

4,700 feet (approximately) above the Saskatchewan valley. This height and its length of over 30 miles make it the most important of the outliers which have been described along the edge of the Canadian Rockies. Near the Saskatchewan and Brazeau the height of the Bighorn range decreases rapidly, and beyond them it is represented by ridges no higher than the rest of the foothills.

In its general form the range differs little from the eastern ranges of the mountains. Like them it presents a precipitous face to the north-east, but to the south-west the slope is usually at an angle between 20 and 40 degrees. The crest line is serrate throughout, and cirques have been developed on both sides, cutting the slopes into spurs and reentrants. The cirques developed on the north-east face are usually deeper, and three of them extend entirely through the range, and are continued as semi-circular depressions behind it.

As has been stated, the basin is traversed by three longitudinal ridges approximately parallel to the bordering ranges. The first of these is only a short distance behind the Bighorn range, but is separated from it by a depression which is never less than 200 feet deep. This ridge bounds the depressions inside the Bighorn range, and, in some cases, it reaches an elevation of 7,500 feet. The outline of the ridge is very irregular, however, and the strata composing it have been much dissected by cirques and stream gullies. Wapabi, Blackstone, and Chungo creeks divide into numerous tributaries inside the Bighorn range, and then cut through the ridge, often obliquely to its general direction. As a general rule, the ridge reaches its greatest elevation on its western side, but the spurs of the ridge often rise to subordinate summits, and many hills are wholly detached from other portions of the ridge by the valleys of the streams crossing it diagonally. Immediately north of the Saskatchewan, the ridge is cut almost in half by the valley of Bighorn river, and its total width is much increased owing to an irregularity of the geological structure in this locality.

The second longitudinal ridge is much more regular than the first, and except for the gaps of the larger streams, and a few notch-like depressions cut by smaller ones, it is continuous from the Brazeau valley to that of the Bighorn. The general trend of this ridge is not quite parallel to the Bighorn range, from which it gradually recedes towards the south-west. However, it is never far from the centre of the basin.

The climate of the basin does not differ much from that of Morley and Banff, on the main line of the Canadian Pacific railway. The rainfall varies somewhat from year to year, but is always sufficient for the growth of grass wherever openings occur in the woods. Summer frosts are frequent, except at the low level of the Saskatchewan valley, where turnips have been grown successfully. Here the growth of grasses and pea vines reaches the knee, and is so thick that tracks of horses made fully a month before could be followed. The frequency with which this valley is visited by Chinook winds prevents the accumulation of snow in winter, and it has long been a favorite spot with the Indians for wintering their horses.

Only seven varieties of trees were seen in the basin—spruce and Banksian pine being much the commonest. The pine flourish where the soil is sandy and the drainage good, while spruce requires more moisture. One grove of spruce, probably 10 to 12 inches in diameter and 75 feet high, was seen near the mouth of Bighorn river, but the greater part of the Saskatchewan valley and the surrounding hills has been burnt over at a comparatively recent date. There has been much less fire farther north, and the valley of the Brazeau has escaped altogether. Balsam usually grows

with the spruce, while aspen poplar and cottonwood are found at lower levels, especially in old brules. A few Douglas fir occur on the gravel banks which line the Saskatchewan.

**Lithological Characters.**—The Bighorn formation consists of siliceous and shaly sandstones, black and brown shales, and several bands of conglomerate, which, like the rest of the formation, bears a strong resemblance to corresponding strata occurring in the Kootanie formation.

**Age and Thickness.**—The only well preserved fossils found in this formation were specimens of *Inoceramus umbonatus*, but a few ribbed shells, probably *cardia*, were also seen. The horizon is Colorado; the thickness is 390 feet. The Bighorn and the first range of the Rocky mountains are huge fault blocks, tilted and thrust to the north-east until Devonian strata at their base have overridden Jurassic and Cretaceous. Along the south-western side of the basin all the formations between the Upper Banff shales and the Brazeau formation come into direct contact with the Intermediate beds at the base of the first range. The throw of the fault east of the Bighorn range is sufficient to bring Intermediate beds into contact with Wapabi shales near the middle of the range, but the amount of the throw decreases rapidly near its ends. This decrease is much more rapid at the southern end of the range, where it is accompanied by a sudden change in the direction of the dip of the beds. To within 5 miles of the end of the range the dip shows but little deviation from the south-west direction which is general throughout the rest of the range, but at the end it has swung round to nearly directly south. This sudden change has probably induced some of the minor structural irregularities which will be described later.

The angle of dip of the strata in the Bighorn range varies between 35 and 60 degrees, and, as a general rule, the angle of dip of the younger strata in the basin west of it decreases gradually until the axis of the deep syncline traversing the basin is reached. Just west of the axis the change in dip is abrupt, and the strata of the western limb are generally nearly vertical, or have been overturned so as to dip to the south-west like those of the eastern limb, though usually at much higher angles. In extreme cases their southwesterly dip may be as low as 60 degrees. The sharpness of the fold has resulted in the thinning out of the softer shale formations, and a great deal of crumpling among the harder beds.

The economic importance of the Bighorn basin arises solely from the coal seams occurring in the Kootanie formation. As has been stated, the strata of this formation vary along the strike, and owing to this variation it is practically impossible to correlate seams in different parts of the basin. General experience in other fields, where seams belonging to the Kootanie formation have been worked, has shown that the coal seams are more regular than the intervening strata. In one case noted by Mr. McEvoy the total thickness of three seams showed a diminution of from 52 to 46 feet in a distance of 7 miles, while the thickness of the intervening strata diminished from 337 to 102 feet.

Kootanie coals are now being worked at Fernie, Coleman, Blairmore, Hillcrest, Canmore, and Bankhead; and except in rare instances the seams have been found continuous, unless cut off by crumples or faulting.

Our knowledge of the number and thickness of the coal seams occurring in the basin is not as complete as might be desired, but, from the list which will be given, at least an approximate estimate of the coal content can be made. It may first be pointed out, however, that in this area it is rather the exception than the rule to find coal seams exposed naturally on the surface, and that, unless the strata have been carefully prospected, the failure to see a seam is