

# Travel and Learn

with the Institute of Human Origins

This past June, Ian Gilby led a group to Gombe Stream Preserve as part of a **Primates and Paleoanthropology tour** that included four days at Gombe and several days in Rwanda to see mountain gorillas. A highlight of the trip was spending an afternoon with Jane Goodall at her home in Gombe—a terrific encounter that the IHO group, including IHO board members Carol and Peter Saucier, will never forget!



IHO's rafting trip to explore the geology and natural history of the **Grand Canyon** with IHO researcher Chris Campisano and School of Earth and Space Exploration geologist Ramon Arrowsmith sold out its 27 spaces quickly. The trip will launch in May 2019.

If you would like to **travel with IHO to the Galapagos Islands**, IHO Director Bill Kimbel is organizing a trip for a possible February 2021 launch. We are taking expressions of interest for joining Bill's fourth trip to Darwin's famed archipelago. Email Julie Russ at [jruss@asu.edu](mailto:jruss@asu.edu) if you are interested in joining this adventure!

# Education and Outreach

For the fifth year, IHO hosted a Research Council weekend in New York City. For the last two years, the event has been at the storied Metropolitan Club across from Central Park. IHO-affiliated PhD graduate Professor Jessica Thompson, an Assistant Professor at Emory University, presented provocative new ideas about how the earliest human ancestors began consuming animal fat long before stone-tool-assisted hunting, which profoundly influenced the course of human evolution. A video of the lecture will be available for viewing on IHO's YouTube channel after the first of the year.

Early in 2018, IHO hosted a viewing of the award-winning documentary film *Rise of the Warrior Apes*, which features the **Ngogo Chimpanzee Project**. Kevin Langergraber is a lead researcher at Ngogo—home to the largest chimpanzee group known, with nearly 200 members. In addition to the long-term research on the behavior of this extraordinary group of chimpanzees, Langergraber leads a conservation and protection effort against poaching and trapping of chimpanzees and elephants in this area of Uganda. To learn more about conservation efforts, find the Ngogo Chimpanzee Project on Facebook.

IHO has long supported an increased opportunity for women in paleoanthropology—65 percent of PhD graduates affiliated with IHO scientists have been women. We are delighted to announce a new endowment—the **Kaye Reed Scholarship Endowment**—that will advance and inspire young women's participation in human origins science. Reed, IHO Research Associate, Director of the School of Human Evolution and Social Change, and ASU President's Professor, has been a role model for young women in science and anthropology, encouraging students in the field and in the lab. If you are interested in donating to this endowment, contact Julie Russ at [jruss@asu.edu](mailto:jruss@asu.edu).

During the past 30 years, researcher Robert Boyd and colleagues blazed a trail for research that connected culture to human evolution. Boyd recognized the need to bring together the diverse global community of researchers interested in evolutionary approaches to culture in humans and other animals. The result is the **Cultural Evolution Society (CES)**, an integrative interdisciplinary community spanning the social and biological sciences. The second international CES

conference was held at ASU in October and included over 200 researchers from around the world, including Boyd and Sarah Mathew, Charles Perreault, and Tom Morgan, who were the organizers of the conference.

IHO Founding Director Don Johanson continues to teach his online **Human Origins class through ASU's partnership with edX**. Over 21,000 students from 57 different countries have enrolled in the course since its launch in 2016. The course maybe taken for credit or for free! Sign up at [edx.org/course/human-origins-asux-asm246](https://edx.org/course/human-origins-asux-asm246).

**IHO scientists speak all over the globe.** Don Johanson will speak in Stockholm at the Planet Earth Symposium and at a conference on human origins in Venice in May 2019. Curtis Marean will speak at the Aquarium of the Pacific in Long Beach, California, on January 16, 2019. He will talk about ancient humans' reliance on seafood and how human evolution may have been impacted by struggles over this resource (see [aquariumofpacific.org](https://aquariumofpacific.org) for details). Bill Kimbel has been invited to speak on the latest research on the earliest hominins at a meeting of the Pontifical Academy of Sciences in Rome in April 2019.

