

Peter Williams was asked to introduce the first speaker of the evening. Matt Sciberras is an Honour student at U.W.S. who has almost completed his degree and will then be looking to pursue studies at U.W.S. and in conjunction with the University of Hamburg towards his PhD. Matt has been working on an area of chemical mineralogy, that of solid solutions and the substitution of various ions into the same structural motif in mineral lattices. The work has pursued two particular areas, one to do with a primary mineral that he was not going to speak on tonight but the work will lead to the discreditation, change of nomenclature and re-accreditation of the mineral in due course. The second area of work has been on secondary minerals in particular minerals which are sometimes associated with acid mine drainage or are sometimes associated with regular oxidation zones in basemetal orebodies. One of these minerals is ktenasite which many Society members, especially the copper collectors, will have specimens of in their collections. It has been turning out however that there is an interesting question about what is ktenasite and this question among others is what Matt Sciberras has been working on and would be the focus of his talk tonight.

### **‘Copper-Zinc Sulphate Minerals’** by Matt Sciberras

Matt Sciberras commenced his talk by detailing the subject of his lecture. Over the past year he has been trying to solve a problem with a particular basic copper-zinc sulphate mineral, ktenasite but in the course of the study he has also looked at several problems concerned with the other such minerals of which there are five. These were listed, ktenasite, schulenbergite, ramsbeckite, christelite and namuwite. Up to the course of this study not too much had been known about the basic copper-zinc sulphate minerals except for namuwite which had been characterised by Peter Williams and colleagues working in Wales in 1982. Accordingly a fair amount is now known about namuwite, its crystal structure has been solved and it had been synthesized but little was known about the other minerals.

Ktenasite is  $(\text{Cu}+2\text{Zn})_{10}(\text{SO}_4)_4(\text{OH})_{12} \cdot 12\text{H}_2\text{O}$ . It was discovered in 1950 and was gradually identified from a number of locations. It has quite an extensive solid solution which may be defined as a crystalline phase which may vary in composition to a finite degree. The single crystal structure was solved in 1978 by two Italian workers who showed that it was composed of a sheet-like structure connected by hydrogen bonds and which was described in some detail by the speaker particularly indicating the capability of the mineral of incorporating varying numbers and types of cations along the sheet planes. Since the proportion of copper and zinc ions may vary in different specimens they would be described as copper-rich or zinc-rich etc. The colour of such specimens would accordingly vary, the zinc-rich ktenasite is bright blue whilst the copper-rich is greenish-blue.

One of the findings of Matt's research was that the type of solid solution in ktenasite proved to be preferential, indicating that Zn will fill one metal site in the sheet structure before it occupies the other. This means there should be three new minerals added to the ktenasite group, reflecting the known extent of solid solution that occurs in Nature

The speaker described a number of aspects of the mineral unit cell structure and solid solution features of ktenasite and then a little about the other copper-zinc sulphate minerals, schulenbergite ramsbeckite and cristellite. Cristellite has only been found in one location from

the San Francisco mine near Antofagaster in Chile. One interesting aspect of the research had been the need to synthesize the respective minerals in the laboratory. This had proved to be a task which had produced a number of other intermediate minerals in the process.