

OFF-CAMPUS '96 - CANYON LOOP TRAVEL LOG

Bruce Selleck ('71), Professor of Geology, chronicles the 2-week "Canyon Loop".

Monday, June 17

5:00 a.m. - Parking lot behind Cushman House:

First grey hint of dawn - 4 vans - 27 students - one assistant - one professor - tents - cooking gear and baggage - Denver or Bust.

It is a long drive from Hamilton to Denver - to state the obvious - and the trek always seems to have its nervous moments. We left town at 5:00 a.m. without a hitch, and made good time until eastern Ohio, where road construction in I-90 slowed us a bit. All students who drive the vans have been tested and registered with Campus Safety, and we try to rotate at least 3 drivers per van, and include a "shotgun" rider who stays awake with the driver at all times.

The I-271 by-pass takes us toward Columbus in due course, and we stop for a late lunch near Mansfield, Ohio. With 30 people in 4 vans, stops for gas, lunch or comfort can drag on if we're not crisp. "With alacrity, folks." is the watchphrase.

Our first mini-crisis strikes at about 4:00 on I-70 near Enon, Ohio. One van shows a puff of smoke issuing from the right rear wheel. Stopped, the van is evacuated and a quick spray from the fire extinguisher is applied. Diagnosis - bad wheel bearing. We limp to the exit ramp - luckily only 1/2 mile - and turn into the "Enon Body Shop and Light Mechanical". Decisions. Should all of us wait while van is fixed (maybe tomorrow if parts unavailable) or leave Will Willis plus a few students to wait for repairs while the remainder press on? We chose the latter course, and find out, later on in the evening via mutual phone calls to Nancy Selleck in Hamilton, that repairs have been made and the van is now behind the rest by about three hours.

We intercept heavy thunderstorms in central Illinois, which provide a spectacular early evening light show. Driving through the night is not anyone's idea of a good time, but setting up camp, taking down early in the morning gains us little sleep, and would put us into Denver near midnight on the next day. We continued on with strict rules - shotgun, 3-driver rotation, numerous stops.

Tuesday, June 18:

The early morning sun lights a series of thunderstorms marching across west-central Kansas. We encounter one directly, but mostly we watch and admire. The late-night shift drivers - Laura Castleberry, Mark Hayes, Allison Gleason - receive special recognition. Our breakfast stop - MacDonalds' in Colby, Kansas - is under bright morning sun, blue skies and fresh breeze. Fast food overload sets in. Nearing the Colorado border, we ever-so-perceptibly climb up the gentle gradient of the High Plains, noting scattered oil wells working small Cretaceous plays in the Pierre Shale and underlying Dakota Group sandstones. Sweep-irrigated cornfields give us an opportunity to talk about depletion of groundwater from the thick Tertiary aquifers overlying the Pierre Shale. Recharge rates in the dry high plains just are not sufficient to replace the large volumes removed for agriculture, and we discuss the merits of winter wheat - which requires no irrigation - versus water-demanding crops like corn.

From Limon, Colorado, the peaks of the Front Range emerge from the haze. "A forbidding wall of tumbled rock and snow." Limon's souvenir shops are our first chance to get postcards and appropriate "western-style" geegaws.

Through the tricky traffic on I-70 around Denver, we climb the Front Range uplift and exit to our campground - Chief Hosa. Thirty-one hours from Hamilton, we check in and set-up tents. The late afternoon brings unwanted news of the van and eight riders left in Ohio. After two hours on the road, another wheel bearing bites the dust, and Will Willis, plus Meilan Chiu, Rick Kulzer, Amy McKnight, Martha McConnell, Paul Zangrilli, Bryan Wehler and Jamie Montesi spent the previous night in a Motel 6 near the Indianapolis Airport. The van's rear axle is beyond simple repair, and a new van is to be driven from Colgate to arrive early Wednesday morning. The group will then depart to join us either in Denver area or in Moab.

Dinner is pasta and salad, and we settle in for the evening. The campground pool provides relief from the 90+ degree temperatures.

