

Many million years ago in the area of the west now known as the colorado Plateau a slow change began that had its origin deep within the crust of the earth. Caused by forces believed to involve the very dynamics of the interior of the globe, a wide-spread uplifting of the sedimentary deposits dating back to the Paleozoic Era gradually raised them above the level of the shallow seas which intermittently occupied this region.

During the preceding several hundreds of milions of years from the first appearance of air-breathing vertebrates until the end of the age of reptiles, hundreds of feet of mud and gravel and sand were deposited, consolidated, and washed away in this area of ever changing landscape. The material of ancient mountains was spread by streams over low lying land and carried into the shallow lakes and encroaching oceans. silt filled in swamps and covered eroded plains until massive layers built up to be themselves worn away with the rising of the land and the changing of climates. Wet periods were succeeded by dry

and swamps were replaced by deserts when aeolian ages came into being. For perhaps a thousand thousand years winds swept unimpeded across limitless spaces of rolling dunes. Timeless as these periods seem in terms of human lives, in geological measure they were but moments in the kaleidoscopic changes constantly altering the face of the earth. Seas gave way to deserts and deserts were inundated by advancing seas in an endless shifting sequence. Sediments from the dust and debris and rubble of crumbling mountains grew to inconceivable depths as the earth's crust sank beneath their weight. Deep in the earth or buried under the waters of the seas these layers were transformed, by the cementing action of dissolved lime and iron, into the yellow and red sandstones of the Entrada, Wingate, and Navajo formations. Where clay and mud predominated over desert sand the thinly-bedded, shaly Moencopi and maroon Kayenta strata, or gray and green, uranium-rich beds of Shinarump conglomerates took form.

At the beginning of the great upwarping the seas drained away and in their place a meandering river carried the waters of the plain into the western ocean. At first, no doubt, a sluggish stream, perhaps much like the Mississippi today, flowing through a still rich land, it carried little but the steepings of the soil. Its dark mahogany waters must have supported an abundance of life which in turn supplied the food needs of many of the riparian birds and animals of the Eocene. But as the continent continued to rise the character of the river changed. Tributaries loaded with debris flowing down the western slopes of the newly born Rocky Mountain range delivered to it the abrasive material needed to cut its way as fast downward through the uprising land as the land itself was heaving up. Had the river's cutting into the ancient beds of sandstone and shale been less rapid than the rate of uplift, its course would have been greatly changed and instead of emptying into the western ocean in the Gulf of California,



as today, it would have ended up in the Gulf of Mexico. But these processes did take place hand in hand through most of the Cenozoic era. The river, gouging its way back through time, first cut into the last deposits of the late Palaeocene layed down more than ten millinn years earlier; then into the shales and clays formed under the vast swamps of the Cretaceous, backwards for a hundred million years and more, and down through this unimaginable distance in history scrubbing away particle by particle through the climactic age of the reptiles. The hard sands of the Rocky Mountains were the first tools for this great channeling effort until theriver made its own abrasives from the rocks through which it was flowing, the way diamond-dust is used to cut diamonds.

And stillrestless forces from deep below pushed up the continental crust. Down into ever deeper layers the tireless river with its burden of grit and powdered rock ground its way. It dug into the consolidated sediments of the Jurassic, deposited under the shallow seas inhabited by ichthyosaurians and other marine reptilian monsters of that age; and on down into the sands of the Jurassic and Triassic deserts through the wind stratified and cross-bedded dunes of the aeolian period, leaving the age of the dinasaurs far behind, and on through the millions of years of the Permian to the steaming swamps of the Carboniferous - the time of the greatest burgeoning of plant life, when the world's major coal seams were formed andwhen the first land animals appeared. In places where previous eróision had removed vast thicknesses of Mesozoic or Paleozoic rock leaving wide unconforming gaps in geological history, the river dug through all the remaining sediments of the Paleozoic to reach and grind into the oldest of all formations on the earth, the hard metamorphic, archaic shists and granites that go back to the time before the appearance of life a million million years in the past. Still today it is cutting into these rocks which can be

seen exposed on the dark, forbidding walls of Granite Gorge at the bottom of the Grand Canyon.

To suppose that all these sedimentary layers from the Precambrian up to the present could be visible anywhere along the river's length is to forget that the processes of building up and tearing down never cease. New rocks are always born from the destruction of the old. Sediments deposited over milleniums of time out of the debris of older sediments are themselves in turn disintegrated to appear later in still younger deposits, to become consolidated, to be heaved up by tectonic forces, sculptured and weathered away again. The outcome of these sequelae is to produce great geological unconformities in which one finds sediments in contact with highly eroded underlying formations separated in time from them by scores of millions of years. Interleaved in time with these weathering processes, further mixing of strata caused by faulting and folding of the crust produces situations of such complexity that the exact sequence of events is difficult to read.

While the river dug into the past at the bottom of the trench it had cut across the landscape - a meandering trench roughly parallelling the path of the primeval stream, but which has here and there been straightened temporarily by cutting through the narrowing neck of a loop and in so doing leaving behind a dry arc of river bed, clear evidence of its once more lengthy course - so have the forces of erosion on the land above been at work reducing it too. Much material has been blown and washed away, most of it into the river itself through its many tributary canyons. A great part of the most recent sediments in the surrounding country has disappeared and their foundations deeply carved, leaving a rugged land of corniced buttes, of deep canyons, of towering castles whose fretted and sculptured battlements seem to glow with their own internal fires in the evening light. It is a land too of wide valleys



and sandy, arid basins and steep-walled, juniper-covered mesas.

