

### “I am the Compass” – the art and science of navigation in the bush. Or why I should stick to the earth sciences.

- Andy Spate

Five or six years ago I found myself “geographically embarrassed” on Mount Mulligan in Far North Queensland. Idiot, I thought! – eventually! I have always prided myself on my bush navigational ability... But on that occasion I was very stupidly wrong - relying on what I thought about my location in the face of the topography, the map and the gentle corrections of my companion on the day.

Whilst leading the post-conference tour to Cooleman Plains a few weeks ago I managed to lead astray a large number of ACKMA personages! And then I did it again. Just as well the powerlines are there! Can I dress it up as test of their navigation skills or an attempt to get them fit? Whatever I say will be interpreted differently by others! We were clearly not lost... And it was good for you! But...

Perhaps this area is my Bermuda Triangle – whilst mapping a fire from a helicopter just a few kilometres to the north about 12 years ago I got my grid references reversed... Let this be a warning to you all!

At least the Devils Sinkhole was where it should have been!

I encourage you all not to believe all that you read in the non-ANDYSEZ pages of this esteemed Journal...

Our Editor (who never gets lost – but has been told to get lost on numerous occasions!) seems to think that we should have some discussion of cave mineralogy – so we will - but not in this edition as I think that we must have some definitions of various terms that we will use when we discuss mineralogy over the next few issues.

What, I hear you cry, is **mineralogy**. Why, it is simply the study of **minerals**. So we had better define minerals – but first:

**Atom.** Particle of matter indivisible by chemical means. Made up of a positively charged nucleus surrounded by a number of negatively charged electrons so that the atom is electrically neutral.

**Molecule.** One or more **atoms** bonded together forming a tiny particle which can exist on its own. The smallest combination of atoms that will form a given compound. Some molecules are made up of two or more identical atoms; others consist of different types of atoms. For example hydrogen ( $H_2$ ) is made up of molecules of two atoms of hydrogen, water ( $H_2O$ ) is made up of two hydrogen atoms and one oxygen atom together in one molecule. Our familiar old calcium carbonate molecule ( $CaCO_3$ ) is

one atom of calcium, one of carbon and three of oxygen.

**Element.** Naturally occurring or artificial substance made up of atoms of the same type. For example, hydrogen, uranium, sulphur and so on. Water is made up of the two elements hydrogen and oxygen.

**Mineral.** A homogeneous naturally occurring substance – usually restricted to inorganic, **crystalline** materials. Sulphur is a mineral of only one type of atom, calcite ( $CaCO_3$ ) is made up of three as we have seen above.

**Crystal.** A regular shape, bounded by flat surfaces, which is the outward expression of a periodic or regularly repeating internal arrangement of atoms. Hence **crystal lattice** – the regular and repeated three-dimensional arrangement of atoms or ions in a crystal.

**Ion.** An atom or group of atoms with an electric charge. **Cations** have a positive charge, **anions** are negative. Don't worry about how they come to be charged – you will have to take something on trust!

**Rock.** Any naturally formed aggregate or mass of mineral matter constituting an essential part of the Earth, Moon, asteroids and planets. Normally hard and coherent (i.e. it hangs together). Some rocks (e.g. limestone and sandstone) are chemically simple; others can be very complex).

**Soil.** An accumulation of various fine rock materials that have been organised by physical, chemical and biological processes into a recognisable entity often layered or changing uniformly with depth. A sand dune is not made up of soil until it has supported plants, developed a clay and organic matter component and so on. Soils on limestones are commonly derived from the insoluble residue of limestone. But they are not true soils until they have become organised in some way (Soils of the World, Unite!).

**Let's stop and consider all of the above. The mineral calcite is made up of three different sorts of atoms forming a molecule of calcium carbonate. Crystals of calcite have definite shapes (such as the one we cave-people call dog-tooth spar). The rock limestone is made up of the mineral calcite, mixed with greater or lesser amounts of impurities.**

Whilst I am here being pedantic (as usual) we might look at a few other “geological” terms that I and others use and which seem to be causing some difficulties around the countryside.

**Weathering.** The group of processes, such as the chemical action of air and rain water and of plants and bacteria and the mechanical action of changes of temperature, whereby rocks on exposure to the weather [climate] change in character, decay, and finally crumble into **soil**. In karstic terrains the chief weathering process is the dissolving of the bedrock by water in streams or, more importantly, the rain distributed across the landscape.

**Erosion.** The group of processes whereby earthy or rock material is loosened or dissolved and removed from any part of the Earth's surface. It includes the processes of weathering, solution, **corrasion** and transportation. The mechanical wear and transportation are effected by running water, waves, moving ice or winds, which use rock fragments to pound or grind other rocks to powder or sand [or coarser fragments]

**Corrasion.** The physical abrading of rocks. As opposed to **corrosion** – the chemical breaking down of rocks (e.g. limestone solution).

**Deposition.** If you have been paying attention you will have noted that weathering and erosion – and

the subsequent transport – has involve both solids and dissolved material. Once these get dumped as sand and gravel beds, for example – or as stalactites – we have sedimentation. There are both physical (sand bodies, for example) and chemical (stalactites and stalagmites) forms of deposition. The materials deposited are sediments – granular or crystalline respectively in our two examples.

**Bed.** A layer of sedimentary rock separated from the beds above and below by a bedding plane. Hence **bedded, bedding** and so on.

**Joints.** Fracture in rock, generally more or less vertical or transverse to **bedding**, along which no appreciable movement has occurred.

**Fault.** A fracture or fracture zone along which there has been displacement of the material on either side relative to one another. It is the displacement that distinguishes a fault from a **joint**.

Enough for now – we will use many of these terms when we next meet to discuss cave mineralogy.