



It's a Small World After All!

By Tony Wu

Digital illustration ©Christopher Hart

I have a quaint little habit that reflects my early struggle to learn the English language — using a dictionary. A well-worn, bulky hardcover dictionary sits on my bookshelf next to my computer; torn, frayed and dog-eared from years of use.

After a recent trip, I tried looking up the term “ecotourism”, and was somewhat surprised to find that this word isn’t in my dictionary. Perhaps I should get a new dictionary, or perhaps there’s something more meaningful to consider.

I asked a few friends to define the term ecotourism. There were some creative answers, but nothing I thought really hit the mark. Many referred to the concept of visiting nature, seeing animals in their natural habitat, and so forth. Others suggested a component of philanthropy should be involved, perhaps a donation to a worthy cause.

All the input was good, but something was still missing.

What got me on this train of thought was a recent trip to Hong Kong, when I managed to take a short trip out on the water to look for the Chinese white dolphin, *Sousa chinensis*.

I had heard about these dolphins before — about their mysterious pinkish-white skin colour, and their loss of critical habitat due to large-scale projects like the construction of the new airport and Hong Kong Disney World. I had read that the population of these mammalian cousins of ours is dwindling rapidly

in Hong Kong waters, and I thought it worth seeing them first hand.

I signed up with Hong Kong Dolphin Watch and headed out to their boat. I listened attentively to the informative briefings from the dedicated and helpful staff, and imagined in my mind’s eye what the dolphins would do if we found them. We soon reached the pier, boarded the boat and headed out in search of these pale cetaceans.

What struck me though was quite unexpected. From the top deck of the boat, I found myself not so much looking for dolphins, but staring at the considerable quantities and forms of garbage floating in the water. Styrofoam, plastic bags, PET bottles, tin cans, aerosol containers, small appliances... everything but the kitchen sink. And not just an isolated bit here or there, but streams and piles of refuse like armies of ants swarming on a molasses patch.

There were a lot of other people on the boat, perhaps 40 or so. Some seemed to notice, but for the most part, few seemed to pay attention to the unsightly pollution. Everyone was, after all, excited about the prospect of seeing dolphins.

Time passed, and we did see dolphins. I was actually the first to spot one swimming by, and took a few pictures for good measure. The dolphins actually are very pink, almost impossibly so, and are as playful as any others I’ve ever seen. The trip was superb, and I can wholeheartedly recommend it if you find yourself in Hong Kong and don’t feel like shopping yet again.

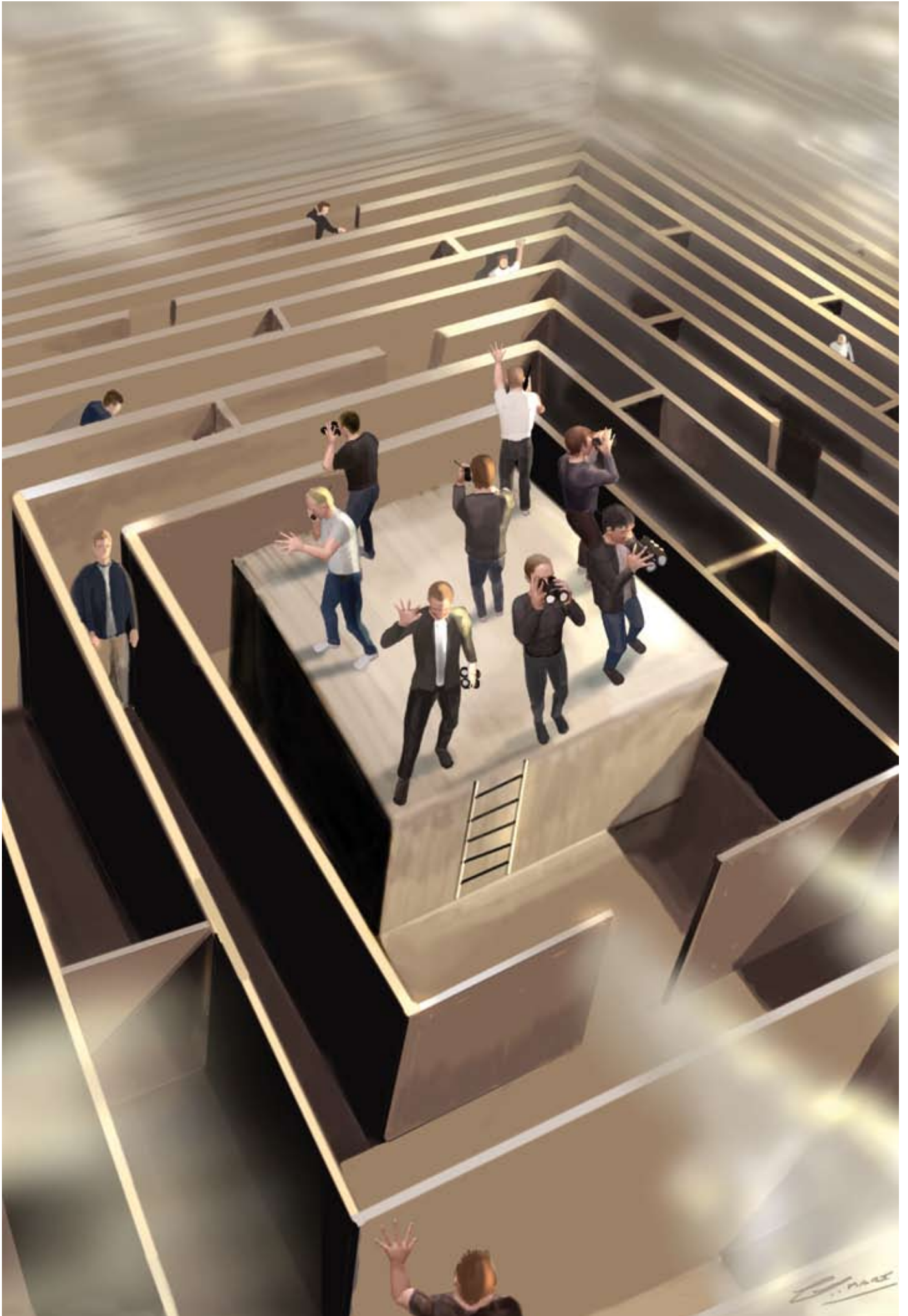
But a thought lingered in my mind as we headed back through the by-products of our civilisation. It was a nagging thought — we humans were headed back to our homes to produce more litter, some of which might end up in the home of these dolphins. I wondered momentarily what effect our garbage, both seen and unseen, had on these dolphins and other marine animals, but I quickly realised that it couldn’t possibly be good.

