

## *Vale Ernie*

Ernst (Ernie) Albert Holland died on Sunday 20 June surrounded by family. Many of our more recent members will not have knowledge of this man. Ernie was a 'larger-than-life' persona (despite his small stature). A long-term guide, and then the Senior Guide, at Jenolan. His enthusiasm and knowledge of caves (and minerals) was both extensive and invigorating.

Ernie was the first President of the then ACMA elected at the inaugural meeting at Yarrangobilly in May 1987. A triumvirate appeared in ACMA at that time – Ernie Does, Celery Reckons and Andy Sez!

A fuller obituary will appear in the September Journal.

## ANDYSEZ 61 CONTINUED...

### A LITTLE MORE ON EARTHQUAKES

Andy Spate

I felt that I had not given you enough information in the last ANDYSEZ on why the people in Jewel Cave didn't feel anything back in 1968 while the kiosk was damaged.

So, I went Googling – as one does - and was surprised to find that some old codger named Andy Spate had written about earthquakes 16 years ago that was to be found in the ACKMA Journal 58 (March 2005, pp 32-37) as ANDYSEZ 51. It was prepared in the same month the original ANDYSEZ 61 - I had forgotten about the article completely!

You can see it at <http://www.ackma.org/membersonly/journal/58/Andysez%2051%20Earthquakes%20And%20Caves%20Andy%20Spate.pdf>

In the same issue, Rolan Eberhard talked about earthquakes at Marakoopa (MC120, Mole Creek – a tourist cave).

On rereading both ANDYSEZs 51 and 61, I was pleased that there were no major inconsistencies or errors (I hope) – the former dealt mainly with earthquakes themselves while 61 was mainly about speleoseismicity.

I want to touch a little more on what one feels, or doesn't feel, in a cave when the ground shakes. In Rolan's 2005 article he says:

On the 22 December 2004 ... We experienced a very obvious rumbling lasting about 5-10 seconds ... None of us noticed a sensation of earth movement. Enquiries later revealed that cave guides who were at the office just outside the cave entrance did not notice a loud noise or anything unusual at the time.

Later Rolan goes on to mention another quake in November 2004 when:

... Dawn was guiding a group through a section of Marakoopa ... The quake manifested itself as a loud roaring noise ...

A curious feature of the November tremor is [was] the lack of noticeable earth movement inside the cave. The event generated sufficient ground movement outside the cave to cause Ross McNeill to be concerned for the safety of the underground party [who did not report shaking and delicate speleothems nearby were not seen to vibrate.

At <https://earthscience.stackexchange.com/questions/5181/is-it-true-that-earthquakes-are-not-felt-in-a-cave>, an unidentified discussant wrote that:

There are three main types of waves produced during an earthquake: P, S, and L waves, which stands for Primary, Secondary, and Love. (There was a mnemonic I read many years ago that went P=pressure, S=Shear, and L=Long.) The P and S waves are body waves. That is, they propagate inside the earth. The P wave is basically a sound wave; as the mnemonic goes, a pressure wave. The S wave is a shear wave and is perpendicular to the direction of fault slip. The L wave, which has the highest amplitude is a surface wave and, as such, propagates along the surface, not inside.

If you were inside a cave when an earthquake occurred nearby, you would not feel the L waves, since they propagate along the surface. Whether or not you would feel the P and S waves would depend mainly on two things: the magnitude of the original earthquake and the type of fault that produced it. If the fault were a thrust fault, the S wave would be up and down, which a standing person probably wouldn't feel unless the earthquake was quite large (>5.5?). However, if the earthquake were along a strike-slip fault, the S waves would be side to side, which a standing person would likely feel.

It seems likely, then, that the damage to the Jewel Cave kiosk was caused by an L wave or an S wave.

Arthur Palmer (2007, page 80) sums the matter up as follows:

Earthquakes seldom have a noticeable effect on caves because the shock-wave intensity decreases sharply with depth below the surface. The local bedrock usually moves almost as a single coherent block that is fairly resistant to damage. People who have experienced earthquakes whilst within caves report low rumbling sounds, oscillation of water surfaces, and occasionally a few loose rocks sliding down slope, but rarely anything more dramatic.

Anyway, that is probably more than enough on earthquakes and caves. Thanks, Rauleigh, for so expeditiously supplying Rolan's article.

Reference:

Palmer AN, 2007, Cave Geology, Cave Books, Dayton, USA