INTRODUCTION

Little is known on the Quaternary geology and geomorphology of Tripura, although geological work in the state started way back in 1908. Surveys conducted by different workers viz: Das Gupta (1908), Das (1939), Vachell(1942), Sen (1957), Trivedy and Sar (1969), Sen (1969), Trivedy (1963, 1964), Ghosh and Bhattacharyya (1980) and others were mainly restricted to elucidation of the Tertiary geology. There is very little systematic account published on the Quaternary of Tripura, except a brief paper entitled 'Pleistocene sediments of Tripura' by Sujit Dasgupta (1979). Although the data presented in this paper is somewhat sketchy, it may be important from the point of view of evolution of ideas on the stratigraphy of the intermontane valleys of Tripura.

The first attempt at systematic study on the Quaternary geology and geomorphology of Tripura with a morphostratigraphic approach was made by the writer during 1980-81 season, in the Khowai Valley of West Tripura District. Subsequently, the investigations were continued for two more seasons during 1981-83, leading to mapping of river valleys such as Khowai, Haora, Sonai Gang and Buri Gang, Lohar Nadi in West Tripura District, Tripura. The mapping demonstrated extensive development of Quaternary fluvial deposits in the intermontane river valleys.
Tripura - the southwestern most border state in northeast India, situated in the western fringe of the Indo-Burman Ranges and overlooking the deltaic plains of Bangladesh, had hitherto remained prehistorically unknown. The Stone Age maps of India usually left Tripura as a blank area (See H.D.Sankhalià 1984, maps in Figs. 31, 33, 55, 55a, 56, 68, 69, T.C.Sharma 1979, map 2, Reba Roy 1987, maps in Figs. 2,4 and 6). Dr. T.C.Sharma observed 'Palaeolithic cultural relics are yet to be reported from Assam, Nagaland, Mizoram and Tripura. Whereas, large collection of smoothed stone tools come from Nagaland, Arunachal Pradesh, Assam, Meghalaya and Manipur. The evidence is still meagre from Mizoram and Tripura' (Sharma 1984-85: 1-28).

The situation has radically changed now as a result of the recent discoveries while carrying out systematic Quaternary geological mapping during 1980-83. The discovery of pottery sites and some scattered stone implements was first made by the writer in course of his surveys in west Tripura during 1981-82 field season. The pottery sites are associated with a lower, younger fluvial terrace at Khas Kalyanpur (Kunjaban) and Seratoli in the Khowai Valley and Kolaghar in the Haora Valley, where the potsherds were found in stratified contexts associated with unaltered Holocene sediments. The peat occurring just below the potsherd layer at Khas Kalyanpur, was dated at 1,430 ± 80 yrs. B.P. by radiocarbon method, indicating that the pottery is likely to date back to proto-historic/historic period.
However, the primitive stone implements embedded in the oxidised sediments of the Upper Pleistocene terrace pointed to Palaeolithic age (Anon 1982:12).

A renewed, methodical and careful search conducted by the writer during the 1982 - 83 season, led to the discovery of at least half a dozen very prolific, primary Stone Age sites (besides 16 scattered sites) in Tripura. This discovery of a long Stone Age series in Tripura has revealed the immense archaeological potentialities of the state for the first time, and has thus opened up a vast scope for prehistoric research in northeast India. It is also perhaps the first attempt in eastern India, wherein the archaeological data are placed firmly in their geochronological contexts, supported by absolute dates. In the present study, only Stone Age sites have been considered.

AIMS AND OBJECTIVES:

The aims and objectives of the present study are:

i) to give an account of the morphology of the alluvial landscape and alluvial streams;

ii) to describe the surficial deposits and associated biological remains;

iii) to understand the nature of soils and their correlation with different morphostratigraphic units;

iv) to reconstruct the Quaternary history;

v) to collect as much archaeological material as possible in their proper geological (stratigraphical) contexts;

vi) to make a site-wise inventory of tool types;

vii) to systematise the collections in order to develop a workable scheme of typological class;
viii) to trace the affinity and origin of cultures and
to workout a chronological sequence of prehistor­
copic cultures of Tripura.

Our main aim has been to trace the developments of the
palaeolithic and neolithic cultures in Tripura and to see how
this area was linked with other parts of northeast India as
well as with the rest of the world of the contemporary period.

FIELD WORK, METHODS AND TECHNIQUES:

The principle of sequential development of landscape of
the alluvial valleys and the techniques of photogeological
studies have been adopted in morphostratigraphic mapping (Fyre
and Willman 1960: 7). Besides sequential toposheets and black
and white aerial photographs, LANDSAT MSS imagery (bands 5 and
7), have also been scanned to delineate broad morphotectonic
and geological domains. However, the account contained in this
thesis is based mainly on the author's extensive and intensive
field work for 362 days spanning 3 field seasons. An area of
about 3000 sq.km was covered by geomorphological and Qua­
ternary geological mapping, by taking close cross-country travel­
ges along rivers/streams and across the jungles, hills and
valleys. Innumerable sections exposed along the natural bank
scarps of rivers and streams were examined and logged for litho­
logical, pedological, palaeontological and archaeological
contents. In addition, sections exposed along roads and in
quarries, trenches and ponds, were scanned for archaeological
data. The cultural sites located during the traverses were plotted on the Survey of India topo-sheets and Quaternary geological-cum-geomorphological map of the Khowai Valley and Haora Valley in West Tripura District, was prepared on 1:50,000 scale.

Schematic section of the Khowai Valley showing the different geological units was prepared. The extent of the Stone Age Sites in terms of vertical and lateral continuities and their geological/geomorphological contexts were studied. The soil profiles and stratigraphy of the sites were studied, photographed and sections of these sites prepared. The implements were systematically collected and numbered site-wise, wrapped in newspaper and packed carefully in cloth bags. The cultural material thus collected were studied in the laboratory, in regard to their typology, technology and nature of raw material used. The implements were classified on the basis of their typology. Site-wise inventory was done and histograms of the distribution of types of tools were prepared site-wise and collectively for Tripura. The representative stone tools were photographed. Line drawings were prepared for some of the more important artifacts. The tool types were compared and contrasted with those (tools documented in the literature) from southeast Asia and rest of India.

**Location:** The study area falls in the Sadar and Khowai Sub-divisions and covers two-third of West Tripura District. It has
international border with Bangladesh on its northern and western limits, while to the east and south lie the North and South Tripura Districts. It is bounded by latitudes 23° 30' - 24° 14' N and longitudes 91° 15' - 91° 45' E and is covered in Survey of India toposheet Nos. 78 P/8, 12 and 79 M/5 on 1:63,360 scale and 79 M/6 & 9 on 1:50,000 scale (Fig.1).

Accessibility: The life line of Tripura, National Highway No. 44, passes through the area and connects the state capital Agartala with Shillong (496 km) and Gauhati (597 km). The nearest railhead is Dharmanagar on N.F. Railway, which is located some 200 km northeast of Agartala. Agartala is connected with Calcutta and Gauhati by regular Indian Airlines services and the airport is 10 km away from the city.

Previous geological work: In recent years, Darshan Kumar, Sujit Dasgupta and Bhattacharyya (1975-76) geologically mapped the Baramura Range in West Tripura District and classified the rocks into: (1) Boka Bill Formation of the Surma Group containing mainly siltstone and sandstone, and (2) Tipara Group consisting of yellowish brown, feldspathic sand rock with clay bands, conformably overlying the Boka Bill Formation on the western limb but having a faulted contact on the eastern limb.

