DOSSIER MALTA

EVIDENCE FOR THE MAGDALENIAN

Anton Mifsud
Simon Mifsud

with a foreword by Anthony J. Frendo
1997

The front and back cover depictions were discovered in 1887 at Hal Resqun. They appeared in Zammit 1935, and have been interpreted as Palaeochristian designs, respectively representing two pelicans feeding their young and "The Creation of Living Things." The authors are working on the hypothesis that the birds represent the extinct Maltese crane, and that both depictions date to the Pleistocene.

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To Maria

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I am indebted to several persons who have rendered considerable assistance to me during the compilation of the information; to the Gauci family, Maria, Bernard and Gotthard, for facilitating access to literary sources abroad, in the United States and the United Kingdom, in most instances acquiring and posting the material themselves.

Daniel Sciberras provided me with an excellent graphics program; he adapted it to my requirements and sorted out the initial difficulties I encountered. My senior registrar, Victor Grech, significantly facilitated my acquaintance with the Microsoft package.

I am indebted to all the senior lecturers in the Department of Archaeology who have rendered me assistance without their knowledge, particularly Anthony Bonanno and Mario Buhagiar. Anthony Frendo played a crucial part in the publication. Apart from accepting to make out the foreword, he proved himself of invaluable assistance to me through his patience in hearing me out on countless occasions and filtering my ideas from matters non-archaeological, for seeking out several of the references I required, for acquiring valuable literary material for me, and for exhorting me to publish. The section on Palaeolithic art at Ghar Hasan would not have been possible without his intervention together with his wife Lillian's. We visited the cave together, discovered and photographed the surviving handprints, and they obtained Anati's photographs of Ghar Hasan for us.

Charles Savona Ventura filled us in on several of the Maltese caverns, and the present fauna contained therein, which caverns he has been investigating since his boyhood. He provided access beyond the steel gates to both Gallery A of Ghar Hasan and to Ghar il-Friefet, which we investigated together for long hours on several occasions in late 1996. It has been mainly in these two and other Maltese caverns that we have merged our research in a forthcoming joint publication.

The professors of Biology, Chemistry and Physics at the University, respectively Patrick J. Schembri, Alfred Vella and Emanuel A. Mallia were also consulted about various scientific matters relating to this work, and their contributions during the interviews were generous and very informative. Patrick J. Schembri provided me with very important references of local biogeography and faunal populations; he obtained photocopies of rare material for me, and he was particularly generous in locating one particular reference which had been eluding me. From the Department of Obstetrics and Gynaecology, Mark Brincat contributed generously from his own research on the local Maltese bovid.

Natalino Fenech's experience in ornithology identified the depictions at the Hal Resqun catacomb in Gudja as Pleistocene Maltese cranes rather than pelicans as previously depicted. He also acquired the relevant literature on the Pleistocene Maltese birds.

Alex Felice is conducting D.N.A. studies on Maltese specimens of fauna, and his discussion was very illuminating and promising for an exciting future avenue of research.

Through the local Archaeological Society we renewed the acquaintances of my ex-colleagues in medicine, the President Anthony de Bono and John Samut-Tagliaferro. The former organized the very informative lectures and outings, whilst the latter's positive and constant criticism has maintained our on-going research. John very obligingly permitted me to view a crucial document in his possession, and George Zammit Maempel subsequently explained the circumstances which were associated with it.

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Nicholas Vella could immediately locate the references we required, remembering authors and titles of articles like the palm of his hand. The long discussions we had over several aspects of this publication were crucial to its final form, which he also scanned and criticised. He acquired a great deal of the reference material for us himself, usually from abroad, particularly that dealing with the Palaeolithic presence in the Mediterranean and its biogeography. Our acquaintance with Field Archaeology we owe entirely to him, from the several excursions we carried out together over the past three years, over varied terrain in Malta, Gozo and abroad. As site supervisor at Tas-Silg (1996) he imparted that sense of making me feel part of the team. This, my very first experience in field archaeology was made possible through the patience and co-operation of my co-diggers, Rachel Radmilli, Daniela Bisazza, Ernest Vella and Noel Vassallo in Trench D (West), and Daphne Caruana Galizia in D3, under the constant supervision of Joseph Magro Conti and Andrè Corrado. My participation in the dig was made possible through the site directors, Anthony Bonanno and Anthony J. Frendo, whose continuous presence, encouragement and the provision of guidelines and relevant information during the excavation enhanced our participation and experience. I am also grateful to Simon Mason, Archaeology Museum of London, and Andrew Appleyard, freelance archaeologist, for sharing their experience in field archaeology with all of us.

Mr. Anthony Pace, Curator at the Museum of Archaeology in Valletta always found time for me outside his busy work schedule in order to hear me out and discuss matters on Maltese prehistory, in which he rendered me expert advice and referrals to the relevant bibliography. I had the privilege of his detailed and personal guided tour of the Neolithic Exhibition in Gozo barely an hour before the official opening. A similar experience was accorded to me at the National Museum of Archaeology during the final phases of its refurbishment.

Mr. Anthony Busuttil went out of his way to render me assistance at the library of the Museum of Archaeology in Valletta. Tabby did no less; she also acquainted me with Anati's 1989 typescript at the Museum and sorted out the arrangements with the Curator, who kindly permitted me to view the document at my convenience and leisure. I am also indebted to the Librarians at the National Library and at Tal-Qroqq, the General Library and the Melitensia section, for their generosity in facilitating matters for me, and at times contributing their own photocopy cards when mine ran out in the afternoon.

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Martin Morana endured long discussions, and his experience during the years he was active at Ghar Dalam was enlightening; he was also particularly helpful in locating the various volumes I required for reference, including those he had utilised himself for his own publication.

Joseph Camilleri is a Registrar in Dentistry at the St. Luke's General Hospital, Malta, and I am indebted to him for being the first to point out the essential differences between taurodont teeth and those with fused roots. He was most generous in imparting his own personal experience of the condition in modern man, and he had also pointed out to me J.J. Mangion's article on the condition; this led to a bibliographic list on taurodontism. Joseph also provided the normal human molar which I required at short notice prior to photographing the three taurodont teeth at Ghar Dalam. I have also discussed the condition with the Heads of the Department of Dentistry, George Camilleri and Hector Galea, and both have given me their valuable experience regarding its incidence and severity over the past three decades. George Camilleri also provided for examination and photography, the entire collection of taurodontic teeth extracted locally and preserved over the past three decades. The other dental surgeons who provided me with their expertise on tooth identification included Malou Ciantar, Alex Azzopardi, John Portelli, James Galea, Alex Cassar, Marie Mangion, Nikolai Attard, Chris Satariano and Jonathan Mifsud. The nurse in charge in the same Department, Miss Maria Cauchi rendered me valuable assistance through her long experience in the department extending over the last twenty years.

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I am grateful to David Trump for his practical way in acquainting me with his methodology in archaeological research, the fruit of his very long experience in the field. Also for the dictum he quoted, that "If two archaeologists agree in all aspects of an issue, the probability is that both are wrong, for they have not been sufficiently critical of each other." Dr. Trump patiently dealt with some points I asked him to clarify on the issue of the taurodont teeth during his time in the Museum of Archaeology.

Mario Mangion scanned the Internet for me for several months, and managed to procure valuable material for me. Liz Groves acquired and reserved several rare archaeological Melitensia for me, and pointed out useful literary sources in London. Kevin and Suzanne Gatt presented me with the latest edition of Renfrew and Bahn's *Archaeology,* and introduced me to Antoinette Bonnici, to whom I am very grateful for imparting her three year experience at the Hypogeum with me. Francis X. Cassar shared his personal experiences in local research piracy; these were very revealing and pointed out the preventitive measures which I have adopted as a routine.

My family I have reserved for the final mention; they certainly cannot be taken for granted. Besides their continuous support and patience, and here particular reference must be made to Marika and Pierre, each provided us with their spontaneous and precious assistance. Abigail provided the hardware, the sophisticated instrumentology, the protective gear and photographic equipment; Tonio's *Discovery* facilitated the journeys to the remote spots in Malta and Gozo. Jael provided the biochemistry and waveforms of Nitrogen decay, the biogeographical aspects of Pleistocene mammals and the literature from *Scientific American* and *New Scientist*. Tabitha accompanied me to the libraries, locally and abroad, and fished out the relevant literature for me; she and James acquired the literature on the pre-history of Majorca during their visit there. She provided the architectural considerations of prehistoric sites, the technical drawings and the mathematics of the chemical incorporation of Fluorine, Iron and uranium oxide into organic remains. Seana accompanied me to all the Palaeolithic sites abroad over the past three years, photographing and video-recording the sites, and surprising me with her observations.

A.M.

FOREWORD

by
Anthony J. Frendo
Head and Senior Lecturer in Archaeology

It was a great pleasure and honour for me to have been asked by Dr. Anton Mifsud to write the foreword to this book, and the reason for my saying so is that I consider him to be truly a gentleman and a scholar. I really believe that Dr. Mifsud is not only a Senior Consultant in Paediatrics. When he befriended me, I immediately realized that here was a man who was endowed with the raw material out of which real researchers are made, namely those who know no bounds in their quest for truth and who are always ready to learn new methods and techniques in a very thorough manner as they pursue their goal. In this sense, the fact that archaeology is not his paid occupation is unimportant because in this book he demonstrates that he has followed the rules of the game. He has indeed written a book on archaeology according to the canons of research practised by those whose main paid job is archaeology. This means that he is competent, and that therefore he qualifies as a professional in the sense of `having or showing the skill of a professional' (Allen 1990: 952).

This book breaks new ground, and the fact that its author has a thorough training in medicine has enormously enhanced its quality. We are confronted with a book, wherein the evidence which is marshalled to show that man's story on the Maltese islands began considerably earlier than we are wont to think, is of a very variegated nature. The data presented by Dr. Mifsud are *inter alia* of an anatomical, dental, stratigraphic, artistic, geological, anthropological, documentary, and obviously general archaeological nature. In every instance he goes to the heart of the matter at hand, never leaving a stone unturned as he tries to unravel a problem which is certainly not one of the least complicated in archaeological research, namely that of pinning down the earliest extant evidence for the presence of the human species in a given region. Indeed, he asks some very sharp questions, and in his attempt to answer them in a very thorough manner he shows how the evidence from the Maltese islands bearing on the aforementioned problem has in fact been tampered with. In this sense, this book also reads like a detective story besides presenting a great deal of pertinent scientific data.

FOREWORD

Dr. Mifsud links all the various types of evidence mentioned above to show that the Maltese islands were inhabited by the human species much earlier than the conventional date of circa 5,000 B.C. The more I delved into his manuscript, the more I realized that it was worth being published. His work is replete with hard evidence which becomes even stronger as it blends with other types of evidence. Indeed, in this book Dr. Mifsud demonstrates how the various types of evidence used in research can converge on one point. In other words, he shows in a very skilful manner how scholarship can make use of the idea of the preponderance of the evidence it marshals in order to make new contributions to knowledge.

Even if certain points discussed in this book were still to be considered by some as being moot, and even if some of the positions held in it were to turn out untenable, this work would have still made a major contribution to knowledge in the sense of having at least definitely shown beyond any reasonable doubt how in fact still unclear and uncertain are our conventional conclusions regarding the earliest human presence on the islands of Malta. Above all, it would have taught us how to keep asking questions about particular problems until we are completely satisfied that we have dealt with them in the most precise and thorough of manners; and that is precisely the path to the furtherance of knowledge both general and obviously archaeological as well.

<u>Reference</u>

Allen, R.E. (ed.), 1990, *The Concise Oxford Dictionary* (8th ed.). Oxford: Clarendon Press.

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PREFACE

These last two centuries have witnessed the emergence of several archaeological artefacts which have modified the history of the Maltese Islands.[1] The prevailing political situation has on several occasions clouded these discoveries into obscurity, specifically those which might trace the Maltese roots back to a *barbaric* non-Latin stem.[2]

During this period of time there were three main factions contesting the national language for Malta. Italian was the official language used in 1800, and this was upheld by the local clergy, the professionals and Italian immigrants. The British official correspondence was in Italian, which was also the language of the courts. The mass was in Latin until very recently.

The second faction was represented by the British administration who attempted to replace Italian with English. The Bishop and local nobility supported this move. Both the pro-Italian and pro-English elements presented a common front against the Semitic and Hamitic cultures; North Africa in particular was shunned absolutely as a possible connection with the Maltese Islands.

The third faction moved to elevate the local Maltese dialect into the national language. Even before the advent of the British, Vassalli and De Soldanis drew parallels between Maltese and Punic. The former later abandoned this hypothesis, but a century later, in the midst of the Italo-British controversy, the question was re-awakened by Manwel Dimech.

English replaced Italian during World War II, and Maltese replaced English in the nineteen seventies as the national language. Independently, through Vatican Two, Maltese substituted the Latin in Mass in the mid-sixties.

The three critical periods of our investigation hinge round the years between 1917 and 1924, between 1952 and 1969, and finally between 1979 and the present time. The controversies over race and origins have left their mark on the revelation and interpretation of the Maltese archaeological heritage.

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[1] The politico-religious situation during the last two centuries in Malta is briefly outlined in the Appendix.

[2] Blouet (1965: 9) was the first to allege corruption of archaeological evidence in the 1950's.

INTRODUCTION

Fifteen decades back, the possibility that man existed before Adam was not entertained. If we take the Genesis tradition literally, as the Archbishop of Armagh, James Ussher did in 1650, then the world was created in 4004 B.C., and most of the world's catastrophes were attributed to the Great Flood of about the same period of time.[1] This flood or *Diluvium* was considered to be represented by the Pleistocene deposits of the Ice Age.[2]

According to the Old Testament, the animal kingdom had been established before the creation of man, so that the reaction to the scientific exposure of very ancient mammals was minimal. However when this pre-Adam existence concerned mankind, it was a different matter altogether, as it represented a direct confrontation of the Biblical teachings. When the evidence accumulated to a significant amount, through the discovery of ancient human remains, their tools and eventually their magnificent art forms, acceptance of man before Adam was inevitable. As with Copernicus and Galileo in earlier times, Genesis was at this time being further crippled with Darwin's theory of evolution.

The Biblical account restricted pre-Diluvian human existence to the generations between Adam and Noah. When scholars such as Isaac de la Peyrere published his *'Primi Homines ante Adamum*,' and suggested therein that these humans were manufacturing tools as well, he was burnt publicly at the stake.[3] This was in 1655, and more than two centuries elapsed before a modification of this concept received some form of acceptance. Until this time the acceptance of Palaeolithic man was tantamount to denying the Old Testament.

During the early 1830's, through his *Principles of Geology*, Charles Lyell demonstrated the great span of time which had been required to accumulate the various elements of the various geological formations, several of which incorporating previously living matter. The time allotted by Creation did not suffice. Lyell also revealed the significance of successive stratigraphic layers in the interpretation of the various phases in antiquity, with the older deposits lying at the lower levels.[4]

The discovery of Palaeolithic tools by John Frere in 1797 and William Buckland in 1823 had in the meantime disturbed the Genesis account even further; however Boucher de Perthes established their Palaeolithic provenance in 1847, thus settling the issue for the time being.[5] When the latter discovered these tools more primitive than the *'haches diluviennes*,' he had initially met fierce opposition when he correctly proposed an antediluvian human culture to account for the fresh repertoire.[6] Although he included natural stones with his collection,[7] Boucher de Perthes' claims were also accepted at the Royal Society of London, at the same time that Darwin published his Origin of Species." [8] However, scepticism of and resistance to Palaeolithic culture was still being manifest. In the middle of the nineteenth century, Dr. John Lightfoot of Cambridge University dated Creation to 3928 B.C., at 9.00 a.m. of the 12th September.[9] The Palaeolithic cave art in France and Spain was not accepted as such initially; Sautuola's description of the Altamira paintings was rejected in 1879, and it was only two decades later, when several other similar art forms were discovered, that this other form of Palaeolithic culture received universal recognition.[10]

The major events that had sparked off the change of attitude towards pre-neolithic man and the re-alignment of the scientific orientation towards fossil man occurred in the 1850's. These were the discovery of a fossil hominid (1856) in the Neanderthal cave, in Germany, and the publication of Darwin's "Origin of Species" (1859). As an isolated find the fossil hominid's importance was only realised later (1866), when similar morphological features appeared in two other hominid skeletons discovered at Spy (1886) in Belgium.[11] The series became known after the source in the Neander valley as Neanderthal Man.[12] Several other species of fossil hominids have been unearthed since, right up to the present time.

The 1990's are still bringing more hominids to the light of day. These specimen ancestors continue to fill in the the ever-growing 'Pithecanthropus chain' between the ape and modern man. The Ice Man on the Otztaler Alps was preserved practically intact; the Neolithic hunter was a mere 5,300 years old.[13] In South and East Africa prospective missing links have been competing with one another for pride of place. The fossil hominids discovered there date back to millions of years rather than thousands.

The recent archaeological finds in Africa have also re-confirmed the currently prevailing scientific opinion regarding the origins of the human species; we have emerged "out of Africa."[14] The new finds however are constantly modifying the fine tuning of the processes involved in human evolution and migratory patterns, so that an overview of these same processes is best limited to a general one at the present time at least.

The earliest human precursors who have been reported so far date back to South and East Africa some 4 - 5 million years ago, in the form of what has been labelled *Australopithecus*.[15] The unusual term simply means "Southern Ape," a title which Bronowski considers inappropriate for the first non-ape hominid. The skull did not hang from the spine as in apes, and he was bipedal; his dentition too lacked the ape-characteristic features of interlocking large canines.[16]

There was a gradual migration northward necessitated by conditions of drought, and the first known human representative appeared 2 million years ago in Sterkfontein (South Africa), Koobi Fora (Kenya), Olduvai Gorge (Tanzania) and Omo (Ethiopia). He is known as *Homo habilis*, and like *Australopithecus* before him, he walked on his two lower limbs. He produced stone tools to make up for the shortcomings of his hands in food gathering, hunting wild animals and defending himself against the contemporaneous carnivores. This was the beginning of the Stone Age, the start of the Palaeolithic Age.[17]

Homo erectus made his debut in East Africa 1.6 million years ago; he colonized the remainder of the African Continent before becoming extinct 400,000 to 200,000 years B.P.,[18] thereby marking the end of the Early Palaeolithic Age. By this time however, environmental changes had necessitated a further migration northward, so that by one million years ago these hominids had reached North Africa. This trigger may have involved periods of severe drought and other phenomena detrimental to his survival, or it may have been due to migration of the species which he preyed upon. At this stage in time and place, the term *Neanderthaler* is usually applied.[19] The Middle Palaeolithic Age which followed extended to 40,000 BP; it saw the emergence of the truly human form, *Homo sapiens sapiens* and the related *Homo sapiens Neanderthalis*. The relationship between the two has not yet been unanimously established. The latter thrived between 130,000 and 30,000 BP, several millennia earlier than the former.[20] By 100,000 BP *Homo sapiens sapiens* had left Africa and reached the Eastern Mediterranean; by 40,000 years ago he reached Europe, Asia and Australia.[21]

After crossing the land bridge from North Africa, across Turkey to Eurasia, the Neanderthaler veered east, thus avoiding Northern Europe, which was by this time undergoing its first phases of the Great Ice Age. He reached

China and has even appeared in Java, but he first appears in Northern Europe during the first break in the extreme glacial conditions of the Ice Age, during the first Interglacial period known as the Gunz-Mindel. Boxgrove and Heidelberg man have been dated to 500,000 years BP.[22]

Cold tolerance and intolerance

During the first Glacial phase Northern Europe was not inhabited by man; during the second, the Mindel, this presence has so far been limited to Verteszollos in Hungary. During the second Interglacial, the Mindel-Riss, human remains have been discovered in Swanscombe (Southern England), in the Pyrenees and at Steinheim in Germany. During the third Glacial period, the Riss, at around 150,000 years BP, finds have been more or less restricted towards the south, such as at Lazaret in southern France. Human specimens during the Riss-Würm, the third Interglacial, include the hominids at Ehringsdorf and Taubach (Germany) and Fontechevade in France. During the last Glacial, the Würm, lasting from about 75,000 to 10,000 years BP, human habitation shies away from Northern Europe and is prevalent towards the south, such as Gibraltar, Yugoslavia, Italy, Iraq, Iran and Israel.[23] Thus the general pattern during the cold phases of the Ice Age manifested a trend towards migration to the warmer latitudes in the South.

The presence of cold-tolerant fauna associated with human presence in Northern Europe during the Würm[24] strongly indicates the priority taken by these hominids (or rather their immediate predecessors in the evolutionary chain) towards further evolution and adaptation to cold rather than migration away from the herds they preyed upon. The effects of the climate was countered by man through adequate clothing, shelter in deep caverns, constant activity and a high metabolic rate associated with a diet rich in protein. Southward such as in Puglia and Latina in Italy, the fauna associated with human presence during the Würm are significantly cold intolerant.[25]

This concept of biomes and biocenoses was already apparent in the mid-nineteenth century. Man, beast and vegetation form units peculiar to their environment, and changes in one unit affect the others to a degree which requires adaptation or change. Thus warm-loving fauna migrate if the environmental temperature cools, and man the hunter will follow the herds or else lose his major source of protein. Changes in climate will affect the vegetation and the fauna which thrive upon it; the latter are obliged to move towards more suitable pastures.[26]

In the 1860's it had already been realised from the excavations of the French caves such as Laugerie Haute, Les Eyzies, le Moustier, La Madeleine and Dordogne, that the old Stone Age, the Palaeolithic period, "the Age of simply worked stone," could be sub-divided according to the fauna which prevailed in the same horizon.[27] Edouard Lartet and Henry Christy pioneered these excavations,[28] and the palaeontologist F. Garrigou added his significant contribution on the prevailing fauna during the warmer periods between the Ice Ages.[29] Another method which was utilised to date the pre-pottery Palaeolithic period was through the type of art which was associated in the same horizon.[30] Thus, whilst the Neolithic period was dated through pottery, the earlier Palaeolithic period was datable through the associated extinct fauna and art forms.

The human hunter-forager eventually settled down; he domesticated plants and animals and thereby established a new pattern for maintaining his survival. This was the beginning of the Neolithic Age, and the dates for its emergence vary in different regions of the globe. At Abu Hureyra in northern Syria, at around 11,500 BP, hunter gatherers also exploited cereals; in 9,600 BP gazelle hunters at this site domesticated plants.[31] Domestication of animals is earliest recorded at Ain Mallaha in Northern Israel for the dog (9,600 B.C.)[32] and at Shanidar in Northern Iraq around 8,000 BC for sheep;[33] the process of domestication reached Europe around 6,500 B.C.[34] and Malta thirteen centuries later.[35]

The Malta story therefore starts at 5,200 B.C. as far as human occupation of the Maltese Islands is concerned. The existence of pre-Neolithic man in Malta has not been sufficiently substantiated so far.

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[1] Trinkaus and Shipman 1993: 46. The flood was known as the one time *Diluvium*, and this is in contrast to the *Alluvium* or alluvial deposits brought about through agencies which are still operative, such as rivers (Oakley 1964: 104-5, fn. 7).

[2] Oakley 1972: 3.

[3] Oakley 1964: 87.

[4] Lyell 1830-3.

[5] Lawson 1991: 15.

[6] Oakley, KP, 1964, pp. 93-4; 1847, *Antiquites Celtiques et Antediluviennes*.

[7] Oakley, 1961, p. 104, fn. 1.

[8] Oakley, 1964, p. 94.

[9] Wenke 1990: 11; Tatersall (1995: 4) and Cootes & Snellgrove (1992: 7) give it as October 23rd 4004.

[10] Lawson 1991: 23-4.

[11] Oakley 1964: 108-9.

[12] Before this a similar skull had in fact been unearthed in Gibraltar in 1848, but its significance was not realised at the time. It was brought over to England in 1862, and presented to the Royal College of Surgeons four years later. It was labeled initially as Homo calficus (Calphe is the ancient name for Gibraltar), until its features were identified and attributed properly to Neanderthal man.

[13] Spindler 1994.

[14] Renfrew and Bahn 1996: 156; Stringer and Gamble 1993: 61. Stringer (1996) has calculated the emergence of man from Africa to date to 70,000 years ago.

[15] Renfrew and Bahn 1996: 156.

[16] Bronowski 1981: 18-19.

[17] Attenborough 1989: 50; Bronowski 1981: 19; Renfrew and Bahn 1996: 156; Stringer and Gamble 1993: 61.

[18] B.P. stands for "Before present," but is actually before 1950.

[19] Attenborough, D., 1989, pp. 50-1.

[20] Bronowski 1981: 26; Renfrew and Bahn 1996: 157; Stringer and Gamble 1993: 63-6.

[21] Renfrew and Bahn 1996; 157.

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[22] Oakley 1969: 300.

[23] Shackley 1980: 8-9.

[24] Oakley, 1969: 303-5; 308

[25] Oakley, 1969: 307.

[26] Colinvaux 1993: 367-8; 369 et seq.

[27] Oakley, 1964: 125 et seq.

[28] Lartet 1960: 334; Lartet and Christy 1868: 62-72, Oakley 1864: 132; Tatersall 1995: 25-6.

[29] Garrigou, in Daniel 1950: 100.

[30] Art forms include tools, decoration and cave depictions.

[31] Lewin 1989: 150.

[32] Renfrew and Bahn 1996: 278.

[33] Wenke 1990: 242.

[34] Renfrew and Bahn 1996: 157.

[35] Report: Museum of Archaeology 1964: 5; Renfrew 1977: 614-623; 1978: 166.

THE GEOMORPHOLOGY AND BIOGEOGRAPHY OF THE MEDITERRANEAN

The Sea of Tethys:

Sixty-seven million years ago Eurasia and Africa-Arabia were still separated from each other by an arm of the Atlantic Ocean known as the Sea of Tethys; there was no Mediterranean Sea then. Africa-Arabia moved northward and collided with Europe initially in the lands of the Middle East. This was twenty million years ago, and an interchange of flora and fauna between Eurasia and Africa-Arabia was sparked off. The Eurasia-derived antelope and horses crossed over to Africa, whilst the Africa-derived monkey and elephant moved northward into Eurasia.[1]

Six to seven million years ago, Africa and Europe came together at Gibraltar, and the Mediterranean became isolated;[2] in the course of a millennium it dried up apart from several scattered large lakes. The waters of the Nile, the Rhone, Po and other European rivers were not sufficient to compensate for the evaporative losses; their mouths advanced as the Mediterranean levels receded. There is geophysical evidence to confirm that the main Mediterranean rivers eroded their beds as they cascaded into the receding Mediterranean, which eventually was converted into a desiccated sea bed.[3]

Mammals have roamed the face of the earth for several millions of years, figures quoted ranging from 60 to 180 million.[4] The discoveries of *Glomar Challenger* have confirmed that the Mediterranean was at one time not merely shallower, but actually dry and restricted to a collection of lakes lying inside desiccated dry land. This would have readily afforded the possibility for all the animals, from both continents, to cross over across the land route towards the present Mediterranean Islands, then represented as high elevations. Mammals had long been flourishing, and they were free to cross the Mediterranean on land as it were. The Nile mammals such as the elephant and Hippo were free to follow their river northward as it advanced towards the Mediterranean Islands and Europe, eventually to reach the mouths of the European rivers as they too in their turn had been advancing southward, *pari passu* with the receding shoreline.

The above hypothesis for the animal crossing during the Desiccation period conforms with the data for the history of the Mediterranean basin;[5] Attenborough however reserves the possibility that the crossing of hippo and elephant occurred later during the Ice Age, through "swimming or drifting across the sea to colonize the islands."[6]

Five million years ago the isthmus between Spain and Morocco collapsed, and the waters of the Atlantic Ocean were released into the dry Mediterranean basin, flooding the bed at the estimated rate of forty cubic miles a day, so that the Mediterranean returned to its former self within a century.[7] Such a flood would have caught several creatures unawares and drowned them; it would also have swamped creatures on the lower terrain on the Mediterranean islands, also drowned them and carried their carcasses to and fro. The fauna on the top terrain were isolated, and over the next millennia evolved into species of different size and morphology. The larger mammals were dwarfed, whilst the smaller ones assumed relatively gigantic proportions. A few millennia suffice for a species to undergo dwarfing in an insular environment. This has been shown to be the case in Wrangel Island with mammoth.[8] The Mediterranean island fauna are characterized by dwarf species of their large mainland equivalents, such as elephant and hippopotamus, and by correspondingly larger forms of the mainland smaller fauna such as the dormouse.[9]

When a glacial period of the Ice Age came along, the sea-levels dropped again, and the new land bridge of Malta with Sicily would have permitted the prevalent mainland fauna to cross over. Besides hippopotamus and elephant, this would have included the smaller fauna such as red deer, brown bear, wolf and red fox. These in their turn would again be caught up on the island with a return of the warm weather and elevation of sea-levels.[10]

The formation of the Maltese Islands:

The Maltese Islands are composed of a few stratifications, with the upper coralline at the top, this overlying successively a layer of sandstone, one of impermeable clay, a layer of globigerina and finally a lower coralline layer at the very bottom. The formation of these stratifications was effected through the sedimentary deposition of dead organisms and detritus upon the seabed between 28 and 10 million years ago. Approximately ten million years ago, these layers had been lifted up to their present level through Africa's continuing tectonic shift northward.[11] The Maltese landmass was at this time continuous with Tunisia, Lampedusa and Hyblean south-east Sicily, whence it derived terrestrial fauna.[12]

The Ice Ages:

Although not represented in an identical manner world-wide, the Ice Age is considered a very useful and standard time-scale; the period is more commonly known as the Pleistocene. It is subdivided into an Early (or Lower), a Middle and a Late (or Upper) phases, and it extends from 1.6 million to 12 thousand years B.P. (i.e. before the present time.) In the Maltese Islands the Pleistocene was represented by a Pluvial Age. Torrential rains poured on the islands and the rivers which were created thereby carved out the landscape into valleys and underground caverns like Ghar Dalam. They also carried in their streams the fragments of rock, which they dislodged, and ground deposits, which they swept along towards the sea. The water insinuated itself into the fissures and cracks in the river bed, and even opened up channels, eventually enlarging to the size of caverns and large tunnel-shaped caves. After making its way through the upper geological layers, the junction of the globigerina with the lower coralline was normally eroded to form the cavern system. In an area at Birzebbuga, one such cave at Wied Dalam was created at right angles to the direction of river flow, so that when the river bed was eroded through, the roof of the cave below was split open and a cave on either side of Wied Dalam was produced. According to Trechmann (1938), the erosion of Ghar Dalam occurred during the pre-Chellean Pluvial period, that is before the first Interglacial, the Günz-Mindel. Close to Ghar Dalam lies another large cavern system made up of intercommunicating cavities, and this is known as Ghar il-Friefet.

The deep fissures, the gaps in the rock and the underground caverns acted as suction holes. These trapped a portion of the dislodged rock fragments and the ground deposit inside them, and prevented their onward passage towards the sea. Remains of previously living organisms were thus caught up in these rock fissures and underground caverns, above the impermeable blue clay which lined the floor of most of these caves. These remains were carried to and fro with the current until the rains ceased and the deposits inside the fissures and caverns dried up. These organic remains were not distributed in an anatomical manner as they would have been in a ritual burial, but they were dispersed in random fashion inside the stratum of earth they lay in. Furthermore the to and fro water action caused a smoothing of their edges into rounded versions which resembled the pebbles amongst which they lay.

In some instances live animals and fresh carcasses were caught up in the currents and were transported *in toto* towards the sea. A few were trapped inside the rock fissures and underground caverns, and in these instances their eventual remains were, partially at least, retained in an anatomical position.[13] These events of "episodic mass mortality" were, through fluvial or alluvial action, typically associated with other features, such as a low incidence of carnivores and a low C.S.I. (Corrected number of specimens per individual), which also serve to differentiate them further from ritual burials in the case of human remains.

With time the volume of the waters and rivers diminished as climatic conditions improved. The constant trickle through the rock fissures into the cavern below their beds gave rise to a stalagmitic concretion on the floor of the cave, at the same time that stalactites dangled from the cave roofs.

There were approximately seventeen glacial cycles altogether during the Ice Age.[14] The Northern Mediterranean was colder and drier than today, whereas the southern shores were probably wetter.[15]

Sea-levels and ancient beaches:

The depth of the sea bed between Sicily and mainland Italy is less than a hundred metres.[16] The decrease in the sea-level during the last glacial peak of the Pleistocene was over 120 metres, and this therefore clearly opened up "windows of opportunity" for man and beast in the Italian peninsula to cross over by land to the warmer climates of the Siculo-

Maltese district. Herds of red deer left the northern latitudes and settled in all parts of present day Sicily, the present day Egadi Islands of Favignana and Levanzo, and the Maltese archipelago, the latter site being the warmest of the Siculo-Maltese district during the Pleistocene, as well as the warmest by way of latitude in all of Europe.

Whilst the sea-level exceeded the 50 metre drop in sea-level, and Sicily was joined to the Maltese and Egadi Islands, biogeographical exchange of man and fauna would have been immediately possible across dry land; with the further decrease of the sea-level to over 90 metres, a major avenue of migration opened up from the Italian peninsula. This was eighteen thousand years ago at its maximum - the ice-sheets were creeping southward from the North, and temperatures were consistently dropping. The cold-intolerant red deer migrated to the Siculo-Maltese district, and man followed the herds; besides the climatic considerations, red deer constituted a major source of nutrition for man the hunter.

Glacial periods previous to the ultimate one, the Würm, were not associated with a decrease of sea-level in excess of 90 metres, so that the crossing from the Italian peninsula to the Siculo-Maltese district could only be carried out by creatures with some ability to swim. Hippos are known to swim distances of 35 kilometres, which is by far in excess of the straits of Messina; elephants too could have effected the crossing, but other fauna apparently were unable to do so.[17] Man could easily have made the crossing by swimming or on a raft, and in other parts of the world he had in fact managed to effect much greater distances by sea.[18] The land-bridge link between Sicily and Malta is thus further invoked through the strong similarities between the fossil fauna of the two islands.[19]

The last two glacial phases of the Pleistocene were therefore associated with the two major migrations of fauna from Italy to the Siculo-Maltese-Egadi land mass.[20] The penultimate Glacial permitted the migration only of the large pachyderms, namely the hippopotamus and the elephant. The last Glacial permitted an overwhelming majority of red deer to effect the crossing southward from Italy. As far as the Siculo-Maltese connection is concerned, the stratigraphy of Ghar Dalam conforms to this pattern of migration. Studies in the Sicilian caverns have further indicated that there were two migrations of elephant from Italy to the Siculo-Maltese district.[21]

The various successive phases of decline and rise in the sea-levels around the world corresponded to the alternating periods of congelation and thawing of ice during the Glacial and Interglacial periods of the Pleistocene. The Great Ice Age itself was subdivided into four main Ice Ages or Glacial periods; these were separated by the Interglacials.

During the Glacials, sea water was taken up to the congelated poles and the sea-levels shrank correspondingly. During the following Interglacial the sea-level did not return towards its previous level, so that a series of beaches was created. It is therefore possible to correlate archaeological finds with the corresponding beaches and sea-levels as they increased and decreased throughout the Pleistocene. During the same period of severe fluctuations in temperature, the contemporaneous formation and breakdown of temporary land bridges between islands and continents permitted and induced migrations of fauna and hominids to more tolerable environments. Whether the elevations and shrinkages in sea-level are attributable mainly to physical expansion and diminution *pari passu* with respective global warmth and cooling, or whether this is due to shifting of water mass to and from the poles with respective congelation and melting, is a matter for further debate.[22]

The fluctuations in the Mediterranean sea-levels left their mark upon the beaches. Because of some rise of land independent of a decline in sea-level, the so-called isostatic land rise, each successive rise in sea-level never quite reached the previous level, so that a succession of beach lines are to be found along the shores. General Lamothe studied the North African coastline, whilst Deperet applied himself to the shorelines of the French and Italian Rivieras. Sea-level changes in other regions were found to correspond world wide.[23]

Initially four main levels were identified and were named after Mediterranean sites. They are respectively known as the Sicilian (which had risen to a 100 m mark above present sea-level), followed by the Milazzian at 60 m, the Tyrrhenian at 30 m, and finally the Monastirian at 20 m. The Monastirian represents the last Interglacial period.[24] Through correlations with these ancient beaches and shorelines, a form of dating in the Pleistocene period can be established as to which Glacial or Interglacial is being indicated.

There were therefore four main falls and rises (regressions and transgressions) during the last Ice Age Another three levels were subsequently described; a Calabrian level pre-dated the Pleistocene and exceeded the Sicilian, whilst two later Monastirian levels measured 7 and 3 m respectively.[25]

In 1969 Milliman and Emery showed that the sea-levels reached their lowest levels ever, approximately 15,000 years ago, at 420 feet below the present sea-level.[26] Other workers included Fairbridge,[27] who studied the Mediterranean changes in sea-levels, and concluded that glacio-eustatic fluctuations were superimposed upon a long term drop. Bowen (1978) estimated the last Glacial drop as lying between 100 and 170 m below present sea-level, whilst Morelli (1972) calculated a drop of 150 metres for the Central Mediterranean during the last Glacial. There has recently been an amendment in dating, and the Alpine glacial maximum is estimated to have occurred at between 20,000 to 18,000 B.P.[28]

The colonization of the islands:

It may be argued by ecologists that the present world fauna are the survivors from the last Ice Age, and that these have since been adapting to a warmer environment. As a basis for this argument the fact is quoted that out of the past one million years or so of the world's history, only the last ten millennia have manifested a climate warmer than that which prevailed during the previous Ice Age. This lasted at least nine times as longer.[29]

From another point of view however, it may be argued that the last ten millennia could merely represent a fraction of one of the several interglacial phases which featured during the same Ice Age; in other words the last Ice Age may not yet be over. The concept of biomes is therefore a vital theme. These represent the individual elements in a 'living system' of flora, fauna and humans in their ideal environment as one unit, whatever the locality and the period in time.[30] This consideration is crucial for the better understanding of the phenomena associated with the presence and extinction of the Maltese fossil fauna. For it can readily be appreciated that significant changes in climate and geography of the landscape, such as would occur in an Ice Age, would have a profound effect on all the elements which constitute the biome. The mobile elements, man and beast, would migrate to latitudes that suited them better.

This pattern of recurring migrations is still very evident today and is mainly dictated by the seasonal climatic changes. Fauna migrate by land, sea and air in their quest for an ideal habitat. The seasonal migration of birds is well known; butterflies too, such as the American Monarch travel over large distances to Mexico during winter, and the *Sternea paradisea* literally flies from one point of the planet to the other. During this period too the blue whale leaves the cold waters and reaches the tropical zones where she reproduces. The tuna moves in a circular path and is constantly in its ideal habitat at all times. On land the Caribou alternates between the forest and the arctic tundra; on a warmer tone mammals such as the elephant and zebra are constantly on the move following the growing vegetation which is utterly dependent on the prevailing climate and their own depradations.[31] Faunal migration has been a feature throughout all time; extreme changes in climate provoke significant migration or mass extinction.

Besides the cold climate, which Man might circumvent through adequate clothing, an added incentive for him to move southward would have been the migrating fauna which constituted his main source of protein. Today this situation is represented by the Lapps, who follow the reindeer on the move.[32]

The Siculo-Maltese district:

Over the past one and a half million years, Malta and Sicily composed one land mass as often as four times.[33] The entire Siculo-Maltese district comprised mainland Sicily and the offshore islands to its West and South. The Egadi islands and the Maltese archipelago formed part of the Sicilian land mass during the Ice Age, in fact during the glacial phases of the Pleistocene period. [34]

The principal effects of the glacial cycles were lowering of sea-levels, creation of land-bridges and the "latitudinal displacement of biomes." The latter event was not possible when geographical barriers prevented the move, and when habitats became extinct; in these cases the fauna would die out.[35] The displacement of biota during the late Pleistocene climatic variations has been investigated by Gauthreaux (1980). The situation which prevailed during the colder periods of the Ice Age permitted the cold-intolerant and warmth-loving creatures in the colder northern regions to travel southward to warmer latitudes across dry land. Among the warmth-loving fauna the typical representatives comprised the hippopotamus, the elephant and red deer. The pachyderms (hippopotamus and elephant) flourished mainly in the mid-Pleistocene period, whereas the hey-day of red deer dated towards the last millennia of the Ice Age which terminated some twelve thousand years ago.

The Ice Age left its impact upon both the animate and the inanimate. Vegetation was replaced by arctic tundra, and the cold-intolerant fauna and humans were obliged to migrate southward into the warmer and humid southern latitudes, where a Pluvial setting represented by torrential rains substituted the arctic conditions of the north. The inanimate landscape was carved up by the rains into valleys, deposits were laid down along the river courses, and underground caverns were hollowed out. The fluctuation in sea-levels and shorelines was complicated by isostatic and tectonic movements that caused lifting up and down of the landmasses and thus modified the sea-levels even further.

Depressions in sea-level earlier than the Würm seem to have occurred around 130,000 and 70,000 years ago, but the effect of other eustatic factors during these latter two phases renders the sea-level changes less accessible to accurate measurement.[36] The figure of 130,000 BP is significant, for it coincides with the date that the hippopotamus thrived in the Maltese Islands. The dating of Maltese hippo by Electron Spin Resonance and Uranium Series disequilibria lies between the range of 130,000 to 110,000 BP.[37]

The land route across the Siculo-Maltese strait was not a crucial factor permitting man and beast to cross over to Malta, for travel by sea had already been established in the Mediterranean during the Magdalenian,[38] and much earlier elsewhere.[39] If there had been abundant evidence for an Upper Palaeolithic presence throughout Sicily and upon its islands to the west, [Egadi and Favignana], then the climate of the Maltese archipelago would have been more suitable during the Ice Age for both man and beast coming from there. And the abundance of game in the form of red deer was an even greater incentive for man the hunter to follow his source of protein to Malta. The deer layer at Ghar Dalam confirms the abundance of this mammal during the later phases of the Pleistocene.

Besides the possibility of a migration on dry land or across the seas by boat, an actual crossing by swimming across the strait was a strong possibility.[40] The true amphibians, such as the turtle, and the non-flightless winged species were naturally free to cross unhindered by the sea barrier. Although winged, the giant swan and crane were unable to fly across the Siculo-Maltese strait.[41]

Caves and sediments:

Caves constitute highly efficient sediment traps, and are particularly useful for studying the Pleistocene period. [42] The 1850's had already brought to light a number of caverns in the Maltese Islands, and the discovery of organic remains of man and beast have imparted a measure of importance to their discovery.

I remember visiting the Ghar Dalam cave as a child, and the memories are restricted to the stalactites and stalagmites. A great deal of importance had been attached by our tutor as to which were the ones on the ground and which the ones clinging on to the roof. The history book used then was Laspina's "Outlines of Maltese History," and the lines of the first paragraph had been indelibly imprinted upon my mind through repeated recital.

> "Malta was the summit of a hill or the peak of a mountain. Landbridges connected Sicily to Africa. That is to say, there was a continuous range of mountains, running down from the Alps, along the whole length of Italy, through Sicily and Malta, right on to the mountains of North Africa. The Mediterranean was divided into three or four lakes surrounded by the high mountains of southern Europe and Northern Africa."[43]

A few pages further on the discovery of two molar teeth at Ghar Dalam was accredited with the opinion of Arthur Keith regarding the presence of Neanderthal Man in the Maltese Islands.[44] The Maltese archaeologist of great renown, Sir Themistocles Zammit lent his support to the land-bridge with Africa and the presence of Neanderthal Man. For the importance of

Ghar Dalam lies not merely in its stalactites, stalagmites and record of fossil fauna, but significantly for contributing towards the first phase of human settlement on the Maltese Islands. The present consensus of opinion is for Sicilian settlers from Stentinello and Monte Kronio reaching our shores with their domesticated animals around 5,200 B.C., thus starting off the Maltese Neolithic phase, the New Stone Age.

Besides Ghar Dalam, caverns with fossil animal remains have also been discovered in areas such as Mellieha, Qrendi and Zebbug. The deposits resemble those at Ghar Dalam cave, except for the human cultural layer at the top. One exception is a site distant by a few miles from Ghar Dalam, and known as Burmeghez, where Neolithic human remains of about forty individuals have been discovered in the form of entire skeletons, and these overlay ancient red deer remains in the red earth inside and outside of the cave.[45] Another exception is the Xemxija tomb site, where remains of deer were also picked up.[46]

In Mellieha and Qrendi the lowermost layers in the bone breccia contained exclusively hippopotamus remains, whilst that of Zebbug, in the centre of the island, contained by contrast only elephant. These remains lay a relatively higher level than the corresponding remains of hippo at the two other sites. At Mnajdra a species of large elephant was discovered by Leith Adams, and this variety was named after the locality.[47]

Whilst Hugh Falconer explored the Sicilian caverns, Leith Adams, Spratt and others were doing the same in the Maltese Islands, and the main concern then were the fossil fauna which roamed the Maltese Islands several thousands of years ago. Remains of elephant, hippo and red deer abounded in Malta, and Leith Adams in particular dedicated several years of effort in exploring and cataloguing the various sites in Malta, thus adding considerably to our knowledge of the Maltese fossil fauna.[48]

There were others like Captain Spratt who did not limit their investigations to the inland sites but also explored the Mediterranean seabed in order to confirm an intercontinental connection in ancient times.[49]

Leith Adams was a renowned naturalist who visited Malta during 1860 to 1866; his first impressions were pessimistic. As the climate changed so did his attitude. During this time he dedicated practically all his time to investigating the natural caverns of Malta and their organic contents. He was especially interested in elephant and hippo, but more particularly the former. He submitted three reports to the Maltese authorities on the fossil elephants found in Malta, and his reports favour an African origin for the Maltese version.[50] While Leith Adams was in Malta, his co-national Samuel Baker was in Africa hunting wild game and searching for the source of the Nile. His concept of an African-Europe link can be gauged from the analogies he makes on the pachyderms, ancient and recent.

> “The more one reads of the existing quadrupeds and other animals of Central Africa, the more they seem to assimilate to the ancient denizens of the Maltese area ... that the river-horse (hippopotamus) wanders at night to great distances and ascends very steep and rugged declivities; moreover, that their swollen carcasses and those of elephants and turtles are borne along to great distances by floods and freshets ... the elephants would perish on the plains or river banks, the hippos would seek their final resting places along the miry sides of pools and river caves, the next inundation carrying off their remains, which would be covered over now and then, or washed into hollows and caverns only flooded during such freshets."[51]

Leith Adams also remarked on the presence of fossil African elephant in Sicily.[52] The presence there of the African elephant had been established by such researchers on the spot such as Baron F. Anca, and G.G. Gemmellaro, who had followed on the footsteps of Hugh Falconer, the renowned British palaeontologist and also the pioneer investigator of the Sicilian caverns.[53] All three refer to one variant of the Sicilian elephant as Elephas Africanus.[54] Vaufrey disagreed with them, as he also refuted the existence of Palaeolithic man in Sicily except possibly in the late period, disagreeing here with the Italians R. Battaglia, G.A. Colini, U. Antonielli and Professor U. Rellini.[55]

Hugh Falconer, A. Leith Adams, Arthur Keith, George Sinclair, Captain Spratt, Gertrude Caton Thompson and C.T. Trechmann all contributed significantly through local field research in Malta, and all agreed on an African land-bridge with the Maltese Islands. Besides, Falconer went further and concluded, on the "strong presumptive proof" of the human implements and fossil remains at Maccagnone near Palermo, that man's occupation of Sicily dated back to "when the Mediterranean was bridged over by land connecting Sicily with Africa as a promontory of that continent."[56] Leith Adams considered Falconer's conclusions as the "always cautious and well-considered deductions of the sagacious natural observer."[57]

Besides supporting the Africa-Europe land bridge, Trechmann also felt that the Maltese fossil animal remains of elephant, hippo and other animals probably derived from East Africa, and that most of the implements discovered at Ghar Dalam were "late Palaeolithic-reminiscent." In this regard, Trechmann also pointed out Baldacchino's discovery of two intact elephant tusks in the Cervus layer, where human remains were also found.[58]

Pre-Neolithic man in the Mediterranean islands

The Mediterranean islands were colonized permanently by humans of the Pleistocene only if the natural resources on the particular island were suitable. The endemic dwarf mammals upon of some of the islands, such as elephant and hippopotamus, were too susceptible to extinction through overkill, and this through their easily being preyed upon, a slow reproduction rate and a slow recovery rate. The large-bodied red deer was swift but it provided a very satisfactory food resource for Pleistocene man. Its speedy locomotion decreased the tendency towards its extinction by overkill.[59]

The presence of pre-Neolithic man has been established in several Mediterranean islands, in the form of "evidence of a significant phase of island exploitation before the arrival of the fully fledged package."[60] Pre-Neolithic sites have been discovered in Cyprus,[61] Crete,[62] the Aegean islands,[63] the Egadi islands,[64] and Corsica.[65] The Balearic, Pitiussae, Aeolian and Maltese islands date so far merely to the 7th millennium B.P.[66]

Arguing for the presence of Pleistocene man in Sardinia, Sondaar[67] assumes that the presence of a predator is equivalent to the presence of man. The general pattern of Pleistocene island fauna in the absence of carnivores is "dwarfing and low gear locomotion." The presence of "normal mainland proportions" of the fauna suggests the concomitant presence of carnivores, who, according to Sondaar must have been human beings. [68] The constant availability of food resources was obviously a requisite for man's presence on the island. The endemic dwarf animals were susceptible to overkill and rapid extinction, so that alternative sources of protein were an essential requisite to human colonization.

The presence during the Pleistocene of Prolagus Sardus and the large bodied red deer in Sardinia therefore made the presence of man at the time more likely. Sondaar attributes the extinction of this Pleistocene island fauna to the presence of Pleistocene man. Red deer abounded in Sardinia, and likewise in Sicily, the Egadi Islands and the Maltese archipelago.[69] The evidence for a human Palaeolithic presence in Sardinia is indirect and is based on the progressive elimination of certain endemic taxa by predators assumed to be human.[70]

In the Ionian Islands however, Middle Palaeolithic evidence has been unearthed at Nea Skala, an insular island throughout the Pleistocene, distant by approximately 20 km from the mainland. Dating for human activities has been confirmed at 50,000 B.P.[71] This situation disqualifies Shackleton's hypothesis that archaic hunter-gatherers never reached the Mediterranean islands.[72] Sicily is another notable exception to the hypothesis.

The largest Mediterranean island, Sicily was non-insular during most of the Pleistocene; its seabed to the mainland lying at 90 metres depth. Humans have indubitably inhabited it for much of the Palaeolithic, and it has a clear sequence of carbon-dated lithic implements, in places reaching back to the Acheulean.[73] The caverns hold the same faunal assemblage as that at Ghar Dalam, namely Pleistocene hippo-elephant-deer fauna.[74]

Upper Palaeolithic cultures have been identified in all regions of Sicily,[75] including the southeastern region on the Hyblean plateau,[76] which abuts on the Siculo-Maltese landbridge of the Pleistocene. Pre-Würm[77] and Lower Palaeolithic cultures have also been identified in certain regions.[78] Palaeolithic man crossed westward to Levanzo and Favignana,[79] and conceivably travelled southward to warmer latitudes in Malta during the Ice Age. The present apalaeolithic status of the Maltese islands is considered to be an anomalous situation by Fedele.[80]

The Archaeology sections of both museums in Palermo and Syracuse, respectively representing western and eastern Sicily, demonstrate this Palaeolithic presence throughout the island very well.[81] At the Paolo Orsi Museum in Syracuse human presence is illustrated to beyond 20,000 years ago, whilst that at Palermo holds more abundant specimens of the time, and comprise mainly finds from the several caverns lying between Termini Imerese and Trapani, the caverns of Monte Pellegrino and particularly that of Levanzo.[82]

The significance of Palaeolithic presence in Sicily lies in the fact that if the island, cut off from mainland Italy around 400,000 years ago,[83] did actually support human beings towards the end of the last Ice Age, the existing land bridge with its nearby islands would have permitted human presence there as well. It would have been natural for the cold intolerant mammals, both man and beast to seek a warmer milieu southward in lower latitudes, and this was permissible through the developing land-bridges towards the Maltese Islands during the Pleistocene.

Pleistocene fauna in the Mediterranean islands:

During the Messinian crisis six million years ago, terrestrial biota from Sicily and Africa reached Malta. Half a million years later, the flooding of the Mediterranean isolated these mammals during the Pliocene. An early-Middle Pleistocene land-bridge of Malta with Sicily allowed Sicilian fauna to cross over to Malta. These fauna evolved during the two periods of isolation, during the Pliocene and the middle Pleistocene.[84] Malta received European Pleistocene mammals possibly during the early Pleistocene,[85] but perhaps later.[86] Dwarf elephants crossed over during the middle Pleistocene.[87] The late Pleistocene land-bridges once more permitted Sicilian fauna to reach Malta.

The theory for a 120-150 metre decrease in Mediterranean sea-level during the Würm creates its own problems, for the other Mediterranean Islands are separated from Europe by depths in the sea bed which are deeper than the Maltese levels, and they would therefore not have been land-linked to Europe through this drop in sea-level. These figures preclude any possible land connection between mainland Europe and the Mediterranean Islands, such as the Balearic Islands, Sardinia, Crete, Cyprus and a few Greek islands during the Pleistocene. And yet these islands harboured more or less the same fossil fauna that the Maltese Islands did, and their arrival there has to be explained through other means; it has always been taken for granted that the Maltese fossil fauna have derived totally from Europe. The absence of pachyderms from Corsica[88] is not readily reconcilable with the hypothesis that the fauna travelled southward from Europe but rather northward from Africa and reaching Sardinia and not Corsica. Insofar as swimming is concerned, the hippopotamus is not universally considered to be a good swimmer. Although it can remain submerged for several minutes, it prefers to rest on the river bed with its eyes and nostrils above water. In water the hippo walks along rather than swims.[89] Elephants were able to swim over submerged stretches of land.[90]

During the Messinian, Malta was one landmass with Sicily, and terrestrial fauna crossed over.[91] The similarities in fauna between Malta and Sicily during the Pleistocene has been realised since the last century.[92] The same applies to the other Mediterranean islands, then also represented as elevations in the practically dry Mediterranean basin.

The 1987 excavation of the Pleistocene site at Aquedolci in Messina has yielded a stratification similar to the one at Ghar Dalam, with Hippopotamus pentlandi, Elephas species, Cervus Siciliae Pohlig, Ursus cf. Arctos Linnaeus, together with a bone breccia with gravels overlying it and containing remains of H. pentlandi and C. Siciliae.[93]

These similarities are more marked in the Sicilian regions abutting on the Pleistocene land-bridge with Malta. In Southeastern Sicily, on the Hyblean plateau, Pleistocene mammal bones include, in the *alluvial* deposit, Elephas mnaidrensis Adams, Cervus Siciliae Pohlig and Ursus cf. Arctos; these are correlated with early middle Pleistocene and late-middle to late Pleistocene terraced marine deposits.[94] The *limnic* deposits which lie beneath the alluvial ones contain Elephas falconeri Busk (which is less reduced in size than Elephas falconeri), cervids and Leithia melitensis Adams. These discoveries confirm that there were two elephant migrations from the mainland to Sicily during the Pleistocene.[95] A strong analogy is here evidently borne with the presence of elephant remains both in the Hippopotamus (limnic) and Cervus (alluvial) horizons at Ghar Dalam, respectively the Hippo and Cervus layers of Zammit Maempel (1989).

Another site in Sicily abutting on the Pleistocene land-bridge with Malta is that of Fontana Nuova. The analogies with the situation prevailing in Malta include the predominance of red deer, and the presence of wild boar, fox and Testudo.[96] Fontana Nuova represents the only Aurignacian site in Sicily. The sole human remains probably derive from one individual, and they have been diagnosed as Aurignacian on the basis of the associated lithic assemblage and the morphological features of the human remains, namely the thickness of the skull plates and the measurements of the teeth. [97] Chilardi *et al*. have hypothesized for a sea crossing to Fontana Nuova rather than one across a Messina strait landbridge.[98]

The presence of brown bear in Malta and the Hyblean plateau in Sicily during the Pleistocene is an exception to the general situation in the Mediterranean regarding this carnivore. Brown bear remains occur in the Deer layer of Ghar Dalam and elsewhere such as Mriehel, and yet it represents a rare mammal among the contemporary carnivores. Brown bear reached Europe at the very end of the early Pleistocene, a crucial event coinciding with the great faunal turnover which marks the Early-Middle Pleistocene transition.[99] A Middle Pleistocene site in France has yielded fossil remains of Ursus cf. Arctos and Cervus elaphus dated to 200,000 years B.P., and these were associated with evidence of human cultural activities.[100]

At the beginning of the Quaternary era, two of the Egadi islands still maintained a land connection with Sicily, itself still attached to Calabria,[101] so that elephants, hippopotamus and brown bear also reached these two islands, Favignana and Levanzo. Several millennia later however, around 12,000 years BP, the upper Palaeolithic immigrants from Sicily to the Egadi Islands found a fauna different from that of the previous epoch; the larger mammals had disappeared, and what remained was Bos primigenius, Equus asinus hydruntinus, wild horse, deer, stag, wild boar, hare, fox, birds and fish. The Palaeolithic population lived mainly by the coast.[102] The analogy to the Maltese prehistoric sites is once again readily invoked. The semi-fossilized remains of *Equus asinus hydruntinus* have been described by Smith Woodward at the site of Wied il-Bieni, near the shores of Kalafrana, in the red soil of a narrow cave, and these remains were intermixed with the bones of red deer.[103] Bovids of the Bos primigenius type have been described at Skorba.[104]

During the period in question, the Würm, which lasted between 75,000 and 12,000 years ago, the sea-level was in regression, and Sicily re-developed, or improved, land connections with two of the Egadi Islands on its western coast, and with the Maltese archipelago towards its south. The two Egadi Islands in question are Favignana, the larger, and Levanzo, measuring a mere 5 square km. In a cavern lying at an altitude of 30 metres above sea-level lies the Grotta Genovese. It was discovered in 1949 by Paolo Graziosi, and the human artefacts and remains lying therein, and in nearby Grotta dei Porci have been radiocarbon dated to 10,000 B.C. The Palaeolithic graffiti represent the Cervus elaphus, the Bos primigenius and the Equus hydruntinus.[105] Man the hunter, who utterly depended upon the contemporaneous fauna for his survival, followed the herds on to the islands as well. He followed them westward and southward from Sicily, and these same fauna, particularly the red deer, Cervus elaphus, abounded heavily in the Maltese archipelago as well. These were certainly the most agile of the fauna at the time, and therefore the most likely to travel farthest. Hence their overwhelming presence in the Malta sites such as Ghar Dalam.[106] They might also have survived into the Mesolithic and Early Neolithic, when they were eventually exterminated.[107]

As in Malta, red deer predominated in the other Palaeolithic sites at Levanzo, San Teodoro and Fontana Nuova. This situation might not have provided an alternative protein source for man other than red deer.[108]

Human beings colonized most of the Mediterranean islands prior to the Neolithic period. Malta was a part of Sicily during this time; Sicily was populated by Palaeolithic man during the Ice Age. By inference alone therefore, the land Malta formed part of was peopled by Palaeolithic man during the Pleistocene.

