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## Museum of Natural History Acquires New Scanning Electron Microscope

*Generosity of anonymous donor puts Department of Invertebrate Zoology once more on the cutting edge*

**(Santa Barbara, CA – June 26, 2019)** This June, the Department of Invertebrate Zoology at the Santa Barbara Museum of Natural History's Collections & Research Center (CRC) upgraded its scanning electron microscope (SEM), switching from the Zeiss EVO 40XVP the department has used since 2005 to the new Zeiss EVO 10 LS. The upgrade was made possible through the generosity of an anonymous donor, as well as a substantial discount offered by Zeiss.

Scanning electron microscopy allows scientists to produce images revealing the topography of specimens that are too small to effectively photograph with conventional microscopes. This technology is essential to the work of Curator of Malacology Daniel L. Geiger, Ph.D., who specializes in micromollusks and microorchids. Dr. Geiger has published extensively on these subjects, and the ability to see the unique characteristics of microscopic specimens has allowed him to name and describe more than a hundred tiny species previously unknown to science. Geiger also trains students to use the instrument, and makes it available to visiting scholars for their own research. The CRC receives hundreds of visiting scholars annually who come from around the world to study the facility's millions of specimens, artifacts, and documents for research that often informs conservation efforts.

The new SEM's exciting capabilities will allow scientists to make better use of CRC specimens. The previous instrument operated either under a high vacuum or standard variable pressure. Because liquid evaporates in these conditions, this limited scientists to imaging specimens that were perfectly dry. The new microscope has the capability to perform environmental scanning electron microscopy (E-SEM), in which the electron beam remains under high vacuum but the specimen chamber contains water vapor at low pressure, and the specimen is cooled or frozen. This will allow Geiger and others to study "wet" specimens in a more natural state that will better preserve their delicate structures. "This opens a whole host of new possibilities," says Geiger.

The new instrument will also enable analysis of chemical elements that could be used to identify the constituent elements in unknown mineral samples, or to analyze historic pollution levels based on specimens. For example, the Department of Invertebrate Zoology is home to over 3.5 million shells: "Some were collected from pristine preserves, some came from the inner Los Angeles harbor," Geiger explains. "We can leverage our collections with new technology to get additional data."

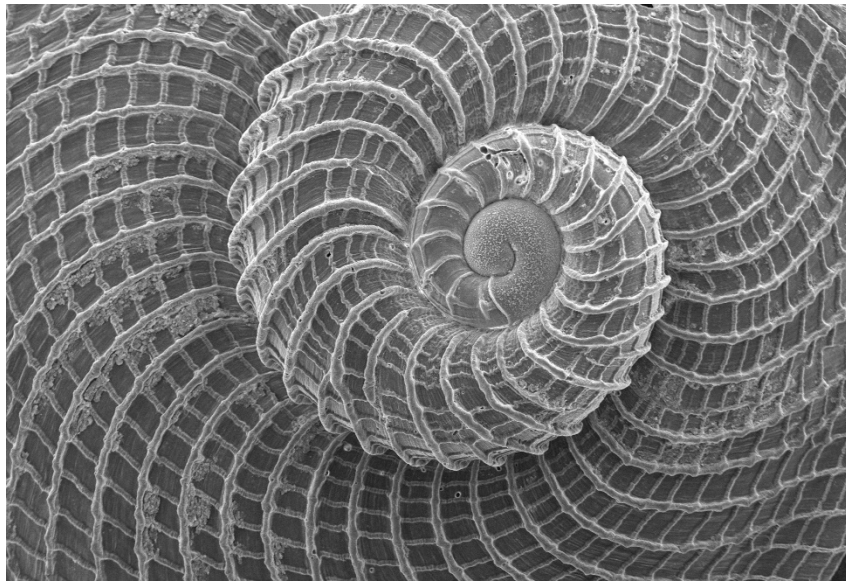
A user-friendly touchscreen interface, an upgraded filament that will result in brighter images at about twice the resolution, and the capacity to produce larger imagery are added benefits of the new system. Its oil-free pumping system requires less maintenance and produces less waste: "Less work for me, better for the environment: everybody wins," said Geiger.

Geiger has been working in electron microscopy for twenty years, but expects to spend at least two weeks exploring the new machine's capabilities. He is especially looking forward to using the E-SEM capability to investigate whether some of his microorchid specimens produce nectar. (The procedures required to dry orchid specimens for the previous SEM could have removed any nectar, and the specimens are too small for nectar to be seen by more conventional means.) He is also keen to try a new beam deceleration capability, which mitigates the buildup of electrical charge that can interfere with imaging non-conducting specimens: "This is a pretty new technology that hasn't been out for more than about three years. We're at the bleeding edge again."

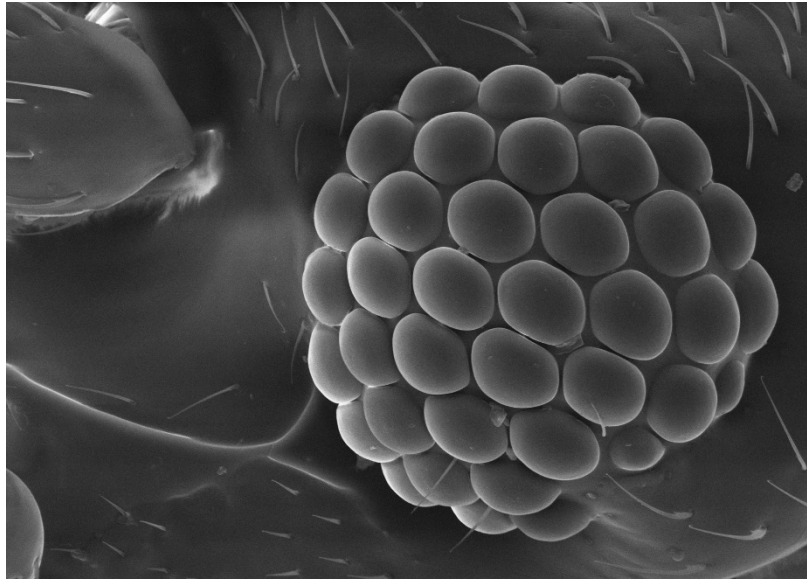
For more information about the new instrument's technical capabilities, visit <https://sbnature.org/collections-research/invertebrates/scanning-electron-microscope>. To learn more about scanning electron microscopy research by Geiger and teen scientist Bianca Campagnari, visit <https://sbnature.org/publications/blog/2/posts/61/sbnature-blog>.

### About the Santa Barbara Museum of Natural History

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Early whorls of a microscopic marine snail SEM imagery by Daniel Geiger Ph.D.



A beetle's compound eye SEM imagery by Daniel Geiger, Ph.D.

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