

FACILITIES AND OTHER RESOURCES- UNIVERSITY OF ALASKA FAIRBANKS

Environment – Contribution to Success



Figure 1. Hibernating arctic ground squirrel in an arousal state. Photo credit: Hoshi Sugiura.

The Institute of Arctic Biology (IAB), University of Alaska Fairbanks (UAF) supports research, graduate and undergraduate education leading to PhD, MS, and BS degrees in biochemistry, neuroscience and in the life sciences of wildlife, physiology, genetics, evolutionary biology, ecology and ecosystems, biomedicine, bioinformatics, and computational biology. Among 60 faculty members in the Departments of Chemistry and Biochemistry and Biology and Wildlife, eight have hibernation and canine studies (Figure 1). Hibernation has been a focus of research at UAF since 1960. World-wide, Alaska arguably has some of the best infrastructure for the study of hibernation with indoor and outdoor housing and a breeding colony for arctic ground squirrels including labs, surgical areas, equipment, and expertise. Canine research is a relatively new research area for the Center, serving as a translational model for brain aging. UAF is home to the Department of Veterinary Medicine (DVM), within the College of Natural Science and Mathematics, located in the Paul B. Reichardt Natural Sciences building at the UAF West Ridge. The DVM, with nine faculty and four staff, offers a four-year Doctor of Veterinary Medicine program in collaboration with Colorado State University. The Center draws on expertise from DVM veterinarians who provide clinical oversight for the Center's emerging canine studies.

The Center for TRIM Admin Core, located on the 2nd floor of the Margaret Murie Life Sciences building, is in a newly constructed building at the UAF West Ridge. The Center has access to administrative services within the Institute as well as other centralized pre- and post-award shared services provided by the IAB. The Center supports one Administrative Core (Admin Core) devoted to supporting research activities for Center faculty and the Health and Metabolism Research Core (HaMR). The Admin Core facility includes one office space for PI Drew and a shared workspace for two Admin Core staff. Each staff has one desk top Dell computer equipped with a webcam for videoconferencing, a Dell laptop with webcam, and access to a main floor printer. The computers are equipped with a full program Microsoft Office suite. Offices for the fiscal technician and other IAB personnel providing shared support services are in the Irving Building, which has close access to the Murie building on the UAF West Ridge via an indoor walkway.



Figure 2. The Margaret Murie Life Science Building at UAF houses the Center's Admin Core, faculty offices/research labs, and the MRI suite of the Health and Metabolism Research Core (HaMR). Other Center facilities are located nearby on the UAF West Ridge.

Institutional Commitment to PI Drew and the COBRE Phase 2.

The University of Alaska Fairbanks (UAF) provides an excellent scientific and training environment for the proposed research projects to be conducted by the Center's ESIs and NIs. The Center provides funding for technique development and relevant training used for developmental research and pilot projects building on the Center's theme and resources. The UAF Chancellor's office has pledged annual support for the HaMR Core, which is in addition to funding generated by the Core's recharge center. The Department of Natural Science and Mathematics (CNSM) provides further support for the purchase of liquid helium used to cool superconducting magnets of the Magnetic Resonance Imaging (MRI) and two Nuclear Magnetic Resonance (NMR) instruments. The IAB is providing an institutional cash and in-kind commitment to support the Center and its faculty researchers.

Facilities

Building: The Margaret Murie Life Science Building (Murie) is a 100,000 square foot integrated teaching and research building completed in 2013 (Figure 2). It contains both open laboratory space, smart classrooms, the HaMR Core's MRI facility, and office space for the Admin Core staff.

Laboratory: Principal investigators for the Phase 2 COBRE have designated laboratory space approximately 500 sq. ft. in two of the large open laboratories at UAF on the West Ridge campus. All labs are equipped to meet the needs of research projects as specified in individual project descriptions. In general, all labs have access to compressed air, vacuum, and natural gas lines as well as full electrical connections for all necessary equipment.

