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STUDIES IN EDIACARAN PRESERVATION

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The fossil record is biased. Sites that preserve soft-bodied organisms are exceedingly rare and truly exceptional. They represent the best source of anatomical and functional information for extinct species, offer idealized views of diversity patterns in deep time, and ultimately guide us towards understanding the inner workings of ancient ecosystems. Understanding the early evolution and diversification of animals, as written in the Ediacaran fossil record, is reliant on our understanding of the preservational constraints affecting the fossilization of soft tissues in Ediacaran *Lagerstätten*. A two-pronged approach has been the focus of recent attempts at unraveling the geobiological intricacies in Ediacaran preservation. On the one hand, decay experiments were conducted under controlled laboratory settings to allow for investigations into the replication of soft-tissue preservation, which identified controls on rates of tissue decay and early mineralization. On the other hand, advanced instrumentation such as environmental scanning electron microscopy (ESEM), energy dispersive X-ray spectroscopic elemental mapping analyses (EDS)x-ray photoelectron spectrometry (XPS), and electron probe microanalyzer wavelength dispersive X-ray spectroscopy (EPMA-WDS), was performed on sectioned Ediacaran fossils which revealed the importance of clay minerals and the precipitation of iron sulfides such as pyrite in casting the external morphology of the organisms. This combined two-pronged approach provides a conceptual framework for understanding the distribution of Ediacaran-style preservation in time and space, and will parameterize the paleoenvironmental settings and conditions where body fossils are preserved in the Neoproterozoic.