Twinkle, Twinkle, Little Star

By Tony Wu

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The brittlestar is a humble animal. It has no head, a disk-shaped body, and five long-thin "brittle" arms that it uses for locomotion. An echinoderm, the brittlestar is closely related to other familiar reef crawlers like starfish, urchins and sea cucumbers. Most divers have probably come across brittlestars; very few (including me) pay much attention to them.

But there's more here than meets the eye.

A few years ago, a group of researchers published a study about a particular brittlestar – *Ophiocoma wendtii* – a species that ranges from Bermuda to Brazil and grows to about the size of an outstreched adult hand.

At first blush, there's nothing particularly special about this brittlestar. It's brittle, it lives on the reef, it looks awkward and alien.

Gordon Hendler, a marine biologist at the Natural History Museum of Los Angeles County, noticed that *O. wendtii* changes color from dark red during the day, to a black/ grey at night. This apparently trivial talent, of course, implies that the brittlestar can sense light, which would be extremely difficult for an animal without any obvious eyes or other photoreceptors.

Hendler and other researchers then noticed that among the many bumps and markings on the arms of the brittlestar were what appeared to be tiny, clear "windows". With further work, they found that each of the bones in the animal's arms is a single calcite crystal, and each "window" is in the shape of a double lens... *Interesting.*

Curiosity peaked, they exposed some of the crystals to light, and found that the clear, window-like areas are able to direct and focus light. Even more exciting, the researchers meticulously measured the optimal focal distance for these miniature lenses, and found that it corresponds precisely with the depth at which nerve bundles are located beneath each of the lenses in the brittlestar's arms. Finally, the quality of the lens images is such that some researchers believe the lens construction to be superior to manmade lenses.

If we put two and two together, it appears very likely that the unassuming brittlestar uses a complex network of lenses to process images from its surroundings. Being small, each individual lens is probably not terribly effective. But if all the lenses, which are distributed over the animals arms, are linked through the nervous system, what results is an elegant compound eye that imparts vision to the brittlestar, and enables it to change colours, detect predators and seek refuge.

Makes you think, doesn't it? A simple animal, relatively low on the evolutionary ladder, may have one of the most complex, and effective photoreceptive/ vision systems in the animal kingdom.

Which brings me to the reason I started thinking about this.

At dinner recently, I met a friend of a friend, who after hearing about some of the vexing issues facing the ocean, said, "It's quite sad, but one person can't make a difference." We talked about this for some time, and I brought up examples of individuals I know who have made important contributions to changing the world around us.

Then echinoderms came to mind, specifically *Ophiocoma wendtii.*

In the case of this animal, it's reasonable to conclude that just one lens wouldn't make much of difference. After all, the small lenses can only point in one direction at a time, with a very limited field of view. Predators and such are rarely so kind as to approach from the side where you just happen to be looking.

For *O. wendtii*, it's the collective result of hundreds, perhaps thousands, of individual lenses that give it an advantage in the quest for survival. Individual lenses do make a difference, but much more so when other lenses are also functioning and cooperating.

In many ways, we are like the lenses of the brittlestar. Each of us can contribute a lot of valuable information and effort to preserving the environment, but we can be much more effective sharing what we know, and cooperating with others.

So the next time that you come across something (good or bad) that affects our reefs and waters, let others know. Write, email, fax…whatever.

The more lenses we have, the better we'll be able to see.