## Awards and Recognition

Melissa Wilson Sayres received three awards this year—the Allan Wilson Junior Award for Independent Research from the Society for Molecular Biology and Evolution, the ASU Zebulon Pearce Distinguished Teaching Award, and one of three inaugural Mary Lyon Awards for early-stage independent female researchers. **Congratulations Professor Wilson Sayres!**

## During the past year, three IHO-affiliated students received their PhDs

**Emily Hallett-Desguez**, advised by Curtis Marean. Dissertation: Zooarchaeological and taphonomic analyses of Pleistocene vertebrate fauna from the Middle and Later stone age occupations at Contrebandiers Cave, Atlantic Coast, Morocco.

**Ignacio Aguilar Lazagabaster**, advised by Kaye Reed. Dissertation: Evolution and paleoecology of Pliocene Suidae (Artiodactyla, Mammalia) in the Lower Awash Valley (Afar, Ethiopia): Implications for hominin evolution and paleoenvironments.

**John J. Rowan**, advised by Kaye Reed. Dissertation: Abiotic and biotic drivers of turnover and community assembly in African mammals.

## Learn more about IHO and get involved!

Stay in touch for breaking science, news, and events by following IHO on Instagram, Facebook, YouTube, and Twitter.

Lucy and ASU Institute of Human Origins

@humanoriginsASU

youtube.com/user/LucyASUIHO

@human\_origins\_asu

And don't forget about visiting IHO's website for school-aged students—Ask An Anthropologist—and connect with the Facebook page for "Dr. Anthropology!"

[askananthropologist.asu.edu](https://askananthropologist.asu.edu)

facebook.com/dranthropology

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Don't miss any announcements, discoveries, or IHO outreach events in our latest e-newsletter. To make sure that you keep abreast of IHO research as it occurs, please update your email contact information online. [iho.asu.edu/subscribe](https://iho.asu.edu/subscribe)

**Institute of Human Origins**  
Arizona State University

A research center of the College of Liberal Arts and Sciences



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# Institute of Human Origins

## 2018 Highlights

### Dear Friend of the Institute of Human Origins,

Although IHO's research enlarges our understanding of human origins through the deep past, recently we've been thinking about the future.

On the home front, **IHO will be moving into Arizona State University's newest science and technology building (ISTB7)**, our first new home since we joined ASU in 1997! Fifteen of our scientists and all of our graduate students and postdocs will share state-of-the-art research space in this new gateway building to the campus, which will also house the Julie Ann Wrigley Global Institute of Sustainability (GIOS). Construction of ISTB7 will begin in 2019, with move-in anticipated by summer 2021. We've been busy meeting with architects and space planners, and we'll keep you posted as the plans unfold!

Our future shared residency with GIOS reminds us that our evolutionary trajectory is still being etched in history. IHO field research in Africa reveals that our delicate relationship with the environment has a deep and complex history, one with profound impacts on human societies today—how we interact with nature and with one another. It is one thing to know that all humans alive today share a common African genetic heritage; it is another to make that knowledge relevant to a global constituency. We've been thinking a lot about these issues lately, and in the year ahead we'll be working to increase awareness of **how our past connects to our future**.

**We are grateful to all of you who have helped support IHO's programs during the past year, through gifts to our operating fund, direct support of our research, investment in our long-term success through endowment gifts and bequests, or participation in one of our international tour programs.** It is the broad support from many sources that enables IHO scientists to produce the exciting research and discovery—whether in the field or in the lab—that drives our field forward.

We appreciate ASU's long-term support of our faculty and, now, IHO's move into ISTB7. But **our research, student training, and outreach programs rely more than ever on the generosity of donors** whose passion for the study of human origins creates the strong "public-private partnership" we enjoy with the university.

