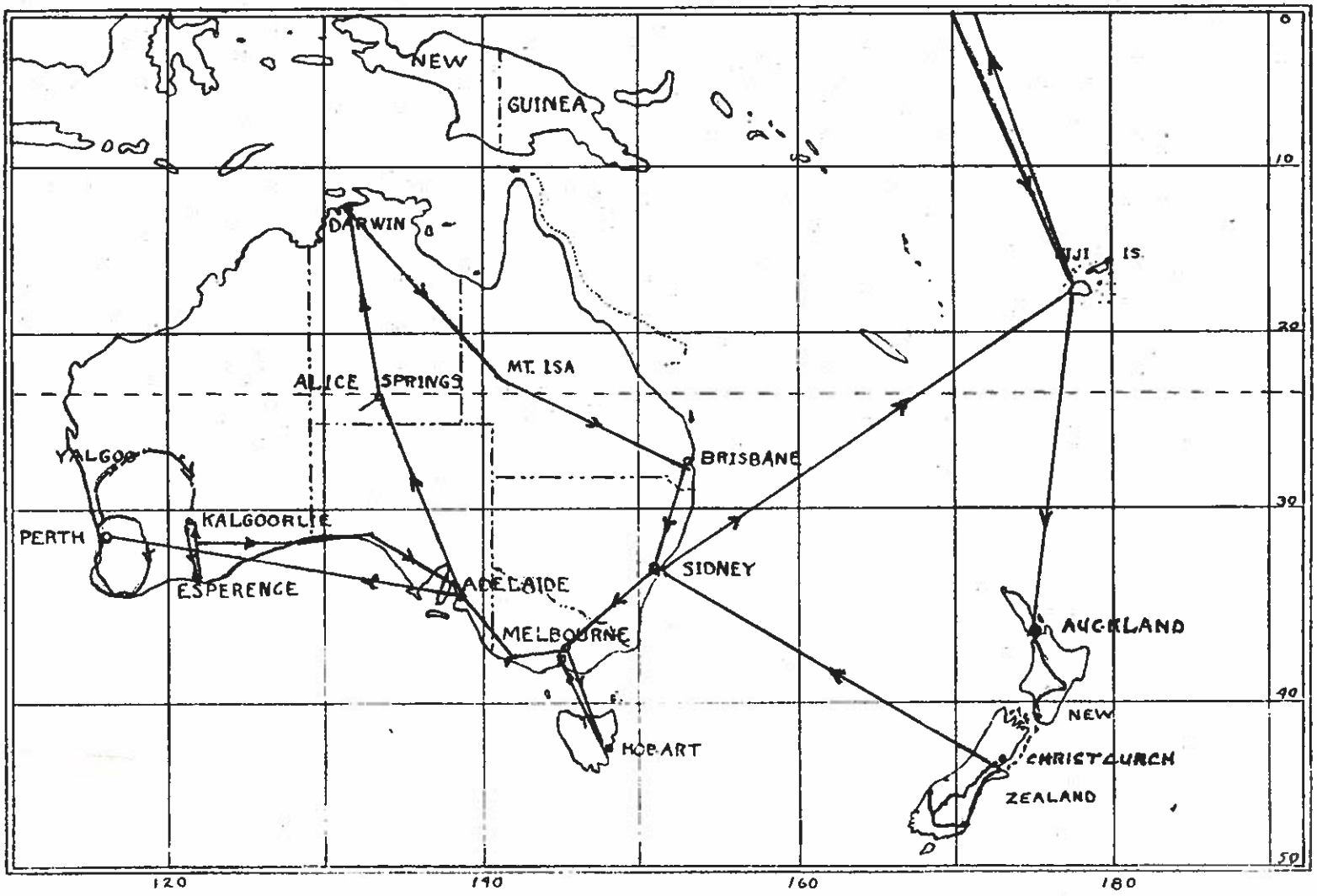
AUSTRALIA

DOWN UNDER ^No
OFF TO ONE SIDE

BY

ALLAN O. KELLY

1959-1960



Map of our trip (my wife Katherine and I) "Down Under and off To Oneside" in December of 1959 and Janurary 1960. Mrs. Kelly flew homefrom Melborne and I continued on to Perth where I met the Niningers as arranged, and we continued thetrip together the rest of the way. AOK

CHAPTER VII

I N T O T H E B U S H

January - 31 - 1959

Our plane arrived in Perth about 6:00 p.m. and after the usual bus ride into town I caught a taxi out to the Charles Hotel where I was to meet the Nininger's. I arrived there a little before 8 o'clock and found them in the dining room waiting for me. We talked that night until nearly midnight and decided, among other things, that we should rent a car and take a week's trip around the perimeter of Perth. Later we would take a larger circle, including a 1,500-mile-drive across the Nullarbor--a stretch of road across the desert which we soon found was regarded by Australians as almost impassable except by train or plane. We agreed to be cautious, but went ahead with our plans. How else, if not by car, was Dr. Nininger going to make his intended search for tektites and meteorites?

January 31, 1959:

We rented a new Holden for out trip into the bush. The man at the rental agency got us started out of town on the right road and I concentrated on staying on the left side of the street. The difficulty comes when you get to a strange intersection and try to think which way to go, read the signs, and try at the same time to remember the left-handed rules. As soon as one concentrates on something else the car seems to get back on the wrong side of the street. Dr. Nininger said he knew he couldn't possibly drive in the city, and he later refused to drive even on the country roads.

The city of Perth is inland about 10 miles from its seaport which is called Fremantle. It lies on a rolling plain about 100 feet above

sea level, but this is only a narrow strip along the coast about 20 miles wide. The area has a climate very much like southern California except for greater rainfall--about 20 to 25 inches annually--and more humidity in the summertime. It is good farm land, consisting mostly of small farms and orchards.

Inland about 20 miles the coastal plain makes a sudden rise to an elevation of about 1,000 feet and continues this height all over Western Australia. This hill country is well wooded close to Perth and has many fine apple and pear orchards. As soon as the top of the plateau is gained the orchards give way to grain fields, mostly wheat.

This country along the edge of the plateau gets a considerable rainfall so that the forest has a thick undergrowth, mostly of tree ferns and blackboys. A blackboy, also called grasstree, is a yucca-like plant that grows from a few feet to as much as 10 or 12 feet high. Its grass-like fronds die and are shed like a palm frond. The trunk is smooth and six to eight inches in diameter and the fronds are long, narrow stems no more than a quarter of an inch thick at the base and about two feet long. The green fronds arch out in all directions in a thick bushy top and the dry ones hang down like a skirt. They are called blackboys because when fires burn through the forest they clean off all the dry skirts and burn the trunks black. Then in the course of a few years another dry skirt grows again and at a distance the palms look like a group of black-legged natives standing in the forest.

All over the plateau area we saw <u>laterite</u> (ironstone, the natives call it), much of it consolidated into a conglomerate-like layer that covers the decomposed granite below. It is composed of little spheres about the size of ordinary marbles, the smallest about one-quarter inch in diameter and the largest about three-quarters of an inch. It looks like red peanut-brittle when a chunk is broken. It makes

wonderful road beds, packing down into a hard surface which, when oiled is unsurpassed as a road material.

There is no orthodox geological explanation for laterite beyond the following sentences taken from the Geological Survey Bulletin No. 95, Page 322:

> Its formation is essentially due to the decomposition of rocks by which iron, silica, and aluminum are dissolved in circulating underground water. Portions of that water is drawn to the surface by capillarity, and laterite is precipitated on the underlying decomposed rocks, which it greatly protects from erosion.

This is a rather brief explanation for a blanket of material that covers practically the whole of Western Australia, great areas of the eastern states and in the north around Darwin. It is found as an ironstone, limestone, and bauxite formation. In the north around Darwin the aluminous-oxide variety is found as nearly round pills about the size of BB shot. This shot-like material is bright red and the samples I saw so loosly held together that they could be easily broken apart with the hands. The fine cementing material between the spheres seems to have been washed away or never was present, which is a very unusual circumstance.

In the limestone areas of southwestern Australia, the laterite spheres average larger in size even than the ironstone variety. Many are as large as golf balls although the average size would probably be about half an inch in diameter. Many of these spheres are found to contain angular bits of stone that look like a dark green lava with layer upon layer of a limey material having been formed around it until the final product is nearly round. The ironstone and aluminous spheres also have small specks or particles around which the sphere has developed, in much the same way as a concretion is supposed to grow, layer by layer.

It should be understood that laterite is like a blanket of hailstones covering the whole of Western Australia three to five feet thick. On hilltops and in valleys it averages about the same thickness, although

at one place near Corrigen it lies up against a big granite dome like a snowdrift. Here they had worked out a deep gravel pit, getting laterite for the highway. The cut bank was at least 20 feet high and it looked as if there might be another 10 feet of the same material, so uniform in size that it looked as though it had been screened. The big granite dome behind the town of Corrigen is about 75 feet high and must cover at least 40 acres. The east side rises abruptly out of the plain, but the west side slopes under the laterite for perhaps a quarter of a mile, the drift of laterite actually being higher than the top of the granite dome.

I suspect that laterite is a product of collision-flood--a sort of "fallout" product that had its origin in the vast clouds of incandescent dust produced by collision. Not the collision of 11,000 years ago but one of the several near Australia such as Fiji, Sunda Arc, or Celebes and Moluccas arcs which are all close to Australia and we think, overlapping collision points. Angular particles of rock or grains or sand thrown to great altitude fell back through this hot dust, collecting layer upon layer of this semi-molten material like ice accumulating on hail stones.

Another possibility is that the angular bits of stone fell into deep ocean water rolled up by the collision and that the layers of iron oxide, lime, or aluminous material collected on their surfaces as the bits of stone tumbled through the turbulent water toward the bottom. The time required for these bits of rock to fall through a turbulent atmosphere or sink to the bottom of a roiled-up ocean would determine the size of the spheres just as the size of hailstones is regulated by the time they may be falling through a freezing zone.

A large collision would conceivably provide both of these (falling through atmosphere of hot dust or falling through deep ocean water) conditions somewhere within its periphery. It is possible, too, that

the moving waters of the oceanic flood carried the laterite stones for considerable distances, depositing them as a blanket of quite uniform thickness. It is inconceivable that any of the ordinary forms of erosion or weathering could have produced this blanket of material. How could this vast bed of tiny stones been turned, over and over, each by itself so that the layers of material could have been deposited to form a rounded stone? Certainly not on the bottom of the ocean, and most certainly not by river action, for the laterite covers the entire country like a blanket of snow.

The arcuate structures which bound Australia on the north and east are probably ancient collision scars. The Sunda Arc is one of the largest in the world and it is followed on the east by the Celebes and Moluccas arcs and the Solomon-Fiji-Tonga group, all of which have a continuous record of seismic activity and volcanic action, indicating the gradually dying (cooling and contracting earthquake) activities at these points of cosmic collision.

The physical evidence indicates that the Australian continent is very old and was probably once deep sea bottom that has been raised step by step (in my opinion collision by collision) to its present position. Never having received a direct cosmic hit, but half surrounded by collision points, it has been raised to its present elevation as a stable land mass. Like other large stable land masses and most of the deep ocean floor, it is relatively free from seismic disturbance, having had only five small earthquakes since seismic instruments have been in use. Its few volcanoes and other signs of volcanic action are very old and of minor significance. Most of its sedimentary rocks, too, are very old, having been tilted often 90 degrees and folded until in many places they look like heavy dough mixed into all sorts of queer configurations.

Another indication that the down under continent was once deep

sea floor is the gigantic swell and swale topography mentioned earlier. The greater part of Western Australia, roughly 275,000 square miles, is underlain with granitic rocks, most of it of swell and swale topography and all of it averaging about 1,000 feet above sea level. Intruding through this granite basement are isolated islands and ridges of greenstone, (a heavier basaltic rock) that in some places rises to as much as 1,200 to 1,400 feet above sea level. It is at these greenstone outcroppings that gold is found.

The swell and swale topography varies some from place to place but in general the swells average about five miles from top to top or about the same distance from the bottom of one swale to the bottom of the next with the difference in elevation being 150 to 200 feet. As one drives across this country the views from the tops of the swells give the impression of one vast plain stretching in all directions as far as the eye can reach, here and there relieved by a dome of hard, exposed granite which may rise from 50 to 100 feet higher than the average swell. It is all a coarse-grained pink granite and many of the domes have "potholes" of considerable size on their surfaces. Many of these granite domes are no more than a few acres in extent and 6 to 10 feet high, but some of the larger ones appear to cover an area of as much as 100 acres and reach heights of 75 to 100 feet. Because they provide a perfect roof to catch rainwater, most of the farms, sheep stations, and towns are located near such domes. Everywhere else the blanket of laterite covers the landscape and drinks up the rain as fast as it falls. Never a stream is to be found and even the bottoms of the swales seldom contain a dry-lake bed, and this is in an area where there is from 15 to 20 inches of rainfall, depending on the distance from the coast. In no other land, so far as I know, does this much rain disappear without trace of streambed or lake.

Since the advent of echo sounding, most of the deep sea floor has been found to be of this swell and swale topography, often with a greater relieve (larger hills and deeper valleys) but the same general form. Submarine ridges and seamounts are, of course, quite common, but most of the deep sea area is of this swell and swale relief. When depth soundings were made by cable at intervals of 40 to 60 miles, the impression was gained that the deep sea floor was a nearly level plain. Now continuous echo sounding gets a reading every few feet along the route of the ship, and the record shows this swell and swale topography.

Another bit of evidence that Western Australia was once deep sea floor is the fact that practically every square foot of this area is underlain with strong salt water. A sheep station owner who had many wells scattered over his 303,000-acre station near the town of Mount Magnet told us that the blanket of laterite was underlain with about 20 feet of clay or decomposed granite above the solid rock and that they had found it useless to dig a well over 10 or 12 feet deep because only the surface water was potable. He said that the water immediately above the solid rock was as salty as the ocean and that this was true everywhere they had tried to go deeper than about 12 feet. I noticed farther west in the grain belt that most of the windmills were located on the tops of the swells and in talking with state geologists later I learned that this was not to take advantage of more wind on the hilltops but because the ground water was less salty.

The swell and swale topography is not mentioned in any of the geological literature I was able to obtain in Australia, this area being described as a tableland or plateau without considering the depressions or lack of streams as anything unusual. Nor is the widespread salty ground water considered as an anomalous condition. Charles P. Laseron, in his book on the geology of Australia (The Face of Australia, Page 45)makes the statement that Western Australia

has been above sea level since Archaeozoic time, giving an estimate of 1,500 million years as the time. This vast granite plateau, he says, represents the roots of mountains long since worn to a level and that for the last 700 million years the land has remained virtually unchanged. If so, why did the mountains wear down to humps and hollows and why was the salt not leached away to the sea?

The first day out from Perth we reached a town called York about 11:00 a.m. and all hands began a search for someone who might know about meteorites or tektites. We asked many people on the street and in the bank and in the pubs. We got a few good leads but they all fizzled out.

We drove on to Corrigen where we got lodging at a very old hotel. Dr. Nininger went down to the bar to talk to the local citizens and came back with the news that he had found a man, Mr. Turnbull, who had a very large australite (As Australian tektites are called) that we might see on the morrow.

Corrigen is a typical "back bush" country town: Old 1890 buildings with corrigated tin roofs painted red, umbrella trees along the streets, and windmills in the back yard. I counted 21 windmills from the upstairs veranda of the hotel and could only see half the town from that side of the building.

Almost everyone, we found, knew about the black glass australites and could tell of someone who had a few, but most of them had been lost or thrown away since the museums had stopped buying them years before.

