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The Study of the History of the Stone Age in Uzbekistan and the Application of Modern Technologies in Archaeological Research

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Abstract---*The study and promotion of the history of Uzbekistan and the cultural heritage of our ancestors, their contribution to the development of world civilization, their widespread use in the field of education and education are important for the education of the younger generation. In recent years, the widespread introduction of digital technologies and modeling programs in the field of archaeology has been accelerating. The study of the history of the Stone Age in Uzbekistan and the use of modern technologies during archaeological research marked the beginning of a new stage in the development of the industry. It is important to use modern technologies when compiling a map of the location of monuments - the processes of development of the territory by the population, determining the level of urbanization of the territory. Today, this direction is the main one in the experience of many countries of the world.*
Keywords---*archaeological excavations, archaeological finds, cultural layer, model of archaeological forecast, reconstruction of monuments, the stone age in Uzbekistan, tools of labor*

Introduction

In recent years, there have been great innovations in the application of modern technologies in world science. This, in practice, serves to improve the quality of scientific research and increase the importance of scientific innovation. Like many other disciplines, archaeology has been using such technologies in several areas to facilitate and increase the effectiveness of scientific research. In particular, the creation of maps of the location of monuments, the preparation of the history of the excavated area plays an important role in the accuracy and convenience of such technologies. Doctors of sciences such as O. Islamov, M. Kasimov, T. Mirsoatov, M. Jurakulov, R. Sulaymonov, N. Kholmatov and candidates of sciences such as N. Tashkentboev, T. Omonjulov, M. Khojanazarov, B. Sayfullaev and their students have been studying the Stone Age monuments from the Early Paleolithic to the Bronze Age.

Materials and Methods

Selangor monument

It is known that in 1938 when AP Okladnikov found finds belonging to the Mustye period of our ancestors in the Teshiktash cave in Boysun district of Surkhandarya region, he equated our history to 100 thousand years. As a result of many years of archaeological excavations by Utkir Islamov in the Selungur Cave in the Fergana Valley, the history of the primitive period of Central Asia was extended from one hundred thousand years to 1 million years, based on evidence. Academician AP Okladnikov visited this monument three times, in 1955, 1960 and 1964, on the right side of the Selungur cave. As a result, for the first time in this cave, several fossils were found, which were identified as belonging to the late Paleolithic period. After A. P. Okladnikov, the Fergana Paleolithic detachment led by Ya. Gulyamov did a great job with the history of the first settlement of ancient people in the Haydarkon valley. In the 1960s, Obishir I and V were discovered and partially studied by this squadron. In addition, 28 caves were

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inspected. Since 1980, the Paleolithic team of the Institute of Archeology of the Academy of Sciences of the Republic of Uzbekistan, headed by O. Islamov, has been regularly excavating the Selungur Cave, creating great discoveries of historical significance not only for Uzbekistan but for Central Asia as a whole. A circular find with Ashel found in Selungur was the discovery of the head, shoulder bones, and several teeth of ancient people. These findings were studied together by well-known anthropologists VM Kharitonov and AA Zubov, and it was scientifically determined that this bone remains belonged to archaeanthropes, and it was named Fergantrop. The second major innovation was the discovery and uniqueness of the oldest tools of labour, the discovery of a large number of animal bones. Most of them are bones of animals that lived 1 million years ago and later disappeared altogether: the cave lion, the hyena, the sword-toothed tiger, the ancient horse, the aspen, the rhinoceros, and others. As a result of archaeological excavations in Selungur for almost ten years, a large amount of archaeological material was collected by O. Islamov. These materials were thoroughly studied by O. Islamov and K. Krakhmal (Lubis, 2018; Barra Novoa, 2021).