Dasgupta and Battaharyya (1980), classified the rocks of the Khowai, Haora and Lohar valleys into: (1) Surma Group, (2) Tipam Group, (3) Post-Tipam Group or Dupi Tilas (?) and
Recent to Sub-Recent Formations. They suggest a conformable contact between the Surma Group and the Tipam Group, while unconformities are postulated between the Tipams and the Dupi Tilas, and between the Dupi Tilas and the younger Recent and Sub-Recent Formations. They questioned the validity of mapping the unit overlying the Tipams as the Dupi Tilas by previous workers, for its very thin nature in comparison with the Dupi Tilas of the type area and also for the reason that it has a well marked conformable relation in most places. Hence, they prefer to consider this unit as simply a weathered product of the Tipams and not the proper Dupi Tilas.

The NRSA, Hyderabad conducted satellite remote sensing survey of natural resources of Tripura in 1979, on a rapid reconnaissance level and has brought out its work in two unpublished volumes. The first volume offers a descriptive account of the investigations and the second volume contains a generalised map on Lineament Tectonic-cum-geological map of Tripura on 1:250,000 scale, besides thematic maps of landuse, forestry and soil. The report however, recommends a detailed geologic/geomorphologic analysis, for precise demarcation of the controversial units viz., the Dupi Tilas and the Tipams and for a better understanding of the structural/tectonic aspects.

Climate: Being located close to the tropic of cancer on the eastern fringe of the Bengal delta, the climate is typically hot,
humid and monsoonal. In the global climatic scheme, it belongs to the monsoon tropics category. The climate is characterised by distinct seasons i.e., summer, monsoon and winter.

There are two climatological observatories in the area of investigation. The Agartala station represents the Haora and adjacent valleys and the Khowai station represents the Khowai Valley.

In the Haora Valley area (Agartala Station), the temperature recorded for the period of 10 years (1960-79) shows that the average maximum and minimum temperatures recorded are 29.2°C and 17.2°C in May and January, respectively. However, the highest temperature so far recorded was 41.1°C on the 25th May, 1962 and the lowest was 5.2°C on the 4th and 5th February, 1968. The average annual rainfall computed for 13 years period (1960-1972) is around 2020 mm received mainly between April and October. The maximum and minimum rainfall received was around 2860 mm (1964) and 1300 mm (1972). The normal rainfall for Agartala Station is 2024.4 mm. The average humidity during a year varies from 71 p.c. to 86 p.c. The maximum humidity recorded was 92.7 p.c. in July, 1975 and minimum 62.68 p.c. in February, 1979.

Thunder storms and occasional heavy showers cause water logging and flash floods due to catastrophic increase in water
discharge of the Haora and Kata Khal rivers. These have caused severe floods during September, 1982 and May 1984, the latter being unseasonal.

The average monthly precipitation for 25 years period (1958-82), average monthly temperature for 11 years (1972-82) and average humidity for 9 years (1974-82) for Agartala are presented in Table 1 and Fig. 2(A).

TABLE 1

AVERAGE MONTHLY AND YEARLY TEMPERATURE, RAINFALL AND HUMIDITY AT AGARTALA. ELEVATION: 13 m AMSL.

<table>
<thead>
<tr>
<th></th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
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<th>O</th>
<th>N</th>
<th>D</th>
<th>Yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T(°C)</td>
<td>18</td>
<td>20</td>
<td>25</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>27</td>
<td>23</td>
<td>18</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>P(mm)</td>
<td>10</td>
<td>23</td>
<td>57</td>
<td>201</td>
<td>342</td>
<td>455</td>
<td>435</td>
<td>305</td>
<td>240</td>
<td>162</td>
<td>39</td>
<td>7</td>
<td>2276</td>
</tr>
<tr>
<td>RH%</td>
<td>79</td>
<td>74</td>
<td>71</td>
<td>78</td>
<td>80</td>
<td>84</td>
<td>86</td>
<td>85</td>
<td>85</td>
<td>82</td>
<td>77</td>
<td>84</td>
<td>80</td>
</tr>
</tbody>
</table>

The mean maximum and minimum temperature for Agartala for 9 years between 1974-82 is shown in Fig. 2(c).

In the Khowai Valley (Khowai Station), only systematic rainfall data was available. The maximum annual rainfall recorded is 3692 mm in 1976 and minimum 1588.8 m in 1975.

Fog is uncommon. Frost is rare. Cyclone strikes occasionally and causes heavy damage. It has swept over this area in 1961. Famine is unknown.
CLIMATIC GRAPHS OF AGARTALA AND KHOWAI STATIONS
WEST TRIPURA DISTRICT, TRIPURA.

INDEX

- Relative Humidity (RH%)
- Precipitation (mm)
- Temperature (°C)
- Dry months
- Wet months
TABLE 2: MONTHLY AND YEARLY RAINFALL RECORD AT KHOWAI STATION, TRIPURA (in mm)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1968</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1560.0</td>
</tr>
<tr>
<td>1969</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1771.0</td>
</tr>
<tr>
<td>1970</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1712.4</td>
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<tr>
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<td>45.0</td>
<td>35.0</td>
<td>266.4</td>
<td>692.0</td>
<td>366.0</td>
<td>238.4</td>
<td>242.7</td>
<td>173.3</td>
<td>117.6</td>
<td>29.0</td>
<td>Nil</td>
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<td>35.0</td>
<td>10.0</td>
<td>101.5</td>
<td>177.0</td>
<td>289.0</td>
<td>247.0</td>
<td>177.2</td>
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<td>45.0</td>
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<td>Nil</td>
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<td>1973</td>
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<td>100.0</td>
<td>59.0</td>
<td>128.8</td>
<td>657.0</td>
<td>450.0</td>
<td>341.0</td>
<td>399.0</td>
<td>218.0</td>
<td>142.0</td>
<td>182.0</td>
<td>131.0</td>
<td>2791.2</td>
</tr>
<tr>
<td>1974</td>
<td>Nil</td>
<td>Nil</td>
<td>89.0</td>
<td>311.0</td>
<td>373.0</td>
<td>514.0</td>
<td>454.5</td>
<td>249.5</td>
<td>461.5</td>
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<td>35.1</td>
<td>Nil</td>
<td>2471.2</td>
</tr>
<tr>
<td>1975</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>204.5</td>
<td>197.0</td>
<td>171.0</td>
<td>114.0</td>
<td>125.5</td>
<td>180.5</td>
<td>202.3</td>
<td>321.5</td>
<td>Nil</td>
<td>1515.8</td>
</tr>
<tr>
<td>1976</td>
<td>Nil</td>
<td>Nil</td>
<td>N.A.</td>
<td>200.0</td>
<td>576.0</td>
<td>1673.0</td>
<td>607.0</td>
<td>449.0</td>
<td>148.0</td>
<td>61.0</td>
<td>36.0</td>
<td>Nil</td>
<td>3701.1</td>
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<tr>
<td>1977</td>
<td>Nil</td>
<td>Nil</td>
<td>8.0</td>
<td>670.0</td>
<td>594.0</td>
<td>762.0</td>
<td>181.0</td>
<td>433.0</td>
<td>195.0</td>
<td>214.0</td>
<td>87.3</td>
<td>16.2</td>
<td>3210.6</td>
</tr>
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<td>1978</td>
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<td>Nil</td>
<td>90.0</td>
<td>370.0</td>
<td>1084.0</td>
<td>N.A.</td>
<td>99.0</td>
<td>259.0</td>
<td>209.0</td>
<td>169.0</td>
<td>Nil</td>
<td>Nil</td>
<td>2280.0</td>
</tr>
<tr>
<td>1979</td>
<td>Nil</td>
<td>Nil</td>
<td>129.0</td>
<td>183.0</td>
<td>156.0</td>
<td>607.3</td>
<td>48.4</td>
<td>470.1</td>
<td>452.1</td>
<td>68.6</td>
<td>149.8</td>
<td>110.0</td>
<td>2374.3</td>
</tr>
</tbody>
</table>

(Source: MI & FC Division, Deptt. of Agriculture, Tripura)
The average monthly precipitation for 25 years period (1958-1982) at Khowai station is presented in Table 3 and Fig. 2(B). The precipitation is received mainly between April and October. The normal rainfall at Khowai station is 2127.7 mm.

