Excellent exposures along the Burdekin River and its tributaries provide special opportunities to detect controls upon the many styles and generations of veins of a major gold and mineral field. Well-defined unconformities help appreciation of the role of older structures in deducing tectonic chronologies from fabrics.

Reference exposures of Middle Devonian limestone between 'Fletcher View' and the Big Bend north of Charters Towers illustrate different types of en échelon vein arrangements and variations in the styles of veins of different ages and compositions. A sheet of limestone rests unconformably upon a pre-Devonian granodiorite basement dissected by older dykes, veins and a NW-trending foliation. Vein fabrics differ markedly from outcrop to outcrop. Patterns emerge in more extensive vein fabrics. These patterns indicate correspondence between younger vein fabrics and complex basement fabrics dominated by NW-trending foliation. A plot of en échelon vein directions reveals that those to the left of the foliation direction are dominantly sinistral and that those to the right are dominantly dextral. These relationships and a range of angular relationships point to a complex model for en échelon arrangements in which Riedel 1 and 2 fractures, as well as tensional fractures are influenced by older basement structures.

An early generation of limestone veins is darkened by inclusions of sulphuretted hydrocarbons. The terminations of these veins are distinctively 'horsetailed' unlike the simple terminations of later, white carbonate veins. A hypothesis for these style differences is that they are responses to changes in pore-fluid pressures and compositions.

Another reference area for veins lies along the Broken River, a tributary of the Burdekin River 150 km west of the Big Bend area. En échelon veins have formed in a quite different tectonic environment within a thick folded sequence of Silurian limestones. Stylolites indicate far greater volume changes than in the Big Bend reference area and also indicate systematic refraction of stress trajectories towards the normals to en échelon arrangements. Contrary refraction about conjugate en échelon arrangements is commonly sufficient to bring gash veins of one arrangement into close parallelism with the en échelon direction of a conjugate set.

Structural analysis of the Broken Hill Block.
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The aim of this paper is to discuss the philosophies involved in the interpretation of multiply deformed terrains with special emphasis, as an example, on the Broken Hill Block. A structural interpretation of the area is presented involving four periods of deformation each associated with the development of macroscopic folds. In addition, later structures associated with retrograde schist zones are developed. Earlier workers have used a classical (Weissian) approach employing mesoscopic fabric elements which have been assembled into a chronological scheme and then used to interpret the macroscopic structure. This led to a macroscopic picture of essentially upright folds superposed coaxially on earlier nappe-like folds. The present study employs the mapped outcrop patterns combined with the spatial distribution of structural facings to identify the macroscopic structure. A step is then made backwards in scale from the macroscopic to mesoscopic to discuss the significance of the mesoscopic fabric elements. On this basis, the regional structure consists essentially of early, inclined to recumbent folds with later upright folds superposed almost at right angles to the trend of the earlier axes. This leads not only to a difference in macroscopic structure between the two approaches but important differences in mesoscopic interpretations arise as well.

Multiple deformation in the Dales Gorge Member of the Lower Precambrian Hamersley Group, Western Australia.
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Analyses of structures in the Hamersley Province indicate the existence of several directions of folds and faults. The WNW-oriented Hamersley Synclinorium is parallel to smaller en échelon folds. A conspicuous E–W trend is outlined by axial culminations of anticlines and two complementary en échelon sets strike NE and NW.

Two complementary fault or joint systems, largely restricted to the Archaean group are known to have acted during the transgression of the Fortescue Group. One strikes E–W, the other is arcuate, striking generally N in the south and swinging to NNE in the north. Another set of complementary faults essentially frame the Province to the south-west and southeast; one swings from NW in the south to N in the west; the other strikes about NE.

Isopach maps, compiled for each of the alternating 33 macrobands of the Dales Gorge Member of the Brockman Iron Formation and for groupings of them, were analysed and are interpreted as interference patterns of multiple axes of thickening and thinning. Despite an apparent haphazard distribution of thicknesses in the successive macrobands, most thickness axes are only displaced in a minor way from one to the next. The trends of thickness parallel and follow the distributional biases of the WNW (regional fold) the E–W (fold and fault) and the N to NNE (fault in basement) structural trends. The distribution and dominance in BIF or S macrobands indicate that thickness variations in the Dales Gorge Member result from several features with a contribution from a form of compaction of slumping during sedimentation engendered by faults in the basement.

Tectonic evolution and fabric development of the Arunta Complex in the Harts Range, Central Australia.
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High-grade metamorphic rocks of the Arunta Block in the Harts Range Area have been divided into two major groups according to lithology and structure. An underlying crystalline basement has been recognized as having a more complex tectonothermal evolution than its structurally overlying supracrustal cover sequence. The basement is comprised predominantly of layered felsic and mafic gneisses which have a complex history of three isoclinal fold events, BD_1, BD_2 and BD_3, followed by tight inclined to upright folds (BD_4) trending in a NE direction. All folds deform a high-grade, layer-parallel fabric which is intensified by the folding. Included with the basement is the Entia gneiss complex (an inlier with the Entia Dome), the Oonagalabi gneiss complex (an isoclinal fold of remobilized basement represented by the Oonagalabi Tongue) and undifferentiated gneisses in the south of the area. Basement thrusts (BT) are confined to the western portion of the Oonagalabi Tongue.

Structurally overlying the basement are the cover rocks of the Irindina supracrustal assemblage (predominantly pelitic gneisses, but including calcareous rocks and quartzites) and of the Harts Range meta-igneous complex (predominantly mafic amphibolites, but including the Entia anorthosite). Both units are complexly folded by three isoclinal events CD_1, CD_2 and CD_3. A thrusting event CT, responsible for décollement surfaces along many of the lithological contacts within the cover sequence, occurred between the last two of these ductile events, and stacked the cover sequence into a series of nappes.

Basement and cover were juxtaposed by a major semi-ductile thrusting event, HRT_1, and then both cover and basement were isoclinally folded during HRD_1 at the commencement of the Harts Range orogenic event. Two thrusting events HRT_2 and HRT_3 were responsible for the tectonic emplacement of the megacrystic Bruna granitic gneiss, which now separates basement and cover throughout much of the Harts Range Area. HRT_2 was isoclinally folded during HRD_2 and HRT_3 during HRD_3. Subsequently the area was deformed by less intense open folds which resulted in the complex major basin-and-dome outcrop style.

Microstructures and sequence of deformation along the Norumbega Fault Zone, Eastern Maine, U.S.A.
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The Norumbega Fault Zone, a NE-trending zone of ductile and brittle deformation (Devonian or younger), consists of about five distinct fault traces. All lines of evidence suggest dextral and south-up oblique shear in the major vertical NE-trending shears, with associated conjugate sinistral shears in some areas. The affected lithologies are phyllite, schist, felsic gneiss, felsic granite, mafic granite and syenite.