INTRODUCTION

Purpose of Study

The thick sequence of Vindhyan sediments (Late Precambrian) has been a subject matter of keen geological interest ever since it attracted the attention of the Indian Geological Survey in 1854. From that time onwards a great deal of work has been done on these interesting rocks, but in view of the enormity of the Vindhyan basin, much more work is still needed before any attempt is made to answer many of the intriguing questions concerning its mode of formation and palaeogeography.

The Vindhyan rocks offer excellent opportunities for studying ancient sedimentary processes and products. Perhaps they present one of the very few cases of unmetamorphosed and undeformed sequences of a very ancient age which contain within them such a wide spectrum of lithological characters and sedimentary structures, and were deposited under so varied hydrodynamic and geomorphic conditions. The eastern part of the great Vindhyan basin, perhaps due to reasons of easier accessibility and better camping facilities, has been studied in greater details as compared to the western part which has remained practically unstudied from the sedimentological point of view.

The present investigation is an attempt to make an integrated
field, petrographic, and palaeocurrent study in a small area near the western end of the basin, with a view to determine the dispersal pattern, provenance, and depositional environments of the "Upper" Vindhyan rocks. The choice of this particular area was based on the reason that it was suspected during the course of preliminary investigations in the western part of the Vindhyan basin, that the shore line repeatedly migrated through this area, and it provided ideal conditions for studying the sediments deposited in marine, near-shore, and fluviatile environments.

Location and Environs of the Area

The study area, approximately 925 square kilometers, is situated partly in the Kota and partly in the Chitorgarh district of Rajasthan. It lies between the north latitudes of 24°50' and 25°15' and east longitudes of 75°30' and 75°55', and falls within the Survey of India half-Inch topographical sheet Nos. 45 O/SE and 45 P/NE. It includes at its northeastern end, the district headquarters city of Kota (also spelt as Kotah) which is well connected by road and railway to most of the important cities of India. Communication within the area, however, is restricted to one bus route from Kota to Rawatbhata, and most of it can be reached only by walking long distances on foot.

By far the major part of the area is covered by dense forests or thorny shrubs. Extensive farmlands, however, exist along the Chambal river in the region below the scarp. Exposures of rock formations are generally good except in regions covered by soil or lateritic covers. Camping facilities are scarce and widely scattered, thus, rendering parts of the area
practically inaccessible.

Scope of Work

The area was mapped geologically by the writer on a one-inch scale and stratigraphic sections were measured at as many localities as possible. The lithological and primary structural features of the rocks were carefully recorded, and an attempt was made to evaluate them in terms of the hydro-dynamic conditions of deposition.

A petrographic study, based on the examination of 195 thin sections of sandstones and limestones, was made. It includes the determination of textural attributes, modal composition, insoluble residues, and heavy mineral characteristics. Thin sections of shales were not studied because the data obtained from their field study were considered reasonably adequate to draw significant conclusions regarding their mode of formation.

A systematic palaeocurrent study of the rocks was made with the help of directional structures such as cross-stratification, ripple marks, and parting lineation, and a total number of 1,348 readings were taken for the purpose. The measurement of cross-stratification received the maximum emphasis as it is the most commonly occurring structure, and also because it gives the sense of sediment transport direction. The palaeocurrent data were further supplemented by dimensional fabric studies, specially in regions where other directional structures were scarce or totally absent. In all, the orientation of 10,600 clastic quartz grains was measured in 53 properly oriented thin sections. The mean current direction at each locality was also computed.
On the basis of the above studies, it has been possible to locate and evaluate the provenance which supplied the detritus to this part of the Vindhyan basin during the deposition of the "Upper" Vindhyan rocks. The data obtained from field and laboratory investigations were used in deciphering the depositional history of the sediments.

Figure 1 shows schematically the plan and methodology of the present investigation.

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FIG. 1.—FLOWSHEET SHOWING THE PLAN AND METHODOLOGY OF THE PRESENT INVESTIGATION