**TABLE 3**

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P (mm)</strong></td>
<td>10</td>
<td>30</td>
<td>98</td>
<td>226</td>
<td>399</td>
<td>503</td>
<td>297</td>
<td>332</td>
<td>244</td>
<td>135</td>
<td>45</td>
<td>14</td>
<td>2333</td>
</tr>
</tbody>
</table>

Flora: The forests of Tripura are classified into mainly three types. These are (1) Climatic types (Evergreen and moist deciduous forest) (2) Seral types (Swampy and riverine forests) and (3) Subsidiary edaphic types (bamboo, cane brakes, Gurjan, Savanah and grass lands) (Tripura District Gazetteers 1975).

In the Haora Valley, the subsidiary edaphic type of forests with bamboo groves and grass lands occur. No climax vegetation is seen in the area, instead it is of a degraded type. The major portion is occupied by open scrub jungles and bamboo forests interrupted here and there by isolated trees. Towards the flanks of Baramura, pockets of mixed forests appear.
Even good bamboo forest is absent. Jack trees and mango trees are commonly cultivated on the uplands.

The forests of the Khowai Valley belong to the moist tropical type. The forest growth in this area is poor. The tree forest pockets are few and far between. It is a kind of open miscellaneous forest which appear to be a degraded successor to a luxuriant evergreen tropical rain forests of the past. The degradation possibly resulted from uncontrolled 'jhuming' since time immemorial. The major parts of the area predominantly support open bamboo forests with scrub jungle and grass land, dotted with sporadic stands of trees.

There is, however, a small patch of natural gurjan (*Dipterocarpus turbinatus*) forest in the area which is a remnant of the climax vegetation, classified under the category of Cachar Tropical Evergreen Forest.

A number of parameters control the composition, distribution and condition of the vegetation, e.g. topography, soil, nature and depth of ground water table and the anthropogenic factors, of which 'jhuming' is significant. The forests generally cover the upper terraces, hillocks and flanks of ridges. Since the valley-flats are under active cultivation, very little of natural vegetation is preserved.

On the basis of differences in composition and density,
the area can be divided into four phytogeographic zones viz.,
the present-day floodplains, the valley flats, the table
lands and the rugged hill ranges.

**Fauna:** Fauna is scanty in the area due to sparse vegetation
cover. However, elephant, jackal, snake, deer and a wide
variety of birds are found in the district. Leopard is
reported to rarely visit parts of Atharampura Range. One
of the rare animal species in India, namely the spectacled
monkey, is commonly noticed in the western parts of the district.

**Inhabitants:** The hilly tracts of the area are mostly inhabit-
ed by tribal communities like Tripuris, Reangs and Kukis.
The valley plains are occupied by Bengalees. The tribals
earn their livelihood by 'jhum' cultivation, whereas, the
valley regions are intensively cultivated by the Bengalees.
Although tribals have different dialects, Bengali serves as the
link language.

**THE BACKGROUND**

Prehistoric studies in India have made great strides since
the first discovery of palaeolithic tool—a handaxe from Pallavaram near Madras in 1863 by Robert Bruce Foote, an eminent
Geologist of GSI (Foote 1866: 1-35). However, Capt. Meadows
Taylor made the first discovery of polished axe from Lingsugur
in Raichur district, Karnataka (cited from Sankmalia 1974:12).
Thereafter, a Frenchman, Le Mosurier made the discovery of a neolithic tool in 1862 in Uttar Pradesh (cited from Ghosh 1966: 151). D.N. Wadia was the first person to draw the attention to the presence of palaeolithic artifacts in the Salt Range, followed by K.R.U. Todd who discovered a site near Rawalpindi in 1930 (cited from Dani 1966: 71). In 1932, Dr. de Terra of the Yale-Cambridge India Expedition reported palaeolithic finds (De Terra and Paterson 1939: 1-354).

The researches into Stone Age India, was however given a new orientation by the Yale-Cambridge Expedition when H. de Terra, T. Paterson and T. de Chardin conducted their intensive studies on the Ice-Age in India and associated human cultures (1939: 1-354). On the basis of pebble-chopping tools found in the Soan and Indus Valleys of northwestern India during the above mentioned expedition, Dr. de Terra and Paterson (op. cit) have identified a new Palaeolithic culture - the Soan (after the river Soan-tributary to Indus). The expedition was then extended southward into the Narmada Valley, as well as to other parts of the Peninsular India. At the same time true handaxes appear in Punjab, but bifacial tools do not constitute the Soan culture proper, which is essentially a chopping-tool culture.

Since these discoveries, the sub-continent of India has
yielded a huge quantity of Palaeolithic and neolithic implements. The distribution of palaeolithic and neolithic industries in India covers almost all the states. The implements are found to occur in different stratigraphic contexts.

The recent find of a fossil skull of early man from Hoshangabad-Narmada Quaternary deposits during 1982-83, is one of the outstanding discoveries by the Geological Survey of India (Sonakia 1984:159-172).

NORTHEAST INDIA

(i) Geographical

Geographically northeast India, bounded by latitudes 21° 57'-29° 18' N and Longitudes 89° 46'-97° 25' E, is well defined by the towering Himalayan ranges of Bhutan and Arunachal on the north and lush green, folded and highly dissected Indo-Burman ranges (Naga-Patkai-Lushai Ranges) on the east and south. To the west, it opens up through the Brahmaputra valley into the vast plains of the Bengal delta. This region has international borders with China (Tibet), Burma and Bangladesh. Both geographically and culturally, this land mass lies at the tri-junction of the Indo-Chinese, Indo-Malayan and Indian sub-regions of the Orient, because of which we observe in this area a great
diversity of flora, fauna and ethnic groups. Moreover, this region has earned the unique reputation of becoming the world's wettest place, coming under the influence of southwest monsoon and characterised by wet summer and dry winter. Because of the availability of wide diversity of plants useful to man and favourable climatic conditions, this region is regarded by geographers and botanists as an ideal place for early domestication of plants and food production (Vavilov 1949, Sauer 1952, Harris 1973). After the discovery of archaeological evidence of early food production or plant manipulation in Northwest Thailand (Gorman 1971) with which Northeast India shares many common physical and cultural traits, this part of India has assumed greater significance as a strategic area for archaeological research of global interest, as evidenced by the interest shown by international scholars gathered in the Indo-Pacific Prehistoric Congress held at Pune on 20-23rd December, 1978 where the following resolutions were adopted—

"In view of the importance of the prehistory of northeast India, confirmed by the papers presented in the Indo-Pacific Prehistoric Congress in Pune as (i) a potential area for the domestication of a number of important plants and (ii) a physical and cultural bridge between the body of India and Southeast Asia, the General Body of Indo-Pacific Prehistory
Association recommends the desirability of an intensified archaeological research programme in northeast India to realise the potentiality of the area. Taking this as a working hypothesis, northeast Indian Archaeology and prehistory can look ahead for a significant contribution to world archaeology (Sharma 1988).

