DISCOVER

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IN THIS ISSUE

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Burke MUSEUM
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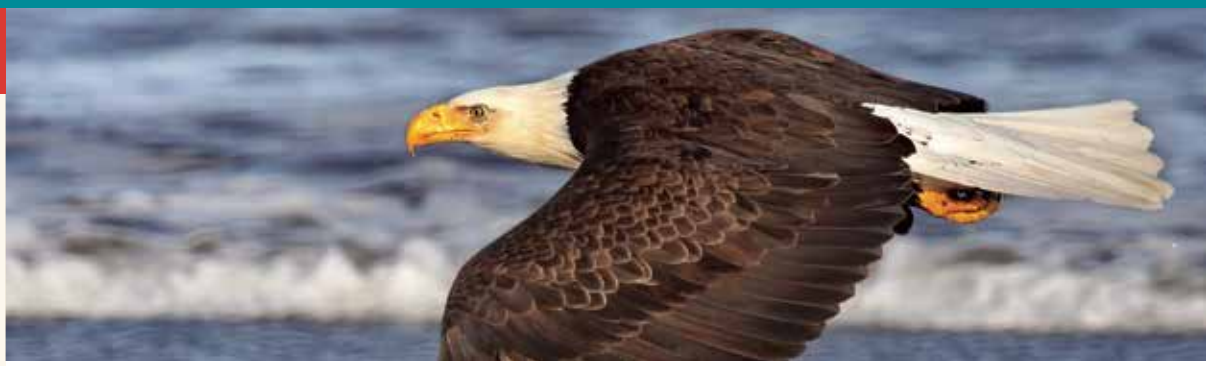
GENETIC RESOURCES



Tracking the Health of Washington's Coastal Raptors

Coastal Raptors is a nonprofit research, education and conservation organization that monitors birds of prey on Washington state's coastal beaches. For over 20 years, Coastal Raptors has been monitoring raptors, including Peregrine Falcons, Merlins, Turkey Vultures and Bald Eagles. Led by Executive Director Dan Varland, more than 250 raptors of eight species have been captured and banded; the list includes 201 Peregrine Falcons and 29 Bald Eagles. Banding provides important information on life span, causes of death and the birds' movement patterns.

After banding and before release to the wild, Coastal Raptors takes blood and feather samples, which are used to assess exposure to contaminants and disease. Many of the Peregrine Falcons are re-captured and re-sampled one or more years after initial capture, providing a valuable means to assess their exposure levels over time. Coastal Raptors sends samples for testing to labs all over the U.S. In addition to this ongoing effort, Varland recognized that small amounts of additional blood could be set aside for genetics research, and contacted Sharon Birks, Burke Museum genetic resources collection manager. Birks was happy to provide advice on how to prepare blood samples and associated data from field work, which resulted in a donation of 150 tissue samples to the Burke's genetic resources collection earlier this year.

The new tissue samples in the Burke collection are still accessible to Coastal Raptors' scientists, and now researchers from around the world. Having samples in the Burke collection can help researchers answer questions about birds that are still living in the wild, as well as aid in research about conserving Washington raptors.

The Burke is grateful to Coastal Raptors for the work they do and for this partnership. The museum is working with Coastal Raptors to continue having the Burke's genetic resources collection as a repository for new samples—which will include samples from 10–15 new Peregrine Falcons each year well into the future.

Top photo: Bald Eagle at the surf line north of Ocean Shores, WA. *Top inset photo:* Coastal Raptors Executive Director Dan Varland draws a blood sample from a Peregrine Falcon with the help of Sandra Miller. *Bottom inset photo:* Peregrine Falcon blood sample intended for the Burke's genetic resources collection. Photos: Tom Rowley.

THE GENETIC RESOURCES collection acquired five new, subzero freezers this year. The Stirling freezers use a new cooling technology that cuts power use by nearly 75% and improves the collection's space efficiency by 50%. The freezers provide a significantly more sustainable way to care for the tissue samples, which need to be preserved at -80° Celsius, and allow more room for the collection to grow. Funding for the freezers was obtained from the UW Student Technology Fee and the College of Arts & Sciences, thanks to the help of students who use the tissues for their research.

The poor condition of the Burke's current facility still threatens this invaluable resource. Without air conditioning, the hard-working freezers could over-heat, and lack of emergency power puts the collection at risk during outages or natural disasters. The New Burke will have back-up power and climate control, providing the ideal setting for these new freezers to preserve the collection's nearly 75,000 specimens for generations to come.

A Future for Washington's Forest Spiders

Clear-cutting forests maximizes the use of lumber, but is detrimental to local wildlife and plants. In order to create more sustainable timber harvesting practices, the University of Washington partnered with the logging industry in the 1980s to create a new logging method called "aggregated retention," in which patches of trees remain unlogged within larger harvested timber areas. These aggregated retention areas were first tested in Washington state before being implemented at logging sites across the world. But how successful was this aggregated retention logging at sustaining local plant and animal life?

To answer this question and measure the long-term impacts and recovery of organisms in aggregated retention timberlands, Rod Crawford, curatorial associate of arachnology, participated with a team of UW and international scientists (led by Sue Baker of Tasmania) to examine the life present in these patches of unlogged land and the logged lands adjacent to them. The team sampled plants, beetles, spiders and harvestmen (another arachnid) in the world's three oldest aggregated-retention sites (21–26 years old) from Washington state and compared them with three recently harvested sites (5–8 years old). Baker, Crawford and colleagues compared the species that were living in the undisturbed patches of forest in aggregated retention lands to the portions of the logged areas that were starting to re-grow, as well as unlogged forests that bordered the sites.

