CHAPTER III

GEOLOGICAL SETTING

In this chapter, the author has given a systematic and detailed account of the distribution, lithology and field characters of the various rock types encountered in the area. As already stated, the area comprises a Delhi metasedimentary sequence into which have been intruded mafic sills and granitic rocks. The rocks show the following age relationship:-

Granitic rocks	...	...	Erinpura granite
Mafic rocks	...	...	Post-Delhi but pre-Erinpura granite
Calc-gneisses	)		
Biotite-gneisses	)	...	Delhi system
Quartzites	)		

The areal distribution and broad details of the various formations are given in the enclosed geological map prepared by the author (Fig.-III.1).

DELHI SYSTEM

The rocks of the Delhi system are ideally exposed in the northern half of the area and include a folded sequence of metamorphosed sediments, occurring in the form of a number of anticlines and synclines. The entire Delhi sequence exposed within the study area has been, following Heron (1953), correlated as under:

Calc-gneisses Biotite-gneisses	...	Ajabgarh series
Quartzites	...	Alwar series

The quartzites form the lower most formation of the succession. To the east, outside the area, these quartzites have been found to be resting over the Aravalli phyllites, and Merh & Patel (1968) and Patel (1968) have shown that the Delhi-Aravalli contact is inverted. According to them, this overturning took place during the Delhi folding. These quartzites are overlain by a pelitic formation which in its present state is seen as a biotite gneiss - a mixed rock of migmatitic nature formed due to permeation of Erinpura

granite. The next younger formation which constitutes the most conspicuous and striking rock of Delhi system in the area is a group of metamorphosed impure calcareous beds. The combined effects of regional and contact metamorphism on these rocks together with their cross-folding have resulted into a very interesting mineral assemblages and structural pattern.

The Delhi rocks are seen folded into a number of synclines and anticlines of varying shapes and dimensions all trending N.N.E.-S.S.W. The calcareous rocks exposed in the northern portion show a pair of fairly open anticline and syncline, while quartzites occuring along the eastern border are seen to have folded into a tight anticline.

Quartzites

The quartzites constituting the lowermost series, mainly occur in the eastern portion of the area and form the basal part of the Delhi sequence. All along the eastern boundary of the area these quartzites show a strong development, outcropping from south to north. They form conspicuous hills and show a considerable thickness on account of repeated folding.

Being more resistant to the effects of weathering the quartzites stand out in higher relief giving rise

to prominent hills (Plate-III.1). The quartzite hills at Munai and Sunsar in S.E. portion of the area have attained heights of about 275 m. to 335 m. The hills tend to rise higher towards N. and Chorivad hill in the N.E. corner forms the loftiest topographical feature of the area. The highest peak of the hill is about 610 m.

The quartzites are of different type and nature, and show variation in colour, grain size, texture and mineral composition. The colour variation is marked by various tints such as grey, pink, buff and white. The variation in texture is shown by the difference in the grain size at different places. Mostly it is fine to medium grained but occasionally becomes coarser. Changes in the mineral composition are also noted at various places. The minerals that add to the diversity are feldspars and micas, though they are quite subordinate to quartz. Some quartzites are completely devoid of these impurities, other contain them in a variable proportion.

Generally speaking, the quartzites are structurally massive and do not show any well marked bedding or cleavage. The quartzite at places shows faint,imponderable

PLATE-III.1

DELHI QUARTZITE SHOWING JOINTS AND
FRACTURE CLEAVAGE (LOC: POSINA)

streaks suggesting original bedding and in contrast to which a distinct secondary cleavage is seen developed at almost all the places. Sedimentary bedding is mostly obscured and only on a very careful scrutiny the lithological variation imparting streakiness has been revealed to understand bedding attitude. The micaceous streaks in these quartzites sometimes reveal a metamorphic cleavage which is seen making an angle with the bedding.

Joints however are abundant and several sets are preserved.

The quartzites form N.N.E.-S.S.W. anticline on account of which they show a great thickness. The regional trend of the strike of the formation is N.N.E.-S.S.W. and the dips are steep easterly or vertical. All along, the rocks have developed a fracture cleavage which almost have the same strike as the bedding but dips due E. with smaller angles. In the absence of well preserved bedding, the cleavage-bedding relationship could not be studied in detail. These quartzites at some places are intruded by granites and porphyries of Erinpura age.