(ii) Archaeological

The homes of the tribal people were the main sources of prehistoric or Stone Age antiquities for the early collectors and explorers, who were mainly British army and Civil Officers. The first incident of this kind, which we call discovery, took place in 1867 when Capt. Steel, a British army officer recovered three brightly coloured stone implements of jadeite from the house of Mr. Wingrove, a tea planter at Joypore in Upper Assam. This collection was reported by Sir John Lubbock in *Atheneaum* of London (1867, June 22). Since then till 1960, this was the only method of collection of Stone Age antiquities in North-east India. Capt. Steel (1870), Lt. Barron (1872), J. Cockburn (1879), H.H. Godwin Austen (1875 a), John Anderson (1871), J.H. Hutton (1924, 1926, 1928), J.P. Mills (1937), collected smoothed stone tools from Nagaland, North Cachar hills and Mishmi hills of Arunachal Pradesh. During this
period, there was a chance discovery of neolithic antiquities in a stratified context at a tea garden near Biswanath in Darrang district, Assam. Some ground and polished stone axes along with some melted or grooved hammerstones were exposed while ditching in the tea garden. The owner of the tea garden Mr. W. Penny despatched these objects to the then Viceroy of India, Lord Curzon, who caused them to be deposited in Indian Museum (1917). J. Coggin Brown incorporated these materials in his Catalogue raisonné of Prehistoric Antiquities in Indian Museum (1917). J. Coggin Brown (1914) and Dasgupta (1913) studied the grooved hammerstone and the shouldered celts found at Biswanath. During this period, a large number of smoothed stools were collected by G. D. Walker in the Garo hills, J. P. Mills and C. W. Pawsey in the Sadiya frontier area. This collection deposited in the Pitt Rivers Museum of Oxford University supplied the main source material for Dani (1960) to write on the "Neolithic Cultures of Assam". Earlier Worman (1949), in his essay on the "Neolithic Problems in the Prehistory of India", observed that Assam could be considered as a corridor through which celt-making technique entered into India from the east and he attributed the origin of Indian Neolithic to sources in eastern Asia.
THE PREHISTORIC CULTURES OF NORTHEAST INDIA

How early Man in northeast India adapted to the environment of the Pleistocene epoch, is certainly one of the primary objectives of palaeolithic archaeology. Ecological adaptation is essentially a process of interaction of Man with the biological and physical environment in which he lives. As mentioned above, northeast India, which lies between 20° 0' and 29° 18' north latitudes, falls essentially within the belt of tropical rain forests. The forest-clad, rugged mountain chains stretching from the Himalayans to the Arakan Yomas, barring the narrow, flat, alluvial valley of the Brahmaputra, provided ideal habitat for a great variety of plants and animals. The Pleistocene glaciation which brought the tundra climatic zone down into Central Europe did not affect the tropical rain forest belt. Rather this belt expanded its area northward. On the other hand, the areas in the higher altitude generally above 6000 ft. on the Shillong peak, Japvo peak and the higher ridges of the Himalayas, appear to have been affected by the Pleistocene glaciation. Godwin Austen (1875 b) during his geological survey observed unmistakable evidence of former glaciation on the Barail range, where large morains occur. He has also observed well developed river terraces in the valley of the Barak river and its tributaries and these could be attributed to the powerful river action of the interglacial period.
Palaeolithic Period: Till 1974, the prehistory of northeast India was known to have only one cultural period - the Neolithic. Dr. Sankhalia after his visit to Gauhati University and to the Garo Hills in 1971, was convinced that some of the sites discovered by Dr. T.C. Sharma and his group in the Garo Hills yielded cultural relics of Palaeolithic period. He incorporated these materials in his book 'Prehistory and Protohistory of India and Pakistan' (1974) as an evidence of Palaeolithic culture in northeast India. The cultural relics of this period consist of handaxes, cleavers, choppers, flake tools, points, borers and blade tools.

1. Meghalaya (Garo Hills): These cultural relics in Garo Hills were obtained from several sites in the Rongram and its tributary valleys. The sites are: 1) Thebrongiri, 2) Selbalgiri, 3) Mokbol Abri, 4) Mishimagiri - I, 5) Mishmagiri-II, 6) Mishimagiri-III and 7) Didami. The sites occur on the older terraces of the river.

The writer took traverses in Garo Hills in 1984 and discovered a blade and flake industry on the slope of the hill, very close to Mishimagiri village. The tools in mint condition were found upto a depth of about 1m and were made of dolerite, which forms the chief raw material for the Stone Age man of Garo Hills. All the tools, like in other sites, were
highly patinated. The source rock dolerite was found at the base of the hill from where the makers of the tools used to bring them up. It is difficult to say how much of the cultural material is already eroded away, as the site itself is prone to active sheet wash.

On the basis of typology and chronology of the artifacts, Dr. T.C.Sharma has been able to identify the following cultural phases of the Palaeolithic period in Garo Hills.

a. Lower Palaeolithic: This period is characterised by pebble tools, handaxes, cleavers and choppers.

b. Middle Palaeolithic: This period is characterised by flake tool industry based on Proto-Levalloisian and Levalloisian traditions.

c. Upper Palaeolithic: This period is characterised by blade tool industry based on fluted core tradition.

d. Soanian or Pebble-chopper culture: Dr. H.C.Sharma and Dr. S.K.Roy have discovered yet another interesting cultural tradition in the Palaeolithic of Garo Hills. The relics consisting of pebble choppers, which are reminiscent of Soanian pebble tools, were recovered from the detrital gravels found at the confluence of Simsang and Nangal rivers.
Close by, another gravel deposit yielded flake tools made on chert showing Levalloisian tradition, comparable to flake tools of Late Sohan and Indian Middle Palaeolithic flake tool industries. The difference in the raw material for the two industrial groups is interesting and therefore, compares well with the Lower and Middle Palaeolithic traditions of India. However, results of the detailed work are yet to emerge.

2. Palaeolithic in Arunachal Pradesh: B.P. Bopardikar (1972) reported discovery of choppers, handaxes, cleavers, scrapers, flakes, points and cores from the Daphabhum area of Lohit district. He suggested that the tool types may be taken to represent the pre-neolithic phase of stone Age cultures in the northeasternmost corner of India. These preliminary reports no doubt, suggest the possibility of discovering Palaeolithic cultures in Arunachal Pradesh.

3. Palaeolithic in Manipur: O.K. Singh (1972) claims to have found stone and bone tools in association with charcoal and split bones of wild animals, in their stratified contexts. The stone tools described by Singh as handaxes, scrapers, points, blades, burins, borers and flakes are made on soft limestones, as such, these do not appear convincing to some archaeologists who examined them, but the bone tools consisting of mainly scrapers, points and awls, are comparable to those found in Kurnool caves.
4. Hoabinhian cultural material in Garo Hills, Meghalaya: Dr. T.C. Sharma in his early studies (1966) recognised two distinctive phases of early Holocene cultures i.e., i) Hoabinhian and ii) the early Neolith, the former characterised by heavy pebble tools and latter by chipped celts.

The typical Hoabinhian site in Garo Hills is at Rongram Alagiri, situated on the third terrace of Rangram. The material includes axes and choppers made of dolerite pebbles and heavy stone pounder. Unlike in the Palaeolithic sites, we do not find flake or blade tools nor pottery here. The upper layer in this site yielded smoothened stone tools and therefore, culturally belongs to the Neolithic.

5. Microliths in the Garo Hills: Microliths were initially found on the surface at Selbalgiri and Thebroingiri. Later, a trial excavation at Selbalgiri II, revealed a clear microlithic horizon below the neolithic level. The Garo Hill microliths are predominantly noneometric in character, consisting of mainly micro-scrapers and micro-points and some lunates, associated with cylindrical cores (Sharma 1978: 215-217).

Neolithic Period: All the states of northeast India have yielded neoliths. There are large collections of smoothened stone tools from Assam, Meghalaya and Nagaland. Collections from Arunachal Pradesh, Manipur, Mizoram and Tripura are still scanty. This
situation is obviously due to lack of systematic investigations in the area rather than their actual rarity. The bulk of neoliths of this region comes from the tribals who usually find them on the surface of hill slopes or jhum fields and preserve them at their houses for using for their attributed medicinal properties. As such, these neoliths cannot be dated as they are passed on to collectors without any reference to their actual context or associated finds. Nevertheless, these are evidences enough to suggest the wide distribution of neolithic culture in the region. Moreover, they give a picture about the typo-technological features of the neolithic industry of this region (Worman 1949, Dani 1960, Sharma 1966, Singh et. al. 1969).