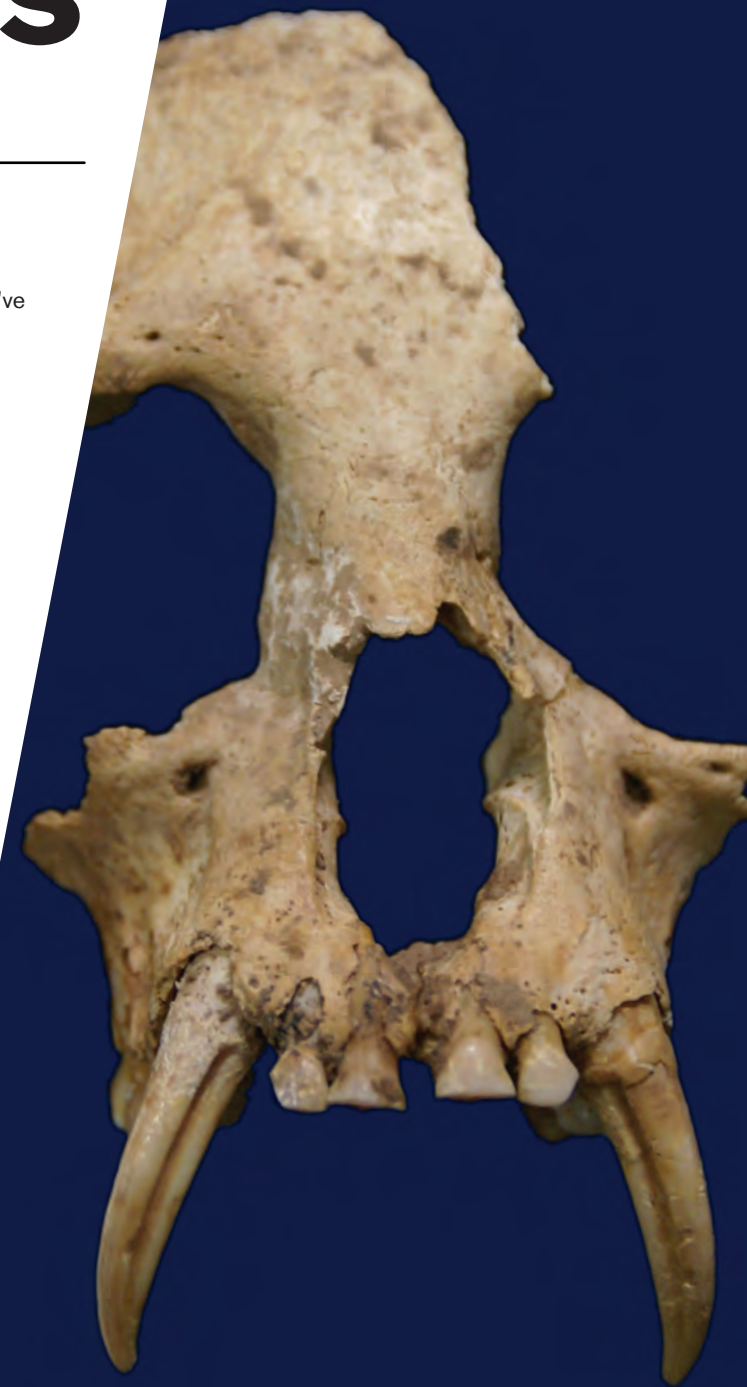
**Please consider the opportunities that your end-of-the-year gift will provide for future research and discovery and then join the quest for our origins by supporting IHO with your generous charitable gift.** Enclosed you'll find the Gift/Pledge Form for your convenience. Or, you can go to IHO's website at [iho.asu.edu/support/supportIHO](https://iho.asu.edu/support/supportIHO) to give securely online.

I thank you in advance for your support and look forward to hearing from you.

Best wishes for the New Year,

William H. Kimbel, PhD

Director  
Virginia M. Ullman Professor of Natural History and the Environment



## Changing the paradigm of human origins research

Since its founding by Don Johanson in 1981, the Institute of Human Origins has been a leader in research and discovery about the deep-time origins and evolution of our species.

In recent years, we've built on IHO's core strength in ancient fossils and artifacts to include research on diverse subjects that promise to provide a holistic account of how we became human—including the social behavior of our nonhuman primate cousins, the large-scale cooperative behavior of modern humans, and ancient DNA and genetics.

Through research at far-flung field sites and in cutting-edge laboratories, our teams are creating new knowledge about our place in the world and how we came to occupy it—collaborative research that promises to reveal how our species transcended its position as a prominent species on millions-of-years-old African landscapes to become the preeminent species on the planet today.