In the following lines the author has briefly described the prominent exposures of these quartzites.

Almost all along the eastern border of the area, these quartzites form conspicuous hills and ridges at Posina, Munai, Sunsar (16 km. S.E. of Idar), Vasai, Mundeti (17.5 km. E. of Idar) and Kathrot and Choriwad (19 km. N.E. of Idar).

At Posina the quartzites are compact, massive, and of pink colour and show occasional development of a distinct fracture cleavage. These are seen intruded by small bodies of granite porphyry. The quartzite hills around Munai are identical to those at Posina, the rock being buff and pink, shows well developed fracture cleavage and faint sedimentary layering. Nearby exposures at Sunsar also show similar quartzites, the fracture cleavage in which strikes N.N.E. Here the quartzites tend to contain a few thin argillaceous layers. The quartzites themselves are seen to have a few grains of feldspars and few specks of biotite. On going northward along the strike of the formation, good exposures of quartzites form hills near Vasai. Here also the rocks are seen cut by the granite porphyry. The intrusion has given rise to typical feather joints along the contact. The Vasai outcrop shows good preservation of bedding and the relationship between the bedding and the cleavage is quite ideally seen. The

strikes of both are almost the same, the latter is somewhat more easterly, but while the bedding shows very steep dips due E., the cleavage dips at about 40°-45° to E.

The quartzites when traced further north show good exposures at Mundeti, Kathrot and Chorivad. The quartzite hill just north of the village Mundeti is similar to that of the exposures described above except that here the cleavage is absent and the rock is massive. Bedding too cannot be seen. The quartzite hill of Kathrot shows some evidences of shearing; a fracture cleavage has prominently developed and abundant formation of quartz veins along some cleavage planes and along other joint planes, is recorded.

The most majestic and prominent exposure of the quartzites lies in the extreme N.E. forming a N.-S. 10 km. long ridge. The village Chorivad is at the foot of the southern end of the ridge. Rising to a maximum height of 610 m., the quartzite ridge shows steep slopes on west and gentler slope in the east. This conspicuous linear outcrop comprises a tight anticline with a steep western limb and a moderate dipping eastern limb. Perhaps it is a northenly extension of the Mundeti exposures shifted by about 3 km. westward by an E.-W. fault.

Biotite-Gneisses

Originally, a pelitic formation and overlying the quartzites is now seen as biotite-gneisses gradually merging into a foliated granite. These gneisses are the best seen in the area in the north-eastern part, between calc-gneiss exposures at Vadali and the Chorivad quartzite ridge. It is quite evident that a considerable portion of the unexposed terrain in the central part of the area is made up of more granitised variety of these gneisses. The biotite-gneisses themselves represented the earliest stage of granitisation and have been considered by the author as feldspathised biotite schists and permeation gneisses. Fairly good outcrops of these rocks are encountered at E., N.E. and W. of Vadali. The villages Damavas and Medh to the E. and N.E. of Vadali, show exposures of gneisses which are relatively less migmatised as compared to those seen near villages Badol, Reda, Kamboya and Hathoj, about 12 km. W. of Vadali (Plate-III.2).

Though handicapped by the disconnected and patchy exposures of these gneisses, the author has been able to collect adequate samples and data to work out quite a coherent sequence of migmatisation which has transformed an originally argillaceous metasediment into granite-gneiss.

PLATE-III.2

FOLDED BIOTITE-GNEISS (LOC: MEDH)

Based on the field study alone the gneissic group can be classified into following four types:-

a. Feldspathised schist,

b. Streaky permeation gneiss,

c. Sub-augen gneiss,

d. Augen gneiss.

Feldspathised schist is a dark coloured schistose rock, highly micaceous and containing small feldspar grains. As compared to other below-mentioned varieties of gneisses, this contains less feldspar. The streaky permeation gneiss shows a somewhat striped appearance with a feldspar content higher than the previous variety. This rock is less schistose. The aggregates of feldspar grains occur as thin straight or wavy streaks alternating with micaceous foliae. With gradual increase of feldspathic material the permeation gneiss turns into a sub-augen gneiss. The rock is less schistose, the feldspar steaks are enlarged and thickened. The gneissic structure is marked by the alternating light and dark coloured bands. The feldspars quite often tending to occur as sub-augens and pods and are somewhat porphyroblastic and wrapped round by the selvages of biotite. With increasing addition of quartzofeldspathic material the rock passes into a

typical augen gneiss. It is a fairly coarse foliated gneissic rock with numerous feldspar augens. The augen gneiss finally change over to the gneissic granite.

