CHAPTER- XI

RESUME

Heron (1953) in his classic work put forth a very elaborate geological framework for the Precambrian rocks of Rajasthan. However, the concepts developed by him for Rajasthan do not appear to be fully applicable to North Gujarat, though for all practical purposes the rocks here comprise their south-western extensions. Some recent studies have shown that in North Gujarat, the Delhi rocks and the associated basics and granites do not conform to the picture as envisaged by Heron and other earlier workers. It is in this context that the author's conclusions have assumed considerable significance.

The study area comprises about 160 sq.km. (N. Latitudes $24^{\circ}16'$ and $24^{\circ}23'$ & E. Longitudes $72^{\circ}48'30''$ and $72^{\circ}54'$) of the terrain shared by the districts of Banaskantha (Gujarat) and Sirohi (Rajasthan).

The geological picture of the Ambamata and its neighbourhood, as visualised by Heron & Ghosh (1938) remained rather intact for the last four decades, and almost all the subsequent workers more or less accepted the stratigraphy, structure and igneous history put forth by the two workers. Recently, Desai et al. (1978) and Sychanthavong (1978) working on the neighbouring areas to the west and east of Ambamata, have provided a wealth of new data on the Delhi metasediments and the associated granitic and mafic rocks. Their studies have brought to light a number of structural and metamorphic complexities which were not visualised by the previous workers.

The author has presented an altogether new and revised geological picture of the area. Considering all aspects of structure, outcrop trends and metamorphic characters, he has worked out a history that essentially evisages deposition of Ajabgarh Series directly over the oceanic basement, and its subsequent involvement in foldings and igneous actions. The area shows the following succession :

Basaltic dykes	Intrusives	Post Erinpura Granite
Granites		Erinpura Granite
Metadolerites		Post-Delhi-Pre-Erinpura Granite
Calc schists and Calc silicate gneisses with marble lenses	Ajabgarh Series	Delhi System
Pelitic schiste		
Biotite gneisses		
Hornblende gneisses		
Ortho-amphibolites		Basement
Granulitic rocks		??

The revised structural geology is also interesting. The outcrop pattern and foliation trends, as well as behaviour of ortho-amphobolite, clearly show effects of two main fold events. The early folding consiste of very tight-folds which follow tortuous trends on account of the effects of late WNW-ESE folding. The three fold episodes visualised by Sychanthavong (1978) are not so clearly revealed in the study area. A perusal of the regional tectonic map (Fig. V.2), shows only some prominent F_1 and F_3 folds and only one F_2 fold. In the southern half of the area, the outcrop pattern comprises interference of F_1 and F_3. In the northern part, the main basin like structure typically comprises a big open F_3 (WNW-ESE) synform, which has distorted the tight F_1 syncline.

Granites of Erinpura age show very interesting time-relationship with fold history. The major hills, ridges and bosses of coarse biotitic granite and cutting through all the structures, are obviously post-F_3. But the pink finegrained granite (free from biotite) that occurs along the F_1 syncline, is seen affected by both F_2 and F_3, and leads one to conclude that this granite is older and Pre-F_2.

So far as the metamorphism is concerned, the metasediments - both pelitic and calcareous, show mineral assemblages characteristic of amphibolite facies. The hornblendic rocks, are quite different from the epidiorites (=metadolerites etc.) and point to a high metamorphic grade. The biotite and hornblende gneisses have been found to comprise derivatives of metasediments produced by deepseated anatectic processes during early phases of Delhi orogeny. The retrogressive changes comprise the effects of hydrothermal alterations related to Erinpura granite. It is quite obvious that only the intrusive masses of coarse unfoliated biotite granite that form characteristic bosses and peaks, represent Post-Delhi Erinpura granite, and most of the gneissic granites (=biotite and hornblende genisses) represent much older rocks, no way connected with the Erinpura granite.

Regarding the geological evolution of the area the author has rallied a variety of evidence based on his own data from the Ambamata area as well as its environs, as also on the work of Desai et al. (1978) and Sychanthavong (1978), to build up an evolutionary history which provides an alternative to the existing picture.

The various observed facts for the Ambamata area ideally fit with the revised model that author has built, taking into full account the concept of proto-plate tectonics. The geological details as obtained by Sychanthavong (1978) in the east and by Desai et al. (1978) in the west, are adequately connected and explained to provide an integrated picture of the successive events.

The author's findings fully substantiate the postulation that the Ajabgarhs are resting over basaltic rocks, now seen as ortho-amphibolites. The entire sequence points to its deposition directly over the oceanic plate. The structural pattern very clearly shows three fold episodes. In the extreme northwest corner, is encountered the tectonic contact which separates the medium pressure amphibolite facies rocks from the high grade granulitic rocks of Balaram-Abu Road area described by Desai et al. (1978). This tectonic plane referred to as Chitrasani Bali fault (Sychanthavong, 1978) is supposed to comprise one of the deep mantle dislocations and a later subduction zone, along which the dehydrated and metamorphosed derivatives of the oceanic crust, and the overlying Delhi sediments, have been pushed up.

The author has chronologically arranged the various geological events that have affected the Ambamata area.

The pelitic and calcareous sediments of the Ajabgarh Series were directly deposited over the oceanic basement. Due to the subsequent involvement of this crust, into the Delhi folding (F_1) and the related metamorphism of the constituent rocks, the basement is now exposed as narrow linear outcrops of ortho-amphibolites. It was during the period that the older pelitic sediments that were resting over the basement, were metamorphosed and granitised. The mineral assemblages developed in pelitic as well as calcareous sediments point to the medium pressure amphibolite facies metamorphism. The squeezing and emplacement of ferromagnesian-free granitic melt (migma) took place along the axial plane of F_1 syncline. Ascent of emanations from the mantle (and/or oceanic crust) rich in base metals took place along F_1 axial plane fractures. These base metals were fixed in calc-magnesian metasediments which have formed the host rocks for mineralisation.

F_2 folding immediately followed F_1 folding. In fact, F_1 and F_2 were more or less connected events. Along the pre-existing foliation planes and axial plane fractures, the sills of dolerite (=metadolerite) were emplaced.

Superimposition of F_3 over F_1 folds have given rise to the existing outcrop pattern of the area. After F_3 foldings, the emplacement of non-foliated biotite granite (Erinpura granite proper) took place which cut across all pre-existing rocks and structures. This granite is responsible for the hydrothermal changes in meta-sedimentaries and meta-dolerites.

The last event of this area is the emplacement of narrow WNW-ESE dykes and veins of oligoclase basalt.