

The long voyage to the defeat of scurvy

The need to include fresh plant food or raw animal flesh in the diet to prevent disease has been known from ancient times. The preventive and curative use of lemon juice for scurvy was recommended as early as 1617, and in 1734 abstinence from fresh vegetables was charged with being the primary cause of the disease. This knowledge was either disregarded or not widely known, and some people attributed this scourge of lengthy sea voyages and polar and desert exploration to other occurrences — even the direction of the wind in Borneo.

A fortunate landfall would yield scurvy grass (*Cochlearia groenlandica*). Within days of eating the leaves, gums shrank back to their normal size, legs straightened, bruising disappeared, teeth no longer wobbled in gums, joints stopped aching and energy was restored.

In 1747 the ship's surgeon James Lind performed what is considered to be the first controlled experiment, comparing results on two populations of a factor applied to one group only with all other factors remaining the same. Two groups of crew members took normal rations but one of the groups had in addition two oranges and one lemon per day. The results conclusively showed that citrus fruits prevent the disease. Little action followed publication of Lind's work, partly because he



gave conflicting evidence in the book and partly because the British Admiralty was indifferent to the welfare of the common sailor.

In the later 1700s James Cook insisted on a diet that included cress, sauerkraut and an orange extract, together with fresh meat when possible. But grizzled sea dogs, accustomed to a diet of salt beef and hard tack, often refused the healthier provisions. It took constant supervision — and the occasional 12 lashes — before they accepted the regimen. Cook's antiscorbutic diet became a model for expeditions and long-distance sea travel.

It was 1795 before the British navy adopted lemons or limes as standard issue at sea, but the reason why vegetables and lime juice were

effective remained a mystery. Some continued to have their own ideas about scurvy, and in the early 1800s the Arctic explorer William Parry advocated beer and exercise as part of an antiscorbutic regimen. As would be discovered later, alcohol and exertion both exacerbate the condition.

Regular sips of lemon juice did not always keep scurvy at bay. Victuallers often issued the juice in concentrated form after boiling it in copper containers. We now know that heat destroys vitamin C and copper catalyses the degradation. But at the time nobody knew that lack of the vitamin was responsible for the disease — or even that vitamins existed — and sea captains assumed wrongly that Lind's suggestions did not work. As late as 1893 Fridtjof Nansen took to the Arctic a store of provisions so varied as to supply whatever was needed to fend off scurvy. It was not until 1932 that vitamin C was identified as the curative agent for scurvy.

A long-standing question was how the Canadian Eskimos (the Inuit) lived on an almost vegetable-free diet yet avoided scurvy. The answer is that most creatures manufacture vitamin C internally and the Inuit got the vitamin from fresh meat that was minimally cooked. But explorers tended to cook their meat thoroughly, thus destroying this life-saving principle.

Cold comfort in the land of fires

Charles Darwin was intrigued by the Amerindians of Tierra del Fuego when in 1831 he sailed on *HMS Beagle* round the southernmost tip of South America on his way to survey Pacific wildlife. Describing the garb of those living on the east of the cape, he wrote: "Their only garment consists of a mantle made of guanaco skin, with the wool outside: this they wear just thrown over their shoulders, leaving their persons as often exposed as covered." And of those on the west, he wrote: "... the men generally have an otter-skin, or some small scrap about as large as a pocket-handkerchief, which is barely sufficient to cover their backs as low down as their loins. It is laced across the breast by strings, and according as the wind blows, it is shifted from side to side."

Tierra del Fuego is a rugged, mountainous and forested land. The region is foggy and inhospitable. Gale succeeds gale, with rain, sleet and snow. The Fuegians' wigwams offered almost no protection from the weather. At night five or six beings, naked and scarcely protected from the wind and rain, slept on the ground. One of Darwin's most striking accounts is that of a woman in a canoe who drew alongside the *Beagle* and remained there out of mere curiosity, while sleet fell and thawed on her naked bosom and on the skin of her naked baby.

The Fuegians gathered shellfish and a few tasteless berries and fungi. The killing of a seal or the discovery of the floating carcass of a putrid whale represented a feast. In search of food they were compelled unceasingly to wander from spot to spot.

Darwin asked himself what pleasure life afforded these people and what could have tempted a tribe to leave the fine regions of the north and enter this inhospitable land. The Fuegians will, however, have drawn cheer from their fires, after which the archipelago was named.

A Victorian engineering triumph

A survey among friends and acquaintances suggests that the British rarely consider the Isle of Man as a holiday destination. This is surprising, in view of the wealth of historical, cultural and scenic interest and the wildlife-spotting opportunities that the island affords.

The island's greatest icon is the Lady Isabella, the Laxey Wheel, named after the wife of the governor of the island. This was completed in 1854 to pump water from the depths of the Great Laxey Mine, which was one of the major producers of lead and zinc in the British Isles.

Coal deposits are not found on the island, so the option of coal-fired steam pumps was rejected on cost grounds and hydropower was employed to drain the mine. The water wheel was designed by the Manx engineer Robert Casement. The axle and cranks were cast in Ellesmere Port and dropped onto the beach at Laxey Bay. The rope broke while a gang of miners was hauling the 9,000kg axle to the wheel site, and all but one of the men fell forward. The lone man who remained upright was sacked on the spot for not pulling his weight.

The wheel has a diameter of 22m and a width of 1.83m. It is of the pitch-backshot type, where water is fed to near the top of the wheel, filling the buckets to provide the motive power. The water was supplied from a cistern higher up the valley in which the wheel resides and, of course, at a level higher than the top of the wheel, which revolves 2.5 to four times per minute. The wheel crank is attached to a system of rods that run to and fro for 180m along an elegant masonry viaduct, leading to the shaft which housed the pumping mechanism. The wheel could pump 1,000 litres of water per minute from a depth of almost 450m. No water wheel capable of such power had been built before in the history of mining. The working life of the wheel was 75 years.