<u>February 1, 1959</u>:

We began a Sunday-morning tour of the outlying farms where we had heard that australites might be found. Most of the people were not at home but we found one man playing cricket with some of his 12 children. The oldest boy went into the house to get his collection and that

brought out the mother who had just had the last baby two weeks before. She was a very thin bird-like little woman who was apparently the most enthusiastic tektite hunter of them all. She had found two herself and had been urging the two oldest boys to watch for them in their farm work. Dr. Nininger happily bought the seven specimens they had managed to collect.

We drove the Holden about 100 miles during the day looking for people in the surrounding farms and small towns but nobody else was at home. Returned to Corrigen about four o'clock and found everyone playing bowls, tennis, or drinking beer. It was plenty hot, about 90 degrees in the shade, and it appeared to me that the beer drinkers were having the best of it.

Bowling on the green is a favorite sport among the Australian country folk. They form a club and the better people put in some money to build a small clubhouse and a green. Everyone dresses in white--hats, shoes, the men in long trousers, the ladies in white dressed. Mr. Turnbull, one of the bowlers, turned up with the very large australite which he wouldn't sell. It was not quite symmetrical in shape but was perhaps the largest one we saw anywhere except in museums.

Dr. Nininger has offered the theory that these bits of black glass are the result of large meteorites blasting a shower of molten rock off the moon. Cooling immediately, it became a true glass. If the earth chances to intercept such a shower, the material may be scattered over thousands of square miles. Other than in Australia tektites have been found in the Philippines (rizalites), in Indo-China (indo-chinites), in Texas (bediasites), in Bohemia (moldavites), on the island of Billiton (billitonites) and recently some have been discovered in Georgia. In Australia tektites are scattered quite evenly over the southern half of the continent, roughly south of a line drawn

from northwestern Australia in the Kimberly country, southeasterly through Alice Springs and reaching the eastern coast between Brisbane and Sydney. I say quite evenly, but actually no one knows how evenly. We were told that in certain localities they were quite plentiful. Natives said that they knew of places far out in the brush where tektites could be found in great abundance, but the white collectors who had found them and the museum people all told us that it was a rare experience to find an australite, even in the areas where they were supposed to be abundant. The family of 12 mentioned above had found only seven tektites in the several years they had been keeping a watchful eye and it seemed to be the opinion of most collectors that not more than two or three could be found on an acre of ground if the surface soil were screened.

Nevertheless, as we traveled along the country roads we kept a constant watch and stopped many times each day to look closer at some small black object. In most cases these objects turned out to be kangaroo manure which is exactly the size and shape of a medium-sized australite. After many disappointments we began calling this material "Kangarooite".

It is an interesting fact that practically all the tektites found have been in the top few inches of the soil or actually on the surface of the ground. This would seem to indicate that they are all of very recent origin whether found in one part of the world or another. They are a rather weather-resistant material and should have survived in the unconsolidated Pleistocene sediments and the much older sedimentary rocks if the earth has always been exposed to these showers; especially in lakes and river muds where plant acids are not strong. Why, then, have they not been discovered in the older sediments?

Most of the Australian scientists seem to favor the proposal that tektites are the surface material melted off of large meteorites as they passed through the earth's upper atmosphere, and most of the collectors

came to the wheat farm of a Mr. Clark who was reported to have a tektite collection. We parked in the shade of a tree to eat lunch and presently Mr. Clark walked out from the house (about 200 yards away) to find out who we were. He was very large around the middle, very bowlegged, very deaf, and wearing very ancient shorts and T-shirt. After much shouting and exhibiting of tektites, Dr. Nininger was able to make him understand what we wanted. He said that his sons had collected quite a few while disking and harrowing their fields in preparation for planting wheat, but that they were not home and he could not sell their belongings. This ended the conversation and he went back to the house; but while we were finishing our lunch he returned with seven very nice australites which he gave to Dr. Nininger. He wouldn't take any money, saying it was a donation to a scientific cause.

The farms in this particular area seemed quite productive. The stubble in the fields indicated that a good crop had been recently harvested, and the big new barns and new farm equipment indicated that crops had been good for a number of years.

We continued south, stopping in a town called Kondinin and at many farms along the way, but we found very few people at home. It seems that Monday and often Tuesday are bad days to find farmers at home, long weekends being the rule after the harvest season is over.

All of this country to the east of Perth was once covered with eucalyptus forest before it was cleared for wheat farming. There are still large sections in the natural state and most of the roads, which are laid out with the compass, are lined with the natural forest which has never been cut. The right-of-way is usually ~~natural~~ 100 feet, but the graded roadway is only about 35 feet in width so that a nice strip of forest remains on either side providing welcome shade and improving the beauty of the landscape. Many of these wheat farmers seem to have had an eye for beauty and in clearing the

land they left some of the largest trees scattered over the fields.

As we continued south in the afternoon we began to notice large granite boulders scattered here and there and the underbrush began to show signs of increasing rainfall. The blackboys and other kinds of undergrowth made it impossible to see more than 100 feet or so into the bush, while farther to the north the forests had been entirely open. Late in the afternoon we came to a river, the first we had seen since leaving Perth, a distance of 486 miles, according to the Holden speedometer. This lack of rivers and streams (not even a tiny stream along the roadside) was a mystery to us. Roadside gutters and steeply sloping fields that would wash into deep gutters and gullies in the United States show absolutely no sign of erosion here in the land of laterite. The rainfall this far south is 15 to 18 inches, enough to grow thick forests with undergrowth and some trees as tall as 100 feet. In our own country where similar forests were cut and the land cleared, the erosion has been very severe. Here, even after the land is cleared of its natural protection and the land plowed to make it still more vulnerable, it does not erode.

Australian geologists have failed to see this unusual and anomalous condition or to realize that if present-day conditions of erosion and sedimentation were projected into the past as Lyell proposed,--there would be nothing to project. Nor can we point to any other locality in the world where this type of topography is being actively produced. To produce a plateau of 275,000 square miles, all of it about 1,000 feet above sea level and extending right up to the ocean, without interior drainage and only short rivers along the coast, yet with a continuous swell and swale topography and without gravel deposits to indicate where the material went that was eroded away (assuming it is the roots of mountains as the geologists say)--then I say it must

have been the devil himself with a very large clam-shell bucket who did the job.

February 3, 1959:

After spending the night in Katanning, a fair-sized town, we got an early start southward toward the Big Tree Country. At Cranbrook, about 50 miles south of Katanning, we drove seven miles out into the country to the east to find a man by the name of Scott who was said to have a collection of tektites. We finally found the place but his wife said he was down the road about two miles "biling'g". With these directions we began looking for someone baling hay, but after driving several miles and finding no such operation we concluded that Mr. Scott, who was a doctor by profession, had gone to visit a patient.

Cranbrook lies at the southwest end of theStirling Range and the Scott farm was really in among the mountains. This range consists of a row of isolated peaks which rise above the plateau, the highest being Bluff Knoll, 3,640 feet in elevation. These peaks are quite sharply pointed but worn smooth by ice erosion of recent time.

As we neared the south coast, the forests became thicker and the streams had real running water in them, It was here that we saw our first dead kangaroo. Many kangaroos get hit by cars on the roads at night and most people who drive in the bush very much, have guards built on the bumper to prevent damage to headlights and radiator. We also saw and heard the famous laughing jackass birds--the Kookaburra. These birds are about the size of a kingfisher and have much the same body build and manner of flight.

We did not go to Albany, largest town on the southwest coast, but took a short-cut by dirt road across one side of a triangle to reach a little town called Denmark. Here we had our first glimpse

of the southern ocean, an arm of a bay called Wilson Inlet, and on this bay our first and last sight of the famous black swans that are native to this region. They were at least a half-mile away but such large birds are seen quite easily through glasses at that distance. There were two large flocks and in the nearer one we counted 120 birds and estimated that the other flock was at least as large. The black swan is about the same size as the white swan of the northern hemisphere and every bit as beautiful and graceful. Now and then a bird would hoist his wings, stand up in the water, and shake out his feathers. When one did this we could see a white patch under each wing.

We had been passing through beautiful eucalyptus forest for some time, down a long straight road--a narrow canyon cut through the timber. The heavy forest grows on the steep front of the great plateau where it suddenly breaks off to the southern ocean. The moisture-laden air rises against this steep 1,000-foot wall, cools, and condenses as rainfall. The average rainfall is between 50 and 60 inches. The road was unusual in that it was perfectly straight but angled down the mountainside, crossing many deep canyons at an angle and producing a series of roller-coaster dips that were quite thrilling.

We turned off the main road at a place called Quarram to see the Valley of the Giants, a state park where some of the biggest trees are preserved. These trees are really huge and rugged, reminding one of the California sequoias with their massive trunks and gnarled and rugged tops. Some of them have had their bases burned out until cars can drive through. This grove of trees apparently covers no more than about 100 acres in a saddle between two low peaks. These trees appear to be much older than the rest of the forest which extends for about 200 miles along this south coast. We saw thousands upon thousands of trees in the general forest that were six to seven feet in diameter

and perhaps one in a thousand might reach eight feet, but here in the Valley of the Giants, many have reached a diameter of 12 to 15 feet.

All through this south-coast forest belt there are large sections of dead trees, bare white poles rising high above the underbrush and young trees that have sprouted. We were under the impression that forest fires were the cause but a pioneer citizen told us that English colonists after the first world war had girdled these trees to kill them so that the land could be cleared for farming. The job proved too great for all but a few, but the dead timber still stands as a monument to the majority.

Most of the lumber used in Australia comes from this section. We saw several sawmills at work and great piles of logs and bright red, freshly cut lumber. It looks very much like mahogany but is much harder. There are two varieties of the big trees, one a smooth-barked gum that sheds its bark in long streamers, called karri, and the other a rough-barked tree called jarrah. I was told that the karri must be sawed within two days after falling or it will split so badly that it is useless for lumber. They have lately invented a new method of driving the oil and sap out of the green wood by steam pressure. This hastens the drying and prevents splitting and checking.

We arrived at the town of Northcliffe about 8:00 p.m. and after dinner in the only hotel we went out into the street to look at the stars. It was very dark except for a few lights in the hotel and the stars seemed unusually bright. We could make out the Southern Cross and the two great nebulae of the southern hemisphere called the Megallanic Clouds (M 31 and M33) which are closer and hence much brighter and larger than ours of the northern sky. These two great nebulae or galaxies (70,000 and 80,000 light years distant) are easily seen with the naked eye and field glasses. Other nebulae

which can be seen from the northern hemisphere too, are visible on the northern horizon. (Reference: Larasse Encylopedia of Astronomy, Page 419). Smog is not a problem here: Nothing but 2,000 miles of ocean and 2,000 miles more of Antarctic ice between Northcliffe and the South Pole.

February 4, 1959:

We left Northcliffe Lodge at 7:30 a.m., driving through magnificent eucalyptus forest for miles and miles. We stopped many times to take pictures and to wonder at the towering trees. At one place we saw two parrots high in the treetops. So high they were, and so dark against the bright sky that they looked black as crows; they sounded like crows, too, but they had long tails and parrot wings.

I noticed that many of the big trees were growing on white sand dunes which had over-ridden the granite and laterite. The big trees always grow on the hills, the valleys being barren of any kind of trees apparently because of the high salt content in the ground water in the valleys. This is opposite to the growing habits of the California redwoods where the biggest trees are always found in the deep soil along the river banks. The salt-water bugaboo is everywhere present in Australia, whether in a section of heavy rainfall or in desert. We saw a few small swamps or lakes in this area but nothing unusual. As we turned north toward Perth the eucalyptus forests began to thin out and more farms and orchards appeared with towns popping up all along the way--such towns as Manjimmmp, Greenbushes, Wonnerup, Donnybrook, Boyanup, Harvey, Yarloop, Waroona, Goolup and Pinjarra. Near Goolup we came upon a roadside clay mine where they were digging out pure white kaolin of very fine quality. It could be ground between the teeth without feel of grit, a test which is said to be as good as any to determine the fineness of clay. In a stratum just above the clay and below the usual blanket of ironstone there were many crystals of black

tourmaline.

Nearing Perth, the road comes down off the plateau and follows the coastal plain for about 20 miles before reaching the city. This plain is two or three miles wide and 30 to 50 feet above sea level, its only unusual feature being a number of small lakes without outlets scattered along its length, a significant geologic fact we shall discuss later.

We arrived in Perth about 4:00 p.m. and I was able to drive on the left side of the street all the way through the city to our hotel. Quite an accomplishment I thought!

February 5, 1959:

We spent most of this day going to banks, shopping for a Volkswagon Combe and looking for camping equipment. We expected to spend about two weeks in a cross-country drive of some 2,500 miles, ending up at Adelaide on the south coast. We would swing north to Mallewa, thence east via Yalgro (from where we hoped to visit the Dalgaranga meteroite crater) to Mt. Magnet, then south to Kalgoorlie, Norseman and on across the Nullarbor to Adelaide. The last 1500 miles or so would be across the Nullarbor (the word means null arbor--"without trees"), and we expected to camp out most of the way. We were told that we would have to carry extra gas and water driving anywhere in this back country, and most people whom we asked thought we were crazy to try it at this time of year--summertime.

February 6, 1959:

My money did not show up from home but Dr. Nininger made a down-payment on the Volkswagon and we went to Boan's, the big department store where we bought camp cots, pads, sheets, thin cotton blankets, folding chairs, cooking utensils, water cans, spare gas cans, and many other items. This store in Perth is six stories high and covers a whole city block. It is truly a department store, selling anything one would want to buy, including groceries and meats. Everything

we purchased was wrapped and sent out to the Volkswagon agency where it could be packed in the Combie.

In the afternoon Dr. Nininger and I went to the university hoping to get some geological maps of the country, but all the geology department had for distribution were some maps of Western Australia which had been made in 1909 when they surveyed and built the railroad from Adelaide to Perth. The professors in charge advised us to go across the street to army headquarters where an officer very kindly showed us what maps they had but said he could not sell us copies. These were available at a downtown book store. There a nice gentleman told us it would be necessary for him to send a messenger up to army headquarters to get the maps, as he had none in stock. Our taxi was waiting so we decided to come back for the maps on the morrow.

We next went to the State Department of Chemistry and Geology where Dr. Nininger had heard of a fine collection of australites. The director in charge of the mineral collection made available their entire collection of australites to Dr. Nininger so that he could make a detailed record of the contents. I was invited to look through their minerals and especially their gold collection which is one of the best in the country. In talking with the director I learned that the man who made this collection for the Bureau of Mines had died in 1920 and that practically nothing had been added since his death. Also, in discussing the progress of meteoritics I learned that he, like the professors in Adelaide and Melbourne, was not aware of the work being done in Canada--the search being carried on for fossil meteorite craters there*(refer to Appendix I on Canada). In bringing him up to date I asked for a map of Canada or North America so I could show him the locations of the craters under investigation in Canada. It turned out that the State Department of Chemistry and Geology and the Bureau of Mines had no such map, not even a small

atlas. It would be necessary to go to the city library to get an atlas.

APPENDIX I.

The Canadian scientist have been doing some outstanding work in their search for large meteor craters in Canada, realizing as they do, that large scale meteorite collision might have had a vital part in the history of the earth and in the mineralization of the earths crust. This has included a search of aerial photographs of the whole of Canada including the arctic islands and the discovery of a whole series of circular depressions and lakes that may be of meteoritic origin.

The discovery of the New Quebec Crater in 1945 and its subsequent exploration by Dr. V. B. Meen of the Royal Ontario Museum of geology and Mineralogy in the summer of 1950 gave the initial impitus to the investigation that is still underway.