Endnotes

[1] Attenborough 1989: 18.

[2] Giusti, Manganelli & Schembri 1995: 46; Schembri 1995: 2.

[3] Attenborough 1989: 17.

[4] Colinvaux 1993: 339, fig. 17.1.

[5] The ESR dates for fossil hippopotamus in Malta, 130,000 to 110,000 BP (Bouchez *et al*. 1988: 54), reflects the period of their mass extinction, not of their colonization of the islands.

[6] Attenborough 1989: 18, 36.

[7] Attenborough 1989: 29; Baldacchino and Schembri 1992: 13-14.

[8] Vartanyan *et al*. 1993: 337-340.

[9] Attenborough 1989: 32.

[10] Baldacchino and Schembri 1992: 13; Schembri 1995: 2.

[11] Baldacchino and Schembri 1992: 13, 20.

[12] Giusti, Manganelli & Schembri 1995: 46.

[13] Extensive hunting of these mammals would, however, have produced similar results.

[14] Bowen 1978: 217.

[15] Thake 1985: 270.

[16] Shackleton, van Andel and Runnels 1984: 307-14.

[17] New Scientist 1996: 15; Schüle 1993: 402.

[18] Perles 1979: 82-5; Durrani *et al*. 1971: 242-3; Shackleton *et al*. 1984; Cherry 1992: 32; Schüle 1993: 407; Allen, Golson & Jones 1977; Groube *et al*. 1986: 453-5; Cassels 1984: 741-767; Terrell 1976: 1-17; White *et al*. 1988: 707-9; Suzuki & Tanabe 1982: 1-5.

[19] Giusti, Manganelli & Schembri 1995: 47; Thake 1985: 269.

[20] The Würm maximum at around 15,000 to 18,000 BP is equivalent to Isotope Stage 2, whereas the previous period of significant sea-level depression, at between 160,000 to 125,000 BP corresponds to Isotope Stage 6. Pleistocene fauna crossed over to Malta during these two stages (Gamble 1994: 5-41).

[21] Bonfiglio and Insacco 1992: 195-208.

[22] Gribbin 1996: 4.

[23] Oakley 1969: 48-9.

[24] Cornu *et al.* 1993: 1-20.

[25] Oakley 1969: 49.

[26] Oakley 1964: 51; Milliman & Emery 1969: 1121-3; see also Shackleton *et al.* 1984; Fedele 1988: 69.

[27] Fairbridge 1961; 1971.

[28] Kaiser 1994: 113-122.

[29] Colinvaux 1993: 365.

[30] Colinvaux 1993: 371-2.

[31] Della Pieta 1995: 44-65.

[32] Bronowski 1981: 30-1.

[33] Gvirtzmann 1994: 203-214; Renfrew & Bahn 1996: 214; Thake 1985: 271.

[34] Schüle's generalisations about landbridges of Mediterranean islands to the mainland do not apply to the Maltese and Egadi Islands, and their shallow submarine connection is with another island, Sicily, and not with mainland Italy or Africa.

[35] Thake 1985: 271.

[36] Fedele 1988: 69.

[37] Bouchez *et al.* 1988: 54; Reese 1996: 111.

[38] Durrani *et al*. 1971: 242-3; Perles 1979: 82-5; Shackleton *et al*. 1984.

[39] Cherry 1992: 32; Schüle 1993: 407; Allen, Golson & Jones 1977; Groube *et al*. 1986: 453-5; Cassels 1984: 741-767; Terrell 1976: 1-17; White *et al*. 1988: 707-9; Suzuki & Tanabe 1982: 1-5.

[40] Schüle 1993: 402-3.

[41] Harrison 1979: 15; Northcote 1981-3: 7.

[42] Colcutt 1979: 290-8.

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[43] Laspina 1966: 9.

[44] Laspina 1966: 12.

[45] Tagliaferro 1911: 147-150; Sinclair 1922; Zammit 1930: 5. In 1925, Zammit describes the deer remains as intimately mixed with the human ones (Section 0, p. 3).

[46] Pike 1971: 240-1. The Xemxija tombs have been attributed to the Ggantija phase.

[47] Leith Adams 1865: 257-263; 1866: 458-9.

[48] Leith Adams 1965; 1966; 1870.

[49] Spratt 1967: 283-297.

[50] Leith Adams 1874a: 185-6; Morana 1987: 16.

[51] Baker 1866: 70; Leith Adams 1870: 208.

[52] Leith Adams 1870: 215.

[53] Bernabò Brea 1966: 15.

[54] This is now known as Archidiskodon africanus, an African member of the Elephas planifrons group.

[55] Vaufrey 1928: 141.

[56] Falconer 1862: 596.

[57] Leith Adams 1870: 263 fn 1.

[58] Trechmann 1938: 5, 11, 14, 24.

[59] Sondaar 1987: 159-165.

[60] Cherry 1992: 34.

[61] Simmons 1988: 554-7; 1989: 1-5; 1996: 97-105; Manning 1991: 870-8.

[62] BM-124.

[63] Efstratiou 1985: 6.

[64] Racheli 1986: 230-8. The evidence includes palaeolithic tools and primitive art patterns.

[65] Cherry 1992: 33.

[66] Cherry 1992: 33.

[67] Sondaar 1987: 159-165.

[68] Sondaar 1987: 159-165.

[69] Schüle 1993: 406.

[70] Sondaar 1987: 159-165. Palaeolithic art appears to be absent in Sardinia (Tanda 1979: 261-279)

[71] Cherry 1990: 145-221.

[72] Shackleton *et al*. 1984: 307-314.

[73] After the site of St. Acheul in France, the period covers the period lying between 600,000 and 75,000 B.P. Hand-axes predominate and the sites include Europe, Africa, the Near East and India (Shackley 1980: 8).

[74] Cherry 1992: 33.

[75] Tusa and De Miro 1983: 13; Bonfiglio 1992: 157-173; Bernardini 1995: 116.

[76] Bonfiglio *et al*. 1992: 523-529.

[77] Fedele 1988: 68.

[78] Segre *et al*. 1980: 177-206.

[79] Racheli 1986: 14, 230-8.

[80] Fedele 1988: 68.

[81] Bernardini 1995: 116.

[82] Tusa and De Miro 1983: 13.

[83] Racheli 1979-86: 16.

[84] Giusti, Manganelli & Schembri 1995: 46; Thake 1985: 269.

[85] Storch 1974, as quoted in Thake 1985: 275.

[86] Zammit Maempel 1989: 39, 58.

[87] Storch 1974, as quoted in Thake 1985: 282.

[88] Attenborough 1989: 30.

[89] Goodall 1990: 12.

[90] New Scientist 1996: 15.

[91] Giusti, Manganeli & Schembri 1995: 46.

[92] Spratt 1967: 294; Giusti, Manganelli & Schembri 1995: 47.

[93] Bonfiglio 1992: 157-173.

[94] Bonfiglio 1992: 523-539.

[95] Bonfiglio and Insacco 1992: 195-208.

[96] Chilardi *et al*. 1996: 558.

[97] Chilardi *et al*. 1996: 560.

[98] Chilardi *et al*. 1996: 562.

[99] Rustioni *et al*., 1992: 487-494.

[100] Auguste 1992: 49-69.

[101] Racheli 1979-86: 14.

[102] Racheli 1979-86: 14, 230.

[103] Government Report for works of the Government Department, 1920-21, Section E1.

[104] Evans 1971: 39.

[105] Racheli 1979-86: 230-8.

[106] The Maltese Pleistocene fauna comprise elephant, hippo, and deer, with a few remains of fox, wolf and brown bear. The list as outlined by Temi Zammit comprises Ursus arctos (?) Linn; Vulpes sp, Canis Sp, Leithia Melitensis, Myoxus cartei, Eliomys

sp, Arvicola pratensis, Arvicola amphibius, Equus sp, Cervus dama (?) Linn, Cervus elephas (var. barbarus), Hippopotamus pentlandi, Hippopotamus melitensis, Elephas mnaidrensis, Elephas melitensis and Elephas falconeri. Morana describes two types of Maltese deer, the Cervus elephus and the Cervus barbarus which have been encountered in the horizon of human remains at various sites on the Maltese islands. (Morana 1987: 16). The list he outlines on the extinct Pleistocene fossil remains comprises Brown bear (Ursus arctos), Hippopotamus (H. pentlandi, H. minutis), three types of dwarf elephants (Elephas mnaidrensis, E. falconeri, E. melitensis), giant dormouse (Myoxus melitensis), vole (Arvicola pratensis), Giant swan (Cygnus falconeri), Red deer (Cervus elephus, C. barbarus), Giant turtle (Testudo robustissima, Testudo graeca), Wolf (Canis lupus), Fox (canis vulpes) and Toad (Bufo viridis).(Morana 1987: 22)

[107] Schüle's hypothesis (1993: 408) for a primary *Neolithic* importation of red deer to Malta is invalidated by the predominance of red deer remains in the Pleistocene deposits of several sites in Malta and Gozo.

[108] Chilardi *et al*. 1996: 558; Vigliardi 1968, 1982.

Plate 1 - The three taurodonts, together with the note registering the referral of Baldacchino's molar, Gh. D./3, (Ma. 7) to Oakley in August 1968.

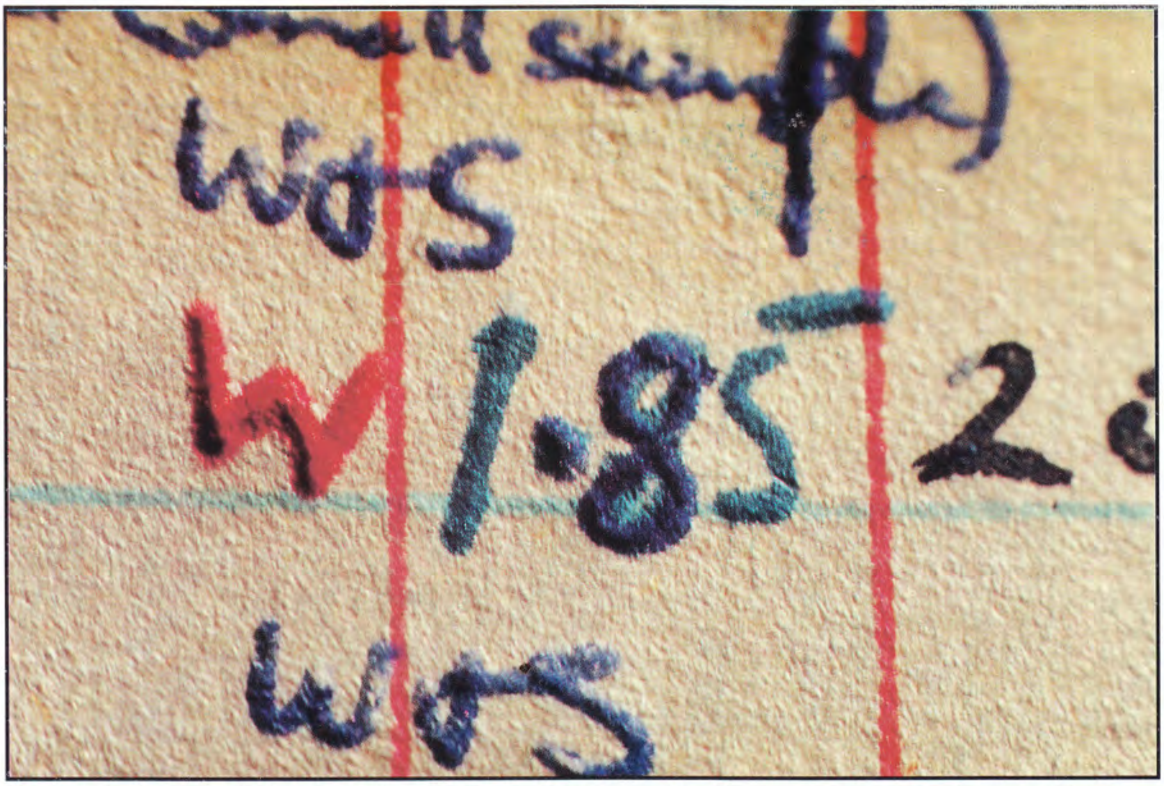


Plate 2 - The Nitrogen value for Despott's molar, Ma. 2, is shown in two shades of ink; the darker ink reads **·8** whilst the later ink reads **1·85** (Bone Analyses, fl. 105); hence the inconsistence of the Nitrogen result published in 1964 with the remainder of the unpublished dating tests, that is the Fluorine, Iron, Phosphate, Fluorine-Phosphate ratio and particularly the Uranium oxide.

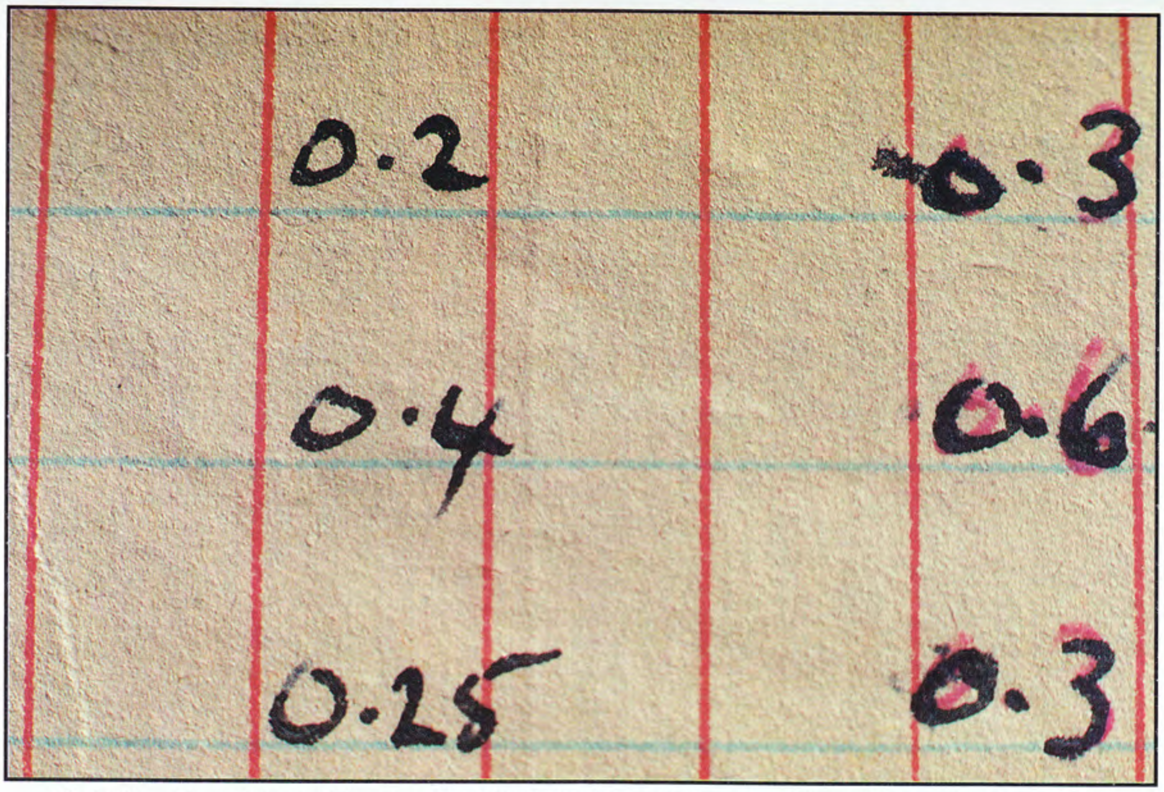


Plate 3 - Unpublished Fluorine Readings for Despott's molar, Ma. 2 (Bone Analyses, fol. 105). See Table 2, p. 110.

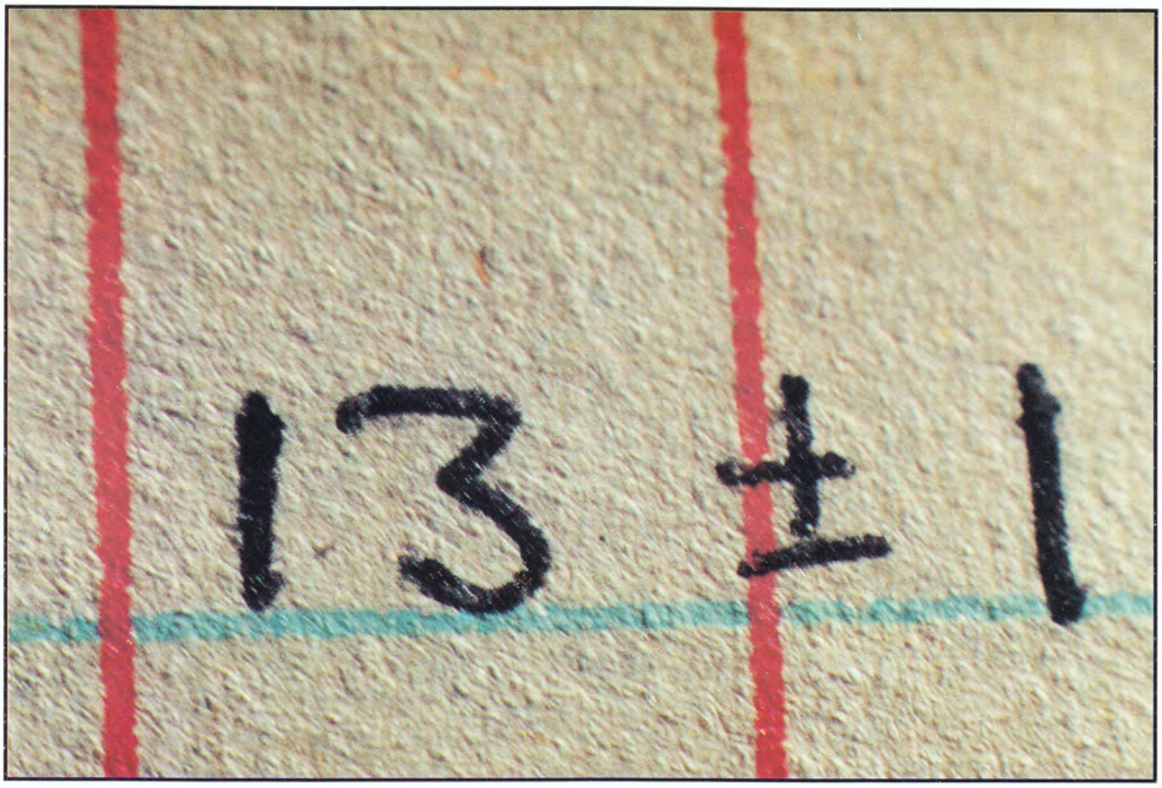


Plate 4 - Unpublished Uranium oxide result for Despott's molar, Ma. 2, reading at 13 ± 1 parts per million, the highest value obtained amongst the Ghar Dalam specimens, (Bone Analyses, fol. 105).

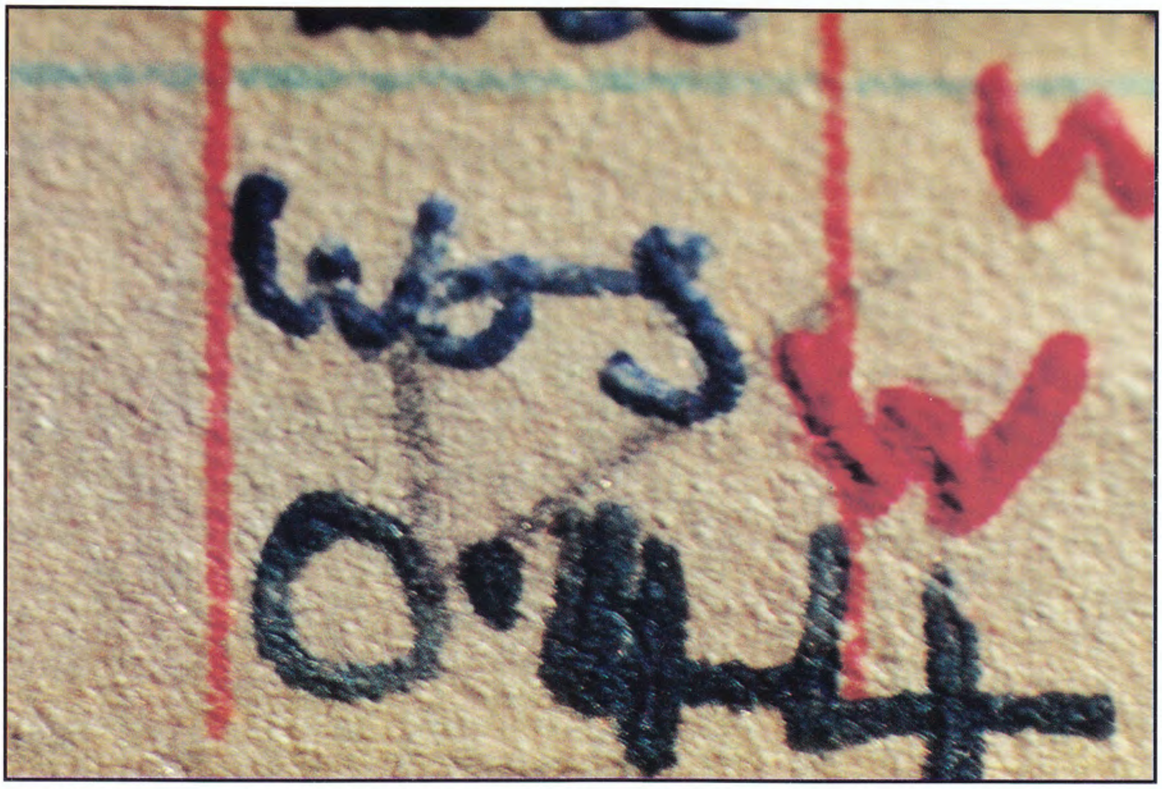


Plate 5 - Unpublished Nitrogen result of Baldacchino's molar, Ma. 7, reading at 0·44%, equal to Ghar Dalam hippopotamus samples Ma. 33 and Ma. 34, (Bone Analyses, fol. 105).

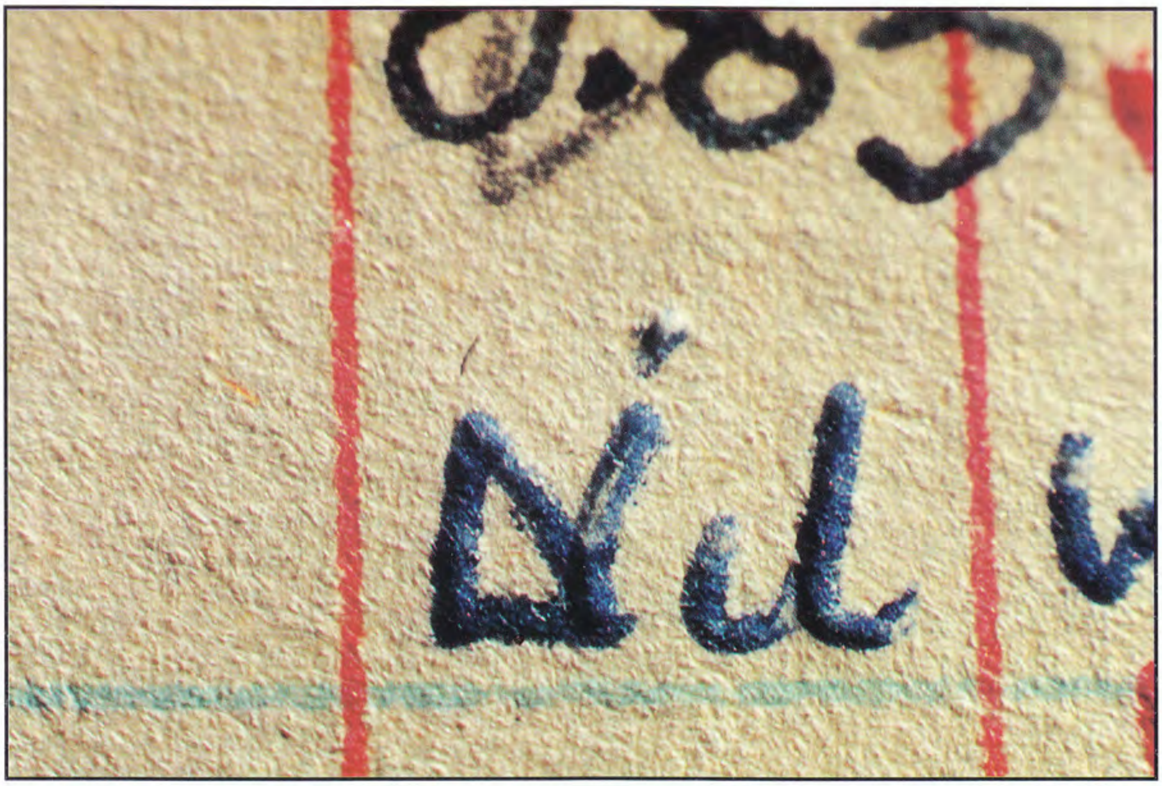


Plate 6 - Unpublished Nitrogen result of Hypogeum tooth Ma. 6, reading at Nil, equivalent to Hippopotamus sample Ma. 4, (Bone Analyses, fol. 105).

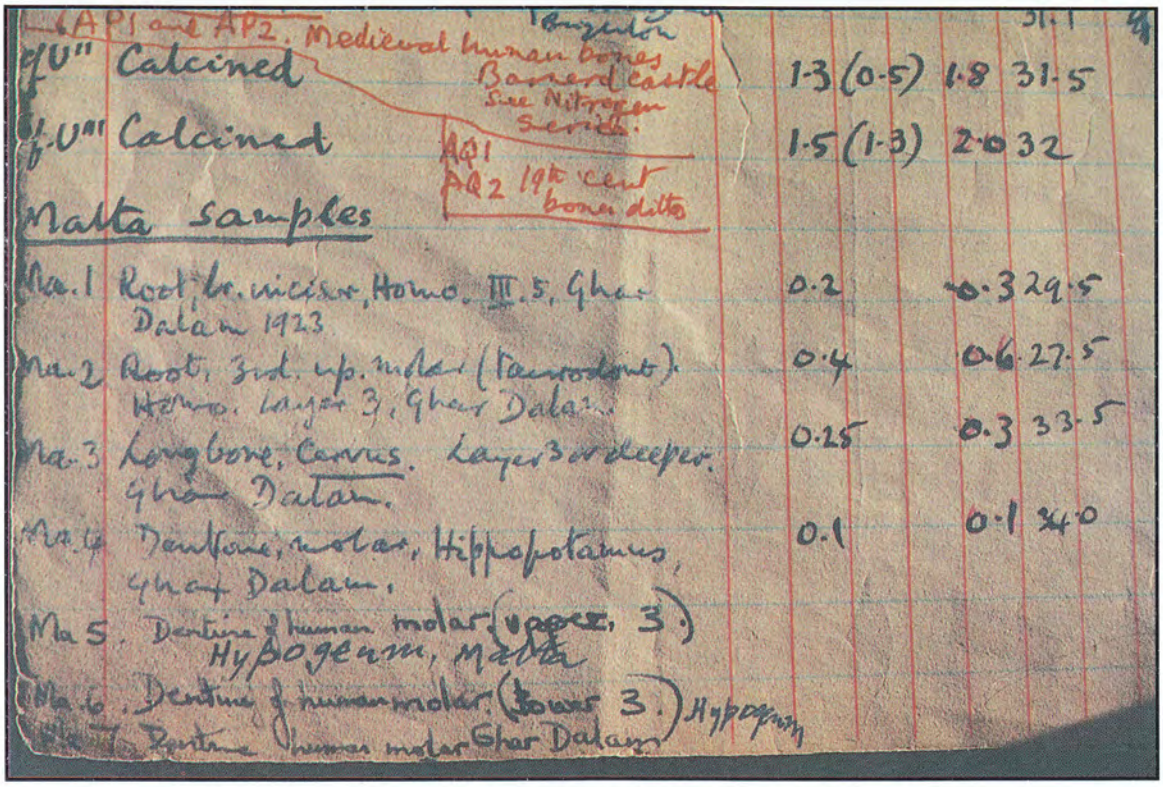
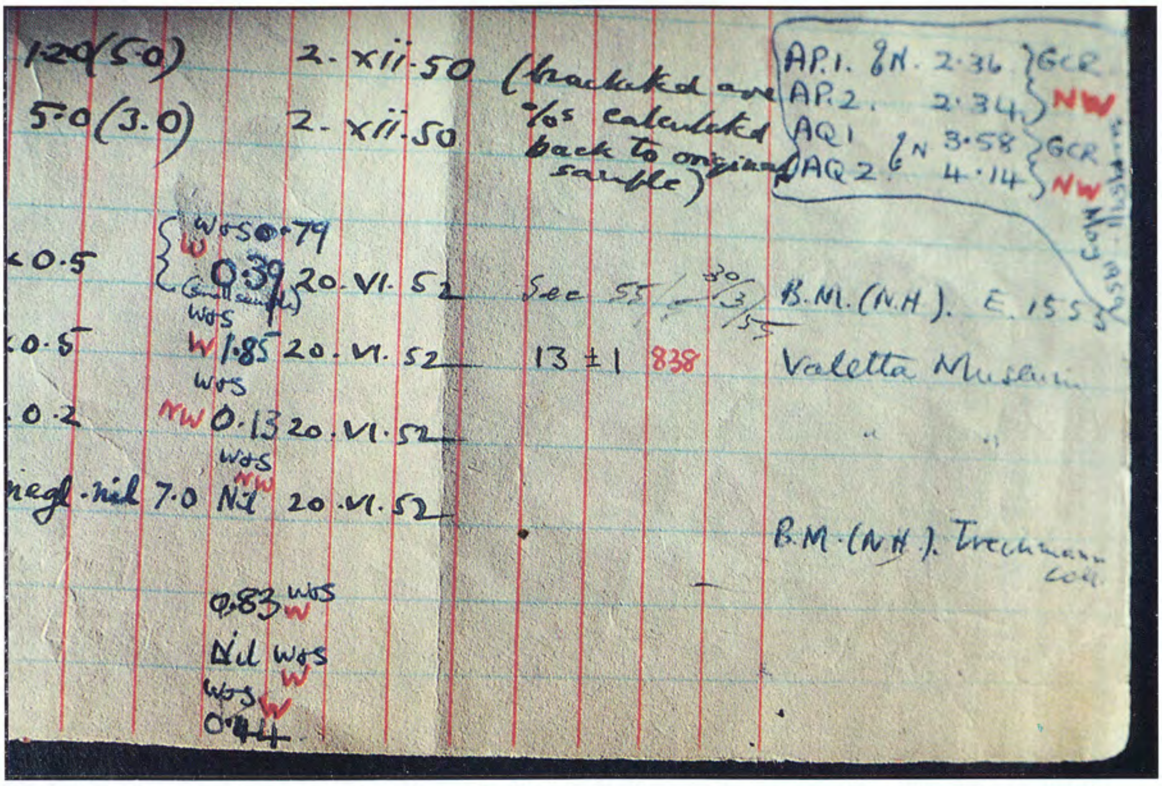


Plate 7 - The "Malta Samples" (Bone Analyses, fol. 105)



1.20 (5.0) 2. xii. 50 (bracketed are %s calculated back to original sample) AP.1. } N. 2·36 } GCR
5·0 (3.0) 2. xii. 50 AP.2. 2·34 } NW
AQ1 } N 3·58 } GCR
AQ2 4·14 } NW
<0.5 W wos 0·79 0·39 (small sample) 20. VI. 52 See 55/ 30/3/55 B.M.(N.H.). E. 1553
<0.5 wos W 1·85 20. VI. 52 13 ± 1 838 Valetta Museum
0.2 wos NW 0·13 20. VI. 52 " "
negl.-nil 7.0 wos NW Nil 20. VI. 52 B.M.(N.H.). Trechmann coll.
0·83 wos W
Nil wos W
wos W 0·44

Plate 8 - The dates of letters from Oakley to Malta are shown, on the 20th of June 1952, and 30th of March 1955 (Bone Analyses, fol. 105).

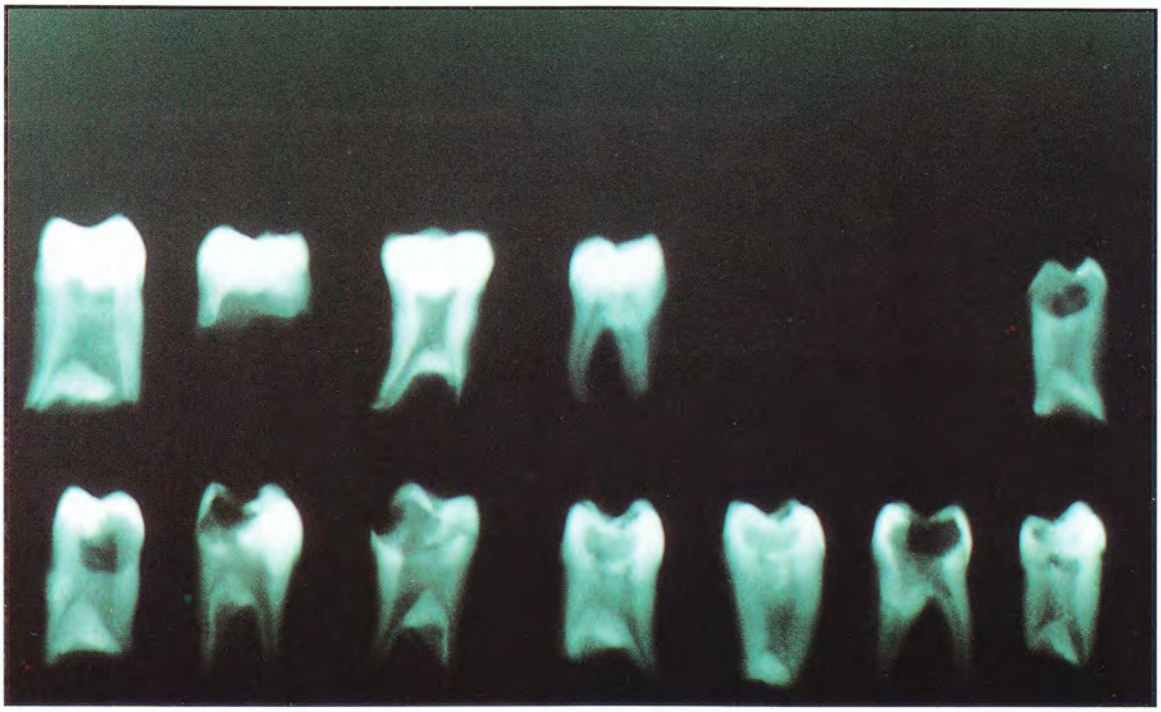


Plate 9 - Radiographs:
Top row, from left to right: The 1917 molars, the controversial Baldacchino's molar, a normal molar and a modern taurodont.
Bottom row: modern taurodonts since 1970 (Medical School, Malta). Mangion's molars were not available for direct comparison on this film.
The larger pulp cavity, dimensions and fossilization are obvious, particularly in the molar in top row, far left- the complete 1917 taurodont molar.

Plate 10 - The handprints surviving in Gallery D by June 1996.

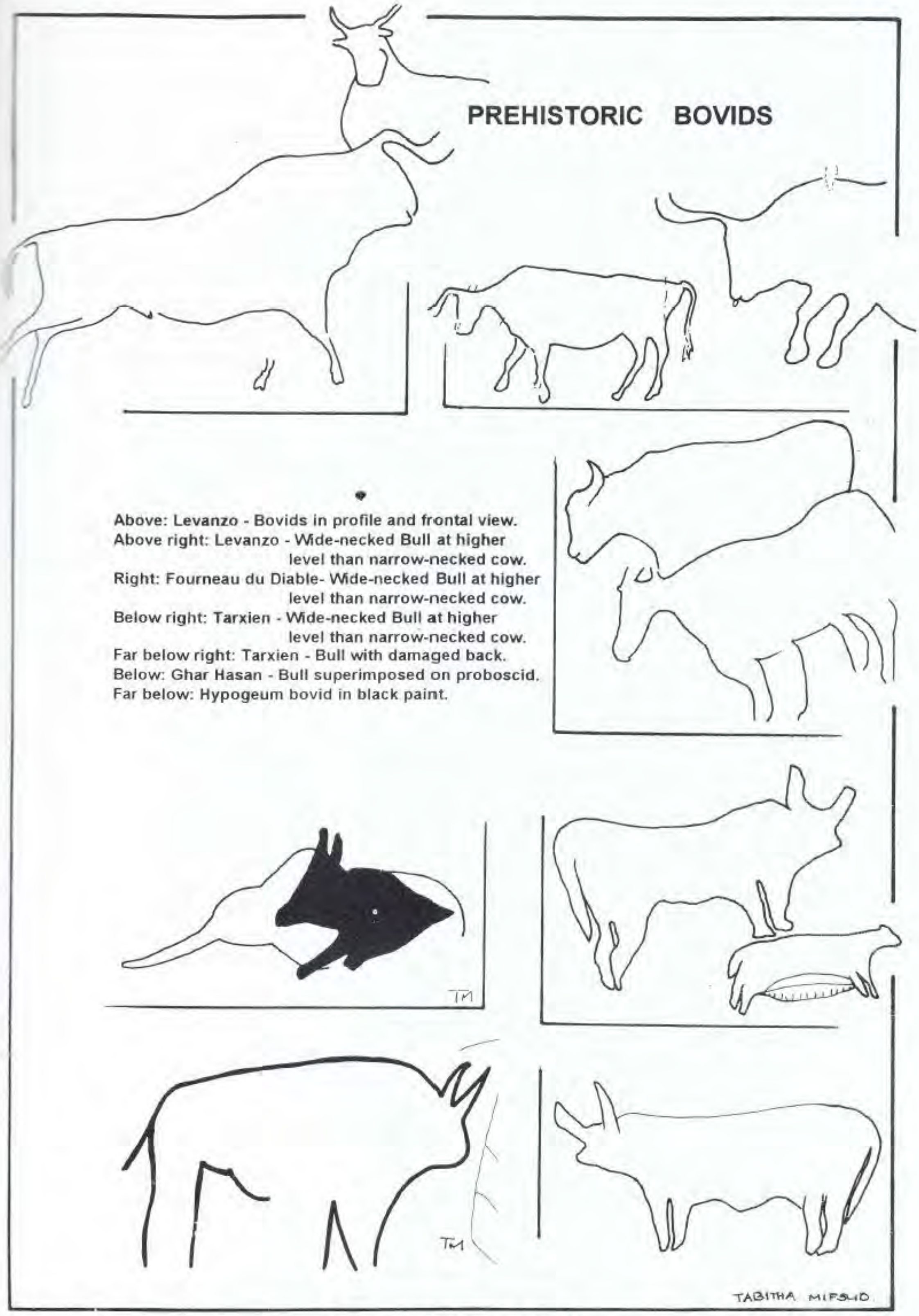
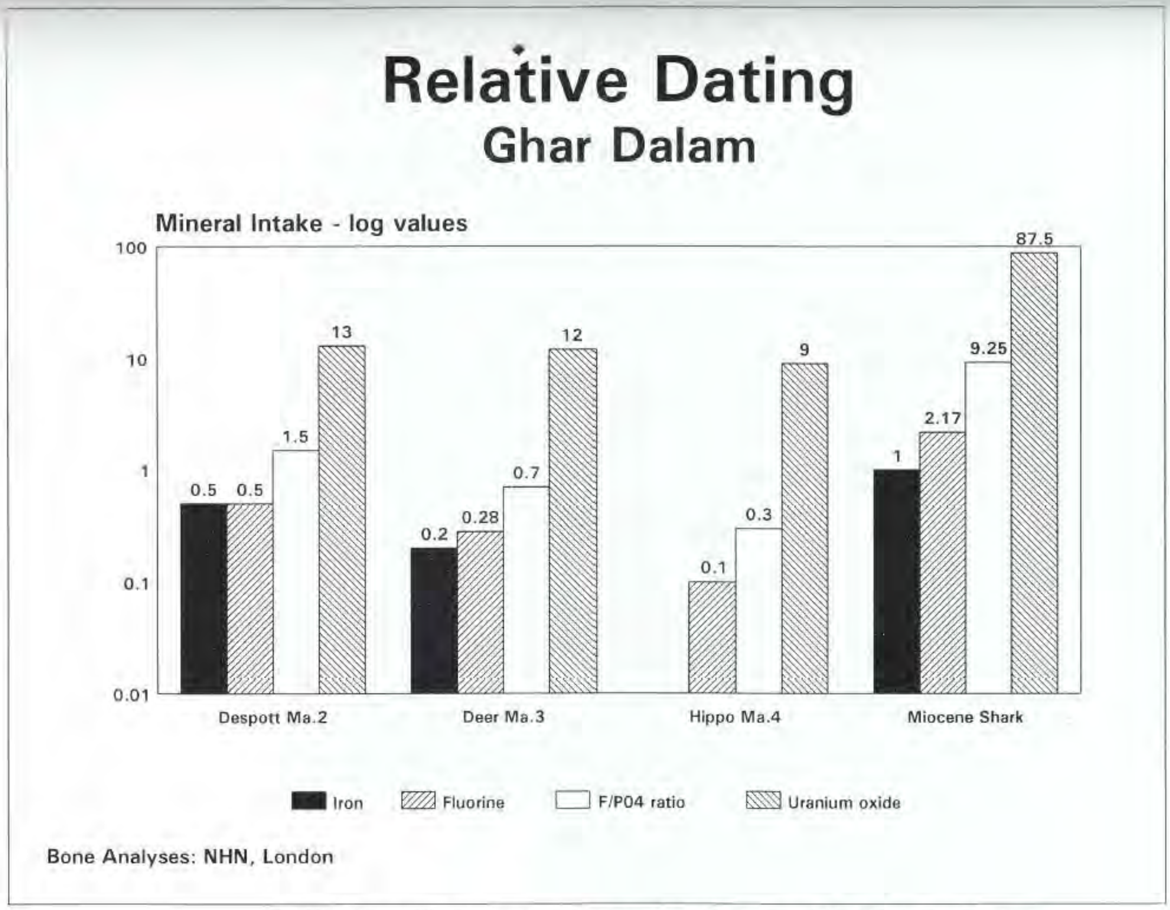
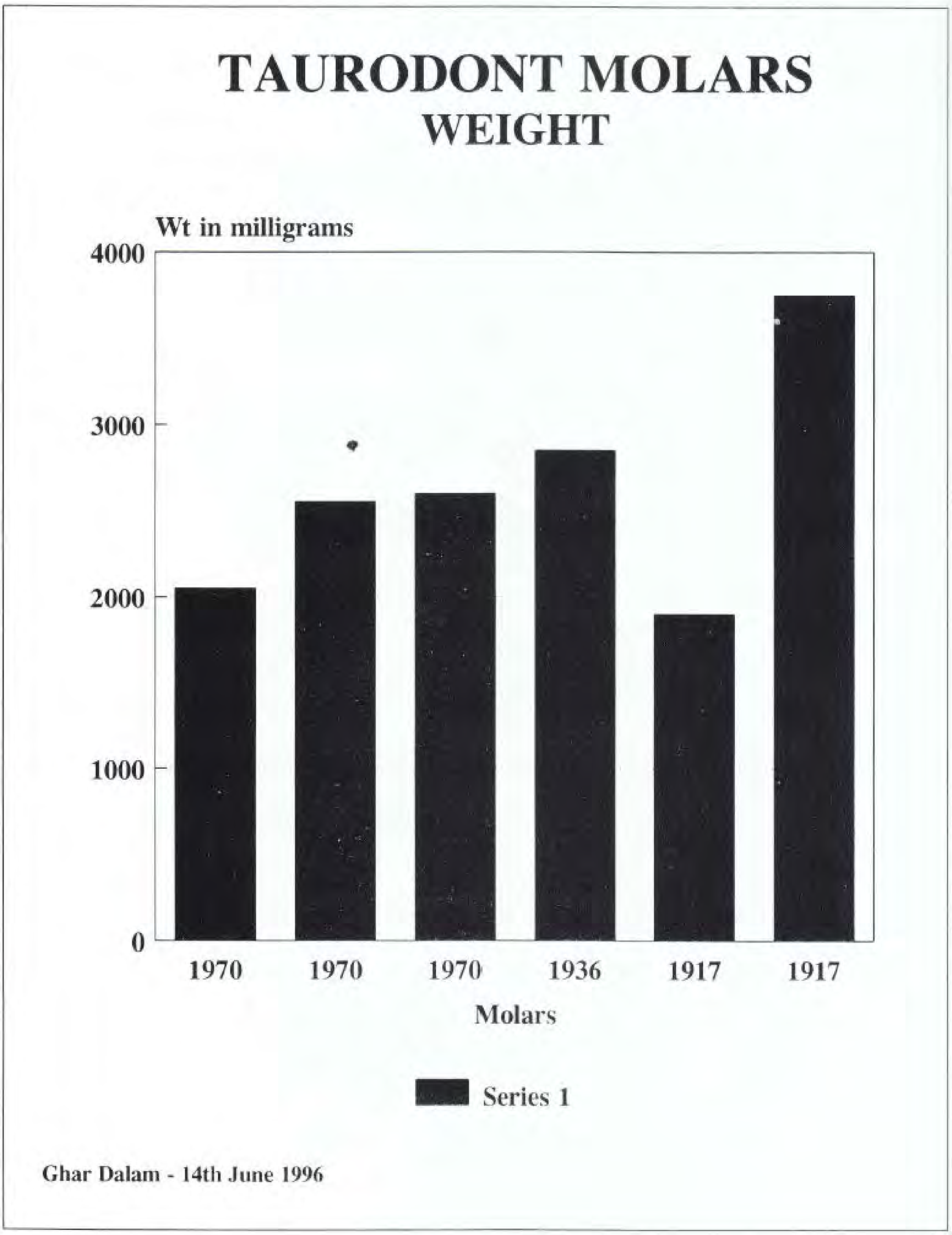


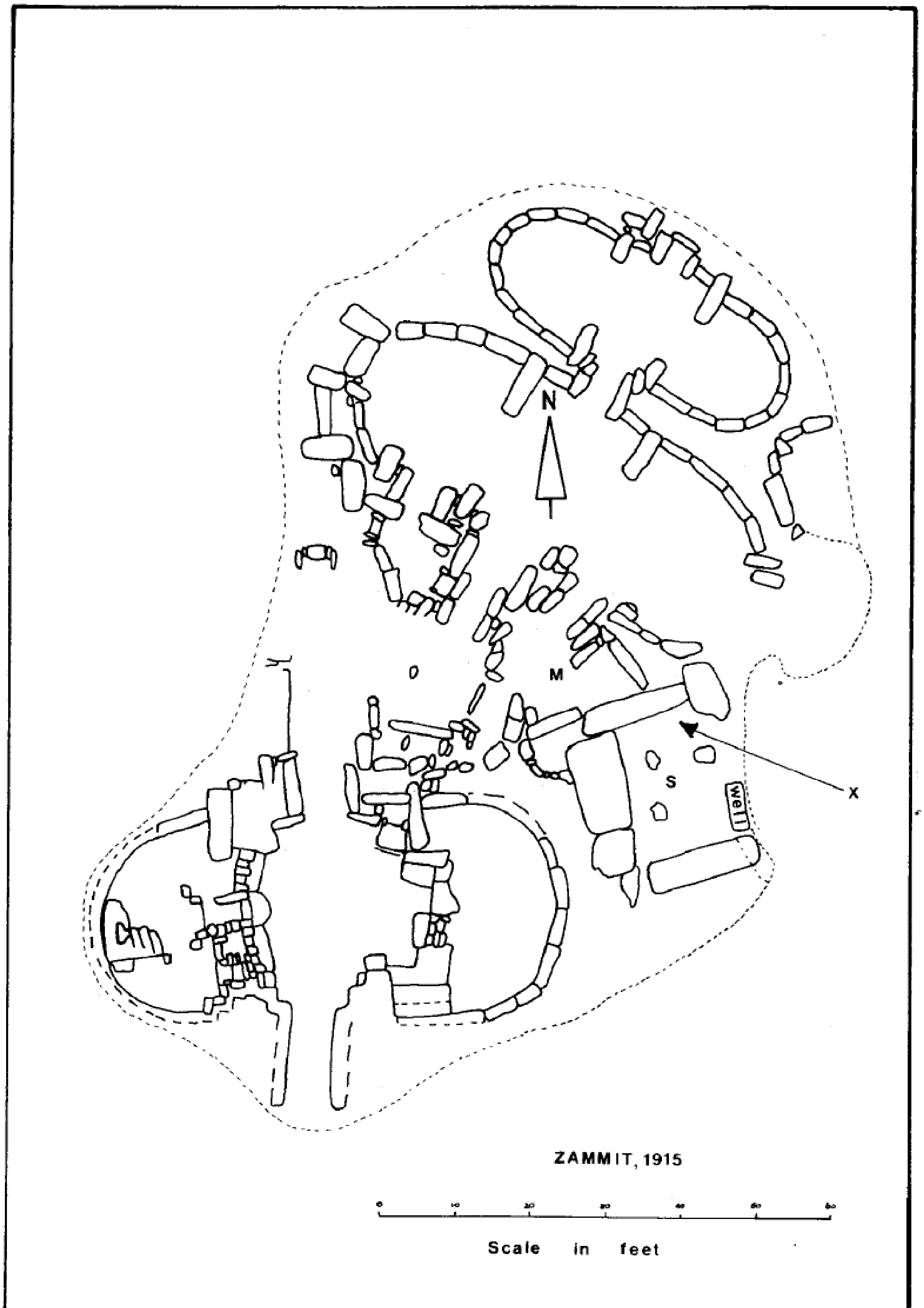
Figure 1 - Prehistoric bovids.



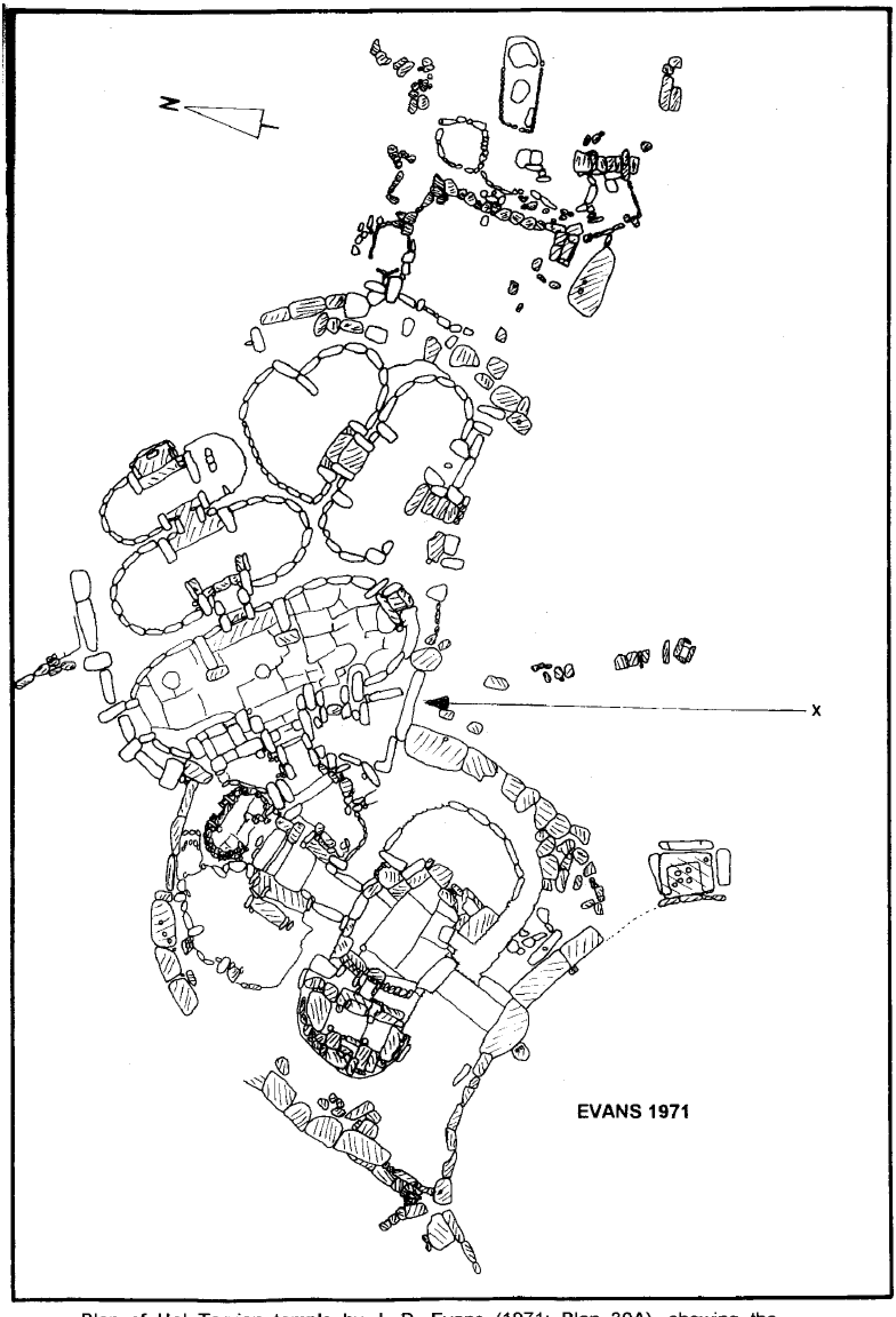
Profile of scientific tests carried out on Despott's molar, Ma. 2, for Iron, Fluorine, F/P ratio and Uranium oxide, with those for Deer, Hippopotamus, and Miocene shark (5 million years BP+). Despott's molar is second only to Miocene shark.



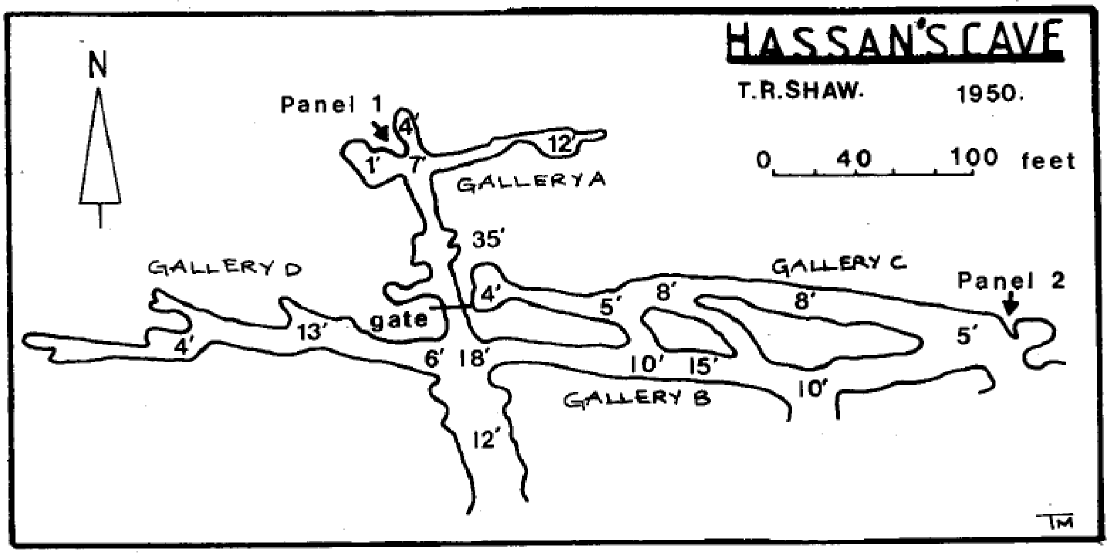
The larger weight of the complete 1917 taurodont, Rizzo's molar, is due to its larger size and its degree of fossilization, which is associated with an increase in weight.



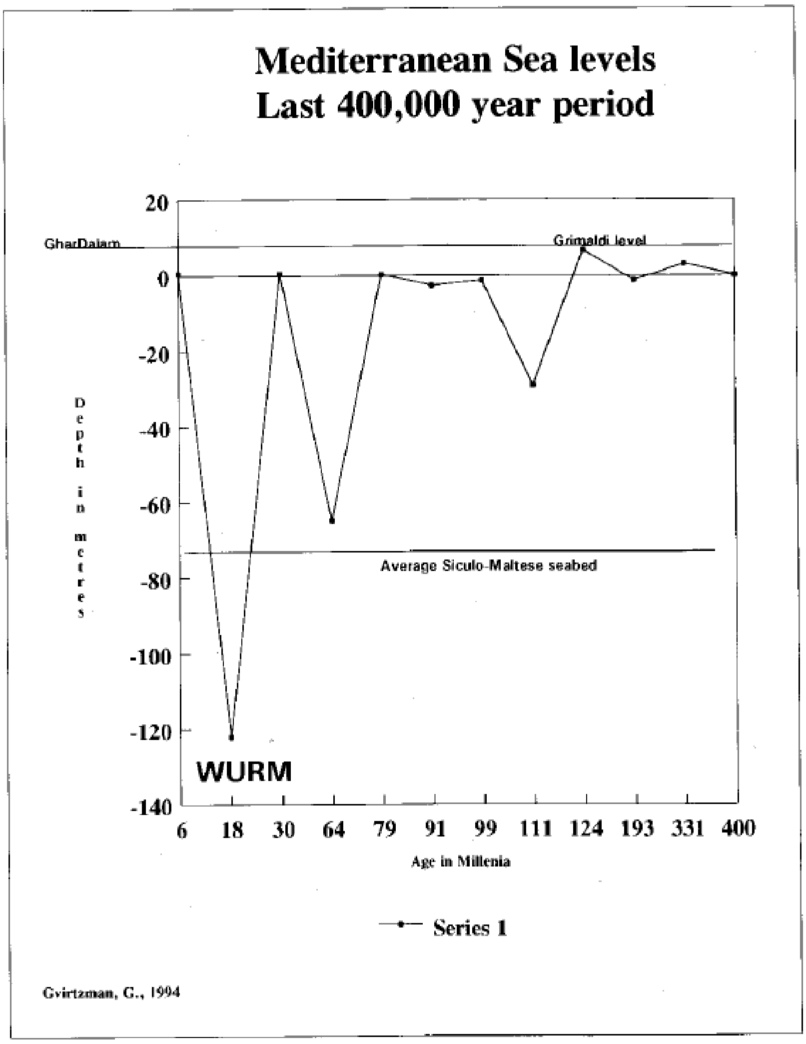
Plan of Hal Tarxien temple by T. Zammit (1916: 131), showing the rectangular enclosure 'S,' cut off from the remainder of the temples. X marks the slab of stone with the bovids in bas relief.