Wednesday, June 19:

The day dawns bright and clear and we are up at seven for breakfast and off into the field. Our first stop is at exposures of the 1.4 - 1.7 billion-year-old gneisses, schists, amphibolites and granites of the Idaho Springs Formation. These resistant rocks hold up the peaks of the Front Range west of Denver, and form the basement rocks on which the late Paleozoic and Mesozoic sedimentary rocks were deposited. At subsequent stops that day - Red Rocks, Turkey Creek, Morrison Village, I-70 Roadcut and Rooney Road - we examine the late Paleozoic-Mesozoic strata which record the history of sedimentation in the Front Range - Denver Basin area. The Fountain, Lyons and Likens Formation are Pennsylvanian-Permian-Triassic rocks deposited to the east of the Front Range Block uplift of the "Ancestral Rockies". The Jurassic Morrison Formation consists of lake and stream sediments that contain dinosaur bones (the first Brontosaurus found in North America came from Dinosaur Ridge just west of Denver) and tracks. The Cretaceous Dakota Sandstone and overlying Pierre Shale record the flooding of the vast interior seaway, which extended from the present day Gulf of Mexico to the Arctic Ocean. We examine the final demise of that sea in the Late Cretaceous Laramie Formation, and the thick Tertiary gravels that were shed from the Laramide uplifts to the west. The petroleum and gas history of the Denver Basin is also considered at a number of stops and we discuss the migration of petroleum into reservoir beds at an exposure of Dakota Sandstone, which contains a "live" oil seep.

All are ready for our return to camp. One of the 4-person cooking crews head off to buy our dinner (chicken pasta, salad, Italian bread, watermelon) and tomorrow's breakfast. The rest write up field notes and complete field exercises. We receive word that the absent van is in western Kansas, to arrive in late evening, making it in time for our departure for Moab early tomorrow. Just after dinner Mark Hempton '76, now a senior geologist with Shell in Houston, visits camp. Mark had been in Denver to examine a number of petroleum prospects, and he showed the group an example of a possible deal in Wyoming, and spoke informally about career prospects and his views on the future of the oil industry. Ryan Hoffman '96, a geology major working as a summer intern with the USGS in Denver, also stopped by. Ryan heads off to University of Minnesota for graduate work in geology in the fall.

The "Indianapolis Eight" arrive at 9:30 p.m. to warm greetings. A few head off to Morrison to check out a Mexican restaurant.

Thursday, June 20:

We are up at 6:00 a.m. to pack for the trip to Moab, Utah. Bruce takes the Indianapolis crew for a 1-hour tour of Red Rocks and Dinosaur Ridge for a quick overview of the geology before our departure. On the road by 8:30 a.m., we head west on I-70 taking the Rt. 6 bypass up Loveland Pass and the continental divide. A short hike presents the scenery and the Pleistocene glacial features, as well as a chance to glissade down the steep patches of "corn snow". Continuing on Rt. 6 to Dillon, we see Mesozoic Rocks exposed in a Laramide syncline, then again encounter Proterozoic rocks in the Park Range as we continue west on I-70. Entering Vail, thick sections of non-marine to shallow marine sandstones of the Maroon Formation tell us that we are approaching the eastern margin of the Eagle Basin. The Eagle is one of the Pennsylvanian-Permian "Ancestral Rockies" depositional basins that formed contemporaneously with the block uplifts of the Front Range and Uncompahgre Plateaus. These uplifts provided an immediate source area for sand, gravel and mud that accumulated on the margins of the basins. Further west on I-70, we stop in the town of Gypsum, where outcrops of the Pennsylvanian Minturn Formation contain evaporite salts - mostly gypsum - that accumulated as the Pennsylvanian seas of the Eagle Basin evaporated to near dryness. At Rifle, we have lunch next to the Colorado River, and examine the Late Mesozoic and Early Tertiary sequences exposed along the valley margins, and discuss the Pleistocene and Holocene Colorado River sediments, which form important aquifers in the region. Approaching Grand Junction, the Cretaceous Mancos Shale and Mesaverde Sandstones rise up to form the Book Cliffs, capped by the Roan Cliffs of Eocene Green River Shale. The Green River Shale contains over one trillion barrels of crude oil locked up as solid kerogen - which gives a distinctive mahogany color to certain beds.

