

## Disease and Healing in the Indus Civilisation





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Robert Arnott

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For Tricia

*“All interest in disease and death is only  
another expression of interest in life.”*

Thomas Mann  
The Magic Mountain (1924)

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# Introduction

The Indus was the most extensive urban Bronze Age civilisation of its time. That part of South Asia with which it is associated is estimated to be approximately 1,500,000 km<sup>2</sup> in size (Figure 1). During its Mature Harappan (or Urban) Phase, which lasted from c. 2600 to 1900 BC, this complex urban civilisation supported c. 1500 sites, ranging from village-farming communities and small towns up to several fully developed and wealthy urban complexes or cities, supporting populations of tens of thousands or likely many more. Its influence was seen far beyond its northern borders, up to what is now modern Tajikistan and as far to the west as the Gulf and Mesopotamia. Indus Civilisation urban buildings consisted of warehouses, massive city walls, gateways, a public health infrastructure, brick-built houses, and extensive areas for craft and industrial production. There were seemingly no palaces or other areas reserved for the use of elites.

The Indus Civilisation is associated with two great rivers, the Indus and the Ghaggar-Hakra, the latter now almost completely dried up. In prehistory, they ran virtually parallel to each other, creating a vast alluvial plain that supported the region's agricultural base, both arable and pastoral.

Supplying the demands for food, raw materials, and finished products, required a sophisticated infrastructure that integrated the widely dispersed settlements. Consequently, many of the specialist craft products became standardised and widely distributed throughout the region. Close similarities in pottery, brick sizes, seals, weights and measures, together with the Indus script, show convincing evidence for a shared ideology and suggest the existence of some form of administrative system to oversee the economy, especially food production and overseas trade.

The appearance of the Mature Harappan Phase of the Indus Civilisation was originally thought to represent the result of cultural diffusion and acculturation from the Near East, but this has now been discredited by the discovery of a structured subsistence economy and proto-urbanisation in the Pre- and Early Harappan Phases in the 5th to 3rd millennia BC. This developed directly from the Aceramic Neolithic that had begun in the 7th millennium BC in such centres as Mehrgarh in Western Baluchistan, and shows a slow and completely indigenous development of their society and cultures from earlier prehistory.

Yet the very existence of this Bronze Age civilisation was unknown until 20 September 1924. It was then that Sir John Marshall, the British Raj's Director-General of Archaeology in India, announced its discovery in the *Illustrated London News*, in an article appropriately titled 'First Light on a Long-Forgotten Civilisation' following excavations by his Indian colleagues at the sites of Harappa (Figure 2) and Mohenjo-daro. Until 1924, it was thought by most scholars that before the 6th century BC, India was a cultural and historical backwater. The discovery of the Indus Civilisation changed all that. Since then, archaeological research centred on modern



Figure 1. Map of principal Indus Civilisation sites (after A. Uesugi, University of Wisconsin-Madison).



