

CHAPTER I

I N T R O D U C T I O N

LOCATION

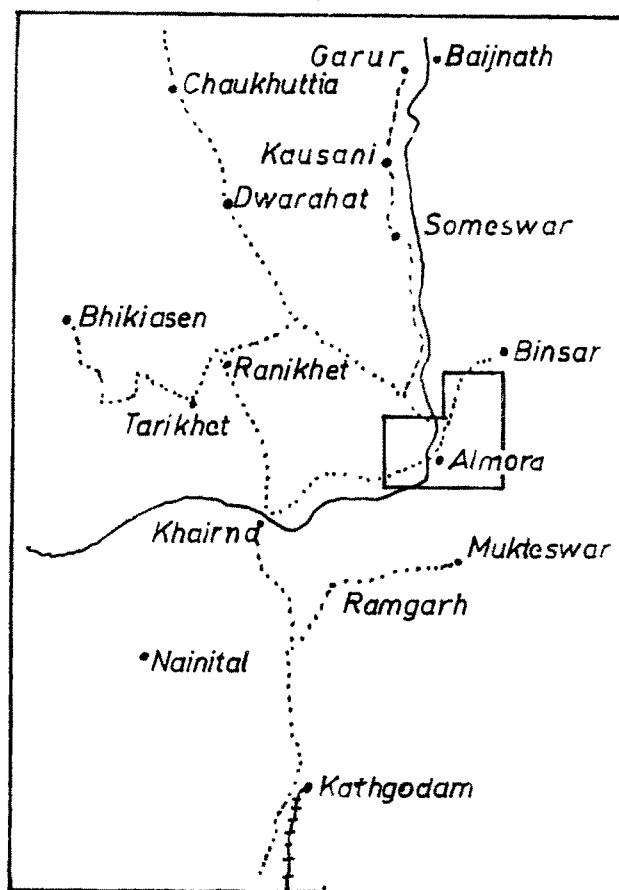
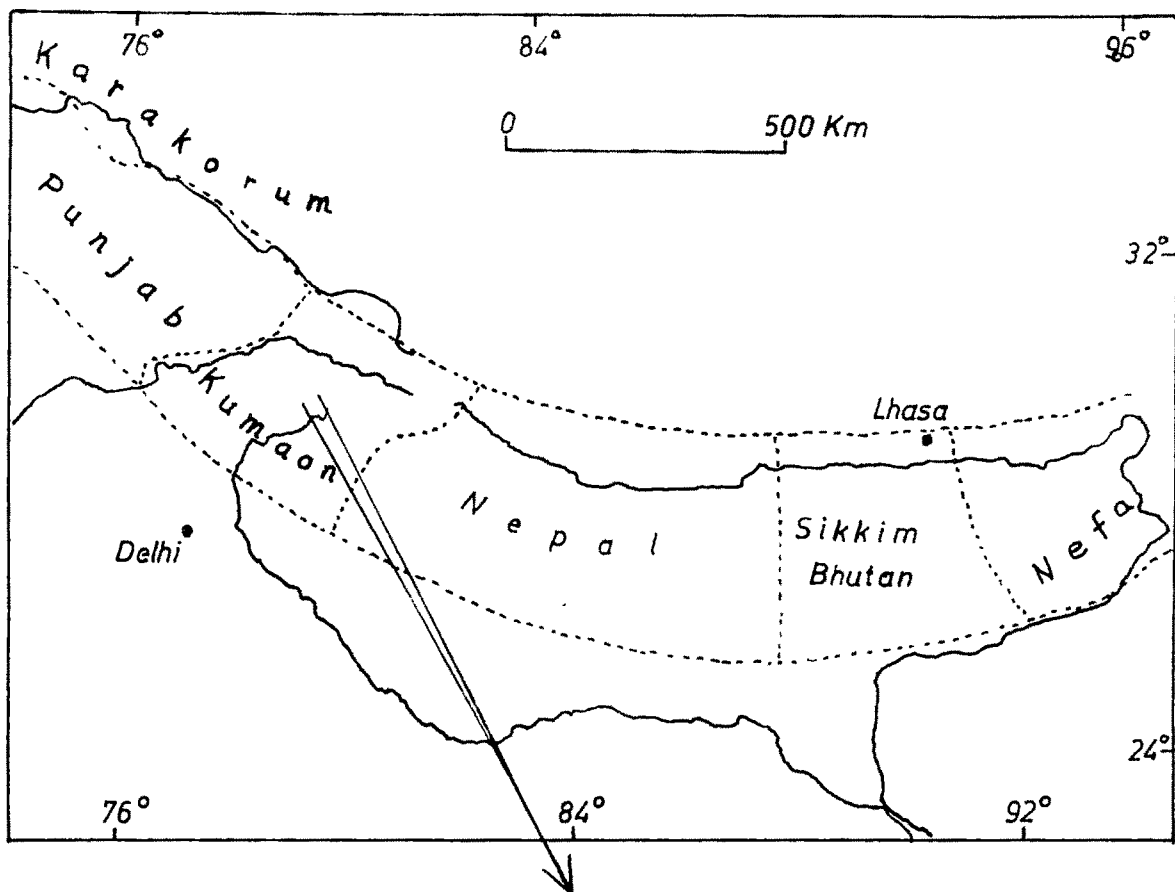
The thesis incorporates the results of a detailed geological investigation of the crystalline rocks around the town of Almora in Kumaon Himalaya (Fig.I.1). The study pertains to an area of about 102 sq. km, enclosed by the N. Latitudes $29^{\circ}33'$ to $29^{\circ}39'$ and E. Longitudes $79^{\circ}36'$ to $79^{\circ}42'$.