Plan of Hal Tarxien temple by J. D. Evans (1971: Plan 30A), showing the disappearance of the rectangular enclosure, and the communication with the temple complex.



Map of Ghar Hasan, adapted from T.R. Shaw, 1950, shows Galleries A, B, C and D, and Panels 1 and 2, where the best depictions were discovered beneath stalagmitic material.



Transgressions and Regressions of the Ice Age

PALAEOLITHIC HUMAN REMAINS AT GHAR DALAM

Ghar Dalam is the archetype for a complete spectrum of Maltese prehistory; other caves, gaps and fissures spread out around Malta have also yielded similar fossil remains. The earliest recorded acquaintance with these archaeological specimens is traced to the Maltese proto-historian G.F. Abela. Dating back three and a half centuries, Malta's first history book records the discoveries of fossil bones of locally extinct mammals, then attributed to the presence of one-eyed giants on these islands.[1] In 1647 Abela gives the following account:

> "But, lastly, what further testimony can we desire of the habitation here of the Cyclops, without the need of borrowing from the ancient scriptures, involved in the obscurity of time, than that given us by the gigantic bones found in Malta, and their hollow burial places cut in the living rock, and very often of enormous size, as, for example, is that now covered by a small garden in the country, between the *Madonna della Gratia* and the Tower of *Blata el Baidha*, and a bone which the owner used as a cross-bar for the door! Another similar tomb was discovered in the vicinity of *Zurrico*; and we ourselves have seen a molar tooth of the thickness of the finger, and an inch in length, which was extracted from a gigantic head found outside *Birchircara*, and afterwards given to Paolo Grimaldi, and a similar tooth of the accompanying form and size is in my possession, and several others of these bones we were able to enumerate that have been found from time to time, only mentioning a large rib that for some time lay in Fort St. Angelo, but which was taken away in 1625.' The drawing referred to by the author represents a flat crown, with a long body and three fangs, and is probably a portion of a molar of a fossil elephant."[2]

The massive human tooth here described and depicted in the illustration by Ciantar is rather suggestive of a taurodontic molar. Another *savant* who manifested a similar interest was the French knight Deodat de Dolomieu. In the 1790's he described the remains of fossil hippopotamus in Malta. The boom however came in the 1850's, soon after the start of excavation works on the megalithic temples of Malta and Gozo. The Maltese valleys, caves and fissures were investigated by several researchers such as Spratt, Busk, Parker, Falconer, Leith Adams, Issel, A.A. Caruana and J.H. Cooke.[3]

Ghar Dalam - The Stratigraphy:

"Palaeolithic man...possibly yet to be found in the Ghar Dalam cavern."[4]

Notwithstanding the several excavations and excavators over several decades, and the various numbers of strata with different nomenclatures, the stratification of the Ghar Dalam cave is really very simple. Instead of using the traditional numbers to label the different layers or strata with its consequent confusion when subdivisions of these various layers occur, the classification adopted by the present Curator of the Ghar Dalam Museum has been adopted. The strata lying at the very bottom are naturally the most ancient.

There were six main horizons reported in Ghar Dalam, and starting from the oldest at the very bottom, the Clay layer (1), this was actually a bone free layer which reflected an absence of organic remains; the Hippopotamus layer (2) is the interesting one, for it is mainly comprises the remains of dwarf elephant and dwarf hippopotamus, which are now both extinct. The Pebble layer (3) is mainly a stony separator of the Hippopotamus Layer (2) from the Cervus Layer (4). This last-mentioned layer contains the remains of another array of Pleistocene fauna, and these comprise mainly Red deer; but there are also remains of fox, wolf and brown bear. The Cervus Layer (4) also contains a small amount of elephant and hippopotamus remains, which differ from those in the Hippotamus layer by being anatomically disposed and less worn through water action.[5] The Calcareous Layer (5) seals off the underlying Pleistocene deposits and separates them from the overlying Cultural or Domestic animal layer (6), which shows definite evidence of human presence from around 5300 BC to the present century. So that, whilst the pachyderms (elephants and hippo) are distributed in the Hippopotamus and Cervus layers, Red deer is confined to the Cervus layer alone. It appears neither in the Hippopotamus nor in the Cultural layers.[6]

The Hippopotamus and Cervus Layers were formed by water action during the Pleistocene period, respectively at approximately 150,000 and 20,000 years before the present time. The former is a lake deposit (also known as *lacustrine* or *limnic*), whilst the latter is an *alluvial*, or river-borne deposit. The Cultural layer was formed by sedimentation; it was piled up since the Neolithic occupation of the Ghar Dalam cave, and it contains no remains of deer, hippopotamus or elephant, nor any extinct Pleistocene fauna. It is separated from the Cervus Layer by the Pleistocene cap, which marks the division between the alluvial, or water-borne, horizons of the Pleistocene from the sedimentary horizons which start off from 5,200 B.C.[7]

On biostratigraphical criteria, the deposits at Ghar Dalam have been attributed to the early-middle Pleistocene.[8] The lower deposits, mainly comprising hippopotamus, have been dated to lie between 130,000 and 110,000 years B.P.[9] They are associated with a wetter climate than the present one, whilst the climate during the deposition of the Cervus layer was also cooler than today's. The latter might not have been deposited in one phase;[10] it is dated to around 20,000 B.P. Temperatures during the Würm were definitely cooler, and the stalagmitic dividers in the Cervus layer strongly suggest at least three phases of deposition of red deer remains.[11] The Neolithic horizons start off at 7,200 B.P.[12]

A history of the excavations

Excavations at Ghar Dalam have been going on at least since 1865. Having been dug up in practically all its various parts, in transverse, longitudinal, short and long sections, and also through the re-digging into previously excavated sites, the cave deposit layout had of necessity created a degree of confusion and even contradiction at times. However if the reports from a primary excavation are assessed in a light different from that relating to a secondary one, then the confusion disappears.

The Italian Arturo Issel is constantly quoted as the first scholar to have applied his trowel to the cave floor. He had originally been searching for Palaeolithic caverns in the Maltese Islands, and had been, inadvertently perhaps, referred to Ghar Dalam. Setting himself to the task, he accordingly measured a hundred paces from the cave entrance, and started his digging at this site. The remarkable finds of his, the first official excavation of Ghar Dalam, included the burnt remains of hippopotamus, whose bones had apparently been cooked and opened up to extract the marrow for consumption.[13]

> "Praticato uno scavo di 60 centimetri di profondita nell terreno della caverna, alla distanza di un centinaia di passi dall'apertura, si trovarono ossami di mammiferi che avevano subito certamente l'azione del fuoco e

> con essi residui di carbone. Due di queste ossa sono il primo e il terzo osso di un metatarso destro d'ippopotamo. Le altre appartengono a piccoli erbivori, probabilmente ad una specie di *Ovis,* e sono omeri, metacarpani, metatarsiani, ecc. in gran parte spaccati per estrarre il midollo. Tutte le ossa, non escluse quelle d'ippopotamo, portano traccie evidenti di cottura." [14]

Not much in the way of attention was then given towards these finds, but this was in conformity with the general attitude at the time towards Palaeolithic humans. Thirty years later, in 1892, an English teacher by the name of John H. Cooke exhibited an interest in the cave, and embarked on a series of systematic excavations starting off from a distance of approximately 350 feet inside the cave. He dug out eight trenches at regular intervals towards the entrance of the cave; the eighth trench lay at 30 feet from the entrance. The main finds were in two trenches. A human hand bone was found in his Trench IV in the Cervus layer, whilst a human implement was discovered in Trench VI, also in the deer layer.[15] For the first time, human implements and remains lay in the same horizon below the cultural layers of Ghar Dalam, precisely in the Cervus layer. Immediately overlying Cooke's Layer 'e,' the fifth layer from the surface, and equivalent to the Cervus layer, at a depth of two feet three inches, a stone implement was discovered by Cooke. According to Dr. A. A. Caruana, he was "of the opinion that it has undoubtedly been fashioned by man."[16]

Following Cooke's excavation of the 1890's, an interlude of two decades followed, during which time no official digs were effected at Ghar Dalam. In the meantime, however, Cooke investigated the Pleistocene deposits in Gozo, at Dwejra and at Wied il-Ghasri; similar Pleistocene fauna were discovered at these sites as well.[17]

At this point mention must be made of a fissure cave which had been discovered during quarrying works at 'Tan-Naxxari' in 1911, three and a half miles away from Mqabba. Here Napoleon Tagliaferro had been called upon to inspect human remains in the company of red deer at a site known as Burmeghez. The site had been disturbed by the workmen, and Tagliaferro had initially believed that he had encountered the remains of Malta's Palaeolithic men. The presence of pottery upset his hypothesis, since the craft had not been developed in Palaeolithic times.[18] Tagliaferro therefore considered it as a burial site of Neolithic Maltese. The following year the Burmeghez cave was explored by Ashby and Despott,[19] and they discovered further remains of mammals of late Pleistocene or the early Neolithic period in the deeper strata.[20]

A series of digs now followed in quick succession. In the winter of 1912-13, Napoleon Tagliaferro and Giuseppe Despott cut a trench at the very internal reaches of Ghar Dalam cave, at 350 feet from the entrance. A year later the excavation was taken over by a committee of the British Association. Despott now coordinated with Temi Zammit and Dr. Ashby, and in 1914 they dug up another trench 200 feet from the mouth of the cave; they published their finds in 'Man.'[21] G. Despott carried on his own and in 1916, he dug up a trench situated 115 feet from the cave entrance, thereafter publishing his finds in the British Association reports for 1916.[22]

In 1917 Despott obtained a grant of ten pounds sterling from the British Association in order to resume the digs. The site he selected was close to the trench where Cooke had discovered his brown bear remains twenty five years earlier. Although the cave had been subjected to several exercises at excavation going back to the nineteenth century, Despott set himself up to conduct programmed excavations with full keeping of records.

The breakthrough came about in the summer of 1917, in one of the two trenches Despott had excavated that year. Trench I was situated 50 feet from the entrance, and the crucial Trench II lay 60 feet further inside the cave. It was in the latter, Trench II, that two taurodont molars were discovered in the stratum of red cave earth.[23] The Curator Giuseppe Despott and a Mr. Carmelo Rizzo[24] were supervising their men digging in Trench II, when the latter's workers came across a large bull-shaped human molar tooth amongst several deer teeth obtained from the Deer layer of this trench; a few days later Despott himself discovered a similar molar a few feet away, several inches deeper in the cave earth.[25] The controversy which was sparked off since is not concluded as yet.

Despott's molar was registered as lying one foot deeper in the cave earth of the Cervus layer, and separated by seven feet from Rizzo's; the pair of molars possibly derived from two individuals, but their relative proximity cannot exclude a single source.[26] The teeth had an unusually large pulp cavity so that the roots were very small. Such teeth had been described just a few years earlier by Arthur Keith, who attributed their presence to Neanderthal Man; Keith had coined the term 'Taurodont' (Bull tooth) for these primitive molar teeth.[27] Despott therefore speculated correctly that this human form might have existed in Malta in the mid-Palaeolithic Age. Rizzo and Despott discussed the matter. Neanderthal man was known to be a cave-dweller, and it was considered worth the while to investigate the possibility of Neanderthal humans having actually occupied Ghar Dalam cave; this would make Malta's first Maltese go back by several millennia. They therefore referred the matter to Sir Arthur Keith himself in London.[28]

The Ghar Dalam reports of the 1917 excavations and finds were discussed at the Anthropological section of the British Association in the following year.[29] Arthur Keith was definitely impressed and spot diagnosed the molars as taurodont from the photograph Despott had submitted. He thus described the taurodont molars on actual inspection in Malta:

> "They are hard, heavy and mineralized; the enamel is of a bluish dark opalescence; the neck and root are of a dull chalky grey...The enamel of the cusps is sharp and crystalline... the details of cusp formation differs from those seen in the cusps of modern man, particularly as regards the size and length of the postero-internal cusps. In size and form such teeth have been seen in no race of mankind except *H. Neanderthalis*; in condition of fossilization and in the fauna which keep them company, in the red cave earth in Ghar Dalam, they are in their proper Pleistocene setting."[30]

Sir Arthur Keith flew into the face of opposition by publishing his hypothesis in confirmation of Despott, in a letter to 'Nature' that same year. He commented that this discovery extended "the distribution of this species (Neanderthal man) to another continent, for, in a zoological sense Malta is African rather than European." He suggested at the same time that the elephants might have been trapped and slaughtered inside the cave,[31] in the same way that the Ambrona Valley elephants had been ambushed and slain by hominids half a million years earlier.[32]

Six years later Keith was even more convinced of his hypothesis, having had the opportunity to examine a large collection of Maltese Neolithic teeth which were providentially presented to him by a relative of his then engaged in Malta. George Sinclair had excavated the recess of the Burmeghez cave in 1921, and had unearthed human skulls and artifacts of a late Neolithic type. He had also gathered a total of 2,250 human teeth in an excellent state of preservation.[33] These he submitted to Keith, who examined them all in minute detail. Although the usual forms of fused roots and caries were present, yet not one single specimen of taurodontism was identified. Keith concluded that the total absence of taurodontism from the large number of Neolithic teeth of Burmeghez contrasted significantly with the presence of the taurodontic molars of Ghar Dalam, thus further enhancing his hypothesis.

Another Englishman in Malta at the time was Dudley Buxton; he was conducting anthropometric studies on Maltese Neolithic skeletons, and his study had included a study of 224 Neolithic teeth in the 1920's; though he described caries and fused roots, neither did he record any evidence of taurodontism.[34]

George Sinclair, a civil engineer with the British Admiralty had a particular interest in Palaeolithic caves, and Temi Zammit suggested to him a further excavation of Ghar Dalam. Sinclair took the suggestion, but he extended his investigations to the areas just out and beyond the cave and down the Wied Dalam valley towards the bay at Marsaxlokk. His study included the plane level of the cave from end to end, and a correlation of the finds in the various strata which fit their subdivision into four horizons.[35]

The cave deposits were further correlated with the Palaeolithic caves at Grimaldi which lay on the northern end of the Mediterranean shores. Sinclair's correlation of the Ghar Dalam cave deposits with those at Mentone, in the Grimaldi caves, was significant, for here was discovered the Mousterian culture normally associated with Neanderthal humans. In position and sequence, the red cave earth (loamy soil) in which the Ghar Dalam taurodonts were discovered, corresponded perfectly with the Mousterian and Aurignacian layer periods in the floors of the Grimaldi caves.[36] This analogy of cave deposits thus lent further vital support to Keith's theory, but it seems that it must have reached deaf ears at the time. The language question was a hot issue in Malta in the 1920's, and Lord Strickland had just then published his Phoenician hypothesis for the first Maltese. Keith was now proposing the Neanderthaler as an earlier ancestor for the Maltese race, at the same time that he was considering Malta as African;[37] his hypothesis was certainly not desirable at the time. Sinclair had also discovered another human molar this time lying 2 feet lower down than Despott's. This tooth bore no mark of taurodontism.[38]

Ghar Dalam was not a routine burial ground for Neolithic humans, in consideration of the scanty amount of human remains discovered there, and these spread out in a non-ritual and non-anatomical position.[39] This is in contrast with the remains at Burmeghez a few miles away, where at least seventy individuals had been buried ritually. Besides the teeth, the remains included 29 skulls which were all dolichocephalic. It has been considered to be a burial deposit in a natural cave, dated to the Copper Age. Similarly, at the Hal Saflieni Hypogeum at Paola a 'heap' of bony remains was discovered and calculated to derive from about 7,000 individuals according to Sir Themistocles Zammit. The latter also proposed that this was a secondary burial site rather than a primary one. These were then assumed to date to the Copper Age, but all have been lost except for eleven skulls preserved in the National Museum. The early Maltese archaeologists, such as A.A. Caruana and Themistocles Zammit, ignored human bones and concentrated their researches on the artifacts.[40] Before the refurbishment program in 1996 however, the number of the Hypogeum skulls on display had already been reduced to six.

As far as their morphology goes, Keith equated Despott's molars with the typical Neanderthal molars discovered at Krapina in Croatia (the largest taurodonts discovered so far) and at St. Brelade in Jersey.[41] Keith was never to know that a third taurodontic tooth was discovered later in 1936 by the then Curator of the Museum, Dr. J. Baldacchino. Themistocles Zammit and Giuseppe Despott provided Keith with all the human teeth discovered in the Ghar Dalam strata, and the latter, unaided by modern dating methods, compared the degree of mineralisation of the taurodontic teeth with those of the fossil animals. He approximated the taurodonts by way of degree of mineralisation with the fossil bones of the upper parts of the hippo layer.[42] Keith thus enhanced the similarity of the Ghar Dalam taurodonts with the Neanderthal taurodonts discovered at Jersey and at Krapina, and on a morphological and morphometric basis supported his own hypothesis that the Ghar Dalam molars were indeed those of Neanderthal Maltese folk.[43]

Within the space of a few years Keith felt that he had to go out in print again in order to defend his hypothesis. The problem which arose was the publication of a few scattered reports of the presence of taurodont teeth in modern humans. This eventuality seemed to cripple his hypothesis somewhat. Keith had carried out extensive research on the dentition of Neanderthal humans, and he had associated his molars with a condition for which he had coined the term 'Taurodont,' or bull tooth. In this condition the body of the tooth replaces the greater part of the roots, so that there is a large body and small roots. Keith had however already dealt with this issue by demonstrating, together with Shaw, that there were at least three different severities of taurodontism. These were known as hypertaurodonts (for the severest forms), mesotaurodonts (the intermediate forms), and the hypotaurodonts (for the least severe).[44] Whereas the 1917 molars were hypertaurodontic to the highest degree, similar in fact to the Krapina molars, a lesser degree of taurodontism was occasionally being encountered in modern humans.

Through funds contributed by the British Association, further excavation works were carried out by Despott during 1918 to 1920. He dug trenches "between and beyond the two trenches of 1916," that is between the 50 foot and 140 foot marks from the cave entrance. "No further remains of Palaeolithic man were discovered, nor any traces of his culture."[45]

Stratigraphically, human remains at Ghar Dalam lie contemporaneously with Pleistocene red deer and other extinct fauna in the deer layer; at some sites like Despott's middle trench, unrolled hippo and elephant remains were discovered in the deer layer, together with human teeth and hand bones, and also implements made by humans. In Despott's outer trench, human teeth and implements lay together with anatomically disposed hippo remains in the Cervus Layer. Caton Thompson has tabulated the presence of the unrolled and anatomically disposed fossil pachyderms together with human remains in the red earth.[46]

A number of tools, weapons and decorations were elevated from Ghar Dalam.[47] The list of implements outlined by Evans comprise five small flakes of obsidian; worked flint and chert, including a fine blade-core of honey-coloured flint (5.8m long and 3.8m wide) and 2 small flint blades with trapezoidal section, one with a serrated edge produced by a retouch on one side.[48] There were also two other short trapezoidal-sectioned blades of poor flint or chert, and a number of flakes of flint and chert, a few retouched. Two of the latter are isosceles with a retouch on the long side. Besides a collection of microliths which had been unearthed at Ghar Dalam are still available with the Curator there; the list for these tools has not been published.

Another significant find at Ghar Dalam was effected by Despott just six inches below the level of his taurodontic molar.[49] This comprised the skull of an elephant with its cervical vertebrae in situ,[50] thus signifying that the animal had been deposited there as a carcass or part thereof, and had not undergone the rolling process which the bones of the hippo layer had been subjected to. Keith therefore concluded that elephant was still present during the formation of the cave layer which contained the taurodontic teeth, and this was during the terminal phases of the Ice Age.

In a nutshell Keith reinforced his hypothesis through the following criteria:[51]

1. The degree of fossilization in the taurodontic molars, together with their large size, the characteristics of their crowns and roots were sufficient indicators of their Neanderthal origins.

2. The analogy of the loamy soil in which they were deposited was perfectly related to the corresponding layer in the Palaeolithic Grimaldi cave.

3. The absence of the taurodontic character in the large collection of Neolithic teeth from Burmeghez was direct collateral evidence against the teeth belonging to Neolithic humans.

4. The associated remains of a relatively undisturbed elephant in the same layer as the taurodontic molars provided further supportive evidence for the antiquity of the 1917 molars.

Another British investigator entered the scene in the early twenties. Gertrude Caton Thompson (1923-25) looked for further evidence to substantiate the Pleistocene presence in Malta shortly after the discovery of 1917 molars had suggested the presence of Neanderthal humans. She was not successful during the time available to her. She did however remark on the impossibility of the contemporaneous presence of humans and pachyderm in Malta during the *Neolithic.*[52] And although she proposed a form of working hypothesis to account for this discrepancy[53], her judgement on the taurodontic molars was nevertheless that they represented evidence for Palaeolithic humans, since they had been discovered in "circumstances incapable of satisfactory interpretation."[54] This phrase is crucial when considered in its context, for it clearly demonstrates its misinterpretation in later years.[55]

> "This discovery of possible Palaeolithic man appeared to me of considerable importance to prehistory, in view of the fact that no human

> remains attributable to Quaternary times have hitherto been recorded in the Mediterranean islands. ... ***Apart from the discovery in the red earth of the two taurodont teeth, in circumstances incapable of satisfactory interpretation, there are but two other records in the island of possible relics of Palaeolithic man."***

She goes on to mention the two stone implements, discovered in 1836 and in the 1860's, and which have unfortunately been lost, the first discarded by the finder, Leith Adams, and the other went missing.[56]

She remarked on the absence of flint implements and of the Mousterian industry[57] in association with the 1917 finds, and it was her desire to throw light on the period of submergence of the land-bridge between Tunis and Sicily, this in connection with the possible presence of fossil humans contemporaneously with hippo and elephant.

Caton Thompson's own method of excavation was difficult; she admits that she had no time to sieve the material as it was being removed, and that the possibility of missing minute fragments was countered by breaking up the lumps manually on a table before disposal.[58] Furthermore her own record for the provenance of the tooth she herself discovered in 1923 at Ghar Dalam is simply "from an unstratified layer."[59] It is unfortunate that its precise relation to the other remains is not registered, as it lay in the company of hippo, horse, deer, thirty potsherds and the end of a flint blade. The layer was only 2 feet deep, and the object of the exercise had been purely to investigate the possibility of the presence of Palaeolithic humans in Malta. This incisor is now preserved in the Natural History Museum as Ma. 1.

Excavations continued until the late 1930's; in 1936 the curator at the time, Dr. J. Baldacchino discovered a third taurodontic molar in the same layer as the previous ones, in layer two of his trench, thus increasing the number and proportion of the taurodontic molars to three out of the five molars described in Layers 2 and 3.[60] Baldacchino had thus described his 1936 find:

> "The human remains were represented by a third left lower molar tooth, exhibiting a degree of taurodontism quite unusual in modern molars. The state of fossilization of this specimen corresponds to that seen in Neolithic burials in Malta. In 1921, Sir Arthur Keith examined in detail about 2,250 very perfect human teeth gathered by Mr. G. Sinclair from the Neolithic

> deposit in Burmeghez cave. This interesting study was made with a view to determine if the Maltese of the Neolithic period might have developed, as a local characteristic, a taurodontic condition of teeth. No trace of taurodontism was found in these specimens; the only form of degeneration which was present was that with which we are familiar in modern teeth - fusion and maldevelopment of the roots, particularly in those of the 3rd or 'wisdom' molars."[61]

It is evident from the quoted paragraph that Baldacchino was familiar with the taurodontic condition and, unlike Evans who misquoted him in later years, could distinguish it from fused roots. Baldacchino's other significant find were two intact elephant tusks in the Cervus layer, a circumstance which Trechmann considered very significant.[62] The former immediately reorientated his excavations to the proximity of Despott's Trench II, where the first two taurodonts had been picked up, but for reasons unknown, all excavations were then suspended, and the 1936 molar has been kept in low profile since.

C.T. Trechmann reviewed the archaeological situation at Ghar Dalam, and in 1938 published his findings. He attempted to demonstrate the Malta-Africa connection through the measurements of the intervening sea bed. "Between Malta and Africa an upheaval of 200 fathoms would render the connection with Tripoli dry except for one or two narrow channels." Trechmann concludes his section on the land-bridge by declaring that "It seems probable that Malta has been joined to Africa as well as to Sicily, but that the junction with Africa was separated earlier than that in Europe." He disagreed with Soos (1933) on the evidence provided by the local malacofauna, "This may be reasonable enough for the living land shell fauna, which is an impoverished one, but the newly found fossil fauna leads to somewhat different conclusions and shows species recalling African as well as Sicilian forms." [63] Trechmann was in later years misquoted by Evans on this matter.[64]

Trechmann also commented upon "the late palaeolithic reminiscent character of most of the implements." [65]Further on he remarks on the earliest bone deposits at Ghar Dalam as "Chellean or Kamasian pluvial of East Africa."[66]

Dr. Zammit Maempel has recently (1996) effected a significant contribution towards the local Pleistocene fauna through his laborious and tedious excavation at Ghar Dalam of extremely fragile remains of hippo jaw and pelvis. The significance of these finds lies in the mainland proportions of the hippopotamus and the extreme rarity of these body parts among the present repertoire of Pleistocene finds in Malta.[67]

Formation of the Ghar Dalam horizons:

The stratification of the various geological layers of the Maltese islands is well known from secondary school age or just before. The Upper Coralline limestone is on top; underneath this hard layer is a stratum of green sand sitting on a layer of impermeable clay; the globigerina comes next, and finally the lower coralline limestone at the very bottom. The Ghar Dalam cave is in limestone, and its lowermost layer of lower coralline is topped by clay which accumulated from detrital matter after the formation of the cave. This layer of clay extends over the entire 350 feet of it, so that running water moves over it and across the other layers of the cave deposits overlying it. Apart from two sites there are no animal fossil remains in this layer; it is practically sterile.[68]

First above the clay layer is the interesting Hippo layer, so called by Zammit Maempel because of the prevailing concentration of rolled bones of hippopotamus. But elephant remains are present as well, and the uniformly characteristic feature of this Hippo layer is that the remains of both hippopotamus and elephant have been rounded off by continuous rolling. The edges and fine features of the remains have been lost, presumably through a long drawn out process of being rolled about along the river bed, before they ended up overlying the clay layer at Ghar Dalam. Over the course of time it would appear that this mass of rolled hippo and elephant remains eventually dried and hardened up into a solid mass, the remains themselves comprising about 75% of the layer mass. This Hippo layer is also known as the bone breccia.[69]

The deposition of the Hippo layer seems to have occurred approximately between 130,000 and 110,000 years ago. Dating of the Ghar Dalam hippo was assessed by Electron Spin Resonance and Uranius Series Disequilibria carried out in 1988 by Bouchez *et al*.[70] Trump pushes this back to "the Great Interglacial" dated to a quarter of a million years ago, but his reference is unclear. Zammit Maempel is right on the mark; his figure was 125,000 B.P.[71]

To recapitulate so far, starting from the bottom of the cave, there is a lowermost Clay layer and an overlying Hippo layer covered with a Pebble layer.

Next layer up has been labelled the Deer or Cervus layer, since the predominant animal remains consist of antler or long bone of red deer. But there are remains of other fauna represented in this layer, notably brown bear, red fox and wolf. The layer consists of red loamy earth containing parts of clay. The date of formation of this layer has been assessed by George Zammit Maempel as lying around 18,000 BP.[72] The interesting feature of this layer is that human remains have also been discovered, together with remains of both hippo and elephant, the majority of which were of mainland proportions, and were lying in their anatomical position.[73] This is in contrast to the rolled condition and non-anatomical disposition of the bones and teeth of both hippo and elephant in the Hippo layer, which predominated in dwarf specimens.[74] These pachyderms in the Deer layer had died there in the cave or just before, and were not carried there by water action as bony and dental remains.

Above the Deer layer lies an inch thick stratum of pebbles, the so-called Calcareous layer. The main significance of this layer is the inference that a substantial amount of time must have elapsed before the subsequent deposition of the overlying Cultural layer.[75]

The Cultural layer lies at the very top; here Neolithic men first started to leave marks and remains of their culture. The pottery ware starts here, and the earliest is the Ghar Dalam phase dated to approximately 5,200 B.C. J.G. Baldacchino has further subdivided this Cultural layer into an upper and lower on the basis of the pottery. Prehistoric crude ware lies in the lower horizon, whilst more refined fragments are encountered in the upper one.

By way of a general recapitulation therefore, there are, again starting from the bottom, the following strata:

1. Clay layer, impermeable to water, and containing no organic remains.
2. Hippo layer, containing the rolled remains of hippo and elephant in an indurated hard mass sometimes known as the bone breccia.

3. A separating Pebble layer, also containing small boulders up to 35 cm in diameter; no organic remains are found here.
4. A Deer layer, approximately 170 cm thick, comprising mainly extinct forms of stunted red deer, but also containing small versions of brown bear, red fox and wolf. The taurodont molars were elevated from this stratigraphic layer.[76]
5. A Calcareous sheet, about an inch thick, which caps the Pleistocene layers beneath it, thus separating the Ice Age from the so called Holocene period, that is the era spanning Neolithic times to the present time.[77]
6. The superficial or surface Cultural layer, also called the domestic animals layer.[78]

Ghar Dalam was tunnelled during the early Pleistocene, and the lowermost four layers were all water-borne deposits occurring during the late Pleistocene phase. In an analogous manner to the caves on the Hyblean plateau in Sicily, the earlier deeper horizons containing pachyderms were a lacustrine or limnic deposit, whereas the later Deer horizon was an alluvial one. During this same period there were temporary land bridges formed between the Maltese Islands and the other Mediterranean countries.[79]

The Cervus layer holds the cold-intolerant animals such as red deer, brown bear, wolf and red fox. This deer horizon underlies the Cultural layer, but it is separated from it by the thin yet significant Calcareous layer, for this latter seals the Pleistocene deposits beneath it. Besides red deer, wolf, red fox, and brown bear, the Cervus layer also holds hippopotamus and elephant in their anatomical position, and these too are cold-intolerant. The cold-intolerant fauna in the Cervus layer therefore represent the last Glacial phase of the Pleistocene period. The fact that there are no cold-tolerant fauna in any of the Ghar Dalam horizons is a crucial point, for it demonstrates the climate prevailing in the Maltese Islands during the Late Pleistocene.

The upper Cultural layer of Ghar Dalam represents the last 12,000 years which followed upon the termination of the last Ice Age, The Würm Glacial. The Cervus layer contains the remains of the cold-intolerant fauna such as red deer, wolf, red fox, and brown bear. The most predominant is red deer, whose various morphological forms reflect a long sojourn on the islands, during which time it underwent several evolutionary modifications.[80]

The Cervus layer also contains remains of anatomically disposed elephant and hippopotamus, the cold-intolerant fauna or pachyderms which would not have survived the Ice Age conditions and died *in situ*; this is in contrast to the presence of elephant and hippo in the underlying hippo layer, where they are mainly rolled, after their remains were carried over long distances along with the river current, until they were deposited in the cave earth. As far as the elephant in the Deer layer is concerned, Neanderthal teeth have also been discovered in association with Elephas (Palaeoloxodon) antiquus at Taubach (East Germany).[81] The Palaeoloxodon is one of the fossil Maltese elephants.[82]

The Hippo layer contains the cold-intolerant fauna, elephant and hippo.[83] This layer therefore represents the Riss-Würm Interglacial, and its dating, which lies between 130,000 and 75,000 B.P., is in conformity with the absolute dating test carried out on hippopotamus in the hippo layer.[84] Yet again the model can be reconciled perfectly with scientific testing.

The question is to identify the human remains in the Deer layer, as either being an intrusive later burial by Neolithic humans, or else an actual deposit of the remains of Palaeolithic humans together with the remains of the deer layer fauna during the late Pleistocene. There is first of all the irrefutable fact that the human remains do not lie in their natural position, not partially and much less so completely, which would be the case in an ordinary human burial. Their distribution is more in keeping with their being deposited there from elsewhere by water action, in much the same way as the other fauna of the Cervus layer were.

Dating Ghar Dalam:

The superficial sedimentary layers in the Southeast of Malta are missing. At some point in time the upper coralline, greensand and clay layers have been eroded or swept away, possibly by the torrential rains rushing towards Marsaxlokk from the Dingli-Mdina-Rabat highlands during the last Ice Age. These torrents also carved out the valleys such as the Wied Dalam in Malta, and the impressive Ghasri valleys in Gozo. They also dissolved underground passages and tunnels as their waters penetrated fissures and cracks in the rock and pursued their subterranean course between the sedimentary layers of rock formations. The Ghar Dalam cave was thus formed approximately in the middle phases of the Last Ice Age, and a layer of impermeable clay covered its floor; this derived from the detritic material that accompanied the water into the subterranean tunnel or cavern.[85]

Eventually the hollowing out of the valley penetrated the roof of the Dalam subterranean tunnel, and gradually sliced it into two large caverns opening on either side onto the Dalam valley. On penetration the gap acted as a suction hole which received a mass of material that lay along the bed of the Dalam river. This included pebbles and the organic remains of the endemic fauna, predominantly hippopotamus and elephant, but also of the giant swan and the micro-mammalian dormouse. To this cocktail was added the stalagmitic material which trickled continuously from the cave roof, infiltrating the mass and hardening it. Before doing so however, the sea deposited its pebbles and caused further rolling and rounding of the remains. On hardening of the hippo layer with the decrease in sea level, the boulders which fell from the cave roof were no longer rolled about and formed the pebble or boulder layer overlying the hippo one.

Towards the end of the Ice Age, the Dalam valley had been eroded beyond the floor of the Dalam caverns to a further depth of 4 metres.[86] Thus this total height of erosion, from the roof of Ghar Dalam to the river valley bed, lasted from at least 130,000 to 12,000 B.P. On and off, a period of 120,000 years was required to carve out this valley height of 11.5 metres, and 4 metres lay below the floor of the cave. Assuming a general uniformity in the process of carving out this valley, and even ignoring the 2 metres of impermeable sediment which had already been formed by the time the Deer layer was being deposited, then approximately 40,000 years were required to carve out the valley below the floor of Ghar Dalam. This dates the Deer layer to around 50,000 years B.P., which is in perfect conformity with the chronology of the horizon underlying the Deer layer. This boulder layer is dated to the Monastirian transgression of 15 to 18 metres, equated with the last interglacial period, and dated to lie between 50,000 to 70,000 years B.P. Furthermore, synchronous analogies with the Grimaldi caves near Mentone in the Northern Mediterranean seal this confirmation, for the context corresponding to Ghar Dalam's Deer layer is the Mousterian-Aurignacian horizon in Grimaldi.[87]

The following transgression, the Late Monastirian, did not reach the mouth of Ghar Dalam,[88] so that there was no beach deposit in the Deer layer, and the deer remains were not intermixed with pebbles in the way the hippopotamus and elephant remains were in the bone breccia; the few pebbles that were present lay at the very bottom overlying the Pebble or boulder layer. Neither was there any severe rolling and rounding off of the deer bones, such as occurred with the pachyderm remains, which finally assumed the appearance of pebbles themselves. The organic remains in the Cervus layer were better preserved; furthermore, the pachyderm remains in this horizon of red deer were not only well preserved but they partially maintained their anatomical position, an indication that death of these pachyderms had not preceded their deposition by any significant lapse of time. Their mainland proportions suggest the presence of carnivores. Brown bear has been discovered by Cooke in Ghar Dalam,[89] by Zammit at Ta' Bidni in Zabbar,[90] and by Zammit Maempel at Mriehel.[91] Carnivores are rare in Mediterranean Islands, and amongst the other carnivores humans are the important issue.[92]

Drying of the Cervus or Deer layer was faster, and the carbonate-containing drippings of water did not infiltrate it and harden it into a breccia. There formed instead two sheets of stalagmite during the deposition of the Cervus layer, and these are registered in the inner stalagmite of Ghar Dalam. Despott measured these sheets, and he recorded them as lying respectively one foot and 2 feet below the upper surface of the deer layer. They extended radially outward for a maximum distance of four feet; their thickness was half an inch at their widest.[93] The significance of these features lies in their obvious indication that the deposition of the deer remains which predominate in this layer occurred in at least three phases. In fact Despott recorded a high ratio of charcoal-black stag bones in the lowermost third, and these had been subjected to a great deal of rolling. The middle third of the Cervus layer predominated in stag antlers, whereas the upper third mainly comprised stag bones of a dark colour. [94] Topping the Cervus layer lies a very thin stratum of fine calcareous matter, aptly termed the Calcareous sheet, and it serves basically to set the archaeological seal as it were, on to the Pleistocene layers underlying it.[95] The natural deposits beneath it were effected during the Pleistocene, previous to 12,000 B.P. Immediately above this Calcareous sheet lies another form of deposit, which is not alluvial, (i.e. water-borne), but sedimentary. It has been formed through the activities of post-glacial Maltese folk.[96]

Water-borne deposits include the river borne, (the alluvial), and the lake produced, (the limnic or lacustrine). In the latter deposits, stalagmitic drippings trickled into the pool collections inside Ghar Dalam. These pools impregnated with calcium carbonate-containing drippings were constantly being replenished and tossed about through wave action, when the sea level was at par with the entrance of Ghar Dalam cave, that is, during the Monastirian transgression, dated at between 70,000 to 50,000 BP. This date marks the formation of the Pebble or boulder layer, and it is chronologically reconcilable with the earlier Electron Spin Resonance and Uranium Series Disequilibria dating for hippopotamus at between 130,000 and 110,000 BP.[97]

The entrance to Ghar Dalam cave lies today at 50 feet, or 15 metres, above sea level.[98] The last of the transgressions to affect Ghar Dalam was thus the Monastirian. This caused the contents of the cave at that time to be rolled about continuously until they were rounded up to closely resemble the pebbles which were heavily interspersed. Once the sea level dropped again, and the rains continued or resumed the process of stalagmitic formation, this infiltrated the semi-liquid mass and caused its eventual hardening into the bone breccia. Towards the time that the cave floor was level with that of the sea, the pebbles and boulders dislodged from the cave roofs and sides, through continued rain action, were rounded off by wave action, and these formed the Pebble or boulder layer overlying the bone breccia. The further drop in sea level after the Monastirian phase left a hardened impermeable bone breccia overlying the basal clay and underlying the boulder layer. The date for the overlying Pebble / boulder layer is thus 70,000 - 50,000 B.P.

Hippo and elephant have been found at altitudes of up to 300 feet, caught up in several caves and fissures of the Maltese Islands.[99] A slopewash accounting for the deposit of pachyderm remains in Ghar Dalam cannot be ruled out. The Hippo layer is definitely a beach deposit in its final stages, and this is borne out by the presence of rounded pebbles in the Hippo layer itself, the heavily rolled nature of the pachyderm remains themselves in the same horizon, and the overlying Pebble / boulder layer with rolled stones. The timing is the Monastirian, dated to the last interglacial period.

There were no succeeding transgressions which reached the entrance of Ghar Dalam, and therefore no more lacustrine deposits after the Hippo layer. The Deer layer is a slopewash deposit, containing red earth. In the absence of sea wave action the Deer layer dried up, rather than become hardened into a breccia like the Hippo layer. Stalagmitic material still made its appearance, and this formed sheets of stalagmite at two levels of the Deer layer, thus signifying at least three phases of deposition of the deer remains. The absence of a beach deposit phase in this horizon is brought out by the absence of any significant pebbles except at the very bottom, overlying the boulder layer. Several of the remains were well preserved, but those which had been transported over great distances in the river bed manifested degrees of rolling and rounding. Pachyderms were also represented in this layer, and these were characterized by the maintenance of a good degree of preservation and anatomical position, which features contrast markedly with the rolled remains of the same mammals in the Hippo layer beneath. A reworking of the hippo layer is thus definitely excluded to account for these pachyderms up into the Deer layer. These rather represent survivors who were caught up alive, and which were fresh carcasses in the river current. Consequently they were dragged to the Cervus layer *in toto* or nearly so. The size of these pachyderms in the deer layer is also significantly different from those in the bone breccia. The former manifested mainland proportions rather than their dwarfed counterparts which predomonated in the Hippo layer, and this feature signifies the presence of predators, carnivores like the brown bear excavated in Ghar Dalam itself and in nearby Zabbar area.[100] Man was another possible predator to account for a return of the pachyderms to mainland proportions. There was also the smaller group of carnivores exemplified by red fox and wolf.

Dating of the Ghar Dalam horizons is further confirmed through the presence of the micro-mammals contained therein. The Hippo layer is dated to the early Pleistocene through the dormouse *Leithia cartei*, and the various species of the bats *Myotis*, which required “large freshwater areas, forests with high trees and green areas.”[101] Through the vole *Pitymys melitensis*, the Cervus layer is dated to the Late Pleistocene, whilst the two phases of the Cultural layer are respectively dated by the field mouse *Apodermus sylvatica* and the rat *Rattus rattus*.[102]

The Taurodonts of Ghar Dalam - the controversy

Until a few decades ago the only indication towards a Maltese human presence during the Pleistocene was represented by the three taurodont molars which had been discovered in 1917 in the upper Pleistocene deposits of Ghar Dalam in the South East of Malta.

Keith's immediate reaction at the time might have been a trifle premature. He had a letter published in Nature[103] wherein he "announced the discovery of Neanderthal humans in Malta." He admitted that taurodontism of a milder form occurred in modern humans, usually in the third lower molars, but never to the degree present in Neanderthal humans.[104] Keith had also studied several hundreds of Neolithic teeth for the condition; he encountered fused roots but no taurodontism. In this he was confirmed by Dudley Buxton on a smaller sample of "Neolithic" teeth from Tarxien. Keith felt that his odontological experience was sufficient to make him an expert at detecting the condition, and in attributing it, *in its severe form*, exclusively to Neanderthal humans. Keith had even made mention of Dr H.P. Pickerill's report of a similar condition, *radicular dentomata*, in modern humans.[105]

Keith had also carefully analysed the human remains at Heildelberg, Spy, Gibraltar, Jersey and at Krapina. The most advanced form of taurodontism had been observed at Krapina in particular. The 1917 Malta molars were "exact replicas in every respect" to the Krapina molars. Although a high grade of taurodontism was not present in every Neanderthal individual, Keith pointed out that the most advanced form of it occurred exclusively in Neanderthal humans.[106] The Neanderthal form therefore included the following specifications, which no modern taurodontic molar possesses, namely its very large size and weight, a labio-lingual diameter at the waist exceeding that of the crown, and a large pulp cavity as seen by radiography.

Arthur Keith had thus eventually coined the term *Taurodontism* as a diagnostic condition representing the large bull teeth characteristic of Neanderthal humans,[107] and this association formed the basis of the hypothesis for the latter’s presence in Malta during the Pleistocene.[108] The Director of Museums at the time, the renowned Maltese archaeologist

Themistocles Zammit lent his influential support to both Despott and Keith,[109] and a slot was thereby secured for Neanderthal humans in the Maltese history books, albeit for a few decades.[110] Even the local Roman Catholic Church accepted a Maltese Neanderthal human from Africa *en route* to Europe.[111]

No definition of the taurodontic condition presented so far in local publications has been both accurate and complete. When Keith originally coined the term to refer typically to the condition prevailing in the Krapina molars, this signified the "tendency for the body of the teeth to enlarge at the expense of the roots." Keith's point of reference lay in the repertoire of Neanderthal remains where the teeth, apart from manifesting this feature, also lacked the constriction at the cemento-enamel junction which is present in normal molars. Furthermore the body of the taurodont tooth was described by Keith as lying below the border of the alveolus, a situation similar to cud-chewing ungulates. This was in contrast to the normal cynodont, or dog-like teeth whose body lay above the border of the alveolus.[112] Different authors gave their own interpretation to the taurodont molars.[113]

A few Maltese historians refuted Keith's hypothesis,[114] whilst others accepted it withut question.[115] In the early fifties the person in charge of archaeological surveys in Malta, J.D. Evans defined the Maltese *Neolithic* calendar as the start of Malta's history, at the same time that he discarded the taurodont molars as unreliable evidence on the basis of their isolation.[116] Three years later, in 1962 a Maltese dental surgeon, J.J. Mangion reported upon the incidence of taurodontism in modern Maltese, and thus seemed to discredit the validity of the Ghar Dalam molars as diagnostic, still less pathognomonic evidence for Neanderthal humans.[117] The *coup de grace* was delivered in 1964, when the *Scientific report* on the chemical tests for relative dating purposes was evidently and selectively corrupted, so that a Neolithic date was falsely assigned to the taurodonts[118]. Within a decade Neanderthal man was out of the Malta history books,[119] and the taurodonts were totally discredited as evidence for a Palaeolithic presence in the Maltese islands.[120]

Evans 1953, 1959, 1968, 1971

Evans' argument for discarding the Ghar Dalam molars was not a valid one, for isolated teeth and pairs have been the exclusive representatives of hominids at other archaeological sites as well; thus the oldest human in England is represented by a pair discovered at Boxgrove,[121] and a similar pair at Taubach make up the equivalent for East Germany.[122] One solitary tooth at Melpignano is the sole surviving remnant of a Neanderthal at the site.[123]

Furthermore Evans based his contentions on false definitions, for he was equating taurodontism with fused roots, which is basically erroneous.[124] For, while the condition of fused roots was quite commonly found in Neolithic[125] and in modern man, taurodontism was not. Hence the reason for Evans' assertion further down on the same page, that taurodontism was described by Baldacchino as being common in Neolithic teeth.

> "Dr. Baldacchino has since pointed out that taurodontism occurs in teeth definitely assignable to the Neolithic period of Malta (for instance, some from the hypogeum)."[126]

Evans further ignores the fact that the hippopotamus and elephant were discovered in two layers; the lower ones in the breccia were rolled, as Evans mentions, but the samples in the upper layers, close to human remains[127] were still lying in their anatomical position, and cannot therefore be definitely excluded from having been possibly trapped and captured by pre-Neolithic man inside the cave, much in the same way that the Ambrona kill took place.[128]

Regarding the other human teeth discovered in the lower layers of Ghar Dalam, Evans mentions them as being of the modern type without pointing out that taurodontic individuals do not have an entire dentition composed purely of taurodontic teeth. The average is 1.5 per individual, so that leaves a theoretical 30.5 normal looking teeth per Neanderthal dentition. The three taurodontic teeth among the thirty odd human teeth discovered *altogether* in Ghar Dalam cave, would as a sample represent a taurodont individual with twice the normal quota which renders him a taurodont.

Evans also misinterpreted Caton Thompson[129] when he extracted one phrase of hers out of its context and quoted it in another;[130] he thus created the impression that the *validity* of the molars was being questioned by her as archaeological evidence, whereas the contrary is correct. This misinterpretation was quoted by later authors who have accepted Evans on the weight of his authority.

Yet again Evans misquoted Trechmann[131] when dealing with the issue of the Siculo-Tunisian landbridge.[132] Here Evans gives the impression that Trechmann was in agreement with Vaufrey and Soos's views over the Malta-Africa landbridge connection, ("this is Trechmann's view"), whilst this was far from the truth.[133]

Other targets included Borg's African flora in Malta and Ugolini's *Malta: origine della Cultura Mediterranea* (1934). Besides, Evans tended to ignore other British investigators like Falconer and Leith Adams, and instead quoted from Vaufrey and Soos, both of whom have been discredited.[134]

Evans' inaccuracies were perpetuated through repetition by later authors including anatomists,[135] archaeologists,[136] medical historians,[137] and other historians,[138] until the errors crystallised into accepted facts. Other authorities gave a different rendering to the condition. Zammit Maempel equated taurodontism with square-shaped roots,[139] and Trump with "a large single hollow root."[140] This tendency to misinterpret the term was not a purely local phenomenon among scholars in Malta; publications by the British Museum committed the same errors.[141]

Fused Roots:

The external appearance of a taurodont tooth is not dissimilar to one with fused roots; yet although the latter condition is relatively common in Neolithic and modern man, the former condition is not. The first person to commit this error in identification was Despott himself, referring to his discovery as a molar "with fused fangs."[142] He did have the insight and common sense however to associate the condition with that described by Keith, and accordingly a photograph of the molars was sent over to the latter at the Royal Anthropological Institute. Keith's identification was a spot diagnosis of Neanderthal man, and he came over to Malta expressly to confirm that this human species had now extended from Gibraltar to Malta.[143]

Neanderthal's place in evolution - contemporary concepts:

At the turn of this century a number of important fossil finds had been effected at Krapina in Croatia; these included 220 teeth of Neanderthaloids, and ten Neanderthal skeletons with intact jaws.[144] Professor Schwalbe of Strasbourg had emarginated Neanderthal Man from the main line to *Homo Sapiens sapiens*, and had allocated him to a collateral species which became extinct in the early Pleistocene period.[145]

The high incidence of taurodontism in the Krapina molars[146] was in line with Schwalbe's hypothesis. The term as coined by Arthur Keith represented the bull-type of teeth typically found in herbivores, in contrast to the cynodont teeth of carnivores. He too had studied the Krapina molars, and committed himself to associate the condition with Neanderthal humans:

> "at least ten individuals of all ages and both sexes. One hundred upper and one hundred and twenty lower human teeth were collected, all of them showing, to a varying degree, the characteristic form we now associate with the Neanderthal race."[147]

Keith associated with Schwalbe and Adloff to contend that Neanderthal humans did not evolve into modern humans, but that although themselves hominids, Neanderthal humans had become extinct towards the last Ice Age, and were substituted by Palaeolithic humans in the so-called Mousterian period.[148]

Adloff had previously postulated in 1907, on the basis of the Krapina finds, that taurodontism was one of the regressive characters which diverted Neanderthal humans from the main stream to modern humans.[149]

On the other hand, the person who had effected most of the finds, Professor Gorjanovic-Kramberger (1906) contended that the Krapina people were the direct ancestors of modern humans; that they had developed taurodontism because of altered chewing habits. The discovery of fire eased chewing and digestion, so that the molars assumed a more pronounced role, including also the chewing of animals skins for the manufacture of their primitive clothing.

When the Heidelberg mandible was described in 1921, Gregory postulated, on the basis of the moderate degree of taurodontism present in the jaw, that it was likely that the ancestors of H. sapiens sapiens were taurodontic, but that they gradually lost this tendency over the evolutionary phases towards modern humans.[150] Starting off as hypertaurodontic, they merged into a mesotaurodontic phase, and subsequently into a hypotaurodontic status. Tooth size has also diminished over the evolutionary phases, *pari passu* with modified dietary habits.[151]

The Malta taurodonts - morphological considerations

When the first pair of Ghar Dalam taurodont molars was unearthed in 1917, it was their *morphology* which had provided the vital link with Neanderthal humans. Similar molars had been discovered only in Neanderthal sites, and the Ghar Dalam pair had even equalled the dimensions of the largest taurodonts ever discovered, namely those at Krapina in Croatia. The molars were also here associated with red deer.

It had largely been Arthur Keith who had also been the main protagonist for the presence of Neanderthal humans in Malta, and this purely on the basis of the shape, coloration and size of the Ghar Dalam molars.[152] Whilst Themistocles Zammit lent his influential support to Keith's hypothesis, the anthropologist Dudley Buxton assumed a guarded stance. The reason for this attitude lay in the absence of radiographs or a sliced section of the molars, and a comparison with sites elsewhere,[153] an objection which Keith subsequently cleared.[154] With the assistance of his cousin George Sinclair (1921), Keith was also able to scrutinise over two thousand Maltese Neolithic teeth found at a site known as Burmeghez.[155] Whilst fused roots prevailed in this repertoire, taurodontism was strikingly absent.[156] Dudley Buxton had reached the same conclusions with smaller numbers of similar specimens amounting to a couple of hundreds.[157] Keith was also able to draw significant parallels for the taurodont molar horizon through stratigraphic analogies with Mousterian and Aurignacian cultures in Mediterranean sites elsewhere, such as the Palaeolithic sites at Grimaldi and Monastir.[158]

Taurodontism in modern humans

The condition of hypertaurodontism is rare in modern humans. When in 1909 it was first described in New Zealand by Dr. Pickerill in a modern human jaw, it was originally referred to as "radicular dentomata."[159] The report also seemed to remove the exclusivity of the condition to Neanderthal humans. Keith however dealt with this issue in the early decades of this century by demonstrating, together with Shaw, that there were at least three different severities of taurodontism. These were classified as hypertaurodonts [for the severest forms], mesotaurodonts [the intermediate forms], and the hypotaurodonts [for the least severe].[160]

In the anthropological studies carried out subsequently, such as by Martin (1923), Middleton Shaw (1928), Weidenreich (1937), Pedersen (1949), Tratman (1950) and Moorrees (1957), the degree of taurodontism never reached the severe form exhibited in the prototype of Neanderthal humans. Moreover, the studies associated with the severe form of taurodontism were sooner or later associated with Neanderthal humans. They comprised mainly those by Dudley Buxton,[161] who eventually confirmed his specimen from Gibraltar as actually representing Neanderthal humans, and by Senyurek,[162] who proposed that the Krapina remains represented a later development of Neanderthal humans, long after the latter had forked off the main stream to *Homo sapiens sapiens*. Tratman's study was interesting in that his excavation at Predmost confirmed the contemporaneity and co-existence of Neanderthal humans with *Homo sapiens sapiens*, with whom they could mix and breed.[163]

The concomitant increase in awareness of the condition among the dental profession has led to the term *taurodont* being applied to include all forms, including the mildest degree of the condition. A low threshold for its diagnosis has been maintained throughout the decades, and a false impression of prevalence in modern humans sustained. A similar situation prevailed in the analysis of fossil teeth.[164]

Thus a degree of taurodontism in modern humans was sporadically highlighted in the dental literature, particularly after the 1950's, by workers such as Lunt (1954), Stoy (1960), Fischer (1961), Lysell (1962; 1965), Mangion (1962), Manson-Hing (1963), Robbins and Keene (1964), Hamner *et al*. (1964), Tennant (1966), Gamer and Zusman (1967), Miller (1969), Crawford (1970), Bernick (1970), Stewart *et al.* (1971) and Mena (1971). These studies altogether involved a mere thirty-three individuals with some form of the condition, and they include one study carried out over three generations. A scan of the radiographs of the reported taurodontic molars manifests a rather low threshold for identifying a hypertaurdontic tooth; most of the examples are really mesotaurodontic at most. The molars locally reported in 1962 are such examples; the pulp cavities of Mangion's extracted molars are strikingly smaller, approximately half the size of the Ghar Dalam taurodontic molars, and this is particularly brought out in the mesio-distal radiographs.[165] Besides, rather than invalidate Keith's hypothesis, the presence of taurodontism in modern Maltese has been interpreted by some authorities as evidence for a continuity in the line from Neanderthal to modern humans.[166]

Studies on the incidence of taurodontism in the general population have been carried out in recent years, and the ones worthy of note were conducted in the United States,[167] Japan[168] and Israel.[169] The average incidence of the severe form in these studies amounts to a mere 0.2%. This figure represents a predominance far removed from that in the deer layer of Ghar Dalam, where Keith's statistics were more in the region of 50%, that is two out of the four molars which were picked up there. The establishment of proof through statistical significance is not however feasible with such small numbers.

The significantly higher incidence of the condition has also been studied in certain medical syndromes associated with faults in genetic material, such as an extra X-chromosome in both males and females, and an extra chromosome 21 in Down's syndrome. In the medical conditions associated with the extra X material, it would seem that the gene content of the so-called X chromosome is associated with the taurodontic state in these individuals.[170] There are medical conditions other than the identified chromosomal disorders which are associated with an increased incidence of the condition. It is well to point out that syndromes previously thought not to be chromosome related are now being identified as such through better technology. Recent examples are Williams syndrome and the

Prader Willi syndrome;[171] the latter condition is moreover associated with an increased incidence of taurodontism.[172]

The prevalence of the condition in congenital diseases associated with chromosomal anomalies in modern humans is interesting. This suggests that genetic material may be responsible, partly at least, for taurodontism, and genetic material is altered during evolutionary change. The most common chromosomal disorders associated with the condition involve an extra X-chromosome in the genetic make-up. Genetic material is subjected to some form of mutation over several evolutionary phases, and it may well be the case that the genetic material carried by Neanderthal humans and other fossil hominids contained extra elements which accounted for the prevalence of taurodontism and their different morphological features.[173]

The third taurodont, Ma. 7:

When Baldacchino described his 1936 taurodont molar he distinctly mentioned its clear fossilization,[174] a feature which it now lacks, as can be seen from Plate 1, where it is evidently identical in shade to modern molar teeth, rather than to the 1917 molars, Rizzo’s molar to the left and Despott’s on top of it. There was no way Baldacchino, or anyone else at the time, could differentiate fossilization dating back to the Neolithic from that dating to the Palaeolithic. The comparison of his molar's fossilization with that found in Neolithic burials would therefore serve to stress an amount of fossilization quite more advanced than that found in more recent burials. At the time the standard of comparison for Neolithic burials was the Hypogeum. However, the two teeth from the Hypogeum which were tested at the Natural History Museum in 1963 turned out not to be Neolithic after all. Ma. 6 had a Nitrogen percentage of nil, thus indicating a much greater antiquity than the Neolithic.[175] Furthermore, there is controversy as to whether the burials at the Hypogeum are actually primary Neolithic burials or secondary burials of earlier Maltese. Unbelievably most of the bones belonging to some estimated 7,000 individuals buried at the Hypogeum have been "lost."[176]

The specimen that is presently known locally as Gh.D/3, and as Ma. 7 at the Natural History Museum in London, may not be the original one discovered by Baldacchino. It has never been published in a photographic form, so that a substitution was all the more easily possible. It has constantly been kept in low profile since its discovery, although chemical and radiometric tests were carried out upon it in 1963 and 1968.