The recent systematic investigations mainly by the Anthropology Department, Gauhati University in various parts of the region, have yielded neolithic relics. The notable sites are 1) Daojali Hading and 2) Rongram Alagiri, 3) Selbagiri and 4) Chitra Abri in Garo Hills, Meghalaya. A neolithic site has also been recently discovered near Shillong in Khasi Hills district, Meghalaya. The site is yet to be fully explored and excavated. Stratified neolithic sites are not located in Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura (Sharma 1988). Dr. S.N. Rao excavated a Neolithic site at Sarutaru, Assam (Rao 1973: 1-19).
ASSAM: Daojali Hading: The excavated neolithic site in Daojali Hading in North Cachar Hills, has yielded neolithic stone tools industry, a ceramic industry and a host of domestic appliances. The stone tools consists of mainly shouldered celts made on indurated shale, and a few flaked tools made on sandstone. The ceramic industry consists mainly of handmade, cord marked, grey and dull red pottery.

Sarutaru: The excavated site is situated at the border of Khasi Hills and Kamrup districts and has yielded mainly shouldered celts in association with cord marked, handmade pottery.

MEGHALAYA: Selbalgiri: The site is found on an older terrace in the Rongram Valley, near Selbalgiri village. The cultural deposit has 3 layers, of which, the top layer yielded both ground and chipped stone axes, the middle yielded microlithic core, hammer-stones and flakes and the bottom layer yielded numerous microliths (I.A.R. 1967-68: 7-8).

Rongram Alagiri: The excavations at Rongram Inspection Bungalow site, revealed two cultural levels: (1) the top neolithic-characterised by rounded butt axes, and (2) the Hoabinhian below, characterised by pebble axes and choppers in association with heavy stone pounders and without pottery.
Dr. T.C. Sharma (1976) observes that the total absence of flake and blade tools as well as shouldered tools in this site is significant unlike in other sites in Rongram Valley where the above mentioned tools are common.

Chitra Abri: It is located on a steep ridge overlooking the Rongram river and is a very rich Stone Age site in Garo Hills. The Stone Age industries are broadly divided into: (1) the flake - blade industry and (2) the neolithic ground stone axe industry, in association with plain, hand-made pottery. This site is dominated by the shouldered celt tradition (Sharma op. cit)

Evidences are lacking on the neolithic economy of northeast India. Further, in the absence of radiometric dates, the absolute dates of the neolithic cultures of northeast India, are not known (Sharma 1988:98-102). Based on circumstantial evidence, it is held by several writers that the neolithic culture of northeast India may be placed within a time span of 2000-1500 B.C. (Sharma 1966, Thapar 1978).

Neolithic cultures of Nagaland: The prehistory of Nagaland is known only through collections of surface find of stone tools. A total of 287 stone implements is known from Nagaland, a bulk of which is preserved in the Pitt-Rivers Museum of Oxford University.

The Nagaland neoliths are mainly based on fine-grained, olive green diorite or serpentine. Shale, sandstone and
schist are rarely used. However, jadeite believed to have come from Upper Burma or China, were also occasionally employed for making tools. The tools on serpentine contain mainly two typological varieties (1) the more common shouldered or tanged celts and (2) the angular or pointed butt axes. The jadeite tools belong to the typical quadrangular type-well known in the Eastern Asiatic Neolithic Complex.

Neolithic of Arunachal Pradesh and Manipur: These two states bordering Tibet, China and Burma, are considered strategic areas for prehistoric research. Unfortunately, systematic work is yet to start in these areas. Early in 1871, John Anderson reported the discovery of neoliths in the Mishmi Hills. There are seventeen neoliths in the Pitt Rivers Museum, Oxford collected by J.P. Mills and J.H. Grace, during 1933-35 from the then Sadiya Frontier Tract. Recently, 18 neoliths were reported from Kameng district (Goswami et al. 1972: 29-35). Bopardikar (1972) found some shouldered celts, chisels, triangular axes and splayed axes from Daphabhum area in Lohit District. Arunachal Pradesh, like Nagaland has yielded neoliths made on jadeite, presumably imported from upper Burma or China.

Neolithic material from Manipur are still meagre. There
are only reports of surface collections of 43 neoliths made of various rocks like, basalt, diorite, shale, schist, and quartzite. Typologically, they are classified into triangular axes, quadrangular axes/adzes, shouldered celts or quasi-tanged Naga Hills type and chisel.

From Mizoram, only one stone axe is reported so far. The axe is made on slate and shows three broad holes, probably to facilitate hafting.

A REVIEW OF QUATERNARY GEOLOGY OF NORTHEAST INDIA

Quaternary sediments cover a considerable part of northeast India and are extensively developed along the major river valleys, particularly Brahmaputra Valley (upto 1000 m in thickness) in Assam and foot hill belt of Arunachal Pradesh. The other important Quaternary areas are North Cachar (Barak Valley), intermontane valleys of Tripura, Manipur (Loktak lake, Imphal Valley) Ziro, Ranga and Tale Valleys in Arunachal Pradesh and fringe areas of Meghalaya plateau. However, systematic study of these undifferentiated formations began only recently. Hitherto, the Quaternaries were unclassified and shown by a splash of 'yellow' under the legend 'Recent' in the geological maps of North Eastern Region (Director General, GSI, 1974) and India. Nevertheless, casual references were made about these unconsolidated deposits since more than
a century ago by Ferguson (1863), Medlicott (1865), Mac Laren (1904), Allen (1905) and others. A review of the previous work on Quaternary geology is not out of place here.

"I scarcely like to touch upon the very interesting and important, but most intricate question of alluvium without having time or data to discuss as it deserve" observed Medlicott (1865), in his geological notes on Assam, a century and quarter ago. Today, his brilliant note assumes historic importance because in these one can discern, to quote the famous words of Hutton, the "Vestiges of the beginning" of scientific inquiry into the interesting, important and intricate question of alluvium of the Brahmaputra Valley (cited from Balasundaram and Murthy 1977:271).

Medlicott undertook traverses in Assam after publication of the classic work of Ferguson (1863:321-354) on the "Delta of the Ganges". He engaged his mind on two problems: 1) the lack of parity between valleys of the Brahmaputra and the Ganga and 2) origin of the 'Older Alluvium'. He recognised that Brahmaputra and Ganga had equal volume of water but the former had immensely greater sediment load and the Valley of Assam above Dhubri was shallow and narrow compared to that of the Ganga above Rajmahal. He endorsed Ferguson's (op.cit) description of Assam as in a 'semi-habitable state' as the
valley was under the dominion of water. It struck him as 'prima-facie anomalous' that inspite of the facts stated above, vertical accretion in the Brahmaputra Valley was less than that of the Ganga.

