

Biomedical Computation Review

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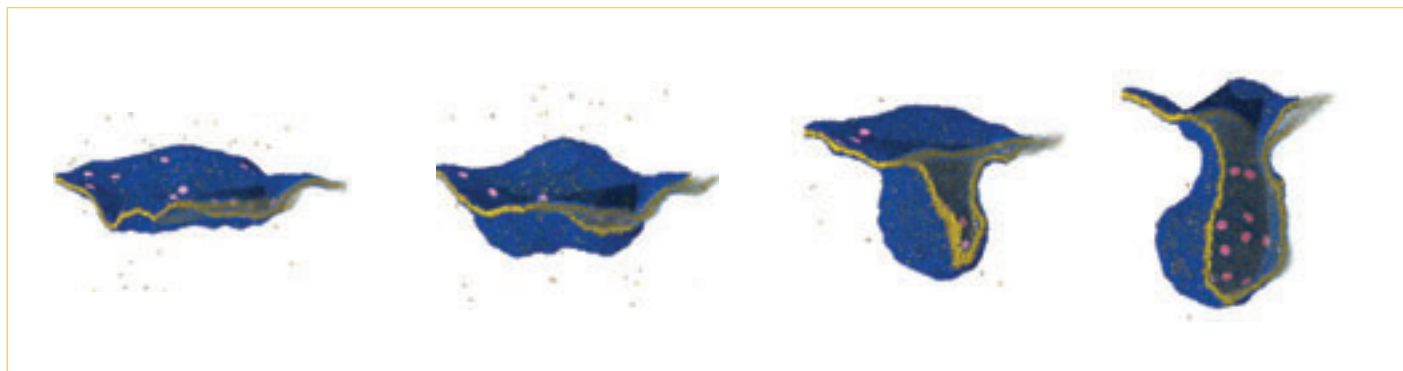
BY KATHARINE MILLER

Remodeling by Curvature

Whenever a cell needs to get rid of waste, transport materials, sort proteins, or build new organelles, membranes remodel themselves. Often that means forming small enclosed compartments called vesicles. Now researchers have gained a better understanding of that process using coarse-grained computer simulations. The work was published in the May 24, 2007 issue of *Nature*.

Researchers knew that specialized proteins are involved in triggering membranes to remodel themselves, but experimental and theoretical research could not explain how they do it. Because the energy required for major remodeling projects is greater than the energy used to bind the specialized proteins to the membrane (or to each other), some suspected that membrane curves themselves could carry the necessary energy.

Using coarse-grained simulations, **Kurt Kremer, PhD, Markus Deserno, PhD**, and their colleagues at the Max Planck Institute for Polymer Research in Mainz, Germany, showed that curvature-mediated attraction can indeed explain how membranes refashion themselves. Once a membrane starts to bend, proteins embedded in that membrane begin to cluster and draw the membrane into a curved shape—not unlike a vesicle.



The coarse-grained membrane simulation starts with a flat membrane containing 46,080 lipids and 36 large hemispherical “caps” (shown in pink) representing membrane proteins. Over the course of roughly one millisecond, the proteins begin to aggregate and form a large vesicle. The final image shows a cross-section of the vesicle in order to reveal the protein caps within. Courtesy of Kurt Kremer and Markus Deserno.