

## GK-12 Graduate Fellows Program

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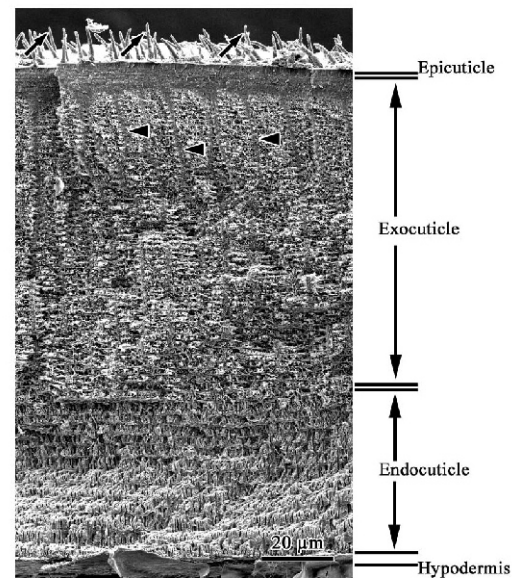
# Dr. Richard Dillaman: the morphology role



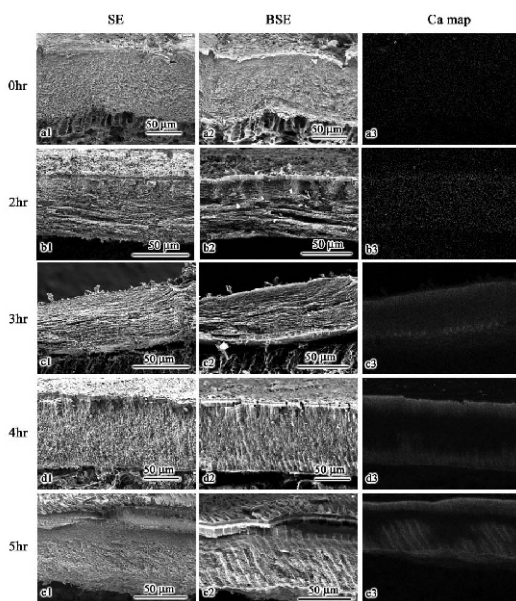
My research deals with cell structure and function as it applies to a wide variety of physiological processes, particularly biomineralization. In my research on calcification I have studied shell formation in mollusks, spicule formation in sea urchins, tooth structure in fishes, and bone formation in chickens and rats. In conjunction with Drs. Roer and Shafer, I have been examining carapace formation and calcification in crustaceans.

Crustacean exoskeletons are comprised of 4 general layers: the epicuticle, exocuticle, endocuticle, and hypodermis. To grow, the epicuticle and exocuticles are shed and regrown in a well-studied sequence of events known as the molt cycle. Using microscopy to examine the patterns and substances deposited during mineralization helps us understand the method by which this process is controlled.

Interestingly, microscopic examination often helps verify information obtained through physiological or molecular experiments.



**TEM micrograph of crab shell.** Notice the distinct differences between the deposition of the sections.



**Time series of calcification of the exocuticle.**

The tools I use in my research include transmission and scanning electron microscopy (TEM and SEM, respectively), as well as light microscopy. I also manage the Microscopy Laboratory that in addition to TEM and SEM microscopes, contains bright

field, phase contrast, Hoffman, epifluorescence and confocal light microscopes. These microscopes are interfaced with computers for digital image enhancement, analysis and storage capabilities. I also collaborate with faculty and students in other laboratories who wish to include a morphological or ultrastructural component in their research programs.



**Sequence of a crab molting (R-L from top L to bottom R).** Notice how much larger the emerging crab is than its molt.