Dr. C. S. Beals, astronomer of the Dominion Observatory at Ottawa, has been directing the search and field studies as time has permitted. In 1956 the Dominion Observatory published a paper by C. S. Beals, G. M. Ferguson and A. Landou called "A Search for Analogies Between Lunar and Terrestrial Topography on Photographs of the Canadian Shield." Also a paper by P. L. Willmore and A. E. Schiedeggar on "Seismic Observations in the Gulf of St. Lawrence". This circular depression in the Gulf of St. Lawrence is filled with sediments to a depth of about 20,000 feet. A deep basin 207 miles in diameter in the granite of the Canadian Shield.

The writer has also learned from personal communication with Dr. Beals that they are investigating the Hudson Bay crater arc which is some 250 miles in diameter. This possible crater was first pointed out by Kelly & Dachille, TARGET:EARTH, Page,58, published in 1953.

The investigation of these very large craters may be the turning point in the acceptance of the collision theory of geology if the evidence proves beyond doubt that they are of collision origin. It is very difficult, of course, to dethrone a ruling theory that has been accepted in the highest halls of learning for 128 years, (since Lyell wrote his Principles of Geology in 1833) but this is surely going to happen.

Collision geology is the key of logic that opens the door. Each new anomaly is explained as it aries by cosmic collision. It requires no special brains or genius, anyone who understands the theory can apply it to any new geologic problem that cannot be explained by orthodox geology.

Turning to local questions of geology I asked about the origin of the granitic plains, the swell and swale topography. He had no knowledge of any theories of origin and was surprised to learn that there could be anything unusual about such a land surface. It had never occurred to him that any anomalus conditions prevailed.

I do not wish to seem over-critical of Australian scientists who do not know what is going on in Canada or the United States because I suspect that we in North America are just as ignorant of what goes on in Australia. Lack of communication works both ways, but it doesnt seem to me that the Bureau of Mines could afford a small map or a globe of the world. I found in searching American universities and public libraries that we are woefully lacking in geological information on the lands down under, but it turns out to be almost as difficult to get such information when in Australia. I inquired in many different book stores in Fiji, in New Zealand, and in Australia for books on the local geology and was only able to find one in each of these lands. The one book on Australia is called THE FACE OF AUSTRALIA by Charles F. Laseron. It is written for the layman and includes a good deal of information on the plant and animal life of Australia. I would recommend it to a layman and geologist alike, as a well written and descriptive work, although I do not agree with most of his geological conclusions.

About two weeks later, while in Kalgoorlie, some members of the local Rotary Club responded to my request for more geological information and very kindly agreed to send me a copy of Geological Survey Bulletin No. 95, "The Physiography of Western Australia", along with a colored geological map of Western Australia. They had to send for this material themselves, so I did not receive it until sometime after returning home. Bulletin 95 is the third edition, first printed in 1934, and apparently the only geological information

available on Western Australia other than short papers published by individual geologists, chiefly on gold mining activities. Too many scientists I am convinced are interested only in the pay check.

Dr. Nininger had placed a notice in the Perth paper that he wished to buy tektites and a like announcement was made over the radio; quite a few people responded. From one of those who telephoned, the Nininger purchased quite a nice collection of tektites. In this collection was a long dumbbell-shaped australite with a thin feather edge extending lengthwise all around it.

Dr. Nininger and I got into quite an argument as to how it proceeded through the air to have produced this feather-edge flow pattern. He argued that it spun like a propeller and I insisted that it rolled slowly like a rolling pin, thus producing the waist at the middle and that the final position was <u>one side on</u>, so that the feather edge was formed where the frontal air flow met the reverse flow from the rear.

<u>February 7, 1959:</u>

Dr. Nininger went downtown early to get the maps we had ordered and to see an individual who had telephoned about tektites. I got busy on the telephone trying to find out why the money I had cabled for had not arrived. I had been calling the Bank of New South Wales who seemed to know nothing about my cable but were making every effort to find out about it. Finally it came out that there was another bank in Perth called The Bank of Australia and New South Wales which I had stumbled into when the thought occurred to me to send for money. I grabbed a taxi and rushed down to the bank just before 11 o'clock closing time, got my money, and went back to the Volkswagon agency for the Combie. Dr. Nininger was there, and after paying the bill and loading in the camping gear we took off for the Hotel Charles. Dr. Nininger rode with the agency owner, who piloted us to the hotel. He didn't seem to want to ride with me through the traffic in the new vehicle.

After lunch we loaded in the rest of our baggage and found there was just room enough for Mrs. Nininger to sit on an aluminum camp chair in the middle of the floor behind the front seat. It had arm rests and was a fairly comfortable chair. Later, when Dr. and Mrs. Nininger had changed places several times it was decided that this seat in the center of the Combie was less bouncy than the front seat.

Our way led north over a good paved road, once we got out into the country. Near the city it was very rough with deep chuck holes and washboard surface, the latter called corrugations in Australia. The weather had been very warm in Perth and we were all glad to get up onto the higher plateau. We stopped for the night in a little town called Dalaroo where we found lodging in the usual choice rooms, just over the bar.

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CHAPTER VIII

THE DALGARANGA METEORITE CRATER

February 8, 1959:

We were up early and off by 6:20 a.m. to the next town for breakfast. We had decided we would eat out and sleep in hotels while we could because camping might get a little tiresome before the month was out.

We began to get into the wheat country, the road paralleling the railroad, and about every 10 miles we passed a big wheat bin. The Australians do not use elevators but build long wooden bins to hold the wheat. The bins are V-shaped in cross-section so that the wheat will gravitate to the bottom as the bin is emptied, and some appear to be 400 or 500 feet long. Usually there are two of these bins. One is open to receive the new crop of wheat and the other has a roof for long-time storage.

The wheat country is the home of a beautiful parrot, a bird about the size of a pigeon with a rose-colored breast, pearl gray back, and some rose and white under the wings. We saw them by the hundreds around the open wheat bins, sometimes literally covering the bins. Like all parrots they are quite at home hanging by their beaks or upside down by their feet. Many were resting on the telephone wires along the railroad and about as many were upside down hanging by one foot, as were sitting upright. I asked a small boy what they called these parrots and he said "gahlah". After having him repeat the word several times, I asked him why, and he

answered, "because that's that they say--'gahlah-gahlah-gahlah'". Sure enough, when I listened, that is what they did say.

In the afternoon we came out into more open country not far from the coast where huge sand dunes had grown into hills. A thick brush vegetation on these sand hills has produced a surface soil sufficient to grow good wheat. A little beyond we passed by the big Yarra Yarra lakes at Carnamah and on north to a town called Mingenew, where we turned eastward on a dirt road across to Morawa and thence 79 miles more to Yalgoo. During the day we counted four new kinds of parrots and were much surprised to find these large birds in semi-desert country where water is very scarce. Most of the birds are seen around windmills and watering troughs. We saw big black parrots--birds at least two feet long, half of which is tail. When they fly and spread the tail a large patch of deep crimson appears on the underside. We saw two other varieties of rose-breasted parrots as well as a white parrot with a sulphur-colored head and breast.

We reached Yalgoo about 5:00 p.m. and got rooms at the Railroad hotel. Yalgoo is the central town in a large county or Road District, and was once a thriving gold-mining area. Most of the mines are now abandoned and Yalgoo has gone back to a population of about 25 people, three times that many dogs, and some roosters. In the middle of the night the dingoes came to see about the roosters and all the dogs rushed forth to do battle with much barking and minor squabbling among themselves. This went on intermittently until near morning when the roosters came to life and began to crow. It reminded me of old-times at home on the farm, and when a few burros joined the sunrise chorus with some choice braying, the sounds were those of a little Arizona mining town, which made the Niningers feel right at home.

Yalgoo was laid out with a 100-foot-wide main street that stretched up the slope from the railroad station. In later years the railroad was moved a bit and now the station is a half-mile from the hotel, the store a little beyond, and the garage just beyond that, with a half-dozen houses lining the rest of the street. Old walls and piles of brick rubble indicate the glory that was pnce Yalgoo.

The hotel had the inevitable saloon in front and a long hall extending to the back with a kitchen and dining room on one side and the bedrooms on the other, each bedroom having a door out onto a long porch. The hotel owner invited us to move our bedding out onto wire cots that lined the porch from end to end. Dr. Nininger and I took advantage of this offer, but Mrs. Nininger, being a lady, stayed inside and suffered the 100-degree temperature all night.

February 9, 1959:

By 6:15 a.m. we were under way, headed for Mr. Ross's sheep ranch, called Dalgaranga Station, about 60 miles north and east of Yalgoo. The road was rough and full of pot holes and corrigations, but the farther we went the better the road became apparently because of lfttle traffic. Much of it was as smooth and hard as pavement and straight for miles. We saw our first wild kangaroos just a few miles out of town, and then three emus, the huge flightless birds of Australia, crossed the road.

We continued on over endless straight road through scrub bush about 12 feet high. We could never see more than about 50 yards into the bush. Arrived at last at Dalgaranga Station where we were met by Mrs. Ross and two friendly sheep dogs. She had no idea we were coming, but she was very hospitable and invited us in for a round of ice-cold beer.

Dalgaranga Station is an old one and has seen years of great

prosperity when wool was high. The house is old but large and well made, and filled with expensive furniture of vintage 1880. It was very dark inside, the curtains being drawn to keep out the heat, but after a few minutes were able to see each other and to enjoy the coolness of a well insulated room. Mrs. Ross said she had come here as a bride 30 years before when her husband had bought the station lease. The station contains 264,000 acres and was named after the peak we could see to the northeast, Dalgaranger Peak, a mountain that appeared to be at least 1,000 feet higher than the surrounding plain. She told us that a spring on the side of this mountain was the only natural flowing water for 100 miles in any direction. Just a few hundred yards to the rear of the house and other outbuildings, a large granite dome stood above the plain. On top, she said, was a lake of several acres which had been dammed off by a low wall which we could see from where we stood. This was their main water supply when rainfall was sufficient, but they had a "dug well" in the yard which produced discolored, brackish water, and the inevitable rainwater tanks which are seen around every house in interior Australia.

Dr. Nininger told Mrs. Ross of our hope to visit the Dalgararga meteorite crater and inquired about the road getting there. She said she had never been there and could not direct us to it, but that if we wanted to drive out into the bush she could direct us to where her husband and the "blackfellow" were working on a windmill. They could show us the way. So, after getting directions from one windmill, to the next windmill, to the next windmill, and right and left turns, we started out.

We went around the big granite dome and took off into the bush. The bush is 15 feet high, so you can't see out of it to keep land marks in view. My directions were mixed, even when I was at the

station and could see Dalgaranger Peak and the granite dome, so when we got into the bush and couldn't see these landmarks, I was completely lost.

After about 10 miles of driving we came to a windmill where we thought Mr. Ross should be but there was no sign of him nor his tracks; so we went back the way we had come for more directions. Mrs. Ross said we had not gone far enough, that there was one more windmill to go and the reason we had not seen tracks was that the men had probably taken a shortcut. She gave us more directions for finding the shortcut and told us to look for fresh tracks turning that way before taking it. "You never know about men. They may not go where they say they are going". She said.

We started out again, found the cut-off and the tracks and, in a remarkably short time, the windmill; Mr. Ross and the boy were eating lunch under a scrub acacia. Mr. Ross was a tall thin man of about 60 years whose hair had once been red. He wore a large "ten-gallon" hat with a wide brim to protect his tender skin, and kept his shirt collar turned up to protect against the bush flies. When he learned that we wanted to visit the crater, he said he had only been there twice, a long time ago, but that the boy could show us where it was. They would lead the way and we could follow. Mr. Ross said it was about 14 miles from where we were but it seemed nearer 20; most of it a straight road along a fence line.

We finally reached a group of big granite boulders where the boy stopped his truck and told us we would have to walk the rest of the way. We walked about 1,000 feet through scrub brush growing in desert pavement when we suddenly came to a hole in the ground. This was the Dalgaranga Meteorite crater which had been reported in scientific literature some 25 years before by the curator of the museum in Perth. He had not seen the crater himself but had assayed

the samples of iron brought in and reported what the discoverer said about its size and depth. It was reported as 75 yards in diameter and about 40 feet deep. It actually measured 75 feet in diameter and was 10 feet deep. Dr. Nininger was the first scientist to visit this crater and we were probably about the fourth or fifth white party to see it.

We looked for meteorites for about 30 minutes but didn't find any. Then Mr. Ross and the aborigine went home and we brought the Volkswagon out through the bush to the rim of the crater where we made camp. We hunted for meteorites all the rest of the afternoon and I found six, the biggest about an inch across. Mrs. Nininger found two or three and Dr. Nininger found several small ones. He had a horse-shoe magnet bolted onto the end of an aluminum tube so that he could rake around in the soil and pick up anything that might cling to the magnet. About half of the ground-surface around the crater was covered with small rusty-colored stones averaging about one-half inch in diameter. They are rough and sculptured in many cases and look almost exactly like the small iron meteorites which are among them. This makes the meteorites extremely hard to find and much time was spent in examining things that turned out to be stones instead of meteorites. It was very hot, over 100 degrees we guessed, and the bush flies were something awful. We stuffed handkerchiefs under our hats to cover our ears and the backs of our necks, but the flies were in our eyes behind our glasses and a constant annoyance.

We had a watermelon break about mid-afternoon and then back to hunting until dark. Mrs. Nininger got some supper out of the cans and all hands turned in for the night--but not before making a semi-scientific meteorite count did we drop off to dreamland. Dr. Nininger is a dedicated scientist who never stops work from dawn until dark,

except to eat, and that he can do six times a day.

February 10, 1959:

We were up early and Dr. Nininger started to search for meteorites with his big magnet. He didn't have much luck so he tried out the mine detector he had brought along from the States. We couldn't make it work. It was supposed to squeal when the plate was held a few inches above a piece of iron, but we couldn't get a sound out of it even on the biggest pieces of meteorite we had found.