It was then that the concept of ecotourism came to mind.

You see, “tourism” is intended to be entertainment. We’re supposed to travel and enjoy. But unlike a family trip to some place like Disney World, where you can litter and abuse with relative impunity because the staff will clean everything up by the next morning, a trip like my journey to see the white dolphins shows that the real world doesn’t operate this way.

The lesson for me was that “ecotourism” is not just about entertainment in the Disney World sense, and it’s certainly more than taking a yuppie adventure to far-flung, pristine resorts. It is about travelling to places, whether far or near, pristine or not, to put into perspective the often adverse effect that we have had on the world, with the objective of trying to avoid making those same mistakes again.

Ecotourism is about understanding, in the words of an entertainment pioneer, that “It’s a small world after all”.



Twinkle, Twinkle,

L i t t l e S t a r

By Tony Wu

Digital illustration ©Christopher Hart

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 outstretched 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 animal’s 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 a 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.



Observations on the

JAWFISH

By Tony Wu

Photography ©Tony Wu

Until recently, I rarely gave jawfish much thought. Granted, they are quite cute, but all you tend to see of these fish is their round faces protruding from burrows in the sand or rubble. My perception of these fish completely changed when my friend Tetsu sent me some pictures of jawfish in some very engaging situations – jumping out of their tunnel-like homes, “spitting” sand, brooding eggs in their mouths. So began my personal quest to learn more about jawfish.

Being a modern diver, my first point of research was the internet. Try as I might, however, I couldn’t find much meaningful information on the web. I plugged the genus classification, *Opistognathus*, into a search engine, but came up mostly empty handed. Resorting to more primitive means, I flipped through my library of marine life guidebooks. Not much better really.

I was able to gather from various sources that there are an estimated seventy species of jawfish, and that they live in almost all tropical waters. They all have large eyes placed high and forward on the head, a disproportionately large mouth and long bodies. Jawfish live in vertical burrows, usually reinforced by pieces of coral or rock. From these homes, they watch for zooplankton floating past in the current, and dart out to grab it. Interestingly, when jawfish retreat to their holes, they can re-enter

their homes tail-first. Occasionally, there is a thin commensal shrimp that lives in the burrow, though the precise relationship between the fish and the shrimp has not been well studied. That’s about all I could find.

Tetsu had been doing some of his own research, and I joined him for a couple of weeks. We spent many hours searching for and observing jawfish, and we learned many things.

For example, we were able to find jawfish at depths ranging from one metre down to twenty-two metres. At one dive site, we found at least eight unique species, with each species living at different depths. Each species behaved slightly differently, with one, for example, being very possessive of the coral around its hole. If we moved the coral, it would look indignantly at us, dart out to grab the coral and replace it. One species was too shy to approach closely, while another was as pugnacious as a pit bull guarding a steak dinner. We also found that jawfish tend to live in small groups or colonies, so if you find one, it’s likely, though not certain, that more are nearby.

Testu also managed to figure out the breeding cycle of one species of jawfish, the gold specs. A few days before the full or new moon, some of the females swim out of their own burrows and into the homes of a nearby male. This may happen several times in one “courtship”,

with the end result being the depositing of fertilised eggs by the female in the mouth of the male. Though we couldn’t count the eggs, there were clearly hundreds in each brood. Subjectively, some females appeared to lay more eggs than others, judging by how “full” the mouths of their mates appeared. We couldn’t figure out if the females always pick the same male, but it seemed as if there were certain “pairs”.

Once the eggs are laid, the male protects them while they mature, a process that takes around eight or nine days. While watching one male, we noted that a thin membrane surrounds the eggs and holds them loosely together, somewhat like plastic wrap around a bunch of grapes. The male is thus able to leave his precious cargo of eggs inside his burrow, dart out to get food and then pick the eggs back up.

As the eggs develop, the eyes and internal organs gradually become visible, until the eggs begin to look “ripe”. When the eggs are ready to hatch, the male opens its mouth as wide as possible and breaks the membrane holding the eggs with a series of quick, jerking motions. Almost all at once, the juvenile fish hatch and swim rapidly away in the current to begin a new generation of jawfish.

So little is understood about these fish that there’s clearly much more work to be done documenting their behaviour.