formations ranging from the broom of Cinchona Hill to the dildoes and *Melocactus* of Port Henderson. Cinchona thus possesses the chief requisite for a botanical station in the abundance and variety of its flora. There are also numerous and important accessory advantages of an even more exceptional nature.

The accessibility of Jamaica makes it a most desirable location for a botanical station. Six to ten steamers each week land passengers at Port Antonio or Kingston, and from either of these places Cinchona can be reached readily in ten or twelve hours of delightful travel by train, carriage and saddle. No other portion of tropical America has as fine a system of carriage roads in the lower country, and bridle paths in the mountain regions, as has Jamaica. To the collecting grounds about Cinchona one can walk or ride, in all directions, upon well-graded and well-drained mule paths. These paths lead to the thickets of Blue Mountain Peak, the dense forests of Mabess, the dry hills and the fertile bottoms of the Clyde, Yallahs and Hope valleys.

The stable government and efficient police system which make life and property secure are an advantage possessed by Jamaica over many tropical countries. The use of the English language throughout the island is a very evident advantage to the transient resident. As a consequence of superior political conditions, we find here government gardens, with corps of resident trained botanists familiar with the flora and very courteous in offering aid, which may prove invaluable to a worker on his introduction to the island. The government gardens are valuable adjuncts to the native flora in furnishing material of many exotics growing under practically normal conditions. In this connection it should be remembered that at Cinchona itself is an extensive garden with greenhouses containing many native and exotic temperate plants. There is also here a series of buildings which can readily be made to fill all the requirements of a tropical botanical station. Such an equipment, I believe, is not to be found in any other available location.

Health conditions at Cinchona, which is 5,000 feet above sea level, are most favorable, and the botanist is, therefore, not liable to be prevented by physical disability from taking fullest advantage of the excellent opportunities for botanical work. Malarial troubles are unknown, and the many dangers to health, so frequent in tropical regions, are here absent. Food in sufficient quantity and variety and pure drinking water from the source of the Clyde River are readily obtained. Moderate temperatures, ranging from 50° to 80°, prevail throughout the year, and the climate is stimulating to physical and mental effort.

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SHORTER ARTICLES.

THE STRATIGRAPHIC POSITION OF THE JUDITH RIVER BEDS AND THEIR CORRELATION WITH THE BELLY RIVER BEDS.*

THE readers of SCIENCE will recall that during last winter and spring a discussion was carried on in its pages concerning the age and relationships of the formations mentioned in the title of this note. This discussion, which was provoked by the publication of Osborn and Lamb's paper on the vertebrate fossils of the Belly River beds, was participated in by Messrs. Hatcher, Stanton, Osborn and Williston.

Since June 1 the undersigned have been engaged in an investigation of this subject in the field, and have reached some definite conclusions which are deemed worthy of prompt publication. Our field studies were begun on Milk River at Havre, Montana, and we examined the excellent exposures along that stream to the International Boundary, and beyond to Pendant d'Oreille Police Barracks, which is near one of Dawson's described localities, where the base of the Belly River beds is seen resting on the marine 'lower dark shales.' This is near Lake Pakowki of the maps, locally known as 'Badwater Lake.' We also examined the exposures of upper Belly River beds showing contact with the

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overlying 'Pierre shales' on Sage Creek, Canada, as described by Dawson and McConnell and continued our observations as far north as the Cypress Hills, where the top of the overlying marine Cretaceous is seen. Passing down Milk River below Havre and around the eastern end of the Bearpaw Mountains to Cow Creek and the Missouri River at Cow Island and thence up to Dog Creek, Judith, and Eagle Creek, Montana, we have studied the typical areas of the Judith River beds described by Meek and Hayden, and of the Eagle formation described by Weed.

We have become fully convinced that the Belly River beds are identical with the Judith River beds, as Dawson long ago suggested. Our conclusion is based on lithologic character, stratigraphic sequence, the vertebrate and invertebrate faunas of the beds themselves, as well as on the paleontology of the underlying and overlying beds in both Canada and Montana. We hope to present the evidence in full in a more formal paper within a few months.

Another important result of our work is the determination of the exact position which these beds occupy in the general Upper Cretaceous section of the west. For many years the Judith River beds have been generally assigned to the top of the Cretaceous and correlated with the Laramie, while the Belly River beds have been generally placed near the middle of the Upper Cretaceous, above the Benton and beneath the Pierre, though Dawson did not assert that they underlie all of the Pierre. We have found that the Judith River beds underlie about 600 feet of beds with the lithologic character and fauna of the Pierre, and that beneath them there is an equal thickness of marine beds that must also be correlated with the Pierre on account of the faunas they contain. Many of the invertebrate species from the beds underlying the Judith River have been described and figured as 'Fox Hills' species and supposed to come from beds overlying all of the Pierre.

On account of the differentiation of the beds representing the Pierre in this region into several formations, it is necessary to give new names to two of them which have not been previously recognized. For the dark clay shales with many calcareous concretions immediately overlying the Judith River beds we propose the name *Bearpaw shales,* since they are well developed around the northern, eastern and southern borders of the Bearpaw Mountains. They have the lithologic and faunal characters of the typical Pierre but represent only a fraction of that formation as generally understood.

Beneath the light-colored, mostly non-marine Judith River beds is another formation, 400 feet in thickness, which in its lower half resembles the Bearpaw shales and yields a few of the same species of fossils. Its upper 200 feet, however, contain several sandstone beds which bear a fauna that has hitherto been called 'Fox Hills.' We propose the name *Claggett formation* for these shales and sandstones underlying the Judith River beds. It is named for old Fort Claggett at the mouth of Judith River, in the neighborhood of which the formation is well developed.

Beneath the Claggett is the Eagle formation (named by Weed in the Fort Benton folio, Geologic Atlas of the U. S.) consisting of several heavy beds of coarse, light-colored sandstone, with clay shales and lignite, and having a total thickness of 250 to 350 feet. This also yields a marine fauna that has been referred to the 'Fox Hills' and is certainly more recent than any Benton or Niobrara fauna.

The Eagle formation rests on dark shales, which are known to include the Benton and probably the equivalent of the Niobrara.

The section may be summarized and compared with the sections in South Dakota, Colorado and elsewhere as follows:

		Ft.
Pierre	Bearpaw shales	600
	Judith River beds	500–600
	Claggett formation	400
	Eagle formation	250–300
Niobrara, Benton	Colorado shales.	

J. B. Hatcher.
T. W. Stanton.

Judith, Montana,
July 11, 1903.