At Grand Junction we see the first of many extensive irrigation networks - here mainly for fruit farming - that line the Colorado wherever alluvial soils are present. The Colorado - issuing from snowmelt in the Rockies - flowing through sedimentary rocks which contain soluble evaporate minerals like gypsum and halite - intensively used for irrigation which enhances evaporation - impounded in two major reservoirs (Lake Powell and Lake Mead) which further exacerbate evaporation - is among the world's most "used" rivers. As the Colorado reaches its outlet to the sea in the Gulf of California, all that remains is a saline trickle.

From Grand Junction we enter the Colorado National Monument, located on the northeast flank of the Uncompahgre Uplift. The steeply dipping Mesozoic strata along the entrance road result from typical Colorado Plateau Laramide deformation - large regions of flat-lying strata interrupted by steep honoclinal structures. Within the Monument, the stratigraphy is much simplified compared to the Eagle Basin to the east. On the Uncompahgre, the entire Paleozoic sequence is absent, due to erosion of older Paleozoic units during later Paleozoic uplift of the plateau when the Uncompahgre acted as a source area. The Triassic Chinle Formation, with red-colored shales that form distinctive slopes recognizable across the entire Colorado Plateau wherever the unit outcrops, is succeeded by massive resistant Wingate sandstone, a deposit formed of ancient wind-blown sand dunes. The road along the rim of the plateau provides a wonderful view of the Colorado River Valley and Book Cliffs to the northwest.

Back on I-70 west, we cross the Colorado-Utah border and head south through Cisco (".. and you think Hamilton is boring..") and rejoin the Colorado River at Dewey Bridge, entering the "Little Grand Canyon". Castle Rocks, held up by the brightly-colored Moenkopi Formation, and the La Sal Mountains, Mid-Tertiary calc-alkaline intrusives, form the vista to the south. The Colorado breaks into the Moab Valley at the "East Portal" and we head south to the Slickrock Campground on the north edge of Moab. Our tents are sandwiched between "Trek America" folks and air-conditioned RV's, but the hot tubs and pool are inviting.

Friday, June, 21:

An unusual early-morning thunderstorm wakes us for our first full day in Moab. We head north to the entrance to Canyonlands for an overview of the stratigraphy and the Moab Fault/Salt Anticline. The offset along the Moab Fault is seen close-up near the Arches National Park entrance, and by mapping the geology on both sides of the faults, we can estimate the amounts of offset. From the road to Potash, the ovate shape of the Moab Valley along the Colorado River is evident. We discuss the solution-collapse origin of the lowland, formed as Pennsylvanian salts rising up the Moab Fault from beneath are dissolved by the Colorado River, resulting in subsidence of the valley in the vicinity of Moab. The incision of the Colorado into the steep escarpments on both sides of the valley results from the down-cutting of the river as the entire Plateau was uplifted over the past few million years. Early geologists noted that the path of the Colorado River seemingly ignored major bedrock structures like the Moab Fault, leading to the name "Paradox Basin" for the thick sequence of Late Paleozoic sediment, which lies beneath Moab.

In the afternoon we tour Arches National Park, where the Entrada aeolian sandstones of Jurassic age are eroded into arch- structures. Unusual fracture patterns caused by folding in underlying Page sandstones and shales localize erosion and lead to picturesque remnants. Our planned hike to Delicate Arch is cut short by an intense late afternoon thunderstorm.

After our return to Slickrock Campground, Jim - "Chief" - McLelland arrives, accompanied by his daughter, Cindy and friend Debbie Holcomb. They will join us for the next few days - travelling to the Grand Canyon.

Saturday, June 22:

A typical Moab morning - bright deep blue skies with early morning sun breaking over the orange rim rock east of town. We head off to Canyonlands - stopping first at Island in the Sky for an overview of the Permian-Triassic-Jurassic stratigraphy, and the dissected terrain of the Grabens-Needles areas to our south. The massive cliff-forming sandstones of the Wingate form the sheer walls of the "Island in the Sky". Chief gives us a tectonic- historical overview of the geology of the western U.S. and Colorado Plateau, with the Green River/Colorado river confluence as the "classroom" backdrop.

Later on we move to Upheaval Dome to assess the alternative meteorite impact/salt dome intrusive models for the origin of this enigmatic structure. Our last stop is at Dead Horse Point, where the deeply incised meanders of the Colorado River provide evidence for rapid entrenchment of the river as the Plateau was uplifted. Deep-blue waters of the potash evaporation ponds are in stark spectral contrast to the otherwise red-orange colors of the rocks of the Canyon. By pure happenstance we meet Kathy Klaski, a Colgate geology graduate of the class of 1983, now living in Boulder, Colorado.

