thought that will be of service to the student who desires to be a working chemist or to teach the subject in our schools. It is possible to reach the standard of knowledge required for a 'first' without acquiring these habits; this would not matter were it not that Firsts go into schools and stagnate. The failure of Firsts in the schools is the outstanding calamity of the costly attempt to introduce scientific training into education made during the past seventy years.

Chemistry at present is a sick man—"mostly conventional signs". Something less Snarkian is needed than "to measure the value of an idea in terms of incomprehensibility."

Darwin in Uruguay

By Dr. J. D. Falconer

H.M.S. *BEAGLE*, under the command of Capt. Fitzroy, sailed from Rio de Janeiro on July 5, 1832, for the Plata and anchored at Montevideo on July 26. For more than a year the ship was employed in surveying the extreme southern and eastern coasts of South America. The Plata was used as a base and to it from time to time the *Beagle* returned. Thus Charles Darwin, the naturalist aboard, had several opportunities of making closer acquaintance with the northern shores of the estuary and more particularly with the natural history and geology of the Banda Oriental, by which name the Republic of Uruguay, to the east of the Río Uruguay, was at that time known.

During the nineteenth century, Maldonado Bay at the mouth of the estuary was a favourite anchorage for ocean vessels. A strip of sand lined the margin of the bay and provided a playground for the men of the sea. In 1832 Darwin spent ten weeks at Maldonado and procured "a nearly perfect collection of the animals, birds, and reptiles" of the vicinity. He described Maldonado as "a most quiet, forlorn, little town: . . . separated from the river by a band of sand hillocks about a mile broad: it is surrounded on all other sides by an open slightly undulating country, covered by one uniform layer of fine green turf, on which countless herds of cattle, sheep, and horses graze. . . . The scenery is very uninteresting; there is scarcely a house, an enclosed piece of ground, or even a tree, to give it an air of cheerfulness"[1]. To this day Maldonado retains its secluded aspect, being overshadowed by the modern resort of Punta del Este on the eastern horn of the bay. The sands, however, are now grassed and treed over, the pastures fenced and decorated with plantations, rail and road communications developed and frequented, and the landscape dotted with houses and gardens and cultivated fields.

It was at Maldonado that Darwin's attention was directed to the occurrence of vitrified siliceous tubes (fulgurites) in the sand dunes, similar to, but shorter than, those described from Drigg in Cumberland in 1814[2]. These tubes, believed to be formed by lightning, are still found at Maldonado but less frequently than before, on account of the cover of vegetation.

Between Maldonado and Montevideo along the northern bank of the Plata, Darwin again remarked upon the absence of trees and the uninteresting character of the grassy plains, decorated only by occasional hummocks of granitic rock. He concluded somewhat hastily that in spite of abundant rain and a favourable climate "herbaceous plants, instead of trees, were created to occupy that wide area"[3]. However this may be, within the last hundred years there has been much successful afforestation, and along the shores of the estuary and in many parts of the interior the aspect of the country has been completely changed.

In November 1833, Darwin made an excursion into the south-western corner of Uruguay, from Montevideo to Colonia Sacrimiento, and thence to Mercedes on the Río Negro. By this time, after some experience of the pampas of Argentina, his opinions of the scenery and amenities of the Banda Oriental had undergone a change. He wrote: "I find that I look at this province with very different eyes, from what I did upon my first arrival. I recollect I then thought it singularly level; but now, after galloping over the Pampas, my only surprise is, what could have induced me ever to have called it level. The country is a series of undulations, in themselves perhaps not absolutely great, but as compared to the plains of St. Fe, real mountains. From these inequalities there is an abundance of rivulets, and the turf is green and luxuriant"[4].

On this expedition, Darwin visited the Arroyo de las Vivoras and Punta Gorda on the left bank of the Río Uruguay. From Mercedes he rode to the Sierra del Pedro Flaco, 20 miles up the Río Negro, and examined the natural sections in the

cliffs of Perika. He returned in a direct line across country to Montevideo, having been absent from the port for fourteen days. The *Beagle* sailed from the Plata for the last time on December 6, 1833.

