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THE ORIGINS OF MEDICINE; ASSESSMENT AND IMPLICATIONS OF THE EURASIAN EVIDENCE FROM THE UPPER PALAEOLITHIC TO THE BRONZE AGE.

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In the text that follows I have drawn primarily from original articles rather than secondary texts, partly to remove possibly biased tiers of interpretation, but also because much of the information relating to early medicine is widely scattered throughout the literature and often only available in medical and archaeological journals. The bibliography is necessarily therefore extensive and approaching comprehensive.

There is no doubt that the beginnings of medicine constitute an extremely fertile area of study which has so far received little attention, and certainly no attempt has been made to collate the available information and arrive at any kind of overall perspective. It has become clear during the course of this investigation that an understanding of the origins of medicine have important implications regarding the acquisition and development of medical knowledge in prehistory, the relationships between religious beliefs and perceptions of disease cause and cure, the relationships between medicine and cultural development, and social inequality and gender differences with regards to medical practices.

Throughout I have endeavoured to rely as far as possible exclusively on archaeological and experimental evidence, resorting to ethnographic parallels only where continuity can be clearly demonstrated. I have also (as far as I am consciously aware) avoided assumptions since what may appear to be a reasonable assumption has often been conspicuously unsupportable by a lack of any evidence- surgical amputation being a case in point (see below).

For reasons that will become clear I have terminated this study in the Bronze Age; various forms of medicine are clearly established by the Iron Age and written records are available describing classical Greek and Roman medicine, as well as traditions of medicine further afield.

Food, shelter and medicine- the three essentials for survival. Much has been written

and is understood of the transition from the hunter- gatherer mode of food acquisition to farming, and similarly a good deal is known about the range of structures affording shelter that have been built from the Upper Palaeolithic onwards and what they reveal of changing social forms. In contrast little is known of how prehistoric peoples perceived and treated disease, although palaeopathology has provided information to some extent on what some of those diseases were (Roberts and Manchester, 1995). However it is debatable what palaeopathology alone can reveal of prehistoric behaviour towards disease (Dettwyler, 1991).

In any attempt to approach the question of the origins of medicine it is useful to begin by attempting an all- embracing definition of medicine, followed by a narrowing down of that definition since, as we shall see, the boundaries between animal and human use of medicines, as with tool use (Klein, 1999), are blurred. In addition modern definitions of medicine are likely to be highly exclusive of those practices that may have been considered as medicine in prehistory. Such an all- embracing definition of medicine might be stated as follows;

> *Any action, procedure or preparation that is intended to restore, improve or maintain the health, well being or fertility of an individual and/or the social group- and is perceived to do so.*

This definition covers surgery and medicinal plant use as well as shamanism and other forms of magico- religious medicine (see below). It also covers ostracisation, sacrifice, art, burial practices, music, the use of certain natural places and other actions which may not to the modern mind be seen as medicine, but often are seen as such by many peoples alive today and may also have been so for peoples in prehistory. This broad definition also- importantly- covers the actions of many primates and other mammals.

Over the past few years mounting evidence has shown that chimpanzees and other higher primates regularly self- medicate, giving rise to the new field of zoopharmacognosy (Sumner, 2000). Plants that are toxic in larger amounts are taken by chimpanzees in controlled doses to clear intestinal parasites and to treat microbial infections. African great apes have been observed medicating with up to 30 different plants at different times (Engel, 2002). Furthermore, the plants actively sought by chimpanzees and other apes when they are ill are the same plants used by local people for similar ailments (Sumner, 2000). What is not clear however is to what extent the use of medicinal plants by primates is instinctive or learned behaviour. Adult chimpanzees do not teach each other or urge peers to consume medicinal plants, but the young do mimic their parents in the selection and preparation of foods. On balance the evidence so far seems to indicate innate behaviour that is genetically determined (Sumner, 2000). The eating of charcoal and kaolin clay amongst many mammalian species during illness has also been extensively

noted (Engel, 2002).

To blur boundaries between humans and other higher primates even further, chimpanzees in the wild have been observed occasionally to lick each others wounds and in captivity to squeeze pus from an abscess, pull a deciduous tooth with the help of a twig, remove foreign bodies from each others eyes and extract splinters from one another's fingers (Prioreschi, 1995).

