Mylonitic, ultramylonitic and cataclastic textures in crustal faults of Central Australia. C. Teyssier, Department of Earth Sciences, Monash University, Clayton, Victoria, Australia, 3168.

The western part of the Arunta block is composed of Middle Proterozoic acid to intermediate gneisses metamorphosed to amphibolite facies and grading northwards into the lower granulite facies with associated partial melting. A thick deformed zone (Redbank Deformed Zone) separates these rocks from mafic granulites further to the north. In this zone, the mylonitic foliation postdates the high-grade foliations as well as the late orogenic granitoids. The mylonitic foliation is coeval with an episode of retrograde metamorphism of greenschist facies grading into lower amphibolite facies to the north. This zonation suggests a progressive uplifting of the northernmost terrains along deep crustal faults which are characterized by a N-dipping mylonitic foliation affecting areas up to 7 km wide and intensifying in mylonite and ultramylonite bands.

The mylonitic foliation is defined by discrete to pervasive planes of deformed biotite interlayered with quartzofeldspathic material; the lineation plunges steeply to the north and is marked by elongation of quartz ribbons and boudinaged feldspars. Zones that have suffered important retrogression are characterized by chlorite in place of biotite. Ultramylonites occur as anastomosing bands (up to 10 m thick) and consist of a dark matrix composed of fine relict grains and of syntectonic epidote and euhedral garnet crystals. Relics of large (up to 5 cm) feldspar grains and quartz–feldspar aggregates are preserved and their edges are finely recrystallized in trails parallel to the mylonitic foliation. The retrograde metamorphic reactions involve a high fluid activity during the mylonitization.

Pseudotachylite veinlets, which are interpreted as a product of fusion along once-active seismic planes, intrude (on a cm scale) the country rocks; they occur on both sides of the major mylonite bands. Some are plastically deformed suggesting local fluctuations of the brittle–ductile transition.

What can pure quartz mylonite tell us about mylonitic foliation development in the Redbank Deformed Zone, Arunta block, Central Australia? C. Teyssier and B. E. Hobbs, Department of Earth Sciences, Monash University, Clayton, Victoria, Australia, 3168.

The Redbank Deformed Zone (R.D.Z.) contains a 10 km long outcrop of quartzite which has been correlated with the Chewings Range Quartzite exposed 10 km further south. The mylonites of this zone result from a late deformation postdating a variety of tectonic events.

The quartzite displays a range of microstructures which reflect the progressive development of mylonitization. The coarsest-grained rocks are characterized by relict quartz grains elongate parallel to the lineation, showing undulose extinction and deformation bands. Optical and T.E.M. investigations show that, with increasing deformation, the development of subgrains and recrystallized grains increases to form entirely recrystallized pure quartz mylonites. The size of these equigranular grains ranges from 35 to 15 μm, from which values of 80–200 MPa, respectively are inferred for the flow stress.

Crystallographic preferred orientations from the quartz mylonites of the R.D.Z. are similar to those described in other mylonitic terrains; *c*-axes are distributed on a single girdle subnormal to the macroscopic foliation and branch into a small circle centered on the normal to the foliation. Basal, prism and rhomb crystallographic planes oriented close to the foliation are consistent with the observed distribution of the *c*-axes maxima. The highest density of basal planes is asymmetrically located at an angle (10–30°) to the normal to the foliation. This systematic feature reflects a non-coaxial plastic flow and indicates a sense of shear towards the south consistent with the field data.

The application of the $^{40}Ar/^{39}Ar$ stepheat method of dating on white micas in a polyphase metamorphic terrain at Naxos, Greece. J. R. Wijbrans, Research School of Earth Sciences, Australian National University, P.O. Box 4, Canberra, A.C.T., Australia, 2601.

