it will fund stipends and cover transportation, housing, food, and other program costs for eight students each summer. Recruitment for the DLC REU internships would target underrepresented minorities, community college students, students with limited access to research



The DLC's Student Projects Program connects students with volunteer, work-study, research, and internship opportunities at the DLC. Students have gone on to study primates in the most remote parts of the world; to become veterinarians and zookeepers; to serve in the Peace Corps; to attend graduate school; to teach environmental education; and so much more. *Photos by Bob Karp.*

A GIFT OF **\$7,500** WOULD FULLY COVER ONE STUDENT FOR THE 10-WEEK INTERNSHIP AT A LIVING WAGE, OPENING THE DOOR TO CANDIDATES WHO MIGHT OTHERWISE BE UNABLE TO CONSIDER THE INTERNSHIP EXPERIENCE.

opportunities at their colleges, and first-generation college students.

Yet even if the REU grant is awarded, our other summer internship positions (Husbandry, Animal Welfare, Communications, and Education) would remain unfunded. To address this, we've developed a new opportunity for DLC donors to give a targeted impact gift that would go directly toward student support for these summer internship positions. A gift of \$7,500 would fully cover one student for the 10-week internship at a living wage, opening the door to candidates who might otherwise be unable to consider the internship experience because of cost and the need to earn a summer income to support themselves or their families. To learn more about this giving opportunity, please visit the Targeted Impact Gifts page on the DLC website: lemur.duke.edu/TIGifts.

We also are committed to increasing diversity within our educational programming, and are exploring new ways to bring the unique experiential learning opportunities available at the DLC to local students. We have a pending grant proposal that would fund K-12

student outreach in Durham schools, with a particular focus at the middle school level.

Research shows that middle school is a formative time for engaging students—particularly girls—in science, and inspiring them to pursue STEM in high school and beyond. The proposed pilot program would support the creation of a new curriculum focused on lemur biology, while establishing a long-term partnership with a local middle school that would include student field trips to the DLC and visits from DLC staff to the classroom. The grant would also support the creation of a web portal that would make it possible for DLC education staff to share new curriculum resources with educators and students on a regional and global scale.

The DLC's student outreach and learning opportunities help to inspire and equip the next generation of primate researchers, science educators, and conservationists. It is imperative that those opportunities are available to all and that diversity and equity be central to the growth of the DLC in the next 55 years. 🙏



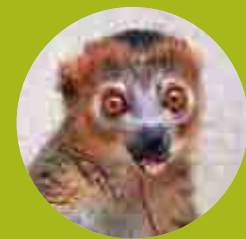
HERE'S WHAT'S NEW AT THE DUKE LEMUR CENTER!



COQUEREL'S SIFAKA
Didius - 01/22/20
Photo by David Haring



BLACK AND WHITE RUFFED LEMURS
Sunshine, Sputnik, Orbit - 04/30/20
Photo by Sara Clark



CROWNED LEMUR
Siwa - 05/29/20
Photo by David Haring



AYE-AYE
Winifred - 06/23/20
Photo by Sara Clark



MOUSE LEMURS
Plumeria and Phlox - 07/30/20
Photo by Sara Clark



FAT-TAILED DWARF LEMUR
Goose - 09/06/20
Photo by Lydia Greene



COQUEREL'S SIFAKA
Terence - 01/1/20
Photo by David Haring



BLACK AND WHITE RUFFED LEMUR
Ripley - 05/12/20
Photo by Sara Clark



FAT-TAILED DWARF LEMURS
Dominique, Serama, Vorwerk - 06/29/20
Photo by Sara Clark



COQUEREL'S SIFAKA
Felix - 12/21/20
Photo by David Haring



BLUE-EYED BLACK LEMUR
Brady - 04/03/20
Photo by Sara Clark



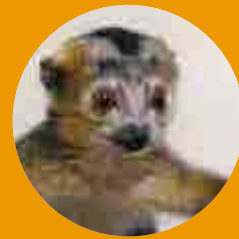
FAT-TAILED DWARF LEMUR
Myna - 06/03/20
Photo by Sara Clark