PHYSIOGRAPHY AND DRAINAGE

Physiographically, the study area which exhibits a typically rugged topography, forms a part of Nag Tibba range of the lesser Himalayas. The

Location Map

Fig.1.1 2



study area comprises four prominent hills. In the north-east lies the famous Kasardevi hill (1954 m). The eastern area is marked by the Bandanidevi hill (2053 m) which extends further south beyond the limits of the study area. The western limit of the area is marked by the slopes of the Siahidevi hill range. The flat-topped Almora hill range (1677 m) comprises the central portion. The famous Dyolidanda granite hill forms a part of the Almora hill. Bandanidevi hill is separated from Almora hill by Sual river which flows from NE to SW to meet Kosi river. The river Kosi flows from N to S along a valley which separates Siahidevi hill range from the Almora hill range. The limits of the study area are marked, in the north by Kasaum and Kaparkhan villages, in the south by Chaunsali and Aincholi villages, in the east and south-east by Chitai, Sual and Pokhri villages and in the west and north-west by the villages of Naugaon, Khunt and Jyoli.

The drainage pattern of the area is mainly of consequent type and is controlled by the topography, structure and tectonics of the region. All the smaller streams flow to either Sual or Kosi river.

The Sual finally meets the Kosi at Gurari bridge south of Chaunsali in a steep valley, characterised by numerous entrenched meanders.

Among the tributaries of the Kosi, draining the Almora area, in addition to Sual river, other important ones are the Jamtharagad which flows westward from Almora bus station and Mahadev-gad from below the Bintola village up to Jaketha in north-east. All these streams are perennial, and in turn fed by an intricate network of numerous seasonal smaller nalas and streamlets.

CLIMATE AND RAINFALL

Climate of the area is very pleasant and healthy. The average temperature is 27°C during summer (mid April-June) and 5°C during winter (November-January). The monsoon by westerly winds which breaks earlier than the plains commences from June, and the area receives about 1500 to 1700 mm of rainfall. Very occasionally, the area experiences snowfall during the month of January.

FAUNA AND FLORA

The area is reported to abound in wild animals like leopards (Felis jabuta), panther (Felis paradisi)

and black bears (Ursustov quartus). Other wild animals are spotted deer (Carvas unicolor), jackals (Cavis querus), pigs and monkeys. Domestic animals such as dogs (Canus jamilians), bullocks (Bos indicus) and goats (Hemitragus himalayan) are very common. In addition to these the fauna comprises birds of various types, snakes and lizards.