Fossil and modern taurodonts:

This taurodont discovery of 1936 was in later years further played down because of the reported rare incidence of this variation in modern humans. A personal survey with the local dental surgeons, from their experience in extractions and from radiological evidence, it seems that the local incidence is less than one per cent, and it is evident from statistical considerations that the occurrence of these taurodontic molar teeth in layers 2 and 3 is significantly higher than its rare incidence in modern humans.

The two teeth presented by Mangion in 1962 have been compared by measuring their diameters, and by comparing their radiographs with that of Rizzo's and other fossil teeth elsewhere. It is readily apparent that all the diameters of both the 1917 molars are larger than both of Mangion's, particularly the crucial bucco-lingual, as can be seen from Table No. 1. A major difference, however, is also evident in the size of the pulp cavity, as can be visualized from radiography; the 1917 molar's pulp width is at least double that of Mangion's molars.

The 1917 taurodontic molars are larger in size than normal molars, including Mangion's taurodont molars. Keith had commented on the larger size of taurodontic molars in fossil hominids. At this early stage the 1917 taurodonts were shown to possess features unique to fossil hominids, practically identical to the Krapina molars of Croatia, the largest ever taurodontic molars discovered so far, and belonging to Neanderthal Humans.

> "Amongst the Neolithic teeth I found a few which were 12 mm or even 12.5 mm in labio-lingual breadth.. in none of these however, did the *labio-lingual diameter of the neck* exceed the same measurement of the crown as in the case in [sic] these Neanderthal teeth." [177]

Four decades before their publication, this feature disqualified Mangion's molars from conforming to Keith's original criteria of taurodontism.

The brilliant anatomist that he was, Keith's remarkable powers of observation had enabled him to pick out the crucial characteristic which distinguished the Neanderthal molar from the modern one, and this on morphological grounds alone. Besides the state of fossilization and sheer size, which might conceivably reflect a subjective bias, the vital statistic concerned the bucco-lingual (or labio-lingual) diameter at the neck of the tooth. The Neanderthal taurodontic molar at this plane exceeded the diameter at the crown.

This feature is absent in modern taurodont molars, including those presented by Mangion. Keith was perfectly justified in identifying a fossil human molar on the basis of its morphology alone. Subsequent radiography, more recent morphometrics (Table 1), an array of chemical tests and finally radiometric investigations have confirmed the antiquity of the 1917 taurodonts. Rather than refer specifically to Neanderthal humans as Keith did at the time, a more general term such as *fossil hominid* would be more appropriate today.

Apart from their external size the inner pulp cavity of the 1917 taurodonts is just short of twice the width of the dentine wall of the tooth, whereas this is far from being the case in Mangion's molars. If the reported cases of the condition in modern humans are perused for actual size of body in proportion to root length, and for their radiographic pulp size, it is readily apparently that in most of these so-called hypertaurodont molars in the dental literature are significantly different from the 1917 molars. The roots are longer in the modern molars, their body shorter and pulp cavities smaller; there is a waist to the molar which is not present in the 1917 molars. Caries is more prevalent in modern molars, whereas it was very rare in Palaeolithic humans, and absent in the 1917 molars.

	DIAMETERS		
Specimen	**Mesiodistal**	**Buccolingual**	**Area**
1. Late Upper Palaeolithic	9.7mm	12.2 mm	118.1 sq. mm
2. Early Upper Palaeolithic	10.2	12.4	126.9
3. European Neanderthals	10.8	12.6	137.0
4. Fontana Nuova M2	11.1	12.1	134.3
5. Keith M2 crown	12.0	12.0*	144*
6. Keith M2 neck	9.1	13.0*	118.3
7. Keith M3 crown	10.7	12.5*	133.75*
8. Keith M3 neck	9.0	13.0*	117.0
9. Mangion A crown	9.5	11.6	110.2
10.Mangion A neck	8.5	11.4	96.9
11.Mangion B crown	10.5	10.8	113.4
12.Mangion B neck	8.9	10.4	92.56

Table No 1. Morphometrics of Palaeolithic teeth (1-4), the 1917 taurodonts (5-8) and Mangion's 1962 molars (9-12). From Keith 1924: 260, Mangion 1962: 309-12 (and measurements from photographs with scale), and Chilardi *et al.* 1996: 561.

Whereas in the mesio-distal diameter of all the taurodonts in Table 1, the measurement at the crown exceeds that at the neck, the crucial measurements in Keith's taurodontism, as applicable to fossil man, lie in the bucco-lingual (or labio-lingual) diameter; here the diameter at the neck exceeds that at the crown. This feature is present in specimens 1 to 8, but in neither of Mangion's taurodontic molars. Furthermore, the grinding surface is largest in Keith's molars (5 and 7), even exceeding that of European Neanderthals (3).

The entire repertoire of modern Maltese taurodonts at the Malta Medical School was also compared with the 1917 molars,[178] and the same dissimilarities with the latter were registered, in their diameters, their morphology and in their sheer weight. The heaviest modern taurodont weighed 2590g, whereas the intact 1917 molar was heavier by a factor of 1.27; it's weight was 3750g.[179]

The low threshold maintained throughout the dental literature in diagnosing taurodontism has caused an inflation of the percentage incidence in modern humans to unrealistic figures; in some instances this has been reported as 6%. To compound the issue further the studies have not been constant in the population examined; at times it was the molars which were studied, at other times it was the individuals, each owning a set of twenty possible candidates for the condition, and the presence of just one taurodontic tooth would render the individual taurodontic.

Prior to the Neolithic phase, humans obtained their food from hunting wild game and gathering the fruits of the earth; his numbers were more limited and he was mainly on the move. Accidents during hunting were more likely, and his remains were more likely to be found scattered outside caves than inside, although customary burial was a feature of Neanderthal humans. The fact that the human remains were not buried deep down in the bottom layers of the Ghar Dalam deposit is no argument against them being of great antiquity; at Monte Circeo a Neanderthal skull was found uncovered on the floor of the cave.[180]

The taurodont issue has clouded the importance and significance of the other human remains, for although the debate has centred on the taurodonts, these were certainly not the only human remains to be discovered in the undisturbed Deer layer of Ghar Dalam. Caton Thompson has conveniently tabulated the finds in Despott's trenches excavated between 1917 and 1922. This table amply demonstrates the close association of human metacarpals and other human teeth in the undisturbed Ice Age deposits of Despott's trenches. It is readily apparent from this table that, apart from the presence of molluscs used as food and of Palaeolithic implements in this Ice Age horizon, the human remains were discovered in an aceramic horizon, in association with remains of red deer and those of anatomically disposed and unrolled elephant and hippopotamus of mainland proportions. This stratigraphic layout on its own is sufficient to date the human remains to the Ice Age. Scientific testing in the form of chemical tests (in 1952 and 1963) and radiometric tests (in 1968) have moreover confirmed this stratigraphy as correct.

The human remains lay in the Pleistocene layers; they are stratigraphically dated to lie between 130,000 and 12,000 years before the present time. Without the confirmation of the scientific tests, they could conceivably have been buried there by Neolithic folk. Their distribution in the earth is reconciled rather more with a deposit than with a ritual burial. The question to be answered was whether the human elements are contemporaneous with the other finds in the same Deer layer; have they been there as long as the deer remains, or have they been placed there through an intrusive burial? Only derivative techniques of relative dating could furnish the answer, and although these had actually been carried out in London over forty years ago, their publication has never been officially released. The conspiracy of silence over the decades represents the triumph of prejudice over logic, and this unwanted child of science was re-buried into obscurity. It has been the exercise of this work to locate, identify and interpret the tests for relative dating in as an impartial a manner as possible.

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[1] Abela 1647: ii, 147-8. The large skulls of pygmy elephant, as is readily observable in the Ghar Dalam Museum, contain a large central depression over the region of the trunk. This was being attributed then, in the seventeenth century, to a large human Cyclops with a large central eye.

[2] Leith Adams 1870: 161-2: translation of Abela 1647: 145.

[3] Tagliaferro 1915:183.

[4] Bradley 1912: 194.

[5] Caton Thompson (1925: 13) tabulated Despott's trenches to show the contemporaneous presence of humans with unrolled pachyderm remains of mainland proportions and disposed in an anatomical relationship to each other.

[6] Zammit Maempel 1989: 41-2, 44-6.

[7] Zammit Maempel 1989: 44.

[8] Storch 1974, as quoted in Thake 1985: 271.

[9] Bouchez *et al*. 1988: 54.

[10] Thake 1985: 271.

[11] Zammit Maempel 1989: 25, plate 4.

[12] Schembri and Baldacchino 1992: 21-2.

[13] The association of burning and cracking the bone open makes the use of the bone specimens as fuel unlikely. Moreover fossil bone burns very much less satisfactorily than fresh bone.

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[14] Cooke 1892: 6; Issel: 1866, passim.

[15] Cooke 1892: 11-12; 7-10.

[16] Cooke 1892: 8-9; 12.

[17] Cooke 1891: 326; Cooke 1892:15.

[18] Tagliaferro, 1911: 148.

[19] Giuseppe Despott was 38 when he came across the taurodont molars. He hailed from a well-off family, and part of his previous training had included the English academies of London and Rome. Since 1913 he had taken up the post of Curator of the University and the Valletta Museum's sections of Natural History. Ironically, during the heat of the debate following his discovery, he was transferred to assume the post of Superintendent of Fisheries with a handsome salary. He still maintained contact with the Museum, but his interests then diverted from archaeology to the biota of Malta. He died in 1936, the year that his successor, Dr. J.G. Baldacchino discovered the third taurodont molar at Ghar Dalam.

[20] Keith 1924: 256.

[21] Man 1916: 17.

[22] Keith 1924: 254 et seq.

[23] Keith 1924: 254; J.R.A.I, 1918: 214.

[24] Chief Engineer of the Public Health Department: (Tagliaferro 1915: 148.)

[25] Keith 1924: 251: The taurodontic second molar (Rizzo) appeared at a depth of 2.5 feet (76 cm) below the surface of the cave floor. The taurodontic third molar (Despott) lay at a depth of 3.5 feet and 7 feet (2 metres) distant from the other one. Despott further discovered a normal human tooth in the Deer layer, together with the remains of deer, hippopotamus and elephant.

[26] Baldacchino's tooth was too far away, so that there were at least two taurodontic individuals and possibly three.

[27] These taurodontic molar teeth were considered to be an atavistic feature and were to be found characteristically in Neanderthal Man.

[28] Trechmann 1938: 12, quoting Rizzo 1932: 20.

[29] Keith 1924: 251.

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[30] Keith 1924: 259-260.

[31] Elephant remains were found in both the Hippo and the Deer layers; they were respectively rolled and unrolled, anatomically disposed. The latter were contemporaneous with deer and man, and they were therefore suitable quarry.

[32] Keith 1918: 404.

[33] These teeth are now preserved at the Natural History Museum in London.

[34] Dudley Buxton 1922: 181-2.

[35] Keith 1924: 255-6

[36] Keith 1924: 257-8; The Mousterian and Aurignacian phases followed each other in the middle of the Ice Age (Oakley 1964: 127).

[37] Keith 1918: 404.

[38] Each individual has twenty premolars and molars which can bear the mark of taurodontism; an average of 1.5 affected molars out of these twenty makes the individual taurodontic.

[39] The C.S.I. in fact confirms an alluvial deposit rather than a pattern of ritual burials.

[40] I am indebted to John Samut Tagliaferro for that observation during his 1996 St Luke's day lecture, entitled "Digging up Bones."

[41] Keith 1924: 255, 256-7.

[42] Subsequent chemical tests confirmed Keith.

[43] Keith 1924: 255.

[44] Shaw 1928: 476-498.

[45] Keith 1924: 255; Despott 1923: 18.

[46] As far as the fossil fauna of Ghar Dalam were concerned, Dorothy Bate also contributed significantly and expounded upon these in print. (Bate 1916: 421-430; 1920: 208). Another Englishman who was conducting related research work at about the same time was Dudley Buxton (1922: 164). He gave an important account of the Neolithic Maltese and their successors. He also studied a number of Neolithic teeth and classified them accordingly. The significant aspect of this study lay in that it excluded the taurodontic form in the Neolithic teeth, but allowed for the presence of

fused roots for which the former condition may be mistaken. Fused roots has been incorrectly considered to be equivalent to taurodontism by such renowned authors as Bonanno, Evans and Morana.

[47] The tools and weapons armamentarium at Ghar Dalam comprised the following objects as listed by Evans (1971: 20).

1. Several globigerina slingstones (12) (GD/S.1) discovered mainly in the pottery layer, Baldacchino's layer 2.
2. Worked animal bones (7) for use as borers. (GD/B.2)
3. Worked mineralized bones (3) (GD/B.9) for possible use as handles.
4. Obsidian flakes (5) (GD/S.7); one short blade with trapezoidal section retouched along one edge.
5. One fine blade-core of flint, 5.8m X 3.8m, (GD/S.2).
6. Small flint blades (2) (GD/S.3) with trapezoidal section, one of which is retouched along one side to a serrated edge. One derives from layer 2 of Despott's trench (J.R.A.I. 1923: pl. iv, fig. 2, no. 3).
7. Chert or poor flint short blades (2) with trapezoidal section (GD/S.5)
8. Several flakes of flint and chert, a few retouched; two retouched are isosceles triangles and are retouched along one or both their long sides.

[48] One from Despott's 1918-20, illustrated in 1923, pl. iv, fig. 2, no. 3.

[49] The molars were discovered respectively at 2.5 and 3.5 feet; this lay at 4 feet.

[50] Keith 1924: 258.

[51] Keith 1924: 259-60.

[52] Caton Thompson 1925: 12.

[53] Caton Thompson 1925: 12.

[54] Caton Thompson 1925: 10.

[55] Evans 1971: 19.

[56] Vide infra.

[57] Despott discovered flint and chert implements, and Evans remarked on the Mousterian appearance of several implements. See below.

[58] Caton Thompson 1925: 1.

[59] Caton Thompson 1923: 12.

[60] Morana 1987: 23.

[61] Records: Museum of Archaeology, 1936-7, Appendix B, 31st May 1937: xx.

[62] Trechmann 1938: 5, 11, 14, 24.

[63] Trechmann 1938: 5.

[64] Evans 1971: 2.

[65] Trechmann 1938: 14.

[66] Trechmann 1938: 24.

[67] These finds are on display in Ghar Dalam Museum.

[68] Zammit Maempel 1989: 37.

[69] Trechmann 1938: 11.

[70] Bouchez *et al.* 1988: 54.

[71] Zammit Maempel 1989: 39.

[72] Zammit Maempel 1989: 42.

[73] Despott 1918, 1923, tabulated in Caton Thompson 1925: 13.

[74] Zammit Maempel 1989: 39.

[75] Zammit Maempel 1989: 44-5.

[76] Zammit Maempel 1989: 42.

[77] Zammit Maempel 1989: 44, 58.

[78] Zammit Maempel 1989: 36.

[79] Zammit Maempel 1989: 58.

[80] Zammit Maempel 1989: 48-51.

[81] Oakley 1964: 130.

[82] Bone Analyses: Malta Samples, Ma. 14.

[83] No woolly mammoths are recorded though these were very commonly present in Europe during the Pleistocene period.

[84] Bouchez *et al*. 1988: 54.

[85] Zammit Maempel 1989: 22, 28.

[86] Zammit Maempel 1989: 13; 9 metres less 5 metres deposit.

[87] Keith 1924: 256, 273-5.

[88] It reached 8 metres above present sea level, which is just short of the cave entrance at Deer layer level by 2 metres.

[89] Cooke 1892: 7, 8.

[90] Tagliaferro 1915: 185; Zammit 1926: 9. The find was effected in 1906.

[91] Bone Analyses, Ma. 20; Zammit Maempel 1982a: 252-4.

[92] Cherry : 1992: 31.

[93] Despott 1916: 296, 298.

[94] Despott 1916: 296, 298.

[95] Zammit Maempel 1989: 44.

[96] Zammit Maempel 1989: 44-6.

[97] Bouchez *et al*. 1988: 54.

[98] Keith 1924: 254.

[99] Leith Adams 1865: 258-9.

[100] Tagliaferro 1915: 185.

[101] Storch 1974: 431-2.

[102] Zammit Maempel 1989: 37.

[103] Keith 1918: 404.

[104] Keith 1924: 253.

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[105] Pickerill 1908-9: 150.

[106] Keith 1924: 253.

[107] Keith 1913: 1; 1924: 252-3; 1925: 348-9.

[108] Keith 1918: 404; 1924: 251; 1925: 349.

[109] Keith 1924; 255; Zammit 1926: 30.

[110] Zammit 1926: 30, Laspina 1943: 12.

[111] Busuttil 1953: 78.

[112] Keith 1913: 103-119.

[113] These interpretations are best appreciated from the quoted comments: Keith 1924: 252-3: Full description with its development. 'The type of tooth to which I have proposed the name taurodont, (1913: 1). "A tendency to taurodontism is present to e very limited degree in teeth found in men of the modern type... a high degree of taurodontism never occurs in modern man." 'I now come to describe the two teeth.' (Keith 1924: 253, 259-60).

Keith 1925: 348-9, & fig. 126: 'These two molars differed from all the other teeth he found in being deeply mineralised and of a peculiar form... both teeth are from the same individual, a young man of about twenty years of age... For forty years I have had opportunities of examining teeth of all races of men; I have never come across these peculiar teeth except in Neanderthal man... fn1 : The only exception that I know of is recorded by Dr. H.P. Pickerill of Otago, New Zealand, who came across an instance in the course of his practice (See Proc. Roy. Soc. Med. (Odont. Section), 1908-9, vol. 2, p. 150) The cusp of the cingulum on the anterior internal cusp of Rizzo's molar is depicted by Keith (1925: 349, fig. 126).

In 1928, Shaw subdivided the condition into three degrees, with the Krapina-type molars classified as hypertaurodont and milder forms termed meso- and hypotaurodont, respectively representing the moderate and mild forms of the condition. A possible variant of taurodontism was proposed by Kallay in 1963 in the wedge-shaped, cuneiform or pyramidal molar with a single root.

Trump, D., (1990: 83): 'Taurodont form, with a single large hollow root.' (This is more in line with Kallay's variant rather than Keith's taurodont).

Morana 1987: 21-22: 'taurodontic malformation, i.e. their roots being fused together instead of separated.'

Zammit Maempel 1989: 42, 43 (Plate 14), 'taurodont molars. These were molars having a square base instead of the usual conical roots.' (1989: 44) 'square based molars.'

Cassar 1964: 3: 'The special feature of these teeth is the marked fusion of their roots known as taurodontism.'

Zammit 1926: 30: 'some teeth of Homo Neanderthalensis (discovered in 1917)'

Pace 1972: 11: 'two very large human molars at Ghar Dalam, both exhibiting the characteristic of taurodontism. Taurodontism, that is when the body of the tooth enlarges at the expense of its roots.' Pace's definition is definitely closer to accuracy.

Despott 1918: 221, 'the molar, which is larger than the average modern molars, and in which the fangs are fused in one.'

Rizzo 1928: 20, 'The molar found by me presented, in my view, special features characteristic of Palaeolithic man.'

Evans 1971: 19: 'two very large molars, both exhibiting the characteristic of taurodontism, or fusion of the roots.'

Evans cannot afford to be so misleading in his interpretation of events and documentary material. Eminent Maltese anatomists such as J. Leslie Pace have quoted him *ad litteram i*n his misinterpretations, particularly that regarding Dr. J.G. Baldacchino's comments on the presence of taurodontism in Neolithic man. (Evans 1971: 19 = Pace 1972: 11-2).

Bonanno 1985: 688-9: defines taurodontism as fused roots.

Mangion 1962: 309, quoted Keith: 'Keith coined the term 'taurodontism' for such molars in which the body of the tooth enlarged at the expense of the roots; a condition which is different from fusion of the roots and from pyramidal roots.'

Witkop 1971: 280: 'Taurodontism ... is seen in higher frequency among modern types who have recently lived in primitive environments ... Eskimos, Aleuts, ancient Egyptians, American Indians, Boskopoid stock of Africa ... Australoid peoples ... Guatemalan Indian tribes of Quiche-Mayan stocks. In contrast to the reported relatively high frequency of the trait among hominid Caucasoid peoples, it is quite rare among modern Caucasoid populations (Hamner 1964: 409-18), although reports suggest that it may occur in higher frequency in modern Caucasoid populations presently located at the sites of Neanderthal occupation. It has been observed in modern Maltese (Mangion 1962: 309-12), Yugoslavs and Bavarians, (Witkop 1971: unpublished data). Reports of taurodontism in modern man from these locations have their counterpart in reports from palaeontologists concerning the occurrence of the trait in Neanderthal man from these same sites. Neanderthal remains with taurodont teeth were found in Dalam cave in

Malta (Keith 1925) and at Krapina, Yugoslavia, (Adloff 1907: 273-82; Gorjanovic-Kramberger 1908: 401-13). There is some support, therefore, for the theory of absorption of Neanderthal man by interbreeding by modern man.'

Shackley 1980: 3: "The molar teeth often have enlarged pulp cavities (taurodontism), an allegedly 'primitive' characteristic," referring an endnote to M.H. Day, *Fossil Man* (1969). Referring to the Krapina molars, to which the Ghar Dalam taurodont molars are identical, Day decribes the teeth as having 'primitive traits such as the extreme taurodontism and wrinkled enamel, but none have cingula.' (p. 70, Third revised edition, 1977). Elsewhere Day demonstrates that taurodontism is not being applied any more exclusively to this extreme form of the condition, but to practically any degree of it, (p. 57, 317). He defines the condition as present when "the pulp cavities are moderately enlarged (p. 57) and when there is any degree of pulp cavity enlargement (p. 317)."

The dental literature defines the condition in less rigid terms. *The Dictionary of Dental Science and Art*, 1947, Dunning and Davenport, defines the condition (p. 560) as "a peculiar condition of the molar teeth found in many, but not in all representatives of the extinct Neanderthal race. The pulp cavity is deepened at the expense of the roots, the former being relatively very deep, the latter correspondingly short. A mild degree of taurodontism is some times found in modern human teeth."

Dorothy Lunt (1954) discusses the characteristics of the condition as they occur in fossil hominid and in modern man, *vis-a-vis* the initial definition of Keith. She hypothesises for her tooth as being hypertaurodont. Mangion (1962) defined the condition correctly and differentiated it clearly from the unrelated condition of fused roots. His publication of two 'taurodont' teeth extracted from modern Maltese seems to have reversed the attitude of the local authorities in their acceptance of Neanderthal man as the earliest Maltese.

[114] Laferla 1935: 2; Bellanti 1934: 1.

[115] Cassar Pullicino 1947: 19.

[116] Evans 1953; 1959: 36, 39.

[117] Mangion 1962: 309-312.

[118] "Palaeolithic revised to Neolithic on the basis of Nitrogen analysis of M3," in Oakley 1969: 341; Zammit 1964: 5.

[119] Vella, 1974 : 26, fn. 2.

[120] Oakley 1964: 341; 1971: 264; 1980: 43, 45; Pace 1972: 12; Trump 1972: 82; Morana 1987: 22; Fedele 1988: 68; Zammit Maempel 1989: 44; Bonanno 1994: 81.

[121] Roberts & Parfitt 1996: 22, 26.

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[122] Oakley 1964: 130-1, 140, 147, 150.

[123] Bologna *et al*. 1994: 265-274.

[124] Evans 1959: 36; 1968: 10; 1971: 19.

[125] Baldacchino (MAR) 1937-8: xiii; Dudley Buxton 1922: 181-2. His brother, the dental surgeon J.L. Dudley Buxton, examined these teeth.

[126] Evans 1971: 19.

[127] Caton Thompson 1925: 13.

[128] Evans 1971: 19.

[129] Caton Thompson 1925: 10.

[130] Evans 1971: 19.

[131] Trechmann 1938: 5.

[132] Evans 1971: 2.

[133] Trechmann 1938: 5.

[134] Trechmann (1938: 5) discredited Soos regarding the malacofauna. Segre, Bidittu and Piperno (1982) and the discoveries of the Sicilian Palaeolithic stations in the South contradicted Vaufrey's hypothesis which limited them to the North coast.

[135] Pace 1972: 11-12.

[136] Bonanno 1985: 688-9.

[137] Cassar 1964: 3; Savona Ventura 1985: 605.

[138] Morana 1987: 21-2; Agius 1970: 7, 21.

[139] Zammit Maempel 1989: 42, 43, 44.

[140] Trump 1972: 83.

[141] Le Gros Clark 1970: 108.

[142] Despott 1918: 221.

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[143] Keith 1918: 404; 1924: 251; 1925: 349.

[144] De Terra, 1903.

[145] Schwalbe 1901; Keith 1913: 103-119.

[146] Adloff 1907: 273-282.

[147] Keith 1925: 196-7.

[148] Hamner 1964: 411.

[149] Adloff 1907: 273-282.

[150] Gregory 1921: 139-141.

[151] Gowlett 1992: 104; Megarry 1995: 138, 170-1, 267; Bermudez de Castro and Nicolas 1995: 335-356.

[152] Keith 1924: 259-260.

[153] Dudley Buxton 1922: 167-8.

[154] Keith 1924: 253-5.

[155] Tagliaferro 1911: 148; Baldacchino 1937: xx.

[156] Keith 1924: 256-7.

[157] Dudley Buxton 1922: 181-2.

[158] Keith 1924: 254, 257-8.

[159] Pickerill 1909: 150.

[160] Shaw 1928: 476-498.

[161] Dudley Buxton 1928: 58.

[162] Senyurek 1939: 119-131.

[163] Tratman 1950.

[164] Day 1977: 57, 317.

[165] Mangion 1962: 309, 310, 311.

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[166] Witkop 1971: 280.

[167] Keene 1966.

[168] Daito & Hieda 1971.

[169] Shifman & Chanannel 1978.

[170] Komatz *et al*., 1978: 452-4; Jaspers 1981: 632-6; Varrela and Alvesalo 1989: 129-133; Varrela *et al*. 1990: 494-5.

[171] Nelson 1996: 475.

[172] Ogden 1988: 32-4.

[173] Varrela and Alvesalo 1989: 129-133.

[174] Records: Museum of Archaeology, 1936-7, Appendix B, 31st May 1937, p. xx.

[175] Bone Analyses, National History Museum, Malta Samples.

[176] Pace 1972: 2, table 2.

[177] Keith 1924: 260.

[178] This was possible through the courtesy of Prof. J. Camilleri.

[179] The measurements were carried out in the Curator's office at Ghar Dalam on the 14th of June 1996.

[180] Oakley 1964: 124.

THE DERIVATIVE TECHNIQUES FOR RELATIVE DATING

A crucial turn to the story occurred over the turn of the twentieth century, during the interlude between the officially organized excavations. Among the several pachyderm remains illegally removed from Ghar Dalam, at least one found itself in the United Kingdom. To this day the perpetrator is unknown,[1] but this molar ended up in a pit alongside several other (16) specimens in the locality known as Piltdown. Here, in 1912 Charles Dawson presented the world with the missing anthropological link between ape and man. The apparently human remains of a hominid with a human skull and an ape-like jaw fooled the archaeological world for a few decades, and the controversy about the Piltdown finds persisted until the 1950's.

At this point in time Kenneth Oakley entered the scene, and he revived an old method for dating the Piltdown remains.[2] Starting off with measuring the concentration of fluorine, the surprise was that the skull and the jaw gave readings which made contemporaneity in the same horizon an impossibility. The other scientific tests, including Nitrogen, uranium oxide, Iron, Phosphate and Iron phosphate ratio confirmed the hoax, and the Piltdown forgery was finally exposed as the archaeological fraud of the century. Pursuing the matter further, Oakley sought the origins of the associated remains of the Piltdown assembly. The hippopotamus molar gave a low fluorine reading which immediately suggested its source from a Mediterranean limestone cave, such as a Maltese one, typically Ghar Dalam. Tests on Ghar Dalam hippo molars confirmed the suspicion.[3]

Malta thus became involved, and this development fortunately led on to the performance of this same repertoire of chemical tests on the other finds at Ghar Dalam. Thus, the solution of the Piltdown forgery in England provoked a response from the local authorities towards an investigation of the taurodont molars. These chemical tests had by this time established themselves as the most reliable indices for the purposes of relative dating of archaeological specimens elevated from the same horizon. Some of the renowned specimens which were contemporaneously dated through these tests included, besides the Piltdown assembly, the previously controversial Galley Hill skeleton, the Olmo calotte, the Bury St. Edmund's calotte, Lloyd's calotte, the Rhunda skull, the Chatelperron calvarium, the Quinzano occipital, the Lagow skeleton and the Moulin-Quignon mandible.[4] The entire repertoire of chemical tests carried out on specimens referred from archaeological sites and museums world-wide are contained in the manuscript folios of *Bone Analyses*[5]; they run into several hundreds.

Although their nomenclature may have been modified to ‘Derivative techniques,’[6] these tests have not been substituted, nor replaced by other methods of absolute dating, such as C-14. They have rather become more established, involving smaller samples and less expense. They are particularly suited to answer the basic question of archaeological stratigraphy - are the specimens in the horizon in question contemporaneous, or are they not? Because of the small specimen size, less than 0.1g being required, these derivative techniques are also utilized to check contemporaneity when selecting samples for C-14 dating. Their major contribution has been that of identifying the intrusive specimens of the Piltdown fraud.[7]

Other derivative techniques of relative dating have since been devised, but these are limited in their application and interpretation. There are problems with Potassium Argon, Aminoacid Racemization, Uranium Series Disequilibria and Obsidian Dating. Uranium Series Disequilibria is a different investigation from Uranium Oxide assay, and the former is dependent upon decay phenomena.[8] Difficulties are also encountered with the progressive degradation of buried bone when testing with Carbon-14, Uranium Series Disequilibria, Electron Spin resonance and Aminoacid racemization.[9]

Scientific basis of chemical tests for relative dating:

The results of the chemical tests on the Maltese samples are best appreciated if the mechanisms involved are understood. The scope of the exercise is really to differentiate between individual organic remains which have been contemporaneously deposited in the horizon in question, and those which had been introduced either earlier on or at a later date, such as by ritual burial. The basis of these scientific tests lies in the fact that contemporaneous organic specimens undergo the same changes in their composition once they are dead and buried.

The principal changes involve:

1. A loss of the organic collagen, which is measured through its content of nitrogen, of which it constitutes 18%. This is mainly suitable for open

sites, but is totally unreliable in a limestone cave environment, unless readings are extremely low.

2. A substitution of the hydroxy-apatite fraction of the inorganic phosphate, through its replacement by fluorine and uranium oxide in the percolating ground water. These tests, involving the measurement of fluorine, phosphate, the fluorine-phosphate, and particularly the uranium-oxide, are the investigations of choice for closed sites such as a limestone cave environment.

3. The incorporation of minerals, such as calcium and Iron, from the percolating ground water, in the process known as fossilization. Although they have been measured in the routine array of tests at the Museum of Natural History, they have not achieved significant status for interpretation in the exercise of relative dating.

Bones and teeth:

Human burial introduces organic remains amongst more ancient ones, and it is precisely the function of the so-called F-U-N analyses to determine this issue. Bones and teeth are often the only material adequately preserved in archaeological sites,[10] and are therefore the specimens most commonly subjected to analysis for dating purposes. Bone, tooth dentine and antler are considered as equivalent organic specimens for sampling purposes.[11] The prototype of these chemical tests was the estimation of the Fluorine content in the specimen. The exposed dentine and compact bone absorb fluorine at approximately the same rate; the rate of absorption is constant whether the stratum is gravel, sand or clay.[12] The estimation of Fluorine confirms or refutes contemporaneity of bones and teeth in the same horizon.[13]

Buried organic remains carry out an exchange process with their environment; they take in minerals from the earth and they lose their organic components into it. The soft tissues of the body are the first to go, whilst the hardier bone and teeth resist total disintegration because of their higher mineral content. Thus bone and teeth are the last to go; they may persist in a state too brittle to handle, so that they disintegrate immediately as they are being excavated.

As far as their chemical composition is concerned, bones and teeth are made up of organic contents (mainly fats and protein) and the inorganic or mineral contents (such as calcium and phosphate). The chemical composition can be analyzed in the laboratory, and it can be utilized to compare different bones buried or deposited in the same layer, (or preserved under similar conditions) in order to estimate their age. This technique was the new method of relative dating of fossil bones and teeth since the late 1940's.

Organic components of bones and teeth - postmortem changes.

The fats are the first organic contents to disintegrate, whilst protein decay is a slower process. Bone protein is also known as ossein. This is usually assessed by estimating the nitrogen content, utilizing a micro-method known as Kjeldahl. 90% of bone nitrogen is found in its structural protein, collagen. This is not soluble in water, and it accounts for 25% of the weight of the bone. Nitrogen accounts for 18% of collagen.[14]

There are two phases in bone formation. The organic phase is practically all collagen, whereas the inorganic phase is Calcium Phosphate. The mineral structure is similar to that of Hydroxyapatite which has a chemical formula of Ca10 (PO4) 6(OH)2. The organic phase of collagen is vital for the laying down of the inorganic Calcium Phosphate crystals.[15] Such a situation prevails during life, and once death of the organism has occurred, buried bone carries out an exchange process with the surrounding *milieu.* The protein is gradually lost, and minerals in the percolating ground water are incorporated into the Hydroxyapatite.[16]

Inorganic components of bones and teeth- postmortem changes.

Buried bones and teeth are exposed to the action of the percolating ground water, and they undergo changes in their mineral contents. Their pores incorporate foreign mineral matter such as lime and iron oxide in the process known as fossilization, which results in some gain in weight.

Besides fossilization, which impressed Keith as being significant in the 1917 taurodont molars, there is also an irreversible substitution of the phosphate content (mainly hydroxy-apatite) by minerals in the percolating water. These are principally fluorine and uranium oxide. This replacement of the hydroxy-apatite is not associated with an increase in weight.

Under normal circumstances, it is this irreversible substitution of fluorine, as well as uranium, in bones that makes them suitable as a relative dating tool. With the passage of time, both elements accumulate in greater amounts. When bones are buried in different levels at the same location, older bones positioned in lower levels show greater amounts of fluorine and uranium than do those positioned above them. The accumulation of both elements is dependent on time and water action present at the location.[17] In view of the low concentrations involved, Fluorine estimation may not be ideal for limestone environments,[18] but once measurable amounts are present, conditions are more suitable than if the percolating water is saturated with the mineral.[19] Levels of uranium oxide in modern bone is practically nil, but in ancient buried bone these may rise to levels as high as 1,000 p.p.m, depending on the concentration of uranium oxide in the percolating water.[20] Aitken gives the range in fossil bone as lying between 1 and 1,000 ppm.[21] Trace amounts of Fluorine are present in modern bone, ranging from 0.01 to 0.1% in human bone,[22] from 0.024 to 0.07% in adult dentine of tooth,[23] and between 0.02 to 0.1% in Red Deer bone.[24] Thus the maximum ever in modern specimens of tooth and bone in man and deer is 0.1%. The level of iron was also sometimes measured at the Natural History Museum,[25] and the level in adult dentine is 0.007%.[26]

Fluorine and uranium oxide are deposited into buried organic remains at a more or less constant rate, and the regulating factors are the rate of water flow and the concentration of the elements in the percolating water. Volcanic ash can saturate layers with fluorine, but such is never the case with caves which are protected from this atmospheric contamination.

In addition to fluorine and uranium, nitrogen can also be a useful tool for dating purposes. The concentration of nitrogen decreases with time and is directly related to the amount of total collagen present in bones, and thus also to the total carbon content of the organic portion. Nitrogen decreases with increasing bone age as protein is removed from the bones. All amino acids containing the element are removed with the protein as well. Comparative readings on bones in the same and in different strata of the same location supply a fairly accurate estimation of their time association relative to each other.[27]

In simple terms, organic (or previously living) remains do not remain static in their composition after burial. They absorb, among other things, fluorine, iron and uranium oxide from the water percolating the surrounding soil matrix. The amount of the elements which they absorb is directly related to the length of time they have lain in the soil, and the concentration of the elements in the percolating water. Fluorine analysis was the prototype and the most popular among the repertoire of chemical tests; it was also analyzed in conjunction with phosphate to obtain their ratio. Fluorine is taken in and phosphate is correspondingly lost from organic remains; the fluorine-phosphate ratio is calculated as a percentage and increases with age of burial, thus providing another index of antiquity.[28]

The Nitrogen method operates in reverse. Bone and teeth contain a certain percentage of nitrogen, averaging 3.4% in teeth and 4 to 5% in bone.[29] Following death and burial, organic remains lose their nitrogen with time, once the requirements for its breakdown are available. These include absence of glacial conditions, an alkaline medium, adequate oxygenation, absence of surrounding clay, and the presence of a specific bacterium, the *Clostridium histolyticum*. This microbe produces a substance known as collagenase, and this breaks down the collagen of the buried bone or tooth.

In the absence of these requirements, nitrogen is retained. The woolly rhinoceros under Lloyd's building in Leadenhall Street was encased in clay, and its nitrogen loss over the millennia was practically nil.[30] In extremely cold conditions the entire body may be retained, such as the Siberian mammoth and the recently discovered Iceman on the Otztaler Alps.

In an archaeological layer, organic remains which have been incorporated during its deposition lie together until the layer is disturbed, whether this be accidentally during the laying of foundations or intentionally during archaeological work. Throughout this space of time that they have lain together in this stratum, they have been exposed to the same environmental conditions of the soil. The regulatory factors which affect the degree of change in their chemical nature can be narrowed down to a few key ones such as:

1. Environmental temperatures which retard nitrogen degradation at extremely low levels, and reduce water flow through freezing.

2. The presence of clay which retards nitrogen breakdown by separating the organic remains from the action of the nitrogen breaking bacteria. These bacteria are essential to nitrogen breakdown.
3. Percolation through the strata of water containing minerals which are incorporated gradually into the buried organic remains.

Whether the flow rate of the percolating water is high or low, their effect on the organic remains contained in the archaeological layer is similar. They should therefore incorporate the elements in the percolating water to the same degree, only if they have lain in the same deposit for the same length of time. It may be argued that percolation through a water-impermeable layer such as the hard breccia layer is not so infiltrative as through a permeable one like the loamy red deer layer, where the human remains were also discovered. In this instance comparisons are valid only if carried out along the same horizon.

The results obtained by both methods serve only for comparison amongst the specimens lying in the stratum. Insofar as they are valuable exclusively for relative dating, the actual readings themselves are not significant beyond the stratum under investigation, and they cannot therefore be utilized in comparison with specimens exhumed elsewhere.[31] One notable exception is the presence of minute traces or a *Nil* result in Nitrogen assay, for this is characteristically significant of antiquity whatever the context.[32]

Nitrogen is lost gradually from a dead bone or tooth, whilst fluorine is taken up from the surrounding soil. Fluorine replaces the 'hydroxy' bit of the so-called hydroxy-apatite content of bone, thus converting it to fluorapatite, which is less soluble and more stable. It thus tends to last indefinitely and be eventually available for relative dating. Nitrogen analysis is a different kettle of fish. It starts off with an unknown quantity of nitrogen, with levels which can fluctuate between 3.4 and 6.89%.[33] The rate of chemical decay is a complicated process and is dependent upon several factors. Extremely low temperatures will retard its degradation, but this is not significant in Ghar Dalam. On the other hand the presence of clay is of vital importance, together with the acidity of the soil, and essentially the presence of specific nitrogen breaking bacteria (*Clostridium histolyticum*) in an even distribution throughout the layer or layers being investigated. The other limiting factors are the exclusion of unoxidised clay from their environment and the presence of adequate numbers of the bacteria *Clostridium histolyticum* in the soil.[34]

In effect therefore, a low nitrogen is useful to indicate antiquity, whereas a high nitrogen is not significant unless it is associated with a low fluorine and uranium oxide, when it will definitely indicate a recent specimen. Conversely, the presence of a low fluorine and uranium oxide is not significant in the presence of a low nitrogen, for there are factors which impede fluorine and uranium oxide uptake, particularly in limestone caves of which Ghar Dalam is one. On the other hand a high fluorine and uranium oxide is significant in reflecting antiquity.

History of the F-U-N tests:

The classical triad of chemical analyses for relative dating comprises the Fluorine, the Uranium oxide and the Nitrogen tests.

The possibility of archaeological dating through chemical means has long been explored. In 1802 an Italian chemist, Morichini detected minute amounts of fluorine in a fossil elephant tooth; since this element is absent from fresh specimens, it was correctly concluded that the fluorine had been introduced into the fossil tooth after death.[35] A few decades later, in England, a chemist by the name of James Middleton carried out comparative analyses of fossil remains with relatively recent ones, and he established a relation between antiquity of the specimens and their fluorine content. Although he submitted his findings to the Geological Society of London in 1844, they were basically ignored.[36]

Towards the end of the nineteenth century the French mineralogist Adolf Carnot carried out fluorine estimations on fossil specimens and averaged his findings, thus ignoring the variation between different localities with the result that no practical value was attached to it. [37]

In the 1940's the anthropologist Kenneth P. Oakley realized the usefulness of fluorine estimation as a measure of relative dating; together with the other tests of relative dating, namely nitrogen percentage and uranium oxide estimation, it formed an essential tool right from the very start of the archaeological dating era by chemical analysis.

The nitrogen technique was originally used in the United States by Cook and Heizer in 1947. Its severe limitations were, however, soon apparent to the same authors. “Variations in Nitrogen levels within single sites can be considerable or slight... great variation even within individual bones, especially in wetter sites.”[38] The basis of the test lies in the fairly constant rate of loss of ossein from buried bone. The relatively rapid rate of loss however, rather limits its use to assessment of fairly recent specimens.[39]

Both methods described so far, the Fluorine and Nitrogen tests, entail partial destruction of the specimen for the performance of the analysis. A better method which followed upon these in the fifties was the uranium oxide technique. This substance is taken up by organic remains through the percolating ground water in the same way as fluorine, but it is thought that it replaces the calcium in the bone. The radioactivity of the specimen can be estimated by scanning it without its destruction, and this feature conferred a definite advantage over the fluorine method which it eventually replaced. Together with fluorine and nitrogen, it composed the so-called F-U-N analysis protocol of the fifties. Back in 1908, however, Lord Rayleigh had already shown that fossil bones contained uranium, and the circumstance was revived and adapted in the 1950’s by Davidson and Bowie at the Atomic Energy Division of the Geological Survey. It was established that although the uranium oxide concentration varied in differed localities, the amount increased proportionately with its antiquity. Specimens in the same environment varied directly in proportion with the length of time that they were buried there.[40]

There is a direct relationship between the length of time that the fossil sample has been buried and the amount of incorporated fluorine and uranium oxide. Estimation of the latter mineral does not involve destruction of the sample and this confers it with a definite advantage which makes it preferable to the former. This is because uranium oxide is radioactive; it emits alpha, beta and gamma rays which can be picked up directly from the fossil specimen by a radioactive emission counter. According to Bowen, this feature renders it preferable to both the fluorine and nitrogen tests.[41] Radioactivity builds up with increasing geological age, and this radiometric assay on its own is effective as Nitrogen and Fluorine put together up to 1 million years B.P.[42]

Limitations of Fluorine testing:

One limitation of fluorine analysis is contamination by volcanic ash rich in fluorine, such as at the Pleistocene site at Mriehel. This volcanic ash may saturate the strata to a degree which makes a chronological separation of the fossils contained therein impossible. In fact Oakley's first application of the tests in 1947 was a failure. He was analyzing a repertoire of human skull fragments and animal bones from the Kanjera beds of Kenya, and their contamination by volcanic ash gave very high readings and relative dating of the fossil remains was impossible.[43] Caves are protected from volcanic ash; limestone caves such as Ghar Dalam are rather poor in their concentration of this element and of uranium oxide.[44]

Undaunted by his bad experience, Oakley turned his attention to estimate the age of two human remains at Galley Hill and Swanscombe by the Fluorine method. His efforts were a success, and the Swanscombe skull was estimated to be the oldest skull in Europe at the time, dating to 100,000 years B.P.[45]

Limitations of Nitrogen testing:

Used alone nitrogen estimation can be misleading; the classical example is that of the woolly rhinoceros fossil of Leadenhall Street, with a nitrogen content of a modern specimen. Its fluorine content however was that of a fossil.[46] When the Castenodolo skulls (discovered in 1880) were analyzed for their nitrogen in order to confirm them as Pliocene, the result suggested an upper Pleistocene or a Holocene dating (circa 12,000 BP at least). Carbon-14 however dated them to circa 996 AD.[47]

A similar occurrence was registered with the human body discovered amidst the Pleistocene deposits at Fleur de Lys in 1968, and thus considered to be Pleistocene. In February 1969 Zammit Maempel submitted a vertebra to the National History Museum for sampling, and the first reading on Nitrogen percentage was 0.43%. This would have sufficed to confirm its great antiquity, but "re-testing" using absolutely the same technique (Weiler and Strauss; unwashed) registered a six-fold increase in values at 2.58%.[48] Subsequent carbon-dating of the specimen gave the figure of 2,500 B.P.[49] The uselessness of the test in clayey deposits is thus further confirmed. The variability of Nitrogen readings under these conditions is attributable to differential oxygenation and an uneven distribution of *Clostridium histolyticum* bacteria in such deposits.

Once a nil percentage of nitrogen is reached, further comparative assessment between specimens in the same horizon is not possible; more than one finding of a nil percentage is no indication that the samples are contemporaneous, unless this is backed up by palaeontological evidence. There is therefore a limitation in backdating samples with nitrogen testing, which is therefore not useful for assaying the past earlier than the Pleistocene. Brothwell and Higgs combined it to Fluorine as a joint method for relative dating.[50]

The rate of nitrogen breakdown is not a uniform affair, and different workers have registered different results. Knight and Lauder for example showed that there is no nitrogen breakdown for fifty years, but after this time the nitrogen drops to 2% at a geological age of 700 years. The Overton study however demonstrated that the nitrogen level dropped to between 3 and 3.5% over four years, and then there is no further drop for the next four years.[51]

The presence of any preservatives which had been applied to the organic remains would have distorted the nitrogen values and inflated the figures, thus giving falsely high readings and a much more recent dating.

The presence of ferrous iron and heavy metals in the soil diminishes the efficiency of collagenase, and certain soil bacteria produce other enzymes[52] which actually destroy the collagenase, thereby enhancing the retention of nitrogen. In a nutshell, the rate of nitrogen breakdown in buried bone and teeth depends on the "presence and suitability of the environment for micro-organisms which produce collagenase."[53] Thus a low nitrogen percentage is significant, but a normal value does not necessarily exclude antiquity; uranium oxide and fluorine would be indispensable in such instances, to confirm or refute.

Such features crippled the validity of nitrogen determination as an index of antiquity, unless readings were in the low range. Further disadvantages of the method rendered it a less favourable tool than the fluorine and uranium oxide techniques. For a start the initial level of nitrogen in fresh samples varies significantly between samples. For bone samples the level is usually taken as 4%, with 3.4% for tooth dentine.[54] However readings of 5.5% have been registered from excavated sites.[55] Nitrogen estimates in modern bone have ranged from 4.7%[56] to 5.36%,[57] and 4.63 to 5.41% in a series of experiments using young to very old sheep bones.[58] In young children levels of Nitrogen are higher at 6.89%.[59] Immature bones contain more nitrogen than bones from aged animals; levels are variable in small mammals such as rabbit and rat, and different parts of the same bone may give different values of nitrogen content. These differences can be significant, such as 0.9% and 1.4% in one Saxon bone.[60]

Different methods of nitrogen determination give different results. The values also vary when the sample is washed beforehand. A look at the Yugoslav series in the 'Green Book'[61] for Krapina, Sandalja and Crvena Stijena for example, shows the different results obtained when the G.L.(Government Laboratory using Kjeldahl) and the W & S (Weiler and Strauss, using Dumas) methods were used. As examples, Y8 read 0.036% (GL) and 0.29% (W&S), Y12 was 1.84% (GL) and 0.3% (W&S); Y14 resulted in 1.68% (GL) and 0.43% (W&S), Y15 1.13% (GL) and 0.51% (W&S). The discrepancies in results are too significant.

The Yugoslav series were examined contemporaneously with some of the Malta samples. As far as the latter are concerned, the very first nitrogen test on Ma. 1 (the tooth discovered at Ghar Dalam by Gertrude Caton Thompson in 1923), gave 0.39% and 0.79% respectively when the same method of Weiler and Strauss was used.[62] Twelve years later the higher figure was published in Malta, presumably to keep away from a Palaeolithic dating.[63]

"The variation in Nitrogen levels within single sites can be considerable or slight ... there is great variation even within individual bones, especially in wetter sites... The greater the age of excavated bone, the greater the range of Nitrogen values reported, and the greater the problems of testing and interpretation."[64]

Nitrogen analysis is the least valuable of the F-U-N range of tests of relative dating. The uptake of Fluorine, Uranium oxide (and other elements) by buried organic remains is related directly to flow of water through the stratum, and the concentration of these elements in the percolating water. As far as Nitrogen is concerned this is mainly dependent upon the presence of specific bacteria, *Clostridium histolyticum,* in the environmental soil, and the absence of enveloping unoxidised clay in the stratum.

The interpretation of the results is therefore dependent upon these considerations. A low fluorine and uranium oxide, with a high nitrogen percentage indicates a recent age for the sample being examined. A high fluorine and / or uranium oxide coupled with an average value for nitrogen percentage indicates an ancient specimen buried in soil unsuitable for total nitrogen breakdown. A low nitrogen percentage with low fluorine and / or uranium oxide represents an ancient specimen associated either with minimal water percolation or a low concentration of these minerals in this percolating water. The ideal situation would be a low nitrogen and a high fluorine and / or uranium oxide. The point being made is that one negative test in the series does not exclude antiquity in the sample being examined.[65]

Limitations of uranium oxide estimation:

As with Fluorine and Iron, the limiting factor of this method of relative dating is confined to its actual concentration in the percolating water. The concentration of fluorine and uranium oxide in gravels and sands is higher than in limestone and clay formations. Ghar Dalam is a limestone cave and its concentration of both minerals is low;[66] this fact has however proven to be a very satisfactory situation to perform a relative dating of the fossil remains there.

"The fact that fluorine and uranium behave analogously in fossil bone makes it possible to use measurements of the radioactivity of the latter element for relative chronological calculations and this has led to the establishment of important data."[67] Ironically these two positive tests on Despott's molar have been ignored by the same author. For reasons best known to himself, insofar as the Malta samples were concerned, Oakley limited himself to refer exclusively to the Nitrogen tests.[68] Apart from the corruption of the reading, no consideration was given to the fact that "conclusions based solely on Nitrogen ought to be treated with caution."[69] In recent years it is Fluorine and Uranium oxide which are still considered useful for confirming contemporaneity of samples in one horizon. Older and younger samples can readily be rejected through a difference in readings.[70]

Archaeological specimens dated through F-U-N analysis.

Dating of fossil hominid remains has been established on the basis of the Fluorine-Uranium oxide-Nitrogen tests. All three tests were carried out on Lloyd's calotte (1925),[71] the Piltdown calvarium (1912), the Chatelperron calvarium (1879), the Rhunda skull (1956) the Lagow skeleton (1920), and the Despott molar (1917).

Fluorine and Nitrogen sufficed for the Bury St. Edmunds calotte (1882), the Galley Hill skeleton (1888), the Moulin-Quignon mandible (1863) and the Quinzano occipital (1938).

Fluorine analysis was performed on its own on the Olmo calotte, and uranium oxide estimation alone was carried out on the Kanam jaw.[72]

After a thirty year long experience with chemical and radiometric dating at the Museum of Natural History in London, the latter tests including over 1,200 archaeological specimens, Oakley (1980) thoroughly reviewed the validity of these investigations in archaeology.

Specimens of bone, tooth dentine and antler are considered as equivalent organic specimens for sampling purposes.[73]

Nitrogen: Samples for Nitrogen dating have to be free from "any nitrogenous hardening agent, adhesive, moulding agent (celluloid, glue, gelatin)... Old museum collection specimens are not suitable."[74] "The principle that like must be compared with like is particularly important in relative dating by Nitrogen content (outer layer of compact bone, spongy bone, dentine, enamel)."[75] "The concentration of Nitrogen does not decrease with absolute uniformity in time, because it is influenced by the variety of factors listed above. Many more observations are required before we shall know the extent to which climatic factors govern the rate of decline in the Nitrogen content of fossil bones."[76] "Nitrogen is lost most rapidly under oxidising conditions."[77] Nitrogen "gives good results in permeable deposits on open sites."[78] "The high Nitrogen content of this Upper Palaeolithic skull is an illustration of the unreliability of collagenous residues for relative dating of bones in limestone cave deposits."[79]

Fluorine: "It is probable that relative dating by Fluorine is more reliable when applied to specimens buried in deposits where the ground water has a low to moderate fluoride content, and where sedimentation and weathering occurs under temperate climatic conditions."[80] Once measurable amounts are present, conditions are more suitable than if the percolating water is saturated with the mineral.[81] The fluorine-phosphate ratio is calculated as a percentage and increases with age of burial, thus providing another index of antiquity.[82]

Uranium Oxide: "There is initially a slow build-up of uranium, but as the adsorbed uranium generates a series of unstable daughter elements, there is a steep rise in the radioactivity of buried bones in the course of tens of millennia, so that radiometric assays usually distinguish quite clearly between fossil and recently intruded bones in Pleistocene gravels and sands."[83]

These tests were still in use as dating tools in the 1980's, in key archaeological sites such as Pont Newydd in North Wales, an important Palaeolithic site where a Neanderthal tooth was discovered, and at Moundville in North America, where archaeological digs have been going on since 1840.[84] The relative dating tests which were carried out at these sites were still sufficiently valid, thirty years after radiocarbon, to deserve selective publication, respectively in 1981 and 1982.[85] A review of the relevant literature confirms their validity to the present time.

1970 - Relative Dating tests confirmed by Oakley, Brothwell, Higgs and Garlick as useful tests in archaeological dating and the establishment of sequence.[86]

1980 - Sara Champion confirms importance of relative dating tests in establishing contemporaneity of bones and teeth in same horizon.[87]

1986 - Parkes confirms that Fluorine and Uranium oxide are still considered useful for identifying "the younger and older samples through a difference in the readings."[88]

1986 - Protsch confirms Fluorine and Uranium oxide and the mechanisms of their incorporation into biological materials.[89]

1987 - Leute confirms the importance of the relative dating tests, giving values of fluorine in modern and in fossil specimens.[90]

1990 - Aitken confirms relative dating tests, giving levels of Uranium oxide in modern and in fossil bones and teeth.[91]

1990 - Wenke confirms the value of the relative dating tests. "In many situations chronometric dates may be difficult to obtain or simply unnecessary for the problem at issue, and for these situations archaeologists have devised several methods of relative dating, and the objective is to arrange sites and artifacts in a sequence that reflects the order in which they were created."[92]

1996 - In the classical book of *Archaeology*, which is also the standard textbook for students in Archaeology, Renfrew and Bahn confirm the relative dating tests as useful methods for establishing the contemporaneity of specimens in the same stratigraphic deposit.[93]

March 1952

The political situation in the early 1950's was dominated by the conflicting slogans proposed by the major political parties. Self Government had been granted by the British to the Maltese in 1947, and the first elections had placed the Labour party in power under Boffa. The party split of 1949 enhanced the chances for the Nationalists who won the elections of September 1950. Mintoff's banner for these elections had been one of Integration with Great Britain. In the wake of the recent war with Italy, the pro-Italian logo of the Nationalist party was transformed into a pro-Latin one with identical connotations. The elections of May 1951 and December 1953 maintained the Nationalists in power through their coalition with the Maltese Workers Party. The Labour party won the elections of February 1955, and Mintoff was determined to blast his way to Integration with Great Britain.[94]

During the early fifties, a move was made to eliminate the validity of the taurodont molars once and for all through Kenneth Oakley's array of chemical tests at the British Museum. This opportunity had presented itself soon after the exposure of the Piltdown forgery by Kenneth Oakley, through the involvement of a Maltese hippopotamus molar in the fraud.[95]

On the third of March, 1952, Dr. J.G. Baldacchino[96] registered the sampling of the taurodont molar discovered by Despott in 1917.[97] Other remains from the Ghar Dalam cave included another tooth which was picked up by Caton Thompson in 1924, and one sample each of hippo molar and deer long bone. There is no record in the Museum of Archaeology Reports of these tests being carried out, but the 'Green Book' at the Museum of Natural History in London is still available and contains the original readings of the entire repertoire of tests carried out between 1952 and 1969 on the "Malta Samples."[98]

The two human teeth submitted to the Natural History Museum in 1952 were therefore Caton Thompson's (Ma.1) and Despott's (Ma.2). The first results of the fluorine tests were unexpected, for Despott's molar gave the highest reading of all the samples tested, and these included hippopotamus and red deer of the Ice Age; repeat testing with Fluorine assay confirmed the first reading.[99] Although unreliable, the nitrogen readings on these two specimens of human teeth submitted were very approximately equal, namely 0.79% and 0.8% (Caton Thompson and Despott respectively). However, Caton Thompson's gave two different readings, 0.39% and 0.79%; the first reading was considered unreliable also because of the small size of sample.[100]

Further chemical testing for Iron, Phosphate and Fluorine-phosphate ratio confirmed the antiquity of Despott's molar even more definitely. The Iron content was highest in Despott's molar, whilst Phosphate loss and the Fluorine-Phosphate ratio was second only to Miocene shark, estimated to date at least to 5 million years ago.[101] In 1952 therefore, these chemical tests had already confirmed the correct stratigraphy of Despott's molar in the Deer layer of Ghar Dalam, and had therefore established that at least one human being lived contemporaneously with Pleistocene deer and hippopotamus in Malta during the last millennia of the Ice Age, before 12,000 B.P. Correspondence flowed between Oakley and the Maltese authorities in June of 1952,[102] yet the results were not released. Arthur Keith, who had lived on for a few years beyond 1952, was even deprived of the satisfaction that he had been right after all.

Having transmitted the results of the chemical tests to Malta on the 20th June of 1952, Kenneth Oakley maintained his intricate involvement in the array of chemical investigations on the Piltdown specimens, and it was not until well into the following year, 1953, that the matter was finally resolved, and the hoax established. In the meantime, however, a policy of silence was adopted in the Maltese Islands, as events evolved along a course unaffected by the outcome of these chemical tests on the human teeth from Ghar Dalam.