Though the sequence of granitization is quite obvious from the samples collected, it could not be possible to delineate the boundaries of the different varieties on account of lack of good continuous outcrops. But in a broad sense, the increase in granitisation is seen on proceeding towards granites. The exposures to the E. and N.E. of Vadali show generally lesser effects of granitisation, and at most places the rocks are feldspathised schist and permeation gneiss. On the other hand, the area to the W. of Vadali shows an increased feldspar content and the rocks are more granitised, being at most places augen bearing. Patches of gneissic granites are frequent in the augen bearing gneiss.

The foliation trends of the gneisses follow the folding of the overlying calc-gneisses. The foliation is almost N.-S. and steep E. around Damavas and Medh (8 km. N.E. of Vadali) but westward it generally swings to E.-W. with moderate dips to N. Further W. in the neighbourhood of Hathoj (11 km. W. of Vadali) the strikes are as much as N.E.-S.W.

Originally these pelitic rocks must be containing frequent psammitic lenses and these now occur sporadically as quartzites all over the gneissic area.

Calc-Gneisses

The biotite-gneisses described above are overlain by the next younger formation consisting of banded calc-gneisses, and are correlated with the upper division of the Ajabgarh series. The rocks of this group occur in the northern half of the area at and around villages Babsar, Ambawara, Gambhipur (N.W. of Vadali) and in Gota, Patera, Damavas (N.E. of Vadali) almost forming northern boundary of the study area.

The calc-gneisses have given rise to an elevated irregular hummocky type of topography, and are ridged along the strike on the map. They also occur in knolls, mounds, rough and broken hills and hillocks which give rise to a rather undulating country. This topography shows contrast sharply on one hand with plain terrain and on the other, with elevated mountain mass of Delhi quartzite and more rugged massifs of granite.

The calc-gneiss is very well banded in layers of varying composition showing different colours and textures. The bands alternatively constitute pale and

dark material. This markedly banded appearance is seen in detail to be due to the layers (1 cm. to 5 cm. wide) of almost pure calcite alternating with those in which quartz, feldspars and various calc-ferro-magnesian silicates are also developed. The banding frequently shows contortions, puckers and compressed S and Z structures which clearly stand out on weathered surfaces due to differential weathering (Plate-III.3). The fold patterns shown by these gneisses clearly indicate a local cross-folding.

The gneisses are abundantly cut by quartzo-feldspathic veins of varying thickness ranging from few centimeters to sometimes as much as 15 meters. This permeated granitic material generally follows the trend of the banding tough occasional transgressions are not uncommon, where they are seen cutting across the calcareous bands (Plate-III.4).

Their metamorphic characters show a superimposition of contact metamorphism over regional metamorphism. Wherever the calc-gneiss is affected by the contact metamorphism, development of corundum porphyroblasts is recorded.

This calcareous formation forms a pair of syncline and anticline. These folds are fairly open and plunging

PLATE-III.3

CALC-GNEISS SHOWING MINOR FOLDS (LOC:VADALI)

PLATE-III.4

QUARTZO-FELDSPATHIC VEINS IN
CALC-GNEISS (LOC: VADALI)

due north. The synclinal structure is in the east and comprises outcrops to the N. and N.E. of Vadali, while the complimentary anticline is in the western part, N.W. of Vadali. The regional strike in the eastern part is N.-S. with local variations from N.N.W.-S.S.E. to N.N.E.-S.S.W. and dips are vertical to steep easterly. This trend rapidly changes at 2 km. N.N.W. of Vadali and the beds run E.-W. so as to to carry the outcrops towards Morad and Dharol exposures (5 and 8 km. N.W. of Vadali respectively). Further west the trend veers to N.N.W.-S.S.E. with comparatively gentle dips of 30° to 50° towards E.N.E. forming the eastern limb of the anticline, the western limb of which forms the westernmost part of the area where strike is N.N.E.-S.S.W. with dips of 55°-70° towards W.N.W. The vertical limb of the syncline in the eastern portion shows a highly contorted and wriggled nature with compressed S, Z and M structures, and 'eyed-folds' (Plate-III.5).