Medlicott's (op.cit) comments on the Older Alluvium are also very illuminating. He observed that the Older Alluvium, which is so extensively developed in the Ganga Valley, occurred commonly as a "zone between the flat area of actual inundation and hill-boundary of the plain and also as islands of various extent in the plains" (op.cit: 53). The Older Alluvium was described by him as massive ochreous clay more or less sandy "differing from the silt deposits of the delta or river courses. He assigned the silt deposits a fluvial origin of the Older Alluvium and sought to explain their upraised position by "secular changes of a river during the process of raising its valley" (op.cit: 54) "without the aid of local or continental upheaval". "We do not yet know enough of the many conditions of river valley deposits to assert that it cannot have been formed by that process", (op.cit:54). But he established his contention "that ochreous clay of older Alluvium is derived by modification of the underlying bed by atmosphere and organic metamorphism" by meticulous description of a river bluff. The method adopted and the conclusion arrived at is astonishingly modern (Balasundaram and Murthy. op. cit. : 272).
Allen (1905 a, b) gave a general description of the landform and river system of Goalpara and Kamrup districts and recorded the impact of great earthquake of 1897 in the area. Oldham (1899), Gee (1934) and Poddar (1950) dealt with the earthquake devastations of 1897, 1930 and 1950, respectively and their effects on the river regimes and landforms. From the graphic description of Allen (op. cit), it appears that at the turn of this century, the alluvial land stretching from the Bhutan foot hill to the north bank of the Brahmaputra in the Kamrup district was divisible into three contrasting longitudinal zones. Nearest to the Brahmaputra was a belt of marshy country which was subjected to annual inundation, and composed of a mixture of sand and silt. The central portion of the district was a well cultivated plain beyond the reach of flood. The level of this plain rose gradually towards the hills. The light coloured sandy soils of the upland was covered with short turf and patches of Ulu and thatching grass (Allen op. cit).

Allen (1905 c) has stated that almost the whole of the Darrang district consists of an alluvial deposit of clay and sand in varying proportions, ranging from pure sand area near the Brahmaputra to stiff clay which is unfit for cultivation. He referred to the Biswanath plain and an elevated tract of land north of Tezpur as the high bank.
The next work of any importance in the valley was by Coulson (1942: 1-152). He described the 'Older Alluvium' as 'Red Bank' which were of erosional rather than tectonic origin with the intensification of geological mapping in the Shillong Plateau, Arunachal Himalaya and parts of the Alluvial Valley since 1961, a clearer, well connected picture of the tectonic history has emerged on the basis of which Rao and Dias (1962) concluded that the linear tectonic scarps separated 'Older Alluvium' areas from the Newer Alluvium in Goalpara district of Lower Assam.

In common with the Sindhu-Ganga Plain, the Brahmaputra Valley has also been classified into Bhabar, Bhangar and Khadar meaning there by the terrace zone, the high level dissected, partly oxidised plain land and the lower level flood plains, respectively. According to Pascoe (1966:1,966), in Upper Assam the land is well divided into Bhangar and Khadar and the Brahmaputra with its affluents are more or less confined to their banks. The greater part of the Assam Valley, however, is a gigantic Khadar or stretch liable to flooding and therefore, scarcely habitable. Stratigraphically, Bhangar and Khadar sediments have been designated as Older and Newer Alluvium, respectively.
A part of the alluvial basin was mapped by Rao (1962), Sar and Basu Chowdhury (1965) and Duara (1965), Rao and Dias (op. cit) relegated the dissected high level gravel to the Older Alluvium and remaining part of the alluvial plain to the Newer Alluvium. Sar and Basu Chowdhury and Duara (op. cit.) divided the high grounds near the foot hills as the terrace deposits and the vast alluvial plains as the Newer Alluvium.

A review of the work above show that till 1970's no attempt was made to study the Quaternary history of the alluvium in a systematic manner in northeastern India. Geological mapping of the alluvial terrain on the basis of geomorphic principles was not initiated (the alluvium of Assam valley was indicated by a splash of 'yellow' under the legend of 'Recent' in the published geological maps of India) Keenly aware of the intricacy of the problem and limitation of knowledge, Medlicott (op. cit.) closed his notes with the following plea: "It is to be hoped that some one who has more leisure than the members of GSI and more opportunity of observing repeatedly in the same district, may arise to extend the researches so admirably begun by Mr. Ferguson". After the lull of a century, which has witnessed only marginal advances in our knowledge of the valley, the GSI began a study of Quaternary history of the alluvium not because its
members have more leisure', but because geomorphological, geological and geohydrological evolution of the valley has gained a new dimension of urgency for ensuring a harmonious relation between the human habitat and the physical environment of the Brahmaputra Valley vis-a-vis the Brahmaputra flood problem (Balasundaram and Murthy 1977: 272).

The problem of floods in the Brahmaputra Valley caught serious attention of the Government of India in 1970's. The BFCC and Brahmaputra Board was constituted in the year 1970 to study all aspects of the problem and to suggest effective remedial measures. Realising the importance of geomorphological and geological studies, Dr. K.L.Rao, former Union Minister for Irrigation and Power, requested the Department of Steel and Mines, Ministry of Mines, that the GSI undertake these investigations immediately. As a sequel to this, GSI under the name of Brahmaputra studies unit at Calcutta formulated and initiated study of the problem involving diverse disciplines of earth sciences viz., geomorphology, sedimentology and engineering geology. This is how a systematic study of the Quaternary geology began in northeast India. The study is the first of its type to have been undertaken by GSI. The basic data and preliminary conclusions have been included in GSI Miscellaneous Publication No.32 entitled 'Contributions
Geomorphology and Geohydrology of Brahmaputra Valley'.
The contributions in this volume provide a basic framework for a proper scientific appraisal by scientists of diverse disciplines—geomorphology, geology, hydrology, geophysics, pedology and archaeology.

In northeast India, the Quaternary deposits cover an area of over 60,000 sq.km, of which, about 56,000 sq.km falls in the Brahmaputra Valley itself. It is highly encouraging to mention here that most (about 90%) of the Quaternary areas have already been covered by systematic mapping by the Geologists of GSI in the last 25 years. The author had the opportunity to associate with mapping of more than 10,000 sq.km area of Quaternary terrain in parts of Assam, Arunachal Pradesh and Tripura.

As already mentioned, GSI for the first time started systematic mapping of the Brahmaputra Valley in 1971 and covered four important drainage basins of the Brahmaputra tributaries with the help of available aerial photos (1951-54) and photomosaics. The river basins covered are: Manas by Poddar et al. (1977), Pagladia by Chakrabarti (1977) Jia Bhareli by Viswanathan et al. (1977) and Subhansiri Basin by Duara et al. (1977), who mainly carried out studies on the fluvial processes, geomorphology and geology.
The main conclusions arrived at from the geomorphological study are that the entire alluvial terrain was not formed in a single sweep, rather it evolved by stages. Until then, only two categories were recognised which were designated as the 'Older' and 'Newer' alluvium. Whereas, the above mentioned workers (demonstrated by detailed maps in GSI Misc Publication No. 32, 1977: 1-291) have generally differentiated a stepped sequence of 4 geomorphic surfaces except in Subhan-siri Basin in which only 3 terraces are marked. The Quaternary surficial deposits have been classified into informal stratigraphic units (four units in the Manas, Pagladiya and Jia Bhareli; three units in the Subhan-siri), mapped tentatively as formations and arranged in chronologic order on the basis of geomorphic surfaces. However, in the absence of palaeontological, archaeologica l and radiocarbon data, the time span of each unit remained unknown.

RECENT ADVANCES IN QUATERNARY STUDIES IN NORTHEAST INDIA

With the creation in 1975 of a full fledged mapping unit of Quaternary Geology, Geomorphology and Environmental Geology Division under North Eastern Region (NER) of GSI, Shillong, the Quaternary mapping operations were intensified and bulk of the Quaternary terrain in different states of NER was covered by systematic mapping in successive years e.g. Dikrangi Basin.
by M.N.Kumar et al. (1974-75), Dihang Valley by K.K.Sinha et al. (1978-79), Upper Brahmaputra Valley by A.B.Goswami et al. (1977-78), Loktak lake area by S.K.Kar (1978-79) and R.C.Shukla et al. (1984-85), Khowai Valley by N.R.Ramesh et al. (1980-81), Khowai and Haora Valleys by N.R.Ramesh (1981-82, 1982-83), Ziro Valley by R.K.Sinha (1980-81), Noa Dihing Valley and Burhi Dihing Valley by S.K.Kar and N.R. Ramesh (1983-84), Itanagar area by K.K.Sinha et al. (1981-82), Lower Brahmaputra Valley and fringe areas of Meghalaya by K.K.Sinha et al. (1981-82, 1983-84, 1984-85), Tezu area, Lohit Valley by N.R.Ramesh et al. (1984-85). The principles and methodology applied to mapping in Tripura basically remained same as in the case of earlier studies on the Brahmaputra Valley (Balasundaram 1977). However, the furtherance of mapping operations has taken a significant step forward in that very useful data have been obtained for the first time in Tripura, regarding absolute age of different Quaternary formations, and their associated archaeological and palaeontological remains. These fresh data have not only helped in inter-basin and inter-regional correlations but also provided an insight into the Quaternary history of different parts of northeast India.