The Sicilian connection:

Developments in Sicily effected an impact upon developments in Malta. The results of Vaufrey's researches in 1928 had limited the Palaeolithic presence in Sicily to its northwestern regions; these were the sites which had been mainly investigated in the middle of the nineteenth century through the pioneering efforts of Falconer, Anca and Gemmellaro.[103] Vaufrey had been in disagreement about some of the key issues, but the weight of his authority at the time had lent its support towards the acceptance of his tenets. He has since been discredited;[104] Sicilian Palaeolithic sites have been identified elsewhere, significantly in the southeastern regions abutting the Maltese islands.[105] Palaeolithic cultures have also been discovered on two of the Egadi Islands, on Levanzo and Favignana,[106] and these are joined to northwestern Sicily in the same way as the Maltese islands are joined to its southeastern tip, that is through a shallow sea bed of less than a hundred metres in depth. The obvious implication was that what was valid for Sicily, Levanzo and Favignana was equally so for the Maltese islands during the Pleistocene period, particularly during its last phase of it known as the Würm, when sea levels decreased by 120 metres at least.[107] During the Würm, the islands of Sicily, Egadi and Malta formed one landmass for several millennia, and during this time man and fauna were free to roam and travel across dry land to every nook and corner. The Maltese Islands at this time consisted of elevations joined to present-day Sicily, where Palaeolithic man abounded as a food-gatherer and as a hunter of the Pleistocene mammals which also reached the Maltese Islands.

The other significant development in Sicilian archaeology was rendered by its leading archaeologist at the time, Dr. Luigi Bernabò Brea.[108] In 1950

Bernabò Brea published his *Prehistoric Culture Sequence of Sicily*, wherein he had remarked upon the similarity of the earliest Maltese pottery at Ghar Dalam with that known as the Stentinello type.[109] Stentinello may be a misnomer if it is taken to represent the site where the pottery style originated from; it merely represents the first site it was discovered in, by Paolo Orsi, in 1890.[110] This pottery type had actually derived from the Near East, and had reached several areas of the Mediterranean contemporaneously.[111]

The Pembroke scholars: The distortion of Maltese prehistory.

Professor J. D. Evans is retired but is still active in Archaeology. In April of this year, 1997, he visited Malta in an unofficial capacity together with a group, and visited various sites including Tarxien Temples and the Brochtorff Circle in Gozo. Since 1973 until his retirement, he was Director of the Institute of Archaelogy and Professor of Archaeology at the University of London. At the young age of 31, he was already Professor of Prehistoric European Archaeology at the same institution.[112] He was born in Liverpool in 1925. His studies in English, Anthropology and Archaeology at Pembroke College, Cambridge, were interrupted during the War years.

J.D. Evans graduated in 1949,[113] and in the space of three years he was in Malta to supervise the survey of the prehistoric monuments of the Maltese Islands; he was then barely 27 years old.[114] Although not a colonial, nor a student at the Royal University of Malta, Evans received “a generous grant from the Inter-University Council for Higher Education in the Colonies to the Royal University of Malta,”[115] and this permitted him to assume his post in Malta. In 1971 Evans modified this grant as having been intentioned for candidates *overseas* rather than *in the colonies.*[116]

Prior to his term in Malta, Evans was in Ankara during 1951-2 as Fellow of the British Institute of Archaeology there.[117] He had started off his career right in the heart of Anatolia, the source of Neolithic culture in the Mediterranean.

The Maltese connection with Oakley in London was temporarily held in abeyance as another link was strengthened with the British School at Rome. J.D. Evans had graduated at Pembroke College, Cambridge, in

1949, and during 1951-2 was a Fellow of the British Institute at Ankara. In September of 1952 Evans assumed the supervision of the Royal University of Malta survey on the prehistoric monuments of the islands. [118] His colleague David Trump was in Malta at the same time for a short period.[119] The Director of Museums in Malta, Dr. J.G. Baldacchino liaised with the British School in Rome and was mainly occupied with the exploration of the tomb repertoire of Malta.[120]

Evans spent a week at Syracuse and Lipari with the Sicilian archaeologist, Luigi Bernabò Brea,[121] who had established, in 1950, the *Prehistoric culture-sequence in Sicily*, in the "Annual Report of the University of London Institute of Archaeology." Bernabò Brea here commented on the similarity between the Stentinello type of pottery and that found in the earliest phases in Malta at Ghar Dalam.[122] From Bernabò Brea, Evans was to obtain "much help from his unique knowledge of Sicilian archaeology."[123] Bernabò Brea had rendered, in 1950, another significant contribution to Sicilian archaeology. He had excavated at Fontana Nuova, a site in Southern Sicily, and had established it as the most ancient Palaeolithic site in Sicily, dating it to the middle Aurignacian.[124] In this he has recently been confirmed by Chilardi *et al.*[125] Bernabò Brea had thereby further crippled the previous hypothesis of Ramon Vaufrey (1928), who had limited the Palaeolithic presence in Sicily to the northern regions. Bernabò Brea had also discovered implements in Fontana Nuova which bore a striking resemblance to the Mousterian, a tool technology associated with Neanderthal man in the middle Palaeolithic.[126]

When, in 1953, Evans published the *Prehistoric culture-sequence* for the Maltese Islands, he too remarked upon the presence, in Malta, of implements which bore features similar to the Mousterian technology,[127] thus provoking an analogy with Fontana Nuova. The 1953 publication by Evans classified the Maltese prehistoric material in eight ceramic phases designated by letters and Roman numerals, rather than by utilising the terms *Neolithic* and *Bronze Age.*[128]

The attitude of the Roman Catholic Church in Malta can be gauged from Busuttil's publication in 1953. The thrice-Imprimatur publication accepted a Maltese Neanderthal ancestor who had originated in Africa and was travelling to Europe.[129]

Between 1953 and 1956, Evans was Research Fellow at Pembroke College, Cambridge, and during this time he plied between the United Kingdon and the Maltese Islands. The presentation of his thesis at Cambridge in 1956, was soon followed by his appointment to the Professorship of European prehistory at the University of London Institute of Archaeology, at the tender age of 31.

During the early months of 1953 Evans liaised with Bernabò Brea, and spent a week in his company at Syracuse and Lipari.[130] Later on in the year, Evans published his own *Prehistoric culture sequence in the Maltese archipelago,*" wherein, without supporting evidence, he extrapolates on Bernabò Brea's hypothesis by asserting that the Near Eastern colonizers had reached Malta via Sicily, via Stentinello. Furthermore Evans analysed the pottery sequence and established a form of dating based upon their typology.[131] This tendency to look for parallels abroad rather than assume a form of originality by the native Maltese has been frowned upon by certain authorities.[132] Besides, "The stylistic analysis of pottery on its own can be very treacherous when it comes to dating."[133] Frendo's dictum was proved right when Evans' chronology sequence was eventually rebutted by radiocarbon dating.[134]

According to Evans (1959) the first Maltese settlers reached Malta from Sicily in approximately 2,500 B.C. These "first colonists were primitive farmers with a poor culture of Neolithic type... Later their culture was strongly influenced by the brilliant Minoan and Mycenean civilizations of Greece and Crete. The late temples are wonderful pieces of architecture... Soon after 1,500 B.C. they disappeared, and a foreign people with a much cruder culture, who seem to have come from southern Italy, took over the islands."[135]

Evans had started off his ceramic phases by attributing the earliest type of ceramic ware to the Ghar Dalam phase. This approximated the Stentinello ware, which was the earliest Neolithic in Sicily. Evans admitted to have followed the Sicilian sequence as laid out by Bernabò Brea in 1950,[136] and it was found tied at several points to the Sicilian sequence."[137] Just when he thought he was on firmer ground,[138] Evans started to slip. His phases which followed Ghar Dalam in the Maltese Neolithic were out of line. He attributed the second ceramic phase to Mgarr and the third to Zebbug.[139] He was thus reversing the order of the Mgarr and Zebbug phases, and he had missed out altogether the two Skorba phases which were later outlined by Trump.

The Stentinello folk were at the time considered to be the earliest Neolithic group in Sicily as well as in Malta, but Bernabò Brea had actually demonstrated that the first ***Neolithic*** colonizers of Sicily ***and*** Malta ***and*** several other Mediterranean sites derived, as expected, from the Near East.[140] There was therefore no basis for the "Stentinello-first" hypothesis as proposed by Evans at the time. There were several other important aspects of Neolithic Malta upon which Bernabò Brea disagreed with Evans.[141] There were also significant differences in pottery techniques between Malta and Stentinello,[142] and Evans' theory was not supported by the later discovery of the Monte Kronio pottery style in Southern Sicily and the Ghar Ilma site in Gozo.[143]

Between 1953 and 1956 Evans was designated Research Fellow of Pembroke College. Together with Baldacchino, Evans reviewed the "Prehistoric tombs at Zebbug" in 1954; in the previous year, Baldacchino had explored the tombs of Ghajn Qajjet together with Dunbabin, of the British School at Rome. The medium of publication was *Papers of the British School at Rome*.[144] Evans left the island after a series of further excavations at several temple sites, in July 1954, and was back in Malta the following January.[145] His arguments for a two-phase settlement in the western Mediterranean were proposed to the London Institute of Archaeology in November 1956. Here he also attempted to dispel the prevailing hypothesis at the time that "the impressed ware people reached Europe from Northern Africa."[146]

The next wave of developments occurred during 1955. The elections of February placed Mintoff in power at the head of the Labour party, and Parliament was declared open on the 21st of March 1955.[147] Correspondence flowed again between Oakley at the British Museum and the Maltese authorities, and this related to the chemical tests which had been carried out on the Malta samples three years earlier.[148] On the 1st June 1955 Dr. Baldacchino was relieved of his Directorship by Temi Zammit's son, C.G. Zammit.[149] David Trump, another graduate from Pembroke College, re-appeared on the scene. He first visited Malta in 1952 . Between 1955 and 1958 he was scholar in Classical Studies in

Rome, and in 1958 assumed the post of temporary Curator at the Museum of Archaeology, an office he held until 1963.[150]

During the mid-fifties there was political turmoil with clashes between the Maltese government and the British governor. In 1958 the Labour Prime Minister resigned. In 1959 Trump starts training abroad, and is relieved by F.S. Mallia, but two years later he is back, whilst Mallia is undergoing his own Archaeology course in London.[151] During the early sixties, Trump was excavating at another Neolithic site, at Skorba. In the meantime J.D. Evans assumes the post of Professor of Prehistoric European Archaeology at the London University Institute of Archaeology (1956).[152] Shortly afterwards, Evans refuted Zammit's "chronological inference" for the Tarxien Cemetery.[153] As with the chronology of the Tarxien temple, Evans was wrong once again, and as Trechmann had pointed out in 1938, "doubtless Zammit's and Ugolini's views are the more correct."[154]

Bernabò Brea had published his *Sicily before the Greeks* the following year (1957), and Evans' "Stentinello-first" hypothesis received a setback. The original Italian version was published a year later by "Il Saggiatore," whilst the English translation was published by Thames and Hudson for their *Ancient Peoples and Lands* series. There are at least two significant mistranslations in the English version, and these relate specifically to the microlithic culture in northwestern Sicily and its *predominance* there during the Palaeolithic. Thames and Hudson[155] misinterpreted this predominance of microliths as an *absence* rather than an *abundance*,[156] and they also added on the Mesolithic period as the source of these microliths,[157] when Bernabò Brea had limited this same source to the Palaeolithic.[158] Thames and Hudson then published Evans' *Malta* in 1959, and here Evans reiterates his previous "Stentinello-first" hypothesis, and gives his dates as absolute on the basis of analogy. Tarxien he dated to 1,600-1,500 B.C., and Tarxien cemetery to 1,400 B.C. This was followed by Borg in-Nadur at 1,300 to 1,200 B.C., and Bahrija at 1,100 to 800 B.C.[159]

Whilst Temi Zammit had compared the Tarxien temples with European Neolithic sites and assigned a dating of 3,000 BC to them, Evans made his analogies with the Mycenean spiral patterns and gave a date of 1600 BC (1959: 42-3). Zammit compared Tarxien cemetery with the Bronze Age of the Eastern Mediterranean and dated it to 2,000 BC (Zammit 1925: 22; 67). Evans played down Zammit's dates as exaggerated (1959: 25), and assumed that the first Maltese reached the archipelago around 2500 BC

(1959: 46-7]. Bernabò Brea assigned the Temple culture to the later part of the 3rd millennium (1960: 135). Uncalibrated RC dates proved Bernabò Brea right, calibrated ones proved Zammit right. Evans refuted the radiocarbon dates (1971: 223-4). The first Maltese settlers were thought to have reached the islands in 4000 BC (Trump 1972: 20; 40). First Maltese settlers 5000 BC (Trump 1993: 20; 53). Tarxien 1800 BC was traditional date, 2400 BC was uncorrected radiocarbon date, whilst 3100 BC was calibrated date (Renfrew 1977: 617).

Bernabò Brea was quick to react in print, in a severe criticism of Evans' hypotheses as manifest in his *Malta.* Brea considered Evans' chronology of the Maltese megalithic civilization as too late, that he "minimizes the significance of prehistoric Malta," possibly as a reaction to Ugolini's thesis of Malta as a "primary focus of Mediterranean civilization." Furthermore Brea sensed the irregularity of Evans' early Neolithic phases, and pointed out unambiguously that the latter's transition between the Ghar Dalam and Mgarr phases was missing "various cultures not yet identified,"[160] that there was a "cultural and chronological break between the Ghar Dalam phase and the rest of the sequence."[161] Evans' answer was that "the idea of widespread Maltese influence in the prehistoric West Mediterranean is attractive as simplifying the problem of megalithic origins, but unfortunately there is just no evidence to support it!"[162] The following year however, Evans submitted charcoal from the Mgarr phase to testing by radiocarbon at the British Museum. "The charcoal came from an undisturbed level containing sherds of the I**B (Mgarr)** phase..."[163] The date was 2710 ± 150 B.C.[164] Reducing a century each from the radiocarbon date and his own 1953 guess, Evans consoled himself that he had gone off the mark by a mere half millennium.[165] The date was rejected even before calibration increased his chronological error to 1.5 millennium.[166] Evans however acknowledged Bernabò Brea's view on the need to re-date his Neolithic sequence, admitting that "we do not yet fully understand the earliest phases of the Neolithic in this area."[167]

Evans' hypothesis for a "culture sweep" across the Mediterranean was not supported by any convincing archaeological evidence.[168] The calibrated radiocarbon chronology refuted Evans' *absolute* dates and the analogies of the Tarxien spirals with those of Mycenae .

Besides the incorrect chronological sequence, in his *Malta* (1959), for the Neolithic phases of Malta's prehistory, Evans also sought to eliminate all possibility of a human presence in the islands prior to his Neolithic package from Stentinello. For without valid reason and with no supporting evidence whatsoever, Evans cast serious doubt on the importance of the taurodont molars as valid archaeological evidence to support a Palaeolithic presence in Malta. "Thus there are as yet no trustworthy traces of the presence of man in Malta before the Neolithic period."[169] Three pages later "we have no reason to suppose that Palaeolithic man ever set foot on (Malta)."[170] Previously "we have no reliable evidence that any of them (Ice Age men) made their homes in (Malta)."[171] These assertions are significant in the light of the contemporaneous developments in Sicilian Palaeolithic archaeology by Bernabò Brea. Initially unsupported by his counterparts abroad, Bernabò Brea was eventually proved right in most of his hypotheses.[172] Significant as well is the fact that Evans also argued against the Siculo-Tunisian land bridge of antiquity. The logic of Evans' conclusions was founded on false premises and a significant iota of misinterpretation. Once again the weight of authority established his hypothesis as semi-dogma; the consequence was bad history.

Professor J.J. Mangion:

Another participant as consultant in Trump's excavations at Skorba was the Maltese dental surgeon, Professor J.J. Mangion.[173] Three years after Evans' rundown of the 1917 molars, the question of these taurodont teeth took a decidedly negative turn. Mangion published his own personal experience on the dental extraction of two taurodont molars from modern Maltese; in 1962 he published this as an article in the *British Dental Journal,*[174] in a manner which tended to obliterate the importance of the 1917 taurodont molars at Ghar Dalam. Keith was dead by this time, and it seemed that the fate of these Ghar Dalam molars was sealed.[175]

It had already been apparent in 1952 that the chemical tests had been carried out *solely to eliminate* the validity of Despott's molar as evidence for a pre-Neolithic human presence in the Maltese Islands. The results were not suppressed because they were invalid or unreliable, but because they had not achieved their purpose. They had rather exposed an unwanted child of science who disrupted the concept of a Neolithic-first

Maltese package. It was a selection of these same chemical tests which were utilized twelve years later to uphold a Neolithic-first Maltese package through a selective publication of the unreliable Nitrogen results, together with a corruption of the Nitrogen figure for Despott's molar. It was also necessary to substitute the teeth which were submitted in 1963, for these had yielded further evidence for a pre-Neolithic Maltese human presence.

The Chemical tests of 1963:[176]

In November 1962 Kenneth Oakley was back in Malta; he picked up a few archaeological specimens (NHM 1963.23.12.3) which he took to the Museum of Natural History in London (Oakley 1980: 43). Dr. Baldacchino had retired from Director in 1955, and his post was assumed by the Assistant Curator, C.G. Zammit, who had been employed in the Museum of Archaeology since early on during his father's time, and had effectively been the Museum's *factotum.* After 1955, Baldacchino pursued his Museum work in an unofficial capacity, and carried on his correspondence with Oakley in London. In December 1962, Baldacchino submitted three teeth from the Hypogeum to Oakley in London for Nitrogen testing. Oakley partially acceded to Baldacchino's request, accepting to date two of them. He awaited an Ghar Dalam tooth which he had earlier requested from C.G. Zammit for dating in London. The latter did not submit a specimen, but Baldacchino submitted his own taurodont molar (1936), and in effect all four specimens were eventually dated by Oakley in 1963.[177] Baldacchino's molar gave a reading of 0.44% nitrogen, and this too represented a dating much earlier than the Neolithic,[178] whilst the two molars from the Hypogeum gave results equal to hippo. Ma. 5 gave a reading of 0.83% nitrogen, whilst Ma. 6's reading was nil, [179] thus conferring great antiquity upon it, making it theoretically as old as the extinct Maltese dwarf hippo. The provenance of this Tarxien tooth beyond the Hypogeum is unknown, since the latter structure served as a secondary burial site.

Hippopotamus samples for nitrogen (Ma. 4, 21, 22, 33, 34, 35) represent the various periods that hippopotamus roamed the Maltese Islands. Barely one specimen of Elephant was submitted.[180] Similarly with Deer (Ma. 3, 23, 24, 25) and man (Ma. 1, 2 and 7). As far as Nitrogen is concerned, Ma. 7 is coeval with hippo and deer. The hypogeum samples (Ma. 5 and 6) are even more significant, particularly Ma. 6, which yielded a nil nitrogen, equivalent to the oldest hippo sample in Ghar Dalam. Although their provenance is different, their nil readings for Nitrogen are significant in clearly indicating great antiquity.[181] Other significant results were similar nitrogen readings between Baldacchino's taurodont molar and two hippo molars from Ghar Dalam.[182] This was strong evidence for the contemporaneity between these fossil fauna and early Maltese man.

Although it seemed in 1962 that Mangion had blown a hole in Arthur Keith's hypothesis about the exclusive association of severe taurodontism with Neanderthal man, yet Mangion's molars were a far cry from the Ghar Dalam specimens. As Table 1 and his own plates on Figures 1, 3 and 4 show,[183] the two molars presented in 1962 bore the milder form of taurodontism, and they also lacked the characteristic feature of the neck being wider than the crown. Mangion's molars were smaller by 2mm in diameter than the 1917 specimens, they bore a waist which the 1917 molars did not, and the pulp cavity was significantly smaller in Mangion's than in Keith's protegees. These molars are now missing.[184]

At this stage therefore, a decision was taken to exploit the results in the following manner. The hypogeum teeth and Baldacchino's molar were ignored. Caton Thompson's tooth was given the higher reading of 0.79%, whilst the figure of 0.8% for Despott's molar was transformed into a 1.85%. The different tonality in the ink is immediately evident and gives the corruption away.[185] But this is the figure which was officially quoted in the Museum of Archaeology Report of 1964, twelve years after the 1952 tests, as *proof* that the taurodont tooth was contemporaneous with domesticated animals.[186] Support for this theory was rallied mainly through the contributions of J.D. Evans, who suggested the Sicilians from Stentinello as the first Maltese, and through Professor J.J. Mangion, who extracted ‘taurodontic’ teeth from modern Maltese.

The Scientific Report of 1964:

When in 1964 the announcement was proclaimed on the radiocarbon dating of the megalithic temples, and another millennium of pre-history was thereby added on to Evans's dates, it was then deemed feasible by the authorities to publish a very limited and censored edition of the 1952 tests.

Only the nitrogen results were released for two human teeth, with the modified 1.85% version for Despott's molar. Baldacchino's 1936 molar and the two teeth from the hypogeum were obscured *in toto*. The Museum of Archaeology Report declared that these results, seemingly just then carried out, contemporaneously with the temple carbon dating tests, confirmed the Neolithic nature of Despott's tooth. It was thereby being inadvertently conceded that if the counterfeit 1.85% figure represented the Neolithic period, then the genuine 0.8% would put the clock way back past the Neolithic and the Mesolithic and into the Palaeolithic era. And Baldacchino's molar, with a nitrogen percentage of 0.44% would have further established, if it had been published, the pre-Neolithic nature of the taurodontic teeth. The Hypogeum tooth, Ma. 6, with its *Nil* percentage of Nitrogen, would have sealed the issue beyond any doubt.

Presumably setting the Coldrum skull yet again as a model for comparison,[187] Oakley dated Despott's tooth[188] as Neolithic.[189] Only two human teeth were reported upon by the Scientific Report of 1964, whereas a total of five teeth had been submitted to the Natural History Museum, two in 1952, and three in 1963. Inadvertently perhaps, the Scientific report was inferring that Caton Thompson's tooth was therefore being dated as prior to the Neolithic. This was, however, circumvented by further subdating Despott's molar to a later date than the Tarxien phase of the Neolithic period.[190] Evans had assigned an absolute date to this period of 1,600 B.C.[191] He was off the mark by fifteen centuries.[192]

Thus in 1964 the taurodont teeth received their mortal blow. The *Scientific Report* for this year, as published in the Reports of the Museum of Archaeology reads thus:

> "Considerable help has been received from foreign experts in the analysis of Maltese material of various sorts.
>
> "Dr. K.P. Oakley of the British Museum, Natural History, analysed a number of bone samples for their collagen content, expressed as a percentage of nitrogen. The figures obtained were - hippopotamus bone nil, deer antler 0.13%, normal human tooth 0.7%, taurodont human tooth (these four all from Ghar Dalam) 1.85%, deer antler (Tarxien) 0.5%, deer antler (Bahrija) 0.8%.

> "This proves conclusively that the taurodont tooth is later than the material from the other prehistoric sites, and so cannot possibly be of Neanderthal man. The deer antler from Tarxien and Bahrija is contemporary with the cultural material and not sub-fossil, disinterred from a bone deposit like that in Ghar Dalam. However it need not imply survival of wild deer in Malta to such late dates as it could have been imported from Sicily."[193]

The *Scientific Report* of 1964 [194] also included the Nitrogen readings for antler of deer from Bahrija and Tarxien; these are recorded as Malta samples Ma. 8 and 9 at the Natural History Museum; the results were respectively 0.5% and 0.8%.[195] The *Scientific Report* concluded, on the basis of the corrupted 1.85% reading for Despott's molar, that the latter was younger than deer from these sites; on the basis of the true reading therefore, that of 0.8%, Despott's molar was contemporaneous with deer.

There was indeed no basis at all for stating in the *Scientific Report* that the taurodont teeth were contemporaneous with the domestic animals; nor was there any solid foundation for the added statement that red deer might have been imported from Sicily; there is no evidence for this, nor is there any supporting evidence from the chemical and radiometric tests.

Furthermore, when the pig and horse samples were later submitted to London, in 1968, and tested for nitrogen and uranium oxide, it was clear that the pig was of the wild variety, with a uranium oxide level of 8 ppm, whereas the horse samples, Ma. 30 and 31, with uranium oxide readings of nil, were clearly not fossil specimens. Publication of these developments has never been carried out through the official channels.

The radiocarbon dates:

The carbon dates for Malta's prehistoric temples followed these modified results of the chemical tests. Evans had initially thought that Temi Zammit's dates for the temples were "considerably too high."[196] Zammit had made his analogies with the European and Eastern Mediterranean Neolithic cultures, and had correctly opted for 3,000 BC for the Neolithic temple-culture, and 2,000 BC for the Tarxien Bronze Age culture.[197] Trechmann concorded,(1938: 14) "doubtless Zammit's and Ugolini's views are the more correct" regarding the megalithic culture of Malta.

Evans made his analogies incorrectly with Mycenae, and proposed a reduction of half a millennium each for Zammit's dates,[198] but eventually radiocarbon testing favoured Temi Zammit's dating rather than his. The Aegean connection with the temple art collapsed.[199] Trump accepted the new dating, but Evans was still contesting the radiocarbon dates in the early seventies.[200]

The Scientific tests on the remains of domesticated animals:

Trump set the year erroneously at 1959 for the performance of the 1952 chemical tests, and he dated the taurodontic teeth as contemporaneous with domesticated animals, on the basis of "careful chemical analyses at the British Museum."[201]

Domestication of animals is traditionally associated with the Neolithic period; it had been previously thought that the domesticated dog has been traced to the Palaeolithic period, when he was utilized to keep watch and accompany the hunt.[202] In Neolithic central Europe there were five truly domesticated animals, and these were the dog, the goat, the sheep, the pig and the cow.[203] The domestication of the horse is still an enigma for it is no easy task to differentiate between the wild and domesticated forms, particularly at an early stage of domestication.[204]

In a final attempt to secure the taurodont molars inside the Neolithic bracket, another three samples were submitted for nitrogen and uranium oxide estimation.[205] Although these were meant to represent domesticated animals, the antiquity of both horse and pig automatically excludes the validity of this test; both have existed on the face of the earth for several millions of years.[206] What was available from Ghar Dalam was a horse tooth from an undefined layer. The same holds for the specimen of pig submitted to the Natural History Museum, although a part of mandible was also available. Whether these were from Sus scrofa (wild pig) or from Sus domesticus (domestic pig) is impossible to say. The entries for these samples in the Ghar Dalam register are merely Gh.D/4 and Gh.D/5, and Zammit Maempel confirms their obscure provenance.[207] Thus although they were later domesticable, there is no evidence that the Maltese samples were from domesticated forms.

Horse and pig have been found in several layers of Ghar Dalam, and tusks of wild pig have also been picked up from the deer layer.[208] Besides, one of the horse teeth, Ma. 30 actually derived from Zejtun in 1962, and is so labelled, as Z/62/1. This gave a nitrogen percentage reading of 1.01%, but the other, Ma. 31's reading was higher at 2.64%, this indicating its recent dating. Both horse samples gave a nil reading for uranium oxide, which thus confirms them as recent. As far as pig is concerned, its nitrogen read 0.88%, which is near contemporaneous with Ma. 1, 2 and 5. Its uranium oxide was 8 p.p.m., which confirms it being significantly later than Despott's molar with a reading of 13 p.p.m.[209] Thus, even though meant to represent domesticated animals, these three specimens could not all have been representative of domesticated animals. The pig must have been of the wild form, but its uranium oxide reading renders it still significantly younger than man.

The three Malta samples for pig and horse (Ma. 30 to 32) were tested for nitrogen and uranium oxide. These have registration numbers higher than the 1966 ones, and their RA numbers for uranium oxide is contemporaneous with Baldacchino's molar (1050-1055). The latter was submitted in August 1968. Therefore the three samples of pig and horse were submitted between 1966 and 1968, but most probably in 1968. The fact is therefore that, prior to 1964, the dating of the Scientific Report, there were no Ghar Dalam pig and horse samples tested for relative dating. When these were tested they were invalid as representing domestic animals for their provenance is unknown; pig and horse have been roaming the earth's surface for millions of years rather than millennia. The presence of wild pig and tusks in the deer layer of Ghar Dalam has also been registered. And the tests themselves have confirmed that whilst the horse sample Ma. 31 is Neolithic, the pig is pre-Neolithic; horse sample Ma.30 lies on the "borderline," but its uranium oxide content groups it with the Neolithic period or younger.

The statement of Trump (1972) cannot therefore be reconciled with the fact that before 1959, no Ghar Dalam specimens of domestic animals were ever submitted to the Natural History Museum for Nitrogen or Fluorine testing. Trump is definitely referring to these chemical tests for he further mentions that the same tests were used in Malta as were used in the investigation of the Maltese hippopotamus molar in the Piltdown forgery.[210] It is evident therefore that Trump was not acquainted with, nor implicated in the suppression of the evidence furnished by the chemical tests.

The third taurodont molar:

Since its discovery in 1936, Baldacchino's molar has been kept in low profile, and omitted in subsequent references to taurodontism in archaic human remains; J.L. Pace (1972) and G. Zammit Maempel (1989) do not mention it in their contributions. C.G. Zammit was Assistant Curator and subsequently the Director of the Museum of Archaeology (Malta) since before the molar's discovery in 1936, right up to his retirement in 1971; he cannot identify the present Gh.D./3.[211] It was never published in photographic form, and modern taurodontic molars were occasionally being extracted locally. In 1952 it had yielded a value of 0.44% of Nitrogen, and yet the present Gh. D./3 lacks the characteristic scar on its crown.

A problem had been created with the corruption of Despott's molar nitrogen percentage, for its value, now transformed to 1.85% and made equivalent to the Neolithic period, automatically rendered as pre-Neolithic Caton Thompson's incisor, Ma. 1, and particularly Baldacchino's molar.[212] There was the tooth from the Hypogeum with a *nil* Nitrogen reading, which thus disturbed the Neolithic setting for the Hypogeum and cast it backward in time towards the middle Palaeolithic. No mention has ever been made of the Nitrogen results of Baldacchino's molar and the Hypogeum teeth, which latter are now lost, together with the overwhelming majority of the remains of an estimated 7,000 individuals discovered in the Hypogeum at the turn of the century.

Oakley's participation in the affair can be gauged from his publications. His *Frameworks for dating Fossil Man* was issued in three editions between 1964 and 1969. It is significant that in all these editions, including the last one, when all the chemical and radiometric tests had been carried out on Despott's molar, his comments related simply to Nitrogen analysis alone; no figure is given, and the "teeth" are ascribed to the Neolithic period.[213] The same applies to Oakley's *British Museum* publications, in 1971 and his last one in 1980;[214] he passed away a year later.[215]

Although no motives are evident for his involvement, it is ironic that the man who uncovered the archaeological hoax of the century should subsequently be dragged into the other side of the court in Malta's major archaeological fraud.

The Radiometric tests:

The Fluorine, Iron, Phosphate and Nitrogen analysis entail partial destruction of the specimen for the performance of the test. A better method which followed upon these in the early fifties was the Uranium Oxide technique. This substance is taken up by organic remains through the percolating ground water in the same way as fluorine, but it is thought that it replaces the calcium in the bone. The radioactivity can be scanned without destruction of the specimen and this conferred a definite advantage over fluorine which it eventually replaced. "Radiometric assays usually distinguish quite clearly between fossil and recently-intruded bones in Pleistocene gravels and sands."[216]

In living bone the uranium concentration is less than 0.1 ppm,[217] whereas the range in fossil bone lies between 1 and 1,000 ppm.[218] Levels of uranium oxide in ancient buried bone depend on the concentration of uranium oxide in the percolating water.[219] The content of both fluorine and uranium oxide in limestone caves such as Ghar Dalam is low, so that significant readings are reached with lower readings than average.[220] Besides, excessive amounts of these minerals, particularly fluorine, in the percolating ground water, would have rendered the test non-applicable.[221]

Zammit Maempel and Oakley shared a common interest in the folkloristic aspects of fossils, and during 1965-6 each published his own contribution in this field.[222] When Zammit Maempel was investigating the Pleistocene material at Mriehel in 1965, he co-ordinated with Oakley for the testing of his specimens of fossil fauna for relative dating.[223] In 1966 Zammit Maempel submitted samples from Mriehel and Ghar Dalam. The samples Ma. 12 to Ma. 25 were tested for nitrogen and uranium oxide; the three Malta samples for pig and horse (Ma. 30 to 32) were also tested for nitrogen and uranium oxide. These have registration numbers higher than the 1966 ones, and their R.A. numbers for uranium oxide is contemporaneous with Baldacchino's molar (1050-1055). The latter was submitted in August 1968.[224]

Uranium oxide testing had not been fully established as a routine procedure by the time that Despott's molar was being chemically tested in 1952.[225] Following on the 1966 samples,[226] Zammit Maempel resumed the connection two years later with London and Kenneth P. Oakley at the Natural History Museum. Oakley was again in Malta in 1968, and he asked for repeat testing of the taurodont molars by uranium oxide; the local authorities complied on condition that casts would be made of the 1917 taurodonts.[227]

Thus the uranium oxide content of Despott's molar was assessed in 1968,[228] in order to confirm or refute the 1952 chemical tests. A surprise was in store. The 1964 dating to the Neolithic in the *Scientific Report* could not be sustained in the face of the 13 p.p.m. reading; this was also the highest reading amongst the Ghar Dalam mammals, including the extinct hippo and red deer. Despott's molar was second only to the Miocene shark teeth, dated at over 5 million years B.P.[229] Arthur Keith had not been incorrect when he dated the taurodont molars to a very remote past. He had confined himself to Neanderthal man, and thus obliged himself to look for the associated assemblage of Mousterian implements.

The contemporaneity in antiquity between Man, red deer and hippopotamus in Malta is thus amply demonstrated by the chemical and radiometric carried out as relative dating procedures during 1952 and 1968. The range comprised the Uranium oxide, the Fluorine and Iron series, the Phosphate and Fluorine-phosphate ratio, and the Nitrogen results. These investigations are also confirmed stratigraphically by the presence of all three species in the same Deer layer of Ghar Dalam, and significantly through the reports of the first ever person to excavate the undisturbed Ghar Dalam horizons in 1865. Issel documented the presence of hearths and the burning of hippo bones in the Deer layer, where these bones were also fractured in order to extract the marrow. If the latter procedure could conceivably be carried out by fauna, the same cannot apply to the burning of the bones, presumably for cooking purposes.

The Maltese human remains in question were the taurodont molars and the various metacarpals and other teeth discovered in the Deer layer of Ghar Dalam. The cave is in limestone and the site is a closed one. The taurodont discovered by Despott was selected for testing, and in the light of Oakley's conclusions (1980), the Nitrogen test was, in retrospect, not a suitable investigation. On the other hand, the obvious scientific tests which were to be carried out were the Hydroxy-apatite replacement tests, namely the Fluorine assay and the Fluorine-Phosphate ratio in 1952, and the Uranium oxide assay after 1955, which was the year that it started to be available at the Natural History Museum in London.[230]

Despott's molar has survived to tell its tale. It is the only one among the Malta series to have been subjected to all three of the F-U-N assays.[231] Its fluorine and uranium oxide content ranks it contemporaneous with the fossil fauna of the Cervus layer. Its fluorine was also repeated and confirmed as giving the highest reading. So was its uranium oxide, its Iron uptake, fluorine-phosphate ratio and its phosphate loss. Even its Nitrogen percentage was way below 1.9%,[232] the figure approximated by Oakley to his Neolithic Coldrum skull from Kent's cavern. The corruption of its nitrogen result is exposed. The fossil fauna in the hippo layer have been dated by Electron Spin Resonance and Uranium Series Disequilibria to lie between 130,000 and 110,000 years before the present time, and one taurodont tooth at least has been proved to have been the property of a fossil hominid, possibly a Neanderthal human. Yet even if the hominid was not a Neanderthal, we can hardly refrain from justifying and vindicating Arthur Keith in his conviction about the great antiquity of this human Maltese, the earliest, for the time being, to have roamed the Maltese Islands.

Unchallenged by 1971, Evans repeats his allegations of 1959 in *The Prehistoric Antiquities of the Maltese Islands*, "the two taurodont molars can hardly be accepted as good evidence for the existence of man in the Maltese Islands in pre-Neolithic times.' [233] Besides, he added on further instances of gross misrepresentations.[234] In order to enhance his own "Stentinello hypothesis," he quotes from the discredited Vaufrey and Soos in preference to the renowned Bernabò Brea.

Colin Renfrew was in Malta as a student in 1959.[235] During the course of his field-work, he co-directed an archaeological expedition to the Cyclades with J.D. Evans in the mid-nineteen sixties.[236] In a series of publications in the seventies, Renfrew highlighted the revolution in the chronology of prehistoric Europe through calibrated radiocarbon dating. Renfrew crippled Evans' chronology and sequence for the prehistory of the Maltese islands. Renfrew also demonstrated that Evans' hypothesis for a "culture sweep" across the Mediterranean was not backed by convincing archaeological evidence. In defiance of the calibrated radiocarbon chronology for Malta's prehistory, Evans maintained his spiral analogies with Mycenae.

When the question of Malta's Phoenician ancestry was re-awakened by Mintoff and Gaddafi in 1979, fresh controversies made their appearance. The molars were reported missing the following year, together with other *African* memorabilia. There was a robbery reported at Ghar Dalam in April of 1980, and several museum items were taken, among which were the casts of the 1917 taurodont molars.[237]

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1 A recent report by the British palaeontologist, Brian Gardiner (Professor of Palaeontology at King's College, London), claims to have identified the hoaxer as Martin A. C. Hinton, a curator of Zoology of the Museum at the time (Linnean Society Meeting of the 24th of May 1996). At the meeting of the same Society on the 20 March 1997, the science historian from the American Museum of Natural History, Richard Milner produced the evidence to propose Sir Arthur Canon Doyle himself as the perpetrator of the hoax.

2 The British palaeontologist, Kenneth Page Oakley, of the Department of Natural History (British Museum), is particularly associated with the exposure of the Piltdown forgery through the series of chemical dating tests which he adapted for this particular exercise. He was in Malta on several occasions, on holiday, and as the guest of George Zammit Maempel, with whom he shared common scientific interests (pers. comm. Zammit Maempel, June 1995; NHM (BM) Archives: Oakley correspondence with de Gros Clarke).

3 Weiner 1980: 21, 30, 33; 36-41; 66-67.

4 Oakley 1964: 146-7; 1969: 340-1.

5 The volume in manuscript is to be found at the Palaeontology Section of the Department of Natural History (British Museum) in London.

6 Aitken 1990: 2.

[7] Aitken 1990: 219.

[8] Parkes 1986: 100; 123.

[9] Aitken 1990: 219.

[10] Protsch 1986: 3.

[11] Oakley 1980: 1.

[12] Oakley 1970: 40.

[13] Champion 1980: 51.

[14] Oakley 1970: 40.

[15] Stryer 1988: 270-1.

[16] Oakley 1970: 40.

[17] Protsch 1986: 9.

[18] Protsch 1986: 14.

[19] Oakley 1980: 3.

[20] Leute 1987: 96.

[21] Aitken 1990: 130.

[22] Leute 1987: 96.

[23] Diem and Lentner 1975: 521.

[24] Kierdorf *et al*. 1995: 299-302.

[25] The Natural History Museum is more correctly designated as the Museum of Natural History (British Museum).

[26] Diem and Lentner 1975: 521.

[27] Protsch 1986: 10.

[28] Oakley 1980: 1-2.

[29] Diem and Lentner 1975: 521.

[30] Bowen 1958: 47; Oakley 1970: 37.

[31] Oakley 1980: 2.

[32] Leute 1987: 96. Leute gives a table of values for the FUN tests in recent and old bone. Of necessity, a range is given for the Fluorine and Uranium Oxide accumulations with antiquity, for their upper limit is practically infinite. The 'maximum' for Nitrogen however is a Nil.

[33] Diem and Lentner 1975: 521.

[34] Thus Oakley takes the so-called Coldrum skull from Kent, with a nitrogen percentage reading of 1.9% as a representative of the Neolithic period. When he equated it with Despott's value, the figure of 1.85%, which was fabricated, approximated the Coldrum figure closely enough for a relative dating to the Neolithic period to be made.

[35] Bowen 1958: 40.

[36] Middleton 1844: 431-3.

[37] Bowen 1958: 40; Carnot 1893: 155-195.

[38] Cook and Heizer 1959: 109-115.

[39] Bowen 1958: 44-5; Cooke and Heizer 1947: 201-20.

[40] Davidson and Bowie 1955: 276-282.

[41] Bowen 1958: 46.

[42] Brothwell and Higgs 1970: 24.

[43] Bowen 1958: 40-7.

[44] Oakley 1970: 41.

[45] Bowen 1958: 41.

[46] Bowen 1958: 47.

[47] Oakley 1969: 340-1.

[48] Bone Analyses, Malta Samples, Ma. 27.

[49] BM-3015.

[50] Brothwell and Higgs 1970: 24.

[51] Knight and Lauder 1967: 205-8.

[52] Enzymes are substances which enhance a reaction, and proteolytic enzymes are substances which enhance the breakdown of proteins. Collagen is remarkably stable in the presence of some proteolytic enzymes (such as trypsin) which break up other proteins. Collagen is broken down by the enzyme collagenase, and this is produced only by a very few bacteria such as *Clostridium histolyticum*. These bacteria are not present in the same concentration in all soils, and there is no even distribution along the layers of deposits. The presence of unoxidised clay interferes with Clostridial action, and nitrogen is retained thereby.

The enzyme collagenase is paralyzed at very low temperatures; its function is related to the oxygen concentration in the environment. It operates best at a soil pH of 7-8, and it becomes less active at lower pH's until it is totally inactive below a pH of 4 - 5. The pH of the soil may vary in the same deposit.

[53] Garlick 1970: 503-9.

[54] Diem and Lentner 1975: 521.

[55] Bone Analyses, National History Museum, Am. 9 (human skull from Peru).

[56] Berger, Horney and Libby, 1964.

[57] Eastoe and Courts, 1963.

[58] Protsch 1986: 10.

[59] Diem and Lentner 1975: 521.

[60] Garlick 1970: 504, 507.

[61] The *Bone Analyses* manuscript, at the National History Museum, Department of Palaeontology, the Museum of Natural History in London.

[62] Bone Analyses, Malta Samples, Ma. 1.

[63] Records: Museum of Archaeology, Scientific Report, 1964.

[64] Garlick 1970: 508.

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[65] Thus a high Nitrogen percentage indicates one of three possible situations:

1. Conditions for collagen breakdown are satisfactory, but the sample is not ancient, so that collagen breakdown has not progressed substantially and a high percentage persists in the sample.
2. Conditions for collagen breakdown are not suitable, and the sample is not ancient anyway.
3. Conditions for collagen breakdown are not suitable, but the specimen is ancient. This state of affairs will be confirmed by fluorine and / or uranium oxide analysis.

[66] Bowen 1958: 46; Oakley 1970: 35-41.

[67] Oakley 1955: 254-265.

[68] In all three editions of *Frameworks for dating Fossil Man*, respectively in 1964, 1966 and 1969 (p. 341), Oakley mentions only the Nitrogen tests, with no results, but only the corrupt conclusion. Oakley also limits himself to the corrupted Nitrogen results in 1971: 264 and 1980: 43.

[69] Parkes 1986: 123.

[70] Parkes 1986: 125.

[71] The brackets denote the year of discovery.

[72] Oakley 1969: 340-1.

[73] Oakley 1980: 1.

[74] Oakley 1980: 11

[75] Oakley 1980: 10

[76] Oakley 1980: 12

[77] Oakley 1980: 9

[78] Oakley 1980: 10

[79] Oakley 1980: 20

[80] Oakley 1980: 51

[81] Oakley 1980: 3.

[82] Oakley 1980: 1-2.

[83] Oakley 1980: 9.

[84] Renfrew and Bahn 1996: 141, 204-6.

[85] Green *et al*. 1981: 707-13; Haddy and Hanson 1982: 37-44; Parkes 1986: 125.

[86] Garlick 1970: 503-512.

[87] Champion 1980: 51.

[88] Parkes 1986: 123, 125.

[89] Protsch1986: 9-10, 14.

[90] Leute1987: 96.

[91] Aitken1990: 130, 219.

[92] Wenke 1990: 57.

[93] Renfrew and Bahn 1996: 113-4.

[94] Schiavone 1992: 221; 237; 253.

[95] Oakley 1970: 40.

[96] At the time Dr. Baldacchino was Director of the Malta Museum of Archaeology.

[97] Initialled memo (J.G.B.) indicating the removal of a fragment from Despott's molar. Baldacchino's *factotum* at the time was C.G. Zammit, and it was he who sawed the fragment, 2mm by 4mm, off from the lower aspect of the molar. C.G. Zammit was aware that the fragment was for testing by Oakley, but no results ever reached him (pers. comm. 31/5/1997).

[98] Bone Analyses: Museum of Natural History, fol. 95-97; 105.

[99] Bone Analyses: Museum of Natural History, fol. 95, 105.

[100] Bone Analyses, fol. 105.

[101] Bone Analyses, fol. 95, 105.

[102] Bone Analyses fol. 105; the date cited is 20th June 1952.

[103] Bernabò Brea 1957: 17.

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[104] Segre, Biddittu and Piperno 1982; Fedele 1988: 68.

[105] Vide supra.

[106] Racheli 1979-86: 230-246.

[107] Vide supra.

[108] Evans 1953: 41. Dr. Bernabò Brea was born in 1910 in Genoa, and graduated in Archaeology in 1935 in Rome; this was followed by four years at the Italian school of Archaeology in Athens. He has held appointments in the National Museum of Toronto during 1938, the Superintendence for the Antiquities of Liguria (1939), the excavations of Arene Candida cave, and eventually in 1941 he was placed in charge of the Superintendence for the Antiquities of Eastern Sicily and of the National Museum of Archaeology at Syracuse, which he reorganized after the war. In 1948 he obtained his doctorate in Palaeolithic studies; he has maintained a special interest in the pre-history of Sicily and its inter-relationship with other Mediterranean sites. Since 1950 his activities have been concentrated on the Aeolian islands and the island of Lemnos (Bernabò Brea 1957: cover jacket).

[109] Bernabò Brea 1950: 19.

[110] Bernabò Brea 1957: 38.

[111] Bernabò Brea 1957. See also fig. 2 in Guilane 1979: 26.

[112] Manduca 1987: 78.

[113] Evans 1959: jacket.

[114] MAR 1955: ii, vi; Evans 1953: 41.

[115] Evans 1953: 41 fn*; Bernabò Brea 1960: 132.

[116] Evans 1971: 4.

[117] Evans 1959: jacket.

[118] Manduca 1987: 76; Evans 1959: jacket; MAR 1955: ii, vi. This was between the 1/10/52 and 12/5/55 (Aquilina 1970: 166), excluding a few months between July 1954 and January 1955 (MAR 1955: vi).

[119] Trump 1959: 3.

[120] Baldacchino and Dunbabin 1953; Baldacchino and Evans 1954.

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[121] Evans 1953: 41.

[122] Bernabò Brea 1950: 19.

[123] Evans 1953: 41.

[124] Bernabò Brea 1958: 21; Chilardi *et al*. 1996: 554-5.

[125] 1996: 555.

[126] Bernabò Brea 1958: 21.

[127] Evans 1953: 63.

[128] Evans 1953: 41, 93.

[129] Busuttil 1953: 78.

[130] Evans 1953: 41.

[131] Evans 1953: 19: 41-94.

[132] Fedele 1988: 72.

[133] Frendo 1993: 171.

[134] Radiocarbon 1986; Anati 1988: 88.

[135] Evans 1959: jacket.

[136] Evans 1960: 219.

[137] Evans 1953: 43.

[138] Evans 1953: 77.

[139] Evans 1959: 44.

[140] Bernabò Brea 1957: 38-41. Stentinello has been dated to 5,600-4,400 BC (Bahn 1992: 475).

[141] Bernabò Brea 1960: 133-136.

[142] Fedele 1988: 72.

[143] Bonanno 1986: 748-9.

[144] vols. xxi and xxii.

[145] MAR 1955: ii, vi.

[146] Evans 1956a: 5.

[147] Schiavone 1992: 268.

[148] Bone Analyses, fol. 105, note referring to 5/55 and dated 30th March 1955.

[149] MAR 1956: 1.

[150] (The 15th of November). MAR 58-9; Manduca 1987: 166.

[151] MAR 1959: 1; MAR 1961: 1.

[152] Manduca 1987: 76; Evans 1959: cover jacket.

[153] Evans 1956: 85.

[154] Trechmann 1938: 14.

[155] Bernabò Brea 1957: 28.

[156] Bernabò Brea 1958: 23.

[157] Bernabò Brea 1957: 28.

[158] Bernabò Brea 1958: 24.

[159] Evans 1959: 42-3.

[160] Bernabò Brea 1960: 132-7.

[161] Evans 1960: 218.

[162] Evans 1960: 220.

[163] Evans 1961: 143.

[164] BM - 100.

[165] Evans 1953: 78; 1961: 143.

[166] Renfrew 1972: fig. 1.

[167] Evans 1961: 144.

[168] Renfrew 1978: 98.

[169] Evans 1959: 36.

[170] Evans 1959: 39.

[171] Evans 1959: 32.

[172] Blouet 1965: 9.

[173] Trump 1966: 52.

[174] Mangion 1962: 309-312.

[175] Mangion 1962: 309-312.

[176] During the letter-debate on *The Malta Independent* in the early months of 1997, we contradicted John Samut-Tagliaferro, who was maintaining that the chemical tests had all been carried out in 1963. We were then unacquainted with a document, which has turned up since, and which confirms that three of these tests were in fact carried out in 1963. The chemical tests on Despott's molar had, however, been carried out in 1952, as we maintained.

[177] Personal communication from C.G. Zammit, video-taped interview, 31/5/1997; NHM 141/30: Oakley to Baldacchino 30/1/1963.

[178] Bone Analyses, fol. 95, 105.

[179] Bone Analyses, fol. 95, 105.

[180] The Elephant's origins are not European, but African and possibly Asian.

[181] Leute 1987: 96.

[182] Bone Analyses, Ma. 7, Ma. 33 and Ma 34.

[183] Mangion 1962: 309-311.

[184] Pers. comm. from the Dean of Dental Surgery, John Portelli, who was closely associated with Professor Mangion.

[185] Bone Analyses, fol. 105.

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[186] MAR 1964: 5.

[187] Oakley 1970: 38 (table A), 41 (table B), 42 (table C); (Nitrogen percentage 1.9%).

[188] Revised nitrogen percentage 1.85%. (Bone Analyses, fol. 95; 105).

[189] Oakley 1969: 341. The first edition was dated 1964.

[190] MAR 1964: 5. "Later than the material from the other prehistoric sites," i.e. Tarxien and Bahrija.

[191] Evans 1959: 42-3.

[192] Renfrew 1977: 615, 617.

[193] The report was anything but scientific, for it was not representing the original records of the NHM. The concept of importation of red deer to Malta by the Neolithic Sicilians is hardly worth considering, when these deer had previously crossed over in massive numbers by land to Malta without any human assistance.

[194] MAR 1964: 5.

[195] Bone Analyses, fol. 96.

[196] Evans 1959: 25.

[197] Evans 1959: 25.

[198] Evans 1959: 46-7.

[199] Renfrew 1978: 164-6.

[200] Evans 1971: 223-4; Renfrew 1978: 166.

[201] Trump 1990: 83.

[202] Bate 1937, vol. I.

[203] Herre 1970: 257-272.

[204] Herre 1970: 268-9.

[205] These specimens comprised two horse teeth and one pig incisor (Ghar Dalam Register, 4 and 5).

206 Colinvaux 1993: 339.

207 Spindler 1995: 229-231.

208 Despott 1918: 217. See also Caton Thompson 1923: 13; 1925: 17.

209 Bone Analyses: Malta samples.

210 Trump 1990: 83.

211 Zammit 1997: videotaped interview. C.G. Zammit could identify and confirm the photograph which was presented by John Samut-Tagliaferro in his talk to the Chamber of Scientists, on the 29/5/1997. The photograph in question had been recovered in the Museum basement a few days earlier, by John Samut-Tagliaferro and Nathaniel Cutajar. The teeth photographed included Rizzo's molar (1), a Neolithic tooth from Ghar Dalam (2), and a Neolithic tooth from the Hypogeum (3). John Samut-Tagliaferro suggested the identification of tooth number 2 in this photograph with Baldacchino's 1936 molar. This identification was not confirmed by myself (A.M.), Anthony Frendo, and Carmelo Caruana, and this on the basis of evident differences in the morphology of the crowns of the teeth being compared. John Samut-Tagliaferro further commented on C.G. Zammit's identification of the photograph as genuine, and as having existed in the Museum for several decades, and definitely prior to the 1950's. John Samut-Tagliaferro insisted on the identification with Baldacchino's molar, and maintained that there could not have been a switch of Gh. D./3, once the tooth had been photographed before its alleged switch between 1963 and 1968.

During a videotaped interview with C.G. Zammit two days later, the latter confirmed that the photograph had existed in the Museum when both his father Temi and Despott were still alive and active in the Museum. The photograph was probably taken by Despott himself. Both Despott and Temi Zammit died in 1936; Despott himself was *hors de combat* by 1930. Moreover C.G. Zammit further confirmed that the photograph has existed at least since 1926/27, during the transfer of the Museum collection from the Xara Palace (in Valletta) to the Auberge d'Italie. The photograph was therefore taken well before the tooth was discovered.

212 Baldacchino's molar was kept in a box of its own separate from Despott's and Rizzo's molars. It was replaced by a modern taurodont and labelled as Gh. D/3. The same could not be done to Despott's and Rizzo's for they had been studied, photographed and radiographed by several workers. However casts were ordered in August 1968, when Oakley asked for Baldacchino's molar for further tests. A *nil* reading of uranium oxide for Baldacchino's molar confirmed the switch for a modern tooth, and the casts permitted the display of a more uniformly shaded set of taurodont molars; the substituted molar tones well with the modern teeth rather than with the 1917 ones. In 1980 a 'surgical' theft was committed from the Ghar Dalam Museum, wherein the two taurodont molars were removed, together with other items associating Malta with an African origin of its fauna. There was in fact no theft at all, for the original and

the casts are still preserved at Ghar Dalam. And the Curator assures me that only one set of casts had been ordered for the taurodont molars.

[213] Oakley 1969: 341.

[214] Vide supra.

[215] Pers. comm. from Robert Kruszynski, Reader in Palaeontology, NHM.
[216] Oakley 1980: 9.

[217] For 'parts per million.'

[218] Aitken 1990: 130.

[219] Leute 1987: 96.

[220] Oakley 1970: 41, 43.

[221] Oakley 1980: 3.

[222] Oakley 1965: 9-16; 117-125; Zammit Maempel 1966: 220-1.

[223] Bone Analyses, Malta Samples, Ma. 14-20.

[224] Memo in Gh.D/3 box, Ghar Dalam Museum.

[225] Oakley 1980: 9, 53.

[226] Bone Analyses, Ma. 14-25.

[227] Pers. comm., Zammit Maempel, June 1995.

[228] The two taurodont molars were not examined concurrently for uranium oxide. Despott's was examined first, between 1966 and 1968, its R.A. number is 838. According to Zammit Maempel, three taurodont molars were handed over to Oakley, in August 1968, for dating and for the preparation of casts (pers. comm. Zammit Maempel, June 1995).

[229] Bone Analyses, fol. 96.

[230] Oakley 1980: 53.

[231] Bone Analyses: Malta series on folios 95-97 and105.

[232] Vide infra: table 1.

[233] Evans 1971: 19.

[234] For example, Caton Thompson's, Trechmann's and Keith's corral. Vide supra.

[235] National Geographic November 1977: 615.

[236] Renfrew 1978: 1. Colin Renfrew studied the natural sciences and archaeology at Cambridge, where he graduated with First Class Honours; at Cambridge he was President of the Union. He travelled widely, particularly in the Cycladic islands of Greece. Between 1965-8 he was Research Fellow at St. John's College, Cambridge, and lectured in European prehistory at the Universities of Sheffield and California. In 1969-70 he was field-director of the Anglo-American excavations in Greece, and during 1974-5 directed other important excavations at Melos. He was Professor of Archaeology at the University of Southampton, and is now Master of Jesus College, Cambridge and Disney Professor of Archaeology at Cambridge. His several literary contributions include the standard textbook which he co-authored with Paul Bahn, and *Before Civilization*. He was made Lord Renfrew of Kaimsthorn in 1991.

[237] Zammit Maempel 1989: 43, 62. It is remarkable that no attempt was made to remove Baldacchino's molar then, and this suggests a knowledge by the perpetrator of its substitution, and an ignorance of the replacement of the 1917 molars by casts. What is even more remarkable is that there was no robbery at all, for all three taurodonts and their casts have been retrieved by Zammit Maempel from the Museum of Natural History in Mdina. It is worthy of note that the latter had been relieved of his curatorship between 1977 and 1987.

PALAEOLITHIC CULTURE IN THE MALTESE ISLANDS

The evidence for a Pleistocene human presence in Malta has been available for several decades; it has so far not been recognised as such. The characteristics, chemical composition and radiometric status of the taurodont molars have provided the primary contribution. The identification of Maltese Palaeolithic tool technology and the relatively recent developments in art assessment have besides permitted the compilation of a more significant corpus of evidence in this direction.

Implementology

In the absence of corroborating evidence, the taurodont molars seemed to stand alone as the sole representatives of Maltese fossil man. The main objections to the latter's presence in Malta have been the absence of his culture in art forms and in the tool-making industry. Cave art has not been identified at Ghar Dalam[1], nor elsewhere in the various Maltese caverns, and Mousterian implements, which are usually associated with Neanderthal man, have not been registered as such in the Maltese Islands.[2]

Arthur Keith had been too specific when he assigned the source of the taurodonts to Neanderthal man. This type of molar tooth is not restricted to this category of humans alone, for it has since been also described with an increased frequency in several other species of early human forms. Among the latter it has been reported not only in the late Pleistocene hominids such as Upper Cave and Broken Hill *H. erectus*, but also in the middle Pleistocene hominids such as *Sinjanthropus pekinensis H. erectus*, Heidelherg *H. erectus*, Temara *H. erectus*, Ternefine *H. erectus* and *H. sapiens Steinheimensis*.[3] The Mousterian tool assemblage is therefore not a crucial requisite for the establishment of a Palaeolithic human presence in Malta; it was definitely not the only type of Palaeolithic tool repertoire.