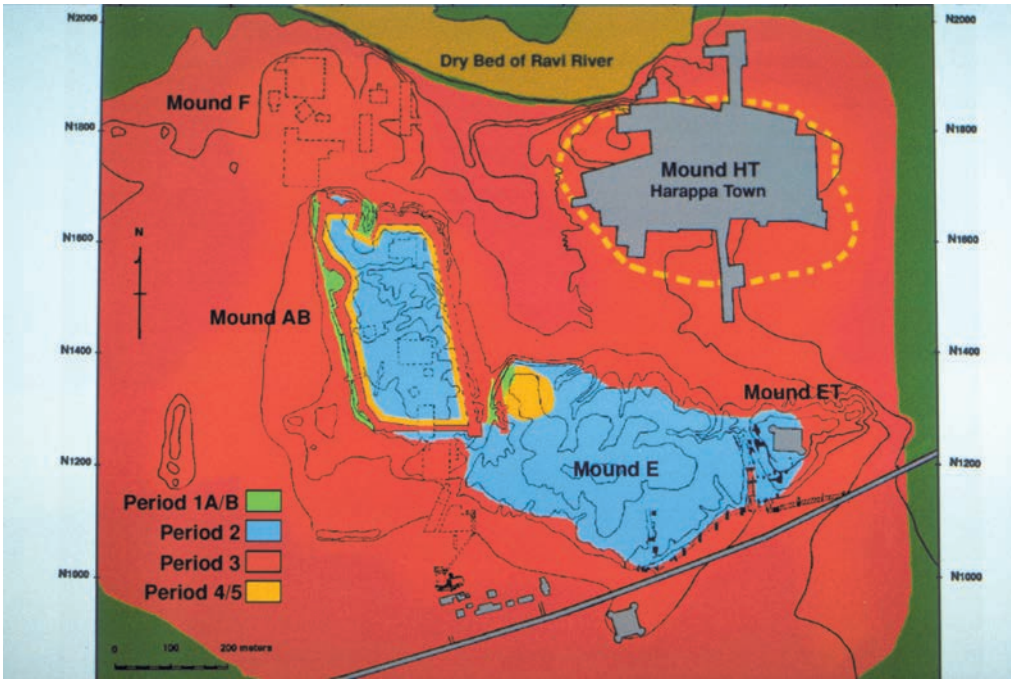


Figure 2. Harappa site plan showing phases of occupation (© Harappa Archaeological Research Project).

India and Pakistan, and even further afield in the Gulf, Central Asia and the Near East, has been constantly expanding our knowledge.<sup>1</sup>

### Earlier Work

Earlier work on healing and medicine in the Indus Civilisation has largely been centred on the archaeological remains of major public health infrastructures, such as that of Henry Sigerist in volume two of his sadly incomplete *A History of Medicine*,<sup>2</sup> where he refers to some of the architecture of the ‘Great Bath’ and sanitation unearthed at Mohenjo-daro. In the introduction to her *A History of Medicine in Ancient India (From Antiquity to 1000 AD)*, Priya Sharma provides a few facts about sanitation, but introduces nothing that is not already known.<sup>3</sup> Earlier work also includes references to animal- and mineral-based medical remedies described by Sir John Marshall in his monumental *Mohenjo-daro and the Indus Civilisation*.<sup>4</sup>

In his review of the history of early Indian medicine, Dominik Wujastyk, who, while again commenting on the public health infrastructure of the Indus Civilisation, particularly the

<sup>1</sup> Gregory Possehl has outlined the recent history and historiography of the archaeology of the Indus Civilisation up to the turn of the century (see Possehl, G.L. Fifty years of Harappan Archaeology: the study of Indus Civilisation since Indian independence, in *Retrospect*: 1-46).

<sup>2</sup> Sigerist, H.E. 1961. *A History of Medicine*, Volume II, *Early Greek, Hindu and Persian Medicine*: 137-145. Oxford: Oxford University Press.

<sup>3</sup> Sharma, P.V. (ed.) 1992. *History of Medicine in India (from antiquity to 1000 AD)*: 8-14. New Delhi: Indian National Science Academy.

<sup>4</sup> *Mohenjo-daro*: 29, 587-588, 669, 671-672.

Great Bath at Mohenjo-daro, and lamenting that the Indus script is unable to offer any clues to their healing, does suggest that healers existed, also acting as religious functionaries. He also comments on the identification of images of the pipal or sacred fig leaf, also known from Ayurvedic medicine.<sup>5</sup> The therapeutic value of the pipal tree in prehistory was also speculated on by Raymond and Bridget Allchin.<sup>6</sup>

Of other historians of ancient Indian medicine, only Kenneth K. Zysk in his *Religious Medicine: The History and Evolution of Indian Medicine* attempts to reconstruct Indus Civilisation medicine and public health and in doing so also properly recognises the importance of understanding the relationship between healing and religion.<sup>7</sup>

In a more recent work, Subhrajit Paul *et al.* curiously refer to an Indus Civilisation health system. However, much of it is fantasy, with the reference to ‘documents from Mohenjo-daro’, which, according to them, describe 960 medicinal plants; they also allegedly offer information on anatomy, physiology, pathology, and obstetrics.<sup>8</sup> Where their evidence comes from is beyond a mystery.

