The style of deformation depends both on mineralogy and pre-shear fabric and on the apparent extent of shearing. In particular: phyllite and schist responded to the shear stress with asymmetric kink folds; gneiss, with proto- to ultramylonite development and fabric rotation; quartz-poor igneous rocks, cataclastically; and quartz-rich granite has a widespread flattening fabric locally overprinted by shear zones of proto- to ultramylonite, producing a *C–S* fabric, and in locations of intense shearing the ultramylonite was refolded as a layered rock.

Quartz, where present, absorbed most of the bulk strain by development of ribbon texture in the quartz-rich granites and gneiss, with feldspar deforming brittly. In the massive quartz-poor rocks there developed narrow zones of intense cataclasis in which all minerals underwent similar comminution followed by alteration; outside of these zones the feldspars experienced extensive intragranular deformation, primarily microcracking and subgrain development.

Why unconformity-related U deposits are unconformity-related. J. D. Johnston, V. J. Wall, Department of Earth Sciences, Monash University, Clayton, Victoria, Australia, 3168, and M. A. Etheridge, Bureau of Mineral Resources, P.O. Box 378, Canberra, A.C.T., Australia, 2601.

Although unconformity-related U deposits constitute a significant portion of the world's economic uranium mineralization, the role of the unconformity, until now, has been little understood. High-grade uranium mineralization in the East Alligator River uranium field is localized in reverse faults and associated zones of kinking, chevron folding and brecciation in schistose basement. The reverse faults have non-planar geometries controlled by the mechanical anisotropy of the basement schists and their contrast with the unconformably overlying, gently dipping cover of massive quartz sandstones. Preferentially following schistose basement units, the faults transform along the unconformity forming flats, and ramp steeply through the overlying massive sandstone, forming discrete narrow zones within it.

Breccia zones, initiated by hydraulic fracturing, are best developed where faults are slightly oblique to the basement foliation and in kink hinges. Chloritic alteration is most strongly developed in such zones of brittle–ductile deformation. The vast mass-transfer required to effect this alteration illustrates the vast volumes of fluid focused through these zones and hence their structurally enhanced permeability. We present geometrical and mechanical models which explain these features.

The essential role of the unconformity results from the cover/basement rheology and permeability contrasts: (a) the former controls the geometry of fault zones and related dilatant regions which enhance permeability and provide space for mineral deposition and (b) fault-focused fluid migration patterns, developed on local and regional scales, reflect the diagenetically reduced permeability of the sandstone relative to that of the hydrofractured basement.

Concentric, ellipsoidal, compositional, shell (C.E.C.S.) development around nodules associated with solution transfer during crenulation-cleavage development. P. A. Jones, Department of Geology, James Cook University P.O., Queensland, Australia, 4811.

Two outcrops of the Robertson River formation, both within 10 m of mafic intrusions contain unusual nodules. These consist of a central pre-D_1 core surrounded by several syn-D_2 concentric, ellipsoidal, compositional shells (C.E.C.S.) of varying phyllosilicate content with an albite groundmass. During the D_2 crenulation-cleavage formation event, incremental effects of the deformation were preserved as shells of modified host rock by progressive albitization outwards from the rigid core.

In the *ZY* plane of the local strain ellipsoid, coaxial and noncoaxial C.E.C.S. were developed in hinge and limb regions of folds, respectively. The geometrical relationships of noncoaxial shells to other structures indicate that no rigid-body rotation occurred during their development and that the D_2 event involved progressive, bulk, inhomogeneous shortening. The shape and orientation of each successive C.E.C.S. was controlled by the perturbation in the strain field generated by the rigid nodule. With the development of each additional shell the orientation of the whole nodule became more coincident with the local strain ellipsoid.

The D_2 event appears to have been locally episodic and the strain rate and rate of solution transfer varied with the waxing and waning of each pulse, producing three distinct types of C.E.C.S. around a central core.

Slaty cleavage generation during deformation of synthetic mica-quartz rocks in a high pore-fluid pressure environment. P. G. Lennox, Department of Earth Sciences, Monash University, Clayton, Victoria, Australia, 3168.

Specimens consisting of synthetic mica and quartz have been shortened up to 60% in a Heard gas apparatus in the presence of high pore-fluid pressures at temperatures up to 550°C, fluid and confining pressures up to 300 MPa, and at strain rates of 10^{-4} to 10^{-5} sec^{-1}. These experiments provide constraints on the deformation mechanisms operative during the generation and modification of deformation microfabrics in low-grade metamorphic rocks.

Deformation mechanisms which are important in these experiments include oriented growth and grain-rotation mechanisms in micas plus solution transfer and quartz-grain translation processes. Synthetic phlogopite–quartz mixtures yield numerous deformation microfabrics similar to those observed in rocks from low-grade metamorphic terrains. Microstructures developed experimentally during the operation of these processes include well-developed slaty cleavage, kink bands in oriented micas, scalloped quartz grains, strain shadows, mica fringe structures and conjugate shear zones (generated at >50% shortening). Vug-filling fibrous micas form when the pore-fluid pressure exceeds the confining pressure.

Experiments are proceeding in a re-designed assembly which assists the permeation of water at high fluid pressures through specimens during their deformation. The aim of these new experiments is to generate deformation microfabrics similar to those observed in low-grade metamorphic terrains in which there was a high water–rock ratio during deformation.

The relation between quartz-vein geometry and folding in a low-grade flysch sequence, Cape Liptrap, Australia. P. G. Lennox, Department of Earth Sciences, Monash University, Clayton, Victoria, 3168.

The Fold Stack area at Cape Liptrap provides an excellent exposure of a quartz-veined, simple buckle-folded sequence of low-grade metamorphosed arenites and mudstones. The quartz veins formed dominantly in hydraulic extension fractures. The quartz veins, measured from the fold-defining one-metre-thick arenite beds, form sets of consistent orientation and dimension. These quartz veins define three major quartz-vein sets; oblique, subparallel or subnormal with respect to the fold axis. They are exposed in unique, overlapping sequential patterns which change around the fold-defining arenite bed and from inner to outer arcs of this bed.

The observed sequence of quartz-vein sets from the outer hinge zone blocks is generally consistent with the theoretical pattern of quartz-vein formation derived from the finite-element model of a buckling competent bed in a thick incompetent matrix. In contrast, the limb block theoretical and observed sequence of quartz-vein sets is not consistent with this model. Derivation of the minimum principal compressive stress path in the limb blocks from the sequence of quartz-vein sets does not accord with the theoretical predictions. Both these discrepancies, for the limb block reflect in part, the effect of the mechanical anisotropy of the arenite bed on the initiation/propagation of quartz veins, the complexity of the limb-block stress history or other unknown factors.

Comparison of the observed sequence of quartz-vein sets with a simplified four-stage model of a stress-field changes during folding indicates that sets must have formed at discrete overlapping intervals within the fold-forming deformation and that some quartz-vein sets must have formed during shear failure.

Implications of the low-angle normal (evolving) crustal shear-zone model for metamorphic core complexes of Cordilleran type, and the origin of the 'accretionary wedge' of the Hellenic arc. G. S. Lister, Bureau of Mineral Resources, P.O. Box 378, Canberra, A.C.T., Australia, 2601.