CHAPTER X

STRATIGRAPHY AND CORRELATION

The stratigraphy of the Precambrian rocks of the present area is discussed below based on the application of lithostratigraphy, as absence of fossils or radiometric age data prevent the use of biostratigraphic and chronostratigraphic schemes.

The geological setting of all the major and minor rock types of the area is discussed in chapter III. These rock types are described in two major lithological groups: the lower Gneissic Group which shows evidences of medium (high?) grades of metamorphism is the oldest group of rocks in the area. Similar rock types in the plateau region is described by others as Sonapahar Group (Rao and Choudhury, 1976). The metasedimentary rocks composed essentially of psammatic and pelitic metasediments which show effects of low grade regional metamorphism (epidote-amphibolite facies) are named as the Nanai Group. The contacts between the two Groups are not conformable. It is locally indicated by the occurrence of a band of sillimanite-garnet conglomerate and elsewhere as a structural and lithological break.

10.1. LITHOSTRATIGRAPHIC UNITS

The rock types of both the Groups are shown below in lithostratigraphical units:
1. Quartzofeldspathic gneisses are the dominant rock type of the Basement Complex. Though the rocks show some variation from place to place in its colour (pink/grey), mineralogy, grain size and structure, its overall homogeneity is being considered as a lithostratigraphic unit. Some of the garnetiferous-sillimanite rocks included within the gneisses probably formed from the sediments by high grade metamorphism.

2. Amphibolite—regionally metamorphosed basic rocks probably including both ortho- and para-types.

3. Metasedimentary rocks—pelitic, psammatic and calcareous sediments which suffered varying degrees of regional metamorphism giving rise to schists, quartzites and calc-silicate rocks.

4. Epidiorite—a few slightly metamorphosed basic igneous rocks.

5. Granite—a massive, fine-grained igneous rocks including aplites and pegmatitic veins and dykes.

10.2. STRATIGRAPHIC RELATIONSHIPS

The stratigraphic relationships of the lithologic units are described below:

Quartzofeldspathic gneisses are the most predominant rock types of the basement. These rocks invariably show
conformable interlayer relations and are, in their turn, intimately interlayered with ganetiferous–illimanite schists and granulites. They were inferred to have formed from sedimentary rocks under conditions of amphibolite facies. Thus, metamorphism accompanied by tectonic influence was responsible for the development of these rocks along with quartzofeldspathic gneisses from the sediments. The quartzofeldspathic gneisses are generally homogenous and show a little variation along as well as across the strike, although some of the rocks show gradations at the contact of the granite. Therefore, the formation of these rocks may be considered to be due to syntectonic metamorphism, later granitized into the gneisses.

10.2.1. Amphibolite

These rocks occur as conformable bands and interlayers along the foliation planes of the quartzofeldspathic gneisses. Some of the bands vary in thickness and persist along the strike. They are involved, with the quartzofeldspathic gneisses, in the different phases of folding and show structural conformity with the latter. As discussed in chapter VIII, they probably include both ortho- and para-amphibolites. The latter would be the metamorphosed product of some calc-magnesian sediments, while the former would represent basic igneous rocks intruded into the quartzofeldspathic gneisses. However, both the types suffered all the tectonic and metamorphic events as witnessed by the rocks of the gneissic complex.
The above rocks of the Gneissic Group are considered to be the oldest rocks of the present area.

It is not possible to establish the true stratigraphic sequence of these highly metamorphosed rocks from their present order of superposition because:
(a) due to recrystallisation during metamorphism, the original sedimentary features of the rocks were completely obliterated,
(b) they underwent repeated phases of deformation due to which original stratigraphic sequence have been disturbed more than once.