The Quaternary formations in northeastern states of India,
representing varying depositional environments have been fairly well dated by the 14C method, through the pioneering and sustained efforts of a team of Geologists of the (erstwhile) Quaternary Geology and Geomorphology Division, GSI, Shillong. The Quaternary morphostratigraphic mapping by various workers from 1977 to 1986 (Goswami and Ramesh 1981, Kar 1979, Ramesh 1981, Sinha 1981, Ramesh 1982, Sinha et al. 1980, 1981, 1982, 1983, 1985, Ramesh and Kar 1984, Goswami et al. 1984, Ramesh and Gadagkar 1985, Kar and Sathyanarayana 1987), in parts of the Brahmaputra Valley in Assam and Arunachal Pradesh, intermontane valleys of Tripura and Manipur and fringe areas of Meghalaya, representing fluvial, glacio-fluvial and lacustrine regimes, has led in general, to the recognition and mapping of four major morphostratigraphic units, which have been assigned informal formational status. On the basis of field evidences viz., geomorphic expression, geologic setting and degree of pedogenesis, two morphostratigraphic units have been assigned the Pleistocene age and the other two to the Holocene age. Radiocarbon dating has been done by Birbal Sahni Institute of Palaeobotany (BSIP), Lucknow on the semi-carbonised wood, peat carbonaceous clay/sediments, obtained from recorded depths of the sediment sequence and known depositional environments in different parts of northeast India. Altogether, forty six 14C dates including 16 Pleistocene dates and 30 Holocene dates ranging in age from Modern to > 40,000 yrs B.P., are available
so far. The dating corroborate well with the inference drawn on the basis of field mapping regarding relative age and order of superposition of events. Thus the carbon dating has helped to provide a Quaternary Calendar for northeast India and has paved way for regional mapping and establishing morphostratigraphy vis-a-vis time stratigraphy, for the first time, in different depositional basins of northeast India. The age data has also helped in proving the existence of the palaeolithic and neolithic cultures during the Pleistocene and Holocene, respectively, discovered recently in the intermontane valley sediments of Tripura (Ramesh 1984, 1987). Besides, the dating has helped in extending the age range upto the Holocene for the fungal elements which were hitherto considered to be the markers for the Neogene (Prasad and Ramesh 1982).

The available radiocarbon data leads us to two important conclusions viz., 1) that the cluster of $^{14}$C dates at our hand, has enabled us in establishing interbasinal and inter regional correlation of morphostratigraphic units of a part of the late Quaternary period of northeast India and 2) that there exists a wide gap in our knowledge about the time stratigraphy of a major part (say 1.96 MY) of the Quaternary, for which no dating has been done (except some Palaeomagnetic dating attempted by ONGC for selected areas e.g. Jammu Hills by Ranga Rao et al. 1989: 361-385) This data will illustrate the need to combine
physical techniques with classical methods and employ them at least in some crucial areas e.g. foot-hill belt of Arunachal Pradesh. This would help to fill the great lacunae in our knowledge of the quaternary time stratigraphy of north-east India.

The geoarchaeological studies have been carried out in certain pockets of the region such as Garo Hills and Manipur Valley.

The archaeology of the Rongram Valley terrace sequence is fairly well known now. Several Stone Age sites have been located on the second terrace, which in the Garo Hills may be taken to represent the Middle Pleistocene. Some of the Stone Age tools have also been found in the third terrace, the gravel of which appears to be of Upper Pleistocene and the silt to be of early Holocene. (Sharma, op.cit).

The Quaternary history of the Garo Hills area and foot hill of Himalaya along the Bhutan border, have been recently studied by Drs. R.V.Joshi, S.N.Rajaguru, R.S.Pappu and D.K. Medhi during 1977-79, and the results of their work are summarised as follows (Rajaguru 1981: 5):

1) The Quaternary sediments of the Garo Hills are fluvial in origin and confined to the river valleys. 2) Early Quaternary formations are represented by ferruginous conglomerate
resting unconformably on the bedrocks at an elevation of 45 to 50 m AM0L of river. 3) After the formation of the ferruginous conglomerates, strong bedrock dissection almost upto the modern bed level of the rivers took place due to tectonic movements. 4) During later Quaternary Period, two cut-and-fill terraces developed. The higher and older is represented by reddish to reddish brown silt which rests on the highly weathered gravel. The younger terrace inset into the older fill and is represented by brownish silt which rests on the slightly weathered gravel. 5) Neotectonic movements (epeirogenic type) and mild climatic changes are mainly responsible for shaping the Quaternary landscape of the Garo Hills. 6) Field and laboratory studies indicate that the climate during the Late Pleistocene was subtropical but drier than of today. 7) Stone Age artifacts can be divided into two groups as Neolithic and Pre-neolithic.

Dr. Rajaguru et al. (Rajaguru 1981: 5) have also collected evidences of dramatic environmental changes during the Quaternary in Imphal Valley and Loktak lake in Manipur. They have observed 30-40m thick gravel built terraces along Imphal river and alternating layers of peat and weathered clays and beach gravels in old lake which was carrying higher water level during the Quaternary, has since shrunk due to drying. They have not
obtained any stone artifacts during their brief survey, nor have they observed any geological evidence of Quaternary glacial/periglacial climate up to an elevation of about 1500 m AMSL. In fact, they have noted evidences to suggest subtropical climate during the Quaternary.

The late Quaternary vegetation of northeastern India, Upper Assam in particular, recorded during the period of 12,210 - 17,930 yrs. B.P. as worked out by Sunirmal Chanda and his group, indicates that it was quite distinct from the present tropical vegetation. The places of higher altitudes of Assam were not affected by direct glaciation, nevertheless the plants bear the characteristics of temperate/subtropical climate, may be due to the high influence of west Himalayan refrigeration (Sunirmal Chanda and Kashinath Battacharya 1987). However, the geological studies conducted by R.K. Sinha (1980-81) in the Ziro Valley, Subansiri district, Arunachal Pradesh, reveal evidences of past glacial/glacio-fluvial environment, as indicated by the presence of glacial till materials and landforms like drumlins. Lacustrine sediments comprise clay and peat. The latter has indicated an Upper Pleistocene age (40,000 yrs. B.P.).

Palaeontological evidences from the Quaternary formations of northeast India are meagre. The soils in this region
are found to be highly oxidised and acidic - a condition unfavourable for fossilisation. There are, however, three reports on the discovery of Pleistocene mammalian fauna. Gurudev Singh (1975:65) reported the first discovery of a molar of Bos sp. from the Upper Tertiary rocks of Subhansiri district, Arunachal Pradesh. This fossil was found in medium to coarse grained, grey and yellowish brown sandstones with lenses and streaks of carbonaceous matter. It was identified by GSI that they are two fragments of teeth, part of a single Bovine molar. Bos ranges in age from the Pleistocene to the Recent and is found in the Pinjore State of the Upper Siwaliks in the western Himalaya (Singh op.cit:65-67). On the basis of the above fossil find the Upper Tertiary of Arunachal Pradesh is correlated with the Siwaliks of the western Himalaya (op. cit.). The other two fauna reported are - one of the Elephas maximum from the Upper Pleistocene deposits in the Brahmaputra Valley (Badam 1974: 75-78), and the other of Elephas hysudricus (cited from T.C.Sharma 1988) from the Middle Pleistocene horizon at Rongra, in the northeastern corner of Garo Hills, bordering Bangladesh.

