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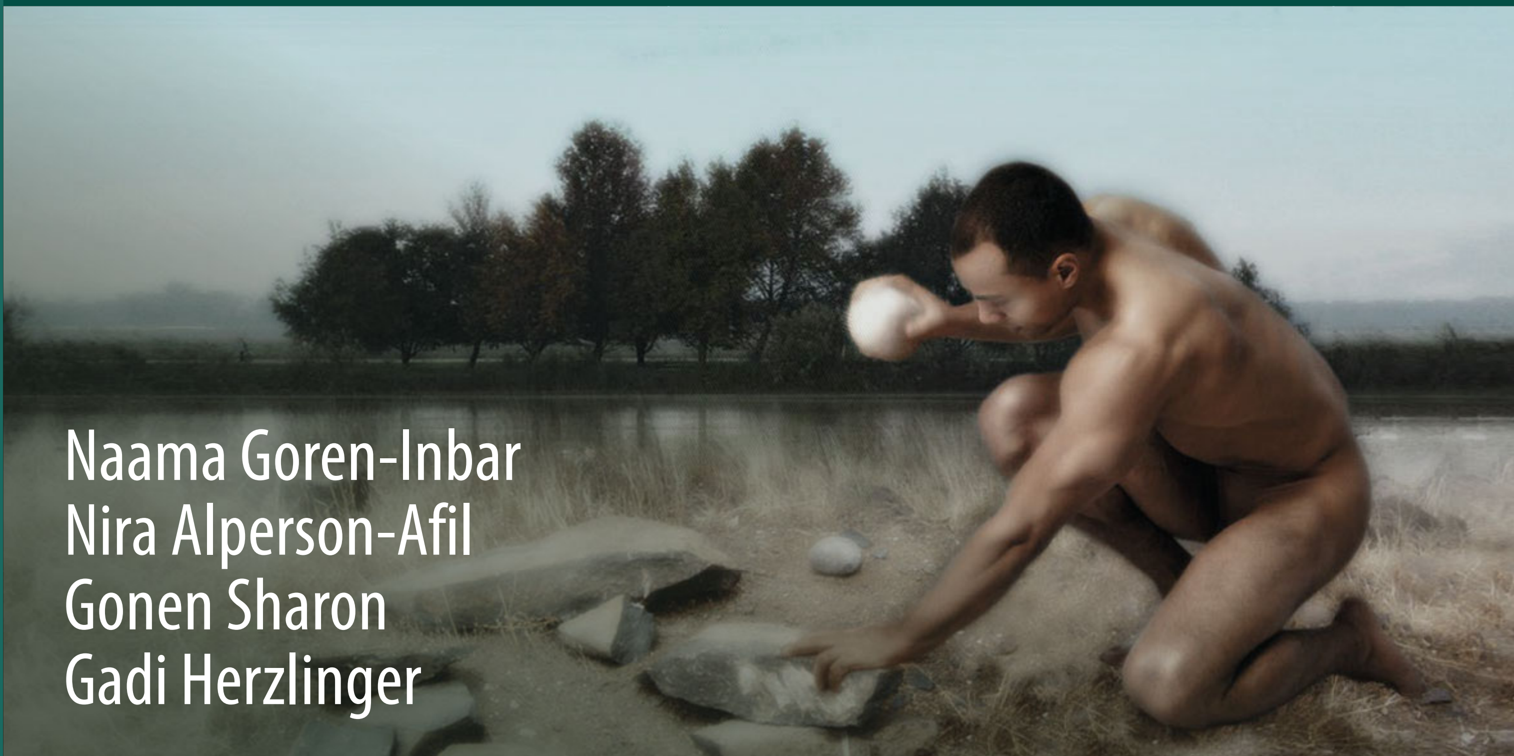

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The Acheulian Site of Gesher Benot Ya'aqov Volume IV

The Lithic Assemblages

Springer

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The Lithic Assemblages

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Cover illustration: The knapping of Giant Cores on the shore of the Paleo-Lake Hula. This image is based on studies of the lithic assemblages of Gesher Benot Ya‘aqov, the essence of this volume. Artist: Guy Hivroni

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The Acheulian Site of Gesher Benot Ya‘aqov

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Foreword

Gesher Benot Ya'aqov is a site which can properly be described as central to our understanding of the Pleistocene record and of the course of human evolution in the last million years. The kind invitation from Naama Goren-Inbar to write this foreword gives me the chance to set its context in the broader picture, to justify the words above, and to touch on the meaning of its artefacts and analyses which this volume so clearly shows.