10.2.2. Metasedimentary rocks

The rocks of the Manai Group vary in thickness. The lower part of this group is predominantly schistose while the upper part is quartzitic. There is no lithological and structural break between these two parts. These schistose rocks, inspite of their mineralogical differences, show an overall similarity amongst themselves. Calc-silicate rocks also occur as conformable layers, closely associated with other metasediments and show mineral assemblages controlled by grade of metamorphism. Thus, all these rocks may be considered to represent a pile of sediments which suffered metamorphism together. These less metamorphosed rocks are recognised to be younger than the Gneissic Group.
Epidiorites, which are undoubtedly igneous origin, included in the metasedimentary group. These rocks suffered metamorphism along with the host rocks and are younger than the rocks of the Manai Group.

True stratigraphic sequence of these metasedimentary members is not possible to establish from the present order of superposition as the rocks have suffered repeated phases of deformation during the course of their formation. However, the present lithologic contact may be due to folding and transposition of the original bedding planes.

10.3. STRATIGRAPHIC SUCCESSION

Based upon field and stratigraphic relations, the following succession of stratigraphic units are suggested for the rocks of the present area:

<table>
<thead>
<tr>
<th>STRATIGRAPHIC UNITS</th>
<th>ROCK TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent</td>
<td>Alluvium</td>
</tr>
<tr>
<td>(?) Precambrian</td>
<td>Granites, aplites, pegmatites and other vein rocks.</td>
</tr>
<tr>
<td>Manai Group</td>
<td>Khasi greenstone, Quartzite, Sericite schist, Biotite schist, Grey actinolite schist, Quartz-muscovite-biotite schist, Quartz-biotite schist, Calc-silicate rocks, Grey-wackes and Sillimanite-garnet conglomerate</td>
</tr>
<tr>
<td>Precambrian</td>
<td>Quartzofeldspathic gneiss, Sillimanite-garnet schist, Quartz-sillimanite-garnet-feldspar granulite, Hornblende-sillimanite schist, Hornblende-sillimanite gneiss and Amphibolite</td>
</tr>
<tr>
<td>Basement Complex</td>
<td></td>
</tr>
</tbody>
</table>
10.4. CORRELATION

A study of the Lewisian rocks of Scotland (Bhattacharjee, 1968; Choudhary, 1972) reveals that the sequence of tectonic events and metamorphism are comparable to the gneissic rocks of the present area. The main, mid and late phases of deformation of Gairloch (cf. Bhattacharjee, 1968) and Gualin, Dionard and Leacach phases of deformation (cf. Choudhary, 1972) can be correlated with the phases of deformation in the present area. This indicates that the Precambrian evolution of the present area show some similarity with Laxfordian orogeny. These phases of deformation are also comparable to the early, mid and late phases of deformation of Simultala area (cf. Bhattacharjee, 1966).

There appears to be similarity in lithology and grade of metamorphism between the rocks of the present area and middle Dharwar rocks of Karnataka. Pichamuthu (1963) divided the latter into three zones, which are characterised by metamorphism of greenschist, amphibolite and granulite facies. Thus, the present area would mainly coincide with the middle zone characterised by amphibolite facies metamorphism.

The structural trend of Eastern Ghat and Chatanagpur Plateau of Bihar and Orissa, as incorporated in the tectonic map of India (Krishnan, 1953; Pichamuthu, 1963) show similarity with the present area.
Radiometric dating has not been made from any other minerals of the present rock types. The only exception is the dating of muscovite (Sarkar, 1968) from a sheared quartzite of Shillong Group, occurring at Jowai, to the south-east of the present area. This age appears to be rather anomalous in view of the higher age of 765±10 m.y. (Crawford, 1969b) given by the Myliiem granite which is intrusive to the former. Recent works on Fission-track age dating on sphene from South Khasi Batholith has given an age of 931±12 m.y. (Talukdar et al., 1982) whereas the zircon of neighbouring Nongkhlaug granite has given a much higher age of 1053±127 (Chakravarty-personal communication).

All the above ages are from granitic bodies that are intrusive into the metasedimentary formations, lithologically and structurally equivalent to the Manai Group of rocks of the present area. Therefore, the Manai Group of rocks are older than 1053±127 m.y. However, the exact age of these metasediments is not known. Lithological similarity was previously used to compare these rocks with the middle Dharuars (Rahman, 1969) of Karnataka (Mysore).