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The Pleistocene Dispersal of Humanity and the Place of Thailand

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Your Excellency, the Ambassador of South Africa, Mr. Dean and Deputy Deans of Siriraj Hospital Medical School, Professor Sanjai Sangvichien and other members of the Sangvichien family, distinguished colleagues and friends, members and dear students of the Siriraj Hospital Medical School, Mahidol University.

It is a special pleasure for me to be back in Thailand and to be visiting your Medical School for the second time in 2002. I feel deeply honoured to have been invited to deliver the Sood Sangvichien Honorary Lecture, the more so since I am the first foreigner to have been honoured in this way, since the lectures started in 1970, in memory of a great Thai scholar who played such a significant role in the development of anatomy and physical anthropology in Thailand. For another reason, it is an auspicious day: at this moment, some 20° of latitude south of Bangkok, the eclipse of the sun is passing over the south of Java! But I am sorry to say that neither the belt of totality or the zone of partiality of the eclipse will be visible in Thailand. There is another reason why the occasion is significant: and that is the 75th birthday anniversary of His Majesty the King – to whom I express my respectful congratulations.

About Professor Sood Sangvichien (1907-1995)

It is good and right that one should start an eponymous lecture by referring to the man in whose honour the lectureship has been created. It is especially important for me to do so, as it was from one of the sons of Sood Sangvichien, namely Professor Sanjai Sangvichien (the former head of the Department of Anatomy at Mahidol University), that I first received the invitation to deliver this lecture, as well as from the Dean, Professor Piyasakol Sakolsatayadorn, and from the Deputy Dean for Research, namely Professor Prida Malasit.

Sood Sangvichien was born in November 1907, just 95 years ago. As a medical student in the late 1920s, he was one of a small group of students who helped Edgar Davidson Congdon, the professor of anatomy, in his research projects on the anatomy and physical anthropology of the Thai population. There followed a period as a Rockefeller Scholar in the United States of America. It was just 10 years after my mentor and predecessor, Raymond Dart, had been one of the first two Rockefeller Fellows in the USA and both men spent time working with the American anthropologist and anatomist, T. Wingate Todd, at Case Western Reserve University in Cleveland, Ohio. For completeness of the record, I,

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too, fulfilled a similar role in the USA in 1956. After his return to Thailand, Sood Sangvichien took up a position in the Anatomy Department at Siriraj Hospital. After Congdon returned to the United States, Professor Sood became first Acting Head and, from 1944, Head of the Anatomy Department. About that time, Siriraj Hospital became the nucleus of the newly created University of Medical Science. After another quarter of a century, this was renamed Mahidol University after Prince Mahidol who did so much to modernise medical education in Thailand. Professor Sood was in charge of the department for some twenty-five years. Later, his son, Sanjai Sangvichien served as head of the department. For a parallel, my chief, Raymond Dart, was head of the Anatomy Department at the University of the Witwatersrand for 36 years and I, as his successor, for 32 years. To pursue the parallel a little further, Sanjai headed the department at Mahidol for 11 years: so we could claim that the Sangvichien dynasty ruled the Siriraj Anatomy Department for 36 years! This is the only example known to me of such a dynasty in anatomy, except for the case of Alexander Munro, the first, the second and the third, who successively reigned over the Anatomy Department at Edinburgh University for more than a century! I have often said that Raymond Dart was a "father figure" to me (although there was no biological relationship); we might regard our case as a quasi-dynasty that lasted for 68 years!

Sood Sangvichien was passionate about the search for ancestors of the living Thai population. Many of his bachelor's, master's and doctoral students between the 1950s and the 1970s devoted their dissertations to anthropological topics. During World War II, a Dutch archaeologist, H.R. van Heekeren, discovered stone artefacts on the banks of the River Kwai. At the time he was a Japanese prisoner-of-war from the former Dutch East Indies. Thus, his discovery was not reported for many years. In 1960, a joint Thai-Danish Archaeological Expedition followed up on van Heekeren's earlier finds (Van Heekeren and Knuth, 1967). Sood Sangvichien and Patai Sirigaroon took part in these excavations, along the Kwai Noi and Kwai Yai rivers in Kanchanaburi Province. Apart from thousands of cultural artefacts, they unearthed human skeletons of the Mesolithic and Neolithic industries. They studied these skeletons in Denmark and publications emerged in 1966 and 1969: (Sood Sangvichien, 1966, 1971; Sangvichien et al., 1969). Great interest was aroused. Thai and foreign investigators engaged in palaeo-anthropological researches in Thailand over a long period (Congdon et al., no date; Dodd, 1930; Wales, 1937; Andrews, 1939, Schlaginhaufen, 1940; Benedict, 1942; Phansonboon, 1957; Lebar et al., 1964; Subhavan and Sangvichien, 1976; Reynolds, 1990; Subhavan et al., 1994).

