

chapter 5

Survival of the Fittest

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It is the innate wisdom of nature that to continue to the next generation, a species needs to survive. Many species have adapted to their environment in various ways as illustrated in these five artefacts. Firstly, the bioluminescence found in mushrooms, bacteria, and fireflies. The cold light can be bacteriogenic, produced by symbiotic organisms such as *Alvibrio fischeri* bacteria or autogenic, produced by the species itself like the fungi and the fireflies. The enzyme luciferase catalyses the oxidation of the protein luciferin which then emits the glow.

The symbiosis between the bacteria and the Hawaiian squid seen in the artefact 'You Light Up My Life!' shows how both creatures have adapted to each other in the way of you-scratch-my-back-and-I-scratch-yours. The fireflies glow as a mating signal and the flash can be synchronous or non-synchronous depending on the species. This inspired the development of microscopy technology where fluorescence is utilised and amazingly the patterns seen in the chromosomes of scleroderma, an autoimmune disease, look like fireflies as seen in the artefact 'Cold Light'.

This chemiluminescence (production of light from a chemical reaction) has been the inspiration for the film Avatar where the effect seems otherworldly. The 'Glowing Mushrooms' artefact illustrates this perfectly. As one takes a night trek in the forest, one is rewarded with this magical beauty. The fungi bioluminescence is typically greenish. However, it has been reported recently that the fungal luciferase can use different substrates leading to changes in intensity and colour of the glow.

Next, there is the adaptation of chemical warfare as a means of protection as shown in the aromatic twigs of some plants. This phenomenon is explored in the artefact 'Wax and Wicks'. Various branches that contain essential oils give off a scent when they are burnt. The fragrance of the agarwood however comes from the resinous material embedded within the wood structure. The resin is produced when the tree is under attack by fungi and the resin prevents further invasion. As for the other species, the fragrance is from the oil glands.

Cats are nocturnal beings that hunt for their food in the dark. They modify their eye structure (*tapetum lucidum*) so they can see in low lighting. In Latin *tapetum lucidum* means bright tapestry. It is a retroreflector as it lies behind the retina. It is found in carnivores and deep sea animals. The artefact 'Cat-Eye Conundrum' demonstrates this with the eyeshine, which is the visible effect of *tapetum lucidum*—the eyes of the cats glow. The scientists harness bioluminescence in innovating analytical and imaging technologies. The roads are made safer at night with reflectors developed based on *tapetum lucidum*. The candle still has a place in our lives despite the modernity of lighting. Nature continues to inspire, to mesmerise, to push the designers and innovators with its patterns, textures, and mechanisms. If we take a moment to stop and really look around us, especially our natural environment, we will never run out of ideas to make our homes, offices, and built environment more organic and as close to nature as possible. Nature not only survives but also helps *Homo sapiens* to survive. It is our responsibility to look after Mother Nature to ensure the survival of all species—mushrooms, squids, trees, cats, and humans to mention just a few.