The two complimentary folds are quite open and plunge gently due N.E. Superimposition of a gentle W.N.W.-E.S.E. folding is seen at most places in the fluctuation of the foliation trend. However in the easternmost exposures at Patera dam-site (6.5 km. N.E. of Vadali) the effects of cross folding are prominently

PLATE-III.5

REFOLDED FOLDS AND EYED-FOLDS
IN CALC-GNEISS (LOC: PATERA DAM)

seen and due to which large number of refolded folds have developed giving rise to 'eyed-folds' and 'mirror-image' structures.

These metamorphosed calcareous rocks show an original lithological variation from layer to layer. The various layers contain calcite and calc-silicate minerals (diopside, sphene etc.) in different proportions and thus depending upon the dominance of silicates or otherwise, the layers have responded differentially to weathering. The later granites have added some quartzo-feldspathic material to these rocks and which is seen as discrete veins, lenses and pods. Lit-par-lit injections of quartzo-feldspathic material is not uncommon. In addition to this, effect of contact metamorphism is also seen at Dharol-Nadri exposures (8 km. N.W. of Vadali), which has resulted into the development of wollastonite and corundum. These minerals are easily indentified in hand-specimen (Detailed petrological account of these rocks are given in the subsequent Chapter).

MAFIC ROCKS

The Delhi system of the area has witnessed two igneous activities, which are represented by mafic intrusions followed by granites.

Mafic rocks are seen cutting the Delhis. Their outcrops are only a few in number and occur scattered in various parts of the area. The outcrops of these mafic rocks have been found to be more of the nature of sills rather than dykes. The important outcrops are noted near villages Kawa, Satharva, Govindi, Reda, and Malpur situated to the west of Idar and Vadali. Scattered all over the area these sills are recorded both in calc-gneisses as well as in the granitic terrain. Their intrusive relationship with the Delhis is clear and well marked. But their occurrence in granitic rocks shows that the latter are younger (Plate-III.6). At many places, granites are seen forming hybrid rocks at the contact. Also fine-grained granitic and pegmatitic veins are seen cutting the mafic rocks (Plate-III.7). This mafic igneous activity obviously followed the Delhi orogeny but preceded the emplacement of the Erinpura granites. It is very evident from the field relationship itself that the Erinpura granite activity followed the mafic rocks and thus the contention of Middlemiss (1921) that these dykes are of post-Erinpura granite age is not valid.

In all, about fifteen occurrences have been recorded and they show considerable variation in their

PLATE-III.6

XENOLITHS OF MAFIC ROCK
IN GRANITE (LOC: KAWA)

PLATE-III.7

GRANITE DYKE CUTTING THE
MAFIC ROCK (LOC: KAWA)

width and extention. It is quite likely that a few more exist but are lying unexposed under the soil cover of the gneissic-granite terrain. These mafic rock bodies are of the nature of lensoid sills emplaced along the beddings. At Morad (5 km. W. of Vadali) a small body of the mafic rock is seen occuring in the calc-gneiss, trending approximately parallel to the strike of the bedding. Another outcrop of mafic rock in calc-gneiss is seen in the hill at Babsar (19 km. N.W. of Vadali), where it forms a lens of about 6 m. in length and 30 cm. in width, striking N.N.E. At both the places, this mafic rock is clearly seen to be of later age than the calc-gneiss in which it occurs but shows considerable alteration due to the nearness of the later granite.