The superficial history of this country has probably changed more in recent geological times than the history of the river itself which would be less effected by climatic changes than the plateaus. During the last glacial epoch this country was much more lush than today. Forests of pines clothed the high land where now are found only a dwarf forest of juniper and pinion. Clear streams flowed in all the valleys and canyons which are today watered by occasional, mud-laden flash-floods of summer. Grass grew thick and high where now rock-strewn, sandy wastes exist and a sparse desert growth only holds on.

Lying between the Sierra Nevada range on the west and the Rocky Mountains to the east and encompassing all of Nevada and Utah, the northern half of Arizona, and parts of Colorado, New Mexico, and California is a great sweep of arid land called the North American Desert. Included in it is the Great Basin of Nevada and the Colorado Plateau. Broken by scattered mountain islands, many volcanic in origin which record a violent geological history of this part of the United States, but crossed by no great mountain chains, except the Uintas in the north, this enormous area takes in the whole upper drainage basin of the Colorado River. All the waters that enter its eastern half, which is the Colorado Plateau, whether from the sky as rain or from melting snow on the peaks of its peripheral mountains, except that which sinks into the soil to appear, perhaps, lower down in a spring to join from there the flow again (or which evaporates into the sky) all these flow finally into the Colorado to be carried thousands of miles to their ultimate destiny in the Gulf of California where they at last mingle with the salts of the ocean.

The most difficult of access and sparsely populated part of the upper Colorado water system lies along either side of the river from Moab south through southern Utah and into northern Arizona as far as the

beginning of Grand Canyon. Throughout this whole length the Colorado flows between high canyon walls for a distance of well over three hundred miles. These bordering lands are among the most rugged, eroded and impassable in the whole nation. They are cut through and through by innumerable canyons having such precipitous sides that into most of them few trails lead. The surface consists in many places merely of rolling mounds of bare rock, more or less literally petrified and dunes. Two major tributaries join the Colorado in this desiccated land: the Green River first, up stream on the right, and below it the San Juan from the left, both through formidable canyons. The physiography and historical geology of the canyon divide it naturally into distinct parts named by the early explorers. Starting just below the confluence with the Green River the gradient increases steeply, the river becoming turbulent and full of rapids for the next ninety miles until it smooths out above the ferry crossing at Hite. This section John Wesley Powell called Cataract Canyon. The cable ferry at Hite was, until construction a few years ago of the high bridge at the Glen Canyon dam site, the only point except Lee's Ferry and subsequent Navajo Bridge where the Colorado River could be crossed by automobile between Moab and Boulder Dam. At Hite, where White River canyon enters on the left, Glen Canyon begins. It extends a winding course for one hundred and thirty miles through the Wingate and Navajo sandstones to Lee's Ferry at which point, emerging between the Vermilion Cliffs of the Paria Plateau to the west and Echo Cliffs on the east, the river enters the older rock formation of Marble Canyon, which gradually deepens to become Grand Canyon at the mouth of the Little Colorado River.

Glen Canyon, also named by Powell, is the part of the Colorado River with which this book is concerned. Since the gradient of flow is very slight throughout the whole length of the canyon, no rapids of any consequence are found here. The river slips along



serenely, disturbed only in the few places where it is confined for short distances to boulder filled narrows, or flows over coarse gravel shoals that during periods of low water threaten more hazard, if any, to boating by the shallowness of the water than by its swiftness. On this account, as well as to the spectacular scenery it offers, Glen Canyon has long been a favored section of the Colorado for river running. It is easily accessible at the ferry crossing at Hite, whereas ~~it~~ exit from it was available at Lee's Ferry before construction of Glen Canyon dam began and can now be made at El Vado de los Padres at Kane Creek where Escalante, nearly two centuries ago, found a way back to Santa Fe after his abortive attempt to establish a route to California.

When I first went through Glen Canyon several years ago this is the trip I took. We rode the river in Army surplus rubber boats called ICRs which are elongated, doughnut-shaped, inflated tubes with rubber floors and stiffened by two inflated cross members. They are incredibly tough and resilient, being made like automobile tires of laminated rubber and fabric, capable of withstanding severe battering on the river rocks, and since they are compartmentalized are practically unsinkable even when punctured. They can carry an inconceivable quantity of baggage without being overloaded. Five times I have made trips through Glen Canyon by boat, three times from Hite, once from Mexican Hat on the San Juan River into Glen Canyon, and once up stream from Kane Creek by out-board motor nearly to the mouth of the San Juan. Each time was a more rewarding experience than the one before. To fully appreciate Glen Canyon requires familiarity with it. The first experience is too overwhelming to leave room for taking in more than the broadest features and boldest strokes. The eye is numbed by its vastness and magnificence and passes over the fine details, ignoring them, very likely, in a manner of self-defense against surfeit. The big features, the massive,

towering walls, the shimmering vistas, and the enveloping presence of light hypnotise the consciousness at first, shutting off awareness of the particular. Later it becomes possible to refocus on smaller, more familiar, more comprehensible objects which when finally seen in the context of the whole are recognised to be endowed with a wonder no less than the total, and it is from them that the greatest rewards are gathered. Then it is possible to see for the first time the velvety lawns of young tamarisks sprouting on the wet sand bars just vacated by a retreating flood; or the way the swirling surface of the green, opaque river converts reflected light from rocks and trees and sky into a moire of interlacing lines and coils of color; then is seen the festooned designs etched into the scaling walls by water and lichens, recalling to a free imagination images of men and birds.

