Interview with Oceanography Chief

Dr Angus McEwan is the Chief of CSIRO's new Division of Oceanography. In his previous work at the Division of Atmospheric Physics, Dr McEwan earned an international reputation for his highly original laboratory experiments in fluid dynamics — a field that relates to both meteorology and oceanography.

Andrew Bell spoke with him recently.

What do you think are the most important links between atmospheric physics and oceanography? Is it possible to put that into a nutshell?

Oh, I think so. In spite of the fact that they look so different, the sea and the air have a lot of things in common. The dynamics of the two are the same, and if you can achieve an understanding of the dynamics of one of them, you can understand the other as well. The other connection, of course, is that they are strongly interacting systems. You have wind blowing over the water and it causes water to move, creating currents.

So it's hard to say whether understanding ocean currents is a problem of atmospheric physics or of hydrodynamics?

It's literally both. You can't take one into account without considering the other. For all sorts of things, all sorts of motions that occur in the ocean, the driving force actually comes from the existence of winds above them. For example, the East Australian Current, and the eddies that that breaks into — all these basically have their origins in the action of the wind.

Do you think that in 20 years' time we will be able to predict ocean movements the way meteorologists predict air movements today?

Well, they are doing that to some degree now. Water and air are the same kinds of medium; they both obey the same kinds of dynamical laws. It is possible today to use an atmospheric computer model, with very few modifications, to predict the movement of the ocean.

One of the difficulties, though, is that the scales of motion in the ocean are smaller than those in the atmosphere, so the highs and lows that prevail in the atmosphere are about an order of magnitude larger than the highs and lows, if you like to call them that, in the ocean. So you need to resolve what is going on to a higher degree of detail in the ocean than in the atmosphere. But it's entirely possible to do so and the Americans have done a fair bit of work.

Will the Division be studying pollution problems?

No, probably not. I would say pollution is really outside our ambit, in the early stages at least. The only possibility there is that we may get a little bit interested in pollution chemistry. The degradation of, say, oil spills on the sea surface, or the surface chemistry associated with pollution — that sort of thing. Possibly, we may study heavy metals in the ocean. But that really is not so much tied up with pollution because a large proportion of the interest in pollution relates to the near-shore areas, the estuaries and places like that.

I was wondering about dumping chemicals at sea and radioactive casks in the bottom of the ocean.

Dr Angus McEwan

We certainly have an obligation to investigate the dynamical factors that might be involved in such activity as that — that's part of our job. But I think other aspects would be outside our province at this stage.

What does happen if a nuclear submarine has an accident under water off Australia?

Now you are talking about what's really a dynamical problem. Your main concern is the direction in which the pollution or radioactive material would go. And that's dynamics. The thing is that the dynamics of the ocean really stands alone — ocean chemistry and biology are dependent on that. However, questions of wastes — movement of wastes and pollution and so on — will not be a matter of primary scientific interest for the Division.

Neither, in the field of atmospheric physics, is the study of smog and the way that carbon dioxide builds up. But surely some interaction with these problems must occur eventually?

Indeed. But a distinction is that the atmospheric environment affects the whole of humanity directly. In the oceans the circulations are slower, the ocean is more positively stratified, and the influences are much more subtle. That's not to say that I'm devaluing pollution studies in the ocean by any means. But you can really say quite fairly that they are more regional than the atmospheric problems.

You can't draw a direct analogy between, say, the examination of fluorocarbons in the atmosphere, which are everywhere and influencing the climate of the whole globe, and the deposition of some pollutant in the sea. The sea is very deep in places and sites for dumping can be chosen so that you can say with a reasonable degree of certainty that the material isn't going to have any influence. It is going to degrade before it exerts any effect on the biological processes of the ocean.

Because the mixing layer is very shallow?

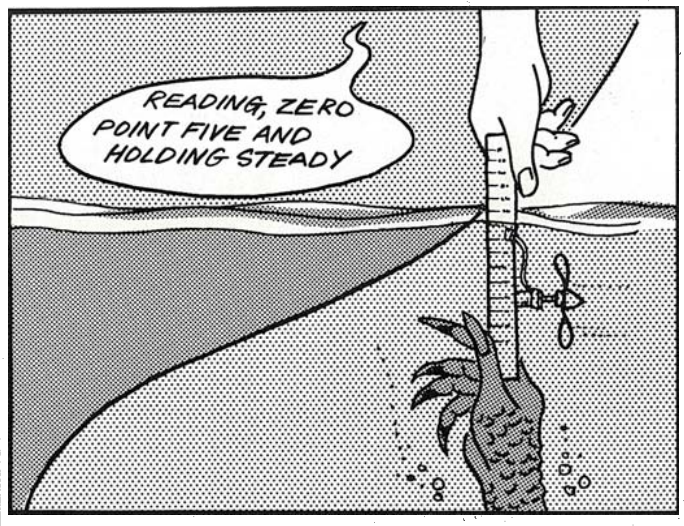
Yes. The ocean is stratified to great depth, with pools of very cold water, very deep, which will be in an environment lacking movement. But I'm not saying at all: 'Let's not worry about pollution in the ocean'. What I am saying is that, as far as choosing topics for detailed scientific exploration is concerned, there are more important things for us in Australia to be studying.

So little is known about the dynamics of the Australian waters, and the processes of chemistry and biology that go on in them, that it really is a discovery science. We have a responsibility, primarily, to just find out what is going on.

And this is an area that has been ignored to date?

Oh it certainly has. But it's very expensive research, so it's not surprising that people have been reluctant to embark upon it.

Oceanography is at the same kind of stage — to draw a crude analogy — as meteorology was at the turn of the century. Then people were making observations of one simple parameter, like atmospheric pressure, and reporting it between Melbourne and Sydney by telephone. Similarly, in oceanography today what happens is that somebody gets into a ship and goes out and does a few measurements at various points along a line and tries to deduce from that what is going on.



However, we do have a few things that will help us nowadays. One important thing is the satellite. Satellites are capable of revealing very small temperature differences on the sea surface; and, using computer capability to enhance those differences, it's possible to pick up features and to make good deductions of the movement of ocean waters. This saves people from actually going out to measure everything. Instead of going out and saying 'let's go and see what we can find', they measure specific things.

The Division of Oceanography

Research activity of the new Division is directed towards: 'investigations of the physical and chemical oceanography of coastal and oceanic waters, aimed at providing an understanding of their dynamic behaviour, productivity and sensitivity to pollutants'.

Initially, the Division will consist of the physical and chemical oceanography groups of the former Division of Fisheries and Oceanography, located at Cronulla. Additional staff are being recruited, and all will ultimately transfer to new CSIRO Marine Laboratories projected for construction in Hobart and currently under consideration by the Parliamentary Public Works Committee. The new Division of Fisheries Research will share this site.

The Executive of CSIRO has identified marine science as an area of highest priority and commitment in its future allocation of the Organizations's resources. In addition to endorsing the new Marine Research Laboratories, the Prime Minister has announced the Government's approval that CSIRO should acquire a modern oceanographic research vessel.