FAT-TAILED DWARF LEMURS
Cuckoo and Dodo - 08/04/20
Photo by Sara Clark



BLUE-EYED BLACK LEMUR
Malala - 04/01/21
Photo by David Haring



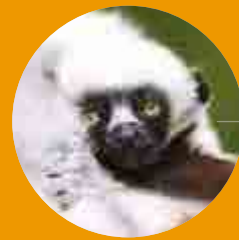
CROWNED LEMUR
Pharaoh - 05/07/21
Photo by Bob Karp



MOUSE LEMURS
Tumbleweed, Cholla, Ocotillo - 07/07/21
Photo by Jodi Stirk



MOUSE LEMURS
Hydrangea, Speedwell - 08/08/21
Photo by David Haring



COQUEREL'S SIFAKA
Cassia - 01/26/21
Photo by Bob Karp



MOHOL BUSHBABY
Coconut Palm - 04/03/21
Photo by David Haring



FAT-TAILED DWARF LEMURS
Starling, Kingfisher - 06/23/21
Photo by David Haring



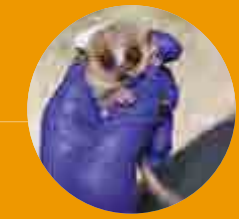
RING-TAILED LEMUR
Atticus - 03/26/21
Photo by David Haring



MONGOOSE LEMUR
Clancy - 04/18/21
Photo by David Haring



FAT-TAILED DWARF LEMUR
Meadowlark - 06/25/21
Photo by David Haring



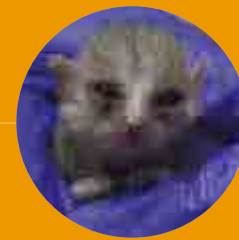
MOUSE LEMUR
Green Bean - 09/13/21
Photo by Jodi Stirk



RING-TAILED LEMUR
Scout - 04/01/21
Photo by Sara Clark



FAT-TAILED DWARF LEMURS
Phoenix, Frizzle, Java - 06/18/21
Photo by David Haring



MOUSE LEMUR
Indigo - 07/31/21
Photo by Jodi Stirk

HIGHLIGHT: HOW DID LEMURS END UP AT DUKE?

MANY PEOPLE ask why and how the DLC's first lemurs came to North Carolina, but few expect the response: through a civil rights protest and a legal journey that ended in the Supreme Court of the United States.

Our story begins in 1963, when Peter Klopfer, a Duke University professor of biology, was charged with criminal trespass while participating in a civil rights demonstration at a restaurant. As his case worked its way through to the Supreme Court, friends and colleagues donated money for his legal defense.

Here, Peter describes what happened next:

■ *When my case began to cost money, my friends and colleagues set up a defense fund and contacted my former teachers and friends at Yale for contributions.*

One of those who contributed was John Buettner-Janusch. John was on the faculty at Yale, and although we'd never met and he didn't know me, he was committed to civil rights.

When he came down [to Durham] to give a lecture—and, although I didn't know it at the time, to be considered for an appointment at Duke—I went to the lecture and introduced myself, so I could thank him personally. He expressed an interest in my work, so I brought him to the site of my Duke zoology behavior station where I had my animals. I had a herd of deer, goats, turkeys, and all kinds of different animals within a 40-acre enclosure.

John was impressed by what he saw. He told me that one of the reasons he couldn't stay at Yale was because they wouldn't give him space for his lemurs. He would much rather have the animals outdoors in facilities such as mine. Would I consider letting him bring the lemurs out to the behavior station if he, in turn, allowed me to use the lemurs for my behavioral work?

I said, 'By all means, come, and we'll form a partnership.' And that's how we met, and that's how the Lemur Center got started. ■ ■

Bill Anlyan, then dean of the Duke University School of Medicine, granted a large swath of Duke Forest to the project, and the National Science Foundation provided the funds to build a "living laboratory" where lemurs and their

close relatives could be studied non-invasively.

In 1966, the nascent DLC—then called the Duke University Primate Center—was founded on 80 wooded acres (later expanded to 100 acres), two miles from the main Duke campus. John's colony of lemurs was relocated from Connecticut to North Carolina, and the DLC began assembling the largest living collection of endangered primates in the world. 🐒



◀ The DLC was established over 50 years ago as an opportunistic collaboration between two researchers: John Buettner-Janusch of Yale University, who was studying biochemical genetics in lemurs; and Peter Klopfer, Duke University biologist studying maternal behavior in mammals. Together, the two biologists conceived the idea of establishing a primate facility in Duke Forest that would combine their research perspectives in order to explore the genetic foundations of primate behavior. Undated image of John Buettner-Janusch courtesy of the Duke University Archives.