Spiders are a useful group to study in this context, because many spider species are restricted to closed-canopy forest habitats, while others occur mainly in habitats open to sunlight. When we know which species favor forests and clearings, it's easier to see how recovery is working based on which spiders are present.

Results indicate aggregated retention has short- and long-term benefits for the plants and animals they studied. Unlogged patches act as a habitat for forest spiders, harvestmen and beetles, along with plants that then become the early populators of recently logged areas. The team advocates for patches of unharvested trees being placed closer together to maximize their "forest influence" on adjacent logged land. This work is helping the timber industry better understand how to provide the best outcome for plants and animals to repopulate an area that has been logged.

Top photo: This wolf spider, *Pardosa dorsuncata,* is a species that lives in clearcut lands. Photo: Laurel Ramseyer. *Inset photo:* Aerial view of aggregated retention logged lands, which leaves patches of undisturbed trees. Photo: Thurston County. *Side photo:* Wikimedia Commons, user "Backslash."

CONTINUING HER STUDY OF spiders that reside in pinecones, Laurel Ramseyer, research associate, searched over 100 pinecones from a tree at a printing plant in Mukilteo, WA, in the fall of 2015. Ramseyer found 34 spiders and seven harvestmen (a group of arachnids that includes daddy longlegs). Included in the sample were six small gray-brown jumping spiders she didn't recognize.

Crawford identified the jumping spiders as *Pseudeuophrys lanigera*, a species that's common in southern Europe, but had never been documented in the Western Hemisphere.

Ramseyer and Crawford have since confirmed the presence of *Pseudeuophrys lanigera* at the Museum of History and Industry, the UW and in Bremerton. These spiders are harmless to humans, and since the species prefers human-made habitats, it's unlikely to become an invasive species. So, welcome to Washington, *Pseudeuophrys lanigera*!

HERPETOLOGY

Hope for Mexico's Frogs

Frogs across the world are threatened by many issues, including climate change, habitat loss and infectious diseases. Mexico is no exception to this global rule. Although Mexico ranks as the fifth-highest country in amphibian diversity, it is second among countries with the highest number of endangered species. Mexico also has the highest number of Alliance for Zero Extinction Sites, which are designated based on areas with a large number of species that will likely go extinct without immediate conservation efforts.

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Itzue W. Caviedes-Solis, a UW biology graduate student working in Burke Curator of Herpetology and Genetic Rources and UW biology professor Adam Leaché's lab, recently published a paper in the journal *Mesoamerican Herpetology* about her fieldwork results from the Mexican highlands. Caviedes-Solis found 26 species of hylid frogs (tree frogs), 23 of which are only found in Mexico. Of particular importance was her rediscovery of five frog species that were considered to be possibly extinct in the wild, and hadn't been seen for at least ten years. In addition, she discovered five new populations of other frog species, including one endemic species, expanding what conservationists know about these frogs' distribution ranges.

Caviedes-Solis' study is unique compared to previous research because she collected frogs from the same locations multiple times, when other studies have only looked at an area once or twice. This approach allowed Caviedes-Solis to find species that were not seen in previous short expeditions by other researchers.

Even though some of these species of tree frogs are resilient in the face of multiple threats, the results from Caviedes-Solis' study can aid conservation agencies and the Mexican government in creating more accurate and comprehensive conservation plans for these animals so they can continue to live and thrive.

Top photo: S. hazelae is one of 26 species of tree frogs Caviedes-Solis found in Mexico. Photo: L.F. Vazquez-Vega. *Inset photo:* Caviedes-Solis studied frogs in the Mexican Highlands, including the State of Chiapas.

JARED GRUMMER, UW biology gradutate student, is studying coastal tailed frogs (*Ascaphus truei*) to investigate whether the Ross, Diablo and Gorge dams on the Skagit River are isolating frog populations. Grummer is comparing DNA of frogs on either side of each dam, which provide Seattle with almost 18% of its hydroelectric-based power. When dams cause stagnant lakes to form, these frogs may have a harder time reaching opposite sides of the lakes and maintaining necessary genetic variation.

Most results show that the dams aren't impeding these frogs. However, depending on the method of DNA analysis used, results differ. A few results show that some groups are becoming isolated from each other, which leads to a smaller gene pool. Frogs can become weak from inbreeding and therefore more vulnerable to extinction from things like disease and climate change.

Grummer's research is featured in the Burke's *Wild Nearby* exhibit, on view through February 5, 2017.

Pass the Pepper, Please: The Coevolution of Pepper Plants and Bats

Short-tailed fruit bats and New World pepper plants have an important relationship with each other. The bats eat the fruits of pepper plants, helping disperse the plant's seeds. Plants in general have evolved an outstanding diversity of fruit characteristics to signal ripeness to fruit-eaters, including attractive scents and colors. In turn, frugivores have evolved specialized sensory abilities that allow them to locate ripe fruits, such as keen olfaction and color vision. Although fruit-eating bats are abundant in the tropics, it is still poorly understood whether and how they have shaped the evolution of fruit traits, and how bat sensory abilities have evolved to detect fruit signals.

Sharlene Santana, curator of mammals and UW biology professor, is working in Costa Rica to study this coevolution. Her team is collecting chemical (scent) samples from pepper plants, as well as bat guano and tissue samples for dietary and genetic analyses. Santana is studying three species of bats along with over 50 pepper plant species. To analyze the sensory abilities of the bats, she is conducting behavioral experiments in the field, and also analyzing their diet and olfactory genes. To determine what chemical compounds pepper plants emit as signals of fruit ripeness, her team is using "scent traps" to capture the aroma of each plant species in the field, which are then analyzed in the lab at UW.