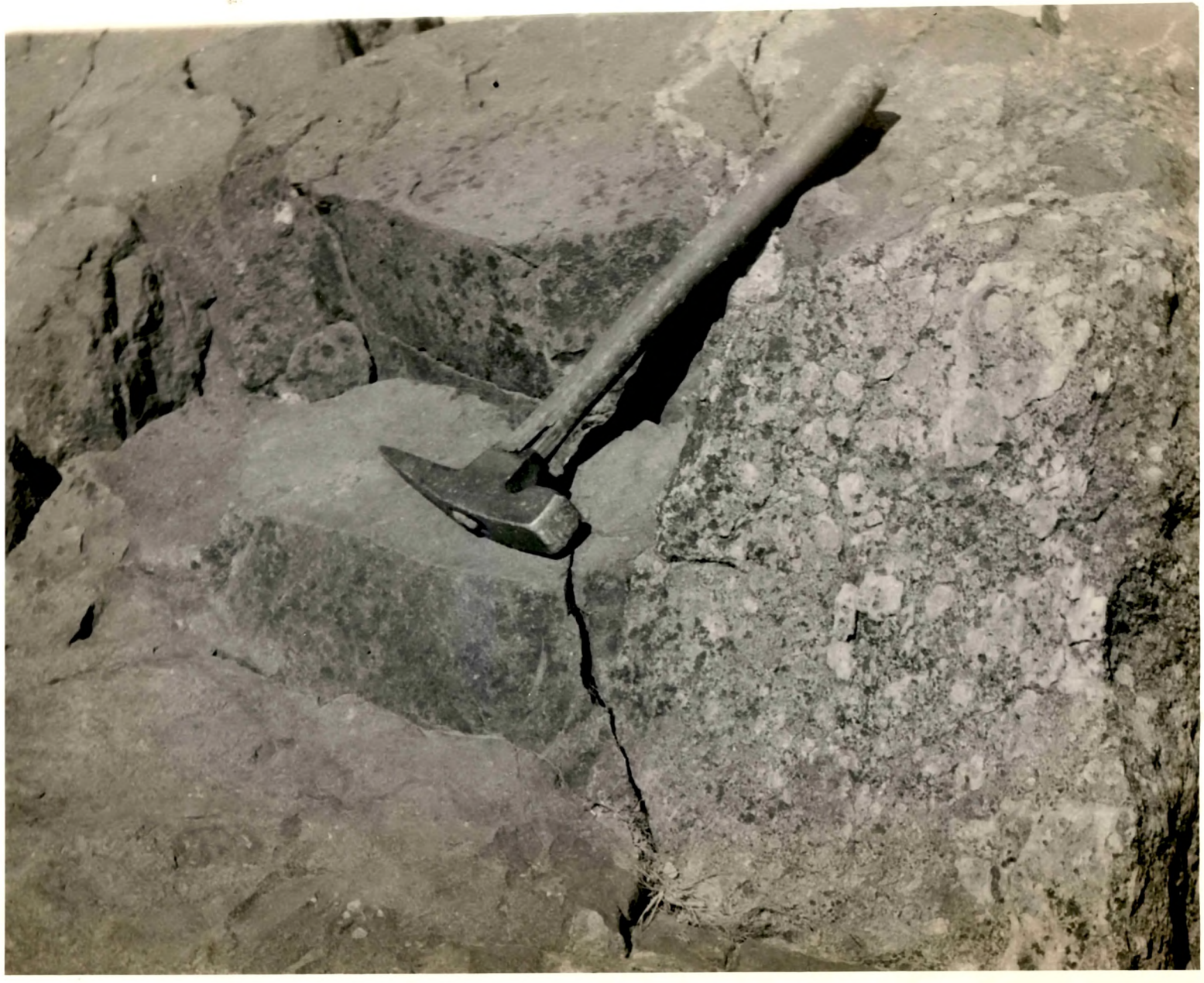
The most striking and interesting exposures of the mafic rock occur within the granitic terrain, and the hills at Kawa (11 km. W.N.W. of Idar), Reda (6 km. N. of Kawa) and Satharva (5 km. W. of Vadali) show all stages from fresh to completely gfanitised varieties. Of the above three occurrences, the one at Kawa is the most prominent. Here the mafic rock forms a striking 285 m. high elongate hill. This outcrop is the largest one, about 600 m. wide and extending for 850 m. Flanked

by the granites on all sides, the main bulk of the rock within the hill is surprisingly fresh and unaltered. It is found to be a coarse olivine bearing dolerite. At many places along its contact with the granite this rock has developed metasomatic clusters of feldspar augens. Assimilation of mafic rock by granite has also given rise to the development of quartz-dioritic rocks along the margins. An interesting feature of this exposure of the mafic rock is the presence of fine-grained dark coloured veins of yet another mafic rock (found to be of andesitic nature under microscope) cutting the entire doleritic mass. These veins hardly exceed 50 cm. in width and extend for several meters. They strike due W.N.W.-E.S.E. These fine grained mafic veins quite often contain fragments of the coarser rock and obviously the two varieties represent the early and late differentiates from a common subterranean source. The entire hill is further seen cut by numerous finegrained granitic veins (Plate-III.8).