The Acheulean is the longest tradition in our human past, and geographically the most widespread. Naturally then, our knowledge depends on many sites, a thin scatter through time and space, telling a largely consistent if somewhat puzzling story: but very few of these sites provide a coherent picture of early human activities. Gesher Benot Ya'aqov stands out as one of the few sites around the world that can be a standard bearer of our knowledge. Is this because it was more important than other places in the past? That can hardly be so: its significance is rather for us, now, made by its archaeology.

Certainly, some favoured places drew a human return again and again, and GBY is one of those. Factors of resources – plants, animals and water – can make such a place focal for a local community. It would be hard to argue that one early human hunter gatherer community is more important than another, whether it is in the Levant, Europe or Africa. Even so, from the point of view of archaeologists, some areas give a better barometer of movement and dispersal than others, and the Middle East is crucial for an understanding of movements out of Africa, the first globalisations.

What makes GBY stand out further are the factors of deposition continuing steadily over a long period, of the order of hundred thousand years; the subsequent geological events which have created exposures, and then the breadth, scope and intensity of archaeological investigation. This combination is very rarely available.

Part of the strength of GBY comes from the 'bandwidth' of its preservation. If we ask what is central or critical to the Acheulean, the handaxe is certainly its hallmark, but field archaeology has moved beyond it, to the full range of evidence. The Acheulean is polythetic, in the sense that multiple features characterise it, but often they are not all present. The team at GBY recognised this early on, with studies of the 'visible and invisible' in the Acheulean which explored the difficulties of distinguishing between true absence and mere absence in a particular locality or preservational circumstances. Although the handaxe has proved as useful to study at GBY as anywhere, the outstanding value of the investigations is that they emphasise a far broader picture: not just categories such as small tools, wood, or butchery, but most especially exploration of the dynamics of activity – not just an abstract concept, but the actions of early humans - plain to discern in this volume.

Paradoxically, a new generation of scholarship with a psychological emphasis concentrates largely on the handaxe – often separated from archaeological context – and then risks missing the point clearly brought out in this research that it is one tool in a toolkit or even set of toolkits. In contradistinction, and over a long period, Naama Goren-Inbar and her colleagues have worked to construct from the multiple lines of evidence a sense of complete, functioning and competent human beings. Through that cognitive approach we see Homo erectus as effective problem solvers, competent and even comfortable in their world.

The Acheulean as global tradition: its reshaping in recent years

Views of the Acheulean have changed significantly in recent years. The tradition has grown yet longer, with dates pushing toward 1.8 million years for its beginnings. The idea of a link with *Homo erectus* remains. The Acheulean is usually seen as originating in Africa, and an early 'Out of Africa' has long been the dominant paradigm for modelling dispersals – one seriously considered in the GBY interpretations.

In this frame, starting dates at least as early as one million years are now possible in both Asia and Europe, although rarely supported by solid age determinations. Gesher Benot Ya'aqov, however, is well dated to periods just after the Brunhes-Matuyama palaeomagnetic boundary of 790,000 years ago. This places it at the head of the second half of the Acheulean, rather older than any handaxe site in Europe that we can see clearly, and older than most dated sites in India. This position makes the site able to stand as a benchmark for looking at the early development of the Acheulean across these areas.

The pivotal position of GBY, and the depth of the research, allow comparisons with other Acheulean industries, in the Levant and around the world, which are only just beginning – and which are made far more feasible by the content of this volume. The great majority of variability studies have been internal to each continent. From its stone technology, GBY seems to be closely allied with the African 'middle' Acheulean – with somewhat similar material occurring in India and parts of Europe such as Spain.

The record of stone

Lithics, the main subject of this volume, still provide the backbone of Palaeolithic studies. GBY shows handaxes and cleavers that are typical of the classic Acheulean idea. Broadly it has been known for a long time that such bifaces are made by striking large flakes from giant cores – but in the European record these are rare, and their global importance is often missed or even ignored. In Africa, the phenomenon is always noted, yet rarely treated with more than a few words. Our colleagues in Israel have provided a great service by exploring the issues, through systematic experiments, and then by systematic survey (Sharon 2009 and this volume).

