

## **Bath Geological Society, Bristol NATs and West of England Geologists' Association**

### **Geology of the Colorado Plateau and Basin and Range Province in the SW USA.**

*This trip has reached its target of 16 participants and has been booked for the period 1 – 18 September 2014. A reserve list is in place in case any of the booked participants are unable to make the trip. If anyone wishes to be added to this reserve list then please email Doug Robinson ([drgladr@gmail.com](mailto:drgladr@gmail.com)).*

The trip is to explore aspects of the geology of the Colorado Plateau and Basin and Range province in the Southwest USA, covering parts of the states of Arizona, Colorado, New Mexico, Nevada and Utah. The Colorado Plateau covers 130,000 square miles and is largely an elevated desert area. The Plateau preserves a remarkable geological history, with Precambrian crystalline metamorphic basement (1.5-2.0 Ga), overlain by Precambrian sedimentary rocks and basalts (~1.0 Ga), both of which can be seen at the bottom of the Grand Canyon. Unconformably overlying these basement rocks is a largely continuous, and flat lying sedimentary sequence, ranging in age from Cambrian to Tertiary. This succession is little deformed, and it records the evolution of the western margin of the USA throughout the Phanerozoic. The lower part of the Palaeozoic sequence is largely dominated by marine sedimentary rocks, marking a passive margin lying to the west. Devonian to Carboniferous sediments record the evolution of Western North America into an active tectonic margin. From the end of the Palaeozoic and through the Mesozoic, terrestrial deposits dominate. Thick aeolian dune deposits are common, particularly from the Permian through the Jurassic, and it is these deposits that give rise to spectacular scenery of the red-rock country as seen in the many famous National Parks of the area. The Tertiary lacustrine sedimentary rocks of the region record the loading of the interior continental crust as a result of the Larimide orogeny that gave rise to the Rocky Mountains.

To the south and west of the Plateau, lies the Basin and Range Province, whose features record the orogenic collapse of the Larimide orogeny. The collapse was accompanied by extension, which stretched the crust giving basins infilled with alluvial fans eroded from the intervening mountain ranges. The extension has also given rise to widespread basic volcanism throughout the Tertiary period, which continues to the present, with volcanics punching through many parts of the Plateau.

The trip will be accompanied by Dr Doug Robinson, who is retired from an academic position in Geology at the University of Bristol. He previously was based for a year at the University of Northern Arizona in Flagstaff, and knows the area well. He also for many years taught a course to third year undergraduates at Bristol on the Geological Evolution of the North American Continent.

The Colorado Plateau is a very large area, and so to see many of the major parks there will inevitably be large distances to cover. The provisional itinerary gives the general distances between locations to be covered, but on top there will be travel within the parks themselves. Travel will be by 7 seater minivans with five persons in each so as to give space for luggage. Volunteers will be needed for drivers – all vehicles will be automatic. Across the region, a range of altitudes will be encountered, from ~ 380m (1250') in Phoenix to nearly 2,700m (9,000') in Bryce canyon, with typical daytime temperatures in September ranging from ~ mid 80s (35°C) to ~70s (21°C) respectively. Because of the number of places to visit, the distances involved, and the need to keep a careful time schedule, there will be little or no opportunity for people to undertake individual activities, with many features of the geology being examined from view points. However it will be possible to follow a variety of the shorter trails in many of the parks, and opportunities to take longer trails such as in:

Grand Canyon – one day will be spent at the main South Rim Village near the start of the Bright Angel trail. There will be opportunity to hike along the rim trail, or venture into the canyon on the

Bright Angel trail. It is not feasible to hike to the Colorado river and return in one day, as it involves a round trip of ~ 26 km (16 miles) and elevation change of ~ 2,700 m (9,000').