O. Islamov's comparative study of the tools found in Selungur with the Olduvai monuments and the stone industry of Ubayda in the Middle East showed similarities between them. Olduvai monuments, according to G.A. Grigorev, are dated to a period of 1.4 to 2.5 million years. Based on the above, O. Islamov determines the depth of Haydarkan and the location of the first people to the south of Fergana in 1 million years. The most remarkable monument after the Selungur monument is the Kolbulak monument, which was introduced to archaeology by M. Kasimov. Kolbulak settlement consists of 41 layers. According to the scientist, archaeanthropes, Neanderthals, Cro-Magnons lived in Kolbulak from the Early Paleolithic to the Mesolithic. This monument, if we translate the above thoughts of M. Kasimov from the scientific language to the vernacular, shows the area of continuous development of the 1 million-year history of our ancestors. The archaeanthropes that inhabited the lake were biologically evolved and took on a modern form. This allows us to conclude that this monument can provide more valuable information of historical significance not only for Uzbekistan but also for world culture. It should be noted about the Middle Paleolithic, ie the Muste period, after the first Paleolithic, this period was studied on a very large scale after the Teshiktash cave. The number of these monuments in Central Asia has reached 300 to date. It has been widely studied by R.H. Sulaymonov, N. H. Tashkentbaev, MG Kasimov, T. Amonjulov. Only in the Tashkent oasis more than 30 monuments were found and studied. According to T. Omonjulov, who researched the monuments of the Middle Paleolithic, the Tashkent oasis plays an important role in illuminating this period for the Central Asian region, and Kolbulak and Obirahmat play a key role in the opening of the Middle Paleolithic (Koutsoudis et al., 2014; Bohren et al., 2019).

Obirahmat monument

Speaking of the monument to Obirahmat, it is worth noting the services of R. Suleymanov, who thoroughly studied this unique place in accordance with modern requirements and introduced it to the world. R.H. Suleymanov not only studied the archaeological finds from Obirahmat but also determined their historical and cultural development on the basis of mathematical and statistical methods. Based on archaeological findings, R.H. Suleymanov proved that the Obirahmat Cave, which contains thousands of artefacts in a cultural layer 10 m thick, is a stage of completion of one of the muste cultures in Central Asia and the transition to the Upper Paleolithic. Another contribution of R.H. Suleymanov to the science of archaeology was that he was able to thoroughly study and compare the tools of all must monuments in Uzbekistan, to determine the evolution of the development of these monuments, as well as to consider the periodization of the stone industry. A thorough study of the Obirahmat industry by the scientist showed that the above monuments did not look less rude and archaic than in the stone industry, but in any case preserved large-scale artefacts, as well as plate-throwing techniques and secondary processing of tools. One of the most remarkable monuments of the Muste period in Uzbekistan is the Kotirbulak monument, where archaeological excavations were carried out mainly by N. Kh. Tashkenbaev. It was studied by the stone industry by NH Tashkenbaev and RH Suleymanov. This monument is multi-layered and is divided into 5 horizons by the authors (Franklin et al., 2015; Rogers et al., 2014).

Kotirbulak monument

In addition to the Kotirbulak monument, there are other muste monuments around the middle and lower reaches of the Zarafshan River: Zirabulak, Omonkuton, Takaliksay, Gurdara and Uchtut workshops. Among them, Zirabulak is very close to Kotirbulak. The technique and typology of the stone industry are close to Kotirbulak. Archaeological finds have been excavated from the cultural layer of the Zirabulak monument in an area of 20 m2. Accordingly, T.

Grechnina concluded that the monument dates back to the late Middle Paleolithic. M. J. Jurakulov is another of our national archaeologists who have made a worthy contribution to the coverage of the history of the ancient ancestors of Uzbekistan with his scientific work. MJ Jurakulov devoted almost 40 years of his scientific activity to the study of Stone Age monuments located in the basin of the Zarafshan River and their restoration on a scientific basis. The Zarafshan basin covers an area of 42,860 km2 and is home to many archaeological monuments. M. J. Jurakulov's contribution to the archaeology of Uzbekistan was that he systematized the monuments in the region, including the Neolithic, many of them restored paleoecology and partly paleo-economics, and studied them comparatively with the monuments of Central Asia and neighbouring countries. As a result, the Zarafshan basin was considered as a whole cultural-historical region, and it was found that they had interrelated relations with the mountainous and plain parts of Central Asia for several tens of thousands of years. It was found that the beginning of settlement by our ancestors in this region coincided with the muste period. It was found out that our ancestors were formed in the Zarafshan basin and took the form of modern times. The role of Samarkand in the periodization of the Central Asian Paleolithic was determined. More precisely, it was found that living in this space was at the beginning of the Upper Paleolithic. Marlon Jurakulovich's contribution to the science of archaeology is that he thoroughly studied the stone industry of the Upper Paleolithic period of Samarkand and showed the dynamics of the development of its culture. Scientific data obtained by M. J. Jurakulov from the monuments of the Zarafshan basin showed that they differed from the cultural and economic traditions of the neighbouring border areas. N. Kholmatov, a student of scientist, continues the research of the scientist and studies the culture of Sazaghan of the Neolithic period (Peigné et al., 2013; Alexandrovskaya & Alexandrovskiy, 2000).