If the GBY bifaces are very like those in Africa made of similar lavas, it is noticeable from the figures that they almost lack thick forms such as picks, even though these occur on the older sites of 'Ubeidiya. This is one aspect of the variability that is so prevalent in the Acheulean: that in almost any respect two sites close together can be as different as two sites far apart. Similarly, GBY shows echoes of techniques otherwise known several thousands of kilometres away. The careful working of large cores is one element of this ("The size and morphology of large flakes were pre-planned" p 376), and if anyone should doubt this, some of the proof lies in biface flakes made by the fascinating Kombewa technique, described perhaps for the first time outside Africa. In this by great skill the maker produces biface blanks with two bulbar faces. The technique occurs at La Kamoa in Congo, and in the Sahara, but is scarcely present on any of the major East African sites – and yet it crops up again at Gesher Benot Ya'aqov, not commonly but consistently (and probably this is its oldest securely dated occurrence).

Choice and cognition

Also of interest are the stone raw material choices. Over a period, here and on other sites too, Naama Goren-Inbar and her colleagues have shown the cognitive implications of selections which were evidently made to find the best properties for carrying out a particular task. Basalt, flint and limestone were preferred in different circumstances. The operational sequences so carefully traced by Goren-Inbar and colleagues show clear preferences of particular materials. Such selection can rarely be studied to the same degree on African sites, where flint-like materials are rare, or on most European sites where, barring the presence of quartzite, flint reigned supreme.

The research described here also reflects other new centres of interest – for example studies of percussion that now extend in a comparative frame to primate tool using practices. In these developments making links with primatology the GBY research has been at the forefront from an early stage. Again the studies have explored the dynamics of action, and there is the interlinking of operational chains – in this case the fashioning of stone, and the processing of nuts. From the circumstances of sedimentation and preservation GBY does not make available very large excavation surfaces, but they do allow the chains of activities to be seen in detail, especially in the case of association of artefacts and butchery.

Aspects of GBY revisited – bone, plants, wood and fire

The organic remains of GBY have been described in other volumes and papers, but it is important to allude to them here. In the later flowering of technology fire use and the hearth create a nexus for intersecting operational chains. It is more than possible that such interactions had already begun by 700,000 years ago. It is not coincidence that both wood and fire evidence are preserved at GBY. There are parallels at Kalambo Falls, and to some extent Schöningen. For physical and chemical reasons burnt material has little chance of being preserved, wood even less so. But where wood is preserved, burnt material is also likely to be found, almost without exception.

'WYSWTW' – what you see is what there was – has too often been the complacent mantra of Palaeolithic archaeology. There is far more than this. Recent approaches to social cognition make plain that we see little more than the tip of the iceberg. The co-preservation of wood and burning points towards complex behavioural patterns which we can only dimly see, but which are convincingly there.

GBY offers many lessons for the archaeology of the Acheulean. The most particular one is to see the value of intensive archaeology, carried out through with a total approach. That is a lesson carried forward in a tradition from the investigations of sites such as Pincevent, and applying equally to the Somme, Boxgrove, or Terra Amata. But GBY is older than these sites, and on older sites it bcomes harder to 'explicate' anything like a full 'palaeoethnology', as Andre Leroi-Gourhan attempted at Pincevent. The Hulah lake is gone, the beds have been tilted, the exposures in and around the present day river Jordan are limited. And yet, this research has emerged successfully in a way that must draw admiration, each question addressed methodically, and carried through in the most painstaking process from field to laboratory.

This volume, and the others which have already appeared, together make up a contribution marking the summation of year upon year of unrelenting hard work. Naama Goren-Inbar has inspired a team of collaborators, but it is to her above all that we owe this work. It is fitting that she has been recognised and honoured in various ways: the Gesher Benot Ya'aqov volumes give us an invaluable insight into the Acheulean and its makers, and will also give an enduring reward to all those whom Glynn Isaac termed the 'aficionados' of the handaxe tradition.

John Gowlett

Preface

The prehistoric site of Gesher Benot Ya‘aqov (GBY) has been known since the mid 1930s. Three eminent archaeologists, D. A. E. Garrod, M. Stekelis, and D. Gilead, were responsible for its introduction to the academic community and beyond. Although each represented a different scholarly world, their studies shared much common ground. The location of the site, and its particular geographical, geological, and geopolitical characteristics, prevented these eminent prehistorians and their successors from conducting long-term investigations, or more precisely excavations, at the site. The efforts and achievements of this particular period are detailed elsewhere in this volume (Chapters 1–3; see also Appendix 1 for the earlier history of the site).

