

Ambrose Research Conference 2024

Sciences Session Abstracts

Sciences Session 1 (Room A2133)

Elijah Babcock, “Studying the longitudinal effects of acute COVID-19 infection on neurologic hypoxia in young adults using near-infrared spectroscopy”

Following the COVID-19 pandemic many individuals were left with physical and neurological dysfunction. This is referred to as the post-acute sequelae of SARS-CoV-2 (PASC) or long-COVID. The mechanisms contributing to long-COVID are not fully understood. Research suggests that one in four adults developed neurologic hypoxia about three months post COVID-19 infection. In this work, I examine the link between acute infection and neurologic hypoxia. Particularly, I examine whether the common cold and COVID-19 lead to neurologic hypoxia 5-, 10-, and 60-days post-infection. To address this question young adults with no neurological, inflammatory, or cardiovascular diseases were enrolled when healthy. Frequency Domain Near Infra-Red Spectroscopy (fdNIRS) was used to determine microvascular oxygenation levels in the frontal cortex. Measurements 5-, 10-, and 60-days after symptom development sought to enable comparative statistics between healthy baseline and post-infection measures of frontal cortex oxygenation. Brain function using neuropsychological assessments and measures of fatigue will be compared at baseline and post infection. In this presentation I will examine the preliminary findings of this active investigation.

Nathan Yeung, “Novel meristic description and morphometric analysis of mouth shape in Alberta populations of *Catostomus* species”

Catostomid suckers are a neglected and diverse group of freshwater fishes that contribute remarkable sources of biomass throughout North American aquatic ecosystems. A more robust understanding of catostomid ecology and morphology is necessary; Alberta populations of *Catostomus catostomus*, *Catostomus commersonii*, and *Catostomus macrocheilus* have yet to be described from a meristic perspective and are difficult to differentiate as juveniles. Sample populations of juveniles from the Peace River Drainage were acquired and meristic data were obtained via manual counting techniques and a cabinet x-ray apparatus (Kubtec-XPRT 80-L) for vertebral counts. Mouth shape morphometric analysis was accomplished using MorphoJ Software. *C. commersonii* pectoral rays differed significantly compared to the other two catostomids and *C. commersonii* pelvic rays significantly differed from *C. macrocheilus*. This study contributes to an improved understanding of catostomids in Alberta, provides statistically significant identification methods, and helps establish a baseline for future evolutionary research which will inform conservation.

Sciences Session 1 (continued)

Matthew Morris, “Finding the source: using haplotype networks to identify potential origin of an invasive fish (*Carassius gibelio*) in Alberta”

Carassius gibelio (Prussian carp) is the latest invader of Canada’s fresh waters, with reports of its presence in Alberta and Saskatchewan. Morphological similarities with introduced *C. auratus* (goldfish) and the putatively introduced (but likely misidentified) *C. carassius* (crucian carp) make it difficult to distinguish these species without careful examination. DNA barcoding of the mitochondrial cytochrome c oxidase I (COI) gene is a potential tool to identify *Carassius* individuals to species, but incorrect annotations of publicly-available sequences can confound attempts at species identification. Here we use morphology and DNA barcoding to identify putative *C. gibelio* specimens collected from two Alberta locations that constituted new records for the province. Morphologically, specimens were consistent with *C. gibelio* but were in the range for both *C. gibelio* and *C. auratus*. Genetically, our samples could not be identified to species level, being a 100% match with multiple *Carassius* species. Haplotype networks, however, supported the identification of Alberta carp as *C. gibelio*, in agreement with statistical analysis. Furthermore, the Alberta haplotype was shared with a fish reported from the seafood trade, suggesting a possible source of entry into Alberta. Early detection and management of *Carassius* species are of critical importance due to their projected ecological impact in Canada; DNA barcoding is one important tool for species identification, especially when specimens are within the phenotypic range expected for multiple species.

Ana Montibeller, “Analyzing Total Phenolic Content in Native Albertan Berries: A Folin – Ciocalteu Spectrophotometric Study”

Plants have the capability to thrive in their own habitats thanks to secondary metabolites like phenolics that they contain. These microscopic molecules occur in a wide variety of shapes and functions and have a wide range of effects. Phenolic compounds are considered the most crucial, numerous, and pervasive classes of compounds in the plant world and have also been classified as water-soluble molecules. There has been extensive research on phenolic compounds in plants and fruits around the world, but little is known about the phenolic compounds in native Albertan plants. The aim of this study is to quantify phenolics and flavonoids present in late-ripening native edible berries using the Folin-Ciocalteu method together with spectrophotometry.

Sciences Session 2 (Room L2084)

Lucas Cusanelli, “Ecosystem management planning: Spatiotemporal land cover/use mapping for justice”

Alteration of the physical properties of Calgary’s lands for anthropogenic use can lead to long-term impacts for both human and natural communities. Following up on my interest in multidisciplinary science approaches (ARC 2023), this is a plan for a future study which may include the geomorphological, hydrological, ecological, historical, and other changes to a mostly underdeveloped local area within the urban setting. Creating this plan required an initial spatiotemporal land cover mapping exercise of historical land use transitions and current conditions (by photogrammetry, satellite imagery, etc.), basic site surveying, and identifying relevant methodology and technologies for a future in-depth environmental field analysis. This plan takes backing from spatiotemporal change dynamics to suggest future studies to address sustainable environmental management that is fair and healthy -- land use policies in line with the United Nations’ Sustainable Development Goal 11, ensuring urban use of the environment is “inclusive, safe, resilient, and sustainable.”

Sierra Menchini-McHugh, “Environmental assessment design: Courage to let nature inform development”

Rapid urbanization, particularly in Calgary's expansion, can create challenges to sustainability when humans and nature interact. Therefore, my continuing interest in care for science-based solutions, in valuing sustainable development through an environmental-science perspective (ARC 2023), inspired the design of an environmental assessment protocol for a municipal land area (that is likely to be developed soon). This is a study framework focusing on assessing existing ecosystem services, then proposing how the value of those services may best fit urban living design and planning models. A near-natural site within the municipal region was identified. Then, a methodology and apparatus for environmental field study (mapping fragmentation, tracking animal corridors, etc.) is proposed along with an overview of existing societal and economic practice and policies. Strategic assessment of the framework itself is also conducted to ensure the protocol can promote sustainable urban growth and community health while addressing ecological networks and species preservation.

Stephen Jeans, “Bio-geoscience research and the undergraduate: Prudence in environmental studies”

In a continuing study of how undergraduates approach bio-geoscience research, selected observation from multiple first-year courses of two universities and from two upper-year independent-research course case studies are summarized. Further analyzed this year is the claim that anthropogenic threats to the environment require action at all levels, but that university programs of Earth and Space Science need to better address the literacy problem of novice environmental scientists. Discussed are aspects of teaching of inter-transdisciplinarity to undergraduates, mentorship on questioning popular messages, to spark innovation, and to give learners a richer science career focus that includes informed goals. Practical research opportunities permit learning that is a blend of knowledge with skills and attitudes (e.g., critical thinking, ethical decision making, and utilizing cardinal virtues), all giving the undergraduate a better base for decision making and life-long appreciation of science-based action regarding the preservation and sustainable use of our environment.