Santana's team has found some similarities in the chemical composition of fruit scents across pepper species that are eaten by short-tailed fruit bats, yet fruits of each pepper species also have their own distinct scent. In addition, the fruits emit their own unique scents when compared to the general scent of the rest of the plant. The researchers believe the bats most likely cue in to a general pepper scent, and then choose ripe fruits and particular species of pepper plants based on signals of the most abundant and distinct chemicals that comprise the fruit scents.

Understanding the relationship between bats and pepper plants not only contributes to knowledge about coevolution of these species, but also has benefits for habitat conservation. These little bats are key dispersers of seeds that can help restore plant life in logged areas.

Top photo: Carollia castanea is one of the species of short-tailed fruit bats Santana studies.
Inset photo: Santana is analyzing the scent signatures of pepper plants like *Piper sancti-felicis* to determine how pepper plants and short-tailed fruit bats have co-evolved.
Side photo (Bottom): Robert Shea.

KRISTIN CAMPBELL, UW undergraduate student, is examining the differences in skull shape, size and bite force across sea otter populations using specimens from the Burke's collection. Sea otters are a keystone species known to eat a wide variety of hard foods, and Campbell is interested in investigating if differences in skull shape and bite force allow them to diversify what they eat. Campbell found that there are differences in skull shape among three populations of sea otters and also between males and females, but that all have relatively high bite forces for their size. High bite forces may allow these mammals to function as generalists, eating a variety of hard-bodied invertebrates and switching prey in times of decreased abundance or in times of increased competition with other animals.

BOTANY

FOR AN UPCOMING VOLUME in the *Flora of North America* series (www.fna.org), Peter Zika, research associate, is co-authoring the *Linnaea* (twinflower) treatment. To support this work, the Burke herbarium recently borrowed *Linnaea* specimens dating back to the 1830s from several herbaria in the U.S. and Europe, including the Smithsonian and the British Museum. Type specimens are the tangible evidence by which taxonomists connect scientific names to species. It wasn't until the early 20th century that naming rules required type specimens be specified for new species. From among the specimens, Zika will designate a type specimen for each of the several scientific names included in *Linnaea,* and in the process bring stability to the usage of these names for plants in this genus.

The Burke herbarium holds nearly 1,500 type specimens from throughout western North America that are consulted by taxonomic researchers on a regular basis.

Origins of the Butterfly-Bush

Many groups of plants can be found widely around the globe, such as maples, which occur in temperate zones of the Northern Hemisphere in North America, Asia and Europe, and lupines, which can be found throughout the American Cordillera from Alaska and the Pacific Northwest to the Andes. How did these plants come to occupy such large areas? And what effect did their spread across continents have on their diversification and evolution?

John Chau, a UW biology graduate student in the lab of Richard Olmstead, herbarium curator and UW biology professor, is studying one such plant group with a wide distribution, the genus *Buddleja*. The Butterfly-bush, *Buddleja davidii,* with its large, purple, bee- and butterfly-attracting clusters of flowers in the summer, is a familiar sight in gardens in the Seattle area and as an invasive weed on roadsides and riverbanks. *Buddleja davidii,* originally from central China, is just one of more than a hundred species in the genus, whose ranges extend across eastern Asia, southern Africa, Madagascar, and North and South America.

For his research, Chau collected plants in China, South Africa, Peru, Bolivia, Costa Rica and California to obtain material for genetic analysis and determine the evolutionary history of this group. These collections have been supplemented by sampling from preserved specimens in herbaria, including the Burke's. By comparing variation in DNA sequences, the pattern of relationships among species can be inferred, which can then reveal different aspects of their evolutionary history, including where the plants lived in the past.

Chau found that *Buddleja* originated in southern Africa. From Africa, the group spread in separate events to Madagascar, Asia and the Americas. These movements are believed to have occurred about 10 million years ago, when a warmer climate may have allowed the plants to grow at higher latitudes in regions that connected the continents. Upon reaching the mountainous, complex environments of the Himalayas in Asia and the cordilleras of Central and South America, the group exploded into many new species, producing the diversity observed today. Understanding how plants evolved and moved across the globe can help researchers explain current patterns of biodiversity and predict how future climatic and geologic changes will affect biodiversity in the future.

Top photo: Buddleja nitida, from Central America, is one of more than 100 species in the genus John Chau studies. *Inset photo:* UW graduate student John Chau doing fieldwork for his research on the genus *Buddleja* in Yunnan Province, China.

ICHTHYOLOGY

The Mysterious Early Lives of Puget Sound Fishes

Adult Pacific herring, Pacific sand lance and other fishes are familiar to those who fish in the Puget Sound. But these fishes, along with many other species, spend their early lives as eggs and larvae as part of the plankton community. Little is known about these fishes during these first stages of life. Where do they live, and at what times in their life cycles?

UW School of Aquatic and Fishery Sciences graduate student Alicia Godersky aims to help fill in these gaps with her research. She is studying larval fishes collected in 2011 across Puget Sound and has arranged to have these specimens donated to the Burke Museum's ichthyology collection. Puget Sound is comprised of six basins separated by sills that slow the mixing of water between regions. Godersky is focusing on differences in the presence of fish larvae between these regions and if seasonal differences occur. Fish larvae are sensitive to temperature and other oceanographic conditions, and her data suggest that there are fish larvae in Puget Sound throughout the year, but peak production occurs in spring. Godersky identified over 9,000 fish larvae for this project from 77 species. "There really is an overwhelming amount of information stored in these samples," she said.