To what extent can these actions be termed medical, since the actions of chimpanzees and other higher primates- it would seem reasonable to suppose- could be attributed to hominid species such as *Homo habilis* and *Homo neanderthalensis* as well as to *Homo sapiens*? Perhaps the question of the origins of medicine needs to be rephrased in the light of the rather broad definition on page 2 and the observations above of the behaviour of higher primates. The question might be more profitably restated as

> *"When did the transition from instinctive self- treatment to systematic approaches to illness, based on bodies of knowledge, occur?"*

In other words when did medicine develop from being genetic into being cultural? It is this question I shall endeavour to answer in the following pages by looking at three main areas of medical practice, all of which are in existence today and can be traced back into prehistory- namely medicinal plant and mineral use, surgery and other physical procedures and shamanism and other magico-religious approaches. Figure 1 shows these

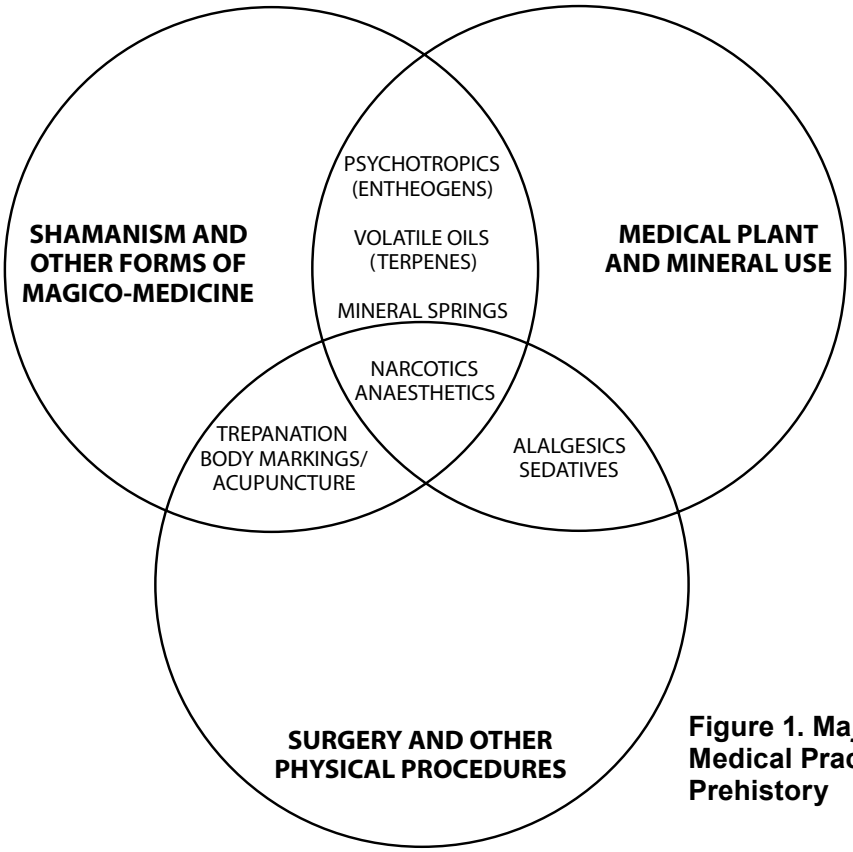

Figure 1. Major Areas Of Medical Practice In Prehistory

three areas of medicine and how they interrelate.

It is clear that some examples highlight these interrelationships. A number of medicinal plants are also psychotropic and are likely to have been used in religious rituals; certain physical procedures e.g. trepanation, are both surgical and almost certainly ritualistic (see below); sedatives and analgesics may well have been used during surgery to alleviate pain. In fact it is quite possible that in prehistory the divisions shown in fig.1 were entirely lacking, but nevertheless they provide a useful framework for a discussion of the evidence.

Evidence for the origins of medicine can be found in many forms and includes-

- Skeletal evidence e.g. trepanation, manipulation and splinting, dentistry.
- Soft tissue evidence where preservation has occurred e.g. body markings; stomach contents analysis; chemical residue analyses of tissues and hair.
- Plant remains e.g. pollen, seeds, flowers (if preservation is good).
- Ceramics e.g. chemical residue analyses, form and style of pots indicating function and/or skeuomorphism.
- Grave goods e.g. shamanic tools; surgical and other medical equipment.
- Art e.g. figurines; amulets.