The earliest tools so far identified date back to approximately two million years ago. These were essentially the core tools, which basically comprised a modified core of suitable siliceous stone such as flint or chert. This modification entailed the provision of a sharp edge through the knocking of flakes off the flint core, thus enabling the latter to be utilized as a cutting, boring, chopping or scraping instrument.[4] Thus the Palaeolithic period was also known as the age of 'simply worked stone.'[5]

The first major development in Palaeolithic implementology involved the utilisation of the individual flakes rather than the core. Instead of striking off a flake to fashion a core tool, the flake itself was fashioned into the desired tool shape before being struck, knapped, or knocked off the core. This technique was economical on the raw material (flint and other siliceous stones), and was the predominant style during the Middle Palaeolithic, from approximately 200,000 to 85,000 BP.[6] The two principal methods involved were the Levallois and the Mousterian; the former technique obtained the larger implements up to six inches in length, whilst the latter produced the greatest number of flake implements possible from a given core.[7] The Mousterian repertoire was typically associated with Neanderthal man.

The Upper Palaeolithic tools followed and were derived from the Middle Palaeolithic flake tool technology; the flakes were now obtained through indirect percussion of the core rather than by a direct hammer blow. Thin blades with parallel surfaces were thus obtained.[8] The transition from the Middle to the Upper Palaeolithic technology was gradual and was probably complete by 40,000 BP.[9] Several types of specialised blades and smaller variants known as bladelets with various functions are characteristic of the Upper Palaeolithic.[10]

Towards the end of this period, during the Magdalenian, the smaller flake tools known as microliths made their appearance.[11] This feature is also particularly characteristic of the tool industries of certain Palaeolithic sites of northwestern Sicily and the Egadi Islands.[12] Thus the trend towards progressive diminution in size is further manifest,[13] just before the style changes significantly to the newer Mesolithic and subsequent Neolithic method of finishing off the instrument through grinding into a polished product.[14] Greenstone and other finer grained igneous rocks were now preferred to flint and chert,[15] and this grinding of the stone tool was effected initially by rubbing the implement against gritty rock; further rubbing against a finer stone followed. The Neolithic technique ensured a tool with a better performance and longer durability.[16] Thus the Palaeolithic age is represented by chipped stone tools, whilst the Neolithic is characterised by the polished variety.[17]

Stone is durable and can last practically forever. On the other hand most materials utilised by Palaeolithic man were perishable objects such as wood, bark, leather and horn; antler and bone lasted significantly longer in an alkaline medium;[18] these would not all have survived the several millennia which have elapsed since the Palaeolithic period. Besides, some fossil men had one tool incorporated into their jaw anatomy. A substantial proportion of the initial controversy on the taurodont molars of Ghar Dalam hinged upon the definition of the condition. As initially described by Keith, taurodontism strictly refers to an enlarged tooth with an enlarged pulp cavity replacing the roots and an absent waist line. Thus a significant proportion of the body of the taurodont tooth lies below the alveolar margin; the body of the tooth is firmly anchored into the jaw. An appreciable amount of hard chewing was permissible, including a significant side to side action. This function facilitated the possibility of using these molars to process hard material such as leather skins for clothing. In fact the taurodont tooth itself is an essential component in fossil man's tool kit.[19]

Teeth are not the only implements that are taken for granted or ignored as such. The abundant presence of fossilized shark teeth in the greensand layers of Malta would have rendered the manufacture of implements superfluous. These fossils have been available since the Maltese Islands were lifted up from the sea five and a half million years ago, and they have been utilised as tools by Maltese humans at least until the Neolithic period. At this time implements more refined than the Palaeolithic set were available, and yet fossil shark teeth were still sought after. Besides Ghar Dalam, they were also discovered in the cultural horizons of other archaeological sites such as Kordin, Qortin l-Imdawwar and Ta’ Hagrat. The fossil is not naturally available at Ghar Dalam.[20] Shark teeth are still used today as tools in isolated communities such as Easter Island[21] and in primitive societies, and so are shells.[22] Shells were also included among the finds in the Pleistocene horizons.

A hand-held shark tooth fulfils the function of serrated blade, scraper and borer quite adequately, and evidence for this form of utilization has been identified in the deer horizon of Ghar Dalam.[23] One shark tooth had had its point fractured through usage in this manner, and it lay in the same horizon where the intact upper parts of elephant were found in an anatomically preserved condition.[24] This situation, together with the stone implement discovered by Leith Adams,[25] tends to favour the other hypothesis of Keith’s regarding the hunting of Pleistocene mammals by Maltese Palaeolithic man. In Europe the latter hunted their cold-tolerant equivalents, the horse, reindeer and mammoth.[26] Besides hunting, a fossil human being armed with a shark tooth and his taurodont molars would have handled the working of leather most satisfactorily.[27]

Contemporaneity of Maltese humans and pachyderms during the upper Palaeolithic has been indicated further in Despott's other trenches,[28] and renowned biogeographers such as Schüle[29] have actually attributed a human presence to the extinction of elephant and hippo in the Maltese islands.

The use of fire at this time has been demonstrated as well. The pioneering excavation of Arturo Issel in 1865 had in fact revealed the presence of burnt bones of mammals at a depth of 60 centimetres from the cave floor; two of these bones were the metatarsals of hippo, the remainder belonging to small herbivores. The ashes were still there, and most of the bones had been split open to extract the marrow.[30] The fractures in the bones contra-indicates their possible use as fuel.

Although an absence of the actual tools is often quoted in confrontation of Keith's hypothesis, this is not altogether correct. The scattered tool repertoire has already been identified as being Palaeolithic in nature, by such local experts in the field as A.A. Caruana, Themistocles Zammit, Carmelo Rizzo, C.T. Trechmann, John Davy and J.D. Evans.[31]

Perhaps the earliest Palaeolithic tool discovered in Malta was that by the British scholar, John Hookham Frere in 1836, at a time when the discipline of assessment and awareness of such implementology was still unborn, and when the advancement of Palaeolithic man was still being considered a threat to the Genesis tradition. John Hookham was 67 when he discovered the stone implement in the garden of his house in Gwardamangia. His own father had been a pioneer of Palaeolithic implementology in Britain at the close of the century, and his discoveries at the time had started to modify public opinion about the presence of humans before Adam.[32] John Hookham was then 28, but his father's memory must have clung to him in a way which made him confirm his own discovery with his good friend in Malta, Dr. John Davy, then Head of the Army Medical Corps.[33] Dr. Davy, brother of the renowned Sir Humphry, was also a geologist,[34] with scientific leanings,[35] and his opinion of the stone was unambiguous. The tool in question lay in a Pleistocene deposit, and Frere's description of it ran as follows:

> "It was hard and heavy, measuring four inches in length and two and a half in width; it was irregularly fractured at the back and at the edges, but on the other and larger side it was reduced to a smooth surface, that is to say smooth, *with the exception of the traces of the instrument which had been employed for the purpose of giving it an even surface. These traces are very distinctly observable upon it.* The stone like many others which were found embedded in the same clay, was covered with a black fuliginous varnish, a mark of authenticity, which if I had had any suspicion of the good faith of the workmen, would have been sufficient to remove it."[36]

According to Dr. Davy, it had the "*form and appearance which clearly indicated that it had been fashioned by the hand of man*.[37] The unexplained loss of this specimen is deplorable.

Another suspiciously Palaeolithic implement was discovered by Leith Adams whilst he was engaged in digging at Benghajsa Gap together with his friend Captain Swann.[38] Amidst elephant remains they lifted a "triangular and awl pointed fragment of the calcareous sandstone (globigerina limestone) thickly encrusted with stalagmite, which, when removed displayed a flat, even surface gradually tapering at one end to a curved point, - such as tool as might have been useful to a primitive race in making holes; but as it bore no traces of chipping, and assimilated closely to many other water worn stones in the gap, I finally rejected it."[39] (Leith Adams was a brilliant naturalist, but his expertise in prehistoric implementology is not accredited in any way). To which course of action a friend remarked that "Some future palaeontologist may be more fortunate than you have been, and not only establish man's presence there, but also show that he rode the donkey elephants."[40]

In 1892 John Cooke unearthed a stone implement in the undisturbed Deer horizon of his Trench VI; a human metacarpal lay in the same horizon of his Trench IV.[41] The tool

> "was nearly rhomboidal in section, its diameters measuring respectively two inches and 1.5 inches; and the length of its cutting edge 1.5 inches. It had been fashioned out of a piece of black crystalline limestone, a compact, close textured variety of the Lower Coralline Limestone ... the heaviest, and most compact of the Maltese rocks."

When inspected by Dr. A. A. Caruana he was "of the opinion that it has *undoubtedly been fashioned by man*." It lay 2 feet 3 inches below the surface, underlying the pottery horizon and overlying the remains of red deer, brown bear and hippopotamus.[42]

During his various excavation projects in Ghar Dalam, Despott discovered several knives, scrapers, borers and burins in previously undisturbed deposits, and although stratigraphically Pleistocene,[43] they have been arbitrarily attributed to the Neolithic. Rizzo,[44] Trechmann,[45] and Evans himself[46] had in fact identified several of these tools picked up at Ghar Dalam as Palaeolithic. Caton Thompson's table further confirms the stratigraphic contemporaneity of these tools within the Deer horizon of Despott's trenches.[47]

Flint is not found in the Maltese geological strata, and the material has to be imported. If imported by Neolithic humans, the flint implements would also have been of Neolithic style rather than of a Palaeolithic technology.

Besides, the morphology of those implements which lay in the Pleistocene horizon conforms to the Upper Palaeolithic flake technologies rather than the Neolithic ones; they have been manufactured by flaking and do not possess a polished finish characteristic of the Neolithic.[48] They comprise mainly blades, scrapers, burins and borers;[49] they are reconcilable with a hunter-gatherer society rather than a farming one. Their purpose in utilization was for hunting, fishing and gathering, rather than for agriculture and herding.

By way of illustration, the flint knife discovered by Despott in 1916[50] has been manufactured through a particular technique of the Upper Palaeolithic where the flake has been knapped off a flint core at a point lying between two parallel vertical ridges; in section this blade will have a trapezoidal appearance.[51] On the other hand Despott's chert and black flint knives[52] have a triangular section and were obtained through a similar process, with the indirect strike hitting a point on the core just above a vertical ridge.[53] These blades were recovered from the Deer layer, in association with the remains of red deer, hippopotamus and elephant; the absence of pottery in the stratum confirms their pre-Neolithic provenance.

The obsidian[54] and flint scrapers in Trench II[55] and the flint knife and burin in the Middle Trench[56] are smaller than two inches in average diameter and represent the microlithic group with geometric shapes which are typically associated with the Magdalenian and later Mesolithic periods in

Europe,[57] but with the upper Palaeolithic in the northwestern Sicilan sites.[58] The chert scraper on the same plate[59] is fractured or truncated at the bottom end and it represents an earlier than Upper Palaeolithic technology. This is further borne out by the instance that these implements as outlined above had all been published *ab initio*, and yet have not been included in the Gozo Exhibition among the *Neolithic* assembly of prehistoric Maltese tools, whereas those which have derived from acknowledged Neolithic sites such as Hagar Qim have been assumed to be Neolithic and arbitrarily included as such.[60] The technology of several of these is however Palaeolithic in nature. The Hagar Qim collection features a total of 26 flint implements[61] which all manifest Palaeolithic features. They are illustrated in Zammit's *The Valletta Museum*,[62] but have since gone missing. The implements comprised blades and bladelets, microliths, scrapers and burins, all datable to the Upper Palaeolithic.[63] Here again the *terminus ante quem* Carbon-14 dates given for these sites such as Hagar Qim are of *before* such and such a year in the Neolithic; whether this period was a year or several centuries cannot be established by the Carbon-14 date alone.[64] The most logical explanation is successive utilisation of such sites initially by Palaeolithic and subsequently by Neolithic Maltese.

The repertoire of Maltese prehistoric implements as reviewed by Evans includes a typically Palaeolithic assemblage of rough flakes of flint in the form of end, side and discoid scrapers, with cultural retouching of the finer blades. Also included are the blades which are trapezoidal in section, and significantly 'some of the ogival retouched blades are curiously reminiscent of Mousterian types.'[65] Thus Evans in 1953 is supporting, inadvertently perhaps, the presence of Neanderthal man in Malta. He also described the very small tools characteristic of the microlithic industry which initiated in the Magdalenian. Among the arrowheads, Evans concluded that 'none can be assigned with certainty to Period 1 of the Neolithic;' the inference is that these were pre-Neolithic not later than Period 1, for, although prehistoric, they were not included in the later periods of the Neolithic. Evans also included the pierced canine teeth of animals as pendants, besides shells and beads; these items of human decoration were features of the Palaeolithic period.[66]

The recent publication of Maltese prehistoric implements in private hands includes several referable to the Upper Palaeolithic in technology and utilisation; these include several arrowheads, a blade knife and a flake four-pointed implement.[67] Amongst these prehistoric tools in Maltese private collections, the burin depicted in the upper section of Plate 6 is typically Magdalenian, whilst that in the lower section is a multiple dihedral burin, also typical of the Upper Palaeolithic.[68] The flint knife in Plate 7 and the arrowheads in Plates 5 and 9 lack the polished lustre finish typical of the Neolithic. The bluish four-pointed tool in Plate 8 represents a multi-purpose prepared flake nucleus,[69] retouched at two adjacent points and truncated on the remaining two to permit a comfortable hand grip; it served both as scraper and burin and it is typically earlier than Upper Palaeolithic in its technology.[70]

At the time that Despott and Keith first suggested the presence of Palaeolithic Maltese human beings, the director of Museums himself, Sir Themistocles Zammit pointed out various other pieces of evidence in favour of a Palaeolithic presence in the Maltese Islands, such as the collection of microliths discovered at Dingli in 1917, then attributable to 12,000 B.C.,[71] and the Hagar Qim collection.[72] The use of red ochre on sites without pottery was another significant observation.[73] Another collection of microliths from Ghar Dalam is still available with the Curator there. These microliths range in size from a half to two inches; they first appeared during the Magdalenean, and perhaps earlier on in the Upper Palaeolithic.[74] The presence of such microliths is further compelling evidence for the Palaeolithic presence in Malta, for they bear strong analogies to the Palaeolithic sites in Sicily at Levanzo, Termini Imerese, Addaura, San Corrado, San Teodoro and Mangiapane, where the microlithic industry prevailed during the Upper Palaeolithic.[75] The distribution of these microlith repertoires in Levanzo, northwestern Sicily and Malta strongly suggest a northwestern source.

The recently displayed archaeological collection at the Neolithic exhibition in Gozo includes at least three examples of Palaeolithic tools, specimens 05, 06 and 09,[76] with striking analogies to North African Aterian ones.

Palaeolithic Art

The absence of Palaeolithic art was the other silent argument advanced against Keith's hypothesis for the presence of Palaeolithic man in Malta; besides implementology, art constituted the other major feature which characterised the Upper Palaeolithic. It assumed a variety of forms including the 'Venuses' or female figurines in stone and clay, personal ornamentation with pierced shells and carnivore teeth, ochre burials, and in particular drawings on rock or portable materials through the processes of engraving, bas reliefs and painting.[77] If the Palaeolithic peoples produced a crude tool technology, their mural art was true art, and represents the most spectacular achievement of this period; most of this cave art is considered to be Magdalenian.[78]

The colours used by the Palaeolithic artists were the reds, blacks, yellow and browns obtained from ochres and other naturally occurring minerals in the cave.[79] White was used on rare occasions.[80] The iron oxides were found as ochre, and from these were derived the red, brown and yellow paints. Manganese dioxide and charcoal were utilized for black. These were pulverized and mixed with water, "extenders" for durability, and a binder which permitted a better adherence to the rocky surface.[81] Cave water is rich in calcium carbonate and is a very good fixer and preservative.[82] The water colour thus produced penetrated into the rocky surface which constituted the artist's panel.[83] The paint was applied by the fingers or sprayed on to the wall through a tube; brushes were also used for its application.[84] The minerals utilized in the pigments were usually mixed together to obtain the desired tone of colour. Iron oxide (haematite) was used for reds and yellows.[85] Yellow ochre oxidises at a temperature above 250 degrees Celsius, and turns red as it is oxidised into haematite.[86] Manganese dioxide and charcoal were used for blacks, and porcelin clay for white; these would be added on to silicone oxide[87] in the form of powdered quartz.[88] A typical red pigment would contain 70% haematite, 20% clay and 5% silicon oxide in the form of quartz; a black pigment would contain 40% calcium phosphate, 25% silicon oxide and 15% manganese dioxide. Although the element for the blacks was typically manganese dioxide,[89] charcoal was used at some sites such as Niaux.[90]

The nine-year old Maria Sanz de Sautuola sparked off Cave art in 1879[91] with her discovery of the painted cave ceilings at Altamira, which ironically does not represent the earliest forms of Palaeolithic art.[92] These were cruder and were executed as simple outlines in black manganese dioxide or charcoal paint, and in engraved or sculpted figures. Even earlier are the handprints, which together with the 'Venuses' represent two of the earliest manifestations of Palaeolithic art.[93]

The Maltese and Egadi islands were contained into the Sicilian landmass during the glacial periods of the Ice Age. Upper Palaeolithic cultures in art and implementology have been established both in Sicily and the Egadi islands. In Sicily the main sites discovered so far lie on the North-west.[94] On the Egadi Islands, the sites are the islands of Favignana and Levanzo.[95] Marettimo is too far offshore, and its seabed is too deep for any Pleistocene landbridges to have been present. The other island in the group, the isle of Formica, has not been adequately studied; it is utilised today as a centre for drug addicts.

The presence of Neolithic artefacts at any given site does not preclude the earlier utilisation of the same site in the Palaeolithic period. The converse is rather the case, since choice sites are utilised again and again through successive generations and cultures. Tas-Silg is a clear example in the Maltese islands.

One site which manifests both Palaeolithic and Neolithic art representations is the Grotta del Genovese in Levanzo, a 5 by 2 km island of the Egadi archipelago;[96] it lies 15 km west of Trapani, with which it communicates through a shallow seabed less than a 100 metres in depth. A landbridge therefore effected a communication during the glacial periods of the Ice Age, particularly during the Würm, with its maximum at 18,000 BP. The Grotta lies along the western coastline at an altitude of 30 metres above sea level. Access to the cave from the ferry quay, Cala Dogana, is only feasible on a donkey's back. Costiglione Natale operates the service together with his twenty-year old son. For 10,000 liri for each rider, the string of donkeys leaves sharply at 11.00 am local time, and the cavern is reached three quarters of an hour later. The width of the cavern is approximately 12 metres, and the inner recess containing the images is guarded by a metal gate. During the hour permitted, and through the use of artificial light, the repertoire of 80 monochromatic Neolithic paintings can be viewed, together with the engraved outlines of deer and oxen representing the Palaeolithic forms. The star of the show is the engraved young deer, in profile but for the face, measuring approximately one and a half feet and lying at eye level.

In view of such definite evidence for the presence of man in Sicily and its offshore islands to the west during the Ice Age, the logical conclusion is that an Upper Palaeolithic presence was also manifest in the regions of the

Pleistocene Sicilian landmass which benefited mostly the cold-intolerant and warmth-loving creatures, namely in the Maltese Islands to the South.

There were three main groups of Palaeolithic art, and they principally appeared during the Upper Palaeolithic, especially the Solutrean and the Magdalenian phases.[97] The Upper Palaeolithic may have started as early as 38,000 BC,[98] which is the earliest date normally attributed to this art. Earlier dates than this have also been proposed,[99] with Neanderthals being considered as the first human artists; the prejudice against the possible African origins of mankind and his culture is held to account for the rejection of this hypothesis.[100]

The first main group of Palaeolithic art forms comprised the mobiliary or portable art forms which varied from engravings on stones to carvings on antler or ivory. In the southwest of France in particular there are representations of the second main group of Palaeolithic art in the form of deep engravings or bas reliefs on large blocks of stones.[101] Bas reliefs were a feature of the Solutrean;[102] "large scale bas reliefs ... such as the ibex at Roc de Sers, and bovid pair at Fourneau du Diable can be reliably included in the late Solutrean cultural province."[103] Cave art proper represents the third group and is to be found mainly in Spain, France and Italy; the greatest concentration of Palaeolithic art lies in the fertile Franco-Cantabrian region, that is, in southwest France and Spain north of the Cantabrian mountain range.[104] It is, however, known in outlying districts such as Portugal, Greece and the Urals, and also on other continents.[105]

Apart from this general classification of Palaeolithic art into three main groups, various forms were manifest. Besides engravings, bas relief sculptures and paintings, the technique of positive and negative finger markings was one of the first to be utilised. Although a few are present in open air sites, the vast majority are to be found in the innermost and most inaccessible recesses of deep natural caverns.[106] The distribution of Palaeolithic art forms in general and that of handprints in particular are identical, which tends to enhance the incorporation of the latter as an integral part of the former.[107] Both footprints and handprints (in positive and negative) are considered to represent one of the earliest forms of Palaeolithic art.[108] The handprints in Cosquer cave at Cap Morgiou, for example, are attributed to 25,000 BC.[109]

The Palaeolithic artists depicted the animals in their environment: horses, bison, aurochs, reindeer and ibex roamed the plains of France and Spain. The painted wall art consisted mainly of large mammals, though carnivores were rarely represented, except as canine teeth pendants.[110] Thus the animal figures predominantly depict the larger herbivores, and particularly those which were hunted in the late Pleistocene. These included the mammoth, elephant, horse, ox, deer and bison-bulls; a high percentage of these were represented by the horse and the bovids, whether these were bulls, cows or bison.[111] Superimposition of images is a characteristic feature of Palaeolithic art.[112]

Other forms depicted were the ideograms, symbols or the non-figurative signs and motifs, which are very commonly associated with the other forms in a particular repertoire.[113] These symbols include the repetitive and often-repeated forms of particular shapes which are regionally distributed and differ from one locality to another.[114] They may therefore represent ethnic markers;[115] their significance also appears to be chronological and geographical.[116] These stylised figures are typical of the early Magdalenian, and are usually engraved or painted, such as in the form of dots or bars, upon the walls of deep caverns.[117]

Yet another form of Palaeolithic figures are the anthropozoomorphic ones, the so-called *sorcerers*, which are rare but typically diagnostic of Palaeolithic art; these are represented by figures combining human and animal features in one body.[118] The purely human form is rare and is crudely depicted;[119] it is rather a feature by far commoner in the Neolithic period.[120]

The Palaeolithic cave paintings themselves seem to be isolated in time, for they are typically absent earlier in the Middle Palaeolithic[121] and in the following Mesolithic period;[122] the latter manifests a geographical variation and represents the transitional zone in time between the Palaeolithic and the Neolithic phases of the Stone Age. The paintings appear once again in the Neolithic period in another form.

Neolithic art started off in post-glacial times in Central Spain and the Iberian Levant facing North Africa, with which it is strongly linked in this regard. It manifests significant differences from the Palaeolithic art forms which originated north of the Cantabrian chain. Neolithic art tends to be present nearer to the cave entrances rather than the deep uninviting interior,[123] and priority is given to human activity in gestures and scenery (battle scenes, ceremonies, hunting) rather than to the exclusive outline of the hunted animals themselves, with or without the weapons which have wounded them.[124] Conspicuous by their absence in Palaeolithic art are the landscapes and naturalistic scenes.[125] The fauna depicted in Neolithic designs are naturally lacking in Pleistocene species.

Identification and interpretation of Palaeolithic art forms:

Although the meaning of the figures, including the most abstract, was evident to the Palaeolithic artist,[126] their identification today presents problems which require a high level of objectivity. The identification and interpretation given by the early researchers is eventually challenged by later ones. [127] "In the past we have tried to run before we can walk."[128] "*A priori* assumptions and pre-suppositions" lead to wrong interpretations; "once proposed these identifications are eventually accepted through usage in the secondary literature."[129] Interpretations prior to 1964 require a re-assessment in view of recent developments.[130]

Although prehistoric cave art paintings have long been discovered, particularly in the Franco-Cantabrian region, the serious consideration of their significance was first pioneered in the middle of this century. The Abbe Henri Breuil (1877-1971) copied, recorded and studied the styles and techniques involved;[131] he designed an assessment scale extending from the Aurignacian to the Magdalenian, and this on the basis of stylistic criteria. Breuil thus analysed the techniques rather than the subjects depicted.[132] Four basic styles were presented and each in succession was assigned a chronological period; these have been conveniently summarized by Lawson. Style I is Aurignacian and dates from 30,000 BC; it comprises decorated stone blocks in daylit areas of caves. The subjects included anthropozoomorphic figures and female sexual symbols. Style II starts off at 25,000 BC and includes the 'Venus' figurines. Animal figures are drawn with a strong curved line for the neck and back, with horns and antlers shown in profile. Large herbivores were represented with a strong arch to the dorsal line in Style III, and this feature is dated to have started around 17,000 BC. The perspective is still inaccurate and the body parts lack proportion. The fourth style was initiated around 13,000 BC, and its main differentiating features are accuracy and the use of polychrome for the painting, which was also more proportioned in its component body parts and also conveyed a sense of movement in the animal.[133]

Rather than study the techniques involved, as Breuil did before him, Andre Leroi-Gourhan (1912-1986) was inspired by Annette Laming-Emperaire,[134] with whom he emphasized a social context in the interpretation of Paleolithic art.[135] Leroi-Gourhan considered the paintings as compositions with a basic thematic unity, rather than as random collections of depictions; he analysed their positions and associations.[136] Horses and bovids comprised the majority of the drawings (60%) and tended to be concentrated in the centre panels of the caverns; ibex, mammoth and deer occupied the peripheral areas, whilst the dangerous animals were confined to the inner cavern recesses.[137] Leroi-Gourhan analysed a database of the individual subjects depicted and presented the classical chronological system for their evaluation. He grouped Styles I and II into one Primitive period; this was followed by the Archaic and finally by the Classic period. According to Leroi-Gourhan, there was a linear evolution in art, from a simple to a complex form. Although Ucko (1987) opposed this hypothesis, the Dellucs (1991) supported Leroi-Gourhan. According to the theory of linear evolution, the Aurignacians' art consisted of scribbles, whilst the Gravettians expressed animal art of an elementary nature, which gradually evolved into an analytical one. The earlier drawings represented animals with poor silhouettes; their attitude was frozen and they lacked animation in the Aurignacian drawings.[138] The fauna represented included rhinoceros and bear only in the Aurignacian; cervids were absent, though vulvaes were numerous.[139] The Gravettians manifested a trace of animation, but there was still no differentiation of foreground from the background before the Solutrean. Neither was there any perspective or infill of the drawings. Aurignacian shelters were commonly covered in red paint; this served as a coloured background before the drawing.[140] Whilst mammoths were very commonly engraved, bison, reindeer, aurochs and megaloceros were painted in black.[141]

Lorblanchet's chronological sequence of Palaeolithic art patterns defines the earliest human representations as handprints and motifs of genital organs, which are generally simplified and reduced to geometric signs. Animalization of the human shape followed on in the Solutrean and Magdalenian, and hybrid figures made their appearance at this stage. Palaeolithic art moved in graphic continuity through the successive stages of dot, outline and profile; partial outlines were often limited to fragments of the animal body or to its dorsal line. The anthropozoomorphic figures derived from the intermediate animals made up of fragmented human and animal parts.[142]

In recent years Jean Clottes (1996) has concentrated on the thematic evolution of these paintings and has thrown the clock backward on the earliest designs by several millennia. Clottes considers "themes more fundamental than conventions in drawing."[143] During the early Upper Palaeolithic, the Perigord, sexual representations, particularly vulvas were common in rock shelters. Also common were cupules, and simple geometric signs, dots or small rods. Live humans are not depicted, whilst the anthropozoomorphic representation, half-man half-beast, were early features. The fauna represented were bison, horses, aurochs, cervids and ibex.[144] Dangerous animals were common in the Aurignacian, and the transition to the depiction of prey animals was apparent at the start of the Gravettian.[145]

The Pyrenees and Spain lack Aurignacian parietal art,[146] whilst the East lacks Palaeolithic decorated caves altogether.[147] Palaeolithic clay works are limited to the Pyrenees; these have survived in the depths of caverns. On the other hand, parietal sculptures are restricted to French sites such as the Perigord, where the limestone is easily worked into shape; the location of these art forms is always in illuminated areas.[148] The bas relief of the Laussel woman holding a horn is universally quoted as one of the earliest forms of Palaeolithic art. It is carved on a large block of stone measuring 4 cubic metres, and lying in front of a rock shelter. Also at Dordogne, at the Palaeolithic site of Fourneau du Diable, a bull and cow have been depicted in bas relief on a block of half a cubic metre. Other blocks of stone with bas reliefs at Roc de Sers are laid out in a semi-circle.[149]

In contrast to Clottes' *thematic* sequence, Funk and Wagnalls Corporation have included a Palaeolithic Art scheme on Internet 1996. This is in the form of a chronology sequence once again based on art *form.* According to Funk and Wagnalls, the earliest manifestation of Palaeolithic art took the form of small incised mobiliary art forms and handprints.[150] Mainly in the East, sculptural elements followed both in the form of animal statuettes as well as 'Venus' figurines; these elements represented the persistent concern for food and fertility. In the West this period in time is represented by the graphic forms of cave art depicting prey animals. The final phases of Palaeolithic art repertoires is represented by rock engravings, commonly in open spaces, and distributed over an area extending from Southern Spain, North Africa and the Middle East.[151]

The dating of these paintings is logically considered to be contemporary with the fauna depicted - "the hunters of the Upper Palaeolithic depicted the animals of their environment." Extinct Pleistocene forms or species which have moved elsewhere after the Ice Age thus point to Pleistocene artists.[152] Modern forgeries are definitely dismissed if either one of two conditions apply; submergence under water, which may be partial or complete, and covering of the drawings with stalagmitic encrustations rule out this possibility.[153] Actual dating of the paintings themselves is resorted to at times, although specimens in the same horizon are normally tested as a routine, through radioactive isotopes,[154] by Carbon-14 for the 30,000 to 40,000 BP period, and by Potassium Argon for periods beyond this date.[155] Recent techniques are being refined to carbon-date the microbes trapped beneath the paint varnish.[156]

"The births of art were, no doubt, the fruit of the mental development of *Homo sapiens sapiens*, endowed with new faculties of synthesis and abstraction."[157] The interpretation of these forms and figures is a controversial issue which is hotly debated; their inaccessibility and the superimposition of images preclude a decorative function.[158] The early interpretations of them as symbolizing hunting magic are no longer widely accepted.[159] Bronowski translates the concept of magic into a *power* of anticipation, which would be experienced by the hunter before coming face to face with the real animal.[160] Pfeiffer (1983) suggests the awe-inspiring and dramatic effects on the beholders when the depictions are viewed by torchlight. Some authors attribute a totemistic function whilst others interpret the figures as male and female symbols.[161] A relatively recent hypothesis attributing some of the depictions to the effects of trance states finds its analogy in some modern primitive societies.[162] As Ucko and Rosenfeld (1967) suggested three decades ago, there is no single cause but a multitude. Present research includes the study of wall configuration and their adaptation to the drawings, and to the significance of human voice resonance,[163] a feature which immediately brings to mind the Oracle room of the Hypogeum.

The climates of Europe were acquired in the Mesolithic period which followed upon the end of the Ice Age. The Arctic zone lay north of Helsinki and the art styles in these regions persisted along the lines of the Upper Palaeolithic. South of this zone however, the Palaeolithic art styles disappeared during the Mesolithic, except for the working of bone, wood and decorated pebbles. Weaving and pottery were introduced, and eventually the megalith made its significant debut.[164]

Palaeolithic art in the Maltese Islands:

Through the developments in the interpretation of prehistoric art over the last few decades, windows of opportunity have been opened up for the further assessment of the artistic repertoire available in the form of cave art within the Maltese archipelago. Caverns have been utilized by early man as living areas, burial sites and places of ritual.[165] Cave art has been discovered in Sicily and its island groups to the west and south. Palaeolithic art is present in Levanzo and Favignana, and it is now recognised that at least two such sites in Malta contain Palaeolithic art forms.[166]

Tarxien - the Hypogeum and the Temple

The Hypogeum is a unique structure situated at Tarxien close by to a megalithic temple assembly. It is located in an area known as Tal-Gherien (literally 'of the caves.');[167] crude caves lie near the entrance to the Hypogeum.[168] The latter structure is hewn out of the soft globigerina, the ideal limestone medium which is both dissolved naturally through water action and is also readily worked by human hand. Like all other natural caves and fissures, it had been initialised through the agencies of nature, but was subsequently adapted by Stone Age man on an extensive scale over several centuries.[169] In fact the technique of chamber formation in the latter becomes more refined as one descends down the storeys.[170] Another system of caverns close by to Ghar Dalam, and possibly inter-communicating, is Ghar il-Friefet; human intervention in the cave architecture is minimal, and the Hypogeum may very well have resembled its pattern in its general form of caverns and passages, before it was remodelled into the form it now is. Ghar il-Friefet is also laid out in at least three storeys. Although the Hypogeum was officially discovered in 1902 by workmen digging at the site, its presence was certainly known around the early nineteenth century, and this is attested by the presence of cannonballs of the period inside the cistern.[171]

From the very start an aura of mystery has pervaded its excavation. Fr. Emanuel Magri was involved for five years (1903-7) in the laborious process, but his notes disappeared with his sudden death in Sfax; efforts to retrieve them have been consistently unsuccessful.[172] He had also been concerning himself with the Punic presence in Malta and in Acholla in Tunisia during the last years of his life. Dr. Themistocles Zammit assumed the excavation process of the Hypogeum thereafter, and he excelled in the tradition of his predecessor, Dr. A. A. Caruana, through his noteworthy achievements, not merely in medicine and at the Hypogeum but at several other archaeological sites elsewhere.

The Hypogeum was initially cleared of all the rubbish which had accumulated inside it, and four sets of caves and galleries were identified. No metal implements were discovered; the finds comprised flint and other stone tools, alabaster, clay and stone statuettes, personal ornaments, animal bones and sea shells. The bones of an estimated seven thousand individuals were also found, but there were no signs of actual human habitation inside the Hypogeum.[173]

This repertoire of human remains demands closer investigation. The *Nil* reading of the Hypogeum tooth Ma. 6 in 1963 confirms the antiquity of human remains in the Hypogeum.[174] By 1912, just eleven human skulls had survived, and they represented the oldest specimens of Maltese skulls.[175] Only six survived before the refurbishment of the Museum of Archaeology, and two of these manifest the characteristics of Palaeolithic man. They are dolichocephalic,[176] and although showing an extreme form of it and of convexity of the forehead, their features include the characteristic thickness of the skull plate, the low forehead, prominent brow ridges and heavy muscular attachments “characteristic of (the) Neanderthal race.”[177] Neither Pace nor Dudley Buxton[178] and Bradley (1912) before him had included a measurement of skull thickness in their investigations.

The skull of Neanderthal man (Middle Palaeolithic) is thicker than that of Upper Palaeolithic man, whose skull is again thicker than that of modern man. The Neanderthal range is 4.5 to 8.8 mm, whilst the Upper Palaeolithic ranges from 3 to 7 mm.[179] A simple measurement has therefore given an index of their antiquity.[180] The pair are reportedly reduced to a single one, and even that has been out of sight since over a year.

The Hypogeum comprises a labyrinth of caves and corridors with niches distributed over three different levels. The upper level is the most ancient; its walls are rough, and it is not possible to determine which portions of it are natural and which are cultural. It is indeed deplorable that the stainless steel-glass assembly is being set up precisely at this site.

The Oracular room lies in the middle level; it has “highly finished walls, niches and recesses, of which the ceiling is richly decorated with designs in red paint... it is highly resonant.”[181] Off the same corridor lies a circular room which was “adorned with spirals and hexagons in red paint.” Apart from the “upper room,” practically all the cave walls were adorned with red paint, and this included the lower storeys. Zammit considered the Hypogeum as a sanctuary of the period; this was later converted into an ossuary.[182]

Some chambers were smoothed off nicely, whilst others were not. The latter were those which bore the decorations; room 27 shows the best workmanship and it lacks red paint.[183] In Room 17, painted discs averaging a 0.25 m. appear on the walls in groups of three, whilst Room 18 bears three discs in red paint and an elaborately painted ceiling in red; these comprise large red discs intermingled with loose spirals joined by lines. Close to Room 17 lies a large hall, chamber 20, which contains painted patterns and carvings; it is painted red all over and an elaborate pattern adorns the ceiling, through depictions in red of branched angular spirals and volutes which are “intricately interlaced.” There is also a pair of rows of Archimedes’ spirals. Room 24 is a large hall which is also elaborately carved and painted.[184] It too is painted in red, and bears a scroll of patterns which are more evident in subdued light conditions.[185] Room 29 resembles a trapezoid in shape and contains an abundance of red paint.[186] The Holy of Holies manifests the best workmanship in carving. The tools used included horn and antler.[187] A recent publication reports that the red ochre in the Hypogeum has not survived.[188]

The Hypogeum has been closed to visitors since 1991. As with other Palaeolithic caverns in Europe it had been sustaining deterioration to its various art forms through the carbonic acid atmosphere created by human respiration on a large scale. Growth of fungus was another problem, and its elimination posed a threat to the paintings.[189] Advice was solicited from the local biologists. An additional chronic problem was the leakage of water and sewage from the overlying human habitations, and the participation of the relevant Government and University departments was elicited as well.[190] Conservationists contributed their share in the salvage operation, and research on the climate inside the Hypogeum chambers was also carried out over a period of three years.[191] The most recent innovation has been the erection of a multi-display unit in the upper storey, as part of the envisaged programme to stagger the amount and duration of visitors in the interests of preservation and conservation of the various art forms.[192]

The art forms in the Hypogeum have required a re-evaluation. The designs in red ochre and black pigment draw strong parallels with Palaeolithic sites abroad. The red ochre designs have hitherto been traditionally assigned a "tree of life" nature and dated arbitrarily to the Neolithic.[193] To date, no specimens from the Hypogeum have been carbon-dated, and it has been universally acknowledged from the start that there had been several phases of occupation of the site extending over several millennia. In fact the Nitrogen analysis tests of 1963, on the two 'Neolithic' teeth from the Hypogeum, gave results which were more reconcilable with a Palaeolithic than a Neolithic date.[194] And the two Neanderthaloid skulls mentioned above support a Palaeolithic presence even further. Thus, the C-14 samples on the Tarxien temples nearby merely represent the later phases of the site, in a typical *terminus ante quem* situation.[195]

Red ochre has been utilised in prehistoric art since the Upper Palaeolithic, and Neanderthal man utilised it in his rituals.[196] Besides the multitude of designs in red ochre at the Hypogeum, there are also drawings in black manganese dioxide pigment, and one of these measures 1.15 by 0.95 metres. It represents a bovid, the equivalent of the Pleistocene bison-bull,[197] "with a hunch on its back, with short horns and tail" and is situated on the left wall at the entrance of the Holy of Holies. Agius compared it to the bas relief bulls beside the Tarxien temple complex.[198] The red ochre wash on the same wall is a later feature for it terminates just short of the figure.[199] This red wash itself is a recognised feature of early Upper

Palaeolithic cultures;[200] at Tito Bustillo, red wash covers the entire surface of the walls,[201] and this has been dated to the Magdalenian.[202] Paintings in black were dominant in the earlier forms of cave art,[203] and considering the simple, crude design of this Hypogeum bovid, together with its frozen aspect, the lack of perspective and infill, and the non-differentiation between foreground and background, its dating in the Upper Palaeolithic is therefore estimated to be very early on in the pre-Magdalenian period.[204]

Together with the horse, the bison was a dominating theme in European Palaeolithic art.[205] Regular bulls also feature significantly in the same culture, with entire halls of bulls being represented such as at the classical Palaeolithic site of Lascaux, which is dated to the early Magdalenian.[206]

The pigments of red ochre at the Hypogeum have been extensively analyzed for their constituent mineral components. In 1979 Janusz Lehman obtained two samples of red ochre pigment from the decorations in the middle level and submitted them for chemical analysis; [207] Kuleshova for Rybakov analysed the pigments again in 1982 and detected the presence of wax and mastic, a possible binder for the paint.[208] In 1987, further samples were taken of red ochre pigment on rock from the north corner of the Oracle room, together with a rock sample without pigment from the same room. On the 26th of July these were examined at the Smithsonian Institute, Washington D.C., at the Conservation Analytical Laboratory. Both samples were submitted to X-ray diffraction studies and the red ochre sample was also viewed through a Scanning Electron Microscope. In keeping with the routine composition of Palaeolithic art pigments, these samples confirmed the presence of the oxides of Silicon, Iron, Aluminium, Calcium, Potassium, Sodium and Magnesium. These results confirmed the earlier chemical analyses by Lehman, and besides X-ray diffraction had picked up barely detectable amounts of Sulphur. On the other hand, Lehman's samples had included in addition the presence of manganese dioxide, the main component of black. This finding confirms that the red ochre design examined by Lehman had been superimposed upon an even earlier design in Palaeolithic black pigment.[209]

An engraved hand at the entrance of the Decorating room in the Hypogeum[210] draws its parallel from similar designs in Palaeolithic sites at Gargas, El Castillo and particularly with Montespan,[211] in the Franco-Cantabrian region. The hand measures 20.5 by 10 cm (at the metacarpus), which is significantly larger than a modern hand. The artefacts at Gargas are now dated to the pre-Magdalenian, to 26,000 BP.[212]

Another design at the Hypogeum is in the form of an ideogram and comprises a black and white chequered pattern;[213] this simple geometric design is considered to represent an early stage of Palaeolithic art,[214] interpreted by several authors as a female symbol.[215] The other significant ideograms include the "tree of life" itself and the polygonal designs in red ochre which are considered by some authorites as representing *ethnic markers* in Palaeolithic art.[216] The spiral designs have been shown by C-14 not to relate with Mycenae, and the *ethnic marker* hypothesis is therefore enhanced through the subsequent repetition of the spiral motif in bas relief in the adjoining Tarxien temple complex and other later sites such as the Salina hypogea.[217] Since the megalithic temples have been assigned a *terminus ante quem* carbon-date of before 3000 BC,[218] nothing precludes that they were a carryover of a tradition which had started in the Palaeolithic. Indeed, the bas relief images of bulls and a cow[219] on the large blocks of stone lying just outside the Tarxien temple complex[220] are themselves diagnostic features of Palaeolithic art;[221] these are chiefly to be found in the Southwest of France.[222] Identical bas reliefs of pairs of oxen on large slabs of limestone are to be found at the French Palaeolithic site of *Le Fourneau du Diable*, attributable to the early Magdalenian[223] or earlier.[224] According to Breuil, bas relief sculpture of this form was already present in the Solutrean. [225] Yet another bovid pair is found engraved at the Palaeolithic site of Teygat. Both bovid and ideogram are themes that are related to Palaeolithic cultures.[226] Another similar pair of oxen is to be found engraved at the Palaeolithic site of Levanzo,[227] an island identical to Malta through its Pleistocene landbridge connection to Sicily during the Pleistocene. Thus the thematic element of the bovid pair links the Maltese specimens to Palaeolithic sites alone, and thus further enhances their Palaeolithic attribution.

Ghar Hasan

At the southernmost tip of Malta, and nearer to Ghar Dalam on the coastline lies *Ghar Hasan*, the site of yet another array of designs depicting characteristically Palaeolithic representations.[228] The opening lies perched up on a precipitous ledge of rock approximately 100 metres above sea level,[229] and access is now a safer procedure through the handrail provided by the British Government at the start of the century:

> "The approach to the Cave was formerly rather a big undertaking, and many visitors declined to risk the scramble over the face of the rock to a shelf some 15 feet below, along which it is necessary to proceed to the entrance. Recently some stone steps and a guard rail have been fixed. Reaching the shelf, or ledge, you are about 200 feet above the sea. From the entrance, the interior branches off into three passages, that to the right, descending for about 100 yards to another opening in the cliff. Here there is a small circular excavation where the saracen Hassan is supposed to have hidden himself after the expulsion of his countrymen from Malta in 1120. From Hassan's chamber a passage takes off diagonally, on the right, with outlets here and there into the main corridor. From the entrance a passage also runs straight forward for a few yards and then becomes narrower, and ends abruptly at about 50 yards within. A spring inside attracts swarms of seabirds and provides some sport for the natives. From one of the dark passages in view of the mouth of the cave, the birds are shot as they enter."[230]

The name *Hasan* is traditionally believed to represent a particular Turk who is reputed to have maintained his quarters in this cave in the company of Maltese lasses who were then illegally smuggled off to awaiting ships. A more likely hypothesis associates it with the Arabic *Hisan*, which is translated into *horses.* This could either refer to actual horses, which have been typically represented in Palaeolithic caves elsewhere, or to the river-horses, otherwise known as hippopotami. Together with Ghar Dalam, which it lies close to on the southeastern part of Malta, and both abutting on to a shallow underwater connection with Sicily, *Ghar Hisan* possibly also marks the earlier presence of Pleistocene horses or hippopotami.[231] It is furthermore most unlikely that the *Dalam* in Ghar Dalam represents *darkness*, particularly when the name is also attributed to the valley, *Wied Dalam*. A dark valley is a contradiction in terms.[232] Yet again, a preferable alternative is available, for the Arabic *Dulam* stands for elephant in archaic Arabic;[233] elephants have been depicted on the *Ghar Hasan* walls, and they have been excavated from *Ghar Dalam* itself and from nearby *Benghajsa fissure*.

Ghar Hasan has never been officially excavated, except on a small scale by Shaw in 1950.[234] No material remains have ever been reported.[235] In September 1985 the Italian Archaeological Mission, from the Centro

Camuno di Studi Preistorici, were in Malta at the invitation of the University of Malta. Prof. A. Bonanno had organized the symposium on "*Archaeology and Fertility Cult in the Ancient Mediterranean*," and the Italian team led by Emmanuel Anati subsequently extended their stay in Malta until 1987, in order to carry out a survey of the archaeological sites, as a joint project together with the University of Malta and the Department of Museums. The publication of their survey followed in 1988.[236]

The group subsequently surveyed several other prehistoric sites in Malta, and these included the cave of Ghar Hasan. Emmanuel Anati is a world authority in cave art,[237] and for the first time in the long history of the cave, a repertoire of Palaeolithic art forms were partially uncovered from beneath the stalagmitic encrustations which covered them for the past fifteen millennia. The figures numbered altogether approximately twenty designs, and they are painted in red, brown, dark brown and black.[238] They represent various animal figures, an anthropozoomorphic design, several handprints and an array of ideograms.[239] Although the images are tenuous and still partially obscured by stalagmitic material, they appertain, by way of style, analogy, graphic design and concept, to a horizon of hunters which was previously unrecorded, and they definitely antedate the first *Neolithic* Maltese folk.[240]

In April of 1989, Anati submitted a typescript to the Museum of Archaeology, together with eight colour photographs of the various art depictions. He also submitted two "schizzi preliminari" of Panels 1 and 2, which depicted the various animals. These included elephant, deer, bovids, and an anthropozoomorphc figure.[241]

In 1990, Anati published several photographs of the Palaeolithic art forms, and a future publication is under way.[242] The photographs were taken in 1988, and those represented in the publication derive from the main sites of the depictions. At the entrance to Gallery B, on the right wall, signs of painting persist.[243] A large animal is represented on one of the walls of Gallery A.[244] A large protruding rock along one of the corridors suggests the form of a large animal, and remains of coloration are evident in various parts. Some of the drawings were left still partially covered over by encrustations.[245] At the *Cunicolo,* the tunnel-like inner chamber in the innermost reaches of Gallery A, Panel One contains the remains of red coloration and manifests at least two phases of paintings, Groups 7 and 8.[246] Panel Two contains the remains of red and brown coloration in superimposition, with infilled bovid overlying elephant in one design; several other animal shapes are painted one on top of the other in Group 1.[247] In Gallery C the profile of an animal in red outline is visible on a section of the wall.[248]

These photographs do not however represent the entire repertoire which awaits full publication in the near future. These depictions are mainly concentrated upon two panels. In Panel One, at least two of the animal figures represent the elephant, "two heavy quadrupeds with a long muzzle." These mammals were extinct in Malta before the end of the Pleistocene. One of these, drawn in red, bears three brown vertical lines upon its body.[249] Vertical lines upon the animal's body were a common feature of Palaeolithic art.[250] Together with these pachyderm designs, one sector of Panel One also contains Group 8, comprising superimpositions of paintings in at least three tonalities, namely red, brown and dark brown.[251] Panel Two also bears at least two representations of elephant, and here again, on an area one metre in breadth, on the left sector of the panel, lies Group 1, comprising another set of superimposed designs in at least three phases of coloration, in red, ochre and brown. The colours of the animal paintings have penetrated the absorbent rock surface and are semi-translucent. They are also lighter in tone than the thick red paint which lines the Panel; micro-analysis has shown that this latter paint has not penetrated the rock surface and merely depicts modern vandalism. Panel Two has been damaged through the construction of Hasan's cave in the not so distant past; the panel lies to the left of the cave's entrance, and now contains ten designs and superimposed figures over an extent of 1.7 metres. The largest figures measure 75 cm, whilst the smallest are only a few centimetres in length. Traces of paint over the damaged areas suggest the earlier presence of other designs.[252]

Paintings and engravings are also present along the galleries. Along the left wall from the *Cunicolo* towards Gallery B, Gallery A also contains traces of coloration and graffiti. Upon the left wall of Gallery B, *en route* to Hasan's cave, traces of paintings lie in a deteriorated state beneath stalagmitic encrustations. A few handprints are also present, but these are evidently modern acts of vandalism. Among the various colour traces along Gallery C, an animal in red silhouette and outline dominates this group, together with several graffiti depicting at least another mammal.[253]

The massive entrance of Ghar Hasan leads to a circular hallway which leads directly north-north-east towards Gallery A; the metal-grid gate lies at a distance of 28.7 metres from the entrance. Beyond this the gallery continues for several metres before it opens out into a wider space. A narrow and shallow tunnel-like passage follows and obliges a crawl on all fours over a distance of four metres and a maximum height of 75 centimetres, before the final chamber or *Cunicolo* is reached. This is of armspan width and has a high vault ceiling. This chamber, the *Cunicolo*, holds Panel One and one of the better collections of cave art in Ghar Hasan. These ten designs lie on a rock surface measuring 2 metres in length and rising 1.5 metres in height; the supporting rock juts out between two recesses and resembles a human face with one of its eye sockets created by human hands.[254]

The temperature at the junction of the various galleries was 18 degrees Centigrade, and the humidity 92%.[255] Twenty one metres from the cave entrance, Gallery B forks off to the right over a curvilinear course until Hasan's cave is met; on the left of the entrance to this cave lie the remains of Panel Two which bore the second important collection of Palaeolithic art representations. Gallery C takes off from Hasan's cave in an arc which meets Gallery B in its centre; Gallery C progressively becomes shallower until a crawl is obliged before its junction with Gallery B.

At a distance of twenty four metres from the cave entrance, Gallery D[256] forks off to the left, and after a distance of eleven metres, on the right wall, at shoulder level, two large handprints in light red paint were observed on the first of June 1996. The light reddish ochre had penetrated into the underlying rock. The left handprint is more evident than the right one. On sustained massaging over the handprint surface a thin covering over by stalagmitic material was palpable, whilst additional illumination[257] further confirmed this feature.[258] These attributes differentiate them from the brown handprints surviving in Gallery B, and also excluded a modern forgery. By the first of June 1996, all the accessible areas of Ghar Hasan had been severely depleted of Anati's repertoire of cave paintings. However, the outline of a proboscid can still be made out in Panel 2.

Although bearing similarities to European Palaeolithic art, there are no direct parallels from the stylistic and conceptual points of view.[259] There is no semblance to Italian Palaeolithic art forms.[260] This makes the Ghar Hasan repertoire unique in the Mediterranean.

The absence of scenery, the intentional superimposition of the paintings and the association with ideograms, dots and lines has obliged Anati to identify Ghar Hasan's art repertoire with an archaic hunter society earlier than the Neolithic.[261] Unaware of other evidence for Palaeolithic culture in the Maltese Islands, the Anati group feel obliged to consider these depictions as out of context. [262]

The association of dots, lines and vulvar depictions in one pattern finds its identical counterpart in the Cantabrian Palaeolithic sites of Cueto de la Mina[263] and Tito Bustillo.[264] The cave walls of the latter site are coated with a red wash similar to that of the Hypogeum.[265] The occupation of Tito Bustillo is dated to lie between 14,500 and 13,500 B.P.[266] Anati is therefore probably hinting at these sites when he comments on the similarities in the cultural and conceptual elements of Ghar Hasan's cave art with that of the Spanish caverns and other areas in the Franco-Iberian region.[267]

Whereas Bonanno[268] rightly reserved his opinion on the matter, pending a re-examination of these depictions on site,[269] the Missione Italiana group has since re-asserted themselves in attributing these drawings unequivocally to a Palaeolithic society of hunters.[270]

As at the Hypogeum, both finger markings and bovids are also present at Ghar Hasan. At the latter site the hands in Gallery B are painted in red ochre, whereas the hand at the Hypogeum is engraved; they are both larger in size than modern human hands. Whilst the Hypogeum bovid is large and in black outline, the depictions at Ghar Hasan never exceed 75 cms; moreover the bovid here is filled in with paint. The in-filled bison at Altamira is dated to 12,000 BP, and the other Franco-Cantabrian sites to which the Maltese art forms are related date to the Magdalenian or earlier.[271]

As far as portable art is concerned, this is most probably also represented in the Maltese Islands. Bonanno[272] gives consideration to the possibility of the Great Mother Goddess figure existing in the Palaeolithic, and it is noteworthy that the various 'Venus' figures which have been discovered in Malta have all been attributed arbitrarily to the Neolithic,[273] whereas they are universally recognised in Europe as Palaeolithic art forms, dating as far back as 30,000 BP.[274] Stringer and Gamble date these European

'Venuses' to between 23,000 to 21,000 BC.[275] They are besides also represented in Palaeolithic bas reliefs.[276]

Regarding art in decoration, several of the various body ornaments which have been lifted from prehistoric sites in Malta bear the distinctive mark of the Palaeolithic. The use of pierced carnivore teeth, such as wolf in Ghar Dalam,[277] and pierced shells, some with red ochre (GD/ B. 7) have now been identified with the latter culture.[278] At the French site of Rocher de la Peine, a necklace of shells and animals teeth is dated to the Magdalenian.[279]

Thus, both in tool technology and in art design, the earliest manifestations of culture in the Maltese Islands are Palaeolithic in style and also in chronology. Because, for the sake of argument, this situation could not, even hypothetically, represent a time-lag in cultural development, where the isolated Maltese Neolithic folk would still be manifesting Palaeolithic patterns from a lack of communication with developments on the mainland. Apart from the existence of sea travel long before the start of the Neolithic period, the earliest Maltese *Neolithic* folk have been attributed to possess identical cultures to Sicily, which has chronistically manifested both Palaeolithic and Neolithic cultures;[280] the people from Stentinello and Monte Kronio were also the earliest *Neolithic* folk in Sicily.[281] And they, therefore, just as they did in the Egadi islands, would have introduced a *Neolithic* culture into the Maltese archipelago at the very start of the Neolithic period, that is in 7300 BP. A Neolithic package would have introduced a Neolithic culture, not a Palaeolithic one. And the introduction of a Palaeolithic culture into the Maltese islands begs a Palaeolithic dating, not a Neolithic one. Furthermore it has been established that the earliest Maltese Neolithic folk actually derived from the Near East, by colonizers who penetrated the entire coastline of the Mediterranean.[282] Whatever the source of the Maltese Neolithic folk, both Near Easterners and Sicilians would have brought their cultures along with them; the hypothesis for a time-lag in cultural development therefore collapses.

[1] Zammit Maempel 1989: 23.

[2] Evans (1953: 63) describes some Maltese prehistoric tools as Mousterian.

[3] Hamner 1964: 414.

[4] Bordaz 1970: 6-30. Jacques Bordaz graduated in Paris in 1944, and obtained his doctorate in anthropology from Columbia University in 1964. At the time of writing this volume he was Associate Professor of Anthropology at the University of Pennsylvania. His field work has been mainly centred in the United States, Mexico, Iraq and Turkey, where he has also conducted the excavation process himself (Bordaz 1970: 146). See also Oakley 1972: 18.

[5] Oakley 1964: 125.

[6] Bordaz 1970: 31, 38.

[7] Bordaz 1970: 39.

[8] Bordaz 1970: 55: Oakley 1972: 37, 59.

[9] Bordaz 1970: 50.

[10] Bordaz 1970: 50-1.

[11] Bordaz 1970: 92.

[12] Bernabò Brea 1972: 23-4.

[13] Bordaz 1970: 56.

[14] Bordaz 1970: 99; Huyghe 1966: 22; Oakley 1972: 3.

[15] Bernabò Brea 1972: 34; Oakley 1972: 21, 31.

[16] Bordaz 1970: 99.

[17] Huyghe 1966: 22; Oakley 1972: 21.

[18] Bordaz 1970: 6; Lawson 1991: 12; Megarry 1995: 166; Oakley 1972: 13-14; 16.

[19] Megarry 1995: 269.

[20] Zammit Maempel 1982: 1-2.

[21] Bahn 1996: 37-8.

[22] Oakley 1972: 5-6.

[23] Evans 1971: 20; GD/B. 10.

[24] Despott 1918: 218; pl. xviii fig. B no. 15; Caton Thompson 1925: 13.

[25] Vide infra.

[26] Bordaz 1970: 92.

[27] Shackley 1980: 5.

[28] Caton Thompson 1925: 13.

[29] Schüle 1993: 408.

[30] Issel 1866: 242; Cooke 1892: 6.

[31] See references below.

[32] Sultana 1988: 149; Oakley 1964: 87.

[33] Sultana 1988: 112.

[34] Sultana 1988: 112.

[35] Price 1954: 13.

[36] Malta Government Gazette 26 July 1836; Cooke 1892: 4-5; Sultana 1988: 112.

[37] Davy 1842: i. 111; Leith Adams 1870: 196-7.

[38] Benghajsa Gap is very close to both Ghar Dalam and Ghar Hasan, two sites with Palaeolithic remains.