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Pacific herring (*Clupea pallasii*) and Pacific sand lance (*Ammodytes personatus*) are two forage fish species with different life history strategies that are ecologically important as a food source within the Sound. Her research suggests that they both have multiple spawning periods that are not in sync with each other and may occur at different times in different basins, even within the same species. Hood Canal Basin is a particularly important area to study, as it often experiences insufficient oxygen in the water column to sustain life. "The question of under what conditions larvae persist within Hood Canal is an interesting one," Godersky explained. She plans to look at oceanographic data, including dissolved oxygen content, to see if there is a correlation between the presence of larvae and oxygen within all the basins—but is particularly interested in the results from Hood Canal. Godersky aims to complete her master's degree by the end of summer and is proud to have spent her time in the Burke's ichthyology collection.

Top photo: A rockfish in its early stages of life. Godersky examined over 9,000 fish larvae to determine where these fishes live in the Puget Sound before they become more recognizable juveniles and adults.

A NEW SPECIES OF ANGLERFISH of the genus *Lasiognathus* was recently discovered by Ted Pietsch, curator emeritus of fishes, while assessing deep-sea fish following the 2010 Gulf Coast oil spill. This species, AKA "Snaggletooth Seadevil," has a unique hook at the end of its lure that protects it from getting eaten or damaged by prey. Named one of the top new species of 2016, the only three known specimens of this species are in the Burke collection.

FOR SEVERAL DECADES, ONLY two species of sand lances were known to exist in the North Pacific region. Jay Orr, curatorial associate of fishes, co-authored a study that showed four species of sand lances live in the North Pacific through analysis of physical characteristics and mitochondrial DNA of Burke specimens. Sand lances are important food sources for many economically important species, such as Chinook salmon and crabs. Better understanding forage species like sand lances helps conservationists aid both sand lances and their predators.

ORNITHOLOGY

ONE OF THE LARGEST FAMILIES of birds is the Tyrant Flycatchers (Family Tyrannidae) of the New World, with over 400 species. One of the most charismatic of all flycatchers is the Great Kiskadee, a colorful and noisy bird of open tropical habitats. Curiously, members of six additional flycatcher genera closely resemble the Great Kiskadee in plumage characters and appearance. It seems likely that a biological process called "mimicry" is involved, but the question of which species is the model, and which are the mimics, remains unanswered. How and why this mimicry provides some advantage is also unknown. UW biology graduate student Dave Slager is researching this phenomenon in a unique way—by presenting mounted specimens along with pre-recorded songs to these birds in their natural habitats—to see how the different species react to one another. The behavioral data that Slager gathers will be examined from a phylogenetic perspective in order to shed some light on these questions.

From Peak to Peak: Hidden Biodiversity in Birds of Western North America's Mountains

Throughout much of western North America, dense pine forests and the animals that inhabit them are restricted to the higher elevations of mountains. These pine forests are isolated by relatively dry and unforested lowland habitats that are geographic barriers for the forest-adapted species, preventing them from moving across the landscape. As a consequence, many animal populations are restricted to isolated mountain-top distributions. In the absence of gene flow, these populations evolve independently, developing physical and genetic characteristics that differ among populations. Over time, new species may occur. This process is well documented in some animals with limited dispersal ability, like small mammals and amphibians, where closely related—but different—species occupy different mountain ranges. But what about birds? Do they simply fly over these otherwise uninhabitable inter-mountain regions, or are they too isolated on different mountain ranges?

John Klicka, curator of birds and UW biology professor, is sampling populations of 15 wide-ranging western montane species from across their distributions in order to answer this question. He's analyzing sequenced DNA to look for evidence of genetic isolation and to measure gene flow among populations that occupy different mountain ranges.

The genetic data indicate that for western montane birds, the isolation of populations on different mountain ranges is relatively common. Many of the species studied were divided into two (or more) independently evolving lineages, some of which have been isolated from one another for more than one million years. The most common pattern recovered in this study is the isolation of montane birds across the desert southwest and the Great Basin, with Rocky Mountain populations differing significantly from those in the Sierra Nevada and Cascade Ranges. The new lineages identified may represent new species, or lineages in the final stages of the speciation process. In either case, they represent important new components of avian biodiversity in western North America. The data also identify regions where long-isolated lineages of several species are now in secondary contact with one another. For example, birds with "Rocky Mountain genes" and birds with "Sierra Nevada-Cascade genes" co-occur in Washington's Okanagan Valley and Blue Mountains regions. These zones of overlap are of great interest, providing a window on the process of speciation, and providing much opportunity for future research.

Top photo: The Steller's Jay is one of many species Klicka is researching across North American mountain ranges. Photo: Shell Game.
Side photo: The Great Kiskadee. Photo: Mike's Birds.

VERTEBRATE PALEONTOLOGY

Dawn of the Dinosaurs in the Petrified Forest

About 220 million years ago during the Late Triassic epoch, Arizona's Petrified Forest National Park was on the western border of the supercontinent Pangea. Although now an arid desert, the landscape was once a lush rainforest home to some of North America's earliest dinosaurs.

Christian Sidor, curator of vertebrate paleontology and UW biology professor, is working with the National Park Service to survey the geology and paleontology of lands recently acquired by Petrified Forest National Park. Sidor's team of graduate students and research associates is conducting an inventory of the fossils present and collecting specimens for research at the Burke Museum.

After two years of studying and collecting, Sidor's team has found much more than the fossilized wood the park is famous for. Specifically, they've found early carnivorous dinosaurs, armored reptiles called aetosaurs, giant salamander-like amphibians, crocodile-mimic phytosaurs, and a new species of shuvosaurid—a bizarre, bipedal, herbivorous creature that is a distant relative of today's crocodiles.