It was in the early 1980s that I was approached by a young geologist, Shmuel Belitzky, who asked my opinion about an isolated sedimentary outcrop located south of the known extent of the GBY Acheulian prehistoric site, in an area that had not previously been investigated for prehistoric finds. The outcrop, at the southern end of the Hula Valley, is located on the slopes of the Crusader fortress of *Vadum Iacob* and forms its sloping protective bank or glacis. This area, the northern extension of the "Korazim Saddle", is known for its extensive sequence of paleo-lake formations representing the very long depositional history of the northern Jordan Valley. As it was beyond the limits of my expertise to assign the exposure to a precise age within the Pliocene and Pleistocene deposits of the Upper Jordan Valley, we decided to examine the outcrop together. The two of us, joined by a small group of students who were working with me that summer (1985) at the Mousterian site of Quneitra, went to take a closer look at the edge of the fortress.

We could see that a series of eastward-tilted (70º) beds composed of sands, pebbles, fossil mammal bone fragments, and occasional boulders and cobbles form the glacis of the fortress. We then decided to excavate a protruding piece of flint from the cemented sediments of the outcrop, trying to minimize the surface damage in order to avert clandestine excavations in the future. After a few minutes we had exposed a flint handaxe and next to it a fossil gastropod (*Viviparus apameae*), the type fossil of the Middle Pleistocene Hula deposits; both finds are yardsticks for assigning the exposure to the Middle Pleistocene and to the Acheulian Technocomplex. Further survey of these beds resulted in the discovery of three superbly fashioned flint cleavers, which were left in place to be collected later, but were never found again.

The results of this short field trip testified to the extension of the Benot Ya‘akov Formation south of the Benot Ya‘aqov Bridges. They also inspired our ongoing study of this formation and its extremely rich assemblages, which has continued for over two decades.

In due course, and following a survey of the Jordan River banks south of the bridges, we initiated the excavations that are reported in this volume. They were located on the left bank of the Jordan River on a piece of land devoid of large cobbles and boulders, bordered on the west by the river and on the east by a dirt road with an extensive minefield beyond it. Although we clearly enjoy better geopolitical conditions than those faced by the previous researchers of the GBY site, we were still challenged by some similar difficulties.

The first field season was an extraordinary educational experience for us all, from the director to the most junior participant. It was then that it dawned on us, when we saw and understood the full extent of the tectonically deformed strata, that the site was extremely rich in artifacts and paleontological remains, and that its waterlogging had preserved wood, bark, fruits, and seeds. Concurrent with this understanding was my conviction that excavating this site demanded a commitment that went far beyond that required for a normative site. This was a goal that necessitated tremendous amounts of time, energy, dedication, strength, and perseverance, a certain amount of obstinacy, and masses of optimism.

During the early years of excavation at ʻUbeidiya, while standing in front of an excavated pit in Layer I-15, we jokingly quoted Prof. Moshe Stekelis, who referred to the pit as a "window into the Pleistocene". My feeling at GBY was that here we did indeed have an opportunity to see through a very small window into the Pleistocene. It was a window not only into the Pleistocene of the northern segment of the Dead Sea Rift, but also into an archive of information about the paleoenvironment, paleoecology, and hominin behavior in the eastern Mediterranean, the Levantine Corridor. The full understanding of this archive demanded a commitment that prevented me for many years from getting involved in studies, excavations, and analyses of any other site. It simply was, and still is, too large a job to be a part-time one.

There was no routine, in the usual meaning of the word, during the excavations, and I moved between excitement and despair. At other times there were absurd moments. An illustration of these was the fact that we needed to pump out the water that accumulated in the trenches and the excavation areas; on the other hand, the exposed organic materials, primarily the wood and bark fragments, had to be kept wet at all times to protect them from deterioration – in short, to the outside observer, an example of a *perpetuum mobile*. Another example is the extremely poor state of preservation of some of the most exquisite basalt bifacial tools (handaxes and cleavers). Many of these artifacts looked extremely impressive when they were taken out of the ground but, as we learned very quickly from bitter experience, they simply crumbled into mud (clay) if they were not immersed immediately in water. Despite all the care and conservation procedures that were applied to some of these items, some continued to disintegrate in the laboratory, ruling out their detailed analysis.

Tilted strata were familiar to me from my previous experience in the excavation of ʻUbeidiya. One aspect, and a very frustrating one, is the exposed surface of the excavated horizons, which usually resembles a strip of minimal height. The same frustration, but perhaps even more overwhelming, derived from the smaller extent of the excavation at GBY. We were able to expose an elephant skull and there were several lines of evidence indicating that it was not greatly disturbed taphonomically, and yet we could not continue the exposure of that particular level (Layer II-6 Level 1) because of the steep dip of the layer.