▲ Peter Klopfer at the Duke Lemur Center's 50th Anniversary Scientific Symposium in 2016. Peter was a member of the search committee that hired John Buettner-Janusch onto faculty at Duke. John accepted the position, on the condition that the University provide accommodations for his lemurs and other primates. Photo by David Haring.

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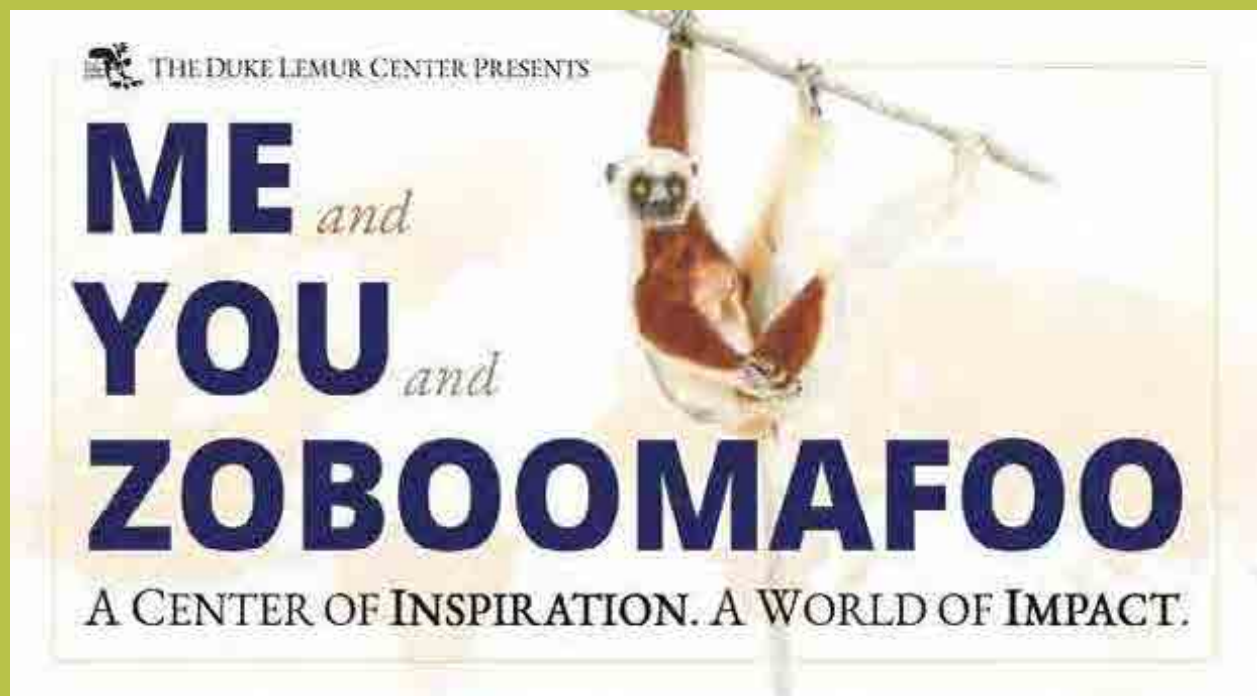


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IF YOU DIDN'T get a chance to watch the video premiere of *Me and You and Zoboomafoo* last fall, grab some popcorn and check it out **FREE** online!

This feature-length video adventure—created by the Duke Lemur Center in celebration of World Lemur Day on October 30, 2020—is co-hosted by Duke alumnus Martin Kratt, co-creator of *Zoboomafoo* and *Wild Kratts*! Through Martin's story and so many others, *Me and You and Zoboomafoo* explores how one place,

nestled in the forests surrounding the Duke University campus, can inspire a whole world of impact.

Martin shares stories of how his experience at the Lemur Center took him from being a Duke undergrad to an Emmy Award winner who's introduced generations of children to lemurs and wildlife conservation. Of course, the film features lots of behind-the-scenes footage of the DLC's lemurs, too, and even some retro *Zoboomafoo*!

WATCH NOW: [LEMUR.DUKE.EDU/ZOBOO](https://lemur.duke.edu/zoboo)