Glen Canyon, despite its impressiveness in so many aspects, is an intimate canyon. It is not like Grand Canyon so vast and, as people frequently remark with despair, beyond understanding that it creates obsessions of unreality. The feeling of intimacy comes partly from being able to travel through Glen Canyon by boat, affording close association with its physical attributes not obtainable from a river canyon seen only from above, or at most dipped into at a very few places. But equally is it owing to the calmness and congeniality of its waters and the closeness of its walls, which lack completely the threatening quality conveyed by either the Black Gorge of the Gunnison or Granite Gorge. One feels safe and protected in Glen Canyon. Life here along the green banks and sandbars is unhurried, and every bend offers a good camp site. Clear springs are not far apart, where amid a shaded, mossy setting of dripping rocks and wild flowers welcome respite from the heat of noon



is available. At evening in the fading glow of burnished copper cliffs across the river a quiet peace settles on the boatmen gathered close to their camp fire, muffling the sound of their subdued voices and accentuating the faint gurgling of the big river slipping past its banks below. With darkening night spreading fast into the far recesses of the canyon, stars appear one by one in the diminished sky against which the canyon's indefinite walls are dimly silhouetted, to evoke an ineffable sense of comfort and security.

Rising hundreds of feet, in places straight from the water, the walls of Glen Canyon are among its most glorious attributes. The sediments through which the canyon has been carved are monolithic sandstones of Jurassic origin. The Wingate formation at the upper end weathers through vertical cracks, extending down from the surface, into massive, burnt-red, columnar blocks and slabs. When these break off and fall, shattering on the steep, narrow talus bordering the river, they strew the slope with upended, jagged fragments, there to weather ultimately into red sand while their faces and the face of the cliff above <sup>oxidize to a</sup> ~~turn~~ purple-black with <sup>dark varnish</sup> ~~oxide~~. This <sup>black coating</sup> ~~black coating~~, reflecting the sky, <sup>turns</sup> ~~assumes~~ in the shade <sup>metallic blue</sup> ~~to deep ultramarine hue~~, but as the sun strikes it near the top of the wall, shines a dazzling white. Further down the river the Wingate formation dips below the surface, its place is taken by Navajo sandstone, and the character of the cliffs change strikingly. Here, ~~where~~ the plateau has been weathered into rounded domes and mounds of rock, <sup>and</sup> the rim is less sharp. Water running down over it in many places after a rain has streaked the walls with dark <sup>stripes</sup> ~~bands~~ and ribbons of discoloration clinging like wet curtains to the face of the cliff. The black ~~stripes are~~ <sup>(are caused by)</sup> stains ~~are~~ algae and lichens, whereas the blueish-white bands ~~are~~ deposits of chemicals leached from the sandstone. More commonly than Wingate, the Navajo sandstone cleaves along curved lines producing immense arches and bays ~~on the walls~~ and all manner of rippled

Polished

(surface structures)  
 and drapery-like ~~fractures~~ imposed on these concoidal shapes, giving emphasis and contrast, oxidation has added to the yellow and orange stone a blue and purple cast; and lichens following the same pattern <sup>superimpose on</sup> ~~give~~ <sup>not the</sup> facing walls a <sup>of tapestry</sup> ~~textured~~ texture to the abstract designs. Slabs continually scaling off the cliffs, one layer after another, produce, where water seeps through cracks in the porous rock or where flowing springs have developed, caves green with tangles of rank vegetation for which Glen Canyon was named. High on the face of the canyon walls in many places huge, eye-shaped depressions - the beginnings of caves - have been flaked out, in which water oozing out along the fracture lines provides enough moisture to support, when ~~facing~~ ~~exposed~~ ~~to the sun~~ shaded, a heavy growth of maiden hair fern and mimulus. Like the pupil-less eyes of marble statues these eyes of the cliffs stare blankly out over the changless scene.

More than its cliffs the quality of the light in Glen Canyon, filling all space between them, reflecting and <sup>re-</sup>reflecting, gives it its magical <sup>quality</sup> ~~essence~~. Its first explorers, Powell, Dellenbaugh, and Dutton, well appreciated its beauty and remarked on it often enough in their accounts to have established its reputation as a wonderland of the Colorado, a peaceful, uniquely beautiful stretch of the river where they felt relaxed and secure after the hardships and excitement of the cataracts behind them. Later visitors, who left <sup>many</sup> ephemeral marks in the canyon, perhaps did not see its finer aspects for they were lured there by greed. They came in barges with tools and dredges and machinery to extract the riches in gold from the river's sands and gravel benches, but they were frustrated by the river's obdurate implacability and returned with empty hands, even losing the wealth they had invested and the materials they had so hopefully dragged into the canyon bottom. They left their mark, however, in a more permanent form than the scratchings they made or the rusting machinery they left behind them. They gave names to the places they came to know, just as the Mormons and the



Indians did, where they strived and lost their hearts and died. Their memory will remain in Smith and California Bar, Klondike and Dead Man Bar long after the crazily tilted, rusted dredge - still to be seen in mid river - is <sup>buried in</sup> ~~swallowed up by~~ the shifting sands.