From the very first field season I fully grasped the enormous potential of the site. Step by step with the exposure of the archaeological horizons, the importance of the discoveries dawned on me. I still remember the tremendous excitement that I shared with Idit Saragusti when we looked at the exposed artifact horizon of Layer II-6 Level 4 – a tilted pavement of basalt bifacial tools. Both handaxes and cleavers were fully exposed on the limited surface of the dig, a thin layer one or two artifacts thick, minimally associated with other classes of finds and visibly unaffected by postdepositional processes. "Just like in Africa", we murmured in astonishment.

Such a complex project as that of GBY could not be run single-handed. It was and still is a team effort. During the last two decades I have been fortunate to be able to train a superb crew – all students of the Institute of Archaeology, The Hebrew University of Jerusalem. It was indeed a privilege to be with them, and eventually to learn from them. They are studious, serious, and joyful, and their uncompromising and long-lasting commitment was an unsurpassed experience for me. Each of the senior students (field and laboratory directors) has been working on the project for more than ten years, and all of them participate in the research effort to try to make sense of it all. There is no doubt in my mind that the GBY project has continued and has been so successful because of the support and enthusiasm of the team.

In the archives of the British Mandate, the Israel Department of Antiquities, and the Israel Antiquities Authority there are many letters documenting the importance that the presidents of the

Hebrew University and other high officials have attached to the study of the site. Alas, despite my attempts to raise awareness of the site as a national heritage locality of great importance, I have been unsuccessful. Furthermore, despite all my warnings, in December 1999, only two years after the end of the last excavation season, the site was deliberately ravaged and partially destroyed by drainage works.

One of the greatest responsibilities of running a project, well known and experienced by all my colleagues, is finding the resources to support the project. This task became harder and harder over the years and, despite my efforts, I had only partial success. For example, the expedition was never able to afford an advanced system of documentation. I feel that a project like GBY deserves the best of means with which to document such a unique field experience. Fortunately, the recent years of research have benefited from much better support.

The exceptional nature of the site (its waterlogged location right on the banks of the Jordan River) does not allow for its conservation in the usual sense. However, its scientific value and hence its importance go far beyond a signboard and some forgotten documents. It should be protected by declaring it a national archaeological heritage site and its natural and archaeological surroundings (including all the archaeological and historical monuments) should be designated a national reserve.

The field and laboratory work enabled me to expand my very limited background in many of the disciplines, and to learn about fields that I never thought would be an integral part of the project. There were outstanding moments of discovery when looking at newly assembled results, and there were other projects that could have been scientific gems and resulted in fascinating studies but were doomed by the human factor, a well-known stumbling block in multidisciplinary projects. And yet, above all this is the treasure of which we have so far exposed only very little. The site extends over 3.5 km on a north-south axis along the main fault line (a plate boundary). In a core drilled on the right bank immediately north of the northern bridge, penetrating to a depth of 80 m, we were able to retrieve a flint artifact from a depth of 54 m below the surface, demonstrating that the Benot Ya‘akov Formation (whose base was not reached in this series of drillings) is far more extensive than what meets the eye on the surface, and that our understanding of it is still in its infancy. To illustrate this, I need only mention that the overall excavated surface of our expedition was limited to 246.84 m^2 and the excavated volume to 40.72 m^3. I give these figures simply to illustrate the enormity of the site and the unimaginable treasures buried under the Jordan River and its floodplain, and to attempt to convey the respect that I feel for the site and its research potential. It is also meant as a word of warning for those who may wish, at some time in the future, to conduct their own excavations at the site and to realize its potential. The task will be enormous!

This volume contains nine chapters: introduction (Chapter 1), the history of research (Chapter 2), the site of Gesher Benot Ya‘aqov (Chapter 3), methodology (Chapter 4), a description of all layers and their detailed lithic content (Chapter 5), three chapters dedicated to each of the three raw materials used by the Acheulians – flint (Chapter 6), basalt (Chapter 7), and limestone (Chapter 8) – and finally a chapter dedicated to discussion and summary (Chapter 9).

