THE HISTORY OF THE MURRAY RIVER OVER THE LAST 12 MILLION YEARS
Report on talk given by Dr Malcolm Wallace of Melbourne University on 27 July 2005

We apologise for the delay in producing this report but know that many members, particularly country ones, are unable to come to meetings and rely on these reports to keep up with our Geology program - so better late than never. This was a popular topic with an attendance of 49, the second highest since we started keeping detailed records in 1999.

Malcolm linked several areas of research to give us the broad picture and background to his theory that the Murray River once entered the sea near Portland, Victoria. He first described the evidence for uplift between 10 and 5 million years ago, followed by a marine transgression in the Pliocene. This sea then steadily retreated as an east-west axis across Victoria and South Australia was uplifted. The retreating sea left a remarkable series of strandlines dating from 5-3 million years both across southern Victoria and the Murray Basin, the whole feature being termed a strandplain. The uplift blocked a postulated proto-Murray flowing south along the line of the Wimmera and Glenelg. The impounded freshwater formed a huge lake (Lake Bungunnia) in the Murray Basin which gradually became saline as the climate became more arid from about 1 million years ago. Eventually the dammed Murray broke through to the sea along its present course in South Australia.

12 million years ago Miocene cool-water carbonates were being deposited in several marine sedimentary basins: the Murray, Otway, Port Phillip, Bass and Gippsland Basins. Then the sea withdrew (regression). Movements in sea level can either be eustatic or due to tectonic uplift or down-warping. Eustasy is when the global sea level changes, perhaps because of bulging of the ocean floors or during the Quaternary when water is locked up in ice sheets. Eustatic changes will be uniform over southern Australia but tectonic or earth movements will generally be more localised.

It was uplift across Victoria that led to the sea retreating about 10 million years ago. The gap in the marine record is marked by an unconformity. For instance, at Beaumaris the Miocene at water level is dated at 10 million but immediately above the famous nodule bed with its fossil teeth and bones, the Blackrock Sandstone is 5 million years old. Similarly, those who went to Muddy Creek near Hamilton recently, saw Pliocene shell beds of 5 Ma (Ma = mega anna = million years ago) underlain by Miocene clay dated at 10 Ma. Hundreds of metres of strata were removed by erosion during this 5-million-year gap.

There was then a marine transgression in the Late Miocene with sandier sediments being deposited. The extent of this incursion of the sea has only recently been appreciated through the analysis of high-resolution airborne geophysical data from Geoscience Victoria and the NASA shuttle. This data shows accurate elevation and magnetic intensity and picks out the strandlines or barrier sands where the shoreline was fixed for a

while before the sea continued its gradual withdrawal. The climate during the Pliocene was warmer and wetter and the barrier sands were subject to lateritic weathering to produce ferricrete, an iron-rich capping. This resists erosion and so may show a higher elevation but its iron content will also show in the magnetic imaging. The strand-lines can actually be traced under parts of the basalt cover in the Western District; they also extend offshore in the Gippsland Basin. In the Murray Basin the strand-lines contain valuable mineral sands and there is the possibility that the newly discovered barrier sands could also.

The uplift that led to the sea retreating was most marked northwest of the Otways where the oldest strand-line is at an elevation of 250 m. The east-west axis of uplift included the Western Highlands-Dundas Highlands, the Gambier Axis and the Padthaway High further west. It was this uplift that blocked what Malcolm believes was the original course of the Murray. Geophysical data and drilling near Horsham show a deep trench beneath the present Wimmera-Glenelg alignment. The present-day gap between the two rivers has a north-south series of small lakes. Offshore at Portland there is a sand-filled canyon that matches a possible outlet of the proto-Murray.

Further evidence for this blocking of a proto-Murray is that at the time when the Pliocene uplift reached its maximum, about 3.2 Ma, a mega-lake (Lake Bungunnia) formed in the Murray Basin. At first freshwater, the lake deposits show the onset of more arid conditions towards the end of the Pliocene with the deposition of dolomitic carbonates. It was the low sea level periods during Northern Hemisphere ice ages that increased aridity. About one million years ago the Murray broke through the barrier at Murray Bridge either through fault movement or erosion; by this time Lake Bungunnia had been reduced to isolated saline lakes.

Our thanks to Dr Malcolm Wallace for a fascinating presentation.

Rob Hamson and Lyn Ansell