Geological Tour of the Barraba Area

The rocks of the Barraba area are split into two major geological belts by a regionally extensive fault, the Peel Fault (see tour map, page 4). This major fracture of the crust is developed for several hundred kilometres from Forster on the coast, to Warialda in the north. The Peel Fault has been sporadically active for over 350 million years. Its presence is marked by a dramatic change in the rock types on either side of it and by a prominent escarpment.

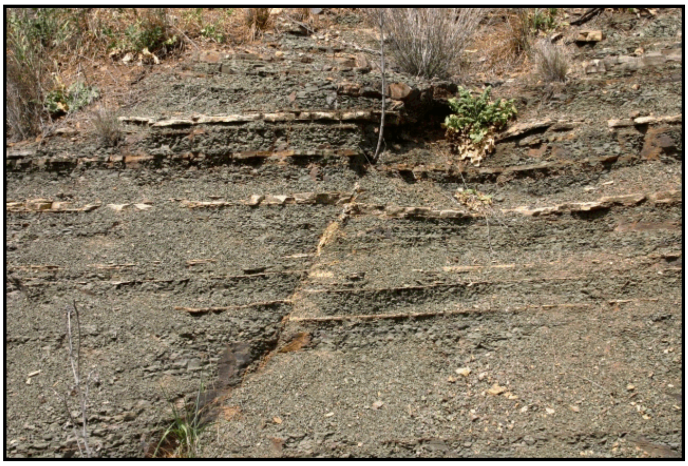
The oldest rocks present locally are of igneous and sedimentary origin (see geological history table, page 3). These were formed more than 500 million years ago in the deep ocean floor. The igneous rocks have been altered to serpentinite (serpentine). Volcanic muds, cherts, jaspers and lavas were deposited in deep ocean water far from land about 400 million years ago. The next major event was around 300 million years ago, with uplifting, folding and faulting of the sedimentary and volcanic rocks. About 36 million years ago, major basalt lava flows covered most of eastern Australia. Basaltic volcanic activity occurred in distinct pulses at 36- 38 and 18-20 million years, in part derived from the Nandewar Volcano which is situated to the west near Mt. Kaputar. Since then the region has settled into the stable area that exists today.

Geological tour 1 passes eastward from Barraba toward Woodsreef, crossing the Peel fault. The tour is a round trip of 45 km. Stop sites are clearly marked by signs.

SITE 1. The Manilla River Bridge.

Travel 0.8 km north from the Post Office on the Barraba-Bingara Road. Park in the bay to the left of the bridge. Exposed in the river bank on the side of the bridge below the Caravan Park are layers of bedded, dark grey mudstone and siltstone. These rocks represent 400 million year old silt which settled in a shallowing sea distant from land to the west. Note the white layers which were wind blown volcanic dust from the volcanic island chain which was active during this period. The rocks are fractured and offset by many faults. Two of the most common fault types are present here: normal faults and reverse faults. Faults are fractures which are accompanied by movement of the rocks on opposite sides of the fault plane. Normal faults are the result of extension (rather than compression) in the crust, with the uppermost side of the fault plane slipping downwards relative to the lower side (see photo). Conversely, reverse faults are the product of a period of compression in the crust, resulting in the uppermost side of the fault moving

Normal fault in mudstones. Note how the white volcanic ash layers have been displaced with the rocks on the top of the fault plane (left) moving downward relative to the opposite side of the fault.



Reverse fault in mudstones. Note how the marker beds have moved upward in the rocks above the fault plane (left) relative to those on the opposite side of the fault.

upwards relative to the opposite side (see photo). The presence of both of these fault types in the outcrops at Site 1 is evidence for prolonged fault development in the region, with the local crust experiencing both compressional and extensional environments.

Concretions composed of calcium carbonate are also present throughout the outcrop (see photo). Concretions can be made of calcium carbonate, iron oxides or quartz. They are oval to spherical in cross section, and result from the precipitation of dissolved minerals about an original fragment of similar material. They are common throughout the mudstones of the Tamworth-Barraba region.

Calcium carbonate concretion (above right of lens cap) in mudstones.

SITE 2. Adam's Lookout.

Cross the bridge and continue north on the Barraba-Bingara Road for 1.7 km, turn right onto the Bundarra Road. After 2.1 km turn right to Adam`s Lookout. The view westward shows folded and faulted mudstones, siltstones, sandstone and volcanic rocks which were deposited 300 to 400 million years ago, in a sea which lay to the east of the edge of a volcanic island chain situated off the coast of the continent. Where we stand now would have been many hundreds of metres beneath the sea. Clouds of ash and fumes may have been periodically visible from the volcanic islands in the far distance. The mainland would probably have been too far west to have been visible.