The Kawa hill received much attention from Middlemiss (1921). He believed that the granites were older to the mafic rock and the hybridisation was a phenomenon of the interaction between an early granite and the late dolerite. This however is not true. The field evidences conclusively

PLATE-III.8

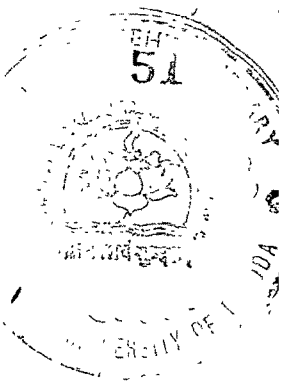
GRANITIC ROCK CUTTING THE
ANDESITIC ROCK (LOC: KAWA)



point to a relationship the other way round. In fact, the author believes that the hill offers solution to almost all the important problems in respect of the sequence of mafic and acidic igneous activities of the region.

About 6 km. N. of Kawa hill there is another N.N.E. trending mafic exposure near the village Reda. It is not clear whether the Reda exposure is a continuation of the Kawa rock or it forms a separate lens. At Reda the mafic rock forms low lying hills cropping out of the soil cover. Here the rock is quite fresh and unaltered almost gabbroic in texture. Veins of fine-grained micro-granite cut this rock.

On going further N.E. the mafic rock is again encountered in the hill near the village Satharva (5 km. W. of Vadali). The hill is of granite - 314 m. high, and within it a fairly big patch of mafic rock is seen surrounded by granites. The mafic body is about 150 m. thick and extends due N.W. for approximately 3 km. The rock here looks quite similar to the hybrid variety found at Kawa and is more of the nature of quartz-diorite or highly biotitic hornblende granite.



Near the village Vehrbar (15 km. S.W. of Vadali) a small occurrence of the mafic rock affords a good example of the alteration brought about by the early metasomatic phase of granite activity during which the rock changed over to an epidiorite. This rock does not show any effects of actual impregnation of the granitic matter.

Similar lenses of altered mafic rock in gneissic granites are also recorded from Vadali. Here too, the rock is epidioritic suggesting a hydrothermal change due to granitising emanations. From a well section at the village Thuravas, (2 km. S.E. of Vadali) again epidioritic rock has been collected. Due to scarcity of exposures the exact number of mafic occurrences in the low lying gneissic granite could not be obtained, but it is probable that quite a few of them are there. Obviously these mafic bodies formed lenses in the biotite schists prior to their granitisation as gneisses.

It is evident that the mafic intrusives were considerably affected by the later granite. The petrographic and chemical studies (Chapter V) amply substantiate the field characters of the mafic rocks, which were variously affected by the granite. To summarise,

the mafic rocks appear to have undergone following changes:

(1) During the early metasomatic phase of the granitic activity, they changed over to epidiorites,

(2) Later on, with the intrusion of potash granite, they gave rise to a variety of hybrid rocks due to their assimilation in the granite.

GRANITIC ROCKS

The Erinpura granite comprises the youngest formation of the region and occupies almost 2/3rd of the area. Belonging to an acidic igneous phase during the closing period of the Delhi orogenic cycle, the granites and gneisses occur in abundance in the central, western and southern part of the area. Broadly speaking, granitic rocks fall into two categories (1) gneissic (2) massive. The gneissic variety occupies the vast plain terrain, capped by a thin soil cover, while the massive granite forms numerous massifs of hard bare rock. It is evident from the field study alone that the hills, bosses and stocks of hard massive granite, represent late intrusions in gneissic-granites. Investigations have shown that the two granitic varieties represent early and late phases of a single granite activity. Salient features of the

mode of occurrence and field characters of the two varieties have been summarised below.

