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## Behold. The Sea!

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I have borrowed my title from Walt Whitman, the words are declaimed by the chorus in the opening bars of Ralph Vaughan Williams' Sea Symphony. Doubtless Whitman was echoing the joyous cry of Xenophon's mercenary army on reaching the shores of the Black Sea: *θαλασσα, θαλασσα* – The Sea! The Sea! Down the ages the sea has captured the imaginations of many artists, composers, poets and writers. One does not normally think of William Wordsworth as being a poet of the sea but in Book II of his Prelude, where he is reminiscing about his youth, he wrote:

*I was only then  
Contented when with bliss ineffable  
I felt the sentiment of Being spread  
O'er all that moves, and all that seemeth still,  
O'er all, that, lost beyond the reach of thought  
And human knowledge, to the human eye  
Invisible, yet liveth to the heart,  
O'er all that leaps, and runs, and shouts, and sings,  
Or beats the gladsome air, o'er all that glides  
Beneath the wave, yea, in the wave itself  
And mighty depth of waters. Wonder not  
If such my transports were; for in all things  
I saw one life, and felt that it was joy.*

A *mighty depth of waters* is not a bad description of the Sea and it contains much that is *to the human eye invisible*. Most of the views of the earth seen from space are dominated by the white of cloud and the blue of the oceans. It has even been suggested that it should be named planet Water rather than planet Earth.

The author of the Book of Job puts words into the mouth of God and uses the sea as the first example of the limitations of human understanding and abilities. God offers both rebuke and reassurance:

*Where were you when I laid the earth's foundations?  
Tell me, since you are so well-informed.  
Who decided the dimensions of it, do you know?  
Or stretched the measuring line across it?  
Who pent up the sea behind closed doors?  
when it leapt tumultuous out of the womb,  
when I marked the bounds it was not to cross  
and made it fast with a bolted door?  
Come thus far, I said, and no farther:  
here your proud waves shall break.*

Even now the sea strains the limits of human understanding. There is an element of ambivalence in our attitude to the sea. In its benign state we flock to its sandy

beaches and take to its waters in all manner of small, and not so small, craft. But we also recognize that the sea also has its violent moods of flood and tempest. The energy associated with an average hurricane is of the order of  $10^{14}$  Watts which is about 200 times the world's total capacity for generating electricity! It is not surprising that seafarers generally have a profound respect for the sea, coupled with the realization that the sea is implacable.

The volume of all the seas put together is more than 10 times that of the land above sea level, and nearly three quarters of the surface of the earth is covered by sea. By any measure you care to use there is an awful lot of it. The deepest place in the ocean is in the Marianas Trench in the Pacific and it is about 11,000m below sea level, some 2000m more than the height of Mount Everest above sea level.



It is quite impossible to do justice to the sea in all its aspects in a short article. I will focus on the sea as a beginning place, as a source and origin of things. And, to start off with, to consider where the sea itself came from. What was the origin of all that water? The matter is far from settled but the most generally accepted theory at the moment is that just after the Earth formed it was very hot and dry but as it cooled, around 4 billion years ago, it was bombarded by millions of water-rich comets and asteroids. The idea is supported by the fact that the ratio of deuterium (heavy hydrogen) to hydrogen in our sea water matches the value found in water-rich asteroids, suggesting a common origin. This may not be the whole story but it is almost certainly a significant contribution.

Where did all the salt come from? The origin of the saltiness is the land, it has its origins in the massive processes of recycling of material between land and sea. Most of the dry land of the earth was formed in the sea.

The sedimentary rocks of the dry land have their origin in the sea and are formed from the remains of living organisms or from the ground down remains of other rocks in a slow but massive process of recycling. Tectonic movements providing the uplift from the sea where wind and rain act to erode the rock and return the material to the sea, where the insoluble and soluble elements are separated, finishing up either as sea salt in solution or as sediment on the sea bed. These processes, the cycle of rock and the cycle of water, have been going for several billion years and will continue to do so for the rest of the history of the earth.

But without question the most significant aspect of the sea is its role in the history of life on earth. It is generally believed that life began in the sea about 3,900 million years ago and for the next 3,400 million years or so, life was found exclusively in the sea. It is worth repeating this in bold – **life began in the sea about 3,900 million years ago and for the next 3,400 million years or so, life was found exclusively in the sea.** It is only some 500 million years ago that the first living organisms struggled onto the land. For nearly seven eighths of the history of life on earth, life was confined to the sea. The organisms that live on the land are relative newcomers in the history of life on earth, as we humans are newcomers among the dry-landers.

Part of the legacy of this is the greater diversity of life in the sea than on land. There are 37 different major groups of animals and of these 25 are found only in the sea. 10 occur on the land and in the sea and only 2 are not found in the sea. One of these is the insects which made it to the land from fresh water and there are many insects which still spend some or most of their lives in water. Over something like 100 million years only ten different kinds of animals crawled out of the sea and managed to survive on the land. Life is really at home in the sea. Humans still have something like sea water in their veins although among the prices we have had to pay for living on land is the fact that we can no longer drink it.

It is perfectly true that having made it, life on land has been very successful. Which is just as well, or else none of us would be here. But it is also true that quite a few land animals have returned to the sea for some or all of their lives. Otters, seals, dolphins and whales among the mammals and also lots of birds spend nearly all their lives at sea. These happen to include two of my favourite birds, the Gannet and the Brown Pelican.

There is a very significant difference in the nature of the basic food web in the sea as compared with the land. On land the plant life tends to be bigger and to live longer than the animals that eat them; trees and people, and plants and insects are obvious examples. In the sea it is

the other way around, apart from the seaweeds most of the plant life survives for only a few days or weeks and the vast majority are single celled organisms, while most of the animals live for months and a lot of them live for many years. The sea has its own ways of being and its own ways of nurturing life. And, in spite of Wordsworth's claim it is difficult for us to cultivate the *sentiment of Being spread/.../ Beneath the wave, yea, in the wave itself/ And mighty depth of waters.* I spent my working career engaged in studies of the ecology of marine organisms most of which are *to the human eye invisible*, at least without the aid of a microscope, but these same organisms are the equivalents of the plants and plant eating animals, the grass and the grazers, that are found on land.

In many traditions the sea is identified as the primeval chaos out of which the ordered life on earth is created. In the creation myths of many of the Native American peoples, both north and south, all that there is in the very beginning is the sea. One of the early Greek creation stories has a Sea Goddess, Eurynome dancing on the waters of the sea, because that's all there was, and creating the great serpent Ophion from the North Wind. Eurynome goes on to turn into a bird and lay an egg which, with the help of Ophion, hatches to produce the world and every thing in it. The Finnish epic of the Kalevala echoes the long gestation of life in the sea. Ilmatar the water-mother lives storm tossed in the ocean for seven hundred years and then a further ten years carrying her firstborn. Only then she:

*Lifts her head above the surface,  
Lifts her forehead from the waters,  
And begins at last her workings,  
Now commences her creations,  
On the azure water-ridges,  
On the mighty waste before her...*

And she goes on to create the land as the home for her son Wainamoinen.

In addition to involving the sea, these creation stories have in common the fact that they involve struggle, they imply that creation is hard work and difficult. This echoes the vast period of time involving seemingly endless trials and failures before the existing groups of living things emerged. And it seems that this could only have taken place in the womb of the sea.

*Michael is a member of the editorial team of GreenSpirit journal. His working career was devoted to research on the planktonic ecosystem of the North Atlantic and the North Sea (see pp. 25-26)*