

**Date: Fri, Feb 5, 2010 at 2:13 PM**

**Subject: Scholes cabin 5 (p): Wind chill**

Dear Stirling,

We are playing cat-and-mouse with the ice again. The cargo we need to take back to Cape Town is waiting for us on the ice shelf. It is mostly waste materials from SANAE IV and the dismantled Neumayer II - nothing gets left here, not even the pooh! If we stay next to the shelf and the wind blows from the east or north we risk getting trapped, or worse still, the ship being damaged by the ice-floes that drift into the bay. So when we see ice coming we duck out into more open water and putter around there until another gap opens up.

The slow cruising makes for very pleasant evenings on the monkey deck, though. There are lots of birds around - Wilson's storm petrels, snowy petrels and skuas, Adelie and Emperor penguins. We quite often see Weddell or crab-eater seals and whales - I am not sure which sort, because we don't have a whale book. They are quite small, so they are probably Minke whales, but there was also an Orca the other day.

The summer is very brief here. Although we are just over a month after the solstice, and the sun only dips below the horizon for a short period, it is already noticeably cooler. Often the air is at -8 degrees Celcius. You can feel that it is cold, but you don't realise how cold until a bit of a breeze springs up. Then you had better get your snow-trousers, padded jacket, hat and gloves, or you will soon be shivering and have lost sensation in your fingers and toes! Why is that?

From a physiological point of view it is not so much the temperature that matters as the rate of heat loss. Humans (and other mammals and birds) are 'homotherms' - in other words, we regulate our body temperatures within a very narrow range, rather than allowing them to vary with the environmental temperature, as fish do. To achieve this, the rate of energy loss has to exactly balance the rate of heat production by the body. We can adjust our rate of heat production a bit by using our muscles (for instance, by shivering). Mostly we regulate our rate of energy loss - by cutting down circulation to exposed parts like our fingers and toes, but especially in humans, by putting on clothes or seeking shelter.

Our bodies lose heat in four ways - conduction, convection, radiation and the evaporation of sweat. I will ignore sweating for the moment. Conduction is through direct contact with a cold object - like why my bum gets cold when I sit on the steel bench on the monkey island. We fix that with insulation - that is what the padding in my snow trousers is for and why my snow boots have 5 cm thick soles. Convection occurs when air or water carries the heat away from our bodies. Under most circumstances it is

the main way in which we lose heat. The rate of heat loss goes up steeply with the speed at which the air or water flows past us, and this is the basis of the 'wind chill index'. For instance, if the air temperature was 0 degrees C and the wind speed was 10 km/hr (a light breeze), it would seem as if it were -2 degrees C; whereas if the wind was 20 km/hr it would seem to be -10 degrees!

The way to protect against wind chill is to wear windproof clothing. You quickly realise that fleecy insulation layers are no good unless there is an outer shell trapping the air inside. You also learn to close up little gaps, like around your neck, using a scarf.

The third way we lose heat is by radiating it. It is funny to think that we glow, just like the sun! We do, but because we are much cooler than the sun our radiation is in the infrared spectrum which cannot be seen with the human eye. You can see it with a special camera. On the bridge of the coastguard vessels they have an infrared camera that can see the warm heads of abalone poachers bobbing the cold sea. Radiation is blocked by reflective coverings - that is partly how those thin, silvery survival blankets work (the other part is because they keep the wind off). The hot parts of our body radiate the most. Since the brain uses nearly half of the energy of the entire body, putting a hat on really helps!

Remember these rules when you go out rowing on a cold dam: try to stay dry (water conducts much more heat than air) and put on a wind shell if there is a breeze. Hypothermia does not only happen in Antarctica!

Love

Dad