Floating plant debris derived from the continent and some islands travelled far out to sea before becoming waterlogged and sinking. Distinctive fossil imprints of the 360 million year old Late Devonian plant fossil *Leptophloeum australe* are locally common in the mudstones of the region.

An example of *Leptophloeum australe* in mudstone.

SITE 3. Tertiary lavas and landforms.

Turn right onto the Bundarra Road and continue for 6.8 km. Just before reaching this site, a low hill on the northern side of the road, just past the road intersection on the top of the ridge exhibits columnar jointed basalt. The columnar joints have formed by slow cooling of the thick lava flow, resulting in slow contraction of the lava whilst it crystallised. This results in fine fractures in a hexagonal pattern within the solidified lava, showing as columnar jointing when the lava is eroding. Further along the road at Site 3 a number of hills with flat tops can be seen on the right.

These mesa-like hills are common in the Barraba area where they have formed as a result of erosional processes encountering hard basalt lavas overlying softer sedimentary rocks. The sub-horizontal basalts protect the softer rocks below them from erosion.

These lava caps were extruded about 35 million years ago, wilst the rocks below them are considerably older.

Site 4. The Peel Fault.
Continue 5 km along the Bundarra Road to the bridge over Ironbark Creek. The prominent road cutting on the eastern side of Ironbark Creek is developed in serpentinite (serpentine). This particular rock type is referred to as *schistose serpentinite* because of its flaky, serpentine character. This rock type is relatively uncommon in eastern Australia. It represents intensely altered metamorphosed and deformed igneous rocks which formed the crust beneath a deep ocean about 550 million years ago (see page 3). Over millions of years the crustal rocks were folded, squashed and altered, undergoing changes to the original minerals and textures to form the serpentinite. The nearby Woodsreef asbestos mine produced chrysotile asbestos from veins within this serpentinite.

This large serpentinite mass was emplaced along faults about 300 million years ago as a result of major geological upheavals at the time in eastern Australia. Serpentinite such as this is present in places along the Peel fault and adjacent, related faults, from Warialda to Forster. The Peel Fault itself is not visible here, but lies concealed several hundred metres to the west (see map).

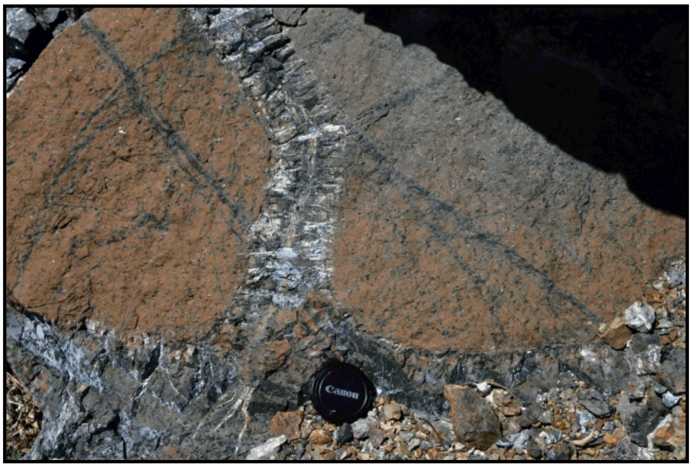
The ridge on the western side of the creek is one of the original rock types which altered to form serpentinite. This rock is *harzburgite*, a hard grey rock with large crystals of *bronzite* (a mineral of the *orthopyroxene* family). Harzburgite is typically found with serpentinite in many places throughout the world. We will examine some spectacular harzburgite-serpentinite-asbestos rocks at the next site.

Site 5. Ancient river gravels overlying serpentinite, harzburgite-asbestos.
Continue 1.6 km from Site 4 on the Bundarra Road. The top of the serpentinite cutting has gravel deposits which represent a river bed which ran during the Tertiary period, up to 65 million years ago. Gravels similar to these occur widely throughout the area, capping hills well above the present river levels. These gravels locally carry low concentrations of gold which was derived from the erosion of gold-bearing reefs in this area. Alluvial gold can be panned from many of the creeks in the area, including the nearby Ironbark and Nangahrah Creeks.