At Naxos in the Aegean Sea, pelitic rocks belonging to the Alpine metamorphic Attic–Cycladic Complex contain widespread high-pressure, low- to medium-temperature mineral assemblages, which locally are partly to completely overprinted by a greenschist- to upper amphibolite-facies event. At Naxos the physical conditions for the first event, M_1, were estimated at ~530°C and 9–12 kb and for the second event, M_2, which caused the formation of a migmatite gneiss dome, at about 700°C and 5–7 kb in the core of the dome to less than 380°C and 5–7 kb in the zones least affected by M_2. Cooling below the closure temperature of phengite for argon after M_1 occurred at 49.5 ± 0.1 Ma, as indicated by a plateau age in a $^{40}Ar/^{39}Ar$ age spectrum. Rapid cooling occurred in the core of the dome after M_2, as is indicated by plateau ages of 15.0 ± 0.1 Ma, 11.8 ± 0.1 Ma and 11.4 ± 0.1 Ma in $^{40}Ar/^{39}Ar$ age spectra from hornblende, muscovite and biotite, respectively.

The effects of the M_2 metamorphic gradient on the microstructural relations, the major element chemistry and the argon isotopic systematics of white micas have been studied. Assemblages least affected by M_2 contain phengites ($Si^{4+} \sim 6.7$) which show elastic folding by at least two phases after M_1. The effect of M_2 metamorphic grade, a muscovite ($Si^{4+} \leq 6.45$; without evidence of the post-M_1 deformation event) becomes increasingly more important. The occurrence of two generations of white mica is reflected in the shape of the $^{40}Ar/^{39}Ar$ age spectra, which show low initial and final ages and apparent plateaux of intermediate age. It is suggested that the observed shape of the age spectra is diagnostic for the presence of different generations of white mica in the sample and may be caused by small differences in physical properties due to the observed differences in chemistry between the two micas. Phengite continues to be present metastably up to the stability field of biotite–staurolite–garnet.

Cleavage-transected folds in an accretionary prism. P. F. Williams, Department of Geology, University of New Brunswick, Fredericton, New Brunswick, Canada, E3B 5A3.

Cleavage-transected folds are a common feature of parts of the Appalachian Dunnage Zone of Newfoundland and New Brunswick and in similar rocks in the Caledonides of Ireland. Work in the Newfoundland Dunnage Zone, in Notre Dame Bay, has led to two hypotheses for this widespread relationship.

The first attributes the relationship to migration of fold hinges in competent layers in response to shear on the axial-plane cleavage. The shear is related to post-folding transcurrent movement which utilises the earlier steeply dipping cleavage. The second hypothesis causally relates the fold hinges, and their orientation, to ramps associated with pre-fold thrusts. The cleavage is more directly related to the strain. Folds and cleavage, in both models, are contemporary.

In-situ recrystallization of ice. C. J. L. Wilson, Department of Geology, University of Melbourne, Parkville, Victoria, Australia, 3052.

Recrystallization via subgrain rotation mechanism(s) and subsequent growth was illustrated in ice using a time-lapse system. The nucleation and growth rate of a recrystallized grain depends on the strain and fabric distribution within the deformed matrix and also on temperature. Grain growth in both static and dynamic environments was compared.

Foliation development in a biotite schist produced from an amphibolite in a fault zone. R. G., Wiltshire, School of Applied Geology, South Australian Institute of Technology, P.O. Box 1, Ingle Farm, South Australia, Australia, 5098.

A fault cutting amphibolite and pegmatite in the Willyama Complex north of Olary, South Australia, has caused brecciation of the pegmatite and conversion of the amphibolite to biotite schist. The amphibolite has a prominent pre-faulting foliation which is defined by elongate hornblende grains. Adjacent to the fault this foliation has been rotated into parallelism with the fault and in a zone about 1 m wide the amphibolite has been converted into a biotite schist with foliation parallel to the fault.

Despite the rotation of the foliation in the amphibolite, the alignment of biotite in the schist does not appear to have been influenced by the orientation of the hornblende. Hence the alignment must be either stress-controlled or strain-controlled.