But now another kind of invasion is taking place; one that will obliterate all the places that bear these nostalgic and provocative names, wipe them out for all foreseeable time, and thus with nothing tangible by which to recall the past, even the memory of the history of the river will be destroyed. This last and final act of obliteration is, as it was with the gold seekers fifty years ago, materially motivated. The wealth of the Colorado this time is its power - ostensibly at least - although there are those who see a less forthright purpose - the need of a semi-autonomous federal bureau to maintain, for its very survival, its power and influence through an endless series of vast engineering projects. The huge dam being constructed across the lower reaches of Glen Canyon is an exemplification of this need. Self-justifying in the minds of many by its imposing magnitude alone, it cannot serve all the beneficial functions attributed to it in the process of obtaining legislative support, or as an apology. When the gates close the waters impounded by this plug of artificial stone will spread back through Glen Canyon over its entire one hundred and forty mile length, inundating the sparkling river, swallowing its <sup>Luminous</sup> ~~iridescent~~ cliffs and tapistried walls, and extinguishing far into the long, dim, distant future its <sup>Fiery</sup> ~~iridescence~~ ~~of light~~ <sup>Pines</sup>. As the waters creep into the side canyons enveloping one by one their mirroring, jewel-like pools, drowning their star-bright flowers ~~and black stemmed ferns~~, backing up their clear, sweet springs with a stale flood; a fine opaque silt settles over all, covering rocks and trees alike, rotting vegetation and limp discolored leaves, with a gray slimy ooze. A darkness pervades the canyons where all is lost in the <sup>umbrageous</sup> ~~hazy~~ gloom and death takes over where not long since life



and shimmering light were their glory. Except for <sup>those who hold</sup> ~~the believers in~~ a cosmic view of nature there is little solace in the knowledge that though man may conquer Nature he will never conquer the forces that mold the earth. The River, tamed for a while but responding to the heavings of the crust, will irresistably, in the end, cut through the paltry obstacles erected in its path by man. Eons from now this waterway will still be here, walled in stone yet unborn, but this dam with its hydroelectric establishment will have vanished as completely as the men who built it. The tributaries of Glen Canyon exhibit <sup>the most</sup> ~~the most~~ fantastic examples of erosion <sup>found anywhere else</sup> ~~phenomena that the tributaries of Glen Canyon exhibit~~ They are a unique natural museum of the particular kind of phenomenal geology that has led to their formation. Their shapes and sculptured forms are not alone responsible for the wonder they excite; the realization of the speed in geological terms with which they must have been produced adds to it. But most of all the phenomena of light, even into the farthest depth of the narrowest canyon, evokes the ultimate touch of awe.

The majority of the most spectacular side canyons are quite short; many no more than a mile in length and some not even that long. From the <sup>identity</sup> ~~similarity~~ of their ground plan it appears that the same forces were at work <sup>molding</sup> ~~shaping~~ them all. Their courses are all in the shape of S curves twisting back into the sandstone of the Colorado Plateau for many turns. Some straighten out as they advance, but others continue back for miles, like Twilight Canyon, which my youngest son followed for fifty seven turns without coming to an end or detecting <sup>a lessening</sup> ~~of~~ the height of the its walls. The shortest ones snake back only two or three turns before ending abruptly in <sup>a</sup> circular chamber surrounding a pool, above which, through a slit in the cliff, the flood waters from the plain ~~above~~ are dumped in times of rain. (From the point of view of flow, side canyons should be considered as progressing in the other direction towards the parent canyon, this being the way their excavation can be understood, but because



they are invariably entered from the river they are usually described  
 from <sup>this</sup> ~~that~~ end.) It is impossible to <sup>go into</sup> ~~describe~~ all the variations of <sup>existing</sup> ~~shapes~~  
~~in~~ ~~and sizes of~~ these tributary canyons ~~connecting, continuing like~~ ~~the mother canyon~~ branching from both sides of the mother canyon like the  
 legs of a centipede. They are all carved by intermittent floods burdened  
 with sand, each grain a chisel ready to liberate an imprisoned ~~fellow~~ grain  
 from the <sup>ancient</sup> ~~confining~~ sandstone walls. The narrowness of some, whose sides  
 are hundreds of feet high and less than six feet apart at the bottom,  
 is dramatic evidence of the rapidity of erosion. A few evidently started  
 as tight meanders in the surface rock, in which fast cutting deepened  
 the channels into wide passages beneath, excavating chambers with sides  
 that come together and actually interlock at the top. To be caught  
 in one of these narrow canyons in a flash flood would be fatal, but since  
 they seldom occur and then only during local storms the hazard is not  
 great. Other wider canyons hold slowly evaporating pools on their  
 rounded floors - pools that never become dry because they are fed by  
 seeping water, and replenished from time to time by ~~the~~ storm-born  
 floods.

In clear weather, in somber, rocky halls of ochre and purple  
 stone into which the sun rarely strikes, shallow pools glitter <sup>brassily in</sup> ~~with~~  
~~brassy~~ the reflection ~~golden luminosity reflected~~ from yellow cliffs towering high ~~above~~ over  
 head. And everywhere, in wet and weeping clefts maiden hair fern,  
 scarlet lobelia, and white columbine have taken root. ~~weeping, trailing~~  
~~leaves~~ Turned to a dusky cyan-green in the blue shadows, the drooping leaves  
 impart a gloomy, almost funeral, atmosphere to the scene. Some canyons  
 are dry and dead; Nothing grows among heaped up boulders; no water  
 trickles and no ~~ferns and~~ flowers spring from the barren walls. But they  
 are not the usual type, most, even those carrying no permanent stream,  
 are green with luxuriant plants. Thick grasses, tall canes, creeping ~~wood~~  
 woodbine and poison ivy cover the sand banks at the bends. Oaks grow



impenetrably in the sunniest spots and redbud fills the shady corners.