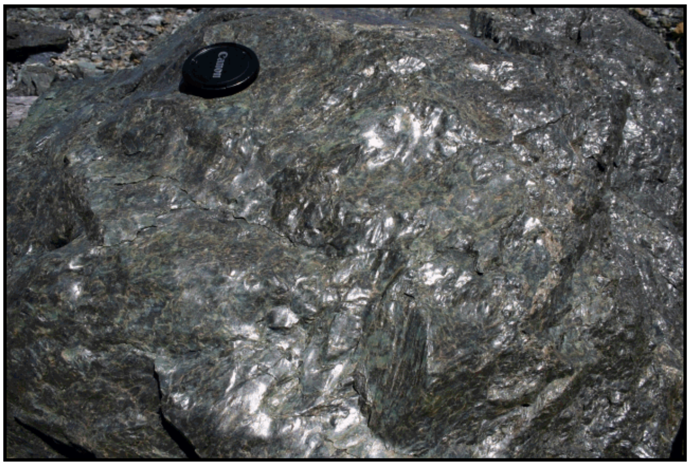

Tertiary river gravels overlying serpentinite.

The cutting on the opposite side of the road is mainly composed of the Silurian to Devonian sedimentary rocks into which the serpentinite has been faulted. Serpentinite occurs on both ends of this cutting, demonstrating that the fault plane separating the serpentinite from the sedimentary rocks is curved. Part of the fault plane is exposed in the cutting (see photo) where an area of crushed rock separates the two rock types. Just beyond the western end of the cutting, boulders of intermixed harzburgite, schistose serpentinite and thin veinlets of asbestos are abundant on the northern side of the road. Very attractive specimens of these rock types and *chrysotile asbestos* occur off the side of the road along the top of the steep slope (see photo below). Some very lustrous masses of schistose serpentinite can also be found here (see photo below).


A debris fan formed near the faulted contact of sedimentary rocks (left) and serpentinite.



Large blocks of harzburgite enclosed within schistose serpentinite containing abundant fine asbestos veins.



Glossy boulders of schistose serpentinite are common at Site 5.

Site 6. Woodsreef Common.

Return several hundred metres to the turn off to the Woodsreef Common picnic and camping area. The narrow gravel road is situated near the point where the main road flattens out. The road is navigable in a conventional vehicle with care. Travel to the bottom of the road to the grassy flats on the banks of Ironbark Creek.

There are numerous interesting aspects of alluvial and reef gold mining to be found about here, and gold may be panned from the creeks. Near the confluence of Nangahrah and Ironbark Creeks the remnants of a floating dredge pond are visible in the banks. Heaps of stones higher up the banks, almost to the top of the ridge to the north of Nangahrah Creek demonstrate the areas which were turned over by hand miners in the 1800s. A number of reef mines can be examined on the flanks of the ridges on both the east and west banks of Ironbark Creek upstream from here. Be very careful about the old mine workings.

You may return to Barraba via the tour route, or alternatively proceed a little further east and take the Crow Mountain Road (see map). This alternative, very scenic route passes through more serpentinite and rolling hills of Devonian sandstones and mudstones before rejoining the Fossickers Way to the south of Barraba.

GEOLOGICAL HISTORY OF THE BARRABA REGION

PERIOD	YEARS AGO	LIFE FORMS ORIGINATING	GEOLOGICAL EVENTS
QUATERNARY	0 2,000,000	Human Beings	Continued alluvial deposition
TERTIARY	65,000,000	Grazing and carnivorous mammals	Volcanic activity produced basalts over much of area
CRETACEOUS	144,000,000	Last dinosaurs First flowering plants	Continued deposition on land
JURASSIC	213,000,000	First birds	No rocks preserved from this period in local area
TRIASSIC	248,000,000	First dinosaurs and mammals	Deposition on land and in shallow sea giving rise to Gunnedah coal field
PERMIAN	286,000,000	Mammal-like reptiles, last Trilobites	Deformation, metamorphism, major activity of Peel fault
CARBONIFEROUS	360,000,000	First reptiles; fern forests	Progressive deformation, alteration and emplacement of serpentine Glaciation and volcanic activity
DEVONIAN	408,000,000	First amphibians and insects	Progressive shallowing of sea. Volcanic activity in west
SILURIAN	438,000,000	Vascular land plants	Deposition of deep sea sediments and basaltic lavas
ORDOVICIAN	505,000,000	First corals, fish with vertebrae	
CAMBRIAN	590,000,000	Shellfish, Trilobites	Formation of oldest seafloor lavas and intrusions which were subsequently altered to form serpentine.
PRECAMBRIAN	700,000,000 1,500,000,000 3,500,000,000 4,500,000,000	Algae Complex cells Primitive cells Formation of the Earth	No record

SIMPLIFIED GEOLOGY OF THE BARRABA TOUR AREA