comes a double layer that creates both the surface structure of the breast and dorsally Scarpa's forms a circummammary ligament that 1) stabilizes the breast against the thoracic wall and 2) is continuous with Scarpa's fascia on the rest of the ventral body wall. The suspensory ligaments of the breast (named Cooper's ligaments in surgical literature) represent the typical, albeit thickened, septations between fat lobules found consistently throughout the human body, and do not attach to the skin. Instead, these ligaments attach to Scarpa's fascia.

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Development of the wettability test on live butterflies and moths

Proboscises of butterflies and moths (Lepidoptera) have unique material properties which allow them to acquire sticky and viscous liquids while remaining clean. Experiments of removed butterfly proboscises reveled hydrophobic/hydrophilic dichotomy where ~ 80% of the proboscis surface is hydrophobic and only the distal 20% is hydrophilic. We report on the development of a new experimental setup and protocol allowing one to study the wetting properties and drinking mechanisms of live butterflies and moths. Using two cameras, a linear stage, and a tube securing and guiding proboscis, one can evaluate the profiles of meniscus at the dorsal, ventral, left and right sides of the proboscis. With the developed LabVIEW program, one can get the advancing and receding contact angles and some other characters specific for a particular specie. This poster will illustrate the working principles of this setup providing a systematic analysis of the wetting features of Manduca sexta proboscises and comparing them with the wetting features of Vanessa cadui proboscises which are much shorter and thinner.

83–6 Sung, JY*; Outomuro, D; Morris, DJ; Morehouse, NI; University of Cincinnati, Cincinnati, Ohio, University of Pittsburgh, Pittsburgh, Pennsylvania; University of Cincinnati, Cincinnati, Ohio; *sungyg@mail.uc.edu*

Where, when, and who to court: ecological interactions and facial diversification of four species of syntopic paradise jumping spiders

During courtship, animals face the challenge of communicating their identity or status to the appropriate audience, e.g., viable, receptive mates. The costs of being misidentified can often be high, ranging from wasted energy and reproductive resources to loss of life, as seen in precopulatory sexual cannibalism in spiders. So what traits do animals rely on to communicate their species identity? In paradise jumping spiders (genus *Habronattus*), males flaunt colorful and distinctive species-specific facial patterns. We hypothesized that male *Habronattus* faces may contribute to communicating species identity, and these faces may have diversified in response to reinforcement selection. In this study, we characterized the spatiotemporal niche partitioning and male facial patterns of 4 syntopic *Habronattus* species. We predicted that species with less niche partitioning (i.e., higher likelihood of interspecific interactions) would exhibit greater divergence in male facial patterns. First, we evaluated niche partitioning by quantifying habitat usage, spatiotemporal distribution and overlap, and interactions of spiders at the Edge of Appalachia Nature Preserve, Ohio. Next, we quantified spider facial patterns using hyperspectral imaging techniques and recognition-based computer vision analyses. Lastly, we examined the relationship between spatiotemporal niche partitioning and facial pattern divergence in a pairwise approach amongst all four species. We discuss the results in the context of likely ecological and behavioral reproductive isolation in this syntopic community.

S10-11 Surapaneni, V A*; Schindler, M; de Faria, L; Ziege, R; Bidan, C; Mollen, F; Amini, S; Hanna, S; Dean, M; Max Planck Institute of Colloids and Interfaces, Potsdam, Germany, University College London, London, UK, Elasmobranch Research Belgium, Bonheiden, Belgium, University College London, London, UK, City University of Hong Kong, Hong Kong; *svamarnadh@gmail.com*

Groovy and gnarly: Surface wrinkles as a multifunctional motif for terrestrial and marine environments

From large undulations on the skin of elephant trunks to nanoscale grooves on flower petals, wrinkled structures are omnipresent, multifunctional, and found at hugely diverse scales. Depending on the particulars of the biological system—its environment, morphology, and mechanical characteristics—wrinkles may control adhesion, friction, wetting, or drag; promote interfacial exchange; act as flow channels; or contribute to stretching, mechanical integrity, or structural color. Undulations on natural surfaces are primarily instabilities arising from stress-induced buckling of surface layers during growth or ageing. Variation in the material properties of surface layers and in the magnitude and orientation of intrinsic stresses during growth lead to a variety of wrinkling morphologies and patterns which, in turn, reflect the wide range of biophysical challenges wrinkled surfaces can solve. Therefore, investigating how surface wrinkles vary and are implemented across biological systems is key to understanding their structure-