The final chapter attempts to present some of the insights gained by the Gesher Benot Ya‘aqov team through study of the material culture. It seems crucially important to me to point out that the contribution of the project goes far beyond simple description of the excavated stone artifacts. Rather, its most important contribution lies in our interpretations of the various behavioral patterns that emerge from the analyses, whether concerned with the cognitive abilities of the hominins, their other abilities, or arrays of hominin behavioral patterns that derive from our findings. We have acquired ample data on some of the main behavioral traits of the ancient hominins: their tool kits and the production of tools from the stage of acquisition of raw material through the transportation of the objects to the paleolandscape and finally their discard. Much has been gained by comparative study of the various archaeological horizons, and the emerging picture testifies to a multitude of different activities that were all carried out on the lake margin of the freshwater paleo-Lake Hula, in a lush environment of rich biomass. It is this variety of tasks – the monumental behavioral complexity of the Early–Middle

Pleistocene inhabitants of the Hula Valley region – that should be the focus of future work at the site and elsewhere.

This volume ends with our perspective on two general issues: hominin behavior at GBY and their cognitive abilities. If we have stretched the yarn too far, I take full responsibility.

N. G.-I.

Acknowledgements

This volume is the result of more than 25 years of continuous archaeological work in the field and in the laboratory. During these years many individuals and institutions supported and contributed to the project in numerous and various ways. There is no simple way for us to express our gratitude to them all. There has been much good will and interest in the project, and the following lines cannot fully express our appreciation. The realization of this volume, a very difficult task that could not have been accomplished without the help of many individuals, is the result of the prolonged efforts of a small permanent staff and of many students, among others, during an enormous number of working hours.

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Special thanks are due to the members of Kibbutz Gadot, who lodged the expedition and made our stay in their home a most pleasant one. They provided outstanding hospitality and shared our enthusiasm; we felt we were at home and were supported, helped, and visited by many members of the kibbutz. Of particular help were Yossi Arbel and Haim Milrad, who constantly provided advice and physical help in many ways and for many years. Others, whose names are too numerous to be mentioned here, contributed to the present volume.

We thank the staff of the Israel Antiquities Authority, especially our colleagues of the Department of Prehistory, for their continuous support and help throughout many years. Their involvement covered diverse aspects and was always characterized by goodwill. We have profited immensely from many and varied discussions with our advanced students. They always showed a lively interest in our study and were helpful in many ways, contributing both their knowledge and their experience (particularly Arik Malinsky-Buller and Yossi Zaidner).

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The team

Idit Saragusti, Rivka Rabinovich, Gonen Sharon, and Nira Alperson-Afil formed the core of the GBY team. They all participated in fieldwork and took part in preparation, excavation, decision-making, and caring for the participants. Special thanks are due to Idit Saragusti, who was capable of turning some of my bizarre ideas into reality. Her command of the fieldwork and powers of observation, as well as her patience and calm, were a vital contribution to the success of the fieldwork. Rivka Rabinovich was in charge of the paleontological aspects in the field and the laboratory and was a most cheerful member of the team, always ready to take on any task. Gonen Sharon and Nira Alperson-Afil first participated as young undergraduate students and grew into prehistorians, each contributing many years and experience as well as understanding to the project. Many of their studies of the material culture of the site have been published in reputable journals, and their continuous involvement made this publication possible. We could not wish for better students, colleagues, and friends than these two.

Many other individuals took an active part in the excavations, whether colleagues belonging to other contributing disciplines or students, friends, and many who arrived from abroad, all full of enthusiasm and contributing to a most joyful atmosphere. We thank the following individuals for their involvement during the fieldwork: John Berg, Scott Brande, Mario Chech, Orna Cohen, Pepa Enamorado-Rivera, David Gordon, Noam Goren, Yuval Goren, Guy Hivroni, Erella Hovers, Simcha Lev-Yadun, Ofer Marder, Charles McNutt III, Dan Reshef-Mishmar, Hagar Taub, Eyal Vadai, Kenneth Verosub, Tzachi Vitelzon, Steve Weiner (for his contributions during the 1990 field season), Marcy Wiseman, and finally Dani Even-Zur (for his brilliant idea of utilizing anchors used in agriculture and hence providing unmatched precision of measurements throughout the different field seasons).

Lithic analysis

The lithic analysis of the GBY assemblages is an extremely difficult task, due to the various raw materials and their different weathering modes as well as the lack of standardization in some artifacts and tool classes. The entire analysis has been a prolonged process. Due to these constraints and many others, it was decided that only a small number of individuals would carry out the actual analyses (see Chapter 4). Those who conducted the analyses during the entire period are Idit Saragusti, Ofer Marder, Hagar Taub, Gonen Sharon, Josette Mimoun Sarel, Nira Alperson-Afil, Ron Lavi, Zinovi Matzkevich, Chagai Cohen, and Eyal Vadai.