Strengthening the new interest, Sood Sangvichien started a museum and laboratory in his Department of Anatomy about 1962. This Museum was visited and formally opened by His Majesty the King in 1972. It bears the name, the Sood Sangvichien Prehistoric Museum and Laboratory. It stands to the credit of the Faculty of Medicine and of the Department of Anatomy that the Sood Sangvichien Museum still exists and contains some most valuable specimens. The anthropological and palaeontological collections of the Museum have been enhanced and expanded by Somsak Pramankij and Vadhana Subhavan (Sangvichien and Subhavan, 1981). I was able to spend time in the Museum, with Dr. Ronald Clarke, in March 2002.

Among Thai and foreign scholars who have investigated the genesis of the Thai people and their early roots, none made more substantial contributions and inspired more scientists and students than Sood Sangvichien. It is most appropriate that, not only the Museum, but this Honorary Lecture, should bear his name. For information about the life and career of Professor Sood Sangvichien, I have been greatly helped by Dr. Sanjai Sangvichien, Dr. Wilhelm G. Solheim II, Ms. Vadhana Subhavan and Mr. Somsak Pramankij (Subhavan et al., 1997).

Earliest hominids from Africa

From discoveries made in Africa between 1924 and 2002, it is now widely accepted that hominids – the traditional family of mankind – originated in Africa. Their remains are to be found in Africa at least 4-5 million years earlier than any traces of humanity outside of Africa. These remains have been dated to the period from nearly 7 myr ago up to the recent past. In the earlier millions of years, these

creatures show anatomical features indicating degrees of adaptation to erectness and bipedalism. Also their canine teeth are small or of modest dimensions, unlike those of apes. Right up until 2.0 myr ago, however, their cranial sizes are small, from which we infer that the brains that they once contained were small, comparable with the brain-sizes of modern apes. On average, they are only about one-quarter to one-third of the brain-sizes in modern humans. It follows that, in the process of hominid evolution, the attainment of bipedalism and small canines occurred far earlier than did the enlargement of the brain.

A number of genera and species of these early hominids that existed between 7.0 and 2.0 mya have been recognised by palaeo-anthropologists. Thus we find the cradle ol of the hominids was inhabited by such diverse genera as *Sahelanthropus, Orrorin, Ardipithecus, Kenyanthropus*, and *Australopithecus*. All of these small-brained kinds of hominids lived in different parts of south, east and central Africa. They preceded the arrival on the world scene of the genus *Homo*. Our living species of mankind belong to *Homo* and the earliest species of it appeared in Africa between 2.5 and 2.0 mya.

From South Africa to the Red Sea, the remains of the ancient ancestors of humans are found near fresh water: along the banks of rivers, on the shores of lakes – both those of the present day and those of earlier times when the shorelines of palaeo-lakes might have been far-removed from their present-day confines. Wherever the early members of the human family were evolving, they needed water to drink. The cultural artefacts of early humans are found near springs, rivers, lakes, river mouths, fresh water estuaries and on beaches. Every archaeologist and palaeo-anthropologist know that if one wishes to discover hominid ancestors it is necessary to find a site that is, or in earlier times was, near fresh water.

Water is essential not only for drinking, but also to keep cool. In the warm tropics of Africa, many mammals today cool themselves in shallow ponds, lakes and streams. Two years ago I was on a visit to the Ngorongoro extinct volcanic crater in northern Tanzania. I found three hyenas lying in the water near the edge of a shallow crater lake, cooling themselves in the heat of the day. Not far away, a rhinoceros was paddling in another volcanic lake, manifestly to cool itself. Gorillas and other African apes have been seen sitting substantially submerged in a pool or stream. It would not be surprising if ancient hominids spent much time cooling off in ponds, streams, or the sea, as their descendants do today.

I claim that water has played a crucial role, not only for drinking and keeping cool, but also for crossing short stretches of water by swimming, or paddling with floats such as bladders, or rafting on tree-trunks or detached free-floating islands of vegetation, or even boating on simple water craft. In other words water helped the dispersal of hominids about the planet.

Early hominids outside of Africa

Early signs of humankind out of Africa have been identified near Orce in south eastern Spain, 'Ubeidiya and probably 'Erq-el-Ahmar in Israel, Dmanisi in the Georgian Republic of the Caucasus, Riwat in Pakistan, Java in Indonesia, Northern Thailand and Yuanmou in China. In these areas signs of humanity, either skeletal remains or cultural relics such as stone artefacts or both, have been brought to light in deposits dated from about 2.0 million years ago and onwards. They testify to the presence of hominids, most probably of *Homo*, in all of these scattered areas of the Old World.

The out-of-Africa remains are of course interesting in their own right and investigators have sought to determine what hominid species and which cultural industries were represented in each area and at what times.

A second important problem is the routes by which early hominids moved from Africa to Europe and Asia and also, at some periods, in the reverse direction, into Africa.

Sondaar and his colleagues have for many years studied the human exploration and exploitation of islands, the extinctions of island endemic fauna and the spread of animal species. They classified dispersal routes and they recognised four modalities of dispersal.

I here recognise three categories of geographical conformations that point to the dispersal routes or gateways.