TERMINOLOGY

The term 'prehistory' is not yet clearly defined in Assam*.

(* Meaning united Assam before the division into 7 states and union territories)
By applying the usual definition of prehistory which includes the period before the art of writing was known to man we may say that the prehistoric period did not begin uniformly in all parts of Assam. We can reasonably accept in the Allahabad Pillar of King Samudragupta, that in the plains of the Brahmaputra Valley, the prehistoric period came to an end in the middle of the fourth century A.D. The legendary period of Naraka dynasty, which preceded the historic period, is yet to be archaeologically attested. On the other hand, in the isolated hilly region everything before the British period can be regarded as prehistoric. Following SubbaRao (1958: 35), we may say that the prehistoric archaeology of Assam has come to cover the material cultures of prehistoric as well as modern preliterate societies. However, in our present study, we are concerned only with a small part of the prehistoric period of Tripura, that is to say the Middle to Upper Palaeolithic and Neolithic periods.

The joint American South East Asiatic expedition conducted by H.L. Movious Jr and Mrs. Movious under the direction of Dr. de Terra, during the 1937-38 season, collected stone implements mainly from north in Upper Burma. These implements differed in several fundamental respects from those of western Europe, and for this reason the culture has been given a new name i.e., Anyathian, after the colloquial Burmese for an upper Burman
The Anyathian is divided into Early Anyathian and Late Anyathian. In a chronological sense, the Early Anyathian roughly covers the time-span of the Lower and Middle Palaeolithic periods of the Old World, while the Late Anyathian may be considered the equivalent of the Upper Palaeolithic period. In Burma, the Early Anyathian is divided into 3 phases, while the Upper Anyathian is divided to 2 phases. The Anyathian is followed up by Neolithic which is post-Pleistocene. Whereas, in Tripura, we have recognised Anyathian and Neolithic, each of which is divided into early and late.

Before we define the term "Neolithic" as applicable to our field of research, it is necessary to mention briefly the usual meaning and significance of the term. The meaning of the term "Neolithic" or the "New Stone Age", first coined by Sir John Lubbock (1900: 2-3) to designate a phase of the Stone Age characterised by ground and polished stone implements, has since undergone many fundamental changes. Originally, it was only a technological term employed to refer to the above mentioned class of stone implements which could be clearly distinguished from their predecessors, the palaeoliths. Later on, when excavated evidences began to accumulate, the real characteristics of culture were revealed. This period of human history is now known to represent a stage when man was able to produce food, thus making the complete change in his economic status from the
earlier food gathering stage. This transition from food
gathering to food production was perhaps the most significant
landmark in human history. Following the discovery of evi­
dence of food-production, cultivation of plants and domestication
of animals in a premetal context, is regarded as the
hallmark of Neolithic culture. The pecked and ground stone
industry, pottery, weaving and permanent habitation are some
of the other important features of this culture. It is now
clearly established that full fledged Neolithic culture was
preceded by a pre-pottery or 'aceramic' phase in those regions.
With this yard stick, certain areas in the present states of
Andhra-Karnataka as well as in Orissa, Bihar, Assam and Kashmir,
may be grouped into Southeast and Eastern Neolithic. According
to H.D.Sankalia (1974), the term "Neolithic" is preferred,
because the site at Daojoli Hading has yielded pottery and
ground and pecked tools, thus justifying the use of the term
by Dani (though previously criticised by Allchin 1961a : 597).

We shall adopt a few terms already employed by T.C.Sharma
(1966) by which certain tool-types and their varieties will
be known. These will be defined along with the description of
the tooltypes. To a great extent, the Eastern Asiatic tradi­
tion in which tools showing square corners and well defined
geometric shapes are common, terms like "rectangular axe", 
"quadrangular axe", "quadrangular adze" etc., which are commonly used in East Asiatic archaeology, and recognised in Assam by Sharma (1966 : 375) will be used.

In a general discussion of the Tripura Stone Age, it is necessary to consider at the outset, the important factor of the raw material used in the manufacture of virtually all implements. Fossil wood, due to its friable nature, flakes in only one direction i.e., a plane transverse to the axis of growth rings. Hence, nearly all the implements in fossil wood from earliest times through the neolithic, are of the same fundamental type. But, although heavy forms are associated with Late Anyathian and Neolithic cultures there is a decided tendency, inspite of the difficulties imposed by the fossil wood, to develop smaller tools. These can be correctly classified as scrapers (Movius 1943:350). In the Early Anyathian however, coarse implements of the same basic type predominate, infact they are as common as the handaxes associated with the classic Lower Palaeolithic cultures in other parts of the Old World. Since they apparently represent a type of chopping implement rather than a tool intended solely for scraping, and since they are only worked on the upper surface of either one or in some cases on both the ends, they clearly belong to the adze rather than the axe family of tools. It
is, therefore, proposed to define more precisely these core implements, and the term "handadze" is suggested for them. In Burma, handadzes occur in silicified tuff as well as in fossil wood. They are true core tools in every respect. Chopping-tools with alternately flaked edges are also found in both the materials, in addition to choppers flaked on one surface only, as well as other types of cutting and scraping implements. On this basis, it seems preferable to refer the Early Anyathian (Lower Palaeolithic) of Burma as a chopper-chopping-tool-handadze complex in which handaxes are conspicuously absent; core implements predominate (Movius op.cit:351).

It should be mentioned here that the criteria used in this study for distinguishing the various categories of implements are based on the form and technique of manufacture of the tools themselves, rather than their presumed function (as advocated by H.L. Movius 1943:351 in his study on Burma relics). As stated above, practically all the material consists of core implements used for chopping, cutting and scraping; indeed it is very likely that many tools served all these purposes. It is therefore, clear that form and technique rather than function must be used as a basis of classification. In other words, when the term chopping-tool is used, reference is made to a special shape of tool manu-
factured in a particular manner, rather than to an implement solely intended for chopping. In this sense, the following definitions as adopted for Burmese Stone Age relics by Movius (op.cit.351) (and Soan Industry of northwest India) are advocated, and an attempt has been made to adhere rigorously to them throughout.

a) Chopping-Tool: This term is used with reference to a well known form of implement, the cutting edge of which has been produced by alternate flaking (Pl.III nos. 1-4, Fig.IV nos.1 & 2). Chopping-tools are always core implements, usually made on pebbles and they have sinuous edges.

b) Handadze: As explained above, a handadze is a type of chopping implement of roughly tabular form (Pl. II nos.1-4. Fig. II and III nos.142). It is made on a core and has straight, slightly rounded or even a pointed cutting edge, which forms a right angle with the long axis of the implement. Handadze may be regarded as a special class of chopper, but of square or rectangular rather than of round or oval form. The secondary working edge is restricted to the upper surface. It is on this basis that a distinction is made between handadzes and handaxes, since the latter are bifacial implements i.e., they are flaked on both the surfaces.
c) **Handaxe:** (biface or coup-de-poing) This was the first standardised implement like the jack-knife, it was probably a general purpose tool. It mainly served the purpose of cutting and scraping and also for grubbing up edible roots which formed an important element of diet of the Palaeolithic man (Pl. I nos. 1-3, Fig. I nos. 1 & 2).

d) **Scraper:** The essential difference between choppers and scrapers can be determined only by size, the term scraper being reserved for small tools made on both cores and flakes which do not fall into the chopper category (Pl. VII nos. 1-9, Fig. VIII nos. 1-5 and Fig. IX nos. 1-5).

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