Although Mesolithic monuments such as Dam Dam Chashma I, II, Jebel and Kaylyu were studied in Central Asia by A.P. Okladnikov and G.E. which has been a monument to Joytun. Therefore, was there a transition from a farm that assimilated not only Uzbek scientists, but all Central Asian scientists in the region to the Mesolithic, as in Old Asia? solving such a problem was on the agenda. The first person to solve this problem was the national archaeologist O. Islamov. To solve this problem, U. Islamov began to study the monuments of the Stone Age in the southern regions of Uzbekistan. U. Islamov introduced such cultures as Machay and Obishir into archaeology as a separate culture. His research on Uzbekistan showed that the Mesolithic period in our region can be divided into three complexes:

- Fergana.
- Tashkent.
- Surkhandarya complexes.

The Fergana complex includes Obishir I and V, Tash-Kumyr and scattered settlements in the north-west, Yangi Kadam 21, Taipan 3, 5, 7, Achikol I, III. The Tashkent complex includes only one Joint Location on the left bank of the ancient Bozsuv Canal. Although there are few archaeological finds in this monument, its industry differs from many other sites in that it consists of a variety of finds. The most characteristic feature is the presence in it of weapons of geometric shape. The Surkhandarya complex includes the Machay industry. The peculiarity of the Machay industry is that it has a large number of hammers and naturally broken dolomites were used as weapons. Thus, these three complexes in Uzbekistan differ from each other in terms of region, chronology and typology. With the growth of the population, the types of tools of labour also began to increase. As a result, there is a growing need for lightning rods as raw materials to make these tools. As the need for lightning increased, there was an exchange between the tribes. This, in turn, led to the development of relations between them and the division of labour. By the Neolithic, new techniques such as grinding, sawing, drilling were emerging. In general, in some places where there is no lightning, bone and animal horns were widely used as raw materials to make tools of labour. According to archaeologist TM Mirsoatov, in the late Mesolithic and early Neolithic, people stopped using raw materials that had lost their quality due to the influence of natural forces from the earth's surface to make tools and began to use high-quality flint. Quality flints are mined from flint deposits in a variety of ways. As a result, the transition from quality raw materials to the manufacture of labour tools has led to an improvement in their quality. Quality tools of labour, on the other hand, naturally allowed the economy to accelerate development (Turgunovna & Habibulloyevna, 2020).

The transition in the world to the production of tools from quality raw materials, ie lightning, coincides with a period. From the same period, more precisely in the Neolithic: in France, the Mur de Barre, in Belarus, Krasnoselsky, in England, the mines of Salisbury and Haydavn were mined and used to make tools. Quality plates were blown out of the lightning. The discarded plates were in the form of knives, reaching up to 35 cm. Archaeologically, the Neolithic Revolution dates back to the same period. T. Mirsoatov said that the main reason for the "Neolithic Revolution" was the extraction of quality raw materials from flint deposits in many parts of the world and the transition from them to the production of quality tools (Kasymov, 1972; Suleimanov, 1972).

Uchtut monument

The results of long-term excavations of the site Uchtut show that the tools of labour of the tribes living in the settlements of Bolshoi and Maly Tuzkan (Bukhara region) were mainly made of flint from the Uchtut deposits (Grigoriev, 1988; Omanzhulov, 1984). This was confirmed by the results of the spectral analysis of the lightning weapon discovered by U. Islamov on the section of the Maly and Bolshoy Tuzkon rivers in Leningrad in the laboratory of the Institute of Archeology of the USSR Academy of Sciences in Leningrad. In addition, T. Mirsoatov proved that in each mine of the Uchtut there were defective plates of the Kaltaminor culture, and in the deposits of the Uchtut there was an exchange of the Kaltaminor tribes with the Uchtut “miners” in chronological order (Mirsoatova, 2021; Mirsaatov, 1973). The Uchtutsk deposits were compared by T. Mirsoatov with many flint deposits in Europe and marked the 5th millennium. It should be noted that when S. P. Tolstov, A. V. Vinogradov, U. Islamov expressed their views on the age of the Kaltaminor culture, the Uchtut deposits were not yet known in archaeology. The Uchtut monument was erected in the fall of 1958, a small group of the Mohandarya expedition led by Y. Gulyamov was found by the leader Kh. Mukhamedov, and in 1959 A. P. Okladnikov dug a hole here to identify the monument. From 1961 to 1966 M. Kasimov carried out excavations of the Uchtut monument. In his early studies, he understood the monument as a workshop (Islamov et al., 1988; Islamov & Krakhmal, 1995). Therefore, Uchtut began to study the monument in the squares, just like during excavations of Paleolithic settlements. As a result, the original shape of the 300 m2 Neolithic mines excavated in these areas was distorted. Since 1967, as a result of a new method of excavation of the monument, T. M. Mirsoatov's Uchtut monument is not a "workshop", but a large Neolithic object, which is a raw material for the Kaltaminor tribes around the Zarafshan oasis, namely flint. it turned out (Izyumov et al., 2008; Okladnikov, 1958).