By late afternoon the Moab Valley temperature reaches 100+ degrees, making the Slickrock pool a popular spot. Since the next day is our day off, we sample Moab's evening entertainment. The Rio Club and Eddie McStiff's Pub offer a variety of social pursuits, and an opportunity to link up with the local citizenry. One of our number, Rich Kulzer, proves most popular.

Sunday, June 23:

While today is an official "day off", there is little chance to sleep late. The early morning sun heats the tents quickly to uncomfortable temperatures, and most everyone is eager to get on with their choice of activity - rafting on the Colorado, horseback riding, hiking in Arches and the LaSal Mountains, and exploring Moab's shops are among the favorite.

Monday, June 24:

We pack camp and depart for Bryce Canyon, driving north to I- 70, then west through the Town of Green River (from where, in 1876, John Wesley Powell began his epic boat trip down the Green and Colorado Rivers), we stop to view the southeastern margin of the San Raefel Swell, where the Triassic-Jurassic sequence is sharply tilted to form a "bear tooth" erosional landscape. Heading south toward Hanksville, Utah, we pass through Goblin Valley, where Entrada and Morrison Formation sandstones are eroded into anthropoid "hoodoos". The Tertiary intrusions of the Henry Mountains rise before us, their slopes enveloped by forest-fire smoke.

We stop for lunch at Capitol Reef National Monument, where the Waterpocket fold exposes the now-familiar Triassic-Jurassic sequence of Moenkopi-Chinle-Wingate-Kayenta-Navajo. Further south and west, we climb and descend Boulder Mountain -capped by Tertiary extrusive rocks - stopping for views of the Henry Mountains to the east and Escalante Valley to the south. Our drive takes us across the winding Utah State Route 12, built on knife-edge Navajo Sandstone slickrock - the "Beastmaster Highway". Climbing onto the Pansangunt Plateau, the pink-coral-red colors of the Claron formation are visible in the cliffs of the Aquarius Plateau to the north. We check into Ruby's Inn, but take the late afternoon hours to drive out to Bryce, Sunrise and Sunset Point overlooks to catch the low sun angle on the sculpted spires of Claron Formation.

Tuesday, June 25:

Early morning hikes on Bryce Canyon's Navajo and Peek-a-Boo Trails give us a chance to examine the lacustrine deposits of the Eocene Claron formation close-up. Many rolls of film are consumed along the way, as the contrasting red-pink-white cliffs and spires, green Ponderosa and Bristlecone Pine and Douglas fir and deep blue Utah sky provide innumerable photo-ops.

Back in the vans by early afternoon, we head southwest for the 3-hour trip to Zion National Park and Springdale, Utah. The entrance to Zion Park is via a winding road and mile-long tunnel. Portals in the tunnel offer views of the red-and-white Navajo Sandstone cliffs. Fantastic aeolian crossbeds are everywhere! Zion Canyon Campground is dry and dusty, but spacious, with swimming/floating in the Virgin River available nearby. Later in the evening, Jeff Frederick (Freddie) and Jim Pickens (Slim), instructors for the Molas Lake mapping project, arrive in Springdale.

Wednesday, June 26:

We start the day with a brief lecture from Bruce concerning Zion area stratigraphy, and contrasts with the Canyonlands-Moab sequences. Our morning hike is to Hidden Canyon (with some of the group taking an early detour to Weeping Springs). Hidden Canyon is a narrow cleft eroded into the white upper Navajo, and provides some fun rock-scrambling and log-climbing.

In the afternoon, those with height-avoidance sensibility head to Emerald Pools, while the more fearless (foolish) make the climb to Angel's Landing. The weather turns cloudy and windy, making for cooler but sand-in-the-face hiking conditions.

The evening hours take us to the Bit and Spur, a local establishment offering fine food and social pursuits, including a pool table which offers Chief an opportunity (opportunity?!) to demonstrate his prowess.