In the first category there are land connections or corridors of to-day, which seem to have been in existence since at least the Pleistocene period or the time of early *Homo*. An example is the Levantine Corridor, between north-east Africa, through Suez and northwards. This was a critical route through which humanity, and other animals, moved between Africa and Eurasia. Astride the southern part of the Levantine Corridor the fossil hominid and stone tool site of 'Ubeidiya in northern Israel is dated to about 1.4 million years ago (mya). Another site in the Central Jordan Valley comprises the early lake deposits of the 'Erq-el-Ahmar Formation: upper fluviatile layers have yielded artefacts, which are like typical Oldowan tools (core-choppers and flakes). There are no accompanying hominid skeletal remains and, thus far, mammalian fossils are confined to a few layers. Thus, the provisional dating of about 2.0 mya needs further study and clarification (Tchernov, 1995).

Some distance further north, lying to the east of the Black Sea and south of Tbilisi, the capital of Georgia, the site of Dmanisi has yielded a mandible, several fossil crania and postcranial bones, which have been dated to about 1.7 mya (Gabunia, 1992; Gabunia and Vekua, 1995; Brauer and Schultz, 1996).

The second category of gateway refers to areas which at present are separated by water but where land connections were present above the water when the sea level was lower, as in glacial periods. A famous example is Beringia, between Siberia and Alaska. When the water level in the Bering Strait was lower the great land connection Beringia appeared. At various times animals and humans traversed Beringia, entering what is today America.

Another well known example of this class of gateway is that of the Indonesian archipelago: at times the islands of Sumatra, Java, Madura and Bali were joined to one another. This conjoint land mass formed part of the Sunda Shelf, which in turn was continuous with the landmass of continental South-east Asia.

A third example is furnished when one contemplates the problem of the peopling of Japan. We may recognise a route from the peninsula or island of Sakhalin to Hokkaido; a second route from the mainland of North China across to Sakhalin and Hokkaido. A third and very obvious route lay from the Korean Peninsula, across the Korea Strait to Kyushu and Honshu. Fourthly, another possible route was from the mainland of South China, Taiwan and the Ryukyu Islands connecting with Kyushu and Honshu. A fifth route could have led from the Kamchatka Peninsula of Siberia down the Kuril Islands to Hokkaido.

A fourth example brings us back to Africa. A former Afro-Arabian land connection crossed the Strait of Bab-el-Mandeb from Ethiopia, Eritrea and the Horn of Africa, on one hand, to the Yemen, Oman and the south-eastern coast of Saudi Arabia, on the other hand. This route enabled coastal movements of animals, including hominids, to take place in both directions (Kingdon, 1993).

There is a **third category of potential access route**. This is one where water or a strait separated flanking land-masses, even when the sea level was lowered. An important example is the deep oceanic trough east of the Sunda shelf between Bali and Lombok. It acted as a barrier between the zoogeographic regions of Sunda and Wallacea, named after Alfred Russel Wallace. This trough coincided with the southernmost parts of Huxley's line and Wallace's line (Storm, 2001). Even when the sea level was at its lowest, Wallacia could be reached only by sea crossings of three deep-water straits between the Sunda shelf, and Flores and other islands (Bellwood, 1985). In spite of this formidable barrier, stone artefacts and Middle Pleistocene fossils, including the archaic elephantid, *Stegodon,* and a giant rat *Hooijeromys nusatenggara*, have been found on Flores at Boaleza (Maringer and Verhoeven, 1970; Hooijer, 1972) and at Mata Menge (Sondaar et al., 1994). Under high magnification the artefacts were found to show edge damage, striations, polishing and residues, indicating their use in the processing of plant materials (Moorwood, et al., 1997). Thus, even without a land-bridge, humans (probably *Homo erectus*) and *Stegodon* must have crossed these deep oceanic straits. Morwood and his colleagues (1998) showed that these tools and *Stegodon* on Flores are in deposits dated to between 900,000 and 800,000 years ago. It has been estimated that, when the sea-level was 200 m below the present level, the minimum distance between Flores and Sumbawa was some 19 km or 20 km.

We have no evidence to suggest that these early *Homo* populations knew how to make boats. Either they floated across using tree trunks, rafts of matted vegetation, or logs, or they paddled holding floats, or they swam, or they made rudimentary water craft. Somehow or other humans – and elephants and some other large mammals – could cross a stretch of water which, at lowest sea level, totalled 19-20 kilometres wide nearly a million years ago (Sondaar and de Vos, 1993; Sondaar et al., 1994; Van den Bergh et al., 1995, 1996; Van den Bergh, 1999).

Let us return to the Mediterranean. A central Mediterranean gateway between Africa and Europe is likely to have traversed the shallow stretch of sea from Tunisia *via* Lampedusa and Malta, or *via* Pantelleria, to Sicily, and from there across a landbridge from Messina to Reggio Calabria, the toe of the Italian boot.

Shackleton's 1984 map showed how, during the last glaciation, sea levels became lowered by 120 metres. This reduced the distance between Tunisia and Sicily to about 60 kilometres. The Maltese Islands are linked to Sicily by a submerged ridge which is for the most part less than 90 metres deep. In the last glaciation this ridge would have become a land bridge from Malta to Sicily.