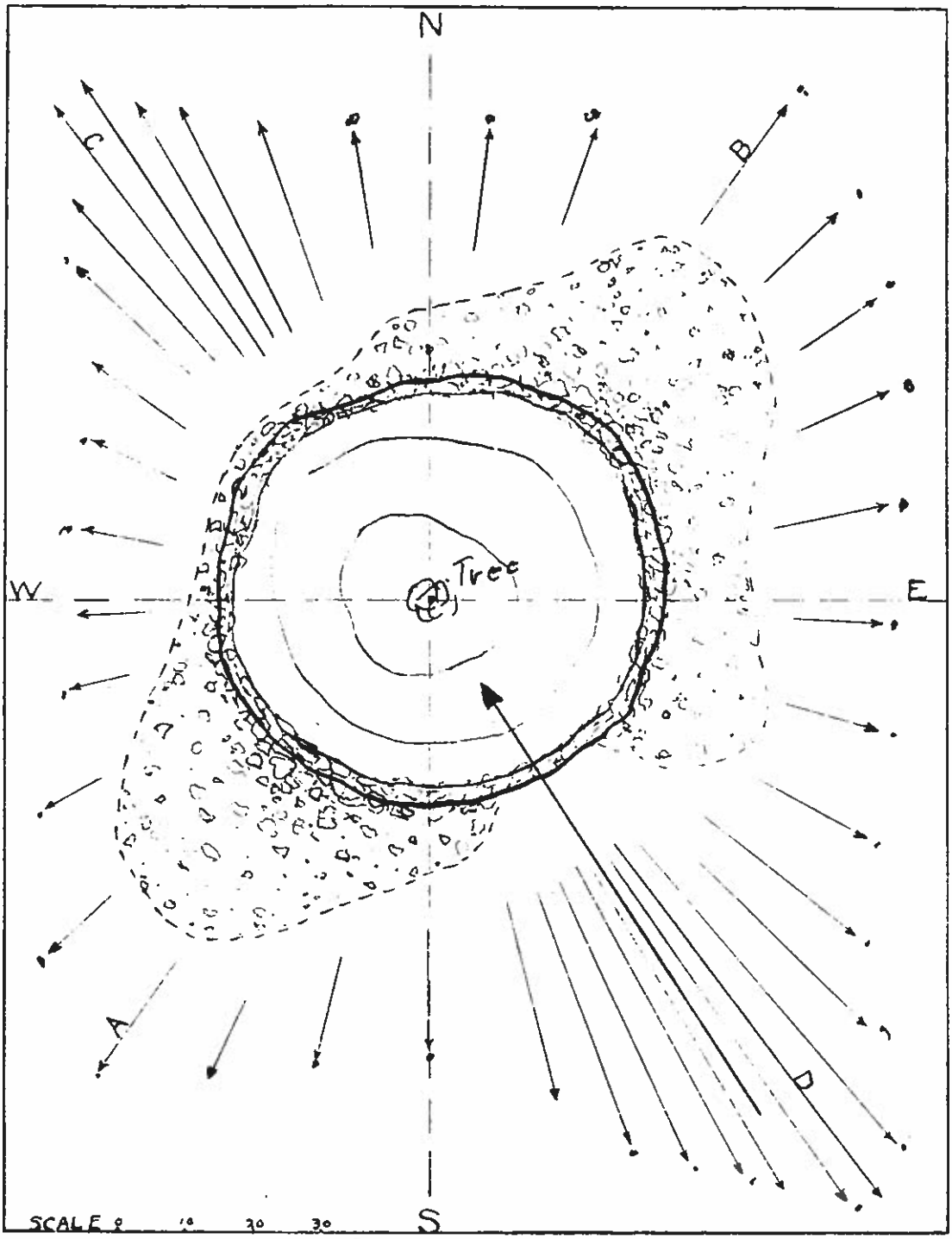
I tried the hand magnet for awhile but decided I could find more by looking. Mrs. Nininger and I each had a little magnet on a string so that we could test likely looking objects without bending over. This was a great help and I collected a few small bits by dragging the magnet behind me.

During the morning I took pictures and we measured the crater with a string. There was a good-sized tree growing right in the center of the crater making it impossible to stretch the string tight. I climed the tree and cut or broke enough branches out so that we could stretch the string and get an accurate measure of the depth and diameter of the crater.

The Dalgaranga crater is in perfectly flat ground in a granite formation with about three feet of laterite on the surface. The explosion upon impact threw up a rim of laterite boulders about five feet high on one side and perhaps four on the other side, and sloping down and outwardly from the rim about 15 yards at maximum points. The debris is not evenly distributed about the crater. Apparently the meteorite came in at an angle of about 45 degrees from the south-southeast and much of the force of the explosion was back in that direction for it cleared that section of the rim of all loose rock debris and hurled most of it a considerable distance out into the bush, most of it from 80 to 100 yards. Another streamer of fragments

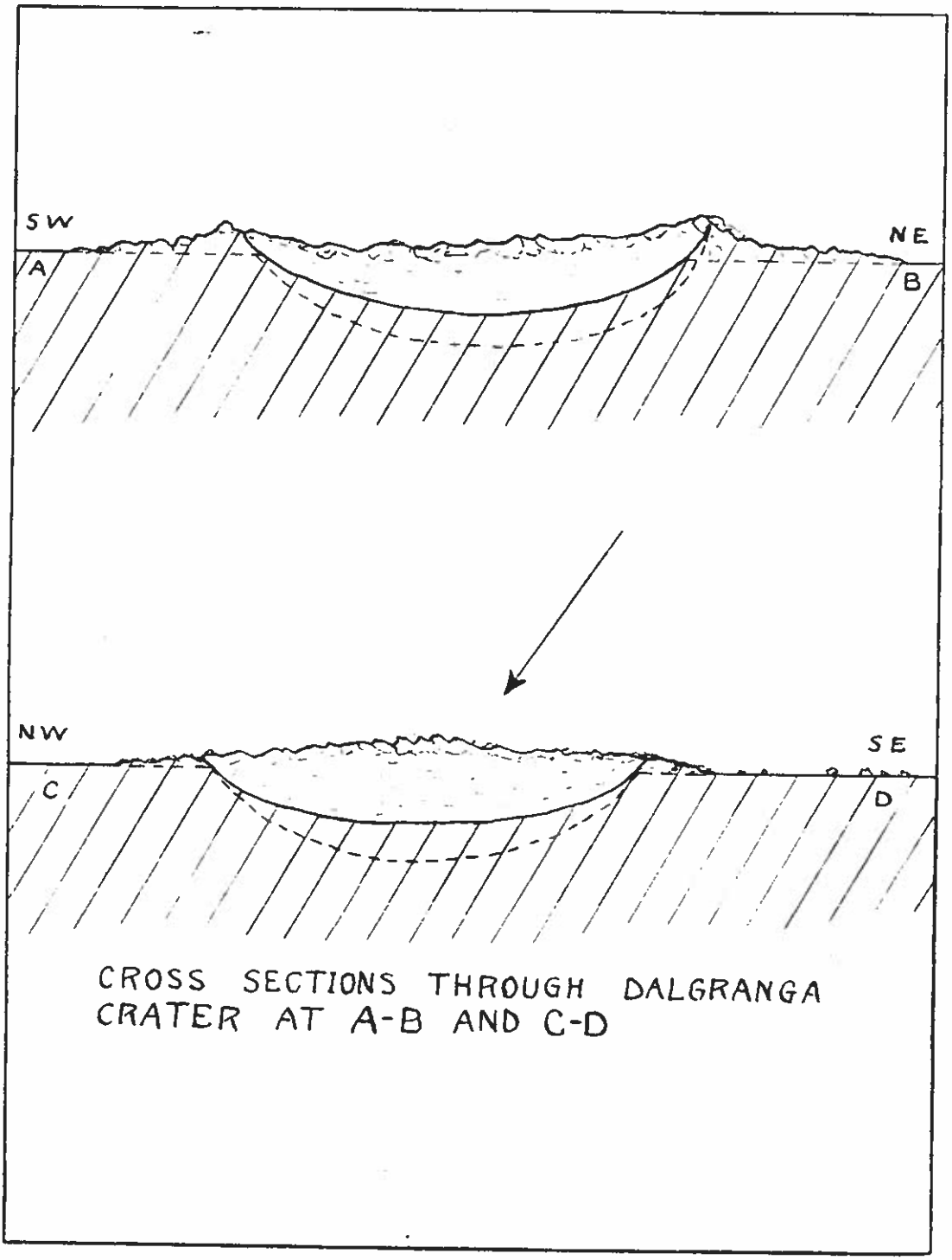
was thrown in the opposite direction, to the northwest, some as much as 200 yards and one chunk of laterite about 8 inches in diameter was 185 yards from the crater rim. There were other smaller streamers of rock debris but the main bulk of the material thrown out was close to the rim on the northeast and southwest sides. (See Fig. 17) I made a complete circle around the crater at a distance of about 80 yards where the largest chunks of laterite were to be found (about 18 inches in diameter) in the hope of finding a large meteorite but had no luck. I did find many pieces of flint that had been flaked by the aborigine. It occurred to me that perhaps the natives had traded artifacts with their gods, putting down a flint where they had picked up a piece of iron mentorite. This, I thought, might account for the small amount of irons as compared to the size of the crater. To test my theory I made a search far out beyond the last piece of laterite ejectamenta and found no sign of either flint stones or flaked flints. Flint does not occur naturally in granite country so the natives must have carried them there and besides, only man can flake a hard stone like flint. No doubt the natives saw this fall, for it would have been visible at a great distance even in daylight. They soon found the sharp little iron meteorites and carried most of them away, not forgetting to leave an exchange gift for the fiery god who came out of the sky.

Judging by the lack of weathering and erosion in the crater walls and in the laterite and granite blown out of the crater, I doubt that this event occurred more than a few hundred years ago. Laterite, being a loosely cemented conglomeration of small pellets, it is not a stone that can be expected to withstand decomposition yet many of the chunks of laterite were quite fresh in appearance and even a stone 16 inches in diameter which I turned over, was only buried about three inches. The desert floor about the crater is extremely flat and quite



PLAN VIEW OF DALGRANGA CRATER SHOWING THE IRRIGULAR DISTRIBUTION OF ROCK DEBRIS AND THE DIRECTION OF METEORITE APPROACH. ARROWS INDICATE CHUNKS OF LATERITE THROWN TO A CONSIDERABLE DISTANCE AWAY FROM RIM

Fig. 17



CROSS SECTIONS THROUGH DALGRANGA CRATER AT A-B AND C-D

Fig. 18

hard, with a pebble surface in many places between the trees. Tires of autos scarcely make an imprint and any rain that falls must stand there until it soaks into the ground, so that there is not much chance for sediment to accumulate around such stones. The flints were lying on the surface as if they had been put there a few days or a few years before. Wind is not an effective force in this area either, the bush being fairly thick and averaging about fifteen feet tall the flat surface is not much affected and there is no sign of a strong prevailing wind that might show in the direction of tree growth.

The trees in this area are mostly acacia (mulga) of one variety or another and do not grow to any size nor great age, probably because of the high salt content of the subsoils. One of the largest trees about was in the crater basin and it showed no sign of great age as compared to old knarled and half dead trees nearby. I would say that it was a tree in middle life and I doubt that the oldest of these trees is more than a hundred years. This tree proves nothing about the age of the crater except that it is probably more than a hundred years old.

It was very hot and so dry that our bodies craved water continually with the result that we drank most of our water before noon. Seeing that we could not stay longer, we broke camp at 1:15 p.m. and started back to the station. We had two compasses, so were able to establish directions at the crater relative to which way the debris was thrown out, but we were just as completely lost when we started for the station as if we had had none. We had no idea in what direction the station was, and when we came to a fork in the road we didn't know which road to take. There was a windmill at the fork so I climbed the tower to look for Mt. Dalgaranges. I could see it far in the distance but still had no idea whether the station was to the right or left of it. We had been at the station during the middle of the day and hence the sun

had been overhead, giving no clue as to which was east or west. If we had seen Mt. Dalgaranger from the station early in the morning or evening, we would have known whether it was east, west, north, or south of the station.

We took the left fork, driving through the bush for what seemed hours, always along fences, for they build the road when they build the fence. We came to other windmills which looked strange but didn't dare go back because we were nearly out of gas. Finally the engine did stop and I turned on the spare tank which meant that we had 35 miles left in the Volkswagon. Only a few miles beyond we made a turn and looming ahead was the big granite rock by the station. Rarely have I seen a more welcome sight!

We were soon back at Dalgaranga Station and Mrs. Ross had us in for another round of beer. We had taken the wrong road at the fork, but had got onto another shortcut which brought us back safely.

We borrowed some gasoline from Mrs. Ross (we were to pay for it to her account in Yalgoo) and headed back for that metropolis. On the way we had a race with a pair of emus which were standing at the edge of a clearing about 150 yards from the road. They started to move and I drove off the road a little way daring them to race. Sure enough, they took the dare. Instead of disappearing into the bush, they started a 200-yard dash to cross in front of us. I slowed down just enough so that they could make it at full speed. They passed only about 50 feet in front of the car doing above 40 miles an hour. Their mouths were open, their necks stretched out, and their tails were bobbing up and down as they took 10-foot strides in their flight.

On our way out to find Mr. Ross the day before we had had a similar experience with another emu. This one had been drinking at a water trough when we arrived. He started to run along a fence leading away from the water trough; we were on one side of the fence,

the emu on the other. At any point he could have turned away from the fence and into the bush but he was determined to cross in front of us. The road was smooth and straight and I kept increasing the speed until we were doing about 30 miles an hour, the emu just ahead of us about 20 feet. We had gone about a half-mile when I decided to get a picture. Dr. Nininger held the steering wheel while I tried to hold the camera out the window. Just then the emu tried to jump through the fence but rebounded off the wire about 40 feet, so that he was to the side of the car where I got two good pictures. Determined as ever he headed back for the fence, but I slowed down taking pity on the poor stupid creature. With no competition his judgment got the better of his instinct and he turned away into the bush.

Many years ago Roy Chapman Andrews told of his experiences in his explorations of Outer Mongolia. They had chased the wild asses and antelopes on the dry lakes of that country in their Dodge touring cars and the animals had raced them for miles in order to outrun and pass ahead of them. He thought that probably all wild animals which protect themselves by fleeing have this instinct to outrun and cross in front of their enemies. In my younger days, I had occasion to try out this theory several times on horses, chasing them in a Model-T Ford. In the spring of the year when the grass is green and the horses are feeling good, the whole herd will try to outrun your car and pass across in front of it. The old mares and geldings will trail behind but the colts and young horses will run 35 miles an hour quite easily and do better than 40 if pressed hard.

The Australian method of sheep raising, as we were told about it at the Dalgaranga Station, is quite simple. No extra labor is required except at shearing time. The land is divided up into large pastures, and at the corners where four pastures come together a well is dug and a windmill and large tank erected. Four watering troughs are set up, one in each pasture. Around the trough and in the corner of each

pasture, a wire corrall is built with a gate in one corner. When the owner wishes to "muster" the sheep in any given pasture, he simply shuts off the water in the trough until all of the thirsty sheep are in the corral bleating for water. This may take a day or two, but they all eventually come in. This is probably the only practical way to gather 200 or 300 sheep from a 20,000-acre pasture, when you consider that a man on horseback can only see a few hundred yards through the bush at most.

The only natural enemies the sheep have are dingos, the native wild dog, and domestic dogs turned sheep killers. Every sheepman carries a rifle in his car and all dogs found in his pasture are shot unless accompanied by their master. To keep the wild dogs down the government employs hunters who do nothing but hunt and trap wild dogs. They are called "doggers" and their method of hunting is by jeep, motorcycle, and shotgun. The dogger puts a light motorcycle in the back of his Land Rover and takes off across the open desert or through the bush until he finds a good hunting ground. There he parks the jeep and starts after the dingoes on the motorcycle armed with a shot gun loaded with buckshot.

In this region we had our first look at the government rabbit proof fence. It is well built wire netting fence about five feet high and extending below ground surface six inches to a foot to keep the rabbits from digging under. This particular section of the fence is an east and west fence to keep the rabbits from migrating down into the grain farming country from the north. It joins the main north and south fence at a point about 100 miles north of Sandstone. These rabbit fences are an important feature shown on every road map for they extend for hundreds of miles across the country, actually fencing the rabbits off in a huge pasture that includes the whole northwest corner of Australia. We saw a crew of government repair men on the Dalgaranga

Station who were fixing a small section of fence that had washed out in a creek bed. Dalgaranga Station is on the headwaters of one of the small coastal rivers.

We reached Yalgoo about 5:00 p.m. and put up at the same hotel for another night of barking, braying, and crowing.

February 12, 1959:

We took off this morning for Mt. Magnet, Sandstone, Agnew and all points east. The road was dirt and badly corrugated but we had heard that Mt. Magnet was a big town with all facilities. The Volkswagon people in Perth had told us that we could get parts there and have our Combe serviced. When we arrived we found one old garage, a few stores and a court house. The main street was three blocks long and 100 feet wide. It began abruptly and ended abruptly in the desert. From either end of this street the tourist can see 20 miles without the view being interrupted by a house. The one touch of modernization was a curbed parkway down the center of the street with newly planted grass and some tiny wisps of trees.

The garage man had no speedometer cable that would fit a Volkswagon so we filled our gas tank and headed for Sandstone. The cable had broken for no apparent reason just before we reached Yalgoo so we were without speedometer until we reached Kalgoorlie, a distance of about 450 miles.