Subhash Walimbe has briefly examined the history of medicine in the period, starting with the view that it would be interesting to see the correlation of Indus Civilisation morbidity and the development of medicine in India; he is not convinced that increasing morbidity experienced by the population gave any impetus to development of medicine. The author rightly believes that the earliest Vedic texts, which can be positively dated to no earlier than 1500 BC, indicate that the practice of medicine had not yet developed into an independent profession; it was a part of the functions of the priest-physician, and basically magico-religious in character.<sup>9</sup>

### **Human Skeletal Remains: Problems and Challenges**

The results of the study of the skeletal evidence from the Indus Civilisation up to 2002 have been summarised by G.L. Possehl *et al.*<sup>10</sup> and some of this evidence is also included in a short article by Bhan and Dahiya.<sup>11</sup> Since 2002, much more has been published and details are referred to in later chapters of this book. Indus healing or medicine, however, has not been an area covered by any of those who have led the way in studying the human remains. All of this points to the need for this book. A more recent review of the evidence in India of human

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<sup>5</sup> Wujastyk, D. 1993. Indian Medicine, in W.F. Bynum and R. Porter (eds) *Companion Encyclopaedia of the History of Medicine: 755-780*, especially 755-756. London; Routledge.

<sup>6</sup> *Rise of Civilisation*: 134, 148, 163, 211, 214-215.

<sup>7</sup> Zysk, K.G. 1993 *Religious Medicine: the history and evolution of Indian medicine*. New Brunswick: Transaction Publishers (revised version of Religious Healing in the Veda’ Transactions of the American Philosophical Society 1985, 75(7): 1-311, especially 1-4).

<sup>8</sup> Paul, S. *et al.* 2019 ‘Pre-vedic medicinal systems in India. *Recent Chronicle in Health Sciences* 5: 1-4. There are also those who try and associate Rudra-Shiva, the Vedic physician and so-called ‘immunologist’ with the Indus Civilisation, in an assertion that the Vedic Culture belongs to that period, see Pal, R. 2019. *Rudra-shiva the Vaidika physician and Manu the sacrifice - a study of science and culture in Bronze-Age India*. New Delhi: [PUBLISHER??]

<sup>9</sup> Walimbe: 115.

<sup>10</sup> *Contemporary Perspective*: 157-176. This review does not include the newer work of G.R. Schug and her colleagues, who are beginning to transform much of our knowledge of Indus life and death from the skeletal record, see *Infection and Peaceful Realm?: passim*. See also V. Mushrif-Tripathy *et al.* Where are they now? The Human Skeletal Remains from India, in G.R. Schug and S.R. Walimbe (eds) *A Companion to South Asia in the Past*: 496-530. Chichester: Wiley.

<sup>11</sup> Bhan, S. and K.S. Dahiya 2001. Disease, Surgery and Health in the Harappan Civilisation, in D. Kumar (ed.) *Disease and Medicine in India: a historical overview*: 3-14. New Delhi, Tulika Books (for Indian History Congress).

skeletal remains and a discussion of its prospects has recently been offered by Walimbe. Here he critically evaluates past work in the field and develops ideas for the future around the need for the application of bioarchaeology to human remains from both past and future excavations.<sup>12</sup>

A surgical procedure for which we do have evidence from the human skeletal remains is cranial trepanation,<sup>13</sup> but it has also been the subject of misinterpretation. For example, Jagat Joshi (2000) in his review of the archaeology of the Indus Civilisation remarked that '[it] appears that the Harappans had a good knowledge of medicine and surgery. Earliest examples of brain surgery are available in this respect. The Harappan burials at Kalibangan and Lothal bear the evidence of trephination, i.e. brain surgery.'<sup>14</sup>

Cranial trepanation in the Indus Civilisation, like elsewhere, is cranial not brain surgery, an especially important distinction. Brain surgery was not attempted by any ancient society and is not even hinted at in any early medical texts. If it had, infection brought on by unsterilised instruments and a lack of anatomical knowledge would have rendered the procedure deadly. Cranial trepanation is an attempt to form holes in the cranial vault for both therapeutic and magico-religious purposes and does not involve the brain or any tissue below the dura mater.<sup>15</sup>

There are no human soft tissue remains in the Indus region so the evidence for disease and trauma is linked solely to the study of the skeletal evidence, largely found in graves. As Ortner and Theobald have reminded us, acute diseases suffered in antiquity, and many that caused death, leave no evidence on bones as observed by macroscopic or microscopic methods or by radiography. Attributing the few diseases and conditions that occur in skeletons to a specific morbid syndrome is therefore difficult and consequently the record has become distorted.<sup>16</sup> We must also take into consideration that the skeletons found at a particular site make up only a very small proportion of the population and may not be wholly representative of that population across two millennia or more of occupation.

