

THE CRETACEOUS-EOCENE BOUNDARY*

"THE study of the Cretaceous-Eocene boundary is a live problem of world-wide interest, and it is likely that studies in India will be of fundamental importance in the elucidation of this problem. We have several areas which offer a promising field for this investigation, and a good beginning has already been made. It is up to us now to pursue these investigations further, and do the best that we can in this fruitful and fascinating field of research"—thus concluded Prof. L. Rama Rao in his Presidential Address to the Geology Section on "Recent Advances in our knowledge of the Upper Cretaceous and Lower Eocene beds of India, with special reference to the problem of the Cretaceous-Eocene boundary."

Reference is made to the recent advances in our knowledge of that great volcanic formation known as the Deccan Trap, with special reference to the age of this formation, and points out how the recent discoveries of fossils in the infra- and inter-trappean beds of different areas clearly indicate at least a Lower Eocene age.

* Summary of Presidential Address,—by Mr. L. Rama Rao. Geology Section—Indian Science Congress, Madras, 1940.

The rich algal flora discovered in the Upper Cretaceous beds of Trichinopoly, Pondicherry and Rajahmundry areas, throws new light on the nature, origin and distribution of Upper Cretaceous and Lower Tertiary algae in general, and a detailed study of this flora will no doubt lead to results of great value both to the stratigraphical geologist and the palæobotanist. Of particular interest and great importance in the study of the Cretaceous-Eocene transition in South India, is the recent discovery of an Eocene bed in the Pondicherry area, which was hitherto considered as composed exclusively of Cretaceous rocks. It is not unlikely that this will lead to similar finds in the other 'Cretaceous areas' along the east coast of Southern India.

After alluding to the Cretaceous-Eocene transition and associated palæogeographical conditions in India and adjacent countries, based on the recent work done on these rocks in India, Africa, Australia and New Zealand, Prof. Rama Rao has put forward some general considerations of great importance in the proper interpretation of the Cretaceous-Eocene boundary, not only in India but also in the adjacent continents.

THE PLACE OF GEOGRAPHY IN NATIONAL PLANNING*

IN any scheme of planning, the physiography of the country is to be known first, then its soil conditions and vegetation coverings. The geographer is competent to furnish ready information on these points. If all the information regarding the existing conditions be not readily available, a geographical survey of these needs be conducted.

No country in the world needs this kind of survey more than India. Take for instance Bengal, where lands are deteriorating, soils fast losing their powers of productivity, rivers failing to fulfil their task of land-building, marshes and lakes increasing in area at the cost of good arable lands, and a large number of population subsisting on insufficient diet in a pitiable environment. Other provinces are no better, though their problems may be slightly different. For a proper solution of these it is maintained that a stock-taking on a provincial basis is needed in the first instance, that is to say, a geographical survey is to be conducted with a view to studying the economic and agricultural possibilities of the provinces, and furnishing materials on which an edifice of future prosperous India could be built up.

As we proceed from Assam to the Punjab through Bengal, Bihar and the United Provinces, we find that the proportion of irrigated area to the total sown area increases steadily following the decrease of rainfall, being maximum in

Sind, where artificial irrigation is practised very extensively. The proportion of irrigated land also increases as we proceed from Assam to Travancore through Bengal, Orissa and Madras. Travancore is one of the rainiest areas of India, and still the area of irrigated land is about one-half of the total area under the plough.

The area of land kept fallow is definitely higher in the lower Gangetic valley (Bengal) than in the upper Gangetic (U.P.) and the upper Indus (Punjab) valleys. In the lower Indus valley (Sind) the proportion of fallow land to the total sown area is about the same as in the lower Gangetic valley (Bengal). In the zone of maximum cultivation, Bombay and Hyderabad have fairly large fallow lands, but Baroda has none.

Let us now have a look at the population map of the Gangetic plain, the most densely populated region of India. It is clear that the population increases considerably as we proceed towards the plain either from the northern mountainous region or from the southern plateau region. If we carefully examine the map, we find that there is some order in the variation of population in the Gangetic valley, that is to say, area of dense population alternates with area of relatively sparse population. This illustrates the theory of Vidal de la Blache that population does not spread out evenly like oil, but spreads out in swarms like bees.