The porous sandstone walling in Glen Canyon is like worm-eaten wood on an enormous scale, riddled with the tunnels of long gone larvae. The smooth bores of their unroofed, twisting holes converge onto a common channel through which they have effected their escape. Viewed from a human perspective the worm holes are the tributary canyons winding back into the earth and the grubs ~~of the canyons~~ are the flash floods which, unlike short-lived real grubs, live a many-times reborn existence. They rush, squirming, along the beds of their predecessors, enlarging them a little and fading away. Violent floods, battering against the rock walls, tear away, in time, all loose material, and gouge out deep pools. But for all their fierce destructiveness, against which no lifeless structure can stand for long, they are helpless against the frailest living things which, like the sea algae of a surf-bound coast, bend to their will and spring back after the torrent has past. And, too prolific is their spread, the plants that are uprooted <sup>are</sup> soon reseed <sup>ed</sup> themselves. At hairpin bends, the waters, doubling back, scoop out deep caves, the overhanging walls of which envelop an opposite peninsula of rock, rounded into a knob that lies in a gigantic, immobile socket. If you stand in the stream bed in one of these caves, facing outward, and look up at the top of the dome-shaped inner wall you see the sky, a crescent of blue folded over the striated inner dome, bounded above by the overhanging black surface of the cave rising behind you. The power of these elementary shapes expanding over your head out of the narrow confines of the canyon floor force upon you a sensation of dream-like unreality.

Far down Glen Canyon its striped, sheer cliffs, undercut by the river which has left no talus, not even a sand bank or bar, to separate them from the water, are sliced unexpectedly by narrow perpendicular slots. ~~The river~~ <sup>when they become navigable,</sup> At high water, the river deposits its



mud in these clefts, ~~which are then navigable~~. The coarsest materials are dropped in the eddies at the entrances but the finer sediments precipitate in the quietest waters farthest from the agitating current. <sup>back</sup> In a varying distance, perhaps as far as a hundred yards, the ~~arm of the river~~ <sup>estuary</sup> blends into a bank of gray, jelly-like ooze which thickens without detectable discontinuity into a slippery bed of clay of uncertain depth extending from wall to wall. After the spring run-off has subsided and the river withdrawn, these slots are left plugged to their mouths with mud and silt that dries slowly to a hard cracked surface which affords access to the canyons on foot. But the first local freshet washes it all out and the mudding-up process does not begin again until the next high water.

<sup>Forebidding</sup> The ~~unassuming~~ portals of these canyons give no hint, do not betray the strange world within their rocky fastnesses. Exploring them with a few adventurous companions on my last Glen Canyon trip, <sup>we plunged in</sup> ~~we~~ were undeterred by mud or water. ~~We plunged in,~~ Sometimes waist deep, <sup>forced</sup> sometimes <sup>we</sup> to swim ~~at first~~, and struggled through the sucking, glue-like clay, one laborious step at a time, until having gained higher and harder ground, we made our way unimpeded into their unknown depths. In ~~Mystery Canyon~~ In Mystery Canyon, after passing through a corridor of creeping woodbine and up a terraced brook, we found ourselves at last, confronted in a circular arena by overhanging, <sup>inaccessible</sup> ~~unclimbable~~ walls. <sup>Dark, viridescent</sup> ~~Dark~~, lumps of moss dotted the surface and, <sup>current of air</sup> ~~in a perpetual draft~~, green fern tentacles, ~~growing blindly~~ grew around them from the slippery rocks. Out of a V-shaped slot at a higher level ~~slid~~ <sup>stream</sup> a thin stream into a black and fathomless pool. The whole interior of this chill, tenebrous chamber, <sup>like a primitive, ciliated stomach</sup> ~~like a primitive, ciliated stomach~~, was lined with <sup>having</sup> ~~groping~~ <sup>experiences</sup> ~~experiences~~, cilia.

In Cathedral Canyon, after traversing many vaulted rooms, we came to a sudden narrowing of the walls where the floor disappeared

into a water-filled trough no wider than a man's body. ~~For~~ Swimming through it was ~~indeed~~ a dream-like adventure. We glided along, seal-like, chin deep in the water through still depths into <sup>an</sup> inscrutable solitude. Only the hollow sound of our slight splashing reverberated ~~back~~ along the contorted channel back into the stoney labarinth. We touched, shivering with surprise, the mysterious bottom - a stone or a graveled ledge-rising to meet us. We climbed over wedged boulders from one ribbon pool to another in a journey "through caverns measurless to man, down to a sunless sea." A sudden shaft of sun, adding a dimension of reality, penetrated the upper stories high above through an unseen window. It lighted a strip of wall a dazzling yellow and was reflected to our eyes at water level from the thin curved lip of the pool lapping the rock in gentle undulations: a golden thread reaching ahead, deliniating for a moment the wavering separation of water from stone. At last, at the end, a wisp of waterfall from unseen heights overhead, slipped over a smooth and algaed chute into a slatey pool. Shivering with cold we retraced our way.

Little Arch, a short canyon, ends in such a waterfall, upon which an early explorer cut shallow steps in the wet sandstone. By following these we were led through a tortured, narrow trough into a roofed room in the red rock. Dry on one side where a sand bank was heaped up, the other side extended a few feet into an alcove giving egress to the free air of the plateau high overhead through a chimney leading straight up to the sky. The sides of the chimney had been ground into concave plaques lying one above the other like immense, ~~boxy~~ elongated scales. Light suffusing down this tube spread through the chamber an infernal glow that turned our faces and half naked bodies to a dull fire-blasted copper. Our imaginations, turning simultaneously to the violent events that must periodically take place in this cavern, pictured the enveloping sparry and heard the roar of water. Collected by many



little channels in the rocky surface from a cloud burst, it pours down the vent in a tumultuous, thundering rush. My feelings were exactly those of one caught in the trap of an enormous drain.