The flora varies with the altitude. Sal (Shorea robusta), Sain (Terminus tomentosa) etc. are found up to the elevation of 1524 m. Beyond this altitude, the Chir (Pinus lengifolia) and oak (Quercus incana) commonly grow. Besides these, the fruit trees of almost all description are noticed, among which apricot, citrous fruits, strawberry, black berry and oranges are common.

HABITATION

Being a district place Almora is very thickly populated. The people of the area are mostly Hindus, though Christians and Muslims also form sizable numbers. The local language is Kumaoni, but almost all can speak and understand Hindi.

TRANSPORT AND COMMUNICATION

Almora is connected with the nearest railway station Kathgodam, the terminus of NE railway, in the south by a good 88 km motorable road. It is also connected by good all-weather roads with important hill stations of Nainital, Ranikhet and Kausani.

PURPOSE AND SCOPE OF INVESTIGATION

Though the Almora area has been geologically investigated by a number of previous workers, none have attempted a detailed study of the structural and metamorphic history of the rocks of the area. The author took up the present investigation with a view to work out in detail the lithology, metamorphism and structure of the area around Almora. His main purpose of the study was to establish successive events of tectonism and metamorphism, and to find out the relationship between the two processes. Such a study was very essential to understand some bigger problems of the geology of Almora nappe. The author spent an aggregate period of about 25 weeks in the field during the summer and autumn months of the years 1966, 1967 and 1968.

The area forms a part of 1-Inch Survey of India Topographical Sheet no. 53.0/10. The mapping was carried out on a 6"=1 mile scale, enlarged from the original 1"=1 mile toposheet. For the purpose of their inclusion in this thesis, the maps were reduced to 4" = 1 mile scale.

The author has prepared a detailed geological map of the area. He has not only delineated the different lithological types, but has also made a systematic record of their metamorphic characters. He has collected considerable structural data that included (i) dips and strikes of bedding, schistosity and a later cleavage, and (ii) lineations of several generations. He has also investigated the granitic rocks of the area with a view to understand their nature and evolution. The structural data obtained was analysed with the help of an equal area net, to work out the structural pattern. Thin section studies of representative samples of the various rock types were made and the textural and mineralogical data thus obtained was utilised in deciphering the metamorphic characters. Petrographic and chemical studies of the metamorphics, gneisses and gneissic granites were

carried out to establish the sequence of changes leading to the granitisation of metasediments. Field mapping together with the data obtained by structural, petrographic and chemical analyses, have revealed interesting sequences of structural and metamorphic episodes.

BRIEF GEOLOGY

In order to provide a suitable background to the reader, the author has given below a very brief summary of the geology of the study area as worked out by him.

The rocks around Almora form a part of the Almora Nappe zone of Heim & Gansser (1939). The synformally, folded Almora nappe rests over the younger rocks of the Krol nappe, separated by the Almora Thrust (Garhwal thrust of Auden). The rocks comprise a crystalline assemblage of garnet mica-schists, quartzites, gneisses and gneissic granites. Stratigraphically, the rocks could be assigned to the Chandpur stage of Jaunsars (Auden, 1937; Heim & Gansser, 1939 & Gansser, 1964).

Textures and mineralogy of the schists from the different parts of the area clearly show their

polymetamorphic nature. The gneissic granites show their derivation from schists by the process of granitisation. Structurally too, the rocks have preserved evidences of several fold episodes, each having left a permanent imprint on the rocks. It is so obvious that the area was subjected to intense isoclinal (reclined) folding, and it was during this deformation that the main progressive regional metamorphism was brought about, the metamorphic foliation viz., the schistosity coinciding with the axial-plane of the isoclinal folds. The next major event of deformation was that of the synformal folding of the entire nappe. Some textural and mineralogical changes were brought about during this fold episode. The last event of folding in NNE-SSW to NE-SW direction, has given the existing outcrop pattern to the area. This folding had little metamorphic impact.

All these aspects are discussed in detail in the following chapters.