CHAPTER IX

S U M M A R Y

This chapter summarises the salient features of the results of the investigations, and contains a brief account of the geology of the Champaner Series, as worked out by the author.

STRATIGRAPHY

The detailed stratigraphic succession of the Champaner Series worked out by the author is as under:

Intrusive Granites			Post-Champaner (=Post Aravalli but Pre-Delhi)
Champaner Series	Upper	Rajgad Slates	Aravalli
		----------Paraconformity-----	
	Middle	Bamankua Limestones	
		Shivarajpur Quartzites and Phyllites	
		Bhat Slates	
		Jaban Conglomeratic Graywackes	
		Jaban Slates	
		Narukot Quartzites	
		----------Disconformity-------	
	Lower	Gandhra Pelitic Group	
		Chhota Udepur Dolomites	
		Basal Conglomeratic Quartzites	
----------Unconformity----------			
Basement Gneissic Complex			Pre-Aravalli

SEDIMENTATION

The stratigraphy of the Champaner Series represents sedimentation in a miogeosyncline - a marginal basin flanking the main Aravalli geosyncline. The depositional

structures and the lithology of the various formations exhibit a connected sequence of events marking the different stages of the evolution of the basin. The disconformity between the Lower and Middle Champaners, and the paraconformity below the Upper Champaners, typically signify events of environmental change, which in turn were related to the tectonism of the basin.

The sedimentation in the Champaner miogeosyncline started with conglomeratic quartzites followed upward by the rocks of orthoquartzite-carbonate suite of platform facies. These were followed by shales, dolomitic-limestones and jasper beds, deposited in shallow water in a restricted basin. Extensive beach sands were deposited after these shales and these typically indicate a temporary but significant uplift. Had this uplift not taken place, the Gandhra group of rocks would have passed uninterruptedly into Jaban Slates, following a more common depositional pattern. Thus the Narukot Quartzites forming vast beach deposits mark a disconformity. The resumption of subsidence brought about deposition of shales and graywacke- characterising deposition in deep waters. It is significant to note that the rate of deposition of

graywackes in the Jaban basin was faster than the rate of subsidence. This fact is illustrated by the progressive shallowing of the basin and a gradual change over of graywackes to protoquartzitic rocks upwards. After the deposition of protoquartzites either the rate of subsidence increased or that of clastic supply decreased, and as a result deposition of finer material gave rise to beds of shales.

An important change in the deposition is marked by the paraconformity below the Rajgad Slates. It signifies a renewed subsidence which brought the entire basin under simultaneous and continuous deposition.

The present study has revealed that the Champaner geosynclinal cycle does not show a complete sequence from marine to continental sedimentation. The molasse facies is totally absent, and the deposition appears to have followed an entirely different trend after the graywacke-protoquartzite suite.

STRUCTURE

The Champaner Series is seen to have been folded into a number of west-plunging folds. Regionally, it

forms a 'S' shaped structure, comprising two anticlines and two synclines. The various folds are moderately closed and angular. The mechanism of folding is dominantly of the similar type, differential slipping having taken place along the axial plane direction. The slip planes now characterise the metamorphic foliation. A slight fluctuation in the dip and strike of this foliation has been found to be due to a slight fanning of the axial planes.

The folding has given rise to a large number of linear structures parallel to the fold axis. These linear structural elements include minor fold axes, crenulations, cleavage-bedding intersections and boudins.

The investigations have also revealed that the jointing and fracturing of the rocks belong to two distinct periods - one related to the main folding and the other due to the uplifting by granite.

The granite intrusion has considerably modified the pre-existing structures and has also impressed new structures. However, effect of granite are confined to the eastern part of the area. These could be summarised as under:

(i) Swinging and deflection of the foliation (bedding, cleavage) trends and regional boudinaging of beds.

(ii) Superimposition of N-S flexures and doming up of pre-existing folds.

(iii) Tightening of earlier minor folds and steepening of their axes.

(iv) Development of numerous faults showing a radial pattern.

METAMORPHISM

The metamorphic history of the Champaner Series is seen to comprise (1) Regional metamorphism that synchronised with the Champaner orogeny, (2) superimposition of contact metamorphism on regional metamorphism, and (3) migmatisation in the vicinity of the intruding granite mass.

The intensity of regional metamorphism was fairly low and the various mineral assemblages point to a chlorite grade. The rocks point to metamorphic changes governed by low temperatures and moderate stress conditions and the assemblages belong to Green Schist facies of Turner and Verhoogen (1962).

The effects of the superimposition of contact metamorphism are seen as progressive recrystallisation of slates and phyllites to schists and hornfelses. The contact aureole has been delineated into a succession of zones of phyllites, mica schists, hornfelses and gneisses. Progressive appearance of andolusite and cordierite has also been recorded. Migmatisation in the innermost part of the contact aureole, has given rise to a gradual transformation of phyllites to coarse feldspathic gneisses.

Contact metasomatism of granite on impure dolomitic limestones and associated rocks has resulted into the formation of interesting mineral assemblages. At Jothwad hill, the limestone is seen transformed into a rock made up of various calc-silicates like wollastonite, diopside, garnet, epidote, phlogopite, scapolite, tremolite, sphene, etc. The interaction of granite with manganese-bearing argillaceous rocks occurring with limestone has given rise to minerals like winchite, blanfordite, and manganophyllite.

CORRELECTION

The broad equivalence of the Champaner Series with the Aravalli System is now almost an established fact, the author too is in full agreement with this correlation

to a certain extent. The present study has revealed that though both belong to the same stratigraphical age and to the same depositional cycle. The Champaner Series was deposited in an environment quite distinct from that of Aravallis. The present investigations have shown that the deposition of Champaner sequence took place in a marginal basin lying between a craton and the Aravalli geosyncline. The Champaner basin was thus a typical miogeosyncline.

The present study has also thrown new light on the granites and gneisses of the area. According to the author, the Godhra granites to the north of the Champaner Series, are unlikely to be Post-Delhi (Erinpura granite). In fact they represent post-kinematic intrusive phase related to the Champaner orogeny only. The author is inclined to classify the entire gneissic and granitic terrain of Panchmahals and Baroda to comprise Pre-Champaner gneissic basement and Post-Champaner late-kinematic and post-kinematic gneissic rocks. It is also obvious that the Post-Champaner granitic rocks were perhaps derived by the mobilisation (? polingenesis) of the Pre-Champaner basement lifted during the orogenic upheaval.