The author has proposed a possible Sardinian route for Afro-European human dispersals (Tobias, 2002a). First, Sardinia at its nearest point is closer to Africa (Tunisia) than to peninsular Italy. Secondly, there are some genetic links between modern Sardinian and north African genomes. Also there is a "Euro-African" component in the Sardinian language according to Hubschmid. This genetical and linguistic evidence suggests that the modern peopling of Sardinia by *Homo sapiens* enjoyed accretions of humanity from both Africa and Europe.

Between Cap Blanc on the north of Tunisia and the south of Sardinia, west of the deep Tyrrhenian Sea, is a region where the present sea-level is shallow. The extension of northern Tunisia, at a time of lowered sea level, would have appreciably reduced the distance to Sardinia. North of that Tunisian platform, there is an inter-pelagic shallow. When the sea level dropped by 120 metres, it would have been possible to walk dry-footed for most of the distance between Cap Blanc and Sardinia.

The inter-pelagic shallow would have provided another significant central Mediterranean route for earlier human movements between Africa and southern Europe. Some North African human communities might have moved to Sardinia and Corsica, thence to Elba and mainland Italy. Some 75 kilometres south of Rome, Italy's oldest hominid, dated to about 800,000 years, has been found at Ceprano. Walsh (2001) has suggested that Ceprano man might have reached Italy through the Tunisia-Sicily-Calabria route. I propose an alternative pathway: the Ceprano population might have traversed another Central Mediterranean route: Tunisia-Sardinia-Corsica-Elba-mainland Italy.

If hominids were moving northwards from Africa into and through Sardinia, or southwards from Sardinia towards Africa, we might expect remains to be found in Sardinia testifying to those ancient human movements. Such traces have indeed been found. They take the form of human skeletal remains and stone tools, and are accompanied by north African mammals.

Arca et al. (1982) recognised Lower Paleolithic stone tools and traces of working on the bones of fossil deer from Pantallinu (Sassari). Stratigraphically, they were placed in the Middle Pleistocene. From this dating they were assumed to have been made by *Homo erectus*. Sondaar et al. (1984) hypothesised that *Homo sp.* had first reached Sardinia during the early Middle Pleistocene. From other evidences it was inferred that Sardinia was peopled on at least two occasions, in the Middle Pleistocene (by *Homo erectus*) and in the Upper Pleistocene by *Homo sapiens*.

This is the background to a recent hominid discovery by Ginesu and colleagues (1998), namely a Middle Pleistocene hominid finger-bone which they have excavated at Cheremule in Northern Sardinia. It has been dated to not less than 250,000 years ago (Ginesu et al., 2001). This confirms the presence of Middle Pleistocene hominids in Sardinia. The new hominid find strengthens my view that the Sardinian route deserves to be recognised as a pathway for human movements, at least from the Middle Pleistocene.

Into Iberia

Let me turn now to the movement of people - and proboscideans - into Iberia. Two important areas have yielded ancient hominid remains. In the north of Spain is the famous site of Sima de Los Huesos - Gran Dolina, near Burgos. Its wealth of hominid remains, which have been assigned to a proposed new species, *Homo antecessor*, are dated to about 0.8 mya. In the south of Spain, near Orce and Murcia, stone objects have been identified as artefacts and manuports. Some scanty, possibly hominid fossils, have been recovered. They have been dated to about 1.5 mya (Agusti, Oms and Parés, 1999). These fossils are still under discussion. But cutmarks on some of the animal bones, the morphology, fractal analysis and biochemical analysis of the bones, have convinced Roe of Oxford (1995), Lowenstein (1995) of San Francisco and Tobias (1995) that there is a good case to support the claims that hominids were present in the south east of Spain between 1.5 and 1.0 mya.

A critical question has for long been: along what pathway did these earliest Europeans reach the Iberian peninsula from North Africa? To get to Spain from any of the routes mentioned earlier would have involved a long trek westwards and the crossing of the Pyrenees to the south. Earlier investigators supported a water traverse from Ceuta and Morocco in north Africa to Gibraltar and Spain. The idea has been supported more recently by several investigators including myself. The deep water channel, the Strait of Gibraltar, has a minimum width today of 13-14 kilometres. When the sea levels of the Atlantic and Mediterranean were lower, the distance would have been smaller. A few islands, at present submerged, and a small peninsula joined to the south coast of Iberia, would have emerged above the water, providing stepping-stones between Africa and Europe. The greatest sea crossing, it has been estimated, would have been only 5 kilometres. If people and elephantids were able to cross 19 kilometres of sea to reach Flores just under a million years ago, it is likely that the 5 km crossing of the Strait of Gibraltar would have been within the capability of humans and some other African mammals just over a million years ago. Again, we must consider floating, rafting on flotsam, the aid of floating vegetation masses, perhaps the use of rudimentary coracles or canoes or other simple water-craft, possibly swimming or paddling with a float. These seem to have been early acquisitions in human cultural and behavioural evolution.