Gneissic Granite

This foliated variety occupies most of the low lying plain area and is either covered by soils or shows highly weathered exposures of low relief. Though its presence is recorded in all low-lying terrain, its fresh samples are difficult to obtain. The atmospheric weathering has affected this rock upto a depth of 5 to 7 m. However, it was possible to collect rather fresh and unaltered specimens from a number of well sections, and these were found to be a fairly coarse and foliated rock with vitreous quartz and big feldspar grains. The mafic mineral is biotite and this mica marks the foliation. The relative proportion of feldspar and micas is somewhat variable. This gneissic granite on going towards N.W., N. and N.E., tends to merge into the biotite gneisses of the Delhis. All throughout, these gneissic granites contain frequent lenses of quartzites, obviously representing the original psammitic layers in schists and now constituting an ideal example of the so called "Ghost Stratigraphy" of Read (1957, p.346). Similarly within the gneissic granites, a number of patches of less feldspathised biotite gneiss

are seen to occur. These are the relicts of the pelitic metasediments only partly granitised. Also the sill-like bodies of mafic rocks, now occur in an epidioritic stage, indicating their alteration during the transformation of schists into granitic gneiss.

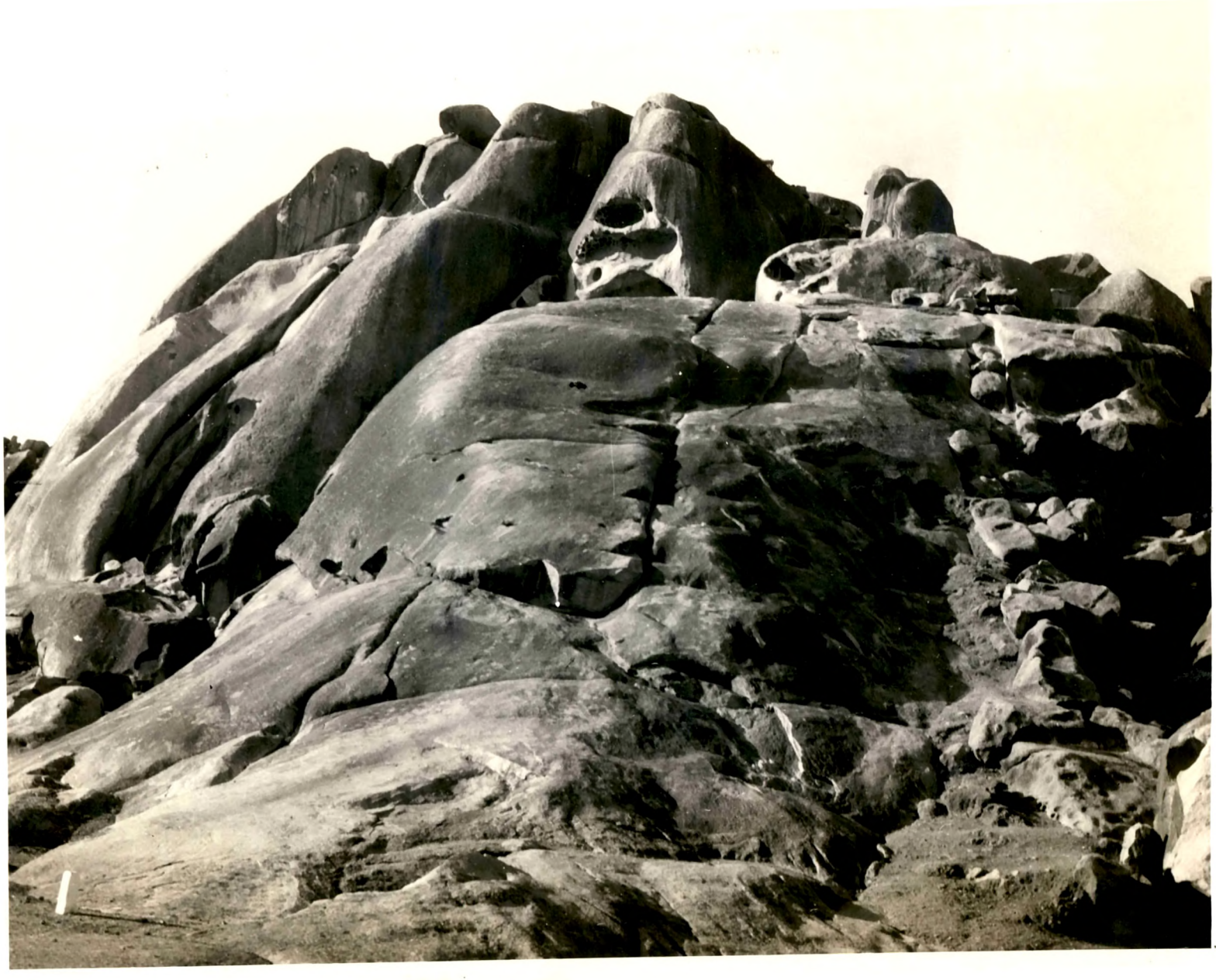
Massive Granites

This variety comprising unfoliated and massive granite forms prominent hills and represents the late intrusive masses. The entire central and southern portion of the area is dotted with hills of this granite, standing out as distinct physiographic features above the gneissic plains. The most conspicuous and the largest exposure of this granite occurs as the Idar massif, occupying about 18.6 sq. km., and rising to a maximum height of 492 m. This granite massif is made up of connected hills showing typical rounded tops with abundant holes and cavities (Plate-III.9). Other prominent exposures of this unfoliated granite occur in the W. and N.W. of Idar and mark the hills around the villages Sabalwad, Dantroli, Vasai, Nadri, Vehrabar, Naranpura, Gulabpara etc.

This massive granite always occurs quite fresh and is made up of a number of textural varieties. In

PLATE-III.9

GRANITE HILL SHOWING TYPICAL
WEATHERING (LOC: IDAR)



the field itself, coarse-, medium- and fine-grained varieties can be easily recognised. Quite often they are porphyritic. For the most part, the colour is pink. The coarse- and medium-grained varieties merge into one another and can be present in the same hill. The fine-grained microgranite and aplite types and porphyries cut the main mass as distinct veins (Plate-III.10). Pegmatitic and quartz veins are frequently developed.

