ANDYSEZ 22
PHYTOKARST PART TWO

What on earth am I going to write about this time? Kent has, as usual dropped the deadline on me - altho' I should have known better and been prepared. I haven't got any reference books or other paper warfare with me - And I haven't had any feedback from you mob, either. I am going up to Yarrangobilly in the morning to undertake a heavy weekend of feral fish eradication with me new mate, Michael Carr (the new manager at Yarrangobilly), so perhaps he can suggest a few ideas in the morning. Or perhaps Wendy Ross has a specific question? What can we say about earthquakes? Going back to the previous ANDYSEZ I see that this tirade is pointless as I have already committed us all to a second go at phytokarst. So I had better do that - but not tonight! It is too hot!

A few days, and more thinking, later. I don't think that I was nasty enough about "phytokarst" as a term. We should be making an all out effort to use it only for destructional karst forms produced by intense biological activity. Delving into what literature there is in this field hasn't helped very much. Considering the ubiquity of speleothems oriented toward light there has been little written about such forms. Here in Australia Julia James and colleagues (e.g. Cox et al. 1989) have discussed the so-called craybacks found in many NSW cave entrances and Michael Lichon (1992) introduced term such as "phototropic phytospeleothems" and "phototropic phytoerratics" to describe light-oriented speleothems of various forms. Our old friends Hill and Forti (1986) talk about "phototropic cave coral" albeit with very little detail. Whatever the name oriented forms "growing" toward light (phototropic) are very, very common, are found in a wide range of environmental settings from tropical to sub-alpine and from arid to moist settings. They vary in scale in scale from the finest of cave corals to the massive craybacks which may be several cubic metres in volume. Whilst photosynthetically active plants are usually involved in their growth other factors may drive the growth alone or just add complexity to the situation. Air currents, either contributing water vapour by condensation or by increasing evaporation rates often plays a role.

Although Lichon (1992) has touched on the various mechanisms involved I can find no research which gives any indication of just what is happening. To quote Lichon:

> ... their growth is controlled by the existence of the moss, hence the use of the term phytospeleothem. ...The mechanism of calcium carbonate deposition may be explained by a net photosynthetic removal of CO_2 from the water supplying the moss thus shifting the hydrogen carbonate equilibrium, resulting in carbonate deposition. There are likely to be two factors involved in this process: firstly, the photosynthesis of the moss removes CO_2 from solution to sustain the plants; secondly, the moss merely provides a physical substrate of large surface area for degassing of CO_2 into the cave atmosphere. It would be speculation at this stage to suggest which is the dominant factor (pages 2-3).

Cox et al (1989) suggest essentially the same process for the craybacks but with cyanobacteria as the organism reponsible. All of this seems emminently sensible. Many light-oriented speleothems appear to be microcrystalline suggesting rapid deposition and to have a lower density than normal calcite possible because of the inclusion of many small cavities and fragments of organic matter in a similar fashion to tufa deposits.

However there is another form of light oriented speleothem which is destructional rather than the constructional forms discussed above. Many of you will have seen "earth pillars" (sometimes called "demoselles") in erosion gully walls and similar settings. These are small towers of earth protected by a small stone fragment which protects the earth beneath from direct attack by rain. In the entrance to Castle Cave at Yarrangobilly there are both conventional light oriented forms and tiny spikes resembling earth pillars but formed in bedrock and oriented toward light. Close examination indicates sand-sized grains on their tips. The grains are presumably not limestone (or are of significantly lower solubility than the bedrock). I am guessing that the bed rock surface is being eroded by the action of the various lichens, algae and so on across the surface but that the grains are protecting part of the surface like the earth pillars' umbrella stones.

REFERENCES

Cox G, James JM, Leggett KEA and Osborne RAL 1989 Cyano-bacterially deposited speleothems: Subaerial stromatolites, *Geomicrobiol. J. 7*:245-252

Hill CA and Forti P 1986 *Cave Minerals of the World*, Nat. Speleol. Soc, Huntsville, Alabama

Lichon MJ 1992 The phototropic phytospelothems of Moss Palace, Mole Creek, Tasmania, *Helictite 30*(1)8-10