**An international team of researchers, including IHO postdoctoral researcher Alejandra Ortiz, discovered a new extinct genus and species of gibbon.**

Image courtesy of Alejandra Ortiz



# In the Field and Lab

A drilling core from the Hominin Sites and Paleolakes Drilling Project. Credit: Chris Campisano

## Early fossil and archaeological records

The **Ledi-Geraru research team**, co-led by Kaye Reed and Chris Campisano, returned to the field to follow up on their 2013 discovery of the earliest fossil of the genus *Homo*—a 2.8 million-year-old partial jaw with teeth. In 2018, the team discovered five new teeth from another jaw, which have not yet been identified to species, and early Oldowan stone tools that are associated with a large elephant skeleton, which they will be excavating in a few months when they return to the field.

In collaboration with the National Museum of Ethiopia and the Max Planck Institute of Evolutionary Anthropology, Bill Kimbel and colleagues have completed **CT-scanning of the Hadar *Australopithecus* and early *Homo* fossil collection**. This work allows access to unseen internal structures of skulls and limb bones, otherwise hidden from view. Kimbel is part of a National Science Foundation (NSF)-funded project that is using the CT data in research on the evolution of jaw structure in early *Australopithecus*.

How do scientists determine when hominins began incorporating significant amounts of meat and fat into their diets? In the past, researchers have relied on evidence of stone tools to pinpoint when and where this practice may have begun. Marks on bones, however, can come from animal teeth, trampling, or tool use, and determining the source of a mark on a bone has been a contentious issue in anthropology. IHO graduate student Jacob Harris, working under the direction of Curtis Marean, has created a new statistical model to assign probable cause to these **surface modifications on fossil bones** based on digital scans of marks on modern bones for comparison.

Bill Kimbel is a cofounder and, with Kaye Reed, an organizing committee member of the **African Rift Valley Research Consortium (ARVRC)**, an international group of more than 30 researchers conducting collaborative research on regionwide questions about human origins and environments spanning millions of years on the continent of our species' birth. Chris Campisano has secured an NSF grant for a geological workshop at Afar-region fossil sites in Ethiopia. The workshop will take 15 scientists, including Campisano and Kimbel, into the field in January 2019.

Data from the **Hominin Sites and Paleolakes Drilling Project** is an international collaboration documenting how changing environments affected ancient hominin populations of east Africa across more than four million years of geological time. A recent paper coauthored by Chris Campisano, one of the research leaders of the \$10 million project, documents how increased climatic variation, coupled with a long-term drying trend in southern Kenya over the last 500,000 years, provided context for the first appearances of the Middle Stone Age and the emergence of *Homo sapiens*.

## Emergence of modern humans in Africa

Curtis Marean has been working at archaeological sites near Mossel Bay, South Africa, for over 18 years. This research has focused on the origins of modern human behavior and the importance of coastal adaptations. Marean is building a project called **HOMER—for Human Origins, Migration, and Evolution Research**—that networks projects from South Africa through Eurasia. The researchers have committed to working in a cooperative manner on a well-defined set

of research goals to solve questions on the origins of cooperation, using the same field and lab techniques.

When **supervolcano Mount Toba** in Indonesia erupted nearly 74,000 years ago, it spewed out ash that was carried to the tip of South Africa. Through geological data analysis published in *Nature* of the glass shards contained in the ash, this discovery ushers in an entirely new and powerful way to date and correlate sites to within two weeks during the ash fall—rather than dating estimates that are plus or minus thousands of years. Marean and colleagues believe this eruption caused a long, severe volcanic winter, but one which early modern humans on the coast of South Africa, thrived despite dire environmental conditions.

On the eastern coast of South Africa, IHO researcher Erich Fisher's NSF-funded **P5 Project** is researching the human behavioral response to ecological variation. Fisher's team is excavating several rock shelters in **Pondoland** where the narrow continental shelf maintained the location of the coastline across glacial and interglacial periods. At one site, they have found evidence of coastal occupation from 50,000 years ago to 8,000 years ago, spanning the enigmatic Last Glacial Maximum, when sea levels were so low that most contemporary coastal South Africa sites were nearly 100 km inland. What Pondoland provides is the unique opportunity to study how early hunter-gatherers used coastal resources during both interglacial and glacial times.