All places where plants grow have their compliment of animal life and Glen Canyon is no exception. And also, as is true of so many environments, its birds are its most conspicuous animals. It is the very nature of birds to live conspicuous lives - they fly - and the majority are not nocturnal, as are most of the rodents, nor furtive during the day, except near their nests, like the foxes, weasels, and coyotes. They advertise their presence too by song even when they seem to be skulking in the thickets. In the spring the Willow and tamarisk jungles stopping ~~the~~ river-side sandbars ring with the cheerful sibilance of yellow warblers, while from among the broken rocks of dry talus comes the bright chant of the rock wren, or echoing from higher up the cliff-side the canyon wren's <sup>deliberate, notes</sup> ~~clear~~ descending cadence. Added to these sweet songs, some most unmelodious, comic sounds issue as frequently from the riverside thickets. They are the harsh clucking, cawing, and whistling of the yellow-breasted chat that lurks mostly unseen in the densest underbrush, but occasionally exhibits himself by bursting from the top of a bush in awkward, wing-clapping, mutual flight.

Great Blue herons leave evidence of their participation in the community life along the muddy edge of the river. Together with the numerous beaver, whose characteristic webbed tracks - a dragging tail between - and the parallel scratches, seen all up and down the river, of willow branches pulled down to the water, these long-legged birds mark with their four-toed prints - three in front and one behind - the soft mud banks bordering lagoons and every shallow backwash. They stand motionless watching for <sup>sharp</sup> small fish or frogs which they seize with a ~~quick~~ jab uninking of their curved necks. When approached too closely they rise smoothly, legs dangling, powerful wings beating slowly, and flap in

unhurried flight down the river.

In the side canyons, along the narrow watercourses of deep *pools*  
~~rock-carved pools~~ <sup>in rock</sup>, where the flow is clear and constant, lives a small,  
 plump, gray bird, who sports a ridiculously stumpy tail. A favorite  
 haunt is the Narrows in Bridge Canyon on the trail to Rainbow Bridge.  
 The only representative of his family on the continent, he is a truly  
 aquatic creature, as convincingly, once his acquaintance is made, as  
 the pelagic petrels that roam the oceans. He is not web-footed; but  
 he is as much at home in the water as a duck - perhaps more so - but  
 unlike that phlegmatic fowl his demeanor is one of sparkling gaiety.  
 He makes his living in the flowing streams and cascades of the high  
 country and the canyons of the west; in truth he cannot live without  
 them, and he never departs far from them. He loves water so much that  
 he builds his roofed nest and rears his young in the spray of waterfalls.  
 He is the ~~Slipper~~ or Water Ouzel and when first encountered will in all  
 probability be bobbing on a stone in mid-stream. The uninitiated, to  
 his astonishment, may see him suddenly plunge into the foaming water.  
 It is as strange <sup>a sight</sup> at first ~~sight~~ as it would be to see a robin go for a swim,  
 for this bird is a land bird who has only recently learned the merits of a  
 subaqueous existence and the art of conducting himself under the surface.  
 He goes about it in a most professional manner as though it were the  
 usual sort of behavior for a bird of his kind. Over a rather somber dark  
 gray suit he instantly slips into a resplendent jacket of shiny silver  
 bubbles and in this outfit walks about on the bottom picking up aquatic  
 larvae here and there with as little concern as ~~though~~ he would show on dry  
 dry land. In a moment he pops out again, leaving his bright diving suit  
 behind, and as dry as before he ~~dove~~ <sup>in</sup>, continues about his business  
 without even so much as taking a deep breath. He is apparently pleased  
 with his mode of life, showing his satisfaction by bursting into song  
 most unexpectedly after emerging from one of his <sup>under</sup>-water foraging



expeditions. He sings his ebullient, varied song throughout the year for no other reason that can be assigned than the sheer joy of doing so. And his own spirit is the only audience he requires when he sings unheard in the mist of a thundering cascade.

To the murmuring and chattering voices of the river is added now and then the harsh caw of a raven from a high ledge or from a point of suspension in a stream of air rising up the face of a canyon wall, where he has found a balance between the law of gravity and the laws of convection. There he hangs, rocking slightly as he drifts and soars, seeking out the current, his black profile a punctuation mark to his words and to the unarticulated words of all the past history of the stony world in which he lives. The raven is a bird of parts; he is no show-off nor does he hide his talents under a bushel. He uses them for his own particular needs when the spirit moves him and without ostentation. He saves a particular quality in his voice, for instance, for special occasions which he does not reveal, and though he cannot sing in the usual sense of the term, he is able to introduce a bell-like quality into his croak which adds a musical touch without melody. Like the ouzel, the raven does not just live but appears to enjoy the process, especially when it involves exercising his greatest accomplishment - flight. One is on very unsafe ground to make anthropomorphic interpretations of animal behavior, as for example ravens sporting in an updraft over a ridge. But nevertheless the interpretation seems justified. A small group may spend hours doing nothing more than playing in the air currents: soaring effortlessly, chasing one another in an endless game of tag which involves all the tricks of aerial acrobatics at their command - diving, swooping, turning on their backs in a wild, exuberant maylay. As the chase becomes close - wing to wing - excitement seems to develop to an unsupportable pitch, to the point at which a pursued bird racing past the face of a cliff, feeling desperately for the up-surge

that will give him the advantage, utters a guttural cry releasing all his pent-up tension in the same way that children cry out involuntarily in the excitement of their play. Is this not an expression of joy?