A little way out of Yalgoo we had passed out of the laterite and had come into a greenstone and quartz formation. Little quartz buttes were scattered all over the landscape, most of the surface rock weathered and split into angular chunks two or three inches on a side. The flats of desert pavement in between these buttes were covered with small blue-black stones that looked as if they had been varnished. The astonishing thing was the uniformity of their size and the steady change to larger and larger sizes. At first they were all half-inch size,

then an inch, two inches, and finally whole fields or flats covered with these black stones averaging about three inches in diameter. Then they suddenly ceased altogether and we entered a country of low bluffs and cut banks of red decomposed granite and pyrophyllite, the latter being an advanced stage of decomposition in granite similar to a very smooth clay. This part of the country is the same rolling topography as described earlier except that the slopes are longer and more gentle. We had been gaining altitude all the way to Sandstone but so gradually it was hardly noticeable.

Sandstone is an old mining town with the regulation 1890 hotel, bar and gas pump, and tumbled-down garage with a few old junked cars. Also a road maintenance station, general store, and a few homes for those who must live in this dreary place.

Like most of these mining towns, Sandstone is on top of a mountain, better described as the highest part of a plain. From the hotel we looked down a long slope to the north that gave one the impression of looking into eternity--so vast, so far away from everywhere, and so uninhabited. There was not a sign of smoke from a farmhouse; just the blue of the brush-covered land fading softly into the blue of the sky. The air was very clear and we must have been looking at least 100 miles to the horizon. The town of Sandstone would do well to import a few of the sandstone cliffs from Dr. Nininger's home town of Sedona, Arizona, to place on that horizon. As far as I could see there was not a smidgein of sandstone in sight. My notes read, "Sandstone is sans sandstone".

We continued on toward Agnew, stopping about 5:30 at a sheep station to get water. We were met by barking sheep dogs and presently the owner came out from somewhere, dressed only in a pair of kakhi shorts. He kindly filled our water bags from one of his five big rainwater tanks. We asked him how many sheep he had and he replied that he was

running about 600 head on 303,000 acres, that being all he had fenced at the time. He said that was too many and that he intended to cut down to about 500 head. We had seen a few very wild sheep run across the road. Since they don't herd their sheep but only muster them twice a year for shearing, the sheep become almost as wild as the wild game.

I asked our host about the average rainfall and he said it was about 16 inches but that they had just had a series of dry years. Ground water, he said, was only six to eight feet down, but when one went much deeper it became salt water. It was in this area that we began noticing how the trees only lived to a certain age and he confirmed our guess as to the reason: When the trees reach a certain size the roots get down to salt water and they die. The dead trees are only about 15 feet high and the younger trees appear as healthy as any tree could be, with bright, lush foliage.

We camped that night in the middle of the road and about 50 yards from a windmill and trough, hoping to see wild game in the early morning at the water. It turned out that the only wild game was mosquitos, so we built a big fire of mulga wood and threw on green weeds to make a smoke. It was effective while the green weeds lasted, but that wasn't long. I made my bed (cot) in the road in front of the car, that being the place most free from stickers which might get into bare feet. There wasn't much danger from passing cars; we had passed only two cars all day, not counting those parked in Sandstone and Mt. Magnet. It had been threatening to storm as we went to bed and later in the night we heard thunder and toward morning big drops began to fall. So, like the characters of Biblical record, "We arose while it was yet night and departed from that place".

<u>February 13, 1959</u>:

The early start was profitable, however, for we saw 30 kangaroos

and three emus in the first hour. We reached Agnew quite early (85 miles from Sandstone) and found it just like its neighbor. We stopped at the hotel for gas and while I was hunting up the manager to pump the gas, Dr. Nininger went into the pub to see what he could find out about local tektite collectors. The gas station consisted of about 50 barrels of petrol, some full, some empty, standing in the yard. The manager broke open a new one and thrust a gas pump in the bunghole, pumped a five-gallon can full and then poured that in my tank. When this was accomplished I went around to the pub to find Dr. Nininger. He was busy drinking beer with a couple of customers and the bartender, trying to get some scientific information about australites. It should be said here that Dr. Nininger is definitely <u>not</u> a drinking man; he hates beer. But in the interest of science, he drank literally quarts of the stuff. The two Aussies had either started early or late the night before, because they were in no condition to [illegible] out accurate information. Dr. Nininger got me into the conversation and while they weren't looking he set the half-empty glass behind something and sneaked out the door. The gentlemen bought me a beer and then I had to return the favor, so it was some time before we got on the road again.

We kept close watch for kangaroos as we drove, because the dirt road had narrowed down to just one track and the bush on either side was quite thick. The kangaroos sleep in the shade of a bush during the middle of the day and if they chance to be asleep under one by the side of the road as you approach, they may dash in front of your car.

About 10 miles east of Agnew we crossed the Depot Range, according to our map. Actually, what we did was to go around the end of a ridge about 150 feet high and 10 miles long. It is hard to get adjusted to these Australian "mountain ranges".

At Agnew we turned southeast and headed for Leonora, 83 miles away

with no gas stations between. We saw five emus in a group but could not get them to race, so decided they must not race on Thursday. We also saw seven wedge-tailed eagles eating a kangaroo someone had run over, two rabbits, a fox, and a dingo. The rabbits were certainly scarce; these were the first we had seen. But kangaroos are more plentiful than rabbits would be along our country roads at home.

Leonora turned out to be quite a nice little town, more buildings than we had seen in any town since leaving the coastal area and quite apparently a trading center for the mining industry. Just before entering the town we came upon the largest aborigine camp we had yet seen. Scattered over a few acres of ground along the roadway were about 20 rude shelters, most of them constructed of old burlap sacks and bits of canvas thrown over bushes to provide a shade in the heat of the day and some shelter from the dew at nightfall. One old blackfellow sitting under a bush had most of his upper body painted with white spots but he quickly put on his shirt when he saw that we were going to stop.

Dr. Nininger had found that nearly all of the natives knew about tektites (they call them meteorites) and have collected them for many years. He began to circulate about the camp showing them a few tektites he carried in his pocket and asking if they had any for sale. He finally found one man who sold him two. Others said that they knew where many could be found but the sites were far away, several days travel. Some said that in years gone by they had collected many, hoping to sell them to the museums or white collectors, but that the demand had ceased long ago and that they had lost or thrown away what they had had.

One fierce-looking old man came up to the car and begged for money so I gave him a shilling for the privilege of taking his picture.

He had a dirty rag tied around his head to keep the hair out of his eyes and a tattered shirt and pants about the same color as his skin. A few specks of white paint remained on his face and chest from a recent paint job that had mostly worn away, and he had the usual ring of flies around his eyes and at the corners of his mouth. The aborigines never fight the flies away but allow them to sit and drink the moisture from their eyes and mouth. Extra flies, waiting their turn, sit on their hosts' backs in considerable swarms.

The Australian aborigines are a very primitive-looking people, many of them with very heavy, gorilla-like features, but they do not impress one as a fierce or aggressive people. They never crowd around your car to see what you may have inside nor do they give the impression that they might steal something if left unwatched. This is generally true in all parts of Australia and New Zealand where honesty is well above the world average. The foreign sections of the big cities are probably not much better than the under-privileged sections of most big cities, but the native population has, by and large, a better-than-average record for honesty.

We saw a good many half-castes in the country towns and learned that they are a product of pioneer days when there was no laws against the inter-marriage of white and black races. Many of these half-castes have apparently married other half-castes and the genetic result is often a person whose skin, eyes, and hair are a uniform shade of brown best described as a milk-chocolate color. In talking with a number of Australians about this peculiar coloration, I was told that the brown or cinnamon-colored hair is a characteristic of the pure-blooded aborigine, not just the half-caste. Later, around Alice Springs, I saw many natives who, though very black of skin, had quite brown hair.

We ate lunch in Leonora in a l'ttle cafe where we had "stike and iggs" (steak and eggs). We asked for water but none was available,

probably because Leonora is in a very dry desert country and entirely surrounded by dry salt lakes. Any ground water produced would no doubt be salty. "Lolly water" (a soft drink of any kind) and beer are always available, and sometimes milk.

A few miles south of Leonora we crossed over Lake Raeside, an ephemeral body of water that consisted of a salt flat about two miles wide and 115 miles long. There are a number of these string lakes in this vicinity which are thought to be the remains of an ancient river system that has been cut into short lengths by encroaching sand dunes. I saw no physical evidence to bear this out but we crossed at right angles and so had little chance to see much of the shoreline.

We continued for 65 miles across a flat salt desert country to the old mining town of Menzies, which, like all the other gold-mining towns in Australia, is located on a greenstone intrusion a few hundred feet above the surrounding country. Menzies is truly a ghost town. Perhaps a dozen old buildings stand along a wide main street, many of them with the windows out and the roofs fallen in. One I remember well had four Greek half-columns in the front wall and a formal Greek doorway and roofline. With the roof fallen in and the back wall knocked out, it looked for all the world like an ancient Greek temple. It was probably the bank of Menzies in its heyday.

According to our map it was 82 miles from Menzies to Kalgoorlie, but night overtook us before we could reach the city so we camped out near a place called Broad Arrow, which was a one-building station on the railroad.

During the last hour before reaching Broad Arrow we had been climbing quite steadily, a long straight road that seemed to rise in steps, each one a little higher and steeper than the last. The eucalyptus forest was increasing in height and density too and it was quite

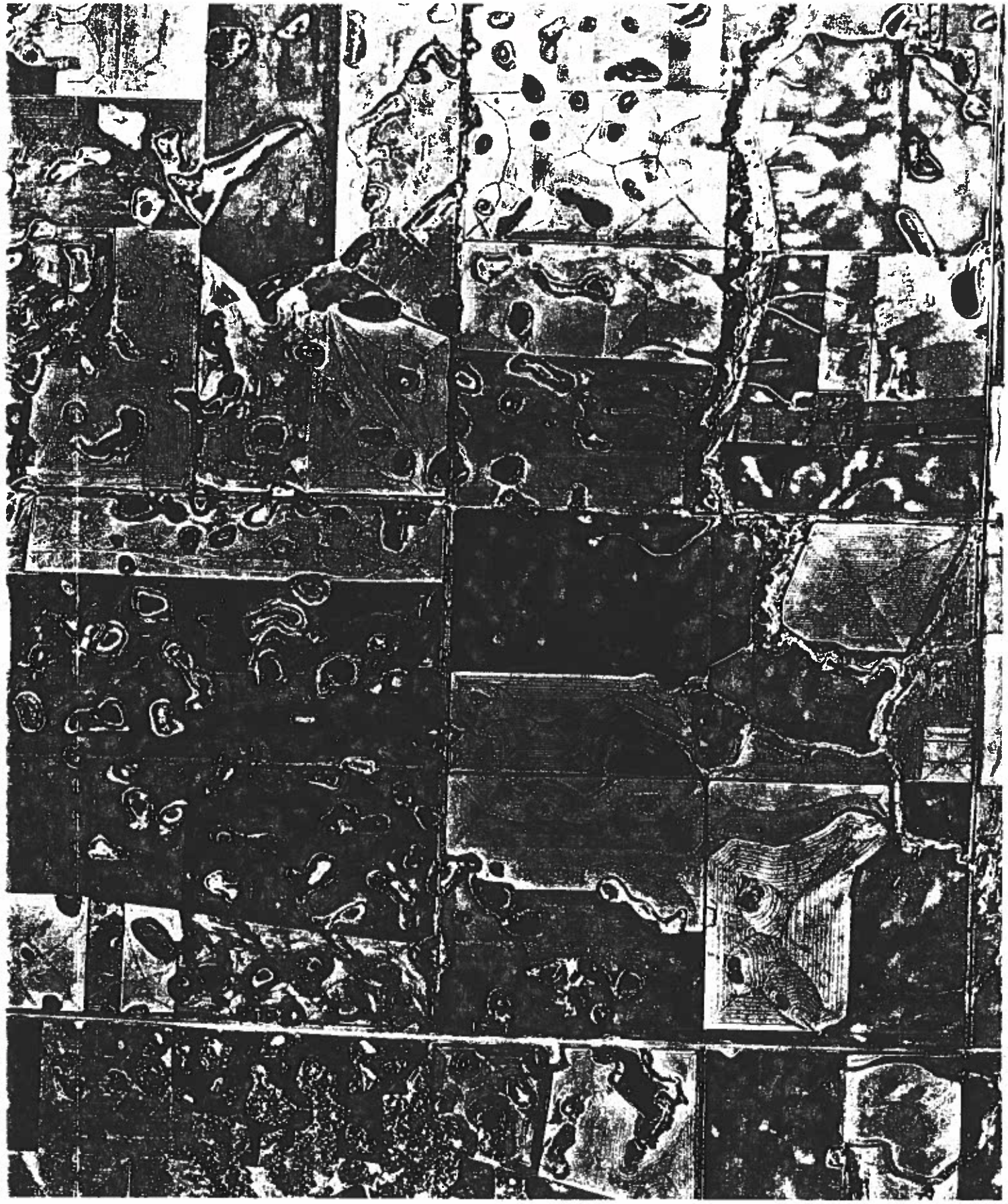
obvious that the rainfall here was considerably greater than on the lower plains. The larger trees were about 75 feet tall and scattered out, tending to grow in little clumps with open spaces between covered with a gray brush two to three feet tall.

We drove off the road about 100 yards and camped near some beautiful salmon-bark gums, a eucalyptus with a salmon-colored, satin-smooth bark which, in the younger trees, sometimes changes to a rich olive green on the shady side of the tree. This tree sheds its bark in long streamers which hang from the main trunk in strips as much as 10 feet in length and add considerable picturesqueness to an already beautiful tree. A chill evening wind was blowing the streamers as we made camp and rustled firewood for the evening meal. There was no lack of wood here in this forest of Magos, the native name for these trees.

The elevation must have been close to 2,000 feet at this camp for we traveled downhill for many miles the next morning before reaching Kalgoorlie which is 1,250 feet high. We put on all the clothing we had and went to bed early but could not sleep because of the cold. Dr. Nininger got up about 3:00 a.m. and gave all of his bedding to Mrs. Nininger to keep her warm. He built up the fire and I got up, too, after another hour; it seemed like a good time to look at Jupiter's moons with my Questar telescope. The seeing was really wonderful and we could count five moons quite easily.

February 14, 1959:

After an early breakfast we got away from camp about 7:30, driving 25 miles down to Kalgoorlie. We found the Palace Hotel without much trouble at the main intersection in town and also some very welcome mail at the desk. I received two letters from Mrs. Kelly, one from Honolulu and the other after she had reached home, so knew that she was safe and sound.



6. Area of lakes, fossil lakes and semi-fossil lakes about three miles east of Virden, Manitoba. Virden is about 20 miles east of the Saskatchewan line.

These iceberg kettle lakes in Canada are very similar to those found in the wheat country in Australia. The elevation about 1000 feet is the same. The randomness is the same too, probably grounded as the water was coming to a stop and circulating. The squares are probably 160 acres.

CHAPTER IX

KALGOORLIE TO ESPERANCE AND THE RIDDLE OF THE DRY LAKES

I took our combi to the Volkswagon agency for our 1,500 mile checkup and they ordered a new speedometer cable from Perth. It arrived the same day, by air--an amazing bit of service!