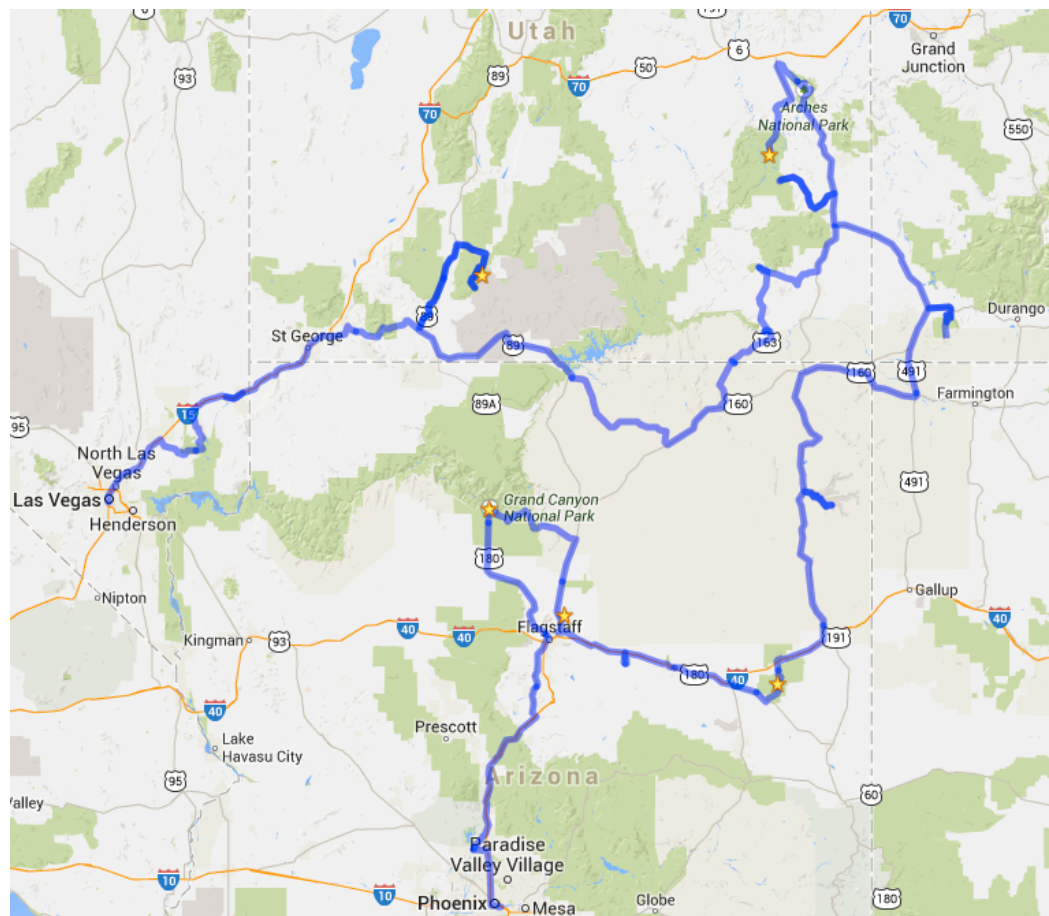
Canyon de Chelly - hike the only public trail into this canyon to see the White House Ruin. The trail starts at ~ 1700 m (5,500'), and it descends some 200 m (700') down a switchback trail through thick aeolian dune beds of the Permian De Chelly sandstone. The trail is without shade and is narrow and with some drop offs in places, and the round trip in hot weather taking ~ 2 hours and covers ~ 4 km.

Arches National Park - hike to the most famous arch – Delicate – formed in the Jurassic, Entrada sst. This trail is ~ 5 km (3 miles) round trip with no shade on the trail, starting at an elevation of ~ 1500 m (5,000') with a gain of ~ 150 m (500') with the final part going along a rock ledge with a dropoff.

Mesa Verde – a 1 hour, ranger-guided tour of Cliff Palace which is the largest cliff dwelling in the park. This is at an elevation of ~ 2000 m (6,500'), and involves climbing five 3 m (10') ladders, on a 30 m (100') vertical climb. The tour is subject to booking, a fee (~\$3), and depends on availability.

