GEOLOGY GROUP
WATERFALLS
Report on talk by Associate Professor Ian Rutherfurd of Melbourne University on Wed 25 Oct 2006

The internet is full of information about waterfalls – photos and statistics – and some people seem to 'collect' them; they log every one they visit. However, there is very little information about why waterfalls are where they are. The National Parks service in Victoria always gives the simple explanation of a harder layer of rock but the situation is more complex than that. Our speaker who is a geographer and Head of School in SAGES at Melbourne University gave us a quick tour of waterfalls of the world, covered the terminology used to describe waterfalls and explained why waterfalls are where they are with particular reference to Victoria.

All waterfalls recede as they erode, becoming cascades and eventually disappearing. One would expect most of the erosion to be beneath the falls but the depth of the plunge pool is limited to how deep the falling water penetrates the pool. There is also erosion above the lip of the falls as the flow accelerates along what is known as the drawdown reach. Current research is starting to show that much erosion is due to sub-surface seepage undermining waterfalls.

Two patterns of drainage can give rise to waterfalls. A *superimposed* system might have a river flowing across horizontal sedimentary rocks underlain by folded strata. When the river erodes down to the unconformity separating the two rock types, it maintains its original course but there may be waterfalls where it crosses harder bands. With *antecedent* drainage, a river has a pre-existing course when geological processes start to alter the landscape it is flowing over, for instance doming up an area. The river follows the same course and keeps pace with the doming but waterfalls may form where harder bands are encountered.

Volcanic activity has given rise to many of the waterfalls in Victoria with rivers such as the Wannon flowing over the ends of lava flows that have filled their valleys.

River capture can also create waterfalls. Bigger rivers erode downwards faster so the Snowy River in Victoria is some 200m lower than one of its tributaries, the Rodger River, at a point where their winding courses take them very close. Research indicates that the Snowy only has to erode another 15 metres sideways before it captures the flow of the Rodger. The same research also suggests that this process will take 1-4 million years!

General uplift or a fall in sea level set off knickpoints in rivers. These erosive points migrate up the river system but faster on larger rivers. The knickpoint itself may be a waterfall or waterfalls may form where the tributaries enter the main water course which has already lowered its bed. In one interesting case, that of the catchment of the Apsley and Macleay Rivers in New England, all the knickpoints are unusually the same distance from the start point (200km from where the river meets the sea). Research shows that the type of rock and erosion along the sides of the waterfalls have determined a uniform rate of cutback.

Waterfalls can also be man-made. Ian pointed out that the head of a gully extending across an eroding paddock is a waterfall. From this comment came some discussion of streams incising their courses and the fact that a natural feature known as a chain of ponds is now quite rare, having been degraded by cattle or straightened into drainage channels. It seems that chains of ponds were quite common from South Australia through Victoria into NSW. Research has shown that the ponds are not the result of scouring by floods but represent the remnants of streams which have been filled with sediment.

The geology Group would like to thank Ian for a stimulating and entertaining talk and we look forward to the excursion on Sat 11 Nov to see some of these features in the field in the Bacchus Marsh area.

Rob Hamson