

HOW WE MAKE A GEOLOGICAL MAP

Talk given by Dr Vince Morand of GeoScience Victoria on Wednesday 28 February

Dr Vince Morand has worked at GeoScience Victoria for ten years and before that was a lecturer in geology at the University of Ballarat. He is concerned principally with mapping and now that geological maps are in digital form, that there is a seamless join between what were once separate paper sheets. We had a technical problem at our meeting and despite Wendy Clark coming in with an alternative laptop, Vince was unable to give his Powerpoint presentation. However, by speaking with just the aid of a paper map, Vince was able to cover his subject and the less formal style allowed a great deal of question and answer with the audience which made it after all a successful night. During his talk our speaker discussed what was being mapped and the methods used to gather information.

On the whole, it is the solid geology that is being mapped. The wind-blown sand of the Little Desert has been left off the latest 1:1000,000 map of Victoria because it is less than 10m thick - even though it shows up clearly on radiometric surveys (see below). It shows up black on these as it is quartz sand and has no radioactive signature. With regard to seamless maps, this could be problematic if South Australia marks it on its maps. Another example of differences between Victoria and South Australia is in the stratigraphic divisions used for the economically important mineral sands of the Murray Basin. The South Australians distinguish between a non-marine Parilla Sand and the heavy mineral-bearing marine Loxton Sand whereas in Victoria the two are lumped together as the Parilla Sand.

There is some demand for maps showing the superficial deposits known as regolith in current parlance but after a small number covering the goldfields were produced in the mid-90s, nothing much more has been done. Mining companies, particularly those involved in gold exploration, are interested in pre-Permian geology so maps have been prepared showing just the Palaeozoic.

With regard to gathering the information required to make a modern geological map, the first step is to look at the existing maps. Until the 1980s geological mapping was done by fieldwork combined with aerial photos. Geologists would not examine every inch of ground but might follow a creek and outcrops and use extrapolation to map strata. Vince mentioned that Lake Eildon was surveyed by hiring a houseboat and taking it slowly along the shore.

In recent years airborne radiometric and magnetic data have added greatly to the information available to the map maker. Radiometric surveys detect gamma rays emitted by potassium, thorium and uranium in the top 30-45 cm of the Earth's crust. This is obviously the soil but it reflects the make-up of the rock beneath, being derived from it. The radiometric maps show K as red, Th as green and U as blue. Granites and shales contain feldspars and clay minerals respectively which contain potassium and so the distribution of these rocks will show as red.

The airborne magnetometer measures the strength of the Earth's magnetism to a much greater depth of 10 km. Scattered grains of the mineral magnetite are present in rocks such as basalt and granite and act as mini-magnets. Thus granites can be detected beneath a thick cover of sedimentary rock. In the Murray Basin, for example, the

Lake Boga granite barely protrudes above ground level but its much larger subsurface extent is revealed by its magnetic signature. Vince was asked if this granite which is famous for some of the rare radioactive minerals found there shows up on the radiometric surveys. He thought that the flight lines 200 m apart could well miss such a small exposure. Ground gravity surveys with readings spaced at 1.5-2 km are also adding to the data. Granites show up as they are less dense than surrounding rocks.

Bringing us up to the present, Vince's fieldwork these days is aided by a hand-held computer with GPS so notes can be made on the spot instead of the laborious transfer of information back at the office. In spite of all the high-tech equipment, he tells us that the boundaries between rock strata, the faults and so on are still drawn by hand on geological maps.

Our thanks to Dr Vince Morand for an informative and interesting talk.

Rob Hamson