CHAPTER II: Present Undertaking

This chapter explains reasons behind the selection of present theme as a topic of this PhD dissertation. It explains how the budding questions of a graduate student ultimately ended up to the research problems of this thesis. It further explains the major research objectives of present thesis and the problems from which the objectives of present thesis came up.

Finding out Problem Areas

As in the preface part of this thesis experience of present researcher on flint knapping and the problems that he faced at the time of flint knapping experiments are already mentioned. In the present chapter the problems and questions faced by present researcher at the time of knapping are further highlighted and focused on the basis of his background readings and literature surveys.

First of all, it must be mentioned that studies of the Paleolithic tool traditions throughout the world have shown that quartzite was used by humans all over the world since the time of first stone tool manufacture. In India the scenario is almost same, but here with quartzite some other rocks like quartz, silicious lime stone and basaltic rocks were used by the Paleolithic people (Ghosh and Das, 1966; Ghosh, 1970; Gaillard *et a,*. 2010). However general information concerning the fracture properties and nature of these rocks are very rarely found in the archaeological literature and even experimental flint knappers have done little work on these rocks. Some earlier workers like Crabtree (1967), Callahan, (1979), Jones (1979) and Ahler (1989) did some experimental knapping on quartzite raw materials but those works were not conducted extensively. In later period Molony (1988) and Molony *et al,* (1988) did some experimentation to understand fracture properties of quartzite as tool making raw material. Very recently a few works on exploitation of quartz in prehistoric times and on its fracture properties are available. Among these, works of Baquiero-Vidal (2006), Lombera Harmida (2006), Prous Poirier *et al* (2006), Perdaen *et al* (2006), Rajala *et al* (2006) and Polley and Ray (2009) are important. Selectivity of raw material for the manufacture of tools played a very important role for the prehistoric men. Different types of raw material such as quartz,

quartzite, flint, obsidian and chert were used by prehistoric men. These varied with time and space. Selectivity of raw material largely depended on availability, though there are other factors as well.

The main reasons behind the selection of raw materials in experimental lithic analysis are several. First one is availability of these raw materials in European and American prehistoric lithic assemblages and that these raw materials are easy to knap, which make them suitable for experimentation. Another reason behind this is that, in places like India, other Asian and African countries where non-flint, non-obsidian raw materials were used by prehistoric people experimental archaeological work and experimental flint knappers are rare. Lack of understanding of the fracture properties of the non flint raw materials produces confusion, leading to the incorrect results among the researchers working exclusively on the non flint raw materials. Beside the application of various mode of lithic analysis, founded on or developed on the basis of experimentation on flint and obsidian on the non-flint lithic assemblages produces incorrect results. Ultimately it produces questions regarding validity of the methods of lithic analysis.

In the year 1990 Donna Morrison in her dissertation work put forward this kind of problem in lithic research. Morrison tried to judge validity of different methods of debitage analysis available during the century. She did it by comparing experimentally produced debitage of obsidian and quartzite. In her work she also gave emphasis on the raw material variability of flaking debris. But the major drawback that is observed in her work was that she compared debitage, produced by different techniques. This can alter the final result. Above all she compared only a few individual attributes, not all possible attributes of debitage. These shortcomings can give wrong results. It can be said that well defined objectives and precisely designed experimentations on this kind of research may give possible solution to this type of problem.

In addition to the above mentioned problem, another new problem area in Indian archaeology was also found, on which experimental knapping can provide some solution. Today it is well known that, over the last hundred years prehistoric research in India has produced rich evidences human of occupation and of Stone Age culture. There are three different trends in the lithic research in India. Researchers of the first or of the earlier

trend were mainly focused on the general description of lithic assemblages found as a result of exploration and excavation of a particular site or of a particular area. In this regard works of Paddayya (1977), Ghosh (1970), Movius (1948), Sankalia (1946), Bose and Sen (1949) etc are mentionable. Later trend of research was mainly concerned with the typo-technological analysis of the lithic artifacts found from a site. Sometimes workers of this phase have tried to find out hypothetical evolutionary sequences of lithic assemblages by quantifying metrical parameters of stone tools through statistical methods (Joshi and Marathe, 1976, 1977, 1985; Ghosh, 1985; Gaillard *et al,* 1986, Chakrabarti, 2004).

Problems with the above mentioned approaches of lithic research are that, both groups of scholars did not take into consideration other important aspects, such as, tool function, raw material variability and manufacturing stages, which influenced size measures and intra-site variation of the lithic assemblages.

Most recent trend in lithic research in India is directly influenced by *chaîne óperatoire* and Reduction sequence (Tostevin, 2006) approaches of lithic analysis. Workers of this trend try to make a systematic step by step reconstruction of the whole process of tool manufacture. At the same time they try to interpret related human behavior (Corvinus, 1983; Pant and Jayaswal, 1991; Pappu, 2001; Gaillard *et al,* 2008; Mishra *et al,* 2009). In India researchers using such type of recent approaches of lithic analysis are making higher level theoretical claims regarding human behavior and together with this on lithic technology and analysis. But these claims are mainly based on the data gathered from the field, which is usually altered by the effect of different natural forces working in site formation process. Therefore , if any elaborate method of lithic analysis or statistical analysis is applied on the lithic assemblages collected from disturbed sites or from secondary contexts, they may perhaps provide erroneous results (Paddayya, 1978), which ultimately lead archaeologist to a wrong understanding of *chaîne óperatoire* and reduction sequence of artifact manufacture. However, very recently discovery of a number of lower Paleolithic sites in primary context, especially from peninsular India (Mishra, 2008) and application of advanced earth science techniques in understanding archaeological sites (Rajaguru *et al,* 2009) have solved this problem of understanding

Indian lower Paleolithic culture. Even then hypothetical claims regarding Paleolithic lithic technology must be judged or validated by proper experimental assessment.