Where to look for early hominids outside of Africa

We need to find rock formations and sedimentary deposits that are between 2.0 and 1.0 million years old. The dating of rocks of this age is difficult. Among the methods used are the analysis of associated fauna, radio-isotopic studies, cosmogenic nuclides, palaeomagnetic determinations, thermoluminescence, photoluminescence and some others. If a site gives us materials to which more than one of these dating methods may be applied, and if the dates obtained by these various methods, when applied to a single site or stratum, agree with one another, we can be more confident about the dating of the site or stratum. As methods are refined by different laboratories, and as new dating methods are added, the dating of a site or stratum may need to be revised. This is not a sign of weakness, but shows that the science is moving with the times.

Many dating methods are highly specialised and require the help of physicists, chemists and other specialists, as well as access to advanced equipment and specialised laboratories. This is a most important reason why, especially from the second half of the twentieth century, the study of hominid evolution has become a multidisciplinary operation. In my own excavation of Sterkfontein near Johannesburg, for example, I have since 1966 built up a multidisciplinary team, including diverse specialists.

So our first problem is to find rocks of suitable age. Often the presence of animal fossils gives us a clue whether we are dealing with deposits of recent or of great age.

Not all rocks of high antiquity are suitable for the preservation of fossils. Oftentimes, physicochemical conditions, the presence of leeching, erosion, corrosion, tectonic instability, militate against the preservation of recognisable and identifiable fossil bones. So our next problem is to find rocks of great age and which are suitable for the preservation and fossilisation of bones.

Hence we need some knowledge of the geology, and even the geochemistry, soil mechanics and soil composition.

Another important factor is to look at the geography of the earth's surface. If fossil hominids or stone artefacts have been found to the north, west, south and east of a territory, it is most likely that such a territory, partly encircled by hominid-bearing regions, must itself have been hominid-bearing in earlier times. Thailand is in just this situation.

The place of Thailand

Signs of early hominids, in the form of very early artefacts dated to about 2.0 myr, have been found at Riwat in Pakistan. Further west, hominid skeletal remains have come from Dmanisi in Georgia in the Caucasus (at about 1.7 myr) and 'Ubeidiya in Israel (at 1.4 myr). 'Erq-el-Ahmar in the Central Jordan Valley (at about 2.0 myr), has given primitive stone tools. To the North and Northeast of Thailand, beyond Laos, lies China and it has provided a wealth of hominoid fossils, notably *Homo erectus* and *Gigantopithecus* – though exactly where it fits into the story of the Hominoidea is still uncertain. Other *Gigantopithecus* remains have come from Bilaspur in India (Kennedy, 1999, 2000).

To the south, and across the Equator, we have important *Homo erectus* fossils from eastern Java and some fossils dated to about 1.5-1.9 mya and which have been given the name, *Meganthropus*. Still further south-east we have hominid cultural remnants from Flores dated to 0.9 to 0.8 myr.

Clearly Thailand lies four-square within an area characterised by hominid habitation between 2.0 mya and just more recent than 1.0 mya. Thailand, also, should have been inhabited by ancient hominids during the Earlier and the Middle Pleistocene phases of human history. Indeed, it would be most surprising if early hominid fossils were not discovered in Thailand in deposits dated to this period. That is the expectation and the prediction. Now let us look to what has actually been uncovered in Thailand.

Very early members of the Anthropoidea in South East Asia

Long before the time of humanity, there are signs of very early members of the sub-order of Primates called the *Anthropoidea*. The earliest anthropoids were a teeming group of higher Primates found in north Africa and south Asia. Some are considered to have been ancestral to the monkeys and apes. From south-east Asia, some of the oldest of the fossils assigned to the Anthropoidea have emanated. They have been dated to the middle part of the Eocene Epoch: between 40 and 45 million years ago. Myanmar, Thailand and China have yielded fossils of this high antiquity and which have been assigned to early anthropoids. The Burmese or Myanmar fossils stem from the Pondaung Formation in central Myanmar. Specimens from there were discovered in the early 1900s, but were described much later when they were allocated to a new genus and species *Pondaungia cotteri* by Guy Ellock Pilgrim in 1927. Later finds of *Pondaungia* included a fine lower jaw with teeth: this was described by the Thai scientist, Yaowalak Chaimanee of the Department of Mineral Resources, Geological Survey Division, Paleontological Section, in Bangkok, with Jean-Jacques Jaeger and Stéphane Ducrocq of the University of Montpellier in France, with Tin Thein and Aung Naing Soe of the University of Yangon, Myanmar, and with other scholars from Myanmar (Jaeger et al., 1999). In 2000 they identified features that strengthened the association of *Pondaungia* with the Anthropoidea (Chaimanee et al., 2000).

Meantime, another find had been made in the later Eocene sandstones near Mogaung in Myanmar by Barnum Brown of America in 1923: it was overlooked for many years and then Edwin Colbert described it in 1937 and made it the type of a new genus *Amphipithecus*. Its status, also, has remained uncertain. Like *Pondaungia, Amphipithecus* showed a blend of primitive or plesiomorphic characters with derived traits relating it to the Anthropoidea.