We would also like to thank Bo Madsen, one of the most skilled and experienced modern knappers, particularly of bifacial tools, for his immense contribution to our understanding of technological aspects of Acheulian lithic technology. It was his experiments with the volcanic rocks from the vicinity of the site and his structured methodology that advanced our understanding of these aspects of the archaeological material.

The building and maintenance of the growing database became a central activity within the project over the years. Programs were changed and updating the files was a routine procedure. In the first years the team was joined by Ester Sivan, who was later replaced by Irena Laschiver. Special thanks are due to our team member Irena Laschiver, who worked with us in the laboratory for many years. She participated first in the sorting of sediments and then in that of the microartifacts. After this she was in charge of digitizing the full record of field maps and later on, for many years, of the GBY database. Her commitment, dedication, and permanent good humor made a huge contribution to the working environment.

The youngest person who made his mark in database management was Gadi Herzlinger, who added to it a programming aspect and as a result contributed much to the efficiency of the work, particularly in the last few years. His work was so valuable and his input so immense that he became a co-author of this volume.

The authors wish to thank the Gesher Benot Ya'aqov staff and students at the Institute of Archaeology of the Hebrew University for sorting of sediments and microartifacts over the years (1989–2007): Tchiya Alon, Doron Ben-Ami, Rachel Berman, Orly Boyum, Keren Braverman, Anat Cohen, Taufik Daa'dalla, Doron Dag, Hila Debono, Olga Dobovski, Michal Dovrat, Tomer Dror, Irit Eckshtein, Caroline Felus, Keren Finkelshtein, Talia Goldman, Emma Goldshmit, Natalya Gubenko, Debby Hochman, Ronit Israeli, Sharon Kaplan, Keren Katzir, Karni Klein, Christopher Konlan, Irena Laschiver, Liora Levy, Ravit Lin, Amit Marari, Maya Margalit, Efrat Mashiach, Noa Mashiach, Zinovi Matzkevitch, Sigalit Mazugi, Michal Meir, Uri Milshtein, Hadas Motro, Tali Nevo, Boaz Ofek, Dan Oriyan, Oded Ramati, Dan Reshef, Menachem Rogel, Keren Rosenberg, Karmit Rubin, Eli Shabo, Reut Shalib, Vivian Shalom, Ruthy Shimron, Iris Shmila, Esther Sivan, Guy Stiebel, Hagar Taub, Lilli-Shantal Tepber, Sigalit Tzaidi, Smadar Tzaidi, Eyal Vadai, and Yulya Volodosky.

Illustrations and photographs

Several individuals were responsible for drafting maps, cross-sections, and an array of other types of illustrations. Drawing in the field was a far from simple procedure, as it involved complicated geometric calculations and precision in laying out the boundaries of the drafted areas. Needless to say, apart from the searing summer temperatures, the tilted archaeological horizons and the dark colors of the muddy sediments presented many difficulties and necessitated inventions and innovations on the part of the drafting staff. These included Tzachi Vitelzon, Johanna Warshaw, Cathy D'Ouzil (Fig. 4.18), Raquel Rojas (Figs. 7.210a, b), Nira Alperson-Afil, Pepa Enamorado-Rivera, and Charles McNutt III. From time to time other talented participants joined in and produced excellent drawings.

Artifact illustrations were carried out by the following artists: Daliya Enoch, Yuliya Moskovich (Figs. 6.3, 6.14, 6.25, 6.30, 6.49, 6.50, 6.51, 6.53, 6.58, 6.76, 7.29, 7.30, 7.36-7.38), Leonid Zeiger (Figs. 6.5, 6.11, 6.46, 6.52, 6.54, 6.60, 6.65, 6.59, 6.69, 6.72, 6.76, 7.1, 7.5-7.15, 7.20, 7.22, 7.31, 7.34, 7.35, 7.143-7.145, 7.163, 7.165, 7.198, 7.199, 7.200, 8.1-8.14), Tzachi Vitelzon, Cathy Douzil, Paolo Giunti (Paolito) (Figs. 6.2, 6.17, 6.46, 6.48, 6.49, 6.55, 6.56, 6.65, 6. 76, 7.2, 7.17, 7.23, 7.26, 7.27, 7.33, 7.39, 7.50, 7.56, 7.57, 7.86, 7.118, 7.121, 7.136, 7.141, 7.148, 7.157, 7.159, 7.160-7.162, 7.164, 7.166, 7.167, 7.170, 7.177, 7.178, 7.182, 7.185, 7.188, 7.190, 7.196, 7.197, 7.208). Yaron Hazan (Figs. 7.131, 7.133), Chagai Cohen, Guy Hivroni, and Noah Lichtinger contributed their expertise in the domain of computerized graphics.