By synthesising the findings of other branches of knowledge, geography presents a complete picture of the country, which may then pass on to the hands of the

* Summary of Presidential Address,—by Prof. Shibaprasad Chatterjee. Geography and Geodesy Section—Indian Science Congress, Madras, 1940.

planner for re-touching. The rôle of the economist in national planning is not underestimated, but what is claimed by geography is that the geographer can certainly help the economist to keep his feet on the earth. To materialize a scheme of national planning in India, which is the home of one-fifth of the

population of the world and where cultivable land per head of population is less than that of other agricultural countries, the starting of an all-India organization for conducting the Geographical Survey of the country, more or less, on the lines of the existing Geological Survey, will be a distinct step forward.

CENTENARIES

Poisson, Simeon Denis (1781-1840)

SIMEON DENIS POISSON, a French mathematician, was born at Pithiviers in the district of Loiret, June 21, 1781. He has recorded an interesting anecdote about his infancy: The infant was put out to nurse. One day his father went to visit his baby. Finding that the nurse had gone to the fields he impatiently broke into the cottage and there saw, with painful astonishment, his darling suspended by a small cord to a nail fixed in the wall to prevent his being injured by the animals in the house. Poisson added, "A gymnastic effort carried me incessantly from one side of the vertical to the other; and it was thus, in my tenderest infancy, that I made by prelude to those studies on the pendulum that were to occupy so much of my maturer age."

After elementary education, he was sent to learn surgery from an uncle of his. "Once my uncle sent me", he says, "to put a blister on the arm of a child; the next day when I presented myself to remove the apparatus, I found the child dead; this event, very common they say, made the most profound impression on me; and I declared at once that I would never be either physician or surgeon. Nothing could shake my resolution, and they sent me back to Pithiviers." There he happened to chance upon a copy of the *Journal de l'Ecole Polytechnique* received by his father and began to solve, unaided, the problems proposed there. This discovered his mathematical propensity. He joined the Polytechnic School at Paris in 1798. His professors discovered his genius and exempted him from the drudgery of the curriculum. This released his energy for creative work and in 1800, he published two memoirs, one on Bezout's method of elimination, the other on the number of integrals of an equation of finite differences. At the instance of Legendre, the latter was published in the *Recueil des savants étrangers*.

This brought him immediately to the notice of Lagrange and Laplace. After the completion of his course, he was appointed repetiteur

of his school. In 1802 he was made additional professor and succeeded Fourier as professor in 1806. The following are the posts he held thereafter: astronomer to the Bureau of Longitudes (1808); professor of mechanics (1809); member of the Institute (1812); councillor of the university (1820); and geometer to the Bureau of Longitudes in succession to Laplace (1827). In spite of the stormy days in which he lived he was left undisturbed in his academic career. That is because, Napoleon was wise enough to see that nothing was to be gained by persecuting the harmless academician whose fame he doubtless regarded like that of the other savants of France as an appanage to his own glory. What a contrast to what obtains to-day under the urge of racial and communal hatred!

Poisson's outstanding contribution to pure mathematics is the series of memoirs on definite integrals. His discussion of the Fourier's series paved the way for the classical researches of Dirichlet and Riemann. His memoirs on the calculus of variation and the theory of probability are also worth mentioning. His range in applied mathematics was very wide; electricity and magnetism, heat, gases, capillary attraction and gravitation. In planetary theory he carried forward Lagrange's work on the stability of orbits to the second degree of approximation. Lagrange thought so highly of this memoir that he made a copy of it with his own hand in spite of his old age (1809). What is more significant, it stimulated old Lagrange to write one of the greatest of his memoirs on the same subject. Poisson's well-known correction of Laplace's differential equation for the potential came out in 1813.

On the whole, Poisson wrote about 300 papers in addition to the five treatises most of which were intended to form part of a great work on mathematical physics, which he did not live to complete.

Poisson died, April 25, 1840.

S. R. RANGANATHAN,