Prof. Karl Walther, of Montevideo, has been at some pains to identify the exact spot on the bank of the Río Negro that Darwin visited, and he has come to the conclusion that the "cliffs of Perika" are those of the Cerro de los Claveles at the confluence of the Arroyo Perico Flaco and the Río Negro[5]. The streams have here incised their channels below the level of the plains and the so-called Cerro is simply a projecting bluff overlooking the river. This locality has been marked by Prof. Walther by the erection of a stone in commemoration of Darwin's visit in 1833. There is, however, a considerable difference between the height of the river-bank, 30–35 m. according to Walther[5], and that of the cliffs of Perika, about 50 ft. according to Darwin[6]: also in the composition of the lower part of the cliffs as recorded respectively by Walther and Darwin. It is thus permissible to doubt whether the actual section described by Darwin has yet been recognized. It is certain, however, that the river bank in this locality was Darwin's "farthest north" in Uruguay, and it was an admirable thought and a graceful tribute on the part of Prof. Walther to mark out a "Rincon Darwin" and to give the name of "Darwin Cliff" to the Cerro de los Claveles in recognition of "the importance of the geological observations initiated by the great British scientist"[5].

Some play has been made of recent years in local scientific circles over the alleged polemic between Darwin and D'Orbigny about the occurrence at Punta Gorda beneath well-defined Tertiary strata (Entrerriano) "in the vertical cliff, nearly on a level with the river" of "a bed of red mud absolutely like the Pampean deposit, with numerous often large concretions of perfectly characterized white, compact tosca-rock"[7]. D'Orbigny, who had preceded Darwin in South America and to whom Darwin was much indebted for examining and naming his molluscan fossils, had not seen the section at Punta Gorda during his sojourn in Uruguay and Argentina in the years 1826–29, but he had stated that he was unwilling to believe that beds of the same nature with the Pampean formation ever underlie the ancient marine Tertiary strata[8]. He maintained that there could be no analogy between the lower beds at Punta Gorda, which were of marine origin, and the Pampean clay, which was of quite a different character "déposée dans un laps de temps très-court, comme le résultat d'une grande commotion terrestre"[9]. Darwin steadily refused to accept this hypothesis and insisted that "from whatever source and through whatever means the great Pampean formation originated, we here have unequivocal evidence of a similar action at a period before that of the deposition of the marine Tertiary strata"[10].

The incident left an unpleasant flavour which has not yet been dispelled. Difficulties of investigation and comparison, of translation and re-translation, keep the controversy alive, while almost every author who visits the locality provides a different interpretation. Kraglievich of Buenos Aires, now deceased, who knew the red mud of Punta Gorda, said that "its nature is not entirely equal to that of the true Pampean of Argentina, . . . being much more similar to the clay and loessitic sandstone of Uruguay"[11]. Windhausen, also deceased, considered this sufficiently confirmative of Darwin's observation of a continental layer beneath the marine Tertiary beds[12]. Prof. Walther supports D'Orbigny, and represents Darwin as having fallen into error[5]. He admits that at first sight the character of the rock at Punta Gorda is "loessoid or similar to Pampean clay"[13], but asserts that there is a distinct petrographical difference between the two deposits. This has been investigated by Frengelli[14], who states that under the microscope the Punta Gorda clay is almost entirely composed of particles of volcanic glass with grains of sand scantily accessory, while in the Pampean clays the volcanic material is accessory to fine sand and silt. Thus it would appear that volcanic dust which falls on the pampas at the present day fell sometimes much more abundantly in the same region in past ages, and that there is accordingly every justification for Darwin's suggestion of the recurrence of similar conditions during the accumulation of the great Pampean formation.

While, therefore, it is clear that in respect of Punta Gorda, Darwin cannot reasonably be accused of any serious error of observation, those of us who know something of the country he traversed will readily agree with Prof. Walther in admiring the fact that, in a hurried journey of fourteen days, he was able to recognize certain details of geological structure the significance and importance of which are still being debated by lesser minds after the lapse of a hundred years.

[1] "Narrative", **3**, 45, 46 (1839).
[2] *Geol. Trans.*, **2**, 528 (1814).
[3] "Narrative", **3**, 53 (1839).
[4] "Narrative", **3**, 169 (1839).
[5] *Rev. Fac. Agr. Montevideo*, No. 8 (1933).
[6] "Geology", **3**, 94 (1846).
[7] "Geology", **3**, 92 (1846).
[8] "Geology", **3**, 93 (1846).
[9] "Voyage", 27, 73 (1842).
[10] "Geology", **3**, 94 (1846).
[11] *Rev. Soc. Am. Arq. Montevideo*, **2**, 33 (1928).
[12] *Geología Argentina*, **2**, 476 (1931).
[13] *Bol. I.G.P. Montevideo*, No. 13, 33 (1930).
[14] *Bol. I.G.P. Montevideo*, No. 12, 26 (1930).