



BIOMIMICRY

By Dr. Richard E. Norris, RRC, PE

We can learn a lot from examining and mimicking successful natural adaptations in our designs. The concept is simple and beautiful in its simplicity. The Biomimicry Institute, whose purpose is to learn from nature and apply that knowledge to designs, explains its intent well on the institute's website (biomimicry.org):

Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies. The goal is to create products, processes, and policies—new ways of living—that are well-adapted to life on earth over the long haul.

The core idea is that nature has already solved many of the problems we are grappling with. Animals, plants, and microbes are the consummate engineers. After billions of years of research and development, failures are fossils, and what surrounds us is the secret to survival.

For steep-slope roofing and waterproofing, I think of the similarities between shingled systems and the duck's feathers. For low-slope roofing, I think of the thick skin of the water buffalo. For insulation, I think

of the blubber of the walrus or seal. For anchoring a roof-mounted antenna or solar panel stanchion, I think of a tall tree and its extensive root system. What do you think of when you design?

This way of viewing a design challenge is particularly apt when designing flashings for resistance to external forces. How does the frog manage water and air with its eyelids? What does the American bison do to weather a wind- and snowstorm? How does the ladybug hang on to a branch when the wind blows? We have a lot to learn from nature. The animals and plants are successful because their bodies and behaviors have adapted to their environments.

When I am designing a seal around a penetration in the wall, I sometimes think about the frog's eyeballs. How do the eyelids (all three) protect against water intrusion under water and against evaporation above water? If my design could protect against those, it can certainly protect against the weather—wind and rain. The frog has a third eyelid that covers the eyeball, sometimes used when the frog is above the water, reducing the evaporation and retarding dehydration. Do I need something similar in my design? This is like an air barrier and vapor retarder. Does the seal around the frog's eyeball hold in any condition the building is likely to encounter? Or, do we need to improve it? Will water penetrate the outer layer and the seal or not? If it does, where will it go? Critically thinking through

these aspects is important to the design, and thinking of a frog's design helps me to do that better.

What I learned from this process is that the plants and animals that have survived all have a solid primary system and sometimes also a back-up system. Their survival depends on their resilience in adversity, and they have evolved to fit into the niche they occupy. Their bodies and behaviors developed to permit them to survive in the extremes of nature.

Similarly, our business's survival depends on our success on each project. It will help us to mimic nature in order to keep nature's dangerous elements from destroying our designs and constructions.



Dr. Richard E. Norris, RRC, PE

Richard Norris is owner of Norris Consulting Services, Fremont, CA, and a Professional member of RCI. He is a registered engineer and an RRC and holds a doctorate from the University of California at Berkeley.