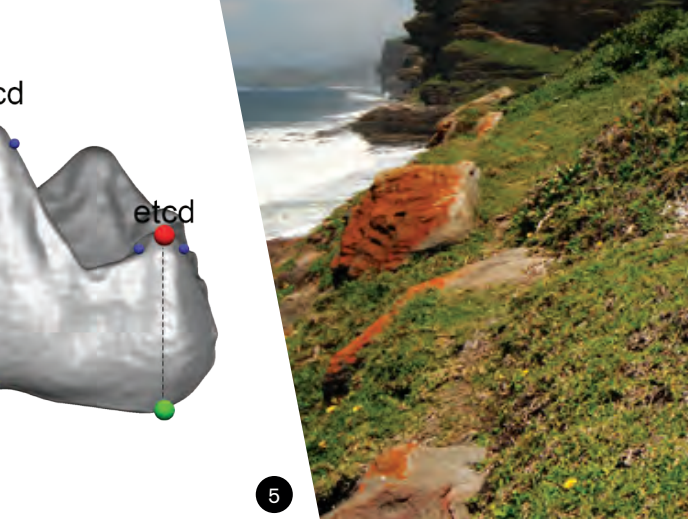
## Life history and adaptation

A study by an international team of researchers, including Gary Schwartz and postdoctoral researcher Alejandra Ortiz, found that the vast diversity in molar tooth design over the past 15 million years of ape and human evolution is predicted by very subtle tweaks in a simple **embryonic model, called the "patterning cascade."** Using state-of-the-art microcomputed

tomography and digital imaging technology in the IHO labs, the researchers created virtual landscapes to chart the location of embryonic cells that determine the final shape of molars. Their results provide some of the strongest evidence that the tremendous diversity in molar tooth anatomy at the core of many evolutionary scenarios of human origins can be explained by simple tinkering with the underlying genetic program controlling tooth formation.

Schwartz, along with IHO research affiliate Jay Kelley, continue their investigations into the fundamental linkages among **dental development** and the life history, ecology, and growth across a wide range of **wild ape populations**, including the famous Virunga mountain gorillas. In collaboration with IHO-affiliated ASU PhD graduate Laura Stroik, Schwartz published research explaining the **origins of higher primates** (40 million years ago) within a new framework reconstructing the competitive feeding environment at the Paleocene-Eocene transition, a key turning point in early primate evolution.

High-resolution, 3D imaging is now possible in the **Visualization Lab**, originally funded by a grant from the John Templeton Foundation and directed by Gary Schwartz. IHO's range of digital imaging equipment includes a Bruker Skyscan desktop microcomputed tomography imaging workstation, a Keyence 3D laser scanning workstation, and a Medit 3D dental surface scanner. The establishment of this lab has fostered collaborations with ASU faculty in other units and created a network of research collaborations across the Phoenix metropolitan area. The lab has become a hub of mentoring and training for ASU students, with eight undergraduate research apprentices each semester, as well as a host of graduate students working on their research projects.



## Genetic inquiry

Building on Sarah Mathew's research among the **Turkana people in Kenya**, geneticists Melissa Wilson Sayres and Anne Stone are asking whether **genetic relatedness faithfully mirrors cultural relatedness**. Education on how genes are passed down using graphics and a beading exercise helped participants understand their own community histories. Four-hundred gene snapshots were gathered from four geographically related tribes, which includes the Turkana, using gene sampling "spit kits." The larger idea in examining these groups is that, just as in the rest of the globe, there is a wide variation in genetic adaptations to environments in Africa, where these variations have not been studied.

Anne Stone is leading research examining **chimpanzee genetic diversity** at Gombe National Park. Through ancient and modern DNA methods, Stone and her team are investigating the reliability of non-invasively collected DNA samples as well as addressing questions of long-term genetic variation within Gombe through mitochondrial DNA analysis. Dental calculus is also being used to understand the core oral microbiome in wild non-human primates and how the presence of certain bacteria may impact chimpanzee health.