Thursday, June 27:

Tents and gear packed yet again, we leave Zion Canyon and head up the winding entrance and tunnel. A short hike at the eastern park boundary gives us a great view back to the west. The hike allows some of the group to consider certain life-style choices and subsequent effects on stomach comfort the following day. Driving on to the east and then south, we travel through Kanab, Utah and begin to drop down through the Triassic-Jurassic sequence onto the Permian Kaibab Limestone. We stop for a view back to the north, with the Pink Cliffs (Eocene Claron Formation), Yellow Cliffs (Upper Cretaceous Mesa Verde Sandstones), White Cliffs (Navajo Sandstone), Vermillion Cliffs (Kayenta and Wingate Sandstone) and Chocolate Cliffs (Moenkopi Formation) forming the "Grand Staircase" of erosional steps, which pass to the south from younger to older rocks. The broad uplift of the Kaibab Monocline brings upper Paleozoic rock to the Plateau surface along the north rim of the Grand Canyon lying to our south, and the topography climbs as we head south to Jacob Lake.

The Jacob Lake Cafe is our lunch stop, and we inspect the latest Forest Science reports on the fires in the Kaibab National Forest to our west. Luckily, a change in wind direction has reduced fire danger in our area. We drive south through the North Rim entrance, continuing our gentle climb to the 8000' elevations on the canyon's edge. After checking in and setting up at the North Rim Campground, we drive to Point Imperial and Cape Royal for overviews of the scenery and discussions of the Paleozoic stratigraphy - Mid-Proterozoic basement - Vishnu Schist - is succeeded by late Proterozoic strata of the rift-related Grand Canyon Series. Cambrian Tapeats sandstone and Bright Angel Shale, Ordovician Mauv Limestone, and Devonian Redwall Limestone are followed by the Pennsylvanian and Permian Tensleep - Supai - Coconino - Toroweap - Kaibab sequence. Tomorrow we hike down through a goodly portion of the sequence.

Tonight is Chief's last evening with the group, so many of us dine at the historic Grand Canyon Lodge, an impressive 1930's structure overlooking the canyon. Some of the group provide a choral accompaniment to our meal.

Friday, June 28:

We arise at 6:00 a.m. to insure that we precede the mules down the North Kaibab Trail to Roaring Springs. The hike - 11 miles roundtrip plus 3500' feet of elevation each way - takes us down through the Paleozoic stratigraphy and provides an opportunity to examine features developed along the Bright Angel Fault Zone. Roaring Springs, gushing from karstic fissures at the base of the Redwall limestone, is a welcome and cooling respite before we head back up. A series of events, some amusing, and others not-at-all funny are encountered during our trip up. Bruce debates a creation scientist; Lynne helps to save a mule-bucked tourist with a broken knee; Chris, Vin and others assist a bedraggled father-son hiking pair. The "Coconino switchback torture" ends for all by 3:00 p.m., and not a few of us take an afternoon nap back at camp.

The last of written work in the field manual is completed in the evening hours, interrupted by a visit to a nearby point to view the sunset. Notwithstanding the vocal efforts of the "louds" in the site next door, a good sleep is had by all.

Saturday, June 29:

Packing camp, we are on the road by 8:30 a.m. and retrace our route to Jacob's Lake. Crossing the Colorado at Marble Canyon and south through Page, Arizona to Tuba City, we see the Vermillion and White Cliffs yet again as the Triassic and Jurassic sandstones sweep south along the east flank of the Kaibab monocline. Lunch is in the "world's best" Burger King at Kayenta, with its display of information regarding the Navajo Code Talkers who were critical in the WWII Pacific Theater. We drive by the Tertiary volcanic plugs and stocks of the Spanish Peaks, then stop in Monument Valley for the requisite "Forest Gump" background photos. Back in Colorado near Ute Mountain, the massive cliffs of the Mesaverde Group rise to our east and north. Through Cortez, we head directly east toward Durango, climbing onto the southern flank of the San Juan Mountains. Notwithstanding some incredibly poor driving by unknown tourists, we successfully traverse Durango's downtown and head north into the San Juan's to Molas Pass and Molas Lake Campground. Freddie and Slim have preceded us, and have prepared swordfish and steak skewers as a wonderful introduction to camp cooking at 11,000'. After dinner and Melissa Barney's birthday celebration, Bruce departs for his trip back to Hamilton. The "Canyon Loop" is over - 2 weeks of mapping with daily hikes to 13,000' await.