A summary of the evidence for disease and trauma in Indus human skeletal remains has again been summarised by Walimbe.<sup>17</sup> He remarks that general or cumulative stress is reflected by higher mortality rates, decreased ages at death, retarded body growth, delicate body, with some diseases leaving more specific indicators of stress on bone and teeth. Infectious disease, caused by viruses, bacteria or parasites, such as tuberculosis and leprosy, or non-specific infectious lesions like periosteal reactions, osteomyelitis, maxillary sinusitis, mastoiditis or inflammation of bone, are included in this category. Traumatic lesions are caused by injury or malformation of the skeleton and associated soft tissue. This category includes fractures, dislocations and artificially induced deformities. Joint disease includes the diseases that affect the joints of the

---

<sup>12</sup> Walimbe: *passim*.

<sup>13</sup> Arnott, R. 2015: 23-34.

<sup>14</sup> Joshi, J. 2000. Harappan Civilization as seen at the close of the twentieth century. *Man and Environment* 25(1): 20. This misinterpretation has also recently been repeated in Sankhyan, A.R. and G. R. Schug 2011. First evidence of brain surgery in Bronze Age Harappa. *Current Science* 100: 1621-1622.

<sup>15</sup> Arnott, R. 2015: 23-34.

<sup>16</sup> *Pre-Roman Diseases: 247-248*. Roberts and Manchester have also outlined the limitations of palaeopathology, see *Disease*: 12-14.

<sup>17</sup> Walimbe: 114.



body and their associated soft tissue. These lesions are commonly seen in older individuals, those in degenerative phase and include osteoarthritis, vertebral osteophytosis or vertebral lipping.

He continues his summary stating that metabolic diseases are caused by a disturbance in the normal process of cell metabolism. The most common examples are enamel hypoplasia, i.e. disruption in tooth enamel matrix formation. Porotic hyperostosis, cribra orbitalia and iron deficiency anaemia are also included in this category. Stress factors are occupationally related stress indicators that are caused by repetitive use of certain body parts, resulting in bone remoulding. Squatting facets, clavicle remoulding, evidence for the use of teeth as cutting instruments and asymmetry in long bones are commonly seen examples.

Finally, he goes on to state that neoplastic or new bone formation includes malignant or progressive growth, which invades and destroys surrounding tissues and spreads to more distant sites in the body beneath the skin. A rare example of this category is cancer. Several diseases of teeth and jaw bones are commonly reported in skeletal populations. Dental anomalies or lesions, e.g. wear, caries, tartar accumulation, fluorosis, enamel hypoplasia, alveolar resorption (abscess in jaw bone), premature tooth loss, dental crowding, and asymmetry are all included in this category. The most affected sites on the human skeleton are the cranium, facial bones, and tibia. However, even regardless of the limitations, the evidence that is available is useful and can produce much of what we seek.

In the past, several attempts have been made, through the study of the human skeletal remains, to understand the anthropological affinities of the inhabitants of all phases of the Indus Civilisation and earlier.<sup>18</sup> This is strongly criticised again by Walimbe, who states that before 1980 those involved in skeletal analysis traditionally relied on cranial dimensions for determining population groups. Regarding craniometry as the main tool used in human skeletal research in the Indus Civilisation (and elsewhere), he roundly disparages this approach and states that labelling population groups by crania is highly questionable and limiting. He infers that it does not take into account the relatively few crania so far excavated and that the skeletons represent widely separated geographical, chronological and cultural periods and levels, and include various age-sex groups, obviously diminishing its value.<sup>19</sup> Much of this work, based on the pathological study of crania, has usually been undertaken to try to prove or disprove Indo-Aryan connections with, or even the origins of, the Indus Civilisation.

The study of Indus Civilisation human skeletons has long suffered from the flawed illusion that there are direct correlations between race, language, and culture. However, recent work by archaeologists from the Deccan College Postgraduate and Research Institute, Pune, has used aDNA extracted from human skeletal remains found at Rakhigarhi and elsewhere to properly research the origins of the Indus Civilisation.<sup>20</sup>