Sidor's excavation of the new shuvosaurid promises to document a new species that will be the first of its kind in any museum collection in the world. To date, the team has collected parts of at least 20 individuals from a small bone concentration, with most of the animal's limbs and backbone represented. With luck, they will find a skull when they continue their excavations this summer.

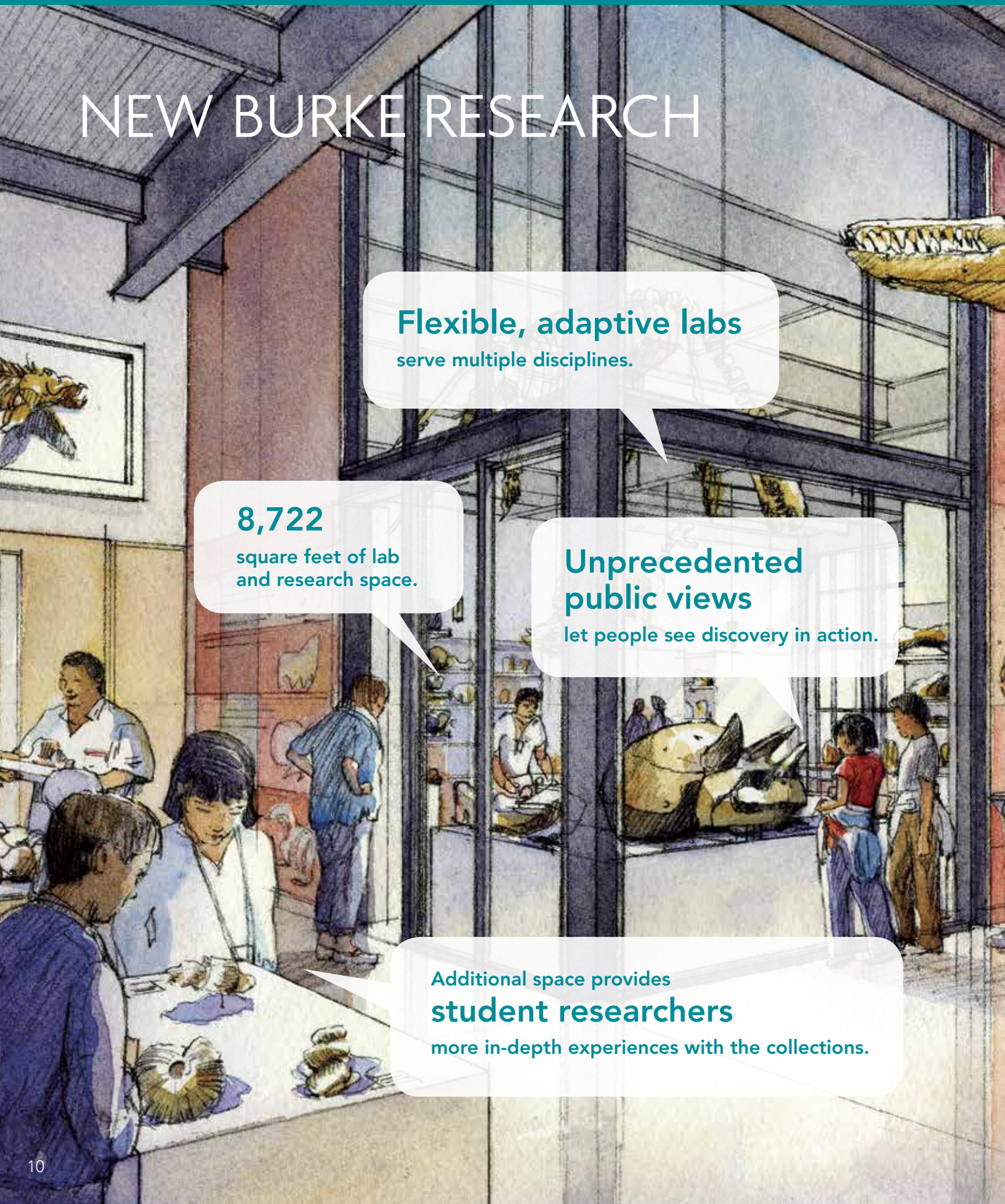
The shuvosaurid is one fossil that is being prepared for display in the New Burke, opening in 2019. Another is *Revueltosaurus,* an herbivorous reptile that was long confused for North America's first plant-eating dinosaur due to having the same type of teeth as plant-eating dinosaurs. But when a full skeleton of *Revueltosaurus* was found, it was clear the animal wasn't a dinosaur at all. This summer, Sidor's team will be collecting large slabs from a bonebed containing *Revueltosaurus* for a special display outside of the New Burke's fossil lab, which will show the visitor what a fossil looks like in the field and how Burke volunteers can make real contributions to research in paleontology.

Top photo: Christian Sidor's team collecting fossils from Arizona's Petrified Forest National Park.
Inset photo: The tibia of a new species of shuvosaurid. This fossil and the rest of the specimen will be the first of its kind in any museum collection in the world.

EIGHT GRADUATE STUDENTS and postdoctorates have been hosted by the Burke's paleontology department over the past two years to study fossil vertebrates from the Pacific Northwest. The researchers analyzed a variety of fossils in the Burke's collection, including fossil rodents from Kennewick, WA, and 15–30 million-year-old baleen whales and sea lions, which are being described as new species. These study grants are made possible by the generous support of Jason and Jennifer Love.