Results and Discussion

Today, the science of archaeology in the world is much more advanced in the application of modern technologies, which play an important role in many studies. Researchers conditionally divide these areas into two groups according to their area of application. 1) technologies used in the direct excavation process; 2) technologies used after the excavation process (Lhuillier & Hasanov, 2013; Murodova, 2020). The first group of technologies is digital technologies (GAT), radiolocation and magnetometry. As the latest innovation in the archaeology of Uzbekistan, F. Maksudov's development of a new "archaeological forecasting model" based on the analysis of the settlement characteristics of nomadic herders living in the mountainous regions of Central Asia with the approach of digital technologies (GAT) allowed to identify several important tasks for specialists. Georadar detects the state of the subsoil by scanning the layers of the monument layers (solid natural or secondary processed bodies) before excavation has yet to begin. This facilitates excavations and at the same time does not damage the monuments, both externally and internally.

Magnetometric search, on the other hand, makes it possible to distinguish the condition of a man-made surface from that of a natural surface. In this case, the difference in the soil layer even after several centuries is based on magnetic waves. This is seen in the magnetometry analysis. Such technologies are being used effectively in several international expeditions in Uzbekistan. In particular, the Uzbek-US joint expedition at the Tashbulak monument in the Jizzakh region, the Uzbek-French joint expedition at the Podayotoqtepa monument in Kashkadarya region, and the Uzbek-Czech joint expedition at the Surkhandarya region. In particular, the use of these technologies at the Tashbulak monument created the history of the first nomadic periphery in the territory of Uzbekistan at an altitude of 2000 m above sea level and improved it through archaeological excavations. In 2019, in the research conducted at the monument Uchtepa in the Namangan region under the leadership of Academician A.Askarov, radiolocation analysis of the object was carried out with the effective use of georadar, and excavations were carried out on its basis (McPherron et al., 2009; Romanengo et al., 2020).

The second group of technologies is modern software used in the preparation of 3D drawings, which can be used in the process of processing the results obtained at the end of more excavations. Such programs are used to determine the function of a monumental structure or parts of a monument that has been partially damaged and not fully preserved. Restoration of lost or damaged monuments is not always objectively possible, so often the reconstruction of undelivered monuments is carried out on paper as a drawing or paper mock-up (it is observed that the accuracy of the reconstruction does not correspond to the original of the monument). Over the past 20 years, a new method of reconstruction has emerged for researchers - virtual modelling. Currently, such programs as Corel Draw, 3D Max, SketchUp are effectively used by experts in this area. Over the last 10 years, three-dimensional modelling software packages have changed significantly. That is, current 3D modelling software provides a detailed view of the interior

and exterior of a building. It reflects the construction techniques, covers the processes of demolition, and can test scientific hypotheses by calculating software models. The three-dimensional model is built based on known sources and differs from any other graphic reconstruction by the richness of its sources. Virtual reconstructions are carried out for several purposes, from scientific reconstruction to the promotion of cultural heritage sites (De Reu et al., 2014; Denbow et al., 2008).

Conclusion

As a result of the use of such programs, effective results have been achieved today at the Khantepa monument in the Kashkadarya region and the Kirkhujra monument in the Namangan region. Modern software can also help identify speech that needs to be excavated in the future, based on data from previous years at the monument. Digital technologies and modelling programs are being widely introduced in the field of archaeology. It should be noted that Academician A. The defence of J. Togaev on the topic "Issues of historical reconstruction of the Bronze and Early Iron Ages (on the example of Southern Uzbekistan)" under the scientific guidance of Sagdullaev serves as a support for scientific work in this area. In conclusion, it can be said that the use of modern technologies in archaeological research allows obtaining quality scientific materials with high accuracy. At the same time, it allows the public to have a broader understanding of the preservation of cultural heritage sites and monuments. The application of such modern technologies to the monuments of the Stone Age is also one of the urgent tasks of archaeology in Uzbekistan today.

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