[39] Leith Adams 1870: 195.

[40] Leith Adams 1870: 197, fn. 1.

[41] Cooke 1892: 12.

[42] Cooke 1892: 8-9; 12.

[43] 1916: 297, 298; 1918: pl. vxiii fig. B; 1923: pl. iv fig. 2.

[44] Rizzo 1932: 20.

[45] Trechmann 1938: 14.

[46] Evans 1953: 63.

[47] Caton Thompson 1925: 13.

[48] Bordaz 1970: 5; 98-9.

[49] Cooke 1892, 8-9; Despott 1916: 297, 298; 1918: pl. vxiii fig. B; 1923: pl. iv fig. 2.

[50] Despott 1916: 297, 298.

[51] Bordaz 1970: 53 fig. 20 no. 5.

[52] Despott 1918: pl. vxiii fig B No. 1.

[53] Bordaz 1970: 53 fig. 7.

[54] Obsidian does not occur naturally in Malta. However, the early presence of Melos obsidian on the Greek mainland, in Franchti cave, has shown that Mediterranean travel across the sea was possible during the late Palaeolithic.

[55] Despott 1918: pl. xviii fig. B Nos. 10-13.

[56] Despott 1923: pl. iv fig. 2 Nos. 2-4.

[57] Bordaz 1970: 86, 92.

[58] Bernabò Brea 1972: 24.

[59] 1923: pl. iv fig. 2 no. 5.

[60] Pace 1996.

[61] These Palaeolithic flint implements were being replaced by obsidian, basal and greenstone in the Neolithic culture of Stentinello (Bernabo Brea 1972: 34).

[62] 1931: plate facing p. 21.

[63] The Rev. Loreto Zammit mentions this collection in his booklet on *Mellieha*, and he refers to it specifically as Palaeolithic, with the soil around Hagar Qim as its provenance (1958: 9).

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[64] Renfrew 1978: 161.

[65] Evans 1953: 63.

[66] Evans 1953: 63-5.

[67] Bonello and Caruana Galizia, 1996: 67-70.

[68] Bordaz 1970: 59 fig. 10; 60 fig. 15.

[69] Bordaz 1970: 31 et seq.

[70] Bonello and Caruana Galizia 1996: 67-70.

[71] Zammit 1926: 30-1.

[72] Zammit 1931: plate facing p. 21.

[73] Zammit 1926: 31. These microliths were discarded by his companion, Captain Stone (Zammit 1917: fol. 41).

[74] Bordaz 1970: 86; 92.

[75] Bernabo Brea 1972: 23-4.

[76] Pace 1996: 83.

[77] Bordaz 1970: 50, 87; Oakley 1972: 64.

[78] Collins 1966: 48.

[79] Bray and Trump 1982:53.

[80] Bahn and Vertut 1988: 97.

[81] Lawson 1991: 52-3; Leroi-Gourhan 1982: 84-8; Renfrew and Bahn 1996: 310.

[82] Bahn and Vertut 1988: 100.

[83] Bahn and Vertut 1988: 97.

[84] Lawson 1991: 52-3; Leroi-Gourhan 1982: 84-8; Renfrew and Bahn 1996: 310.

[85] Leroi-Gourhan 1982: 80, 85.

[86] Bahn and Vertut 1988: 100.

[87] Leroi-Gourhan 1982: 80, 85.

[88] Bahn and Vertut 1988: 97.

[89] Leroi-Gourhan 1982: 80, 85.

[90] Bahn and Vertut 1988: 97.

[91] Lawson 1991: 23.

[92] Bahn and Vertut (1988: 192) state the same for the Lascaux depictions.

[93] Breuil 1966: 33; Huyghe 1966: 16; Lawson 1991: 31; 36; 39-40.

[94] Bernabò Brea 1957: 27, map II.

[95] Bernabò Brea 1957: 27, map II; Racheli 1979-86: 225-246.

[96] The visit to Levanzo together with Seana was carried out on the 17th of September 1995.

[97] Bahn 1992: 378.

[98] Bray and Trump 1982: 180.

[99] Clottes 1996.

[100] Wavell 1995.

[101] Bahn 1992: 378.

[102] Breuil 1966: 34.

[103] Collins and Huyghe 1966: 47.

[104] Huyghe 1966: 16.

[105] Bahn 1992: 378; Bray and Trump 1982: 53.

[106] Bahn 1992: 378.

[107] Lawson 1991: 39-40.

[108] Breuil 1966: 33; Huyghe 1966: 16.

[109] Stokstad 1995: 41.

[110] Lewin 1989: 120.

[111] Bahn 1992: 378; Bray and Trump 1982: 53.

[112] Davis 1989: 84; Morphy 1989: 10; Lawson 1991: 56.

[113] Breuil 1966: 36-7.

[114] Lawson 1991: 49.

[115] Bahn 1992: 457.

[116] Lawson 1991: 49.

[117] Breuil 1966: 36.

[118] Bahn 1992: 378.

[119] Bray and Trump 1982: 53; Renfrew and Bahn 1996: 377.

[120] Huyghe 1966: 21.

[121] Bordaz 1970: 47.

[122] Bordaz 1970: 92.

[123] Huyghe 1966: 21.

[124] Huyghe 1966: 21; Lawson 1991: 14; Oakley 1972: 68.

[125] Bray and Trump 1982: 53.

[126] Leroi-Gourhan 1965: 60.

[127] Clottes 1989: 22.

[128] Bahn and Vertut 1988: 193.

[129] Clottes 1989: 42.

[130] Clottes 1989: 49.

[131] Breuil 1952.

[132] Clottes 1996: 277.

[133] Lawson 1991: 29-37.

[134] Bahn and Vertut 1988: 166.

[135] Lewin 1989: 123.

[136] Leroi-Gourhan 1965.

[137] Renfrew and Bahn 1996: 377.

[138] Clottes 1996: 278.

[139] Delluc 1991.

[140] Clottes 1996: 278; 286.

[141] Clottes 1996: 281.

[142] Lorblanchet 1989: 135, 137, 139, 140.

[143] Clottes 1996: 277.

[144] Clottes 1996: 286.

[145] Clottes 1996: 284-5.

[146] Clottes 1996: 284.

[147] Clottes 1996: 286.

[148] Bahn and Vertut 1988: 96.

[149] Bahn and Vertut 1988: 96.

[150] Breuil (1966: 33) defines handprints and footprints as one of the earliest forms of Palaeolithic art.

[151] Encarta 1996: Palaeolithic Art.

[152] Beltran 1984: 355; Breuil 1905, 1966: 34; Clottes 1989: 21, 23; Gonzalez-Echegaray 1974.

[153] Breuil 1966: 34.

[154] Greene 1996: 129.

[155] Stokstad 1995: 49.

[156] New Scientist (274) 6: 17.

[157] Clottes 1996: 280, quoting Anati 1989.

[158] Bray and Trump 1982: 53.

[159] Bahn 1992: 378.

[160] Bronowski 1987: 32-3.

[161] Bray and Trump 1982: 53-4.

[162] Lawson 1991: 59; Lewis-Williams and Dowson 1988: 201-245.

[163] Renfrew and Bahn 1996: 377.

[164] Varagnac 1966: 53.

[165] Schmid 1970: 151.

[166] At the time of going to press, a third probable site is being investigated at Hal Resqun in Gudja (Zammit 1935: 189-195). The two birds represented there and so far reported as pelicans have now been identified with the extinct Maltese crane. The present hypothesis of the authors is that the wall containing this Palaeolithic art form was cut through in order to fashion the tomb area, in the same way that Hasan's cavern has been dug out in Ghar Hasan, through Panel 2, which also contained Palaeolithic art forms. The inner array of designs in the same tombs are similarly thought to be Palaeolithic.

[167] Zammit 1926b: 5.

[168] Evans 1971: 45.

[169] Zammit 1926a: 59.

[170] Evans 1971: 45, 59-60.

[171] Zammit 1926b: 6.

[172] Bonnici 1989: 18-19; Zammit 1926b: 7.

[173] Zammit 1926a: 59-63.

[174] Bone Analyses, Ma. 6.

[175] Pace 1972: 8.

[176] All the 39 human skulls at Burmeghez were dolichocephalc, and they were found in the company of red deer (Tagliaferro 1911: 149; Pace 1972: table 2: 2).

[177] Bradley 1912: 198; Zammit, Peet and Bradley 1912: 26; Pace 1972: 9.

[178] Dudley Buxton 1922: 164-211.

[179] Chilardi *et al*. 1996: 560.

[180] The Neanderthaloid skull indicated by Bradley (1912) measures 9.5 mm at the parietal, which is within the range for Neanderthal man as outlined by Frayer.

[181] The significance of human voice resonance in Palaeolithic caves is one subject of present research (Renfrew and Bahn 1996: 377)

[182] Zammit 1926a: 59-63.

[183] Evans 1971: 54: Zammit 1910: 15.

[184] Evans 1971: 49-56.

[185] Zammit 1910: 20.

[186] Evans 1971: 56.

[187] Evans 1971: 59-60.

[188] Streep 1994: 92-4.

[189] Bonnici 1989: 2.

[190] Vella *et al.* 1991.

[191] Bonnici 1989.

[192] A disaster was averted in 1994 through the timely intervention of Charles Ebejer for Guillaimier Industries Ltd. The latter intervened during the final phases of this project by pointing out that the lower levels might not withstand the weight of the unit in the upper storey; this amounted to 8 tons of steel and another 5½ tons of glass. A re-assessment of the structure situation in this regard proved Mr. Ebejer right (Bonello

1995), and necessitated an alteration in plan design, whereby the unit was suspended from the ceiling rather than made to rest on the floor.

[193] Zammit 1925: 28.

[194] NHM-BM: Ma. 5 and Ma. 6.

[195] Radiocarbon dating was not carried out on the structures themselves, but on the remains of vegetation which were associated with the structures. Thus Judas tree, Hawthorn and Ash were tested for the Ghar Dalam phase, Phyllyrea for the Ggantija and Olive tree for the Tarxien phase (Bonanno 1986: 26; Giusti, Manganelli and Schembri 1996: 49). Thus the dating is a *terminus ante quem.*

[196] Shackley 1980: 52, 60, 109.

[197] Megarry 1995: 261.

[198] Agius 1959: 5-7; 1968: 7; Rossiter 1968: 90; McGregor Eadie 1995: 104.

[199] Trump 1972: 63; 1990: 65. This depiction had lost its head and shoulders by the time Trump described it in 1972. The entire drawing was eventually removed eight years later on the express instructions of the Director, who manifested a difference of opinion on the nature of the drawing with those who believed it represented a bull. It was scrubbed off by the cleaning staff of the Hypogeum in the presence of the Custodian, museum guides, and other personalities.

[200] Clottes 1996: 278; 286; Delluc 1991: 340.

[201] Lawson 1991: 53.

[202] Lawson 1991: 29.

[203] Clottes 1996: 281.

[204] Clottes 1996: 278; Delluc 1991: 320; 342; 348; Leroi-Gourhan 1965: 68; 147-8; 159.

[205] Bahn 1992: 378. Paul Bahn obtained his Doctorate in Archaeology at the University of Cambridge in 1979, specializing in the prehistory of the Pyrenees, and with a special interest in Pleistocene art. In 1986 he was the first foreigner since the Abbe Breuil to deliver a lecture in Paleolithic art in Beijing. He is the co-author with Colin Renfrew of a major textbook in Archaeology (1996), and he is the author of one of the best dictionaries of Archaeology. He has lectured in the U.S.A., Australia and Japan (Bahn 1988: Jacket).

[206] Lemonick 1995: 41.

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[207] Lehman 1980. Lehman was a UNESCO expert invited by the Malta Government for the preservation of the Hypogeum. This was betwen the 16th and 20th of December 1979 (Bonnici 1989: 32, 33).

[208] Bonnici 1989: 33, 131.

[209] Bonnici 1989: 27, 33, 65-7, 128-131.

[210] Agius 1959: 5-7; 1978: 7.

[211] Bahn 1992: 151, 177, 334.

[212] Clottes *et al.* 1992; Clottes 1996: 284.

[213] Zammit 1928: 18.

[214] Clottes 1996: 286. See similar pattern in Moulin 1965: 35, lower photograph.

[215] Forbes *et al.* 1979: 362.

[216] Bahn 1992: 457.

[217] Frendo & Friggieri (eds.) 1994: pl. 12.

[218] Renfrew 1977: 615; 1978: 161.

[219] Although constantly referred to as a sow, the image is that of a cow. Comparison with the bas relief of pig in the same Tarxien complex clarifies the issue.

[220] “On wall slabs of small room tucked between the south and middle temples.” (Bonanno 1993: 39). A study of the plans of the Tarxien temple complex from 1915 (Zammit) to 1993 (Bonanno 1993, as in Evans 1971: Plan 30A) demonstrates the discreet process of obliterating the square enclosure, marked ‘S’ by Zammit (1916: 131), and incorporating one slab of it into the temple structure.

[221] Bahn 1992: 378; Renfrew and Bahn 1996: 376; Lawson 1991: 51.

[222] Bandi and Maringer 1952: 84.

[223] Lawson 1991: 29, 51- Plate 45.

[224] Bandi and Maringer 1952: 88-89; Huyghe 1966: 53.

[225] Breuil 1966: 34.

[226] Bahn 1992: 378; Clottes 1996: 281; 285-6.

[227] Guido 1967: 78.

[228] A guide by the name of Grazzju provides the information and the torchlights necessary to view the cave. He has been there for the past 35 years, but does not remember any foreign visitors carrying out research studies at the site. Anati and his team must therefore have visited it after six in the evening, for that is the time that Grazzju leaves for home. He has recently changed his Ford Prefect to a Skoda. I first visited the cave on the first of June 1996, in the company of Anthony and Lillian Frendo. Grazzju delineated the configuration of the labyrinth for us, pointing out that one fork, Gallery A had since January this year been closed off by a metal-grid gate in order to protect a colony of bats therein. The disappointment was partially curtailed through earlier descriptions of the gallery (Evans 1900: 53; Anati 1989: 1990), together with a vivid description rendered by a party of youths who visit the cave regularly and had regularly ventured into Gallery A before the gate was erected. We have since visited these reaches as well, together with Charles Savona Ventura.

[229] Anati 1995: 103.

[230] Evans 1900: 53.

[231] The Arabic word for *Hippopotamus* is *Hisan el bahar.*

[232] I am indebted to Lillian Frendo for this significant observation.

[233] I am indebted to Dr A. Frendo for the translation.

[234] Shaw 1950: 191-3.

[235] Trump 1993: 92.

[236] Anati and Anati 1988: 9-8; back cover.

[237] Emmanuel Anati (1930-) is Professor of Palaeoethnology at Lecce University, and is also the director of the Centro Camuno di Studi Preistorici at Capo di Ponte. He completed his studies in archaeology and prehistory at the University of Jerusalem, specialized in anthropology and the social sciences at the University of Harvard, Cambridge (USA), and in ethnology at the Sorbonne in Paris, where he obtained his doctorate in letters in 1960. Anati pursued his studies in the human sciences at the Universities of London and Cambridge (1960-2). He has taught and organized lectures at various universities and institutes of higher research, and these included the Universities of Jerusalem, Tel-Aviv and Manchester, the National Museums of Canada and Ottawa, the Smithsonian Institution in Washington and the Frech College in Paris. Research missions and expeditions for UNESCO and other governments have been undertaken by him in all five continents. In particular he has organized courses and

international seminars on prehistoric and primitive art, which discipline he has promoted on a large scale world-wide. His Centro Camuno di Studi Preistorici is based in the Alpine valley of Valcamonica, reputed for its rock art and included in the UNESCO list of cultural World Heritage sites. The last Symposium he has organized (1996), dealt with *Prehistoric and Tribal Art (Images, Symbols and Society.* His publications on rock art and related subjects are numerous and include *Har Harkom; World Rock Art; Valcamonica Rock Art; Helan Shan - the Rock Art of China; The Religion of Origins; The Roots of Culture;* and *Prehistoric Brescia*. Emmanuel's wife Ariela is also very active in the same field; besides she is editor of the Centre's *Bulletin* and of *'Who's who in Rock Art. A world directory of specialists, scholars and technicians*." (Anati & Anati 1988: back cover).

[238] Anati 1989b: 20; 1995: 103.

[239] Anati 1989b: 20.

[240] Anati 1989b: 20; 1990: 167, 171; 1995: 103.

[241] Anati 1989c.

[242] Anati 1990:166-172.

[243] Anati 1990: 167; fig. 155; MLT.88.EA: XLIII.35.

[244] Anati 1990: 170; fig. 159; MLT.88.EA: XLIII. 36.

[245] Anati 1990: 168; fig. 156; MLT.88.EA: XLIII. 31.

[246] Anati 1990: 169; fig. 157, MLT.88.EA: X.6.

[247] Anati 1990: 169; fig. 158; MLT.88.EA: X.14.

[248] Anati 1990: 171; fig. 160; MLT.88.EA: XLIII. 30.

[249] Anati 1989b: 20; 1990: 170; 1995: 103.

[250] Lawson 1991: 36.

[251] Anati 1989b: 20; 1990: 170; 1995: 103.

[252] Anati 1990: 168; 170.

[253] Anati 1990: 168.

[254] Anati 1990: 170.

[255] This was on the first of June 1996.

[256] Gallery D is the authors' nomenclature for the fork of the labyrinth not described by the Anati team.

[257] This additional lighting was provided through video lights.

[258] Photography in colour slides and prints and video record the previously undescribed find, attributable also to Anthony and Lillian Frendo. On the 28th of July (1996) I re-visited the cave and Gallery D, and demonstrated the handprints to a group then visiting; I re-videoed and photographed the handprints once again, perhaps for the last time.

[259] Anati 1995: 71.

[260] Anati 1989b: 20; 1995: 104.

[261] Anati 1990: 170-1.

[262] Anati 1995: 71. The only depictions which have survived, unless more are still obscured by the stalagmitic material on the cavern walls, are the two handprints in red pigment in Gallery D, the only section of the labyrinth not described by Anati. Another remaining pair of handprints in Gallery B are obviously modern. Vandalism not of the popular type has destroyed and obscured the entire repertoire of images on the accessible areas; a recently erected steel gate prevents entry to Gallery A, where the best paintings have been reported, described, photographed and published (Anati 1988, 1990, 1995. The gate was erected within a few weeks of the arrival in Malta of two copies of Anati's publication of 1995. On the 28th of February 1997, Mr. J. Borg informed us, at Ghar Dalam, that the request for the gate had been submitted in 1993.

[263] Vega del Sella 1916: fig. 19.

[264] Jorda Cerda, Mallo & Perez 1970: fig. 26.

[265] Lawson 1991: 53; Trump 1972: 63; 1990: 65.

[266] Moure-Romanillo and Cano-Herrera 1979: 287.

[267] Anati 1989b: 20.

[268] Bonanno 1993: i, 17; 1994: 81.

[269] A preliminary inspection was actually carried out by Anthony Bonanno, Tancred Gouder and JoAnn Cassar in 1989, but this had to be postponed indefinitely owing to lack of facilities to conduct a proper examination.

[270] Anati 1995.

[271] Bahn 1992: 151, 177, 334; Jorda 1979: 343.

[272] Bonanno 1991: 165.

[273] Malta's fat lady was initially dated to 1,500 BC, but with tree-ring correction of C-14, she definitely pre-dates even the temple dates of 3100 BC (Renfrew 1977: 615), by an unknown quantity of centuries (Renfrew 1973: 161).

[274] Bahn and Vertut 1988: 138-140; Lemonick 1995: 40; Leroi-Gourhan 1966: 29, plate 24; Megarry 1995: 286; Renfrew & Bahn 1996: 378; Sieveking 1995: 6-7.

[275] 1993: 209.

[276] Bahn and Vertut 1988: 99, plate 67; Bandi and Maringer 1952: 85, plate 109; Huyghe 1966: 19, plate facing p. 18; Lawson 1991: 31, plate 21; Leroi-Gourhan 1966: 29, plate 24.

[277] Zammit Maempel 1989: 47, pl. 17.

[278] Megarry 1995: 285.

[279] Lemonick 1995: 41.

[280] Bernabò Brea 1957; Trump 1993; Vaufrey 1926, Evans 1971; Guido 1967; Tusa & De Miro 1983; Bernardini 1995; Racheli 1979-86.

[281] Bernabò Brea 1957: 38.

[282] Bernabò Brea 1957: 40-1.

CONCLUSION

Documentation for the presence of Palaeolithic man in Malta was initiated in 1917 through Despott, Zammit and Keith, who proposed Neanderthal man as the first Maltese settler; the hypothesis held its ground until 1964. In 1995 the original readings of the 1952, 1963 and 1968 derivative techniques were recovered and interpreted correctly. Although the Hypogeum designs have long been recorded, and the Agius' repertoire was published in 1959, the identification of the drawings as Palaeolithic has been effected by the present authors in 1996. Ghar Hasan was identified as a Palaeolithic site of cave art by Anati in 1988; by 1995 the hypothesis remained isolated in context and was therefore shelved. In 1996 sufficient supporting evidence had accumulated to sustain it.

Bias has prevailed over logic and a wave of counteractivity was prominent during the nineteen eighties. Under the façade of a robbery, the taurodont molars have been removed from public display since April 1980. During the same time the bison-bull at the Hypogeum was removed at the express directive of the Director of Museums, and since 1991 the monument has been closed for major modifications. At Ghar Hasan the depictions have been sabotaged since 1988 under the cover of popular vandalism; an important section of the cave has been closed off since January 1996 for the protection of a small colony of bats.

The situation prevailing at the present time, regarding Maltese pre-Neolithic humans, is that the scattered fragments of documentation which have been identified appeared to be out of context as isolated features. Before the recognition of Maltese Palaeolithic art, the earlier shreds of evidence seemed unsupported by a cultural backup and were eventually discredited into oblivion. With the increased awareness of art after the Abbe Henri Breuil, Andre Leroi-Gourhan and Jean Clottes, the re-evaluation of the Maltese prehistoric implementology and the scientific tests carried out on the taurodont molars, a reorientation is in line. A position has now been attained wherein further thematic and scientific testing on the art forms, and excavation of selected sites such as Ghar Hasan are indicated in order to identify the actual stage in the Palaeolithic when man started to roam the Maltese Islands, whether this was the Mousterian, the Solutrean or the Magdalenian. The last-mentioned phase covers the period from 20,000 to 10,000 BP, and as it includes the Würm maximum[1], it thus seems the most likely candidate. Accelerated Mass Spectrography or Electron Spin Resonance testing of the taurodont molars would furnish the dating without ambiguity.

In the meantime, the key issue hinges round the array of chemical and radiometric tests carried out in London respectively in 1952, 1963 and 1968. These were the very tests which formed the basis for the obliteration of the taurodonts as evidence for the Palaeolithic.[2] They were not carried out for direct dating of the samples submitted, but their purpose was to prove or refute contemporaneity of the samples in the Pleistocene horizon; the taurodont molars and the remains of the Pleistocene fauna were thus proven to be coeval. The results have also clinched the validity of the taurodont molars as valid evidence in support of the associated repertoire of Palaeolithic culture as outlined above. The Nitrogen results on the Hypogeum teeth, particularly Ma. 6, confirms the similar antiquity of the Hypogeum remains. There is hardly any doubt that during the Magdalenian, approximately 15,000 to 18,000 years ago, humans roamed the Maltese Islands together with Pleistocene Siculo-Maltese deer and the occasional pachyderm. Malta's history is thus extended backward by eight millennia.

The Maltese art repertoire bears strong analogies with those deriving from the Franco-Cantabrian region, particularly the regions of Tito Bustillo. The abundant presence of microliths in Levanzo, northwestern Sicily and Malta provides further compelling evidence for a Palaeolithic migration from the Northwest. During the period in question, the late Pleistocene, which is contemporaneous with the late Palaeolithic, the creeping ice-sheets from the North, the deterioration of climatic conditions, especially during the Würm maximum of 18,000 BP, in the fertile Franco-Cantabrian region, would have forced humans and the cold-intolerant fauna to migrate southward towards the Mediterranean coastline. The Pyrenees and the Cantabrian range limited their migration routes towards the Southwest, and they would have of necessity eventually found themselves in the south of France. From here a Mediterranean journey to the South and the Southeast would have brought them to Levanzo, Northwestern Sicily and the Maltese Islands. A few would have trickled between the Pyrenees and the Cantabrian mountain ranges and reached the South of Spain. The distribution of decorated caves and shelters in the Franco-Iberian peninsula supports this migration pattern.[3] Gibraltar was the last outpost of Neanderthal man, and the dating has been considered recently as 25,000 BP.[4] Towards the beginning of this century Arthur Keith had suggested that Neanderthal man's domain had extended from Gibraltar to Malta;[5] if the taurodont molars are shown by Accelerator Mass Spectrometry or

Electron Spin Resonance to date to that period, then the connection is a plausible one.

Neolithic cave art started in the south of Spain and thence spread to North Africa and down the Nile;[6] there is no evidence so far to show that it has reached the Maltese Islands from this source. The distribution of Sicilian Palaeolithic sites indicates that these people colonized the Maltese and Egadi islands together with the northwestern regions of Sicily from a western source. On the other hand, the Neolithic package reached the Maltese islands as it did with the rest of the Mediterranean basin, namely from the regions of Anatolia and the Near East;[7] thus no Neolithic rock art techniques reached the Maltese Islands, such as occurred in Levanzo. It is likely therefore that the latter's Neolithic cave art derived from Neolithic Sicily rather than from the East.

Very recent DNA studies have shown that the Neolithic colonizers from the Middle East did not migrate in large numbers, but rather in small "pioneer" groups, and thus a "technology transfer occurred, rather than a large-scale population replacement."[8] It therefore seems that although the origins of the Maltese are not African after all, they derived, in part at least, not from Sicily, nor from Turkey, but from the fertile regions of the Franco-Cantabrian region; they reached the Maltese Islands during the last millennia of the Ice Age.

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1 Kaiser 1994: 113-122.

2 Trump 1990: 83; Fedele 1988: 68; Zammit Maempel 1989: 44; Samut-Tagliaferro 1997: 20.

3 Lawson 1991: 19; quoting Baudry 1984 and Moure Romanillo 1987.

4 Connor 1996: 1.9. Chris Stringer, co-author of *In Search of the Neanderthals* and author of *African Exodus*, renowned palaeontologist at the Museum of Natural History in London, has, together with his colleagues identified the latest Neanderthal remains in Gibraltar, and dated them to approximately 25,000 BP.

5 Keith 1918: 404. Keith was actually suggesting an extension from continent to continent, since he considered Malta as being African.

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[6] Personal communication from Alicia Meza prior to reading her paper at the Forlì Conference, September 1996.

[7] Sykes 1996.

[8] Sykes 1996.

APPENDIX ONE
Politico-religious aspects

Politico-religious considerations have modified the identification and interpretation of the cultural heritage of the Maltese Islands. From the point of view of religion, the adherents of the Biblical account of Genesis have antagonized the advancement of Palaeolithic man; in an effort to establish a permanent link with the Northern continent, all possible links with the East and the South have been severed by the politicians.

The British had taken over the Maltese Islands according to the prevailing wishes of the local population; this was early on in the nineteenth century. The circumstances of this take-over had been unique and bore 'no analogy to any other instance in the modern history of this (British) kingdom.'[1] The final years under the Knights and the three year interlude of French domination had been hard on the population. The archipelago was initially considered desirable by the British merely because of its strategic importance, as a stationary man-of-war in the Central Mediterranean.[2] Because of Malta, Britain had resumed the hostilities with France which ended at Waterloo. At this time Malta was being considered by the British as forming part of the European rather than the African continent.[3] This attitude contradicted the earliest reference to the Maltese islands by Skylax, who had placed them with Africa instead.[4]

The British administration encountered three main hurdles in its administration of the Maltese islands. The first in chronology was the local Catholic Church, the second was unified Italy and the third was the Partito Nazionalista which took up the Italian cause. Maltese nationalism rested on two pillars according to Frendo, and these were the Italian language and the Roman Catholic faith;[5] these pillars had to be removed if the Colonial Government was to control the archipelago absolutely.

At the turn of the nineteenth century Rome no longer ruled supreme in Malta through the Knights of the Order and the local Church; worse still the religion of the new rulers from Britain was the Protestant one, and as such created an even greater rift between the British administration in Malta and the local Roman Catholic church.

The British were aware that 'he who rules the soul, rules everything,'[6] and the life of the Maltese centred around the Church; [7] the Bishop exercised a 'moral power over an entirely Catholic population.'[8] Although the Colonial Government respected their committment to preserve and protect the Roman Catholic faith in Malta, the question of the Church's temporal authority was another matter.[9] From early on in the nineteenth century the British adopted measures to curb this temporal authority of the church, at the same time that Britain maintained good diplomatic relations with the Vatican; even the selection of a new bishop eventually required the sanction of the British.[10]

The other major problem constantly facing the British Colonial Government in Malta was the Italian language. The local clergy and professionals opposed its replacement vehemently; one political party was created in order to maintain the language in the archipelago. [11]

Other influences from overseas however also competed with the British. Political refugees and immigrants from the Italian states had made the Islands their haven during the pre-Risorgimento revolutions, and these elements helped to reinforce the Italian '*identita*' amongst the Maltese. Italian was still the language of the Courts and Latin of the Church, so that the local lawyers and the clergy immediately opposed the introduction of another language to demote the Italian one. During the early years of British colonial government in Malta, Italian was the language which was used in its official correspondence.

The British navy had shielded Garibaldi's landing in Sicily at the start of the Risorgimento in 1860, but with the unification of Italy which followed, a rival power now appeared to threaten Britain's man-of-war in the Mediterranean. Notwithstanding the indirect assistance rendered to Garibaldi, diplomatic relations between Britain and the Vatican remained satisfactory, and the Maltese bishop would not normally condone his clergy in its antagonistic stance against the British. Yet although the bishop would therefore not usually oppose the Colonial Government, the clergy in their turn often withheld their co-operation. One such example was when they failed to transmit the Bishop's circular in support of the Colonial Government. [12]

Fresh waves of political refugees and immigrants reached the archipelago after the Risorgimento, and the publication of the so-called Keenan Report in 1876 [13] sparked off the language issue. [14] The British were again enhancing their efforts to have the Italian language replaced; their initial efforts to have it substituted by English had been interpreted as an attempt to introduce Protestantism thereby, and the plans were aborted. Their move now towards the end of the nineteenth century was for its substitution by Maltese.

It was at this time that the Partito Anti-reformista or Nazionalista was born under the leadership of Fortunato Mizzi, and its slogan was the Italian language and *identita* for the Maltese nation. [15] The Nationalists were anti-Imperialists and anti-reformists, and thus opposed all changes proposed by the Colonial Government. [16] Initially the local church opposed both Mizzi and Strickland,[17] but a common interest in the preservation of the Italian language soon brought the clergy and Mizzi together against Strickland and the pro-British community. Furthermore the clergy still considered English as a Protestant threat and identified Italian with Roman Catholicism.[18] Thus a united front was formed by the Partito Nazionalista, the local clergy, the lawyers and other professional bodies against the British Colonial Government in its efforts to demote the Italian language. There was, however, one significant section which supported the British. This was the local nobility. The anti-Italian '*redentist*' group led by Sigismondo Savona supported the British in the language question, [19] whilst the Minister for Education, Sir Augustus Bartolo lent them his support for other reasons. Using the testimony of the ancient authors like Diodorus Siculus, the latter hypothesized that Malta was never Italian, the Maltese were Phoenicians, and also that, according to anthropologists, they were a pure race.[20]

Fortunato Mizzi, the leader of the Partito Nazionalista, denied a Phoenician ancestry, and was convinced that the Colonial Government was doing all in its power to attribute a Semitic nationality to the Maltese, especially an Arabic one.[21] Mizzi stressed that at least anthropologically the Maltese were certainly not Arabs.[22] Mizzi's hypothesis was rather that for a Sicilian colony which populated Malta after Count Roger's conquest. He insisted on retaining the Italian language which made the Maltese people European, for without it Malta would not pertain to the Arab world but to the African one.[23]

In this battle between the pro-British and the pro-Italians, the protagonists attempted to seek out the roots of the Maltese race in order to identify the real ancestors. The pro-Italians identified the Maltese with the Latin races of Europe who had left their indelible marks on the Maltese people through their constant exposure since Rome. The pro-British were led by Count Strickland, who, like Bartolo was proposing the Phoenicians as the ancestors of the Maltese race; anthropologically, the Maltese resembled the Phoenicians,[24] and their languages were very similar as well; in fact the Maltese language was derived from the Phoenician - Punic.[25] Besides, Strickland proposed, the Phoenicians were a white race, and the Maltese were descended directly from them. [26] He clashed severely with both the local clergy and the Partito Nazzionalista on these counts.

In this context therefore, the pro-Italians associated Malta with Sicily, at least insofar as its ancestry was concerned. The pro-British were naturally against such a link, and supported a Phoenician origin of the Maltese race, refuting however any connections with Africa or the Semites.[27] In their turn the pro-Italians utterly refuted the Phoenician hypothesis, and they therefore antagonised all theories which suggested non-Sicilian forefathers for the Maltese, whether these were Pleistocene men in general or Neanderthal man in particular. The fallacy in this attitude was that a Pleistocene ancestor links the Maltese Islands with Europe rather than with Africa, and would therefore have strengthened their own hypothesis for Latin roots.

These developments towards the turn of the twentieth century had therefore given a new twist to the language question, and affected further the response to the discoveries in the local archaeological campus. In 1901, F. Mizzi submitted a resolution in Council to have Strickland removed from Chief Secretary, and the Colonial Government acquiesced by having him transferred to the other side of the world; Mizzi died a few years later in 1905, and was eventually succeeded by his son Enrico,[28] whose slogan was one of integration with Italy.[29] During the war years he was court-martialled by the British for his irredentist leanings, and the party was led by a member of the clergy, Mgr. Panzavecchia.

Church and State now worked hand in hand to ‘protect their common interests,’ [30] an attitude which irritated the new entrant on the scenario. Manwel Dimech had admired Enrico’s father in his anti-British stance, but had opted for Maltese rather than Italian as the national language.[31] Maltese was accepted as a dialect but not as a language which could replace Italian. [32] In 1900 Bishop Pace admonished Dimech, and eleven years later he excommunicated him after founding his *Xirka tal-Imdawlin* and re-circulating his

Bandiera tal-Maltin; he was accused of being a heretic, a freemason, a Protestant and an Illuminist, he was persecuted, even stoned, and eventually exiled to Alexandria in 1914 by the British, and was kept from returning to Malta after the war through the local Curia's maneuvers, until he died in 1921. His tenets were perpetuated in Malta through his followers. [33] His supporters included Fr. Manwel Magri[34] and Sir William Willcocks.[35]

When Count Strickland returned to Malta in 1917 he renewed his efforts against the Italian irredentists,[36] and in 1921 he published his "*Malta and the Phoenicians*," wherein he again expressed his arguments and re-proposed his hypothesis for a Phoenician ancestry of the Maltese race. In the following year, a motion which proposed the adoption of Maltese as the national language was defeated by 15 votes to 12.[37]

The incidents of the Sette Giugno of 1919 decreased further the popularity of the British administration and fostered strong anti-British emotions in several Maltese. After the 1921 Constitution the Nationalists under Mizzi manifested an even greater fanatical allegiance to all that was Italian.[38] The elections of 1921 returned the first Maltese Prime Minister in the form of Joseph Howard, a candidate in Mgr. Panzavecchia's U.P.M. party; anti-Strickland propaganda was rife at this time. A coalition with Savona's Labour Party lasted till 1923. The elections of 1924 resulted in a Coalition government by the U.P.M. and the P.D.N.; these merged into the P.N. in 1926. The following year Strickland's party took over the government, but prior to the projected elections of 1930, the local church issued a ban upon the faithful from voting for Strickland and his party under pain of mortal sin;[39] the protagonist among the clergy at this time was Monsignor Dandria, and his slogan was for a Latin ancestry rather than an Italian one. He accused Strickland of being pro-Maltese in order to demote the Italian.[40] The elections were deferred until 1932, when the P.N. were elected. When it was felt that Italian influence in Malta had attained significant proportions, the Colonial administration assumed the government as well, and although the official take-over was in 1936, the British had actually governed from 1933 to 1939.[41] The elections of 1939 returned the Constitutional Party, but Lord Strickland passed away the following year.[42]

When Italy joined Germany against the Allies in the early 1940's the question of Italian *identita* received a setback, and several pro-Italian Maltese were deported to Uganda throughout the war years. These included the PN leader Mizzi and the Chief Justice Sir Arturo Mercieca.[43] Once the war was over, self-government was granted in 1947, and the elected Labour Government split into two factions three years later. The Nationalist Government under George Borg Olivier governed between 1950 and 1955; in view of the political events of the previous decade, the P.N. re-proposed Dandria's slogan for a Latin identita *in lieu* of an Italian one.[44] Whilst the Labour party at this time wanted integration with Britain, the Nationalists were still in favour of an alliance with Italy. [45]

Mintoff held office between 1955 and 1958, he resigned on the latter date when he failed to make headway with the British over the question of Integration; in 1962 the Nationalists were back in power for the following ten years, and independence was granted during this time, in 1964. Once again the local church had interfered with politics as it had done in the 1930's electoral campaigns against Strickland, and this by imposing moral restrictions upon the electorate in their choice of candidates.[46] In 1971, Henry Frendo's attempts to resuscitate Manwel Dimech encountered drastic opposition from the clergy and he was sacked from Editor of the '*Il-Hajja*.' [47] A monument to Manwel Dimech was set up in May 1976 under the Labour Government.[48]

Labour governed until 1987, and at the very start of this tenure, in 1971, Mintoff adopted a definite anti-British stance; by 1979 there was no longer a British military base in Malta. A Republic was proclaimed in 1974; Mintoff turned towards Gaddafi and Libya, and the questions of language and ancestry were re-awakened following Gaddafi's visit to Malta in 1976. In his speech at Cospicua, Gaddafi declared that 'the Maltese people are not Italians, nor British... The Maltese people are Phoenicians..... the origin of the Maltese is Phoenician, that is of a Semitic state.' and thus similar in its history to Libya.[49] The following year, at Birzebbuga, Gaddafi declared a common ancestry for the Maltese and Libyan people. At the People's Congress of the Jamahirijah on the 31st of October 1978, Mintoff echoed these statements by stating that both Libyans and Maltese are descended from the Phoenicians, and both have the same language.[50] Mintoff and Gaddafi were re-proposing the hypothesis submitted by Bartolo and Strickland a few decades previously.

These declarations elicited a response from the local tabloid affiliated to the Nationalist Party. Historicus lashed out at these hypotheses by re-awakening Mifsud Bonnici's tenets [51] and the impressions of Prof. Ugolini, the latter being accused of a strong political bias by some.[52] The rebuttal of these statements of Historicus was also published shortly afterwards.[53]

Towards the turn of the twenty-first century Malta has been lined up for incorporation into Europe, independently of the origin of the Maltese race. Our first ancestors did not derive from the Neolithic folk of Stentinello or Monte Kronio, for humans had already roamed the Maltese Islands before the end of the Ice Age.

ENDNOTES:

1 Earl of Liverpool to Royal Commissioners, 1/5/1812.

2 Frendo 1979: 5.

3 The Malta Act, 1801, in Harding, W. (ed.) 1945, vol. vi, p. 300. In 1973 the Colonial Office file no. 890009 (CO/158-536, of the PRO for 1941-3) was destroyed; this file dealt with the question of which continent Malta belonged to (Cf. Vella 1974: i, 14).

4 Skylax in Muller 1965, quoted by Leith Adams 1870: 257 fn. 2.

5 Frendo 1980: 17.

6 Shebbeare 1756: 144.

7 Bezzina 1985: 145.

[8] Pace Forno to SS, 2/7/1858.

[9] Abercrombie to Pigot, 10/12/1800; Bathurst to Maitland, 16/7/1813; Odo Russell to Lord Russell, 3/5/1861; Hobart to Cameron, 14/5/1801.

[10] Koster 1984: 43.

[11] Koster 1984: 56; 73-5.

[12] Koster 1984: 60; Frendo 1979: 43.

[13] Frendo 1968: 32.

[14] Koster 1984: 56.

[15] Frendo 1978: 106; Koster 1984: 56.

[16] Frendo 1980: 11, 26.

[17] Frendo 1980: 67.

[18] Koster 1984: 58.

[19] Koster 1984: 62.

[20] Bartolo 1930: 616-7, 618, 622.

[21] Hull 1993: 147.

[22] Hull 1993: 138.

[23] Hull 1993: 135, 137.

[24] Strickland 1950: 22.

[25] Hull 1993: 145. Even before the advent of the British, eminent Maltese scholars such as Agius de Soldanis (1750: 40) and M.A. Vassalli (1791) were proposing the Punic tongue as the direct ancestor of the Maltese language. In 1827 Vassalli repudiated his former hypothesis.

[26] Hull 1993: 147.

[27] Strickland1950: 7.

[28] Koster: 1984: 68-9.

[29] Frendo 1968: 31.

[30] Frendo 1968: 89.

[31] Frendo 1979: 51.

[32] Hull 1993: 167.

[33] Azzopardi 1978: 12; 1981: 6. Frendo1972: 147, 156, 158.

[34] Mallia1978: 129-134.

[35] Willcocks 1926: 1-17.

[36] Hull 1993: 55, 145, 197.

[37] Frendo 1968: 38.

[38] Hull 1993: 366; Il-Mument, 22.6.1986, p. 8, Mario Azzopardi to the Editor.

[39] Schiavone 1992: 61, 74, 96, 103.

[40] Schiavone 1992: 136, 168.

[41] Schiavone 1992: 103, 153.

[42] Schiavone 1992: 159-160.

[43] Frendo 1979: 10-1.

[44] Frendo 1979: 100; Koster 1984: 145.

[45] Hull 1993: 99.

[46] Koster 1984: 183.

[47] Koster 1984: 241-2.

[48] Azzopardi 1978: 146.

[49] Libyan Embassy, 1976: 39.

[50] Historicus, 6/1/1979.

[51] Mifsud Bonnici 1931, passim.

[52] Evans 1971: 4.

[53] Historicus, 6/1/1979, 13/1/79; Mifsud, A., 3/2/1979.

BIBLIOGRAPHY

Abela, G.F., 1647, *Della Descrittione di Malta Isola nel Mare Siciliano, con le sue antichita*. Paolo Bonacota: Malta.

Abelson, P.H., 1954, *Palaeochemistry*. Yb. Carnegie Institute, Washington, **53**: 97-101.

Ackerman, J.L., Ackerman, A.L. and Ackerman, A.B., 1973, Taurodont, pyramidal and fused molar Roots associated with other Anomalies in a kindred. *American Journal of Physical Anthropology* **38** (3): 681-94.

Adloff, P., 1907, Die Zahne des Homo Primigenius von Krapina, *Anatomischer Anzeiger* **31**: 273-282.

Agius, A.J., 1959, *The Hal Saflieni Hypogeum*. Union Press, Malta.

Agius, A.J., 1970, *The Guide Book to Ghar Dalam and Museum*. n.p.

Agius de Soldanis, G.F., 1750, *Della Lingua Punica presentemente usata dai Maltesi*, Rome.

Agius De Soldanis, G.F., 1754, *Gozo, Sacro, Profano, Antico, Moderno*. Maltese Translation Giuseppe Farrugia, 1. 1936; 2. 1953, Malta.

Aitken, M. J., 1990, *Science-based Dating in Archaeology*, Longman, London.

Allen, J., Golson, J and Jones, R., 1977, *Sunda and Sahul*. Academic Press, London.

Anati, E., 1989a, *Les Origines de l'Art et la Formation de l'Esprit humain*. Albin Michel, Paris.

Anati, E. (ed.) 1989b, Malta: Importanti scoperte della Missione Archeologica Italiana, in *B.C. Notizie*, Dicembre 1988, Anno V, **4**: 20, Centro Camuno di Studi Preistorici, Capo di Ponte, Italy.

Anati, E., 1989c, *Arte Parietale a Malta (Relazione Preliminare).* Typescript at Library of Museum of Archaeology, Valletta. DAG 16.100q. Box 16.6.f. Prog. No. 2114. TS (86) Vol. 1.

Anati, E., 1990, Arte Parietale a Malta (Relazione Preliminare), in *Bollettino del Centro Camuno di Studi Preistorici*, **25-26**: 166-172.

Anati, E., 1995, Archaeological Exploration in Malta, *in Bollettino del Centro Camuno di Studi Preistorici*, **28**: 103-4.

Anca, F., 1859, Note sur deux nouvelles ossiferes decouvertes en Sicile en 1859, *in Bulletin de la Societe Geologique de France*, (2), 1859-60, **17**: 684-695.

Anca, F, 1867, *Paleontologia Sicula*, Palermo.

Aquilina, J., 1945, *L-Ilsien Malti*, Lux Press.

Aquilina, J., 1970, *Papers in Maltese Linguistics*, The Royal University of Malta.

Arambourg, C. and Arnould, M., 1950, Note sur les fouilles paleontologiques executees en 1947-48 et 1949 dans le gisement Villafranchian de la Garaet Ichkeul, in *Bullettin de la Societe de la Science Naturelle de Tunisie*, II, **3-4**:149-57.

Aramburu, J., Garrido, C. and Sastre, V., 1995 (2nd. ed.), Guia Arqueologica de Mallorca. Les Fonts Ufanes, Palma de Mallorca.

Ascenzi, A., 1955, Some histochemical properties of the organic Substance in Neanderthal Bone, in *American Journal of Physical Anthropology*, Washington (n.s.) **13**: 557-566.

Ashby, T., Zammit, T, and Despott, G., 1916, Excavations in Malta in 1914, in *Man,* 1916, **1**: 14. The Royal Anthropological Institute, London.

Attenborough, D., 1989, *The First Eden, The Mediterranean World and Man*, Fontana Paperbacks, London.

Azzopardi, G., 1978, *Ghejdut Manwel Dimech,* Union Press, Valletta.

Azzopardi, G., 1981, *Manwel Dimech u Dun Gorg Preca,* Kumitat Monument Manwel Dimech, Marsa.

Bahn, P. (ed.) 1992, *Dictionary of Archaeology:* Harper Collins, Glasgow.

Bahn, P. and Vertut, J., 1988, *Images of the Ice Age,* W.H. Smith & Son Ltd, Windward.

Baker, S., 1866, *The Nile Tributaries of Abyssinia,* Macmillan, London.

Baldacchino, J.G., 1931-34; 1935-49. Correspondence with Museum of Natural History, in DF 100. K.P. Oakley to Baldacchino 30/1/1963 in 141/30. Archives of the Museum of Natural History, London. Archives 2, PAL 100-199.

Baldacchino, J.G., 1934, *Ghar Dalam*. The Museum, Valletta.

Baldacchino, J.G., 1965, *The supposed existence of Neanderthal Man in Malta.* Typescript in private collection.

Baldacchino, J.G. and Dunbabin, T.J., 1953, *Rock Tomb at Ghajn Qajjet, near Rabat, Malta,* Papers of the British School at Rome **21:** 32-41, Plates XII - XIV.

Baldacchino, J.G. and Evans, J.D., 1954, *Prehistoric Tombs near Zebbug,* Papers of the British School at Rome **22:** 1-21.

Bandi, H-G, and Maringer, J., 1952, *L'Art Prehistorique: les Cavernes, le Levant Espagnol, les regions Arctique,* Charles Massin & Cie, Paris*.*

Barker, P., 1993 (3rd ed.), *Techniques of Archaeological Excavation*, B.T. Batsford Ltd, London.

Bartolo, A., 1930, *The Present Position in Malta,* Journal of the Royal Institute of International Affairs, 616-635.

Bate, D.M.A., 1935, The New Mammals from the Pleistocene of Malta, *Proceedings of the Zoological Society* (London), **112**: 247-264.

Bate, D.M.A., 1937, in Garrod, D., *The Stone Age of Mount Carmel,* vol. i, Oxford.

Baynes-Cope, A.D., 1955, The Bulletin of the British Museum (Natural History), *Geology*, **2:** 283-4.

Bellanti, D., 1934, *Malta: A Historical and Descriptive Guide*. Giov. Muscat, Valletta.

Beltran, A., 1984, Les Animaux de l'Art rupestre des Chasseurs du Levant Espagnol, in Bandi, H.G. (ed.) *La Contribution de la Zoologie et l'Ethologie a l'Interpretationde l'Art des Peuples Chasseurs Prehistoriques.* 353-369. Editions Universitaire, Fribourg.

Berger, R., Horney, A.G. and Libby, W.F., 1964, Radiocarbon Dating of Bone and Shell from their organic Components, *Science,* **144**: 999-1001.

Berkovitz, B.K.B., Holland, G.R. and Moxham, B.J., 1992, *A Colour Atlas and Text of Oral Anatomy, Histology and Embryology*. BPCC Hazells Ltd, Aylesbury, Bucks for Wolfe Publishing Ltd.

Bermudez de Castro, J.M. and Nicolas, M.E., 1995, Posterior dental size reduction in hominids: the Atapuerca evidence. *American Journal of Physical Anthropology* **96** (4): 335-356.

Bernabò Brea, L., 1950a, The Prehistoric Culture-Sequence in Sicily, *Annual Report of the University of London Institute of Archaeology of London*, **13** (6).

Bernabò Brea, L, 1950b, *Il Neolitico a Ceramica Impressa e la Diffusione nel Mediterraneo,* Rivista Internazionale di Studi Liguri*, **16,*** vol. i***.***

Bernabò Brea, L., 1957, *Sicily before the Greeks*, Thames and Hudson, London.

Bernabò Brea, L, 1960, *Malta and the Mediterranean,* Antiquity, **34:** 132-137.

Bernabò Brea, L, 1966 (rev. ed.) *Sicily before the Greeks*, Thames and Hudson, London.

Bernabò Brea, L, 1972 (5th ed.), *La Sicilia prima dei Greci,* Il Saggiatore, Milan.

Bernardini, E., (ed.) 1995, *Sicilia Archeologica*. Istituto Geografico De Agostini, Novara.

Bernick, S.M., 1970, Taurodontia, *Oral Surgery, Oral Medicine and Oral Pathology*, **29**: 549-550.

Betts, A.V.G., 1987, *The Hunter's Perspective: 7th millennium B.C. Rock Carvings from Eastern Jordan,* World Archaeology **19** (2): 214-225.

Bezzina, J., 1985, *Religion and Politics in a crown Colony. The Gozo-Malta Story,* Bugelli Publications, Valletta.

Blouet, B., 1965, *Gozo,* Progress Press Co. Ltd., Malta.

Bologna, P. et al., 1994, Late Pleistocene Mammals from the Melpignano (LE) "Ventarole," in *Bollettino della Societa Paleontologica Italiana* **33** (2): 265-274.

Bologna, P., and Petronio, C., 1994, The first occurrence of Bison priscus Bojanus in the Melpignano area, in *Bollettino della Societa Paleontologica Italiana* **33** (2): 275-8.

Bonanno, A., 1985, Archaeology in Malta (4), Before Man, in *Civilization,* **25**: 688-689, P.E.G. Ltd, Malta.

Bonanno, A., 1986a, Archaeology in Malta (5), the Earliest Inhabitants, in *Civilization,* **27**: 748-749, P.E.G. Ltd, Malta.

Bonanno, A., 1986b, A Socio-economic Approach to Maltese Prehistory. The Temple Builders. in *Malta: Studies of its Heritage and History,* 15-45. Mid-Med Bank Ltd., Malta.

Bonanno, A., (ed.) 1991, Introduction, to History, Culture and Society in the Mediterranean World, *Journal of Mediterranean Studies*, **1** (2): 163-9.

Bonanno, A., 1993, The Birgu Peninsula in Prehistoric and Classical Times. In Bugeja, L., Buhagiar, N. and Fiorini, S. (eds.), *Birgu, a Maltese Maritime City,* vol. i, 17-30. Malta University Series Ltd., Msida.

Bonanno, A., 1994, Archaeology, in Frendo, H. and Friggieri, O. (eds.) *Malta: Culture and Identity,* Ministry of Youth and the Arts: Malta.

Bondi, S.P., 1995, Malta, Millenni di Civilta nel Cuore del Mediterraneo, in *Archeo,* **122** (4): 52-87. De Agostini, R.C.S., Rizzoli Periodici S.p.a., Milan.

Bone Analyses manuscript, Department of Palaeontology, The Museum of Natural History, British Museum, London.

Bonello, J., 1997, Video-taped interview.

Bonello, G. and Caruana Galizia, D., 1996, Prehistoric Discoveries in Maltese Private Collections, in *Treasures of Malta,* **2** (3): 65-70. Fondazzjoni Patrimonju Malti, Malta.

Bonello, M.A., 1995 (April), *New Hypogeum Hall - The Hypogeum,* unpublished Structural Assessment Report, Guillaimier Industries Ltd., San Gwann.

Bonfiglio, L., di Stefano, G., Insacco, G., Massa, A.C., 1992, New Pleistocene fissure-filling deposits from the Hyblean Plateau (South Eastern Sicily), in *Rivista Italiana di Paleontologia e Stratigrafia* **98** (4): 523-539.

Bonnici, A., 1989, *A Study of the Micro-climate within the Hal Saflieni Hypogeum Complex,* unpublished B. Ed. (Hons.) Dissertation, University of Malta.

Bordaz, J., 1970, *Tools of the Old and New Stone Age,* Dover Publications Inc., New York.

Borg, J., 1911, Remains of the Prehistoric Flora of Malta, in *Archivum Melitense,* I (1910-12), nos. 2-4 (April 1911).

Borg, J., 1915, Agriculture and Horticulture in Malta, in Macmillan, A., (ed.), *Malta and Gibraltar*, 173-182. W., H. and L. Collingridge, London,

Borg, J., 1936, Traces of the Quaternary Ice Age in the Maltese Islands, in *Archivum Melitense*, X, No. 1, (May 1936).

Borg, J. 1988, Malta, in Stebbings, R.E. (ed.), *Conservation of European Bats*. International Union for the Conservation of Nature, Croom Helm Publishers, London.

Bouchez, R., Condomines, M., Faure, M., Guerin, C., Jeunet, A., Ma, J.L., Piboule, M., Poupeau, G., Rossi, A.M. and Sarcia, M.N.G., n.d., *Radiometric dating of Hippopotamus pentlandi from Ghar Dalam Cave, Malta*. ms.

Bouchez, R., Condomines, M., Faure, M., Guerin, C., Jeunet, A., Ma, J.L., Piboule, M., Poupeau, G., Rossi, A.M. and Sarcia, M.N.G., 1988, ESR and Uranium series disequilibria dating of an Hippopotamus pentlandi from the Ghar Dalam Cave (Malta), *Proceedings of the International Conference "Early Man in Island Environments,"* Oliena, 25th September - 2nd October 1988, p. 54.

Bowen, R.N.C., 1958, *The Exploration of Time*, George Newnes Ltd., London.

Bowman, S., 1990, Radiocarbon Dating, in *Interpreting the Past*, British Museum Publications, London.

Bradley, R.N., 1912, *Malta and the Mediterranean Race,* T. Fisher Unwin, London.

Bray, W. and Trump, D., 1982 (2nd. ed.) *Dictionary of Archaeology,* Penguin Books, London.

Breuil, H., 1905, La Degenerescence des Figures d'Anmaux en Motifs, Ornamentaux a l'Epoque du Renne, In *Compte Rendus de l'Academie des Inscriptions et Belles Lettres, 105-120.*

Breuil, H., 1913, Les Subdivisions du Paleolithique Superieur et leur Significance, in *Compte Rendu du Congres International d'Anthropologie Prehistorique,* **14:** 165-238.

Breuil, H., 1952, *Quatre Cente Siecles d'Art Parietal.* Centre d'Etude et de Documentation Prehistorique, Montignac.

Breuil, H., 1966, The Palaeolithic Age, in Huyghe, R. (ed.)., *Art and Mankind,* 30-39. Paul Hamlyn Ltd., London.

Brincat, J.M., Malta 870-1054, 1991, *Al-Himyari's Account*, Said International, Malta.

British Museum (Natural History), 1995, *Compiled List of Data for Malta: Relative Dating of Archaeological Samples*. Personal Communications from Molleson, T., Department of Palaeontology to the author, 12/7/1995.

Bronowski, J., 1987, *The Ascent of Man*, Futura Paperbacks, London.

Bibliography

Brothwell, D. and Higgs, E., 1970, Scientific Studies in Archaeology, in *Science in Archaeology*, 23-34. Thames and Hudson, London.

Brothwell, D.R., 1981, *Digging up Bones: The Excavation, Treatment and Study of Human skeletal remains*. Oxford University Press, Oxford.

Bryce, T.H., 1913, Teeth of Prehistoric Man. *British Dental Journal*, **134:** 105.

Burkitt, M.C., 1955 (3rd. ed.), *The Old Stone Age*, Bowes and Bowes, London.

Busuttil, A., 1953, *The Pageant of Life on Earth*. Giov. Muscat, Valletta.

Calvert, J., 1996, *Second Half of Ghar Dalam expected to be completed this month,* Times of Malta, 15th March 1996.

Capasso Barbato, L., Gliozzi, E., Malatesta, A., Petronio, C., Zammit Maempel, G., 1996, *Endemic Pleistocene Cervids of Mediterranean Islands: populating Models.* Beijing, 30th International Geological Congress, 4- 14th August 1996.

Caporlingua, M., 1995, *Sicilia Archeologica,* Istituto Geografico de Agostini, Novara.

Carnot, A., 1893, Recerches sur la composition generale et la teneur en fluor des os modernes et des os fossiles de differents ages, *Annales de Mineralogie*, (9, Mem.) **3:** 155-195.

Caruana Gatto, A., 1915, Maltese Flora, in Macmillan, A., (ed*.), Malta and Gibraltar*, 173-182. W. H. and L. Collingridge, London.

Cassar, P., 1964, *Medical History of Malta*, Wellcome Foundation Medical Library, London.

Cassar Pullicino, J., 1947, The Caves of Malta and Gozo. *Mageos, Organ of the Malta Geographical Society,* **1**(1): 19-23.

Cassels, R., 1984, Faunal extinctions and Prehistoric man in New Zealand and the Pacific islands, in Martin, P.S. and Klein, R., *Quaternary Extinctions*, 741-767. University of Arizona Press, Tucson.

Castle, W.M., 1977, *Statistics in small Doses*, Churchill Livingstone, London.