Kalgoorlie is a city of 22,000 people and apparently very progressive. It is the second largest gold-producing area in the world, being surpassed only by South Africa. As we had seen, Western Australia is dotted with old gold-mining towns but Kalgoorlie is the only steady producer left. Its main street is called the Golden Mile. It is about a mile long and at its end many roads fan out over the "golden hill", an area of several hundred acres that is literally covered with big stamp mills, smoke stacks, and mine elevator shaft heads. Beyond, in a valley, are dozens of big mesas of "mill tailings" where the slurry from the stamp mills is pumped out to dry after the gold has been extracted. Some of these big tailing piles cover as much as 20 acres and are over 100 feet high. They are big square mesas surrounded by a rim, or dam about two feet high made up of old cement sacks full of mud. As the mud settles out of the water and raises the floor of this hilltop lake, the dam around the edge is raised from time to time by laying on another tier of cement sacks. It seems almost incredible that so much dirt and rock could have been removed from beneath this hill. Many of the old mines have caved in or have been "worked out" and whereas there were once over 30 separate mining companies at work here there are five now and they are trying to consolidate into three or four.

I visited the School of Mines in Kalgoorlie where I was told

I should go to see a Mr. Campbell who was the mining engineer in charge of one of the big mines. This I did, and after a long and pleasant chat I was invited to go down in one of the mines the next day.

Mr. Campbell told me that all of the ground water around Kalgoorlie was salty; even 3,000 feet down in the bottom of the mines it is almost as salty as the ocean. He told me the story of how one of the early pioneer mining engineers had spearheaded the drive to bring fresh water from the coast near Perth, 348 miles away, and how this wise benefactor was abused and condemned by most of the people until the day of his death as a waster of public funds and a scoundrel. This pipeline, which we crossed several times, is laid above ground on cement piers which take the thrust of pumping and give it a long life which it would not have if buried underground in strong chlorides. Mr. Campbell said that the ground water farther north (where we had just come from) was fresh; strangely he had not heard that the water just beneath this surface layer was also salty. I told him of my theory that all of Western Australia and probably most of the continent was ancient sea bottom that had once been the bottom of the deep ocean and that the presence of salt water deep in the mines indicated that this was true, the terrific pressure of the deep sea having driven the salts far into the fractures of the earth. He considered this theory without committing himself and went on to tell me that the oxidized or decomposed surface rarely exceed 200 feet in thickness and in most areas, far less. Also, that except for a few isolated peaks, no land in Western Australia is higher than 1,500 feet and most of it is between 100 and 1,200 feet in elevation. Every gold mine in Western Australia, he said, is on or by a mountain and all the gold is found in the greenstone. The greenstone is geologically younger than the granite, having intruded the granite as dykes, but it also weathers

more slowly and thus forms the ridges and low mountains that carries the gold. (See Bulletin No. 95, Geological Survey of Western Australia, Page 316). I asked about the large dykes and veins of quartz that I had seen farther north around Sandstone and he told me that in Western Australia quartz is always barren of gold.

In the afternoon, I went to the Bank of New South Wales to cash a check and met the manager of the bank, a Mr. Haigh who I found to be a fellow Rotarian. He expressed a strong interest in our scientific expedition into Western Australia and asked if I would speak at the Rotary luncheon on the following Monday. I agreed and got a spot on the program for Dr. Nininger too. Dr. Nininter in the meantime had met a Mr. Compton, a retired mining engineer who had taught geology in the local School of Mines for 30 years. He invited us out to his home that evening to see his collection of gold specimens and his collection of tektites, or so we though. It turned out that he kept the tektites downtown at his club but we did enjoy their company very much and their hospitality. Fresh grapes and figs were his pride and joy.

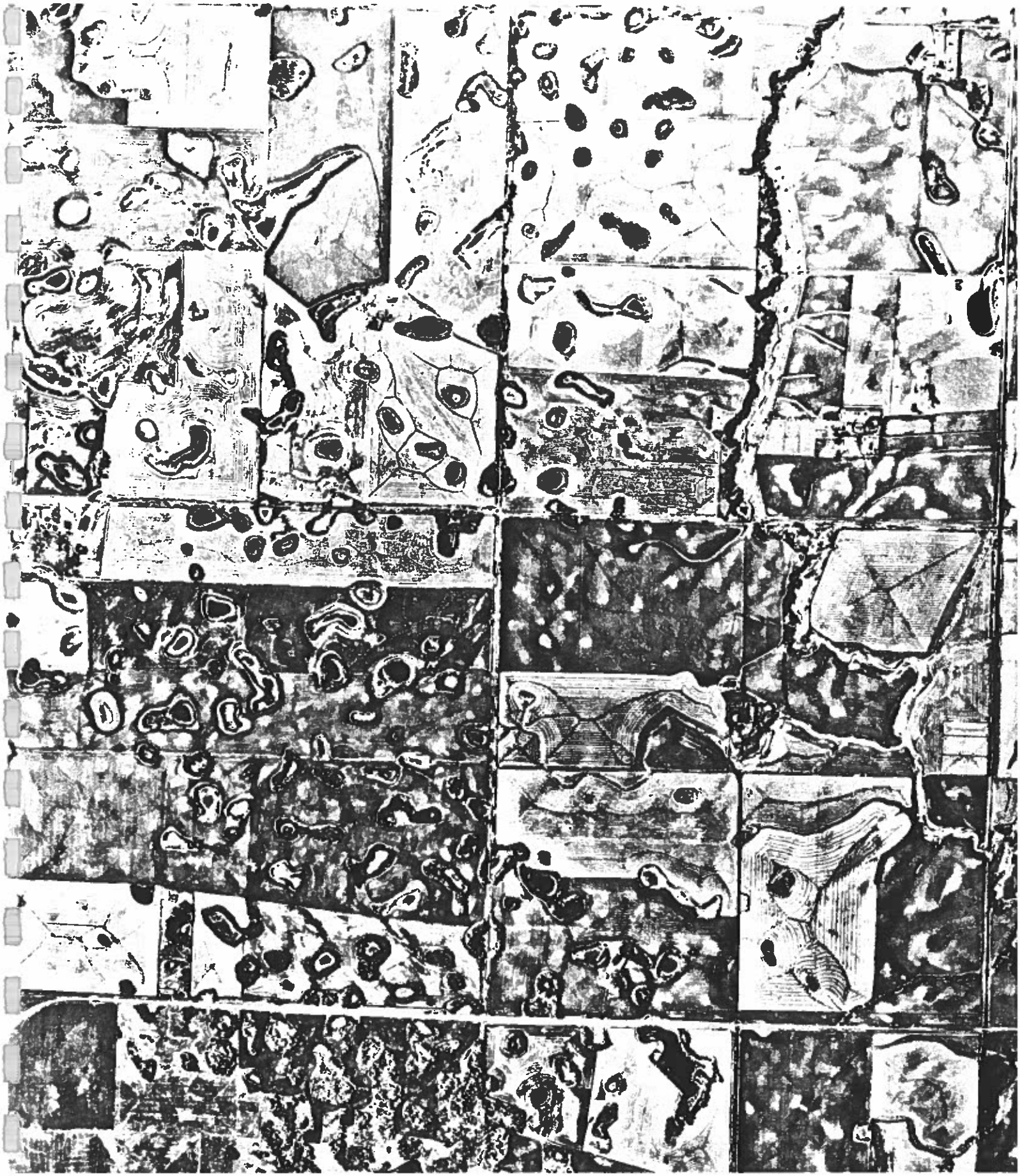
February 15, 1959:

Mr. Compton and his son came down to the hotel about 10:30 a.m. and Dr. Nininger went with Mr. Compton to his club where they were to sort out some 38 specimens of tektites which Dr. Nininger hoped to purchase. The younger Compton is a geologist for one of the big mining companies at Kalgoorlie. We two sat in the hotel lobby and talked geology until nearly noon. He was very much interested in the collision theory and I gave him one of the books I had brought along. He complained because neither the mining companies nor the government would spend any money for exploration beyond the immediate vicinity of the mines. He said that nothing was known of the structure five miles

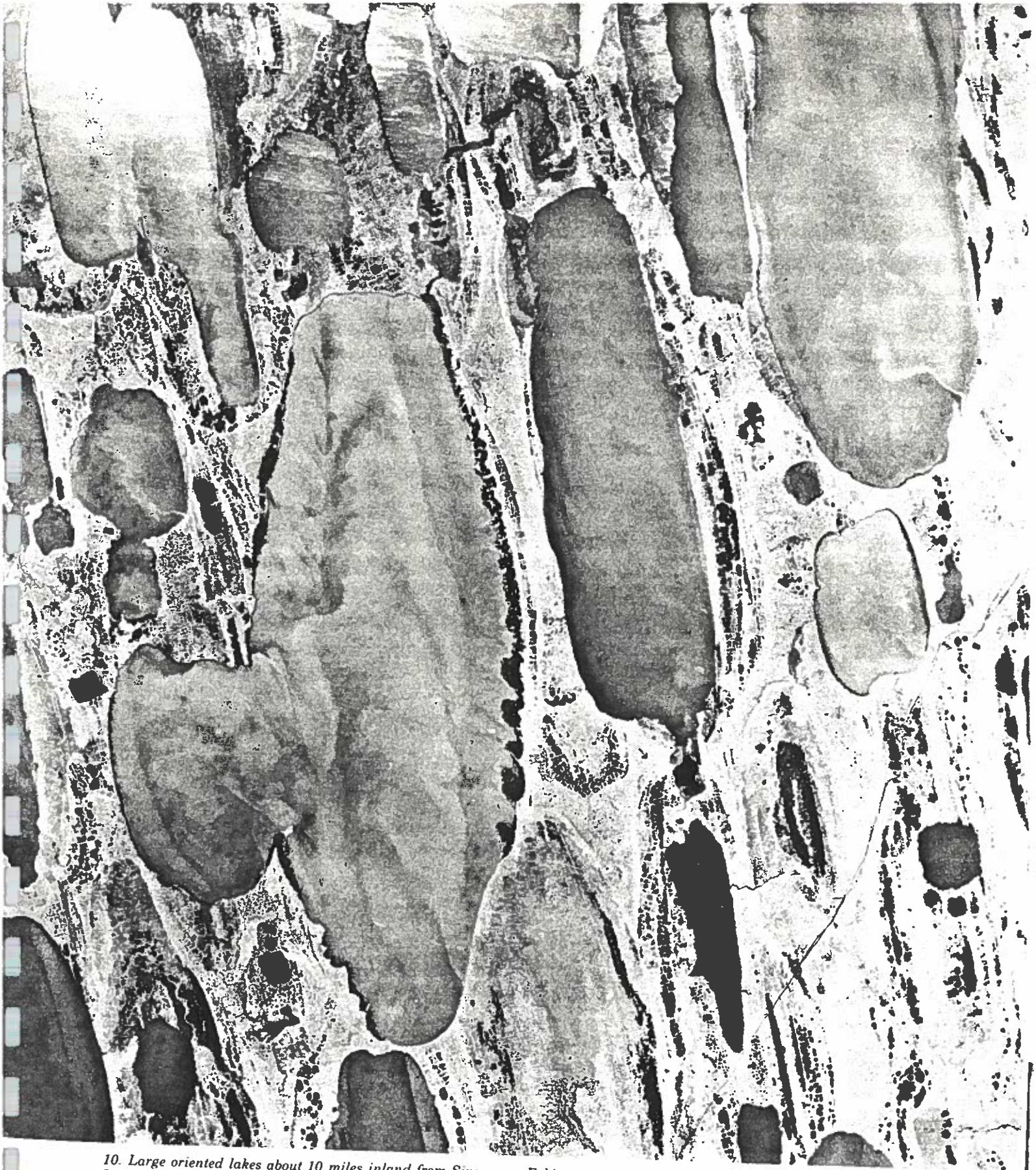
away from Kalgoorlie. We talked about the origin and migration theory of lakes, the swell and swale topography-ocean bottom theory, and I explained to him Dachille's precipitation theory: (See TARGET:EARTH-The Genesis of Minerals, pages 202-207) how the elements might have rained down from a collision cloud. I could see that most of this seemed too fantastic for him to believe but he did agree that most of Australia was old ocean bottom. He had long held to this theory himself although he said it was not generally accepted among geologists in Australia.

Dr. Nininger had given the word to the press and announced over the radio that he was interested in acquiring tektites and by that afternoon we began to get results. Several people brought their collections, some willing to give them for the sake of science, some wanting to sell. One young man named Smith who had quite a nice collection gave me five tektites, one of each of the several varieties of shapes found in Australia.

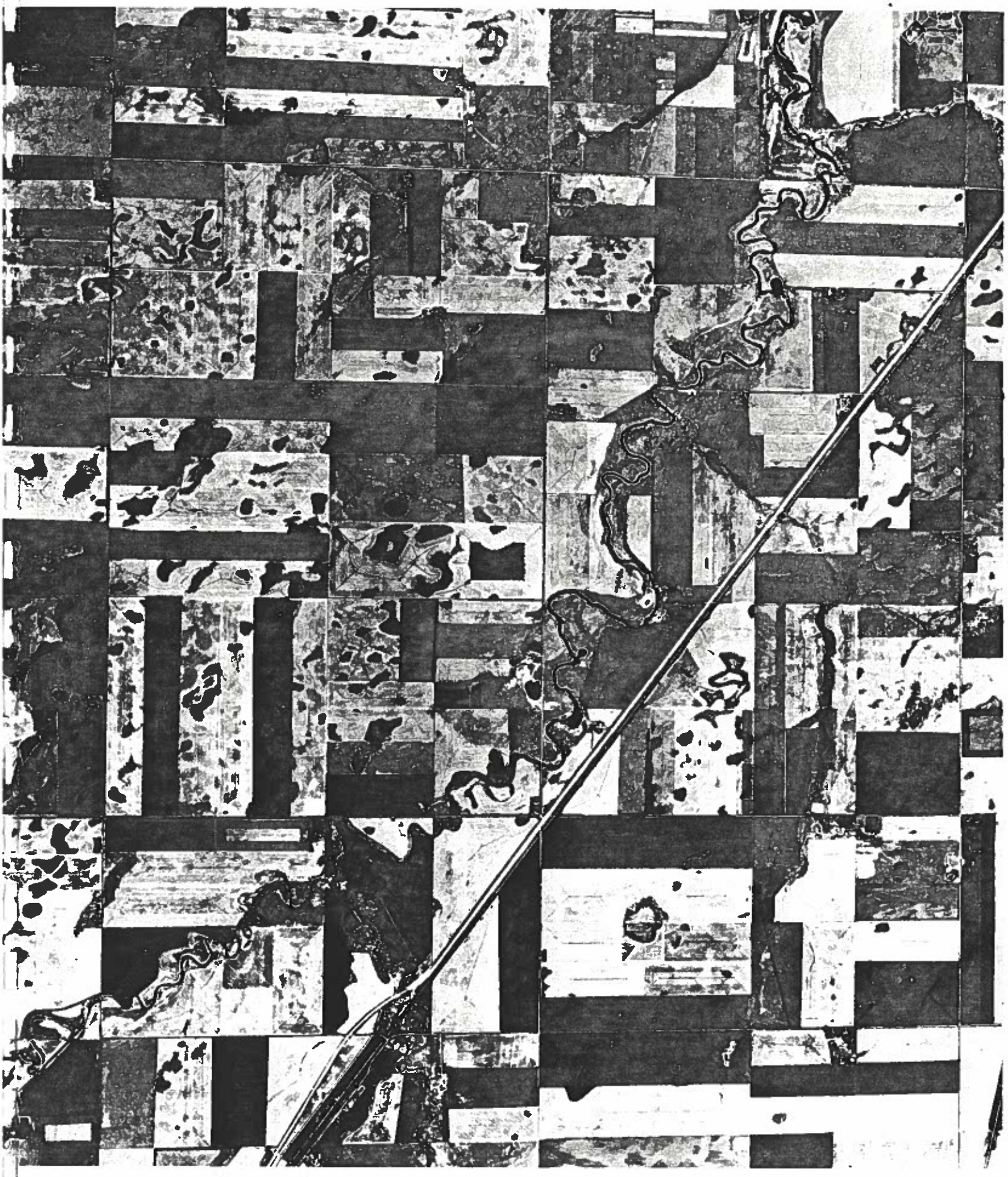
Later in the afternoon we went to visit Johnnie Carlisle, known locally as "the Dogger" who lived on the outskirts of town. He was a government hunter who had charge of reducing the numbers of dingoes which are so destructive to sheep in Australia. His job consists of traveling all over Western Australia for several hundred miles in all directions from Kalgoorlie hunting wild dogs. His equipment consisted of two Land Rover on which he carried two light-weight motorcycles. With this equipment, he and a couple of helpers, one a cook and the other a hunter, travel out through the desert to the hunting grounds. They make camp and the hunters take off on their motorcycles to run down the dingoes and shoot them with shotguns. Everyone told us that Johnnie the Dogger knew more about the back bush country of Western Australia than any man alive. He had a collection of about 100 tektites which he had either found himself or acquired from the aborigines. He



6. Area of lakes, fossil lakes and semi-fossil lakes about three miles east of Virden, Manitoba. Virden is about 20 miles east of the Saskatchewan line.



