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Small angle x-ray diffraction through living muscle links the lattice structure to macroscopic material properties TRAVIS TUNE, Georgia Inst of Tech, TOM IRVING, Illinois Institute of Technology, SIMON SPONBERG, Georgia Inst of Tech — Muscle is a unique hierarchical material composed of millions of molecular motors arranged on filaments in a regular lattice structure. The macroscopic, material behavior of muscle can be characterized by its workloop, a periodically activated force-length curve. Muscle is capable of operating as a spring, motor, brake, or strut, defined by its workloop. We are interested in the multiscale physics of muscle that drive its energetic versatility – the ability of muscle to alter its function. Here we introduce a system of two muscles from the cockroach whose workloops are not explained by our current understanding of the determinants of workloop function (the classic force-length, force-velocity, and twitch response). Differences in material behavior may arise from structural differences in the muscles active lattice. Using the BIOCat beam at the Advanced Photon Source at Argonne NL, we tested for differences in the two muscles lattice structure. Small-angle x-ray scattering (SAXS) revealed a difference of 4-8

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