## Cooperation and cognition

Kim Hill's expertise of a lifetime of living with and understanding the lives of human hunter-gatherer groups has revolutionized our **understanding of the exchange of goods and services among community members**, a hallmark of our uniquely large-scale cooperation. Hill and his team conducted field work among the female heads-of-households of the Samal people in Mindanao, Philippines, asking them to detail all goods and services that went in

and out of a household during a 24-hour period. The team was astounded at the high degree of sharing between households and noted that no other animal species cooperates to this extent—which can explain how we evolved our extensive networks of non-kin cooperation.

Collaborating with former IHO postdoctoral researcher Maxime Derex, Rob Boyd is conducting research to understand **how and why people faithfully copy "experts" in making decisions** about tool manufacture and other processes even when they are unsure of why they do so. Their results explain an apparent enigma: the accumulation of cultural innovations makes our species better at adapting to variable environments than other species, but at the same time allows the spread of many apparently maladaptive behaviors. The idea behind this research was extended by IHO-affiliated graduate student Jacob Harris to hunting-bow making by the Hazda people in Tanzania.

Sarah Mathew investigates why **humans, unlike other animals, cooperate in groups** comprising large numbers of unrelated individuals and how the evolution of this unique form of cooperation is tied to the origins of moral sentiments, cultural norms, and warfare. Her field project is in Kenya among the Turkana people, who are a politically uncentralized pastoral society. Mathew is currently working with IHO-affiliated graduate student Lea Gleason to investigate why Turkana warriors earn reputations as a "good" warrior—does it have to do with cooperative traits, strength, weapon mastery, or are other ideas at play?

Using Dallinger, an innovative online platform to connect thousands of people for participation in scientific research, Tom Morgan has been taking the **experimental study of human cultures online**. Morgan's DARPA (Defense Advanced Research Project Agency)-funded project has anywhere from 1,500 to 2,500 people logging in as test subjects, who can then interact with each other and naturally form online "cultures." Using this approach, Morgan has designed a series of experiments to examine the

processes humans have evolved to use cultural knowledge to accommodate environmental change.

Joan Silk is leading a project about the **development of prosocial behavior in children**. The project has deployed researchers to six different cultures around the world to study how sensitivity to social norms form during child development. We know that people in different cultures vary in the extent of cooperation and sharing, and Silk and her colleagues are studying how and when social norms shape cooperation in different cultures. It turns out that children become sensitive to social norms in middle childhood across cultures. As they get older, however, they internalize these social norms and their behavior begins to mirror adult behaviors consistent with their culture. The process seems to unfold the same across cultures, but of course, the cultural behaviors are different.

## Non-human primates

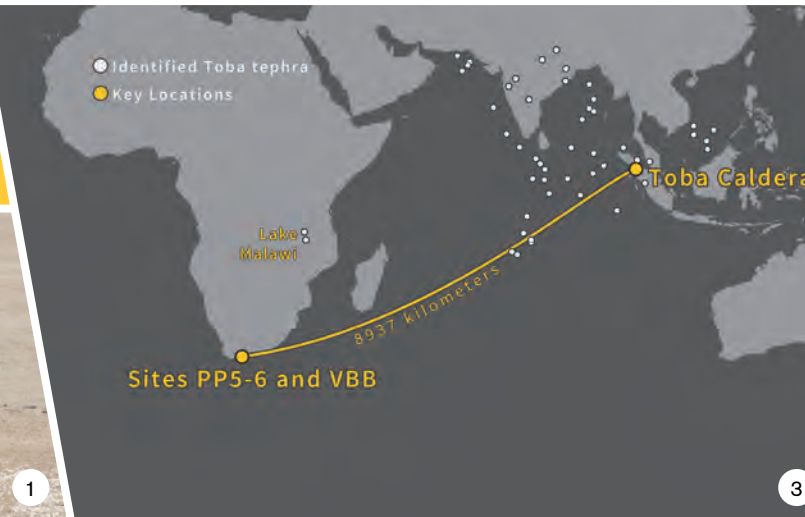
Joan Silk's long-term research of **baboon behavior is studying the evolution of long-term breeding bonds**, which has implications for the evolution of human social behavior. In most mammals, long-term male-female bonds and male care of offspring are limited to species that form pair bonds and live in small family groups. This is puzzling because the last common ancestor of humans and other apes probably lived in multi-male groups, and it is not clear how pair-bonding and male paternal care evolved from this system. Baboons may provide some insight about this. During pregnancy and after they give birth, females associate with particular males. Silk and her students' work show that these males are often the fathers of their infants. Now, she is investigating how baboons "know" who the