Hills around Idar: Around Idar town, the granite is seen to form a group of rugged and pinnacled hills and tors of smaller sizes. The hills show grotesque outlines due to unequal weathering by exfoliation. In the immediate vicinity of Idar the constituent rock is dominantly a coarse-grained nonporphyritic pink granite with a subordinate mafic mineral content. In its southern part,in the hills overlooking the Mahakali temple, a fine-grained porphyritic variety is encountered. Perhaps it shows an intrusive relationship with the main granite. In the outcrops on the northwestern end, (N.E. of the village Barvav) the granite is medium-grained, highly jointed and shows a more pronounced weathering resulting into somewhat rounded and flat topped hills.

PLATE-III.10

VEINS OF MICROGRANITE CUTTING
THE MAIN GRANITE (LOC: DANTROLI)

Just south of Barvav, near the village Surpur, at the foot of these granite hills, the junction between the gneissic and massive variety is quite clearly seen.

Hills at Bhawangadh and Dantroli: A little to the N. of Idar, two group of hills of this granite occur - one to E. of Bhawangadh and the other around Dantroli. The rock at Bhawangadh is medium-grained biotitic while that of Dantroli is again coarse-grained. At both places the granites are identical in colour and massiveness but show same variation in grain size.

Hill at Satharva: The granite here occurs in a small hill which also has an early mafic sill. The granite is a coarse massive pink equigranular but its contamination by the mafic rock has resulted into a hybrid hornblende-biotite rich variety.

Hill at Vehrabar: In the western extremity of the area, this rugged hill comprising several peaks, affords a very interesting occurrence of the late granite. It is in this hill that a clear age relationship between the early foliated granite and the late massive variety is ideally recorded. Here, the main mass of the hill is seen to contain a pink granite with abundant patches of grey foliated variety. From the field relationship

it is obvious that the grey and biotitic granite is older than the pink one. All along the eastern periphery of this hill, one comes across numerous fragments of gneissic variety included in the massive granite (Plate-III.11).

Dykes and veins of microgranite cutting the various outcrops of the massive variety are considered as igneous bodies intruded during the late phase of the granite emplacement. An interesting late granitic differentiate is seen as quartz-feldspar porphyry. This variety forms a distinct mass intruding the quartzites near Vasai (E. of Idar). Similar porphyry is also seen at the south-eastern end of the Idar hill massifs.

PLATE-III.11

XENOLITH OF GNEISSIC GRANITE IN
UNFOLIATED MASSIVE GRANITE
(LOC: VEHRABAR)