For many years Gabi Laron, the former director of the photography laboratory at the Institute of Archaeology of the Hebrew University, invested many long working days in trying to achieve, and indeed achieving, most impressive and excellent results from very demanding and difficult objects. His quest for perfection is well documented in an array of superb photographs of very unimpressive artifacts that were extremely difficult to document. The following are his photographs: Figs. 3.3b & c, 3.19, 3.20, 3.21, 5.24, 5.36h & g, 6.78, 7.103, 7.104, 7.105, 7.106, 7.111, 7.112, 7.114, 7.115, 7.130, 7.134, 7.137, 7.138, 7.139, 7.140, 7.171, 7.172, 7.173, 7.186, 7.187, 7.192, 7.193, 7.194, 7.195, 7.213 (#7699), 8.4, 8.5, 8.6. The aerial photographs were taken by Arik Baltinester (Figs. 2.22 and 3.4).

In recent years great progress has been made in the field of digitized scanning (photography). All artifact illustrations that were not drawn by the above-mentioned artists were produced by 3D digitized scanning. Pioneers in this field, to whom we are extremely grateful, are Uzi Smilansky and particularly Leore Grosman of the Computerized Archaeology Laboratory at the Institute of Archaeology, who were attentive to our exacting demands and searched unknown territory in order to produce the digitized images of the artifacts. It is due to their collaboration that we are able to present many of these images in this report. In addition, Gadi Herzlinger produced many of the scans that appear in this volume, and a few were produced by Maya Oron.

Geologists

There is no doubt that we were able to decipher the complex geological structure of the site only thanks to Shmulik Belitzky's long years of involvement in the project. His involvement began with a survey on foot and by boat and included the decision as to where precisely the excavation should be located and, of prime importance, where and how to place the trenches (I–VI) that were the key to any stratigraphic, chronological, cultural, or other understanding of the site. Rarely does one find such an agreeable and talented colleague, with whom it is a pleasure to work. Shmulik's modesty and vast knowledge and experience should be a model for other geoscientists and scholars of other disciplines. We are greatly indebted to him and were privileged to work hand in hand with him.

We thank Craig Feibel for taking part in the last three field seasons and for sharing with us his understanding of the sedimentological aspects of the site. His involvement was crucial for gaining insight into the composition of the sediments, their origin, and their cyclic nature. His (so far) preliminary interpretations of the paleoclimate and the chronological location of the exposed sediments in the study area enabled us, both prehistorians and others, to provide better and more precise interpretations of the assemblages recovered during the excavation, and improved our understanding of hominin behavior in the Upper Jordan Valley.

Those who have passed away

Three colleagues and friends who were actively involved in our project passed away during the years of excavation and analysis. The late Shaul Sopher contributed his entomological knowledge and enabled us to enjoy the fieldwork without being bothered by insects (particularly wasps). The late Giora Parnos was an enthusiastic student in the first field seasons and became a much-appreciated colleague in the field of archaeology. His untimely death shocked us all, teachers and friends, and his loss is a great tragedy. The late veterinarian Dr. Eli Lotan, to whom we dedicated GBY Volume III, came for one field season and stayed for the entire project. He was hardworking and always ready to volunteer, and we were all jealous of his energies, strength, and manifold contributions to the team.

Others

The documentation of the large amount of activities causing destruction to the GBY site deserved a particular place in this volume. Data collection for parts of Appendix 1 was carried out by Tomer Dror, who familiarized himself with the different archives and zealously collected essential information. We thank Tamar Nachmias-Lotan for integrating Tomer's catalogue and archive into Appendix 1, covering the history of the Jordan River at the location of the site. Ofir Kelty helped in proofreading the volume.

We thank the staff of the Biological Database of the Israel Nature and Parks Authority for providing us with important data on the fauna of the Hula Valley.

Sue Gorodetsky edited this volume and helped immensely in making it clear and coherent in her meticulous and efficient way, for which we are most grateful. Noah Lichtinger made a great contribution to many of the computerized graphics and produced the book creatively and in her usual skillfull and professional manner.

Many thanks are due to Eric Delson and Eric Sargis, editors of the Vertebrate Paleobiology and Paleoanthropology book series, who generously accepted our study for publication and improved it with expertise and dedication. We thank the three anonymous reviewers for their comments and the editorial staff at Springer, particularly Sherestha Saini and Shobana Ramamurthy for their constant interest and efficiency.

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