**Trip logistics:** The flights, vehicle rental and accommodation will be arranged through the Audley travel company, who have identified the accommodation, apart from that in Winslow, Canyon de Chelly and Monument Valley which is on personal recommendation. Accommodation will be at Best Western-type motels. The estimated cost as of August for the air fares, vehicle rental and accommodation in a twin room is **£2250 pp**. In order for the trip to be viable 14 participants will be needed. Once that number is reached a 15 % deposit will be required to confirm a place, and the balance to be paid 10 weeks prior to departure. Additional costs will include a share of fuel costs (~ £90 pp) and one-way vehicle drop off fee (~£20 pp), park entrance fees (~ £20 pp), all meals and drinks, and any optional tours (e.g. Antelope Canyon ~£25; helicopter trip Grand Canyon ~£170, etc). Provisional timing: the trip is planned for September 2014, and will involve 18 days including travel to/from UK

Provisional route



**Day 1 Monday September 1<sup>st</sup> LHR – Phoenix  
BA289 departs 14.40, arrives 17.10.**

**Overnight** Hilton Garden Inn Phoenix Airport North

**Day 2 Phoenix – Flagstaff, 150 miles**

Visiting Lake Pleasant for saguaro cacti; Montezuma Castle; Sedona and Oak Creek Canyon; early evening drink in Museum Club - famous Flagstaff bar - icon of Route 66.

**Overnight** Little America Hotel, Flagstaff

**Day 3 Flagstaff - Grand Canyon, 120 miles**

Walnut Canyon and Sunset crater;

**Overnight** Yavapai Lodge, Grand Canyon

**Day 4 Grand Canyon**

Hike a trail, or take a helicopter flight over the canyon.

**Overnight** Yavapai Lodge, Grand Canyon

**Day 5 Grand Canyon – Winslow, 140 miles**

Stops along southern rim of G Canyon, finishing at Desert View and then onto Meteor crater. Standing on the Corner, Winslow (of Eagles fame).

**Overnight** La Posada, Winslow.

**Day 6 Winslow – Chinle, 180 miles**

Petrified Forest, Painted Desert and Hubbell Trading post

**Overnight** Holiday Inn & Suites, Chinle, Canyon de Chelly

**Day 7 Chinle - Cortez, 180 miles**

Canyon de Chelly and Shiprock.

**Overnight:** Holiday Inn Express, Cortez

**Day 8 Cortez – Mesa Verde - Monticello 91 miles**

Mesa Verde Park,

**Overnight:** Inn at the Canyons, Monticello

**Day 9 Monticello – Moab, 55 miles**

Needles overlook Canyonlands.

**Overnight:** Moab Valley Inn, Moab

**Day 10 Moab – Arches National Park, 50 miles**

Day in Arches National Park.

**Overnight:** Moab Valley Inn, Moab

**Day 11 Moab – Blanding, 140 miles**

Day in Canyonlands Park, Dead Horse Point - Thelma & Louise cliff scene.

**Overnight:** Blue Mt Inn, Blanding

**Day 12 Blanding – Monument Valley, 115 miles**

Natural Bridges Park; Mokee Dugway; Monument Valley.

**Overnight** The View, Monument Valley

**Day 13 Monument Valley – Page, 126 miles**

Drive around Monument Valley; Antelope Canyon.

**Overnight:** Courtyard Page at Lake Powell, Page

**Day 14 Page – N Rim Grand Canyon 135 miles**

Marble Canyon, Vermillion Cliffs, Grand Canyon North Rim

**Overnight** Grand Canyon Lodge, N Rim

**Day 15 N Rim Grand Canyon – Bryce Canyon 160 miles**

Bryce Canyon

**Overnight:** Best Western Bryce Canyon Grand Hotel

**Day 16 Bryce – Zion, 90 miles**

Breakfast at Galaxy diner in Hatch – 50's style American diner. Zion Park

**Overnight:** Hampton Inn & Suites, Springdale

**Day 17 Zion – Las Vegas, 165 miles**

**Overnight** Tropicana, Las Vegas

**Day 18 Thursday 18 September, Las Vegas – LHR. BA 274 Departs 21.15 arrives 15.00 (next day)**