It is already mentioned in earlier chapter that, a serious short coming still remains in the field of experimental flint knapping in India. As a result many hypothetical interpretations regarding lithic technology of lower Paleolithic culture of India are not judged or validated properly. Although a few works on flint knapping experimentations are done in this subcontinent but most of these works are focused to solve problems regarding microlithic technology and technology related to stone bead making industry of western India (Kosambi, 1967; Paddayya, 1983; Kenoyar, Vidale and Bhan, 1991; Roux and Dietrich, 1995). Except a very few experimental works (e.g Shinde, 1988; Polley and Ray, 2009) on lower Paleolithic technology this area of study is left almost untouched.

Besides the above mentioned two problem areas another problem in the field of experimental or actualistic study in archaeology is found; and the problem emerged from representation of the results of actualistic or experimental studies in archaeology. Among several benefits of experimental knapping one of the most important is that it helps archaeologists to develop an 'emic' understanding on the behavior pattern of early man (Flenniken, 1984:193). Here the term 'emic' refers to thoughts and patterns which human being experience within their mind, speaking in another way it refers to the patterns going on inside the people's head (Harris, 1976:329-330). However, before 1980's the so called emic approach in archaeological research was completely absent. Archaeologists in that time studied past societies by reading traces or life expressions of those societies left behind. Role of the individual as well as interpretative position of the archaeologists have been ignored in explanations and explications of prehistoric societies.

After 1980 due to the influence of the works of Ian Hodder trend of archaeological research changed and a new sub discipline of archaeological research gradually emerged, which is known as 'contextual archaeology' (Johnsen and Olsen, 1992:423). Since appearance of experimental studies in archaeological research was highly influenced by the 'Principles of Unitarianism' of geological science and then was principally supported by the positivist approach of New Archaeology (Nami, 2010); earlier works of experimental archaeology were influenced by the 'etic' understandings of experimental

archaeologists, more particularly experimental stone knapper. Here the term 'etic' understanding refers to the "body motions and the external effects produced by body motions" (Harris, 1976:329-330). Although experimental interpretations of stone tool type, technology and functions were emerging out from the investigators own perception during stone knapping or stone tool use, but the individual perspective of experimental knapper was neglected and only effect of the actions or body motions of experimental archaeologists were focused (Harris, 1976:329-330; Johnsen and Olsen, 1992:423; Nami, 2010:122). Even after the development of Post-processual archaeology by Hodder (1990) and after the reestablishment of the symbolic and interpretative sphere of material culture in archaeological research, dream of the development of emic understanding of the behavior pattern of early man through experimental knapping (Flenniken, 1984:193) is a mile away. Still today almost no place is left in experimental literature where an experimental knapper can express his or her own perceptions and interpretations. One exception to this may be the publication of the book 'American Flintknappers: Stone Age Art in the Age of the Computers' by Whittaker (2004).

Objectives of the Present Research

The present work is designed in such a way so that solution to the above mentioned problems are found. Endeavour is made in this research for reconstructing reduction sequence of Lower Paleolithic hand axes of three specific sites of eastern India. This is done following imitative experiments. It is assumed that it will not only help to understand classification of the different stages of tool manufacture, planning and formulating knapping strategy and the ultimate design and shaping of the finished product but also will help to reconstruct part of the *chaine operatoire* of specific lithic assemblages of the selected sites. Attempt will also be made to explore the fact that whether or not raw material types, reduction stages, fracture properties or flaking techniques are controlling factors for determining debitage variability, rather than merely being something whose effects are relatively unimportant. Three main areas are specifically explored in this research. They are as follows:

1. The first and foremost objective is to get an idea of the reduction sequence of the entire manufacturing process of various lower Paleolithic hand axes, found

in eastern India and then to reconstruct related behavior patterns connected with their manufacturing process.

2. Second one is to study the debitage, produced during the experimental manufacture of the hand axes and to get an idea on the effect of raw material variability, knapping techniques and stages of reduction on variability and identification of flaking debris or debitage.
3. The last one is to study the thoughts and the condition of the knappers mind at the time of manufacturing a stone tool. The third goal is very much related to the first one and in some cases both of these goals overlap with each other; the methods of study and results of the work solve these two objectives in a combined way.

Since one of the major aim of experimental approach is to test validity of methodological assumptions (Ingersoll and Macdonald, 1977). Present experimentation with debitage variation will go a long way of fulfilling this aim and finding out solutions to the methodological problems of lithic debitage analysis. Beside this present work will also try to understand the production process of lower Paleolithic hand axe of eastern India, this will also satisfy the aim of imitative experimental research in archaeology (Ingersoll and Macdonald, 1977).