function relationships. In this work, we synthesize the literature in a metadata analysis of surface wrinkling in various terrestrial and marine organisms to review important morphological parameters and classify functional aspects of surface wrinkles in relation to the size and ecology of organisms. Building on our previous and current experimental studies, we explore case studies on nano/micro-scale wrinkles in biofilms, plant surfaces, and basking shark filter structures to compare developmental and structure-vs-function aspects of wrinkles with vastly different size scales and environmental demands. In doing this and by contrasting wrinkle development in soft and hard biological systems, we lay out structural rules for biological tissues, as well as for functionalized wrinkled biomimetic surfaces.

P2-47 Tait, TR*; Enriquez, MS; Gluesenkamp, AG; McGaugh, SE; Mensinger, AF; University of Minnesota Duluth, San Antonio Zoo, University of Minnesota Twin Cities; *tait0014@d.umn.edu*

Comparing the visual spectral sensitivity of native surface Mexican Tetra (Astyanax mexicanus) with recently diverged cave populations

The Mexican Tetra, *Astyanax mexicanus*, is a fish with two morphotypes: a surface form, and a cave form that develops troglomorphic features including reduced pigmentation, vestigial eyes, and increased olfactory and lateral line sensitivity. While their native range extends from central/southern Mexico to the lower Rio Grande and Nueces River, several satellite surface populations were introduced to a Texas aquifer approximately 100 years ago and have shown evidence of rapid evolution in certain phenotypic traits. A recent study by McGaugh et al. (2020) comparing the morphological and behavioral data between surface and cave *A. mexicanus* in the Honey Creek Cave system indicated notable differences have developed over a relatively short amount of time. One native and five satellite populations (two surface and three cave) were tested and compared for dark-adapted visual spectral sensitivity using electroretinography (ERG). No differences were found between the native and satellite surface populations. However, significant differences in visual sensitivity were found at the wavelengths 530 and 560 nm ($p < 0.05$) between the Honey Creek Cave and surface populations. We hypothesize that the data indicates rapid divergence between the Honey Creek Cave population and the surface populations, where the cave population is less sensitive to light. This indicates that the recently diverged cave populations are undergoing retinal reorganization that may eventually lead to vestigial eyes.

66–4 Talal, S*; Chahal, A; Osgood, G; Brosemann, J; Harrison, J; Cease, A; Arizona State University, Tempe, AZ; *stav.talal@gmail.com*

Migratory locusts regulate their ratio of carbohydrate to lipid consumption for energetically efficient gain of migratory fuel

Herbivorous insects regulate their protein to carbohydrate intake; however, it is unknown whether they regulate their lipid intake relative to protein or carbohydrate consumption, as has been shown in some omnivores. Theoretically, lipids and carbohydrates might be interchangeable as an energy source, so lipid intake regulation might be unnecessary. However, regulation of lipid intake might be important since synthesis of body lipids from ingested lipids is more efficient than from carbohydrates, and some lipids are essential. Locusts have an impressive migratory flight capability that strongly relies on oxidation of lipid stores that are accumulated in the late-juvenile and early adult stage. While late-instar locusts can synthesize lipids *de-novo* from carbohydrates, we hypothesized that they might regulate lipid intake to more efficiently fulfill lipid accumulation needs. To test whether locusts regulate a specific carbohydrate to lipid intake ratio, we designed artificial diets varying in carbohydrate to lipid energy ratios, all with constant energy and protein content, using 5^{th} instar migratory locust nymphs, *Locusta migratoria*. Nymphs selected a very narrow ratio of ~2:1 carbohydrate: lipid. To test whether gaining lipid stores from carbohydrate is less efficient, we compared nymphal development on carbohydrate- and lipid-biased confined diets. Development time, survival, mass gain, and lipid growth did not differ between diet treatments. However, nymphs that were reared on carbohydrate-based diet consumed more energy and exhibited higher metabolic rates; plausibly due to the extra energy costs associated with converting carbohydrates to lipids. Our results suggest that lipid consumption is an important, previously ignored "third rail" of the geometric framework for herbivore nutrition. This work was supported by NSF # 1,942,054.

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Introduction to the "Open source solutions in experimental design" symposium

In this symposium, we introduce the utility and accessibility of open technology approaches for the SICB community. Open technology, technology for which plans are publicly available and is free for people to reproduce, modify and redistribute, presents a significant po-