Health and Metabolism Research Core (HaMR): The HaMR Core's facility is divided into two suites located on the northwest edge West Ridge campus at UAF. The first suite is a 570 sq. ft. space, established in 2011, that houses two NMRs located in the Paul B. Reichardt Natural Sciences Building. One NMR spectrometer is used for solution-state at 300 MHz and one, in addition to solutions, can be used to examine tissues and other semi-solids, as well as powdered solids at 600 MHz. The second space is a 2120 sq. ft. imaging suite in the basement of the Margaret Murie Life Sciences Building devoted to magnetic resonance imaging (MRI) facility, dual-energy x-ray Absorptiometry (iDXA), and a microscopy/histology facility that maintains several microscopes used for a variety of imaging techniques, as described in the equipment section of the HaMR Core. The imaging suite consists of five main areas: a prep/anesthesia room, the iDXA scan room, an infusion room, the MRI scan room, and the microscope/histology facility. The Cell culture facility, located in the Weltzin lab, first floor of the Murie Building, assists with planning and implementing cell culture for various research needs. This facility supports research by offering bench space, equipment, and training on a recharge basis for research, academic labs, and corporate partners. The lab contains a laminar flood hood, incubators, centrifuges, and basic microscopes. Services include technical expertise and hands-on training in addition to assay development and optimization.

The Molecular Imaging Facility contains a 1.5 Tesla research MRI instrument used for in vivo studies with a system having a variety of coils for a multitude of imaging applications used for imaging bears and dogs. The GE Lunar iDXA is available for Dual-energy X-ray Absorptiometry experiments. This instrument is used to measure bone density as well as lean body mass and adipose tissue. The Microscopy/Histology facility houses several microscopes, including fluorescence and confocal, and other similar imaging instruments. Instruments are maintained and users are trained by dedicated staff. Western blot materials are also available through this core. The histology core houses a cryostat, vibratome, chemical fume hood, bench space, slide dryer, and other histology tools. Histology services include immunohistochemistry treatments such as samples of frozen tissue embedded on paraffin from frozen sections and fresh slices. Dedicated staff are also available to assist and train users. The Molecular Imaging Facility is identified as a clinical research center site within the Northwest Participant and Clinical Interactions Network.

Other HaMR Core services include animal instrumentation, animal support, and cell culture. Animal Instrumentation services include technical support and expertise in methodologies for measuring metabolism and physiology via open-flow respirometry and biotelemetry in hibernating species and laboratory rodents. Animal instrumentation is dispersed between the (1) laboratory animal holding facilities within the Biological Research and Diagnostics (BiRD) Facility on the West Ridge Campus, (2) a specialized bear hibernation facility located in an isolated, undisturbed spruce forest within the UAF Biological Reserve, and (3) a vivarium facility in the Integrated Sciences Building on the UAA main campus. Animal Support Services provide access to trained surgical personnel ready to assist with most animal research needs, including performing surgeries and surgical training. The Cell culture facility, located in the Weltzin lab, first floor of the Murie Building, assists with planning and implementing cell culture for various research needs. This facility supports research by offering bench space, equipment, and training on a recharge basis for research, academic labs, and corporate partners. The lab contains a laminar flood hood, incubators, centrifuges, and basic microscopes. Services include technical expertise and hands-on training in addition to assay development and optimization.

All of the proposed research projects in COBRE Phase 2 will make use of services provided by the HaMR Core.

Offices: The Admin Core facility includes one office space for PI Drew and a shared workspace for two Admin Core staff. PI Drew's office measures approximately 150 sq. ft. (15 ft. X 10 ft.) and is adjacent to the Program Manager and Community Coordinator shared workspace measuring 300 sq. ft. (15 ft X 20 ft. space) to promote

daily interactions. PI Drew's office is equipped with a desk, one desk chair, a meeting table with two chairs, a filing cabinet, phone, two bookshelves, desk computer, and a black and white printer. The staff shared workspace has two built-in desks, two filing cabinets, one common bookshelf, 2 desk chairs, two phones, and two desktop computers. The Admin Core staff have access to a main floor printer. Offices for the fiscal technician and other shared IAB support services are in the Irving Building and are fully equipped with computers, phone, and printers.