DR. GREG WILSON, ADJUNCT curator of vertebrate paleontology, is studying the fossils from the end of the dinosaur era. The Hell Creek Formation in Montana is one of the best places to study the extinction of dinosaurs 66 million years ago. This past summer, Wilson's team found several dinosaurs, including one of the largest *Triceratops* skulls ever found, a nearly complete backbone of a Cretaceous dinosaur and the jaw of a small crocodile. The specimens are now part of the Burke's collection.

NEW BURKE RESEARCH

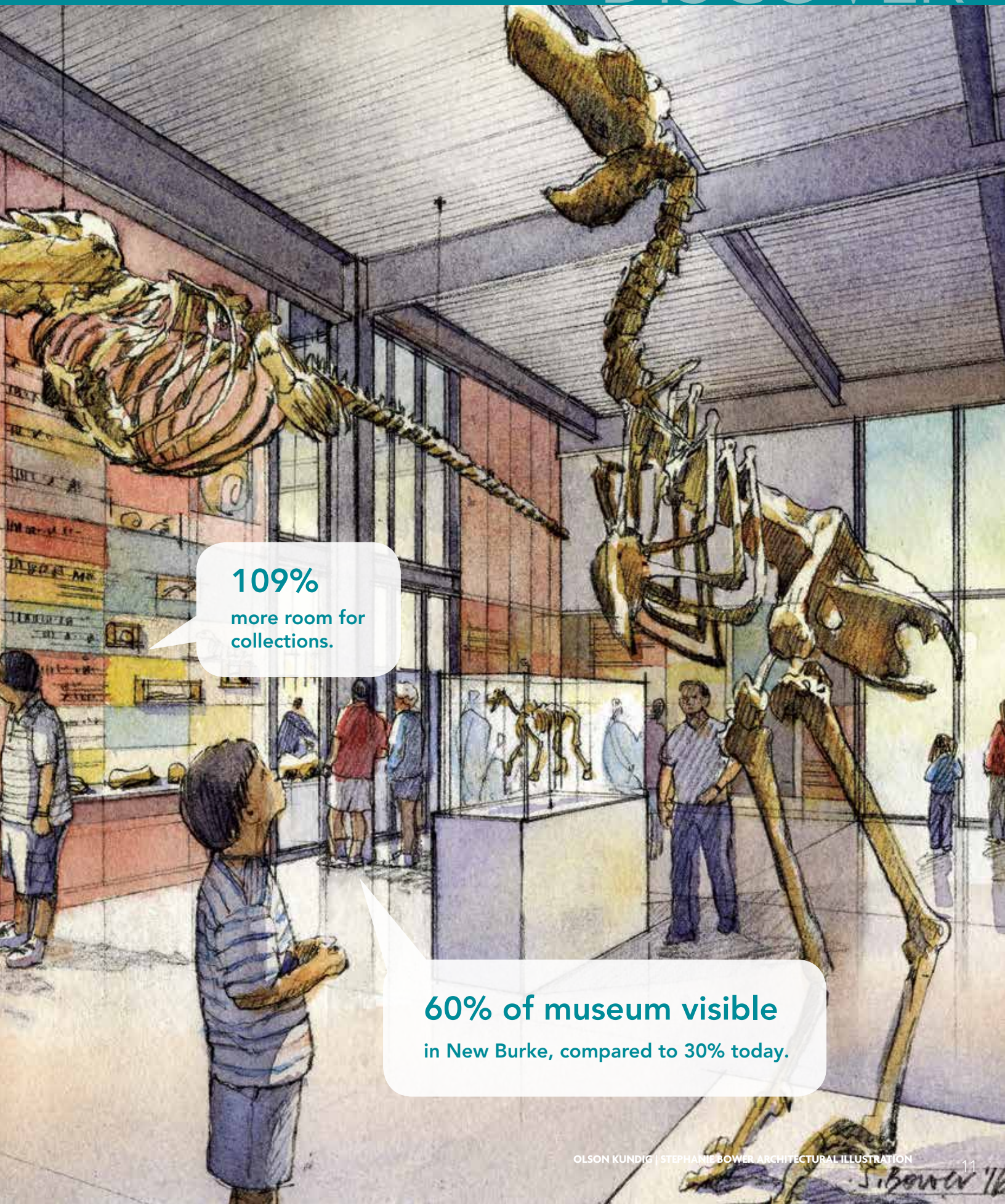


Flexible, adaptive labs
serve multiple disciplines.

8,722
square feet of lab and research space.

Unprecedented public views
let people see discovery in action.

Additional space provides
student researchers
more in-depth experiences with the collections.



OLSON KUNDIG | STEPHANIE BOWER ARCHITECTURAL ILLUSTRATION

ARCHAEOLOGY

UNDER THE TUTELAGE OF STEVEN Weidner, UW affiliate instructor of mechanical engineering, two UW Museology students are scanning archaeology collections to create digital 3-D renderings and print 3-D replicas for research and education purposes. Tasia Williams printed an atlatl (an ancient spear-throwing tool) weight and a walrus skull mug. Blair Martin is hoping to use the 3-D digital data created by visiting researcher Nate Garcia from the University of Southern Denmark to cut a form-fitting cradle for a 20-foot-long wooden canoe from the Green River.

VIOLENT DRUG TRAFFICKING in Guerrero, Mexico, has made parts of the region off-limits to archaeologists today. Guerrero has a rich archaeological history, with parts once under the Aztec Empire's control from AD 1428-1519. Anna Cohen, UW anthropology graduate student, discovered that former curator Dr. Robert Greengo (1923–2012), conducted research there in 1967. Cohen recently cataloged the collection of nearly 9,000 ceramic, lithic, shell, jade and bone artifacts from Greengo's expedition.