A trip through Glen Canyon in August is hot - it is hot even in October - but in August the heat has a special quality lacking the tempering of autumn. It is not simply a matter of the temperature, which may be as high later; it has to do with more subtle properties: heat capacity, the day to night differential, the angle of the sun, and even perhaps with the knowledge that it is still summer. In August the sun is still in its summer ascendancy. It beats down straighter and is above the line of the cliffs longer; its radiation is reflected on to you more powerfully from rock and sand and water. In summer the heat of the sun soaks in to a greater depth, is more uniformly distributed, and takes longer to dissipate. The situation is similar to the difference between an over-heated room and a bonfire out doors. In the former the heat becomes insufferable although the temperature may be quite moderate, as compared to summer temperatures; but the bonfire in winter, which heats your face to a higher degree, is comfortable because your back is cold. Floating down the river in August past a sunlighted cliff is like passing the open mouth of a huge furnace. In fall, even on the hottest days, the heat is welcome. However hot it may become in August there is always the river beside you for relief. You can dangle your feet in it or tie a wet handkerchief around your head and you will immediately feel much cooler; or better still soak your shirt in its tepid waters and you will instantly be reduced to a state of shivering. The river is the creator, the life giver, and the moderator of Glen Canyon. It is Glen Canyon. Without it there would remain only a pile of dead <sup>and</sup> burning rocks.

At the first glow of dawn I wake and turn in my sleeping bag towards the east. A faint paling of the sky is just perceptible. But soon the gray dim light will give way to the waxing twilight

of morning and the world will fill with color. It is a positive time, a time of expansion and increase and expectation. In the waning, evening twilight the world is closing in and shutting down and everything is in retreat. Then is the time for rest and contemplation. But now, at dawn, when each moment is brighter than the preceeding moment, the path into light, into activity, is full of hope and renewed energy and all things are seen through optimists's eyes. The sun, still some way below the horizon and a long way beneath the rim of the canyon, routs the last stars down the brightening sky. They congregate, shining palely in the west, taking a final stand in the thinning shadow of the earth. Venus alone holds out, resisting the stampede, expressing thus her kinship with the earth. Directly overhead a flock of gray, fleecy clouds sails across the space between the canyon walls from the northwest. They preserve the order of their ranks while their shapes shift and flow in constant flux. Presently a tinge of pink spreads over them, changing gradually to salmon and then to yellow, when suddenly from a point on the horizon out of sight behind the walls the sun bursts into my hemisphere. It flashes a beam of light onto the top of the cliff across the river transforming it into a hot orange tower of metal. Slowly, the fiery glow creeps down the opposite wall plating it with copper and enveloping the canyon in its warmth. The river still in shadow picks up the color, multiplying it, converting its gray stones along its muddy bank into uncut lapis lazuli floating in molten bronze. Blue highlights thread the dry sand ripples as proof that day is near and that on the turning earth/<sup>it</sup> will soon blaze into the canyon world.

The yellow light fades with <sup>day's</sup> ~~its~~ swift advance. The purple mud banks and blue sand dunes become common mud and sand, and all the bazaar morning colors revert to their normal daylight hues. The river becomes muddy green, the rocks turn back to brick and clay, and



with the appearance of the sun above the canyon rim day is full born.

We have had our breakfast of coffee and bacon and eggs, have packed our few possessions, and are ready to resume our journey. All

that remains to do is to shove off into the current lapping at the loaded boats; but we linger, reluctant to leave our camp site. We check again the sands for forgotten objects, postponing the final moment, loath to depart the little world which has become more than a night's stop - a temporary, resting place - has become in one night the focus of our lives, an eternity in the timelessness of existence in this river wilderness. We start at last, wading out knee deep in mud to gain the deeper water before climbing on board. The day is shimmering bright and still. No wind ruffles the river, which presents a surface of imperfect glass lined with swirling striae produced by the current, upwelling, of from ~~water caused by~~ irregularities on the bottom. The sandstone cliffs imaged in it are distorted by these imperfections when viewed at a steep angle but at near glancing incidence, down the reach of the river, are nearly perfectly reflected. In the winding canyon first one side and then the other is shaded by the perpendicular walls and thus one sees dark and light reflections replacing one another in slow succession. Yet with the boats underway, the gentle wake they produce breaks up these images into curious wavering spots and patches. In the troughs between the waves cerulean shapes represent a fragmented sky, which mixes with golden globules of sun-lighted rock, ~~reflected from the sides of the waves that present to the observer a favorable angle,~~ flickering and weaving in ever changing patterns of color.

Reflection is the magic of water and water is the magic of Glen Canyon and its tributaries. Every pool and rill, every sheet of flowing water, and every wet rock and seep mirrors with enamelled luster the world about. In narrow chasms flow streams of melted <sup>gems</sup> ~~stones~~ over

purple sands past banks of verdant willows. Pools like lustrous eyes give back the rose-red rocks fused with empyrean blue. And nothing remains the same from hour to hour, from day to day, and from year to year. Erosion, weathering, shifting channels, drought and flood alter incessantly the finer details leaving, however, the grand plan - the overall fable quality - of the Colorado's master work unchanged.

The trench that is Glen Canyon is a microcosm separated from the world in depth as well as in breadth. Its vegetation has been reproducing for centuries, the main contact with the outside being the highway of the river. Its animals too are isolated, a few having developed their own races in the slow evolutionary processes within their restricted environment. And its winds as well are its own, developing from the temperatures and convections within its rocky confines. They come puffing up the canyon stirring up the sand into smoky plumes and graying the water. Progress against them even with the help of a motor is slowed to a snail's pace. Spray flies and the heat of the day is tempered to such a remarkable degree that when possible we seek the sunny side of the river. Then around the next bend all is quiet and still again and the heat settles down as before.