Computers: Each Admin Core staff has one desktop Dell computer equipped with a webcam for videoconferencing and a Dell laptop computer. PI Drew has a Dell desktop computer Dell OptiPlex 7070, i7-9700, 32GB of RAM and 1TB internal storage that connects to a Dell UltraSharp 34 Curved Ultrawide Monitor and a 18 X 27-inch monitor. She has a HP laser jet pro printer. In addition, Dr. Drew has a Dell laptop (Windows Surface Laptop 4, i7, 1 Terabyte Hard Drive, 16Gb Ram). The Program Manager and Community Outreach Coordinator each have one Dell desktop and laptop computer with connections to two standard monitors. All Admin Core computers run Windows 10 Enterprise with comparable memory storage to PI Drew. Offices for the fiscal technician and other shared IAB support services for pre- and post-award are in the Irving Building, which has close access to the Murie building via an indoor walkway. UAF has Zoom, Google Gmail and Drive accounts available for every member of the Center's team.

Videoconferencing: Face-to-face videoconferencing bridges the Center with external resources. We have a reserved meeting room close to our office space that includes face-to-face videoconferencing equipment used for Journal Club, seminars, and other Center meetings such as the virtual Advisory Committee, Translational Advisory Committee, TRiM Research Action Committee, technical training, and other purposes as required for those off campus including Anchorage, California, Washington, Texas, New York, Massachusetts, New Jersey and international locations. This conference room is furnished with a computer that provides videoconferencing, conference table, task chairs, and a large whiteboard. UAF has a robust videoconferencing network infrastructure to connect numerous video conferencing sites. This infrastructure includes Multi-Conferencing Units (MCUs) capable of connecting 120 sites in both High and Standard Definition video equipment; devices for lecture capture and storage; web-streaming on demand; computer connectivity with webcam on a laptop or desktop into a standard video conference from anywhere; connecting phones into conferences for those unable to attend in person; and an ISDN line to connect legacy sites into conferences with IP videoconferencing. Zoom is the primary and most robust videoconference platform at the University of Alaska (UA). The UA system can support up to 300 participants per standard meeting and includes features such as screen sharing, file sharing, breakout rooms, meeting recording, livestreaming, and security features (meeting locks and participant controls) that comply with UA-specific security practices. The video conferencing technology has become a rapidly expanding technology post COVID to reduce travel budgets and provide content to diverse locations. Video conferencing is used for committee meetings, training seminars, collaborations with other institutions, and connectivity to state and national health organizations.

Other Resources:

UAF Arctic Ground Squirrel Facilities: The UAF Biological Research and Diagnostics (BiRD) facility was completed in 2010 and is a 42,000 sq. ft. animal facility designed for holding small animals, including arctic ground squirrels, that is equipped with procedure and surgery rooms for physiological research. This facility can be accessed from the first floor of the Murie building through an indoor tunnel. The facility has six walk-in environmental chambers with specialized lighting and temperature controls (to -40° C). The facility provides housing for hibernating and active arctic ground squirrels (AGS) used by the Center's research investigators. Non-hibernating animals are kept in cages measuring 12"X19"X12" with stainless steel ¼" wire mesh hung over trays of ammonia absorbing corn cob litter. They are fed 10 pellets of Mazuri rodent chow daily, given water ad libitum, and supplemented with carrot sticks or apple slices once weekly for enrichment. Hibernating animals are housed in either similar sized cages or 12"X8"X12" stainless steel ½" wire mesh hanging cages over trays of ammonia absorbing corn cob litter. All cages with wire mesh floor contain cotton batting equal to two times the animal's body size. All surgical equipment for the animal experiments conducted at UAF are located in the suites assigned to researchers. The surgical suite houses a downdraft table and surgical supplies for tissue harvesting and fixation perfusions including surgical microscopes, blood gas analyzer, data logger implants, and mouse/rat/squirrel size pulse oximeters.

