SUMMARY AND CONCLUSIONS

A geological study of the Parsoi area, covering nearly 260 sq km, has been presented in the preceding pages.

Except for a few notes published as a result of cursory observations, the systematic studies of the 'Bijawar' rocks remained practically neglected in the Indian Stratigraphy. In the present case the Bijawar rocks around Parsoi, the type area for the 'Parsoi group' of Mathur (1959), were studied in detail in an endeavour to understand their structure, petrology and sedimentation.

The metasediments were subdivided into two formations as a result of the recognition of two persistent but distinct lithological assemblages. The underlying assemblage is composed essentially of interbedded phyllite with meta-sandstones. This sequence of rock units is characterised by a distinct lithological homogeneity and several inherited sedimentary structures. The overlying assemblage comprises carbonate rocks, banded-haematite-quartzite and brecciated quartzites and is distinct from the underlying assemblage. In working out this order of superposition of beds, primary sedimentary structures such as small-scale cross-laminations, ripple marks, and sole marking structures, and cleavage-bedding relationship were made use of. For the stratigraphic nomenclature and classification, the code recommended by the American Commission on Stratigraphic Nomenclature (1961) has been informally used as a basis for lithostratigraphic classification of the rocks since the standardisation of the Indian Stratigraphic Nomenclature is incomplete and yet to be adapted. Thus, the term 'Parsoi phyllite' is proposed for the underlying formation, whereas the term 'Tatapahar quartzite' is suggested for the conformably overlying formation depending upon the major lithology in each formation.

Lithologically 'Tatapahar quartzite' compares favourably with the'Bijawar Series' of the type area. Also the lava flows in both the areas have yielded ages of 2.4. b.y (Crawford, 1969) indicating more or less simultaneous eruption. It is, therefore, suggested that the Bijawar type area and the area under review represent parts of the same geosyncline. This may justify their correlation, albeit with reservation The suggested stratigraphic sequence of the Parsoi area is given in table 1.

The geological structure of the 'Bijawar group' is superficially simple. Detailed examination, however reveals complex structural history of the region. Thus, it was found that the study of secondary minor structures was extremely useful and significant to trace out the structural history of the region. The following minor structural elements were found in the area-bedding, axial plane slaty cleavage, slip cleavage, lineations due to the intersection of bedding and cleavage, mineral lineation, minor fold axes and crinkles etc., while giving the specific description of different types of minor structures, an attempt has been made to discuss the genetic relation of one with other and of the minor with the major structural elements, and finally, of these with the main tectonic movements. It is suggested that the area under-went two or possibly three phases of deformation. The major folds with their co-axial minor folds trending nearly in east-west direction are the earlier folds (B_1). This suggestion comes from the evidence of the distribution of the rock types mapped together with the geometry of the minor folds. They are tightly appressed folds overturned towards the north and plunge towards the east with low angles. It is suggested that these earlier folds(B_1) are produced by subhorizontal compressive stress in a north-south direction. Subsequent changes in stress directions, nearly oblique to the earlier one, have produced westerly plunging folds (B_2). During the late stage of deformation these earlier folds were deformed by slip cleavage which forms axial plane for younger generation folds (B_3). Their axial planes strike N-S to NW-SE. It is suggested that a subsidiary stress during the late stage which acted nearly at right angles to the earlier folds has resulted in N-S trending cross-folds. Thus, all the movements which were responsible for the present structural configuration appear to indicate the different phases of a single orogenic cycle.