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<sup>18</sup> See K. Kennedy's review 'Biological anthropology of human skeletons from Harappa' in *Retrospect*: 293-316. For a debate on the importance or otherwise of using human skeletal remains to determine race and origins, see the antagonist S. Ratnagar's 'Back to Bones?', in *Man and Environment* 1998, 23(2): 101-105 and the protagonists in their responses, with a plea for looking at biological variations and affinities of ancient populations in Kennedy *et al.* 2000. Bring back the bones: the hard evidence. *Man and Environment* 25(1): 105-109; Walimbe, S.R. 2000. Tumults in skeletal biology of the Harappans: response to Ratnagar. *Man and Environment* 25(1): 111-116, and Joglekar, P.P. 2000. Back to Bones - a rejoinder. *Man and Environment* 25(1): 117-118. See also Ratnagar's response in Ratnagar, S. 2000. Reply to Kennedy *et al.*, Walimbe and Joglekar. *Man and Environment* 25(1): 119-120.

<sup>19</sup> Walimbe: 105-106.

<sup>20</sup> *Bioarchaeology: passim*; Vasant Shinde *et al.* 2019. An ancient Harappan genome lacks ancestry from Steppe

Today, modern biological anthropology is concerned with much more.<sup>21</sup> Serious scholarship is now concerned with the reconstruction within an ancient society of biological profiles and human demography that includes and is understanding of, e.g., mortality, morbidity, health, disease, nutrition, fertility and fecundity, medicine, migration of people, and migration of disease.

There is also the need for caution, particularly when studying traumatic injuries for example. The Late Harappan Phase intramural skeletons from Mohenjo-daro have been in the past identified to be the victims of a massacre by a so-called Indo-Aryan invading army. Subsequent study has shown them to have been nothing of the sort and are likely victims of disease.<sup>22</sup> It cannot be assumed that a cranium found apart from its sub-cranial skeleton is evidence for massacre or decapitation, nor missing long bones a possible indication of amputation. Many bone lesions that may apparently be identified as physical trauma often have post-mortem and post-burial causes.

Before passing on to consider healing and medicine in the period, one of the things that characterises the study of human skeletal remains from the Indus Civilisation is not the disarticulation of the remains, itself problematic, but sometimes the disarticulation of the literature. In the past, some of those publishing the results of archaeological fieldwork from sites of the Indus Civilisation, particularly much earlier excavation reports, do not always contextualise their skeletal finds, often publishing information without primary references, grave numbers, and skeleton numbers. This makes work such as this more difficult if one is to identify certain graves and individuals buried therein and not to make mistakes in the identification of both the individual and the pathology described. Thankfully, a basic register of all human skeletal remains found in India has now been published and goes significantly towards understanding the extent of these remains and the possibility of further study, although it is recognised that those from the Indus Civilisation are still comparatively few.<sup>23</sup>

## Ancient Healing and Medicine

As with the study of the history of disease, healing, and medicine for any period of the human past, the study of it within the Indus Civilisation, with its known limitations, leads to further caution. One is always conscious of the problem in medical history of applying modern concepts, ideas, and clinical definitions to describe earlier and sometimes more primitive societies. If one is not careful, this can result in a seriously distorted perception of that society. It is not possible to investigate the past through the lens of the present.

I should also warn readers, perhaps not too familiar with the study of ancient medicine, about one theoretical position that underpins much of what is understood from this and similar research.

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pastoralists or Iranian farmers. *Cell* 179: 729-735; Varghese Narasimhan *et al.* 2019. The formation of human populations in South and Central Asia. *Science* 365: On-line: east7487.

<sup>21</sup> The previous work in this field has been summarised by Kennedy from his work on the skeletons from Cemetery R37 at Harappa, see Kennedy, K. 2005. Biological Anthropology of Human Skeletons from Harappa, in *Retrospect*: 293-316. See also Kennedy, K. 2005. Archaeological and Anthropological Research in South Asia: developments of the past fifty years. *Man and Environment* 31(1): 36-41.

<sup>22</sup> Walimbe, S.R. 2011. Aryan invasion in the Indian Sub-Continent: facts and fallacies – the physical anthropology perspective. *Iranian Journal of Archaeological Studies* 1: 35-43.

<sup>23</sup> Mushi-Tripathy, V. *et al.* 2016. Where are they now? The Human Skeletal Remains from India, in G.R. Schug and S.R. Walimbe (eds) *A Companion to South Asia in the Past*: 496-533. Chichester: John Wiley.