How does Rainfall Affect Prehistoric and Current Farming Practices?

Beginning 4,000 years ago, a revolution swept through Island Southeast Asia. People shifted from living solely on wild foods to farming and raising domestic animals. Why did this change in livelihood occur?

Peter Lape, curator of archaeology and UW anthropology professor, is searching for answers in the islands of eastern Indonesia. Very few archaeological sites span the pre- and post-farming periods in this region, making it difficult to understand the factors that might have caused people to change their livelihoods. In fall 2015, Lape co-led a UW-Indonesian team that searched two previously unexplored islands for sites dating to the critical 3,000–4,000 year age. They found nine new sites, including caves, rock shelters and open sites. Using radiocarbon and luminescence dating, the team identified three of these sites with both pre-farming and very early post-farming deposits. Next year, the team will return for extensive excavations.

Long periods of rainfall, without significant drought, may have encouraged farming.

Lape theorizes that long periods of stable rainfall, without significant drought, may have encouraged farming. He is collaborating with Dr. Julian Sachs in the UW oceanography department to reconstruct prehistoric rainfall from the mud of local mangrove swamps. Mangrove leaves adjust their chemistry to local salinity levels. When the leaves drop to the ground, they get buried in layers of mud. Lape's team drilled nearly 100 cores up to 1.5 meters deep, which represented over 3,500 years of mangrove leaf deposits—potentially one of the longest prehistoric rainfall records recovered from Island Southeast Asia. The links between rainfall and farming will also be useful in understanding how farmers respond to future climate changes, particularly as drought becomes more common.

Top photo: Lape found nine new Indonesian archaeological sites, including rock shelters, that span the transition from hunter-gathering to farming.
Inset photo: To determine prehistoric rainfall, Lape's colleagues compare lipids from present-day mangrove leaves to prehistoric lipids buried in layers of mud.
Side photo: 3-D printed replicas of Cat.# 2015-47/1. Gift of Danny Beatty with approval from his brother David Beatty.

Beyond Aesthetics—Honoring Cultural Context in Art History Research

If you took Bill Holm's classes at the University of Washington in the 1970s, you would recognize the "tribal style characteristics" of the above frontlet (the sculptural part of a dancing headdress). You would notice the thin, arched eyebrows, the unpainted eyelid lines, and the distinctive coming together of the planes of the face in a cheek-pyramid. You might conclude that this frontlet was made in Tsimshian territory in Northern B.C., Canada. But does that make it a "Tsimshian frontlet"? Recent research by Kathryn Bunn-Marcuse, former Bill Holm Center associate director and the new curator of Northwest Native art, reveals a much more complicated history forged in the frontlet's travels from the Tsimshian in the 19th century, through the Nuxalk leader Tlakwamot, to the 'Namgis chief, Lagiyus, whose daughter, Ruth, wore it at her wedding to Charles Nowell in 1898 in Alert Bay. Does being part of the regalia, songs, dances and hereditary privileges transferred during this wedding make it a Kwakwaka'wakw frontlet?

Bunn-Marcuse considers not only the visual aspects of historical Native art, but also the intangible properties to which they are connected—such as song, dance and genealogy. This research method reflects a wholistic understanding of Indigenous networks, connecting people and their cultural belongings while challenging traditional methods of categorization based solely on aesthetics.

This frontlet appears in a set of films made in the village of Tsaxis (Fort Rupert) by Franz Boas in 1930, with members of the Hunt, Martin, Wilson and Williams families. These films are in the archives of the Burke Museum and are the central focus of a collaborative research project led by Bunn-Marcuse with colleagues who are descendants of the film's original participants. The film shows the frontlet being danced by Lucy Martin Nelson whose father, Mungo Martin, recognized the dance and its accompanying song, reconnecting the frontlet to his family's intangible property demonstrated through performance. This collaborative work on the Boas film has reconnected kinship ties to specific dances, and reawakened songs that were silent for several generations.

Reframing museum collections in light of their usefulness to Indigenous cultural revitalization and resurgence efforts is a priority for Bunn-Marcuse and the Burke, in order to promote use of the collections by community members, researchers and students, while supporting the urgent needs of communities' access to, and use of, their own heritage.

Top photo: Bunn-Marcuse studied this Tsimshian frontlet and found it had connections to many families across Northern B.C., Canada.

ROBIN WRIGHT, EMERITUS curator of Native American art, retired in winter 2015. Since 1985, Wright greatly contributed to educating the public about Northwest Coast Native art through numerous exhibitions and programs. Wright's research of historical pieces resulted in attributing artists to pieces when they were previously unknown, and connecting those artists to their descendants, who are carrying on the art forms today. To honor Wright's 30 years at the Burke, the museum has raised nearly $30,000 for the Bill Holm Center endowment.

THE BILL HOLM CENTER supported two Coast Salish artist workshops this spring. Weavers and carvers from Suquamish, Skokomish, Tulalip, Puyallup and Grand Ronde came to the Burke to study Coast Salish wool weavings and the wooden tools used to create these pieces. The workshops brought together master and novice artists alike to learn from the objects and from one another in order to carry on their knowledge to the next generation.

A HISTORICAL WOODEN KAYAK frame from St. Michael, Alaska, will be restored by Haakanson and collection outreach coordinator Justin McCarthy. Currently held together by deteriorating cotton string, the kayak needs to be re-twined and stabilized before moving the boat to the New Burke. Haakanson and McCarthy plan to re-assemble the frame with durable materials and invite community members from St. Michael to help in the restoration.