A compositional term 'quartz wacke' is suggested for the sandstones of the study area based on the sedimentary rock classification system Williams <u>et al</u> (1954). The metamorphosed quartz wacke sandstones are divided into two varieties: 1. phyllitic quartz wacke 2. schistose quartz wacke, depending upon the degree of metamorphic recrystallisation exhibited by argillaceous matrix and consequent development of metamorphic structure. Petrographically quartz wacke sandstones are poorly sorted sediments and texturally immature. The detrital grains in these rocks range from silt-size particles to fine-grained size. The following mineral constituents are present in these rocks:- quartz, feldspars, quartzitic and phyllitic rock fragments embedded in a micaceous matrix. The matrix ranges upto 40%. Tourmaline and zircon are the most abundant non-opaque heavy minerals. Although these rocks are compositionally and texturally immature, the high ZTR index and fresh feldspars (though in minor quantity) indicate feature of high maturity. This constrasting feature in these rocks is referred to here as 'inverted maturity' (Stanley,1965). It is suggested that the high ZTR index in quartz wacke is due to a lack of diversity of heavy minerals in the source rocks themselves. The mineralogical composition indicates that the plutonic rocks with a composition close to that of granite associated with pegmatites and metamorphic rocks of the sedimentary origin are source rocks which have contributed in the making of these sandstones.

The pelitic rocks are composed of an extremely mixed sequence of varied phyllites, argillites, and quartz-mica schists. These rocks have undergone low grade metamorphism and belong to the greenschist facies of the muscovite-chlorite subfacies (Turner and Verhoogen,1951, p.469). Similarly the carbonate rocks have also undergone metamorphism to the greenschist facies. These carbonate rocks are characterised by recrystallised and partly recrystallised limestones and dolomites, and where they are in immediate contact with the basic lava flows, pass into coarsely crystalline marbles under the influence of thermal metamorphism. The partly recrystallised carbonate rocks indicate that they are chemically precipitated sediments as there was no evidence of detrital origin, either for dolomites or for calcites.

Petrographically banded-haematite-quartzite is composed of haematite layers alternating with cherty quartz. It is suggested from the petrographical characters that the banded-haematite-quartzite is of chemical origin and is formed under marine environment.

An array of sedimentary structures observed in the metasediments of the 'Parsoi phyllite' contributes to the understanding of the conditions of deposition and the direction of transport of sediments. The sedimentary structures include, ripple-drift cross-lamination, convolute lamination, graded bedding, ripple marks, flute casts, and load casts, etc. The assemblage of these sedimentary structures can be held to be diagnostic of turbidity current origin in the deeper marine basin. The turbidites are interbedded with pelagic shales (now phyllites). The dominace of turbidite structures that are formed in the lower flow regime, a pelitic nature of sediments, and relatively thin interbedded fine sandstones in the northern part of the area indicate distal turbidite (Walker, 1967). On the other hand, thick bedded sandstones with relatively coarse-grained texture and poor sorting as well as sharp contacts between sandstones and phyllites in the southern region of the study area indicate proximal environment for these turbidites (Walker, 1967). Paleocurrent studies indicate a westerly source of sediment transport.

Basic igneous activity of post-Bijawar age in the area has manifested itself as lava flows, sills and dykes. The intrusives came in different phases. It was recognized that sub-rounded to elliptical volcanic bombs and lapilli are embedded in the lava flows. The detailed petrological account along with the chemical characters of the four analysed basic rocks is given in chapter IV. The dykes are doleritic in composition, the sills are epidioritic to epidositic in composition, and lava flows are metabasites. The study of chemical characters reveals that the dolerites are abnormally rich in potash. It is suggested on the evidence of highly sericitised feldspars in the dolerites that the addition of potash through deuteric solutions might have brought about the enrichment of potash. Differentiation follows the alkali basalt trend in variation diagrams. But complete absence of modal olivine, rather high value of normative hypersthene, and micropegmatitic textures, on the other hand, are suggestive of tholeiitic nature. The dual nature of Parsoi dolerites is problematical. It is possible that the composition of parent magma lies in between alkali and alkali-calcic series of Peacock (1931). In the course of magmatic differentiation at depth the mobilization of alkali content to the higher levels within the magma reservoir and also an increase in the potash contents through deuteric solutions, might have been responsible for the observed high potash content in the dolerites.