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Op-Ed Contributor

Why I'm Happy I Evolved

By OLIVIA JUDSON

London

IF chimpanzees observed New Year's Day, they would have much to reflect on. In 2005, they joined humans, chickens and mosquitoes, as well as less famous occupants of the planet, on an exclusive but growing list: organisms whose complete genomes have been sequenced.

What would they make of this news, I wonder? Perhaps they would resent the genetic evidence that they are related to us. Or perhaps they would, as I do, revel in being part of the immensity of nature and a product of evolution, the same process that gave rise to dinosaurs, bread molds and myriad organisms too wacky to invent.

Organisms like the sea slug *Elysia chlorotica*. This animal not only looks like a leaf, but it also acts like one, making energy from the sun. Its secret? When it eats algae, it extracts the chloroplasts, the tiny entities that plants and algae use to manufacture energy from sunlight, and shunts them into special cells beneath its skin. The chloroplasts continue to function; the slug thus becomes able to live on a diet composed only of sunbeams.

Still more fabulous is the bacterium *Brocadia anammoxidans*. It blithely makes a substance that to most organisms is a lethal poison - namely, hydrazine. That's rocket fuel.

And then there's the wasp *Cotesia congregata*. She injects her eggs into the bodies of caterpillars. As she does so, she also injects a virus that disables the caterpillar's immune system and prevents it from attacking the eggs. When the eggs hatch, the larvae eat the caterpillar alive.

It's hard not to have an insatiable interest in organisms like these, to be enthralled by the strangeness, the complexity, the breathtaking variety of nature.

Just think: the Indus River dolphin doesn't sleep as you or I do, or indeed as most mammals, for several hours at once. Instead, it takes microsleeps, naps that last for a few seconds, like a driver dozing at the wheel.

Or consider this: a few days after its conception, a pig embryo has become a filament that is about a yard long.

Or: the single-celled parasite that causes malaria is descended from algae. We know this because it carries within itself the remnants of a chloroplast.

It's not that I have a fetish for obscure facts. It's that small facts add up to big pictures. For although Mother Nature's infinite variety seems incomprehensible at first, it is not. The forces of nature are not random; often, they are strongly predictable.

For example, if you were to discover a new species and you told me that the male is much bigger than the female, I would tell you what the mating system is likely to be: males fight each other for access to females. Or if you discover that the male's testicles make up a large part of his weight, I can tell you that the females in his species consort with several males at a time.

Suppose you find that a particular bacterium lives exclusively in the gullets of leeches and helps them digest blood. Then I can tell you how that bacterium's genome is likely to differ from those of its free-living cousins; among other changes, the genome will be smaller, and it will have lost sets of genes that are helpful for living free but useless for living inside another being.

Because a cell is a kind of factory that produces proteins, and because proteins can have a variety of components, some of which are cheaper to synthesize than others, you might expect that proteins that are mass produced are made from cheaper components than proteins that are constructed only occasionally. And you'd be right.

The patterns are everywhere. Mammals that feed on ants and termites have typically evolved long, thin noses and long, sticky tongues. A virus that is generally passed from mother to child will tend to make its host less sick than one that readily jumps from one host to another via a cough or a sneeze.

When I was in school, I learned none of this. Biology was a subject that seemed as exciting as a clump of cotton wool. It was a dreary exercise in the memorization and regurgitation of apparently unconnected facts. Only later did I learn about evolution and how it transforms biology from that mass of cotton wool into a magnificent tapestry, a tapestry we can contemplate and begin to understand.

Some people want to think of humans as the product of a special creation, separate from other living things. I am not among them; I am glad it is not so. I am proud to be part of the riot of nature, to know that the same forces that produced me also produced bees, giant ferns and microbes that live at the bottom of the sea.

For me, the knowledge that we evolved is a source of solace and hope. I find it a relief

that plagues and cancers and wasp larvae that eat caterpillars alive are the result of the impartial - and comprehensible - forces of evolution rather than the caprices of a deity.

More than that, I find that in viewing ourselves as one species out of hundreds of millions, we become more remarkable, not less so. No other animal that I have heard of can live so peaceably in such close quarters with so many individuals that are unrelated. No other animal routinely bothers to help the sick and the dying, or tries to save those hurt in an earthquake or flood.

Which is not to say that we are all we might wish to be. But in putting ourselves into our place in nature, in comparing ourselves with other species, we have a real hope of reaching a better understanding, and appreciation, of ourselves.

Olivia Judson is an evolutionary biologist at Imperial College in London.