These developments raised the exciting possibility that the most ancient Anthropoidea might have evolved in south-east Asia, as nothing quite so early and of comparable morphology had emerged in Africa.

Even before the discovery of the lower jaw of *Pondaungia* published by Chaimanee and her colleagues in 2000, Russell Ciochon and his colleagues (1985) had suggested this possibility at a time when most investigators looked to the Egyptian Oligocene for the beginnings of the Anthropoidea. In 1990

Conroy of St. Louis, Missouri, USA, summed up the situation in these words: "...the two Burmese genera [*Pondaungia* and *Amphipithecus*] present a mosaic of lower- and higher-primate characters with the latter predominant, indicating that by later Eocene times in southern Asia primates may have entered an anthropoid adaptive grade."

Scarcely had the world assimilated the idea of an Asian origin of the Anthropoidea when Thailand made a dramatic entry into the early anthropoid contest!

In 1997, Chaimanee and her colleagues announced the discovery of a new anthropoid from the Late Eocene locality of Krabi in Southern Thailand. It was assigned to a new genus and species, *Siamopithecus eocaenus*. It was a large Eocene anthropoid primate of about the size of *Pondaungia* from Myanmar. It comprised a right maxillary fragment with all five cheek-teeth (from P^3 to M^3) and a right mandibular fragment with the distal half of M_1 and the entire crowns of M_2 and M_3. In discussing the status of *Siamopithecus*, they drew together evidences supporting the likelihood of mammal exchanges between North Africa and Southeast Asia. They cited the possibility that "The ancestor of the Southeast Asian anthropoids therefore may also have originated in Africa, and then migrated into Southeast Asia during or after the Early Eocene (as Godinot and Mahboubi, 1992, had suggested), but before the end of the Middle Eocene. This ancestor, either African or Asian, may have undergone a local radiation and evolution there, and probably gave rise to several lineages, among which those of *Amphipithecus, Pondaungia* and *Siamopithecus*, taxa so far restricted to Southeast Asia." Finally, they concluded, "In any case, Southeast Asia has definitely played a key role in the early evolution of anthropoids."

I have not here spoken about several other genera of Eocene primates, such as *Eosimias* of China and the recently described *Bahinia pondaungensis* of Myanmar (Jaeger et al., 1999). They are less distinctly anthropoids than *Amphipithecus, Pondaungia* and *Siamopithecus*, but they have some resemblances to these anthropoids.

So far I have referred to early anthropoids, 40 million years old primates. Some of them could have been ancestors of the ancestors of the modern human species. What evidence do we have from Thailand about more immediate progenitors of humankind, over the past two million years?

Hominids in Thailand

The first evidence to be discovered was of an archaeological nature. It happened unexpectedly during World War II. Ancient artefacts were discovered along the River Kwai in Kanchanaburi Province, Thailand, by a Japanese prisoner-of-war during forced marches and forced labour in the early 1940s. He was the Dutch archaeologist, H.R. van Heekeren, who had done much archaeological research in Java. His finding of stone tools along the River Kwai were followed up nearly twenty years later when a joint Thai-Danish Archaeological Expedition made surveys and systematic excavations in the Kanchanaburi Province. This operation over 1960-1962 laid bare skeletons and cultural remains of late phases in the prehistory of Thailand, namely the Mesolithic and Neolithic. After that, a number of foreign scholars, collaborating with Sood Sangvichien and other Thai scientists, revealed Palaeolithic remains. For example, Geoffrey Pope of the USA excavated several Lower Palaeolithic sites in northern Thailand. These studies proved that there were human cultural remains, not only of the 4,000 years-old Neolithic, but also of older deposits of the Later Pleistocene – and even of the Middle Pleistocene.

The Anatomy Department of the Siriraj Hospital Faculty of Medicine, Mahidol University, played a large part in opening up Thailand's past. Sood Sangvichien and his students collected prehistoric artefacts. These growing collections of Thai artefacts played a major role in leading the professor to establish in the Anatomy Department a museum and laboratory of prehistory which were later to bear his name. Professor Sood became convinced that early hominid fossil remains would be found in the Lampang Province up north. He searched diligently there and in other parts of Thailand. From 1977, he was accompanied and helped by Mr. Somsak Pramankij. For a quarter of a century Somsak continued in Professor Sood's footsteps. In this time, he recovered a fine collection of stone tools of varying ages and cultural affinities – ranging from large pebble tools and hand-axes to small microlithic

specimens. Somsak became an expert in what archaeologists today call "replication studies". Instead of simply saying that this method or that technique was probably the way in which tools were constructed, the scholar seeks out similar material to that employed by Stone Age men, and then tries to replicate the form of the ancient artefacts. It's not as easy as it sounds. The subtle nuances of angle of percussion, force, resistance of the material, whether it is placed on a stone anvil or on the scholar's thigh (protected by animal skin), what nature of hammerstone or fabricator was utilised (remember, no metal hammers were employed!)...all of these variables entered into the picture. Somsak taught himself to manipulate the tough materials and produce quite beautiful replicas of the ancient tools. He showed that an admirable hand-axe could be produced in a very short time. He became proficient also in drawing artefacts. Assisted by his wife, Vadhana Subhavan, he recovered thousands of stone tools. These show that ancient man lived in Thailand for a very long time. With tool factories in many parts of the country, it is clear that ancient hominids were not simply passing through Thailand en route to China or Indonesia: they must have inhabited the territory for hundreds of thousands of years. Now, where was the man who was the maker of the ancient tools? Always, Somsak, just like his mentor, Sood Sangvichien, was searching for the bones, skulls, teeth, of the people who had made and used the ancient artefacts.