An international team of researchers, including postdoctoral researcher Alejandra Ortiz, discovered a **new extinct genus and species of gibbon** in an unusual place—a tomb. *Junzi imperialis*, a small-bodied ape that lived in China as recently as 2,200 years ago, was discovered in what was the ancient capital of Chang'an (now Xi'an) in the high-status tomb of Lady Xia, which contained 12 pits with animal remains and other grave goods. While today all species of living apes are threatened with extinction due to human activity and habitat loss, it has generally been believed that prior to the industrial age ape diversity had not been depleted by human pressures. The well-preserved partial skull of Lady Xia's gibbon challenges this view, representing the first documented postglacial extinction of an ape and of any continental primate caused by human impacts and pressures on the environment.

Ian Gilby was a lead researcher in the creation of a **state-of-the-art NSF-funded laboratory at the Gombe Stream Research Center** in 2018. Gilby is codirector of the Gombe Chimpanzee Database, a repository of over 50 years of detailed demographic and behavioral data on chimpanzees. Although the center's core research has focused on chimpanzee and baboon behavioral ecology and life history, the new facility will allow Gilby to collaborate with other researchers, from disease ecologists, geneticists, endocrinologists, and conservation biologists, who have a growing interest in conducting broad, interdisciplinary research at Gombe. The center was started by Jane Goodall in 1965.

1. Researchers Amy Rector and Kaye Reed flagging specimens in Ledi Geraru, Ethiopia. Credit: David Feary

2. Glass shards from Mt. Toba were carried nearly 9,000km from their source in Indonesia. Credit: Erich Fisher



4. A map of the areas covered by the international ARVRC Project.

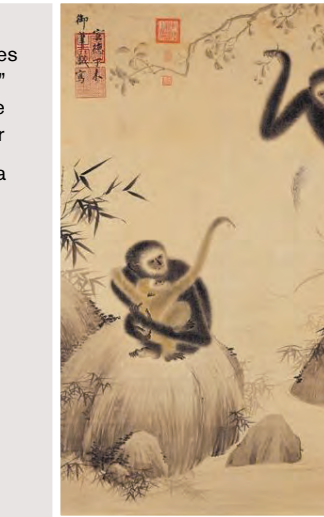
5. Gary Schwartz and Alejandra Ortiz used the location of embryonic cells to determine the final shape of adult molars. Credit: Gary Schwartz

6. Pondoland, South Africa, is a rich field site for Fisher, with evidence of coastal occupation during the last glacial age. Credit: Erich Fisher

7. Melissa Wilson Sayres demonstrates the "spit kit" used to collect DNA in the field. Credit: James Baxter

8. Teaching the Turkana people about genetics using visual aids. Credit: Melissa Wilson Sayres

9. One of the educational examples Wilson Sayres distributes to show how genes are passed down. Shown in use in image 8. Credit: Melissa Wilson Sayres



The high-altitude mountains of Tibet were one of the last places for human habitation on Earth, up to 30,000 years ago. These hearty humans would have had to adapt to a low-oxygen environment to survive. The underlying genes for high-altitude adaptation from current day Tibetans comes from the mysterious extinct Denisovan population of Asia. Charles Perreault was invited by Lanzhou University to revisit sites that he has been working in for 10 years and collect sediment samples, hoping to find **ancient DNA from the original colonization of the Tibetan Plateau**.

10. Lady Xia's gibbons, now extinct, featured in this historic Chinese painting.

11. A young Tibetan monk. Credit: Charles Perrault

12. The Tibetan plateau. Credit: Charles Perrault