10. Large oriented lakes about 10 miles inland from Sinaru, an Eskimo village on the coast about 40 miles SSW of Barrow, Alaska. North is at top of the picture. Multiple shore lines are in evidence around all of these lakes; probably caused by slow melting of the large cakes of ice that once stranded here. Ice would strand easily because of its deep submergence in the water and because its great momentum would cause it to plow deeply into the subsoil.



2. Area of fossil lakes one mile southeast of Regina, Sas. Highway 33 is seen in picture. Fossil lakes are seen to parallel the highway. Note that not a single lake drains into the stream.

also had three small meteorites, one a pallasite of beautiful structure (a mixture of stone and iron, the stony material being in the form of olivine crystals). Dr. Nininger arranged to buy his collection and offered to buy any other meteorites that he might find. Carlisle said that about three years before he had found in the desert some 500 miles to the northeast a large meteorite which weighed well over 100 pounds. He had hauled it to the nearest station and notified the museum at Perth, but it was still there when he had last seen it something over a year later. He supposed it was still there, but we learned later that the museum had finally gone after it. Such lack of interest was hard for Dr. Nininger to understand.

February 16, 1959:

Dr. Nininger had made arrangements for the banker, Mr. Haigh, to take us some 20 miles out in the country to see a man who was said to have "buckets full of tektites". Mr. Haigh and his wife and daughter called for us at the hotel and on the way out to the station we learned that Mr. Jones, the owner of the sheep station, was a man of outstanding character and ability. His sheep station contained 640,000 acres, or 1,015 square miles of land with the homestead located near the center. On the way out we passed through an old ghost-town called Kuanalling which Mr. Haigh told us had once been quite an important gold producer until the much higher grade ore at Kalgoorlie drew the miners away. This ghost town was on Mr. Jones's station, only two or three miles from his home, and I began to wonder what such land might be worth per acre. Later I asked Mr. Jones what such land as his might be worth--what it would sell for--and he replied, "We don't sell gold-bearing land in Australia". This was not an unreasonable answer when one considers that they have taken out over a billion pounds worth of gold from under the "golden mile" at Kalgoorlie. Most of Mr. Jones's 1,015 square miles is flat or gently rolling land and so completely covered with a blanket

cattle. Their water problem, he said, was a serious one but they were overcoming it by building stock water ponds and small dams to colect the rainwater.

Soon after we arrived the two oldest boys, about 18 and 20, excused themselves to start on a week's trip to build fence. It seemed that only 400,000 acres were under fence and they were busy just then extending their fences. A few minutes later they drove out of the yard with two big trucks, one carrying a wheel tractor and supplies and the other loaded with aborigines and their wives, children, and dogs. The tractor had an auger attachment to dig holes for the posts and also a power drill to bore holes through the posts. Everywhere in Australia they drill holes through the posts and string the unbarbed wire through the holes rather than staple the wire to the posts as we do in the United States. With five wires on a fence, this is a tremendous job.

As in New Zealand, relatively few sheep are sold for meat in Australia simply because there are so many sheep compared to the consumer demand for meat. Wool is therefore the main cash crop. The wethers (castrated rams) are kept for shearing and in the average year will produce a fleece weighing about 12 pounds.

Mr. Jones was also a collector of gold samples and some of the specimens he showed us were indeed beautiful. He said the actual total gold content was worth around £500. He then brought out his tektite collection, which consisted of some 1,100 specimens. This was by far the finest collection we had seen in Australia outside of the museums. It represented some 40 years of collecting and was important scientifically because it was complete, no specimens having ever been extracted from what had been found by the Jones family in that area.

We returned to Kalgoorlie with the Haighs and were invited to their home for a Sunday-night snack which turned out to be quite a

meal. Mr. Haigh showed us his collection of native weapons and told us several amusing tales about the local aborigines who hang around the edges of the town and beg for food and whatever else they can get. He said that if you once give them something at your door they never stop coming back for more. For this reason the citizens never give anything directly but turn it over to the government welfare agency for distribution. As an exception to this rule he said they had once had several bushels of apples from their trees which they wanted to give to some native families camping nearby. In order to keep the natives from bothering them at the house, Mr. Haigh took the apples out at night and scattered them near the camp. Next morning there was a great hullabaloo and a near riot when the women found the apples and got into a fight over the division of this manna from heaven. The Haighs watched the fracas from their kitchen window and when the fight was over they saw that the natives had begun to wonder where this wonderful fruit had come from. They looked all around, in all directions, and finally they looked up at the sky. The final verdict it seemed was that the apples had fallen from the sky. What more natural conclusion in a desert land where no fruit of any kind is known but where things do fall from the sky.

February 17, 1959:

On Mr. Campbell's invitation I spent this morning visiting one of the mines, under the guidance of Mr. Compton, Jr., the young geologist I had talked with on Saturday. We changed into coveralls, slickers and boots, and miners' hats and took the elevator down into the mine. The elevator consisted of a platform just big enough for four men crowded close together and enclosed by a hand rail about waist level. We got off at the 900-foot level, the 1,100 and 1,300 foot levels, and walked through tunnels (drifts), having to bend nearly double in many places. The main drifts, where the rails carried the ore cars, were shored-up with timbers, but the smaller working shafts were not, being just wide

enough to get a little ore car through. There was water running everywhere and a constant rain dripping from the roof so that our slickers and rubberboots were a necessity. Geologist Compton explained the structure and the theory of how the gold was deposited, and dug out many samples of the ore with his hand pick which he gave to me to take home. He assured me that the company wouldn't mind as the total gold content could not be more than a shilling or two.

I was impressed by the violent folding and shattering of this deep underground structure. It looks as if a giant blast of explosive had shattered the greenstone into millions of pieces about the size of one's fist, and then the whole mass shaken down and compressed until all the voids were filled. Seldom is there a fault plane surface of any size or length.

Compton took me into a large underground room a little way from the lift at the 900-foot level. Here the roof had caved in forming a long room about 80 feet long by perhaps 50 feet wide and 30 feet high. Along one side they had worked out a vein that paralleled the floor and extended into another adjoining room. This left a pillar hanging from the roof but unsupported at the bottom. The rooms had flat fault surfaces along the roof and I wondered how the company bosses had ever persuaded the miners to work out the vein underneath that central pillar. I was very glad to get out of the place, what with those big trucks running around only 900 feet above.

Shortly before noon, Dr. Nininger and I were picked up at our hotel by a Rotarian who was head of the geology department at the School of Mines and taken to the regular meeting of the Kalgoorlie Rotary Club. After lunch we each gave a 10-minute talk which was tape-recorded and later broadcast over the local station. Dr. Nininger talked about his search for meteorite and tektites, and I told them about my interest in collision geology and my search for anomalous

conditions in Australia which might point toward cosmic collision as the origin of such conditions.

Mr. Jones was a guest at this Rotary meeting and had come to close the deal with Dr. Nininger for purchase of his tektite collection. He agreed to sell his entire collection except one very large tektite which his father had found and which he especially prized for that reason. It was oval-shaped, nearly two inches long, over an inch wide and about three-quarters of an inch thick, with a flow rim around its greatest circumference. Mr. Jones had not brought the tektites with him so he took us back out to the station in his pickup truck. He carried a rifle slung in the roof of his truck where he could get it quickly. He said they were having a great deal of trouble with wild dogs, city dogs, and two-legged dogs. The latter, gold miners who, though better paid than most Australian laborers, continued to steal sheep.

Before heading east across the Nullarbor, we planned to make a trip south to the town of Esperance on the coast, a distance of 118 miles. When Dr. Nininger and I returned to the hotel from Jones's station about 5:00 p.m., we found Mrs. Nininger ready to start on this next leg of our travels. She had had the camp chair, her seat in the back of the combi, re-upholstered in a local furniture store, the old canvas set and back having split out with much travel over rough roads. When we were all ready to depart, she got into the back of the combi and sat down. There was a great ripping sound and Mrs. Nininger went through the new canvas seat. It was funny to the two men on the front seat, but not so funny to Mrs. Nininger. She was ready to chew that furniture man up in small bites and spit him out! The shop was just around the corner from the hotel so the Niningers took the chair to the store and got their money back. We bridged over the canvas seat with some thin box lumber and I promised to buy some clothesline and weave a seat of it the next day at noon.

We got out of town about six o'clock and made nearly 20 miles before sundown, camping off the road a few hundred yards in a nice forest of eucalyptus. It is possible to leave the road almost anywhere as the road gutters are seldom more than a foot deep and the trees take so much of the moisture that most of the ground between the trees is barren of brush.

After supper I got out my Questar and mounted it on the trunk of a fallen tree which made a good solid mount of just the right height. The seeing was by far the best I have ever experienced, the highest magnification being exceedingly clear and steady. The moon was a little past the first quarter so that Mare Imbrium was in a good position to view. We could see the straight wall very plainly and in fine detail. The mountain walls of the Appennines and Alps were very sharp, many small craters being visible which I did not remember seeing in any photograph. The mountain peaks on the rim of the big crater Plato cast sharp, clear shadows on the floor of the crater.

The seeing was very good for several nights thereafter but the moon too bright to see much detail. The seeing in this section of Western Australia should be especially good because it is a forest-covered country all the way to the southern ocean and with prevailing winds from that direction the air must be unusually free from dust. The forest cover should help too in preventing so much heat radiation from the earth. For the next week we experienced quite cool weather even though it was mid-summer down under. The nights were so cold we were quite uncomfortable and the dew so heavy it was almost like rain, getting our bedding so wet we had to dry it out in the morning sun before breaking camp.

<u>February 18, 1959:</u>

We were awakened early by roosters crowing and dogs barking so had not been camped so far away from civilization as we had thought

We arrived in Norseman about 10:00 a.m. where we stopped long enough to stock up on groceries and buy some rope to fix Mrs. Nininger's chair. Norseman is a rather interesting little town of about 500 people but business-wise is bigger because it lies at the crossroads, or "T", of the most easterly north and south highway in Western Australia and at the western end of the only transcontinental road in Australia. It is built in a forest of salmon gums at the foot of a good-sized mountain which appears to be some 500 or 600 feet higher. Here supplies are taken on for the trip across the Nullarbor Plain, a trip of over 1,000 miles to the next town big enough to call a town.

Norseman is one of those gold-mining towns at the foot of a mountain like most of the others. The gold, however, is found in what are known as "deep leads" to the mining engineers of Australia. These deep leads are deep clefts or depressions in the granite basement rocks which have been filled to the surface with angular gravels, muds, and some water-worn pebbles. The free gold is found mixed in this mass of detritus. The geological survey maps of Western Australia give the elevation of Norseman as 927 feet but the National Geographic map of Australia shows an elevation of 1,595 feet. Probably this latter figure is the height of the peak east of the town. In any event, the whole country is relatively level and from a prospector's standpoint the deep leads are about as difficult to find as the laterite-covered greenstone dykes. Quoting from Bulletin No. 95 Geological Survey of Western Australia, Pages 207-208:

> "The undissected and arid nature of the plateau with its cover of laterite, travertine, clays and sands has had an important effect on gold mining, in that many of the lodes are quite hidden, and have been discovered only by the merest chance; in that few lodes can be worked from tunnels or adits, as may often advantageously be done in more dissected countries; and in that the absence of streams has caused much difficulty in obtaining the necessary water for mining purposes. Against these serious disadvantages, is the great advantage of easy transportation by road and rail. It may also be pointed out that over considerable areas there is not much accumulation

of surface detritus; consequently the bed rock and its contained lodes in those areas are quite close to the surface, although unfortunately a thin cover of laterite or other superficial deposits often conceal the lodes. This cover, however, is a small difficulty compared with that which would arise if great thickness of detritus existed to any extent. That such thick deposits do occur is shown by the records of the deep lead workings".

I offer this quote because it bears out my own observation about the general thinness of the laterite covering and at the same time the very complete covering of the rock structure beneath. This Bulletin No. 95 also bears out my observation of the flatness of this plateau country, as they call it. For distances from 100 to 175 miles in any direction from Kalgoorlie the maximum fall per mile is 4½ feet and in some instances only 2½ feet per mile. As an example, between Mt. Magnet and Sandstone, a distance of 93 miles, the rise is only 355 feet or an average of 3 3/4 feet per mile. It should be remembered, however, that over most of this country the swell and swale topography prevails, and rises and falls of 100 feet or more in a few miles are the rule. It is the top of this swell and swale topography which remains so nearly level over long distances. To use the word plateau is a misnomer. In other parts of the world the word is applied to mesas or table-lands which are generally above the surrounding country and dissected by streams. Also, in every case I can think of, such plateaus are composed of sedimentary rocks or lava flows.

We left Norseman about noon, well stocked with fresh fruit for lunch which we stopped to eat a few miles out of town. After lunch I made good my promise and laced up a good, strong rope seat in Mrs. Nininger's aluminum camp chair.

For the first 20 or 30 miles south out of Norseman the road passed through tall, thick eucalyptus forest in an uphill-downdale topography, the road fairly straight and bearing south. This gradually flattened out to a more open country with farms and the

timber more scattered and lower. This trend continued with the trees getting smaller and scrubbier as we approached the south cost and finally, for the last 20 miles, nothing but a thick heavy brush growing on sand dunes. Suddenly this long straight road comes to the brink of the great plateau and far below, actually about 1,000 feet, is the coastline with lagoons, sand dunes, and the little town of Esperance in the distance. To the right and left are rocky peaks and many off-shore islands, all of which are lower than the plateau. This comes as quite a shock! After traveling for hundreds of miles across a nearly level country we had got the impression that we were near sea level, and that nothing, and certainly not a mountain, could possibly be below the surrounding country.

The granite promontories rising from the shoreline to the east and west of Esperance are nearly as high as the top of the plateau, but most of the coastline is made up of low granite hills which have been rounded off and polished by the recent Pleistocene glaciation until they are no more than 150 to 200 feet above the sea. Offshore are dozens of islands protruding through the intensely blue waters of the southern ocean, and all are so beautifully glaciated that hardly a cliff or angular prominence appears anywhere on the skyline. There is some vegetation growing on these islands but at least half of the surfaces appear to be bare granite.

We arrived in Esperance about 4:30 in the afternoon and failing to see a good place to camp decided to stay in the hotel. Esperance is an old beach resort but so far from the haunts of men that it never has attracted any number of people. There were two small resort hotels on the beach and a number of cottages for rent but not a soul in sight on the beach. Next day we did find a trailer camp up the beach about a mile but there were very few trailers there. There are probably 500 or 600 people in the whole town, but some day this may well be a famous beach resort. for a more

beautiful place would be hard to describe. It has a beautifully protected coves with fine sand beaches and smooth granite points extending down into the water; fine waves for surf-board riders and many little islands offshore for boaters to explore.