The first tendency of many is to view the diagnoses and treatments in ancient medicine as weird and outlandish, clearly a product of ignorance and superstition, although with an occasional lucky discovery that worked. This evaluation is based upon the standards of our own western scientific medicine. When it resembles a little of what we recognise today in modern medicine or surgical procedures, then it is considered rational, perhaps even scientific, while those ideas and practices that do not fit this pattern are labelled superstition or sorcery and ignored. This leads to a misunderstanding of these societies. The selective singling out of modern medically acceptable elements misses seeing the total healing activities of a culture, including the aspects that we classify as religious or magical, as an interconnected health care system and makes it impossible to gain valuable insights into their culture and ideology.

There is also the nature of the society itself. Ancient societies often suffer from a stereotype. This is particularly acute for our perception of the Indus Civilisation, as popular convention often considers its population as coming from a peace-loving, egalitarian and prosperous society, made wealthy by trade and pastoralism, where attention is often superficially focused on the architecture of the large urban centres and differing aspects of their culture. Whilst this picture is accurate in so many ways, it neglects the unavoidable realities of everyday life for much of the population who lived in both the urban centres and in rural communities.

## **Sources**

This book is both a synthesis of what is currently known about health, disease, and healing in the Indus Civilisation, combined with original research. It has been produced from a detailed study of published work on human skeletal remains and upon an understanding of their material culture and with an increasing awareness of the natural environment. When combined with a knowledge of palaeoepidemiology and the natural history of disease, ancient climate change and its effect on disease patterns and what is known of healing, medicine, and health in contemporary Bronze Age societies of the Near East, with which the Indus Civilisation was in contact, it has been possible to piece together a knowledge of disease, the practice of healing and the development of public health. This has therefore led to an understanding how the Indus Civilisation was affected by disease, how long they lived, and from what they died.

Of all the contemporary ancient societies, the Indus Civilisation is unusual in the degree by which we are wholly reliant on archaeology for an understanding of its culture. Several ancient societies, such as those of the Near East and Egypt, have a comparatively rich textual record of healing and medicine. However, the Indus Script currently remains undeciphered and this means that it does not offer us the same resources. One can only hope that if the decipherment is eventually achieved, it will perhaps offer a glimpse of something of Indus Civilisation healing practices. However, the very nature of the script suggests this is unlikely.

## **This Book**

This book brings together for the first time a comprehensive picture of the health, diseases and healing of the population of the Indus Civilisation and offers an important contribution to its social prehistory. For those archaeologists and medical historians unfamiliar with the civilisation, Chapter One offers a background to the civilisation, its origins and decline, but primarily its Mature Harappan or Urban Phase (2600-1900 BC) and its chronology. Chapter Two

examines the health of the population, life expectancy, nutrition and urbanisation and the overall effects of disease, singling out women and children. This theme continues in Chapter Three, which examines in detail individual diseases and trauma, including dental disease. Chapter Four looks at occupational health, detailing the diseases, injuries and hazards faced by metalworkers, craftsmen, farmers, textile workers, sewer cleaners, builders, carpenters, bricklayers, and many others. Chapter Five describes the major public health, sanitation and water supply infrastructure that exists in the major cities, especially Mohenjo-daro. The subject of how the populations of the Indus Civilisation were healed from the effects of disease and trauma, whether by themselves, others, or their gods, detailing the evidence we have for their *materia medica*, is discussed in Chapter Six. Chapter Seven is a short epilogue, bringing together various strands of the main argument of the work. For the first time, this book illustrates the health, life expectancy, and the illnesses and injuries from which those at the bottom of society suffered, both at work and at home.

## Finally

I first became interested in the Indus Civilisation when I read at school the works of Stuart Piggott, Sir Mortimer Wheeler, and Raymond and Bridget Allchin. This interest was renewed during my first visit to India in 2007, when I became involved with Bilga General Hospital, a charitable institution in the Indian State of the Punjab, serving the poor amongst the villages that exist along part of the western shore of the Sutlej River, near Jalandhar, and I was able to visit India very frequently and take some time off to pursue research. It is particularly gratifying to contribute to the early history of healing in a region of India where I work in modern global health and rural healthcare. The change after having studied disease and medicine in the prehistoric Aegean and Anatolia for thirty-five years has been refreshing. However, it is also gratifying to know that I learned much of my archaeology in the same research institution as Sir John Marshall, namely at the British School at Athens, and excavating on Crete, being like him, firstly a Minoan and then an Harappan.

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