ATLATL THROWING IS A popular activity at the Burke's annual Archaeology Day. Visitors can try their hand at using the ancient spear-throwing tools and learn about how people still use atlatls across the globe. But the atlatls are hard for younger visitors to use. Haakanson, an accomplished carver, has created new, smaller atlatls to use for demonstrations. The atlatls range from child-sized to adult, and show a diversity of types of atlatls people use for different hunting practices (by boat or land, for example), and also from different cultures around the world.

Angyaaq Takes its Maiden Voyage

After several years of work and planning, the traditional open-boat called an Angyaaq took its maiden voyage this spring!

The Angyaaq (plural Angyaat) project, led by Sven Haakanson, curator of North American anthropology and UW anthropology professor, was inspired by model Angyaat from the Burke and other museum collections. These traditional Native boats were made by Southern Alaska's Sugpiat peoples, and were an essential part of their livelihood and culture for thousands of years before they were destroyed by Russian settlers in the 1860s. This destruction had long-term consequences: very little is known about a type of boat once common on Kodiak Island, with no new Angyaat built on the island in over 150 years.

In previous research newsletters, we described how Haakanson was reengineering full-sized Angyaat based on the models, practicing by making model-sized Angyaat and creating blueprints for a full-sized boat.

Much has happened in the past year, culminating in the launch of the full-sized Angyaaq on Boating Opening Day in May. Last summer, Haakanson, with help from Archaeology Curator Peter Lape and UW alumna Rosemary Mathison, carved the pieces of the wooden frame at the Burke before creating a similar frame with community members from the village of Akhiok on Kodiak Island, Alaska. The prototype Angyaaq frame at the Burke was then assembled and covered with fabric during the museum's *Maker:Market* exhibit in December 2015. Visitors spoke with Haakanson about the project, while getting a first-hand look at how museum collections can aid in cultural revitalization.

In the spring of 2016, Haakanson finished carving and painting 12 paddles and waterproofing the fabric cover of the Burke Angyaaq using polyeurethane and epoxy paint. Haakanson, UW students and master boat-builder Alfred Naumoff painted the paddles using traditional designs found on historic Angyaaq paddles.

A dozen people took part in the Angyaaq's maiden voyage on Lake Washington. Moving forward, Haakanson plans to invite the public to participate and ride in the Angyaaq this summer. The knowledge gained from the museum experience will be brought back to the Akhiok community to finish their Angyaaq, helping restore knowledge about this important boat, with many voyages to come.

Top photo: Sven Haakanson assembled the frame of the Angyaaq during the Burke's *Maker:Market* this past winter. *Inset photo:* The maiden voyage of the Angyaaq on May 10, 2016.

The Research Sisters

A group of Pacific Islander women called the "Research Sisters" are conducting research at the Burke Museum. Exemplifying their cultural traditions, the Research Sisters are using Indigenous research methods in Oceania—an approach that values communal learning and sharing of information—to improve the wellbeing of their communities and families through their studies at the UW. From officer positions in the Micronesian Islands Club and Polynesian Student Alliance, to outreach to high school students beyond the Seattle area, these women take the initiative to keep cultural resiliency alive on and off campus. For the past three years, the Research Sisters have created a safe space within the Burke Museum to embrace the collections—and the presence of their ancestors.

The Research Sisters' latest work focuses on current U.S. Government healthcare policies affecting Micronesian migrants from the Freely Associated States (FAS). The students are doing applied research focusing on the exclusion of Micronesians from participating in Medicaid, even though they are legal, taxpaying immigrants in Washington state. Together, Micronesian students and community partners, including the Commission on Asian Pacific American Affairs, aim to attain affordable healthcare for FAS citizens.

To the Research Sisters, the Burke is an area where questions about their cultures lead to inspiration. Through researching and having access to artifacts, these women are able to increase their strength and share their research with others at their annual cultural night and symposiums.

Many of the Research Sisters plan on pursuing graduate school, working professionally within careers focused on healthcare, education, law and museology. Research Sister Randizia Crisostomo, who graduated this spring, plans on entering the socio-cultural anthropology program at the UW.

The youngest of the Research Sisters is Natalie Bruecher, a Native Hawaiian who discovered the Burke through reading articles about other Pacific Islanders doing research at the museum. "I have finally found a place where I can serve my community, thrive in my personal identity and bring back knowledge for my family," she said.

ON APRIL 7, HIGH SCHOOL students from South Seattle visited the Burke under the wing of mentor Matthew Vaeena, a UW alumnus who encourages cultural awareness and the importance of education among Pacific Islander students. The students connected with Pacific Islander undergraduates at the Burke. Partnering with Holly Barker, curator of Oceanic and Asian culture, the Pacific Islander students were inspired to share the values of their culture with their peers—bridging the gap between educational and cultural ties to academia.

At the end of the visit to the Burke, many of the younger students realized they could extend their education beyond high school. The objects and presentation from the undergraduate students opened a new door for them, revealing an avenue to higher education.

Top photo: The Research Sisters helped local Marshallese community members with a Day of Remembrance to mark the 50th anniversary of the U.S. nuclear testing on the Bikini Atoll on March 1, 2016.
Inset photo: Members of the Research Sisters.

DISCOVER...

THE DAWN OF THE DINOSAURS, HOW TO 3-D PRINT ARTIFACTS, AN ANGYAAQ'S MAIDEN VOYAGE, THE MYSTERIOUS EARLY LIVES OF PUGET SOUND FISHES, NEW BURKE RESEARCH, HOW ANCIENT RAINFALL AFFECTS CURRENT FARMING PRACTICES.

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