In addition, UAF has an outdoor arctic ground squirrel breeding colony located in the Large Animal Research Station (LARS) to produce pathogen-free AGS animals used for the Center's research (figure 3). Specifically, the space includes one large open-air facility, six 500 sq. ft. encapsulated pens for AGS breeding designed to prevent escapement and provides protection from predators; as well as ground covering of sandy gravel soils optimal for burrowing to simulate AGS natural conditions with drainage rock. In spring 2024, there was a total of 83 AGS with 29 bred in the colony and 52 wild-caught animals. Each spring, the colony is evaluated and supplementation with wild caught animals considered. This designated colony was established using renovation funds from the COBRE Phase 1 award and completed in 2022. The Alaska State Public Health Laboratory (APHL) provides statewide viral diagnostic services that aid in the diagnosis and surveillance of human viral diseases that are of public importance. This facility is located on the UAF west ridge campus next door to the BiRD building. *The indoor and outdoor arctic ground squirrel facilities will be used to house the animals needed for Drs. Rice, Goropashnaya, and Weltzin research projects in the COBRE Phase 2.*



Figure 3. Arctic ground squirrel resident of the UAF breeding colony. Photo credit Oivind Toien

UAF Bear Facilities: The UAF bear facilities are comprised of the Bear Hibernation Facility and the Summer Bear Facility (figure 4), located in Interior Alaska. Bears are received from the Alaska Department of Fish and Game. The Bear Hibernation Facility is the only facility in the world equipped with state-of-the-art automated respirometry equipment for continuously measuring metabolic rates in hibernating bears.



Figure 4. Modernization of the Summer Bear facility at UAF Large Animal Isolation Facility., winter 2025.

Two fully automated large animal 4-channel respirometry systems allow for continual metabolic monitoring of bears through a full hibernation season. The Bear Hibernation Facility can hold up to a maximum of four bears per season. Summer holding facilities are currently undergoing modernization to be completed by the summer of 2025 and will include four 147 sq. ft. cages with corresponding 375 sq. ft. enrichment areas for holding a maximum of four bears per season. The project, funded by an NIH Office of Research Infrastructure Program R-24 award (1R24OD035499-01), includes new caging of the facility to allow long-term summer holding of bears until they start to hibernate and can then be transferred for study to the dedicated Bear Hibernation Facility, which is separate from the Summer Bear Facility. Upon completion, the modernization will provide both individual indoor and natural outdoor area caging to allow greater enrichment and exercise as well as opportunities for continued bear research. *Although the bear facilities are not identified for the COBRE Phase 2 designated research projects, these facilities are planned for future bear research using alternative funding.*

Alaska IDeA Network of Biomedical Research Excellence:

The Alaska IDeA Networks for Biomedical Research Excellence (Alaska NBRE), funded by NIH National Institute of General Medical Sciences, is a statewide program to build biomedical research and training capacity within the Alaska INBRE network. This program supports new faculty to conduct biomedical research using Research Project and Developmental Research Pilot Program award mechanisms, as well as provide funding for student research assistantships. Alaska INBRE provides professional development travel awards for faculty researchers and undergraduate students to present their research at conferences and other professional meetings and benefit from expanding their professional networks and training opportunities. Alaska INBRE assists with manuscript publication charges. This program also hosts the "INBRE Retreat," an annual conference where students and faculty can share their biomedical research. The Alaska INBRE program is in the Irving Building of UAF's West Ridge. *Four of the Center's investigators received research development awards through Alaska INBRE during Phase 1 and participate in their annual retreat.*