On the main street of Esperance, near the post office, is a row of Norfork Island pines or star pines as they are sometimes called. These trees were well over 100 feet tall and about five feet thick at the base, with thick, deep green foliage, yet they grow on land not more than 10 feet above sea level nor more than 100 yards from the ocean.

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Not far from Esperance we came upon the largest granite dome we had yet seen. It was oval shaped and rose quite abruptly about 400 feet above the surrounding mesa. At many places it was too steep to climb, its sides being well rounded and smoothed by glaciation. I climbed about half-way up the side of the dome and could see no sign of real glacial polish, the surface having long since succumbed to decomposition and to exfoliation. There was, however, considerable evidence of ice gouging and grooving along the base of the dome. About half-way up the dome and on a more gently sloping area were a number of perched boulders. I could also see some big ones on the top of the dome. This would seem to indicate that the ice melted in place and left the boulders stranded and they have since been rounded and perched by the usual weathering and exfoliation. This area must have been covered by a thick ice cap that was not moved by oceanic flooding.

There were a few potholes and cracks in the rock where vegetation had made a start and among other plants was a wild geranium in bloom. Around the foot of the rock and on the surrounding mesa was a cover of thick brush about six to eight feet high interspersed with a kind

of palm with a thick head about four to five feet in diameter and a stem a foot thick and eight to ten feet tall. The brush had been burned to clear the land for farming but the thick succulent stems of the palms resisted the fire so that they had to be knocked down with a tractor and were heaped in piles for later burning.

It was in this area that we saw some of the paper-bark trees which grow among the sand dunes and along the edges of the salt sloughs that lie south and east of Esperance. They only grow to a height of about 15 feet and tend to branch from the ground extending upward in a clump. We were told that they made excellent fence posts because the high salt content of the wood prevented fungi and termites from attaching them. The bark is about three-quarters of an inch thick and composed of dozens of thin layers, no thicker than paper, which can be separated or peeled off the tree.

We had been unable to find anyone in or around Esperance who had any tektites for sale, so we decided to return at once to Norseman.

LAKES.→On the way down from Norseman and back, and later along the Nullarbor road, I had an opportunity to see at close hand some of the numerous dry lakes I had seen earlier from the air on my flight from Adelaide to Perth. There are not many lakes immediately south of Norseman, but as soon as the open country begins there are dry lakes on either side of the road all the way to the edge of the plateau where it breaks down steeply to the sea. In a distance of 80 miles there is no stream drainage whatever, and the fall, if any, is certainly not more than 2½ feet per mile. The lakes are seldom more than a mile across and the average appears to be fairly round or oval in shape; all, whether large or small, are about the same depth--20 to 30 feet.

A typical lake a quarter of a mile in diameter from rim to rim will be about 900 feet across the bottom with a ring of willows around the shore line. The lake itself gives no indication of ever having

held more than two or three feet of water in the wet season and the sloping sides of the basin have, in most cases, been cleared and planted to wheat or other small grain crops. The farming operations have rounded the rims to some degree but even where the original forest cover remains the edge of the rims is not very sharp. The road cuts across many of these lakes and affords good cross-sections of the rims which in most cases are beach san four to six feet deep covering a yellow limey shale.

Farther north around Norseman and east along the Nullarbor road we saw a good many lakes in the thick eucalyptus forest country. Most of these had a fairly steep rocky slope on the west and north-western side rising from 10 to 30 feet above the dry lake bottom and sloping away to a low sand rim on the east and southeast side. Like the other lakes farther south they gave no indication of older, higher shorelines bu presented evidence of having held only a foot or two of water in the wettest season.

On the plateau a little way north of Esperance I saw a number of dry lakes which were relatively shallow basins and which appeared to have drainage one to another. Unlike any others these had a central plateau which was three or four feet higher than a channel around the rim of the lake. In one of these the channel contained water with reeds and other plant growth, indicating that the water was present most of the year although the central portion of the lake, the plateau area, was dry. We were told that the rainfall along this coastal area was from 15 to 18 inches per year. Probably the thick blanket of fine sand above the clay and granite tends to keep the water table relatively high.

Imagine a stretch of country 1500 miles wide and as much as 500 miles north and south covered with these more or less symmetrically shaped lakes, and never a stream of any kind to fill them. In most

parts of the world we expect to see small streams or dry creek beds entering a lake even though it may be dry most of the year, but these dry lakes are without visible stream support. Usually they are found in groups with adjacent terrain, looking exactly the same, being devoid of lakes. The whole land is so nearly level that the depressions are only a little lower than the gentle rises between and the lakes are found anywhere and everywhere--on slopes, on rises, or in depressions.

Many Australian geologists have remarked on the peculiar features of these lakes. Bulletin No. 95 of the Geological Survey of Western Australia devotes a whole chapter (Chapter X, pages 213 to 228) to "The Salt Lake Division of Salinland." Herein, a number of geologists are quoted as to the origin of these lakes, but most of the discussion is confined to the larger irregular and elongated lakes which are closely associated with the deep leads by the mining industry. As indicated earlier, these deep leads are deep troughs like those along mountains in the deep ocean. They are not true canyons but are rather fault troughs in the basement rocks. In Western Australia many of these troughs have been filled with a detritus of gravels, angular fragments of rocks, sand, and clay. Some in the higher country around Kalgoorlie and Norseman have been mined for free gold which seems to have carried into these depressions by water action. Some of them have been so completely filled that there is no indication on the surface of their existence; only excavation shows where the hard rock walls may be.

The large, elongated dry salt lakes which I saw near Kalgoorlie and Norseman are apparently of this nature. Lake Cowan just north of Norseman is about 50 miles long, and Lake Lefroy, a little farther north, is some 30 miles long. Both of these lakes have steep rocky shoreline on the western sides which descend into the lake bed at a

steep angle. The generally flat country breaks off in steep walls from 50 to 75 feet high and the whole thing gives the impression of a deep trough in a flat landscape filled to within 50 feet of the brim. They mine salt in some of these lakes by scraping it up in long windrows with road graders after the rains crystallize' the surface layer into clean crystal salt.

The great number of smaller lakes of oval or circular nature are not considered by the geologists, beyond the mention, that most of them have steep rocky shores on the west side and flat sloping sandy beaches on the east side. They have failed to see anything unnatural in thousands of little oval lakes lying on nearly flat land, as many of them on the tops of the rises or slopes as on the lower elevations, and without drainage pattern to have formed them.

The author of Bulletin 95, J. T. Jutson, is of the opinion that all of these lakes were formed by a combination of deformation and wind erosion. I maintain that it is impossible to account for such lake depression by wind erosion or any other ordinary form of erosion. Wind erosion is not known to produce depressions in flat country in any of the deserts of the world. The only place in the world where wind is know to dig holes of any size is the Seistan Depression of Persia. Here in a vast depression surrounded by high snow mountains there occurs at one season of the year what are called "the 120-day winds" which blow down off the high mountains at velocities sometimes over 100 miles per hour. This condition is caused, according to meteorologists, by cold heavy air flowing downgrade from high altitudes and replacing warm air which is rising. It does not occur in flat country like Australia but only where mountain canyons or passes tend to funnel this cold heavy air into a stream. Southern California has a similar condition in winds that occasionally blow down the Santa Ana Canyon into the Los Angeles

Basin in the fall of the year. These are known locally as Santa Ana winds, but their velocity seldom exceed 40 miles per hour and they have never been known to produce ablation basins.

Jutson further advocates the theory that all of these lakes, large and small, are migrating toward the west into the prevailing west winds. The rock floor and rock walls on the west side, he feels, are due to wind ablation. After rains, when a few inches of water accumulates, the beach lines on the east side, he thinks, follow the migration westward. Acoording to him the rising salt kills the vegetation as the lake moves across the land.

I saw no evidence of such migration. Most of these lakes are surrouned by trees and shrubs, the larger and stronger vegetation being on the western rim. I judged that the salt blows out on the east side confining the vegetation there to small shrubs and annual plants that are highly salt resistant. However, there is no strong evidence that this is occurring now to any extent. In fact the rims of most of these lakes which I saw from the ground were so thickly wooded with trees 20 to 30 feet tall that even very strong winds could have little effect. There is no evidence of strong prevailing winds in the growth of the trees.

In the area south of Norseman toward Esperance I saw many lakes' which were merely depressions in a gentle rolling plain covered with a blanket of laterite. There is no steep bluff on any side of these basins and not much sign of salt. Most of them are in a grain-farming country and nearly all are surrouned by willow or other trees. Certainly no migration here.

In my opinion there is no real evidence that any of these lakes are migrating now or that they ever did in the past, either by wind ablation or other means of erosion. Sand dunes may move across country, and the movement can be seen and it can be measured from month to

month or even day by day. But where is there a desert country with dry lakes moving across the landscape, all of them roughly the same depth but of greatly varying diameters? How is it that around Norseman most of the lakes in the forest country have a steep rocky shore on the northwest side and a low flat shore on the opposite side, with a few exceptions in which one side is as high as the other? How doé we explain the fact that these dry lakes gradually change in form as we move south toward Esperance? Within a dozen miles they change to a form in which there is no low side, only a flat sandy plain with basin-like depressions of all sizes scattered over the landscape. How do we explain the fact that these basins gradually grow shallower as we move south until some are only about six feet deep and with a plateau perhaps three feet high in the center with a channel around it?

It is my belief that these lakes are the result of a combination of forces following the last major collision and oceanic flood. Australia being almost opposite on the globe from Bermuda, where the last collision is believe to have occurred, it was less violently affected by oceanic flood; but being right on the edge of the old Antarctic Circle there was plenty of flat-bottomed sea ice to be washed inland to be stranded on the flat tableland of Western Australia. The trough depressions were filled with angular rock, gravel, leaves, sand, and other debris, including gold. Some of the bergs came to a stop in rock debris or the decomposed granite blanket which must have covered most of the land, plowing up an embankment of loose rock and other material on the west side, that being the direction they were traveling. The other side was left low and flat. But sometimes, depending on the topography and various other conditions, sand rims were produced all around the stranded bergs, or perhaps none at all. In the case of chains of lakes, it is likely that a large

elongated cake of ice broke up into several smaller pieces upon running aground and thereafter the receding waters carried sand and gravel in between and around these bergs until they were quite separated from one another. When the bergs melted and the water evaporated, a chain of dry lakes had been produced with no stream connection from one to the other.

The continent of Australia was a polar desert before this catastrophe and remained a desert afterward, except along the coast. The flat cakes of ice preserved the land beneath from erosion and also from sedimentation, and the widest and most distinct shorelines were on the sunny side where the ice melted fastest. Ice cakes could have occurred in fleets, accounting for the fact that in some of the very flat areas near the sea coast numerous lakes occur, while nearby on exactly similar ground there are none. In other localities they grounded at random and it can be expected that some might ground on slopes or the tops of low ridges or in valleys, the whole land being so nearly level that there was not much tendency to slide downgrade into the depressions. Thus lakes were produced in the most unlikely places and no entering streams were needed.

The reader should recall the fact that the whole of Western Australia is underlain with strong salt water, chemically like the ocean, and this in a land where the hard basement granitic rocks come right to the surface being scarcely anywhere covered by more than 20 or 25 feet of decomposed rock. In the United States decomposed granite soil is almost a sure indicator of high-quality water. How then did similar rocks in Australia get so thoroughly impregnated with salt water if not by ocean flood, and having been deep sea floor in still earlier time.

The reader will no doubt consider the above not a theory but mere speculation--conjecture without experiment, according to dictionary

definition. In answer I must admit that I have not performed the actual experiment but I am confident that a scale model of the Australian plateau could be built and ice cakes floated in and stranded on it in the way I have described, and that the same results would follow.

On the other hand, I have observed these phenomena in stream flow and especially in tidal basin flow: 1) A stranded object which produced a bluff or rim on one side and a very low rim or none at all on the other side. This corresponds to the type of dry lake which Jutson calls migratory--a rocky rim on one side and none at all or a very low rim on the other, which he proposes were made by wind erosion. 2) A stranded object which had a sand rim entirely around it and half buring it. This happens in a very slow current, in a wide tidal mud flat or shallow stream. 3) I have seen a stranded object produce a pedestal, the receding water washing a channel around the object below the base of the object and yet leaving the surrounding sand flat higher than the base. (Jutson fails to mention the second and third types of lake depressions and I have been unable to find any other reference to them.)

In each of the above cases, the object which produced the surrounding erosion had to be removed before the basin was in evidence. Ice, we insist, is the only thing in nature which could have produced the three types of depressions and then have vanished--melted.

If we try to imagine how wind erosion could have had these three distinct types of lake depression in the same relatively small area, the absurdity of the idea becomes more apparent. First, all three types are of the same age and of very recent origin. They are all in a forest-covered area and there is no orthodox geological reason to suppose that the forest was not there when the lakes were made. But even if we remove the possibility of forests and how they might

have prevented wind erosion and imagine instead the whole land surface as barren and covered with sand, then it is still impossible to expect wind to perform such antics. In fact it would be very difficult to build a scale model and produce the three kinds of depressions even with a vacuum suction tube. It would require a separate and special nozzle for each type of crater depression.

Jutson's migratory theory would also be very difficult to simulate in the laboratory except by special equipment which would in no way resemble winds blowing across a nearly level landscape. The idea that lakes may slowly migrate by a process which leaves a continuous steep slope on the windward side and a flat open side on the other is like imagining a gold dredger that could chew up the rock in its pathway and blow it out as a dust so fine that it would spread far and wide as a thin blanket over the landscape, and all this so slow that the dredge would only move a few inches a year.

Orthodox geology has long called upon the genie of inertia, of extreme slowness, to answer whatever problems could not be answered in a logical manner. Imagine a climate where winds are now so gentle that a carpet of leaves covers the forest floor right down to the edge of many of these dry lakes, and then try to explain these lakes as the product of wind erosion, a wind erosion that supposedly caused these dry lake beds to actually migrate a few thousandths of an inch each year. This type of reasoning is one with the discussions of the Middle Ages as to how many angels could stand on the point of a needle.

I feel that the orthodox geologist should follow his own ruls, and his supreme rule is the so-called Law of Uniformity: That we can only project present processes of change, sedimentation, and erosion into the past to explain the origin of prehistoric features on the earth. I insist that the orthodox geologist show me, the catastrophist, where wind erosion, for example, is producting the effects today

that he says it produced in the Pleistocene. I agree with orthodox geology to this extent: We have no reason to suppose that the ordinary forces of erosion and sedimentation, the forces of change going on about us, were to any degree stronger or weaker in the Pleistocene or in any older epoch in the earth's history. The natural forces have always been in operation and are quite uniform over a long period of years. So long as the earth, moon, and sun retain the same position relative to each other there can be little drastic or sudden change in climatic conditions. This seems obvious and was probably one of Lyell's best arguments for the theory of Uniformity.

What Lyell and his contemporaries failed to recognize, and what most geologists today are still loathe to admit, is the existence of phenomena for which the Law of Uniformity has no explanation. Cosmic collision has had no place in orthodox geological thought for it has been considered to be in opposition to the Law of Uniformity. In actual fact, however, nothing could be farther from the truth. Cosmic collision actually lends support to the Law of Uniformity by providing explanations for conditions which have not been logically explained by that Law. Why the science of geology has been so slow to accept the helping hand of cosmic collision, I cannot comprehend.

AOK
9-15-88

AN EXPLANATION.

This booklet is part of a book of 11 chapters--the log of a trip to Hawaii, Fiji, Tasmania, New Zealand and Australia (Down Under) to study the impact-oceanic -flood evidence to be found and we found it. This was in Janurary and Feburary of 1959, this book being the last three chapters of the log.