At the same time, another group, a Thai-French palaeontological project, was searching for signs of ancient life in Northern Thailand: the Thai wing was from the Department of Mineral Resources, Geological Survey Division, and comprised Yaowalak Chaimanee, Varavudh Suteethorn and Somchai Triamwichanon; the French wing was led by Christelle Tougard and Jean-Jacques Jaeger of the *Institut des sciences de l''evolution*, of the University of Montpellier II. Since the early 1990s, they had been investigating the progressive disappearance of the giant panda (*Ailuropoda*) from Southeast Asia during the latest Middle Pleistocene (Tougard et al., 1996). Chaimanee with J.-J. Jaeger concentrated on Plio-Pleistocene rodents of Thailand (Chaimanee and Jaeger, 2000a, 2000b).

Then, in the dying days of the twentieth century, both the Thai-French Project and the Mahidol University team made dramatic discoveries of early fossil hominids from Northern Thailand.

The Thai-French expedition reported the presence of stone tools in Middle Pleistocene deposits of Northern Thailand - at Ban Don Mun and Ban Mae Tha in the Lampang Province. Their work was extended to the Thum Wiman Nakin cave (or Snake Cave) in Chaiyaphum Province (Tougard et al., 1998). They excavated numerous mammalian remains, including teeth of 31 species of large mammals and of 30 species of small mammals. Among these remains, they reported in 1998 the discovery of a single, isolated human tooth. It is of a right upper fourth premolar. It shows some features of *Homo erectus*, whilst other traits align it with Neandertal and modern human teeth. The investigators decided to call it *Homo sp.*, as there was not enough evidence to assign it to a particular species of *Homo*. It was published in 1998 and was described as "the first and oldest fossil human remains from this country". Massimo Esposito and his Thai and French colleagues (1998, 2002) have dated these fossils by uranium-series dating to older than 169,000 years - that is, in the latter part of the Middle Pleistocene.

Nobody should scorn this evidence furnished by a single tooth. As the English idiom goes, it may be the thin end of the wedge! We should recall that Peking Man was originally identified from a single tooth, or two teeth; while *Gigantopithecus*, also, was recognised and named from a single gigantic tooth! By any reckoning, it is a most important discovery.

During 1999-2001, Somsak Pramankij and Vadhana Subhavan of the Anatomy Department, University of Mahidol, found some very interesting-looking fossils at Hat Pu Dai in Lampang Province of Thailand. They identified some of the remains as hominid! In 2001, they came to visit me in Johannesburg. I had met them in Beijing in October, 1994, at the 65th anniversary of the Institute of Vertebrate Palaeontology and Palaeo-anthropology. There I had been enormously impressed by Somsak's skills in replication studies. To my laboratory they brought nineteen specimens of fossils in hard matrix that they

had recovered from Hat Pu Dai in Northern Thailand. We made a careful study of these fossils and were assisted by Dr. Ron Clarke. The most important of the 19 pieces are four cranial fragments which fit together perfectly conformably. The assembled four pieces, I wrote in my unpublished report, are "strongly suggestive of the right frontal region of a calvaria. The vault is moderately curved from above downwards and then shelves forwards with a gently concavity, as in the region close to the supra-orbital torus. In these respects it is similar to the corresponding parts of some Asian *Homo erectus* specimens... The thickness of the bones is marked, though not excessive. In this respect, also, these four specimens are in keeping with the calvaria of a *Homo erectus* as from Java and China." (Tobias, 2002c).

I concluded: "...we may have here the first indication of a *Homo erectus* partial cranial vault ever discovered in Thailand. The pieces were found *in situ* in the heavily consolidated breccia of Hat Pu Dai."

From our examination of the fauna as a whole, I summarised as follows: "The indications shown to me from Hat Pu Dai reveal a rich site with a varied mammalian fauna including various carnivores, probable ungulate, suid, and primate remains. Especially interesting are the primate remains which, scanty as the remains may seem, point to the presence of at least two and possibly three different primates, namely, fossil orang-u-tan, late surviving *Gigantopithecus* and possibly a hominid such as *Homo.*" Not only the partial cranium but also one incisor tooth suggested the presence of *Homo erectus.* My opinion, which was formed during the visit of my Thai colleagues to Johannesburg from 28th May to 24th June 2001, and formulated in my report at the end of the study period on the 19 specimens, has just been published by the Mahidol University.

Thus, in the isolated premolar from the "Thum Wiman Nakin" cave in the Kon San District, Province of Chaiyaphum, and in the calvarial part and isolated incisor tooth from Hat Pu Dai, Lampang Province, we have evidence suggesting the presence of *Homo sp.* in northern Thailand.

