

Pearly perfection

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Credit: AI-generated image ([disclaimer](#))

The mystery of how pearls form into the most perfectly spherical large objects in nature may have an unlikely explanation, scientists are proposing in a new study. It appears in ACS' journal *Langmuir*, named for 1932 Nobel Laureate Irving Langmuir.

Julyan Cartwright, Antonio G. Checa and Marthe Rousseau point out that the most flawless and highly prized pearls have perhaps the most

perfectly spherical, or ball-like, shape among all the objects in nature that are visible without a microscope. Pearls develop as nacre (mother of pearl) and other liquids accumulate around grains of sand or other foreign objects inside certain [oysters](#) and other shellfish. But how do pearls grow into such perfect spheres?



The answer, they say, may be relatively simple—with developing pearls having a saw-toothed, or ratchet-like, surface. That texture generates forces that make the pearl turn inside the oyster's tissues in response to movements in the environment. The result is a spherical build-up of nacre and other textures. Rotating [pearls](#) are a perhaps unique example of a natural ratchet, the scientists say.

More information: Cartwright, J. et al. Pearls Are Self-Organized Natural Ratchets, *Langmuir*. [DOI: 10.1021/la4014202](https://doi.org/10.1021/la4014202)

Abstract

Pearls, the most flawless and highly prized of them, are perhaps the most perfectly spherical macroscopic bodies in the biological world. How are they so round? Why are other pearls solids of revolution (off-round, drop, ringed pearl), and yet others have no symmetry (baroque pearls)? We observe that with a spherical pearl the growth fronts of nacre are spirals and target patterns distributed across its surface, and that this is true for a baroque pearl, too, but that in pearls with rotational symmetry spirals and target patterns are found only in the vicinity of the poles; elsewhere the growth fronts are arrayed in ratchet fashion around the equator. We argue that pearl rotation is a self-organized phenomenon caused and sustained by physical forces from the growth fronts, and that rotating pearls are an example—perhaps unique—of a natural ratchet.

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