But not all weather in the canyon country is perfect. Storms sweep over it from the northwest - the out-riggers of wide-spread meteorological disturbances blowing down from Alaska and the Pacific. They may last for a day or a week enveloping the canyon in a gray shroud of mist and rain. More usually in summer bad weather originates locally and is consequently less extensive and shorter lived. Thunder showers develop over the bordering plateaus, the Kaiparowits and Paria, and over the adjacent mountains, the Abajos, the Henrys, and the mass of Navajo Mountain. The latter in particular is a manufacturer of bad



weather. Rising out of barren, rocky defiles surrounding its western foundations hot air streams up its wooded slopes sucking out the moisture they contain and forming a platform of cloud and condensation over its summit. This accumulation grows, darkening and spreading out over the encircling land until full blown thunderheads rumble their warning of rain. Down in the canyon abysses from which no view of the surrounding country is afforded, - whence only the jagged sky between their walls is visible, these storms come upon you unexpectedly. The first warning may be a sudden grumble of thunder followed by a white-edged, black cloud rising above the canyon rim, and then a louder crash with a flicker of lightening, and then a spatter of large drops that leave wet circles on the red sandstone. They evaporate quickly from the hot surface and are replaced by more as the shower gathers momentum. A dusty smell pervades the hot air. I look up at the cloud, feeling apprehensive, searching for a clue to the magnitude of the storm, but find none, only the rain curving into the canyon in gusts defined by the sun as bright points and streaks against the shaded cliffs. I am struck by the slowness of its fall; the drops float down on a drifting path which belies the force with which they strike my face. The sun disappears and the black cloud occupies the entire opening of sky. A cold, chilling wind sweeps through the canyon, which a few moments before was oppressively hot. Following a flash of lightening that brightens the increasing obscurity, thunder crashes again, much louder this time. The sound reverberates from higher terraces, rolling and rumbling up and down the gorge, and finally <sup>dies</sup> away in a remote cul de sac. The rain comes down hard now. I run for the shelter of an overhanging rock. From this vantage point the opposite cliffs shine with wetness. They have lost all color, glistening like new pennies rubbed with mercury from the sheets of water pouring over them.

Through all the notches and dips in the rim and wherever the walls have been streaked with discoloration streams of water pour down. From small drainage areas thin streams, following the stripes of oxidation, cling to the cliffs, whereas through larger notches that drain the biggest basins in the plateau torrents come spuming over, free-falling hundreds of feet, with a deafening roar. Some of the waterfalls are white and clean, others are brown with sediments. The noise of falling water and the rush of the rising creek drown out even the thunder. I wait for the cloudburst to pass; it retreats as quickly as it came. The waterfalls diminish to a trickle, then cease altogether, and the sun comes out again. The rocks dry off - a few puddles alone remaining to fill their hollows and cavities. Trees glitter and drip briefly, but the creek runs brown and full and is the last to return to its former peaceful pace.

One night a thunderstorm overtook us where we slept on a high grassy shelf between a vertical wall and the river. The day preceeding had been stormy but towards evening the sky had cleared promising a good night without rain. I had been asleep for several hours when I was awakened by the distant rumble of thunder. It was two a. m. In the star light I saw a black mass edging up above the buttes and cliffs across the river. I could not distinguish its outlines against the sky but the storm did not seem very near or very threatening. Which way it was moving was not at first apparent, though presently as I watched I became aware of the disappearance of stars. One by one and a few at a time they were being snuffed out. Silently, insidiously, an opaque curtain was being drawn across the sky. The character of the thunder also was changing from far off rumbling to a sharp, insistent cracking, and the lightening, no longer flickering on the horizon, was flashing bright strokes ~~lighting up the landscape~~ that lighted up the landscape to register persisting images in the eye. While watching the progress of the storm I thought, when first awake, it surely would pass



harmlessly by, then, as the lightening grew brighter and the thunder louder, I wishfully argued that although it was coming nearer it certainly would miss out camp, with all the space around to maneuver in. By what chance, I reasoned, could it pass over this precise spot with all the breadth<sup>A</sup> of land around. The coincidence of this storm and our camp site seemed much too improbable. But as the crashing and ripping drew ever nearer and louder I realized that no wishful reasoning would preserve my comfort or keep me dry and that if I delayed much longer in doing something to protect them both, I would soon be neither comfortable nor dry. I jumped up to secure a large tarpaulin which I drew over my sleeping bag tucking my clothes under its sides and propping on my duffle bag the end covering my head. Hardly were these preparations completed than the first drops came spattering down. The storm came on with a rush. I heard the swish of the initial downpour on the river below the bank before it hit our sandy shelf, and in the next instant it was upon us in full force. The crashing of thunder and the rattling of heavy rain on stiff canvass a few inches from my ears blended into a mixture of sounds that preoccupied all sensation. How the other campers fared I knew not, not a shout, not an outcry did I hear. It rained for a long time, more than an hour, I slept and waked again and it was still coming down hard. When at last it stopped the roar was still there, not a ringing in my ears; it was the roar of a waterfall from the top of the cliff. Two members of the party who had camped near its base had been inundated by the first burst of water. Their bags and clothes were soaked and they spent the last hours of the night huddled under a canvass boat cover, shivering with cold. Before dawn we built a huge fire<sup>dead</sup> with oak logs ignited with gasoline, and with the morning the sun rose in a clear sky. We ate an enormous breakfast in the soaking grass and sand and drank quarts of coffee. Before long the internal warmth produced by food and the external warmth produced by the sun exorcised all

residues of misery. We moved on into the next day living as all good river rats should in the present.