For the first calvaria of a probable *Homo erectus* from Thailand, we acknowledge the diligent and devoted searching of Mr. Somsak Pramankij. I offer him my congratulations.

These scattered human remains are an end and a beginning: the end of a long search, and the beginning of a new period in which I prophesy that more remains of early *Homo*, dating from the Middle Pleistocene, will be found in Thailand. I would go further: just as there are Lower Pleistocene *Homo* fossils in Georgia, China and Indonesia, I confidently predict that hominid remains from the Lower Pleistocene and dating back to nearly 2.0 myr will be found in Thailand. I do not know whether I shall live to see these predicted discoveries, but you most certainly will! It is a privilege to have played a small part in the unravelling of Thailand's ancient history.

Prehistoric movements of humans and our travelling companions, elephants

It is a remarkable fact that elephants and humans crossed stretches of water "together" late in the Early Pleistocene or early in the Middle Pleistocene (Tobias, 2000, 2001, 2002a,b).

According to Paul Sondaar (1986), sixteen Mediterranean islands (or former islands) contain fossils of endemic, or unique local, fauna. There are elephants on ten of these islands.

The presence of proboscidean remains in Sardinia/Corsica (Malatesta, 1954; Ambrosetti, 1972; Azzaroli, 1981), raises the question of elephants as markers of large mammal including human dispersals. There is a parallel situation in the Western Mediterranean. The mammoth (*M. mammuthus*) of Early Pleistocene Spain (Venta Micena) was very similar to, if not identical with, a species known from Early Pleistocene Algeria. It is likely that these early mammoths swam from North Africa to Iberia, or from Iberia to North Africa, in the early Pleistocene.

As for the elephants of the Celebes Islands (Sulawesi), Indonesia, Darlington (1957) concluded that they swam the 40 km of the Makassar Strait during the Pleistocene. Similarly, the archaic elephantid (*Stegodon*) on Flores in the Wallacean Archipelago of Indonesia must have reached there by crossing the water-gap of the Wallace Line from Southeast Asia.

In the New World, Pygmy proboscidean remains (*Mammuthus exilis*) occur in late Quaternary deposits on the North Channel Islands off the coast of California. It had long been assumed that elephants were poor swimmers and therefore that

there must have been land-bridges connecting these islands to the Californian mainland. However, there is no evidence that a land-bridge had formerly existed; and recent evidence shows that elephants are skilled at crossing water gaps. The Santa Barbara Channel between the Californian mainland and the Northern Channel Islands was only 6 km wide at times of glacially lowered sea levels (Johnson, 1978). Thus, the islands on the Pacific coast of North America provide Later Pleistocene models of elephants' dispersal by way of stepping stones across stretches of ocean.

Present-day elephants are excellent swimmers. They swim at speeds of up to 2.70 km/h, while a maximum distance of 48 km has been estimated. Stevenson-Hamilton described how, when elephants are submerged, their trunks protrude above the surface "like periscopes". Johnson reported that they swim in a lunging fashion, as porpoises do, and that they use the trunk as a snorkel. Paul Sondaar often pointed out that "Elephants have a snorkel" - and that was the title of a *festschrift* in his honour. After the construction of the Kariba Dam between Zambia and Zimbabwe and the flooding of the Zambesi River valley, elephants were observed swimming in Lake Kariba.

A close relationship has existed at least in recent centuries between Asian elephants and their quan chang or mahouts, for example, the Indian subcontinent and Thailand. The question arises whether such a symbiotic relationship between men and semi-domestic elephants subsisted even in the Pleistocene. The movements of early humans and of early proboscideans might have been synchronised as they crossed the straits between the Sunda Shelf and Flores, the Makassar Strait, those between Tunisia and Sicily, and between Tunisia and Sardinia, the Strait of Gibraltar, and the strait between California and Santa Rosa. I suppose it could be dismissed as pure coincidence that these large-bodied mammals, which could swim or paddle over modest distances, crossed the same stretches of water to gain access to the same islands, in many parts of the Old World and the Pacific coast of the New World. If humans and proboscideans had enjoyed a close relationship over a long period of geological time, as in South Asia today, in some way proboscideans might have helped the crossing of such straits by humans! – as long ago as 900,000 years before the present in the case of the Flores Straits, or even 1.5-1.0 mya across the Strait of Gibraltar.

Anthropologists, anatomists and physiologists should keep an open mind about the possibility that human beings have been able to swim, or to paddle with floats such as bladders, for at least a million years.

An important lesson I have learnt from these new analyses is this: we must abandon the old view that evolving mankind was a heavy, plodding, earth-bound creature. We must recognise the crucial role that water played in the development and dispersal of hominids, especially during the Pleistocene. Our ancestors foraged along lakeshores, river-banks and beaches, paddled, waded, floated and sooner rather than later swam. The training period for the Olympic swimmers has probably been about one million years! The elephants showed our ancestors the way! Dare I suggest that humans and elephants crossed stretches of water hand in trunk?

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