CHAPTER - XI

R E S U M E

1. The present thesis comprises the first ever succint account of detailed stratigraphy and structure of the exposed Tertiary and Quaternary rocks of the southern Cambay basin of Gujarat. The present investigations have not only enabled the author to obtain routine details of the stratigraphy, structure and lithology of the rocks but also provided new data of considerable regional significance. The revised stratigraphy is primarily based on a detailed mapping and thorough appraisal of the field characters, lithological aspects and relationships with the respective

underlying and overlying formations.

2. The author has ruled out the faulted contact of the Tertiaries with the Deccan Traps to the east and the south-east of the area as envisaged by Sudhakar et.al. (1970) and Gadekar (1980a). In fact due to the uplift and folding of Tertiaries and the underlying Deccan Trap rocks, and a strong SW plunge the eastern and the southeastern limit of the outcrops form a sinuous course and the Deccan Trap occurs as partial inliers.

3. Being in the easternmost part of the Cambay basin, 3 regressive and 2 transgressive phases had controlled the sedimentation with the intervening unconformities.

4. During the early two regressive phases material derived from the Deccan Trap rocks were deposited and during the last regression a thick sequence of arenaceous sequence was deposited. In the outcrop area during Upper Eocene fossiliferous limestones were deposited, and during the Lower and part of Middle Miocene transgression limestones, marls and calcareous sandstones were deposited.

5. While studying the fossil assemblage of the Upper Eocene limestones the author has found the presence of species Disclocyclina sella from the exposed coquinoidal limestones for the first time. The occurrence of Discocyclina sella, Discocyclina dispensa with Nummulities fabianii in the Dinod limestones has established the age of the rocks as Upper Eocene.

6. The Upper Eocene Dinod formation limestones are different than the sub-crop limestones of Motwan-Ankleswar area to the NW which are of Oligocene age. The exposed Upper Eocene limestone changes to a shale facies in the subsurface of Motwan-Ankleshwar area. These two limestones on a general lithological similarity were tied up and correlated by previous stratigraphers.

7. Evidence of the provinance close to the depositional site during the deposition of the sediments of the Babaguru formation has been obtained from the presence of highly ferruginous lateritic rock with agate pebbles embedded in it.

8. A radical change in the provinance and the drainage system which had brought in the sediments to the depositional site has been brought out from the mapping of the upper part of the Kand formation and the Jhagadia formation. The provinance was essentially that of metamorphics exposed to the north and the NE of the area of the Aravalli folding.

9. The structural style of the study area is unique as it is located at the intersection of the Narmada and the Cambay basins in Gujarat.

10. A number of linear anticlinal structures trending SW to WSW, plunging SW to WSW, and invariably flanked by reverse faults along their SE limbs have been mapped. The Dinod and Dungri anticlines show NE plunge as well. The overlying Quaternary sediments also show evidences

of neo-tectonic activity which had uplifted the Tertiaries and exposed them. A total of 11 anticlinal features have been mapped in detail by the author with the help of aerial photographs and ground mapping. At times the structural features are marked by subtle topographic expressions, and they could be mapped by the study of drainage pattern and photo-tone analysis.

11. The detailed structural mapping has brought out that all the structural features in the study area trend NE-SW and are linear structures faulted along their SE limbs by reverse faults hading due NW, and that most of the structures plunge due SW. The Dungri and Dinod anticlines also show NE plunges, and are doubly plunging anticlines.

12. The presence of neotectonic activity in the study area has been found by the present author from the study of drainage pattern and topographic expressions of subtle geomorphic features representing structures underneath. These features have been found to be manifest as geomorphological anomalies and lineaments. The author was able to identify and decipher these features with the aid of Landsat image, aerial photographs and drainage pattern. An excellent evidence of Late Cenozoic neotectonic activity has been observed in the feature of the Narmada river paleo-bank suggesting continued uplift and reactivation of a fault. The Aliabet Island is another significant feature which seems to have taken its shape in Quaternary times. Recent

neotectonic activity in the area is evidenced from the occurrence of 1970 earthquake of Broach. Geological investigations and the analysis of both geological and geophysical data typically and conclusively point to a release of compressive stress through the Narmada reverse fault resulting in the earthquake.

13. From the analysis of drainage pattern prepared from the aerial photograph mosaic, 17 significant and prominent circular to elliptical geomorphic features have been deciphered. The most striking characteristics of the geomorphic features delineated are that they are linear in trend in a NE-SW direction. This trend is in conformity with that of the geological structures mapped from the exposed rocks of the Tertiaries. A number of these features lie in the alluvial part and area of Quaternary sediments of Kim river drainage system.

14. The contrasting tectonics of the Tertiaries south and north of the Narmada river point to the significant control exercised by the movements along the Narmada geofracture passing through the study area. After Cretaceous sedimentation in the Narmada basin, the Deccan Trap basalts flowed over a vast tract of Central India and the Cambay basin in Gujarat. At the end of Paleocene the Cambay basin rifting took place and it superimposed over the westernmost rifted part of the Narmada basin. As such the study area fell on the cross trend of these

two rifted basins. There were horst and graben features in the area. Subsequent to the filling up of lows, between the horsts, by the sediments which were essentially trap derivatives, a pronounced tectonic activity took place along the Narmada basin, including the area of study, resulting in the uplift, folding and partial erosion of the early Tertiary sediments. That tectonic activity is correlated by the present author, to the first collision of the Indian plate with the Asian plate in early Tertiary. He suggests that the Narmada rift basin along which the Narmada geofracture lies demarcates the northern Indian subplate from the southern Indian subplate. In early Eocene the sediments of the study area, falling in the western part of the Narmada basin, were thus uplifted and folded due to the compressional stresses experienced by NE-SW trending basement fault blocks. During Late Cenozoic when the final drift and welding of the Indian plate with the Asian plate took place, once again the study area and the Narmada basinal area experienced a narrowing effect due to another push of the southern Indian sub plate against the northern Indian subplate causing differential vertical fault block movement. It resulted in the development of compressive stresses that folded the incompetent Tertiary sediments and releasing the stresses through reverse faults. The author has further resolved that the early Tertiary tensional faults were reactivated as reversed faults during the two prominent tectonic phases.

As the northern part of the Cambay basin north of the Narmada river forming Broach depression lies north of the area of the Narmada geofracture zone and beyond the limits of the Narmada tectonic belt which had experienced the above described tectonic activity, there had been no uplift of the N-S trending fault blocks. On the other hand the area of the Broach depression was comparatively sinking as the blocks of the study area were being uplifted. As a result of this sedimentation throughout Tertiary and Quaternary times continued in the Broach block whereas in the study area the uplifted Tertiary rocks were being partially eroded.