Caton Thompson, G., 1923, Ghar Dalam, in Murray, M.A. (ed.), *Excavations in Malta*, Part I, 7-13. Bernard Quaritch, London.

Caton Thompson, G., 1925, Ghar Dalam, in Murray, M.A. (ed.), *Excavations in Malta*, Part II,1-18. Bernard Quaritch, London.

Chalmers, N. (ed.) 1991 (2nd ed.), *Man's Place in Evolution*, Natural History Museum Publications, Cambridge University Press.

Chamberlain, A., 1994, *Human Remains*, British Museum Press.

Champion, S., 1980, *Dictionary of Terms and Techniques in Archaeology*, Everest House, New York.

Cherry, J.F., 1981, Pattern and Process in the earliest colonization of the Mediterranean islands. *Proceedings of the Prehistoric Society*, **47**, 41-68.

Cherry, J.F., 1992, Palaeolithic Sardinians? Some Questions of Evidence and Method, in Tykot, R.H. and Balmuth, M.S., (eds.) *Sardinia in the Mediterranean: A Footprint in the Sea*., Sheffield Academic Press.

Chilardi, S., Frayer, D.W., Gioia, P., Macchiarelli, R. and Mussi, M., 1996, Fontana Nuova di Ragusa (Sicily, Italy): southernmost Aurignacian site in Europe. *Antiquity* **70:** 553-563.

Cichon, J.C. and Pack, R.S., 1985, Taurodontism: Review of Literature and Report of Case. *Journal of the American Dental Association*, **111** (3): 453- 5.

Clottes, J., 1989, The identification of human and animal figures in European Palaeolithioc art, in Morphy, H. (ed.) , *Animals into Art*, pp. 21-56. Unwin Hyman, London.

Clottes, J. (ed.), 1992-96, *International Newsletter on Rock Art*. Comitè International d'Art Rupestre, France.

Clottes. J., Valladas, H., Cachier, H. and Arnold, M., 1992, Des Dates pour Niaux et Gargas, in *Bulletin de la Societe Prehistorique Francaise,* **89** (9): 270-4.

Clottes, J., 1996, Thematic changes in Upper Paleolithic Art: a view from the Grotte Chauvet, *Antiquity,* **70:** 276-288.

Coles, J.M. and Higgs, E.S., 1969, *The Archaeology of Early Man,* Faber and Faber, London.

Colinvaux, P, 1993, *Ecology 2,* John Wiley and Sons, Inc., New York.

Collcutt, S.N., 1979, The Analysis of Quaternary Cave Sediments, in *World Archaeology,* **10** (3): 290-301.

Collins, D. and Huyghe, L., 1966, Historical Summary: Prehistoric Art, in Huyghe, R. (ed.), *Art and Mankind*, 40-51, Paul Hamlyn, London.

Congreve, C., 1930, The Villa Frere, Malta, in *Country Life* (5th July), London.

Connor, S., 1996, Last of Cavemen found in Gibraltar, in *The Sunday Times* 29.9.1996, **1:** 9. London.

Cooke, J.H., 1891, Notes on the Pleistocene beds of Gozo, in *Geological Magazine*, **38**, 348-255.

Cooke, J.H., 1892, *Some Evidences of the Occupation of the Maltese Islands by Prehistoric Man*. (no pub.)

Cooke, S.F. and Heizer, R.F., 1947, The Quantitative Investigation of Aboriginal Sites: Analysis of Human Bone, *American Journal of Physical Anthropology*, **5**, 201-20.

Cooke, S.F. and Heizer, R.F., 1959. *The American Journal of Physical Anthropology*, as quoted in Garlick, J.D. 1970: 508.

Cootes, R.J. and Snellgrove, L.E., 1991 (2nd ed.) *The Ancient World*, Longman Secondary Histories.

Cornwall, I.W., 1960, *Bones for the Archaeologist*, Phoenix House Ltd., London.

Cottrell, L., (ed.) 1960, *The concise Encyclopoedia of Archaeology*, Hutchinson, London.

Crawford, J.L., 1970, Concomitant Taurodontism and Amelogenesis Imperfecta in the American Caucasian, *Journal of the Dentition of Childhood*, **37.**

Daito, M. and Hieda, T. 1971, Taurodont Teeth in Primary Dentition, *Japanese Journal of Pedodontology*, **9,** 94-106.

Daniel Glyn, E., 1950, *A Hundred Years of Archaeology,* Gerald Duckworth & Co., London.

Daniel Glyn, E., 1962, *The Iea of Prehistory,* Penguin Books, Middlesex.

Davidson, C.F., and Bowie, S.H.U., 1955, Bulletin of the British Museum, (Natural History), *Geology*, **2** (6), pp. 276-282.

Davy, J., 1842, *Notes and Observations on the Ionian islands and Malta*. London.

Day, M.H., 1977 (3rd ed.), *Guide to Fossil Man*, Cassell, London.

De Bono, P., 1908, *A Brief Compendium of the History of Malta*, (English Translation by Prof. D. Fallon), Daily Malta Chronicle, Valletta.

Della Pietà, C., 1995, Animali in Viaggio. La Migrazione, in *Airone* **173:** 44-65. Giorgio Mondadori, Milan.

Delluc B. and G., 1991, L'Art Parietal Archaique en Aquitaine, in *CNRS* **28,** Suppl. a Gallia Prehistoire.

De Stefani, C., 1913, L'Arcipelago di Malta, in *Rendiconto della Reale Accademia dei Lincei*, Roma, Series V, XXII, pp. 3 et seq.

Della Pieta, C., 1995, Partiam, partiamo, in *Airone* **173**, 48 - 65. G. Mondadori, Milan.

Demetsopoulos, J.C., Burleigh, R. and Oakley, K.P., 1983, Relative and absolute dating of the human skeleton from Galley Hill, Kent. *Journal of Archaeological Science* 10: 129-134.

Despott, G., 1916, The Excavations conducted at Ghar Dalam (Malta) in July 1916, in *Reports on the State of Science*, The British Association, Section H, Newcastle, 1916, 294-302.

Despott, G., 1918, Excavations conducted at Ghar Dalam (Malta) in the Summer of 1917. *Journal of the Royal Anthropological Institute*, **48:** 214-224.

Despott, G., 1923, Excavations at Ghar Dalam (Dalam Cave), Malta, in *Journal of the Royal Anthropological Institute*, **53:** 18-35.

De Terra, M., 1903, *Mitteilungen zum Krapina-Fund unter Besonderer Berucksichtigung der Zahne*, Schweiz Vrerteljahrschrift Zahnheilkd, **13,** 11-23.

Diem, K. and Lentner, C., (eds.) 1975, (7th ed.), *Scientific Tables*, Ciba-Geigy Limited, Basle, Switzerland.

Dorn, R.I., 1997, Constraining the age of the Côa valley (Portugal) engravings with radiocarbon dating. *Antiquity* **71:** 105-115.

Dudley Buxton, L.H., 1922, The Ethnology of Malta and Gozo, in *Journal of the Royal Anthropological Institute*, **52:** 164-211.

Dudley Buxton, L.H., 1924, Malta: An Anthropological Study. *The Geographical Review*, Vol. XIV, No. 1, Jan 1924, 75-87.

Dudley Buxton, L.H., 1928, Excavation of a Mousterian rock shelter at Devil's Tower, Gibraltar, Chap. 2, Human Remains, *Journal of the Royal Anthropological Institute of Great Britain and Ireland* **57:** 58.

Dunning, W.B. and Ellsworth Davenport, S., 1947, *A Dictionary of Dental Science and Art*, J. & A. Churchill, London.

Durrani, G., Khan, S.A., Renfrew, C. and Tai, J., 1971, *Obsidian Source Identification by Fission Track Analysis*, in Nature, **233**, 242-3.

Duterloo, H.S., 1991, *An Atlas of Dentition in Childhood*, BPCC Hazells Ltd, Aylesbury, Bucks for Wolfe Publishing Ltd.

Eastoe, J.E. and Courts, A., 1963, *Practical analytical Methods for connective Tissue Proteins*, E. and F.N. Spon, London.

Eisenbarth, P. and Hille, P., 1997, A non-destructive method for the age-determination of fossil bone. *Journal of Radioanalytical Chemistry* **40:** 203-211.

Elliott Smith, G., 1929, *The Migrations of Early Culture.* Manchester University Press.

Ellul, J.S., 1988, *Malta's Prediluvian Culture at the Stone Age Temples*, Malta: Printwell Ltd.

Evans, G.H., 1900, *A Guide to Malta and Gozo*, W. Watson and Co., Valletta.

Evans, J.D., 1953, The Prehistoric Culture-Sequence in the Maltese Archipelago, *Proceedings of the Prehistoric Society*, **19:** 41-94.

Evans, J.D., 1956a, Two Phases of Prehistoric Settlement in the Western Mediterranean. *Institute of Archaeology Bulletin,* 1-22.

Evans, J.D., 1956b, The Dolmens of Malta and the origins of the Tarxien cemetery culture. *Proceedings of the Prehistoric Society for 1956*, **22:** 85-101.

Evans, J.D., 1956c, *Aegeo-Anatolian and Indigenous Elements in the Cultures of the Western Mediterranean in the 2nd Millennium B.C., with Special Reference to Malta.* Unpublished thesis, Cambridge.

Evans, J.D., 1959, *Malta*. Ancient Peoples and Places series, XI. Thames and Hudson, London.

Evans, J.D., 1960, Malta and the Mediterranean. *Antiquity* **34:** 218-220.

Evans, J.D., 1961, C-14 date for the Maltese early Neolithic. *Antiquity* **35:** 143-4.

Evans, J.D., 1968, Malta in Antiquity, in Rossiter, S. (ed.) *Malta,* 9-28. Ernest Benn Ltd, London.

Evans, J.D., 1971, *The Prehistoric Antiquities of the Maltese Islands*: *a Survey*. The Athlone Press, University of London.

Evans, J.D., 1977, Island Archaeology in the Mediterranean: problems and opportunities, in *World Archaeology*, **9** (1) (Island Archaeology), 12 -29.

Evans, J.D. 1995, (Malone, C. and Stoddart, S. eds) Malta in Antiquity, in Macgregor Eadie, P., *Malta and Gozo- Blue Guide,* Malta.

Fairbridge, R.W., 1961, Eustatic changes in sea level, in *Physics and Chemistry of the Earth*, **4,** 99-185.

Fairbridge, R.W., 1971, Quaternary shoreline problems at INQUA. *Quaternaria*, **15**, 1-17.

Falconer, H., 1860, On the Ossiferous Grotta di Maccagnone near Palermo, in *Quarterly Journal of the Geological Society,* 99-106.

Falconer, H., 1868a, On the Fossil Remains of Elephas Melitensis, &c., from the Ossiferous Caves of Malta, *in Palaeontological Memoirs and Notes of the late Hugh Falconer*, Vol. ii. Ed. C. Murchison, London, pp. 292 et seq.

Falconer, H., 1868b, Memorandum on the former Connection by Land of Sicily with Malta, in *Palaeontological Memoirs and Notes of the late Hugh Falconer*, Vol. ii. Ed. C. Murchison, London, pp. 552 et seq.

Falconer, H., 1868c, Primeval Man and his Contemporaries, *in Palaeontological Memoirs and Notes of the late Hugh Falconer*, Vol. ii., Ed. C. Murchison, London, pp. 596 et seq.

Farris Lapidus, D., 1990, *Dictionary of Geology.* Harper Collins Publishers, London.

Farrugia Randon, J., R. and S., 1996, *Three Maltese Personalities.* J., R. and S. Farrugia Randon, Malta.

Farrugia Randon, S., 1995, *The Fishing Industry in Malta.* Independence Print, Malta.

Fedele, F., 1988, Malta: Origini e Sviluppo de Popolamento Preistorico, in Anati, F. and Anati, E. (eds.) *Missione a Malta*, 51-90, Jaca Book spa, Milan.

Fenech, N., 1997, *Bird Shooting and Trapping in the Maltese Islands - Some Socioeconomic, Cultural, Political, Demographic and Environmental Aspects,* 144. Unpublished Ph. D. Thesis, University of Durham.

Fischer, H., 1961, Die "Primatichen" Molaren von Krapine, Kroatien, in Lichte rezenter Funde, *Deutsche Zahnaerztl*., **16.**

Flower, W.H., 1870, *Osteology of the Mammalia.* Macmillan & Co., London.

Forbes, A. (Jr.) and Crowder, T.R., 1979, The problems of Franco-Cantabrian Abstract Signs: Agenda for a New Approach, in *World Archaeology* **10** (3): 350-366.

Frendo, A., 1988, H.J. Franken's Method of Ceramic Typology: An Appreciation. *Palestine Exploration Quarterly*, 120: 108-129.

Frendo, H.,1971, *Manwel Dimech, Hajtu u Hsibijietu.* Klabb Kotba Maltin, Malta.

Frendo, H., 1972, *Manwel Dimech's Malta (1860-1921).* Mediterranean Publishing Ltd., Malta.

Frendo, H., 1978, L-Evoluzzjoni tal-Partiti Politici fil-Gzejjer Maltin (1880-1926), in Frendo, H. (ed.) *Storja 78*, 97-120.

Frendo, H., 1979, *Party Politics in a Fortress Colony: the Maltese Experience.* Midsea Books Ltd., Malta.

Frendo, H., 1980, *Ir-Rieda ghall-Helsien, 1880-1905.* Azad Publications, Sliema.

Frobenius, L. and Fox, D.C., 1937, *Prehistoric Rock Pictures in Europe and Africa.* Museum of Modern Art, New York.

Funk and Wagnalls Corporation, 1996, Paleolithic Art*, in Encarta 1996,* Microsoft ® Encarta ® 1996 Encylopedia, © 1993-1995 Microsoft Corporation.

Galea, R.V., 1915, Geology of the Maltese Archipelago, in Macmillan, A., (ed.), *Malta and Gibraltar*, pp. 173-182. W., H. and L. Collingridge, London.

Gamble, C., 1994, The Peopling of Europe, 700,000 to 40,000 years before the present, , in Cuncliffe, B., (ed*.), The Oxford Illustrated Prehistory of Europe*, pp. 5-41. Oxford University Press.

Gamer, S., and Zusman, S., 1967, Taurodontism in a 15-year-old Boy and his Mother, *Journal of the South California Dental Association*, **35**.

Garlick, J.D., 1970, Buried Bone: The Experimental Approach in the Study of Nitrogen Content and Blood Group Activity, in Brothwell, D. and Higgs, E., (eds.) 1970, *Science in Archaeology*, pp. 503-25. Thames and Hudson, London.

Garrigou, F., in Daniel, E. G., 1950, *A Hundred Years of Archaeology*, Gerald Duckworth & Co. Ltd, London.

Garroud, J.R., (n.d.), Archaeological Remains, in Ennion, E.A.R., *Field Study Books*. Methuen & Co. Ltd., London.

Gauthreaux, S.A., 1980, Long and short term climatic changes*. Animal migration, orientation and navigation*, Academic Press, New York.

Gemmellaro, G.G., 1866, *Sulla grotta di Carburanceli, nuova grotta ad ossame e ad armi di pietra dei dintorni della Grazia di Carini*, Palermo.

Gimbutas, M., 1974, *The Gods and Goddesses of Old Europe: 7,000 - 3,500 B.C. Myths, Legends and Cult Images.* Thames and Hudson, London.

Gimbutas, M., 1991, *Civilization of the Goddess*. Harper: San Francisco.

Giusti, F., Manganelli, G. and Schembri, P.J. 1995*, The Non-marine Molluscs of the Maltese Islands*, Museo Regionale di Scienze Naturali, Torino.

Gliozzi, E., Malatesta, A., Scalone, E. and Zammit Maempel, G., 1993, Revision of Cervus Siciliae Pohlig 1893, late Pleistocene endemic deer of the Siculo-Maltese district, in *Geologia Romana* **29:** 307-353, University of "La Sapienza" Studies, Rome.

Goldstein, D.M.D. and Gottlieb, M.A., 1973, Taurodontism: Familial Tendencies demonstrated in eleven of fourteen case Reports*. Oral Surgery, Oral Medicine and Oral Pathology,* **36** (1): 131-144.

Gonzales Echegaray, J., 1972, Notaspara el estudio cronologico del arte rupestre de la cueva del Castillo, in *Santander Symposium,* 409-422.

Goodall, J., 1990, *Animal World (Hippos).* Collins, London.

Gorgjanovic-Kramberger, K., 1906, *Der Diluviale Mensch von Krapina in Kroatien*, Wiesbaden. Kreidel.

Government Report for Works of the Government Department, 1920-21, Section E 1.

Gowlett, J.A.J., 1992, *Ascent to Civilization*, McGraw Hill Inc. New York.

Green, H.S. et al, 1981, Uranium Oxide dating at Pont Newydd cave, *Nature,* **294:** 707-713.

Greene, K., 1995, *Archaeology, An Introduction, (Rev. 3rd ed.),* B.T. Batsford Ltd., London.

Gregory, W.K., 1922, *Origin and Evolution of the Human Dentition*. Williams and Wilkins, Baltimore.

Gribbin, J. and M., 1996, The Greenhouse Effect, in *New Scientist* **2037** (151): 1-4.

Groube, L., Chappell, J., Meeke, J. and Price, D., 1986, *A 40,000 year old occupation site at Huon peninsula, Papua, New Guinea*. Nature 324: 453-5. London.

Guido, M., 1967, *Sicily: an Archaeological Guide.* Faber and Faber Ltd., London.

Guilaine, J., 1979, The Earliest Neolithic in the West Mediterranean: a new reappraisal, *Antiquity* **53** (207): 22-30.

Gvirtzman, G., 1994, Fluctuations in sea level during the past 400,000 years: the record of Sinai, Egypt, in *Coral Reefs* 13 (4): 203-214.

Haddy, A. and Hanson, A., 1982, Nitrogen and Fluorine Dating of Moundville skeletal samples, *Archaeometry* **24:** 37-44.

Hamner J.E., Witkop, C.J., and Metro, P.A., 1964, Taurodontism, *Oral Surgery, Oral Medicine and Oral Pathology*,**18** (3): 409-418.

Harding, W., (ed.) 1945, The Malta Act, 1801.

Harrison, C.J.O., 1979, The Extinct Maltese Crane, *Il-Merill,* **20:** 14-15. The Ornithological Society, Malta.

Harrold, F.B., A comparative analysis of Eurasian Paleolithic burials, in *World Archaeology* **12** (2): 195-211.

Haug, E., 1911, Traite de Geologie, **2**. Paris.

Heizer, R.F. and Cook, S.F., 1952, Fluorine and other chemical tests of some North American human and fossil Bones. *American Journal of Physical Anthropology*, Washington (n.s.) **10:** 289-304.

Herre, W., 1970, The Science and History of Domestic Animals, in Brothwell D. and Higgs, E. (eds.), *Science in Archaeology*, 257-272. Thames and Hudson, London.

Hillson, S., 1986, *Mammals in Archaeology: Teeth.* Cambridge University Press.

Historicus 1979, The Maltese and their Origins, in *The Democrat*, 6.1.1979, 3.1.1979.

Hobbs, W.H., 1914, The Maltese Islands: A Tectonic Topographioc Study, in *Scottish Geographical Magazine*, January 1914.

Holt, R.D. and Brook, A.H., 1979, Taurodontism: a criterion of diagnosis and its prevalence in mandibular first permanent molars in a sample of 1115 British Schoolchildren. *International Association of the Dentition of Childhood*, **10**: 41-7.

Holy See, 1930, *Correspondence with the Holy See relative to Maltese Affairs.* His Majesty's Stationery Office, London.

Hopson, M.F., 1915, Apes to Modern Man: Neanderthal Race. *British Dental Journal*, 36: 985.

Hull, E., 1914, The Invasion of Africa by the Animals of Europe, in *The Outlook*, 7/2/1914.

Hull, G., 1993, *The Malta Language Question*, Said International, Malta.

Huyghe, R., 1966, Prehistoric Art: Art Forms and Society, in Huyghe, R. (ed.) *Art and Mankind,* 16-25. Paul Hamlyn, London.

Huyghe, R., 1966, Primitive Art: Art Forms and Society, in Huyghe, R. (ed.) *Art and Mankind,* 72-77. Paul Hamlyn, London.

Hyde, H.P.T., 1955, *Geology of the Maltese Islands*. Lux Press: Malta.

Ikeya, M., 1986, Electron Spin Resonance, in Zimmerman, M.R. and Angel, J.L., (eds.) *Dating and Age Determination of biological Materials*. Croom Helm, London.

Issel, A., 1866, Note sur une Caverne a Ossements de l'Ile de Malte, in *Materiaux pour l'Histoire de l'Homme*, **2** (Sept. 1865 - Aout 1866), pp. 242-6.

Jaspers, M.T., 1981, Taurodontism in the Down Syndrome, *Oral Surgery, Oral Medicine and Oral Pathology*, **51** (6):632-6.

Jorda, F., 1991, The Cults of the Bull and of a feminine Divinity in Spanish Levantine Art, *Journal of Mediterranean Studies* **1** (2): 295-305.

Jorda Cerda, F., 1979, Sur des Sanctuaries Monothematique dans l'Art Rupestre Cantabrique, in Proceedings of the Third Valcamonica Symposium, July-August 1979*, The Intellectual Expression of Prehistoric Man: Art and Religion*, pp. 331-348, Capo di Ponte, Italy.

Jorda Cerda, F., Mallo Viesca, M. and Perez, M., 1976, *Les Grottes du Pozo del Ramu et de la Lloseta (Asturies, Espagne) et ses Representations Palaeolithiques*, in Bulletin de la Societe Prehistorique d'Ariege, xxv: 95- 139.

Jorgenson, R.J. and Warson, R.W., 1973, Dental abnormalities in the Tricho- dento-osseous syndrome, *Oral Surgery, Oral Medicine and Oral Pathology,* **36** (5): 693-700.

Kaiser, K.F., 1994, On the trail of the glacial climate by tree rings and snail shells. *Vierteljahrschrift der Naturforschenden Gessellschaft in Zuerich* **139** (3): 113-122.

Kalley, J., 1963, A Radiographic Study of the Neanderthal Teeth from Krapina, Croatia. In Brothwell, D.R. (ed.) *Dental Anthropology*, Pergamon Press, London and New York.

Keeley, L.H., 1980, *Experimental Determination of Stone Tool Uses. A Microwear Analysis.* University of Chacago Press.

Keene, H.J., 1966, A Morphologic and Biometric Study of Taurodontism in a Contemporary Population, in *American Journal of Physical Anthropology*, **25:** 208-209.

Keith, A., 1913, Problems relating to the Teeth of the earlier Forms of Prehistoric Men, *Proceedings of the Royal Society of Medicine*, **6** (Odontological section): 1.

Keith, A., 1918, Discovery of Neanderthal Man in Malta, in *Nature,* **101**: 405 et seq.

Keith, A., 1924, Neanderthal Man in Malta, *Journal of the Royal Anthropological Institute*, **56:** 251-260.

Keith, A., 1925, *The Antiquity of Man*, (2 vols.) Williams and Norgate, Ltd., London.

Keith, A., 1950, *An Autobiography*, Watts & Co., London.

Komatz, Y. et al. 1978, Taurodontism and Klinefelter's Syndrome. *Journal of Medical Genetics*, 15: 6: 452-4.

Koster, A., 1984, *Prelates and Politicians in Malta*, The Netherlands, Van Gorcum and Comp.

Kurten, B., 1970a, Pleistocene Mammals and the Origin of Species, in Brothwell D. and Higgs, E. (eds.), *Science in Archaeology*, pp. 251-256. Thames and Hudson, London.

Kurten, B., 1970b, Evolution at a Population Level, in Brothwell D. and Higgs, E. (eds.), *Science in Archaeology*, pp. 661-8.

Laferla, A.V., 1935, *The Story of Man in Malta*. A.C. Aquilina & Co., Malta.

Lamb, H.H., 1977, *Climate: present, past and future*, Methuen: London.

Laming-Emperaire, A., 1962, *La Signification de l'Art Rupestre Paleolithique*. Picard, Paris.

Laming-Emperaire, A., 1972, Art Rupestre et Organisation Sociale, in *Santander Symposium,* 65-82.

Lang, D.M., (n.d.) *Soils of Malta and Gozo.* Her Majesty's Stationery Office, London.

Lartet, E., 1860, in *Bulletin de la Societe Anthropologique de Paris* (1865) **6**.

Laspina, S., 1966 (Revised 10th ed.), *Outlines of Maltese History*, A.C. Aquilina & Co., Malta.

Lawson, A.J.,1991, *Cave Art*, Shire Archaeology, Buckinghamshire.

Leakey, M., 1995, The Dawn of Humans - The Farthest Horizon, *National Geographic*, September 1995, pp. 38 - 51.

Le Gros Clark, W.E., 1955, The Fossil Evidence for Human Evolution, in De Bruyn, P.P.H.*, The Scientist's Library, Biology and Medicine,* University of Chicago Press, Chicago.

Lehmann, J, 1980, *Hal Saflieni Hypogeum at Paola : A Study of the Prehistoric Temple with a view to establish a programme for its conservation.* Unpublished Report prepared for the National Museum of Archaeology.

Leith Adams, A., 1865, Maltese Caves - Report on Mnaidra Cave. From *The Report of the British Association for the Advancement of Science for 1865.*

Leith Adams, A., 1866, Second Report on Maltese Fossiliferous Caves, from *The Report of the British Association for the Advancement of Science for 1866.*

Leith Adams, A., 1870, *Notes of a Naturalist in the Nile Valley and Malta*, Edmondston and Douglas, Edinburgh.

Leith Adams, A., 1874a, *Concluding Report on the Maltese Fossil Elephant.* Report of the British Association for 1873, 185-7.

Leith Adams, A., 1874b, On the Dentition and Osteology of the Maltese fossil Elephants, being a Description of Remains discovered by the Author in Malta between the years 1860 and 1866. *Transactions of the Zoological Society*, **9**, Part 1, November 1874.

Leith Adams, A., 1881, *Palaeontological Society*, Part III, **41:** 2-4.

Lemonick, M.D., 1995, Odysseys of Early Man, in *Time International* **145** (6): 40 - 2.

Leroi-Gourhan, A., 1965, *Prehistoire de l'Art Occidental*. Mazenod, Paris.

Leroi-Gourhan, A., 1966, Prehistoric Art: Beginnings of Art, in Huyghe, R. (ed.) 1966, *Art and Mankind,* 26-30. Paul Hamlyn, London.

Leroi-Gourhan, A., 1966, The Art of Living Primitive Peoples, in Huyghe, R. (ed.) 1966, *Art and Mankind,* 78-80. Paul Hamlyn, London.

Leroi-Gourhan, A., 1973-4, Resume des Cours de 1973-74, in *Annuaire du College de France* **74:** 381-390.

Leroi-Gourhan, A., 1982, The Archaeology of Lascaux Cave, in *Scientific American,* June 1982: 80-88.

Leroi-Gourhan, A., 1984, *Arte y Graphismo en la Europa Prehistorica.* Collegio Universitario Ediciones Istmo, Madrid.

Leute, U., 1987, *Archaeometry: an Introduction to Physical Methods in Archaeology and the History of Art*, VCH publishers (UK), Cambridge.

Lewin, R., 1989 (2nd. ed.), *Human Evolution,* Blackwell Scientific Publications, Edinburgh.

Lewis, H., 1977, *Ancient Malta*, Colin Smythe, Bucks.

Lewis-Williams, D. and Dowson, T., 1988*, The Signs of all times: Entoptic Phenomena in Upper Palaeolithic Art*, in Current Anthropology **29**: 201- 245.

Lorblanchet, M, 1977, From Naturalism to Abstraction in European Prehistoric Art, in Ucko, P.J. (ed.), *Form in Indigenous Art,* 44-56. Duckworth, London.

Lorblanchet, M., 1989, From Man to Animal and Sign in Palaeolithic Art, in Morphy, H. (ed.), *Animals into Art,* 109-143. Unwin Hyman, London.

Lunt, D.A., 1954, A Case of Taurodontism in a modern European Molar, *The Dental Record,* November 1954. Saward & Company, London.

Lyell, C., 1830-3, *Principles of Geology*: London

Lysell, L., 1962, Taurodontism: A Case Report and Survey of the Literature. *Odontological Review*, **13.**

Lysell, L., 1965, Taurodontism in both Dentitions; Report of a Case, *Odontological Review*, **16.**

Madeira, M.C. et al. 1986, Prevalence of Taurodontism in Premolars*, Oral Surgery, Oral Medicine and Oral Pathology* **61** (2): 158-162.

Mallia, S., 1978, *Manuel Magri S.J.,* IKS Istitut Kkomunikazzjoni Socjali, Malta.

Manduca, J. (ed.) 1987, *Malta Who's Who 1987,* Progress Press, Malta.

Mangion, J.J., 1962, Two Cases of Taurodontism in Modern Human Jaws, in *British Dental Journal* **113** (9): 309-312.

Manson-Hing, L.R., 1963, Roentgeno-oddities: Taurodontism*. Oral Surgery, Oral Medicine and Oral Pathology*, **16**.

Martin, H., 1923, L'Homme Fossile de la Quina, *Archives de la Morphologie Generale et Experimentale*, **15**.

McGregor Eadie, P. 1995, *Malta and Gozo - Blue Guide.* A. & C. Black, London.

Megarry, T., 1995, *Society in Prehistory*, Macmillan Press Ltd., Hampshire.

Mena, C.A., 1971, Taurodontism, Oral Surgery, *Oral Medicine and Oral Pathology*, **32** (5).

Menard, H.W., *Islands.* Scientific American Library, New York.

Metro, P.S., 1965, Taurodontism, a dental Rarity in modern Man*, Oral Surgery, Oral Medicine and Oral Pathology* **20:** 236-7.

Middleton, J., 1844, On Fluorine in Bones: Its Source and its Application to the Determination of geological Age of fossil Bones. *Proceedings of the Geological Society of London*, **4**: 431-3.

Mifsud A., 1979, The Maltese and Their Origins, in *The Democrat*, 3.2.1979.

Mifsud Bonnici, C., 1931, *The Soul of the Maltese Race*, Malta: Sapienza's Library.

Miller, W.A., 1969, Pulp calcification in a Taurodontic Tooth, *British Dental Journal*, **126.**

Milliman, J.D. and Emery, K.O., 1969, *Sea levels during the past 35,000 years*, in Science, **162**: 1121-3. Washington DC.

Mizzi, J.A., 1995, *Hippopotamus Jaw found at Ghar Dalam.* Sunday Times, 17th December 1995, Malta.

Moorrees, C.F.A., 1957, *A Correlative Study of Dental Characteristics in an Eskimoid People*, ed. 1, Cambridge, Harvard University Press.

Morana, M., 1987, *The Prehistoric Cave of Ghar Dalam*, Printwell Ltd., Fgura.

Morelli, C., 1972, Bathymetry, Gravity and Magnetism in the Strait of Sicily, in Allan, T.D., Akal, T. and Molcard, R. (ed.), *Saclant ASW Research Centre*, La Spezia.

Moulin, R.J., 1965, *Prehistoric Painting.* Heron Books Ltd., London.

Moure-Romanillo, J.A. and Cano-Herrera, M., 1979, Tito Bustillo Cave (Asturias, Spain) and its Magdalenian of Cantabria, in *World Archaelogy* **10** (3): 280-289.

Murray, J., 1890, The Maltese Islands with special Reference to their geological Structure, in *The Scottish Geographical Magazine*, VI, September 1890, pp. 449 et seq.

Nelson, W., 1996 (15th ed.), *Textbook of Paediatrics.* N.B. Saunders Co., London.

Neville, B.W. et al., 1991, *Color Atlas of Clinical Oral Pathology*, Lea and Febiger, Philadelphia and London.

New Scientist, 1996, *Artful Dating,* **274** (6): 17.

New Scientist, 1996, *Elephants swam in two by two,* **150** (2036): 15.

Northcote, N.M., 1981-3. The Giant Maltese Swan, in *Il-Merill* **22:** 6-7. The Ornithological Society, Malta.

Northcote, N.M., 1984-5. The Giant Maltese Crane, in *Il-Merill* **23:** 1-4. The Ornithological Society, Malta.

Nougier, L.R., 1966, *L'Art Prehistorique.* PUF, Paris.

Oakley, K.P. and Hoskins, C.R., 1950, New Evidence on the Antiquity of Piltown Man, *Nature*, **165:** 379-82.

Oakley, K.P., 1948, Fluorine and the Relative Dating of Bones, *Advancement of Science,* **16:** 336-7.

Oakley, K.P., 1955, Bulletin of the British Museum (Natural History), *Geology*, **2**, pp. 254-265.

Oakley, K.P., 1964, The Problem of Man's Antiquity, An Historical Survey, *Bulletin of the British Museum* (Natural History), Geology, **9,** No. 5, London.

Oakley, K.P., 1969 (3rd ed.), *Frameworks for Dating Fossil Man*, Weidenfeld and Nicolson, London.

Oakley, K.P., 1970, Analytic Methods of Dating Bones, in Brothwell, D. and Higgs, E., (eds.) 1970, *Science in Archaeology*, 35-45. Thames and Hudson, London.

Oakley, K.P., 1971, *Catalogue of Fossil Hominids.* Trustees of the British Museum.

Oakley, K.P., 1972, *Man the Tool-maker*, (6th ed.), Trustees of the British Museum (Natural History), London.

Oakley, K.P., 1980, *Relative Dating of the Fossil Hominids of Europe.* Bulletin of the British Museum, Natural History (Geology Series).

Ogden, G.R., 1988, The Significance of Taurodontism in Dental Surgery, *Dental Update,* Jan.-Febr. 1988, pp. 32-34.

Orme-Johnson, W.H., 1985, Molecular Basis of biological Nitrogen Fixation, *Annual Review of Biophysical and Biophysiological Chemistry,* **14,** 419- 459.

Pace, A., 1995, Hagar Qim, a World Heritage Site, in *Malta this Month,* December. Valletta: Advantage Advertising Ltd, May issue, pp.27-30.

Pace, A., 1996 (ed.) *Maltese Prehistoric Art*, Patrimonju Publishing Ltd., Valletta.

Pace, J.L., 1972, *The Anatomical Features of Prehistoric Man in Malta*, Royal University of Malta.

Palmer Imbrie, J. & K., 1979, *Ice Ages: Solving the Mystery*. London.

Parkes, P.A., 1986, *Current Scientific Techniques in Archaeology*, Croom Helm, London.

Peake, H. and Fleure, H.J., 1927, *Hunters and Artists*, Clarendon Press: Oxford.

Pedersen, P.O., 1949, *The East Greenland Eskimo Dentition*, Meddellsen, Om Gronland, **142**: 1-256.

Penck, A. and Bruckner, E., 1909, *Die Alpen im Eiszeitalter,* 3 vols. Leipzig.

Perlès, C., 1979, Des navigateurs méditerranéens il y a 10,000 ans. *La Recerche,* **10** (96): 82-5.

Pfeiffer, J., 1983, *The Creative Explosion*, Harper and Row, New York.

Phillips, F.M., Flinsch, M., Elmore, D. and Sharma, P., 1997, Maximum ages of the Côa valley (Portugal) engravings measured with Chlorine-36. *Antiquity* **71:** 100-104.

Pickerill, H.P., 1909, Radicular aberrations: Bilateral radicular dentomata, *Proceedings of the Royal Society of Medicine*, (Odontological section) **2**: 150-2.

Pike, G., 1971, The Animal Bones from the Xemxija Tombs, in Evans, J.D., *The Prehistoric Antiquities of the Maltese Islands: A Survey,* 239-241. The Athlone Press, University of London.

Pindborg, J.J., 1970, *Pathology of the Dental Hard Tissues*, Munksgaard, Copenhagen.

Pontier, G., 1925, Etude sue l'Elephas planifrons (Falconer) du Pleocene Superieure d'Angleterre, *Annales de la Societe Geologique du Nord*, **48**:153-9.

Prabhu, S.R. et al., 1992, *Oral Diseases in the Tropics*, Oxford University Press, Oxford.

Price, C.A., 1954, *Malta and the Maltese.* Georgian House, Melbourne.

Protsch, R.R.R., 1986, Radiocarbon Dating of Bones, in Zimmerman, M.R. and Angel,J.L., (eds.) *Dating and Age Determination of biological Materials*. Croom Helm, London.

Public Records Office, C.O. 158-536 (1941-3), Kew.

Racheli, G., 1979-86, *Egadi, Mare e Vita*, U. Mursia, Milan.

Rackham, J., 1994, *Interpreting the Past: Animal Bones.* Trustees of the British Museum, London.

Randall-MacIver, D., 1935, The Prehistoric Antiquities of Malta*, Antiquity* **9** (34): 204-8.

Reader, J., 1990 (2nd ed.), *Missing Links: The hunt for Earliest Man*. Penguin Books.

Reese, D.S., 1996, Cypriot Hippo Hunters No Myth. *Journal of Mediterranean Archaeology* **9.1:** 107-112.

Renfrew, C., 1977, Ancient Europe is older than we thought, in *National Geographic* **152**, (5): 614-623.

Renfrew, C., 1978, *Before Civilization*, Penguin Group, London.

Renfrew, C. and Bahn. P., 1996 (2nd ed.), *Archaeology: Theories, Methods and Practice.* Thames and Hudson Ltd, London.

Reports: *Museum of Archaeology*, 1912-1939; 1946-1967; 1973-4. Govt. Printing Office, Malta.

Rizzo, C., 1913, *Geologia dell'Arcipelago dell'Isola di Malta*, Malta.

Rizzo, C., 1932, *Report on the Geology of the Maltese Islands*; 31/8/1928 , Government Printing Office, Malta.

Robbins, I.M., and Keene, H.J., 1964, Multiple Morphologic Dental Abnormalities; Report of a case, *Oral Surgery, Oral Medicine and Oral Pathology*, **17**.

Roberts, M. and Parfitt, S., 1996, *Long in the Tooth*, in UCL Universe, **6** (2): 22, University of London.

Rybakov, A.A., 1982, *Report on the Inspection of the underground complex “Hypogeum”.* Unpublished Report prepared for the Museum of Archaeology.

Saliba, P.C., 1994, *The Evolution of Domesticated Animals*, Assignment re Monitored Field Work, Department of Archaeology, The University of Malta.

Samut-Tagliaferro, J., 1997, Malta and Neanderthal Man, in *The Malta Independent*, 5.1.1997.

Sauk, J.J, and Delaney, J.R., 1973, Taurodontism, diminished root formation, and microcephalic dwarfism*, Oral Surgery, Oral Medicine and Oral Pathology,* **36** (2): 231-5.

Savona Ventura, C., 1985, Ghar Dalam. *Civilization* **22:** 605-7; **24:** 669-670; **26:** 715.

Sawyer, D.R. et al., 1982, *Developmental Anomalies of the Teeth, Jaws and para-oral Structures in pre-Columbian Peruvian Indians.* Nigerian Dental Journal, **3**: 36-53.

Schembri, P.J., 1994, Natural Heritage, in Frendo, H. and Friggieri, O. (eds.), *Malta: Culture and Identity* . Ministry of Youth and the Arts, Malta.

Schembri, P.J., 1995, *The Mediterranean and the Maltese Islands*, Lecture of the 26th October 1995, at the Marine Natural History Course, SSCN Marine Committee, Valletta.

Schembri, P.J. and Baldacchino, A.E., 1992, *Ilma, Blat u Hajja. Is-Sisien tal-Ambjent Naturali Malti.* Malta University Services Ltd., Malta.

Schiavone, M, J, 1992, *L-Elezzjonijiet f'Malta 1849-1992. Storja, Fatti, Cifri.* Stamperija Indipendenza, Malta.

Schmid, E., 1970, Cave Sediments and Prehistory, in Brothwell, D. and Higgs, E. (eds.), *Science in Archaeology,* pp. 151-166. Thames and Hudson, London.

Schüle, W., 1993, Mammals, vegetation and the initial human settlement of the Mediterranean Islands: a palaeoecological approach. *Journal of Biogeography,* **20**: 399-412.

Schwalbe, G., 1901, *Verband. der anat*. Gesellschaft., 44.

Schwalbe, G., 1909, *Die Vorgeschichte des Menschen*, Braunschweig.

Schwalbe, G., 1914, *Anatomischer Enzeiger* **47:** 337.

Schweinfurth, G., 1907, Ueber das Hohlen-Palaolithikum von Sizilien und Sudtunisien, in *Zeitschrift fur Ethnologie* **6:** 832-915.

Scientific American, 1977, *Ocean Science*, W.H. Freeman and Company, San Francisco.

Scientific American, 1996, *Artful Dating* **274** (6): 17.

Scott, J.H. and Symons, N.B.B., 1974, *Introduction to Dental Anatomy*, Churchill Livingstone, Edinburgh and London.

Segre, A.G., Biddittu, I. and Piperno, M., 1982, Il Paleolitico Inferiore nel Lazio, nella Basilicata e in Sicilia, Atti della XXIII Reunione Scientifica. *Il Paleolitico Inferiore in Italia*, Firenze 7-9 Maggio 1980, pp. 177-206. Istituto Italiano di Preistoria e Protostoria, Firenze.

Senyurek, M.S., 1939, Pulp Cavities in Primates. *American Journal of Physical Anthropology*, **25**: 119-131.

Shackleton, J.C., Andel T.H. van and Runnels, C.N., 1984, Coastal palaeogeography of the central and western Mediterranean during the last 125,000 years and its archaeological implications, *Journal of Field Archaeology,* **11**: 307-314.

Shackley, M., 1980, *Neanderthal Man*, Gerald Duckworth & Co. Ltd.

Shafer, W.G., 1983, *A Textbook of oral Pathology*. W.B. Saunders, United States of America.

Shaw, J.C.M., 1928, Taurodont Teeth in South African Races, *Journal of Anatomy* (London), **62**: 476.

Shaw, T.R., 1950, Hassan's Cave, Malta, in *Cave Science* **2** (13): 191-3.

Shebbeare, J., 1756, *Letters on the English Nation,* **1:** 144.

Shifman, A. and Chanannel, I., 1978, Prevalence of Taurodontism found in radiographic dental examination of 1,200 young adult Israeli patients. *Community Dentistry Oral Epidemiology* **6** (4): 200-3.

Sieveking, A., 1984, Palaeolithic Art and Animal Behaviour, in Bandi, H.G. *et al.* (eds.) *La Contribution de la Zoologie e de l'Ethologie a l'Interpretation de l'Art des Peuples Chasseurs Prehistoriques,* 91-109. Editions Universitaire, Fribourg.

Sieveking, A., 1995, Palaeolithic Art, in Gowing, L. (ed.) *History of Art*, Andromeda Oxford Ltd.

Simmons, A.H., 1988, Extinct pygmy hippopotamus and early man in Cyprus. *Nature* **333:** 554-7.

Simmons, A.H., 1989, Preliminary Report on the 1988 test excavation at Akrotiri Aetokremnos, Cyprus. *Report to the Department of Antiquities, Cyprus.*

Simmons, A.H., 1996, Whose Myth? Archaeological Data, Interpretations, and Implications for the Human Association with Extinct Pleistocene Fauna at Akrotiri Aetokremnos, Cyprus. *Journal of Mediterranean Archaeology* **9.1:** 97-105.

Sinclair, G.G., 1924, Ghar Dalam and the Eurafrican Bridge*, Journal of the Royal Anthropological Institute*, **16**: 261-275.

Skylax, in Muller, K., 1965, *Geographi Graeici Minores*, I, Georg Olms, Hildesheim. Not. III.

Smith, H. and Koster, A., 1984-86, *Lord Strickland,* 2 vols. Progress Press Co. Ltd., Valletta.

Smith, M.A., 1952, *The Mesolithic in the South of France*, Proceedings of the Prehistoric Society (NS), **18**.

Sondaar, P.Y., 1986, The Pleistocene Deer Hunters of Sardinia, in *Geobios* **19**, 17-25.

Soos, L., 1933, A systematic and zoogeographical contribution to the Mollusc fauna of the Maltese islands and Lampedusa. *Arch. Naturg*. **2,** 305-353.

Spindler, K., 1995, *The Man in the Ice,* Phoenix, London.

Spratt, T.A.B., 1852, *On the Geology of Malta and Gozo*, Malta.

Spratt, T.A.B., 1867, On the Bone-Caves in the Island of Malta, near Crendi, Zebbug and Melliha, *Proceedings of the Geological Society for November 1867, 283-297..*

Stenvik, A. et al, 1972, Taurodontism and concomitant Hypodontia in Siblings, *Oral Surgery, Oral Medicine and Oral Pathology* **33**, (5): 841-5.

Stewart, R.E., Lovrien, E.W., and Wyandt, H., 1971, Unusual Findings in a Patient with a rare Bone Dysplasia (Dyschondrosteosis) and a Chromosomal Anomaly, *Oral Surgery, Oral Medicine and Oral Pathology* **32**.

Stokstad, M., 1995, *Art History.* Harry N. Abrams Inc. Publishers.

Storch, G., 1974, Quartäre Fledermaus-Faunen von der Insel Malta. *Senckenbergiana Lethaea*, **55**: 407-434, Frankfurt a. Maine.

Stoy, P.J., 1960, Taurodontism associated with other Dental Abnormalities, *Dental Practice Dental Records*, **10**.

Streep, P., 1994, *Sanctuaries of the Goddess*. Little, Brown & Co., Boston.

Strickland, M., 1950, *Malta and the Phoenicians*, Progress Press, Valletta.

Stringer, C. and Gamble C., 1993, *In Search of the Neanderthals.* Thames and Hudson, London.

Stringer C. and McKie, R., 1996, *African Exodus. The Origins of Modern Humanity.* Jonathan Cape, London.

Stryer, L., 1988 (3rd ed.), *Biochemistry*, W.H. Freeman and Co, New York.

Stuart, A.J., 1988, *Life in the Ice Age.* Shire Archaeology, Bucks.

Sultana, D., 1988, *The Journey of William Frere to Malta in 1832.* Progress Press Co. Ltd., Valletta.

Suzuki, H and Tanabe, G., 1982, Introduction. Suzuki, M. and Hanihara, G. (eds.) *The Minatogawa man*, 15. University of Tokyo Press.

Swinscow, T.D.V., 1978, *Statistics at Square one*, British Medical Association, London.

Sykes, B., 1996, Anthropology: New DNA Study gives clues about the Origins of Europeans, September 1996 Update on Microsoft ® Encarta ® 1996 Encylopedia, © 1993-1995 Microsoft Corporation, quoting Bryan Sykes, geneticist at the Institute of Molecular Medicine, University of Oxford, in *American Journal of Human Genetics, July 1996.*

Tagliaferro, N., 1911, Prehistoric Burials in a Cave at Bur-Meghez, near Mkabba, Malta, in *Man*, **11** (10): 147-150. Royal Anthropological Institute, London.

Tagliaferro, N., 1915, *Ossiferous Caves and Fissures in the Maltese Islands*, in Macmillan, A., (ed.), *Malta and Gibraltar*, W., H. and L. Collingridge, London, 173-182.

Tanda, G., 1979, Arte e Religione in Sardegna. *International Symposium on the Intellectual Expressions of Prehistoric Man: Art and Religion, 261-279.* Valcamonica, 28th July - 3rd August 1979. Centro Camuno di Studi Preistorici, Brescia.

Tattersall, I., 1995, *The Fossil Trail*, Oxford University Press.

Tennant, R.D., 1966, Taurodontism, *Dental Digest* **72**.

Terrell, J.E., 1976, Island Biogeography and man in Melanesia. *Archaeology and Physical Anthropology of Oceania* **11,** 1-17.

Thake, M.A., 1985, The Biogeography of the Maltese Islands, illustrated by the Clausiliidae, *Journal of Biogeography*, **12**, 269-287.

Thuesen, I. and Engberg, J., 1990, Recovery and Analysis of human genetic material from mummified tissue and bone. *Journal of Archaeological Science* **17:** 679-89.

Tooley, M.J. & Shennan, I. (ed.), 1987, *Sea-Level Changes*. Oxford: Basil Blackwell.

Torre, F., 1995, I Graffiti di Levanzo, in Minuscoli, M. (ed.), *Panteco*, anno iv, **32-33**, Bisedit, Bergamo.

Tratman, E.K., 1950, A Comparison of the Teeth of Indo-European racial Stock with those of the Mongoloid racial Stock. *Dental Record* **70**: 63-88.

Trechmann, C.T., 1938, Quaternary Conditions in Malta, *Geological Magazine* **75**: 1-26.

Trinkaus, E. and Shipman, P., 1993, *The Neanderthals.* Jonathan Cape, London.

Trump, D., (n.d.) *National Museum of Malta: Archaeological Section.* National Museum of Malta.

Trump, D., 1959, The Archaeological Collections of the National Museum, in *Malta Year Book 1959.* Malta.

Trump, D.H., 1966, Skorba, in *Reports of the Research Committee of the Society of Antiquaries of London*, No. XXII, University Press Oxford and The National Museum of Malta.

Trump, D., 1980, *The Prehistory of the Mediterranean.* Allen Lane, London.

Trump, D.H., 1990 (2nd ed.), *Malta: An Archaeological Guide*, Progress Press Co. Ltd., Malta.

Tusa, V. and De Miro, E., 1983, *Sicilia Occidentale*, Newton Compton, Rome.

Ucko, P.J., 1989, La Subjectivité et le Recensement de l'Art Paléolithique, in Gonzales Morales, M.R. (ed.), *Un Siglo despues de Sautuola.* Disputacion Regional de Cantabria y Universidad de Cantabria, Santander.

Ucko, P. and Rosenfeld, A., 1967, *Palaeolithic Cave Art*, McGraw-Hill, New York.

Ugolini, L.M., 1934, Malta: *Origini della Civilta Mediterranea*, Rome.

United States Navy, 1992, *Hydrographic Charts*, US Naval Photographic Interpretation Centre, USN PIC-902/61-U.

Varagnac, A., 1957, From the Neolithic to the Early Bronza Age, in Huyghe, R. (ed.) 1966, *Art and Mankind, 53-56*. Paul Hamlyn, London.

Varrela, J. and Alvesalo, L., 1989, Taurodontism in Females with extra X Chromosomes. *Journal of Craniofacial, Genetical and Developmental Biology* **9** (2): 129-33.

Varrela, J., Alvesalo, L. and Mayhall, J., 1990, *Taurodontism in 45, X Females*. Journal of Dental Research **69** (2): 494-5.

Vassalli, M.A., 1797, *Grammatica Melitensis - Mysen Phoenico-Punicum - Lexicon.*

Vaufrey, R, 1927, Observations de Paleontologie humaine en Sicile, Tunisie et Italie meridionale, communication to the French Institute of Anthropology, in *L'Anthropologie* **37**: 151-154.

Vaufrey, R., 1928, *Le Paleolithique Italien, in Archives de l' Institut de Paleontologie Humaine*, Mem. 3. Paris: Masson et Cie, Editeur.

Vaufrey, R., 1929, Les Elephants nains des Iles mediterraneennes et la Question des Isthmes pleistocenes, *in Archives de l' Institut de Paleontologie Humaine*, Mem. 6. Paris: Masson et Cie, Editeur.

Veen, V., 1992, *The Goddess of Malta*, Inanna-Fia: Holland.

Vega del Sella, Conde del A., 1916, El Paleolitico de Cueto de la Mina (Asturias*)*, *Comision de Investigaciones Paleontologicas y Prehistoricas*, mem. 13, Madrid.

Vella, A.J., Cassar, J., Brincat, D. and Copperstone, S., 1991, Water Seepage in Hal Saflieni Hypogeum, Malta: Tracing the Source by Chemical Analysis, in Ganorkar, M.C. and Rama Rao, N. (eds), *Proceedings of the 1st International Colloquium on the Role of Chemistry in Archaeology, 9-16.* 15th - 18th November 1991, The Birla Institute of Scientific Research, Hyderabad, India.

Vella, A.P., 1974, *Storja ta' Malta*, vol. 1, Klabb Kotba Maltin.

Vigliardi, A., 1968, L'Industria Litica della Grotta di San Teodoro in Provincia di Messina, in *Rivista di Scienze Preistoriche* **23:** 33-144.

Vigliardi, A., 1982, Gli strati Paleo-mesolitici della Grotta di Levanzo, in *Rivista di Scienze Preistoriche* **37:** 79-134.

Ward-Perkins, J.B., 1942, Problems of Maltese Prehistory, *Antiquity* **16** (61): 19- 35.

Watson, W. and Sieveking, G. de G., 1967, *Flint Implements.* British Museum Publications Ltd., London.

Weidenreich, F., 1937, The Dentition of Sinjathropus Pekinensis, *Palaeontology Sinica* (Whole Series 101, New Series D-1).

Weiner, J.S., 1980, *The Piltdown Forgery*, Dover Publications, Inc., New York.

Weiner, J.S., Oakley, K.P. and Clark, W.L.G., 1953, *The Solution of the Piltown Problem*. Bulletin of the British Museum (Natural History), London, (Geology) **2 (**3): 141-146.

Wenke, R.J., 1990 (3rd ed.), *Patterns in Prehistory.* Oxford University Press.

Wettinger, G., 1984, *The Arabs in Malta*, Report and Accounts, 23 et seq. Mid- Med Bank Ltd., Malta.

White, J.P. et al., 1988, Pleistocene dates for human occupation of New Ireland, Northern Melanesia. *Nature* **331**: 707-9. London Williams and Wilkins, Baltimore.

Whitehouse, D. and R., 1975, *Archaeological Atlas of the World.* Thames and Hudson, London.

Willcocks, W, 1926, Syria, Egypt, North Africa and Malta speak Punic, not Arabic, in Egypt during the Forty Years of British Occupation, *Bulletin de l'Istitut d'Egypt,* **8**, Session 1925-1926.

Windels, F., 1948, *Lascaux.* Centres d'Etudes et de Documentation Preistorique, Dordogne.

Witkop, C.J., 1971, Manifestations of Genetic Diseases in the human Pulp. *Oral Surgery, Oral Medicine and Oral Pathology* **32** (2): pp. 278-316.

Woodhead, P., 1985, *Keyguide to Information Sources in Archaeology*. Mansell Publishing Ltd., London and New York.

Wright, J.T et al., 1994, Tricho-Dento-Osseous Syndrome. Features of the Hair and Teeth. *Oral Surgery, Oral Medicine and Oral Pathology* **77** (5): 487- 93.

Yeager, C.G., 1986, *Arrowheads and Stone Artifacts.* Pruett Publishing Co., Colorado.

Zammit, C.G., 1964, Scientific Report, in *Report: Museum of Archaeology, 1964,* 5. Government Printing Ofice, Malta.

Zammit, C.G., 1997, Video-taped interview.

Zammit, L., 1958, *Malta: Mellieha - the Riviera*, Progress Press, Valletta.

Zammit, T., 1915, Archaeology: Prehistoric Remains in Malta and Gozo, in MacMillan A., (ed.), *Malta and Gibraltar Illustrated*, London: W.H. and L. Collingridge, pp. 186 - 198.

Zammit, T., 1916, The Hal Tarxien Neolithic Temple, Malta, in Archaeologia **67:** 127-144, Plates 15 to 26.

Zammit, T., 1917, *Archaeology Field Notes,* Manuscript 18. The Library of the National Museum of Archaeology, Valletta.

Zammit, T., 1925, Burmeghez Cave - Mkabba, in *Reports on the Working of the Governments during the Financial Year 1922-23,* Section O: 3. Government Printing Office

Zammit, T., 1926, *Malta: the Islands and their History*. A.C. Aquilina & Co., Malta.

Zammit, T., 1928 (2nd ed.), *The Neolithic Hypogeum at Hal Saflieni.* Empire Press, Valletta.

Zammit, T. and Singer, C., 1924, *Neolithic Representations of the Human Form from the Islands of Malta and Gozo*. Malta.

Zammit, T., Peet, T.E. and Bradley, R.N., 1912, *The Small Objects and the Human Skulls found in the Hal Saflieni prehistoric Hypogeum*. Second Report. Malta.

Zammit, T., 1935, An Early Christian Rock Tomb on the Hal Resqun Bridle Road at Gudia, in *Bulletin of the Museum* **1** (5): 189-195. The Director of the Museum, Valletta.

Zammit, T., 1966 (4th ed.), *The Copper Age Temples, Tarxien, Malta.* Orphans Press, Ghajnsielem, Gozo.

Zammit Maempel, G., 1977, *An Outline of Maltese Geology*, G.Z.M. Malta.

Zammit Maempel, G., 1982a, A Maltese Pleistocene Sequence capped by volcanic Tufa. *Atti della Societa Toscana di Scienze Naturali*, Ser. A., **88**: 243-260.

Zammit Maempel, G., 1982b, The Folklore of Maltese Fossils, in *Papers in Mediterranean Social Studies* **1.** Midsea Books Ltd., Valletta.

Zammit Maempel, G., 1986, Biology and Ecology of Ghar Dalam Cave, Malta. *Atti della Societa Toscana di Scienze Naturali*, Ser. A, **92**: 351-374.

Zammit Maempel, G., 1989, *Ghar Dalam, Caves and Deposits*, G. Zammit Maempel, Birkirkara, Malta.

Zammit Maempel, G., 1989, *Pioneers of Maltese Geology*, Mid-Med Bank, Malta.

Zammit Maempel, G., 1994, Ghar Dalam Cave, Oldest National Monument, in *Malta this Month*, December. Valletta: Advantage Advertising Ltd, pp. 25-28.

Zerafa. S., 1838, *Sulla Storia fisica di Malta e sue adiacenze*. Malta.

Zeuner, F.E., 1945, *The Pleistocene Period, its Climate, Chronology and Faunal Successions.* Bernard Quaritch Ltd., London.

Zeuner, F.E., 1946, *Dating the Past.* Methuen & Co. Ltd., London.

Zimmerman, M.R. and Angel, J.L., (eds.) 1986, *Dating and Age Determination of Biological Materials*. Croom Helm Publishers, London.

The authors are both paediatricians by profession, and being father and son, their interest in the archaeology of Malta and Gozo dates back to 1977.

The research for this present work was initiated in the spring of 1995. It is an attempt to present the accumulation of all the available evidence from the primary sources, when possible, in order to reinforce the presence of humans in the Maltese Islands before the presently established date of 5,200 B.C. The documentation for the dating of several human remains has been manipulated, and when re-interpreted in its true context, it confirms the other evidence which is available in art and implementology.

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