It is also important to stress that medicine has its social context- medicine as intervention and control; medicine as bodies of knowledge; medicine as power; medicine as belief and ritual, and any interpretations must remain cognisant of the possible social contexts of medical practices and what may have been intended by the treatments in relation to the definition on page 2. For instance, was a particular treatment for the benefit of the individual or the community or both?

1. Surgery and other physical procedures.

(i) Trepanation

Trepanation is the surgical procedure by which a full-thickness piece of cranium is removed exposing the cerebral *dura mater* (Parker et al., 1986). Figure 2 shows a particularly clear example from the Bronze Age reported by Piggott (1940). Trepanation is the oldest known surgical operation and cases run into the thousands from most countries of Europe as well as the rest of the world. The earliest examples have been reported from Ensisheim (Alsace) (Alt et al., 1997) dated to 5200-4900BC (early Neolithic) and more recently from the Dnieper Rapids Vasilyevka II cemetery near Kiev in the Ukraine dated to 7300- 6220BC (late Mesolithic) (Lillie, 1998). Both skulls showed extensive remodelling of bone and almost complete closure of the trepanation, indicating survival

from the operations. These cases confirm an earlier study from the Baltic states (Derums, 1979) of some 4000 skeletons which indicated the earliest trepanations date from the Mesolithic period. Several other studies of substantial numbers of trepanned skulls from Denmark (Bennike, 1985), Sweden (Jennbert, 1991) and Great Britain (Piggott, 1940) suggest the following conclusions

- A high proportion of subjects (80%) survived trepanation as indicated by bone re-growth inwards from the operation site.
- Four methods of trepanation can be discerned. The most common (~80%) and the one with the highest survival rate because of the degree of operative control, was one of gradual scraping of the surface of the cranium with a flint to produce a saucer shaped lesion. This method does not produce rondelles (see below). The second method involves delineating a circular groove which was gradually deepened by scraping until the cranium was cut through and the circular piece of cranium (the rondelle) prized out. This was the method used in the skull from Crichel Down (fig. 2). The absence of bone re-growth in this case indicates the patient died during the operation or that the operation was conducted *post-mortem*. The third and fourth methods involved a series of drill perforations followed by sawing of the intervening bone or the removal of a roughly quadrilateral fragment of cranium by sawing. These final methods would have carried a very high mortality rate.
- Rondelles are usually missing from graves even where death occurred at or before surgery (Crichel is an exception).
- The majority of trepanations were conducted on males (95%); hardly any on women or children.
- Some skulls show multiple trepanations (2,3 or even 4) conducted over a period of time.
- Trepanations peak in the Neolithic period- cases are rarer from the Bronze Age onwards.
- A high proportion of trepanations were conducted on the left side of the skull, particularly the left parietal bone (>60%) (again Crichel is an example); some on the top of the skull; some towards the front; hardly any on the right side.
- Around 6-10% of Neolithic skulls show evidence of trepanation.

In any attempt to understand the reasons for trepanation there are likely to be two broad possibilities- one medical, one religious (Parker et al. 1986). If the reasons are religious one would expect the archaeological record to show trepanned individuals to have been treated differently in some way. The evidence for this is inconclusive except rondelles, as stated above, are generally missing from graves, indicating they carried some ritual significance (e.g. as amulets). That rondelles have been found with perforations

for hanging supports this view (Sigerist, 1951; Janssens, 1970). If trepanations were conducted for medical reasons one would expect evidence of the condition for which the treatment was undertaken. Unfortunately many illnesses leave no skeletal evidence. From ethnographic sources it is known trepanations are carried out to relieve intracranial pressure following skull fracture, epilepsy, severe headaches and mental illness, but there is no way of knowing if these were the reasons for trepanation in prehistory except possibly the first. Bennicke (1985) has argued that most skull fractures would occur as a result of fighting, hence would occur predominantly in males and on the left side of the skull, assuming weapons were more commonly wielded with the right hand. This scenario may account for the left sided male predominance of trepanations but a large proportion of skulls show no evidence of prior trauma. Prioreschi (1991) has suggested that a connection had been made by prehistoric peoples between resultant unconsciousness from head injuries followed by, on occasions, regaining of consciousness (death → rebirth) and a similar 'death' and 'rebirth' with other illnesses. By trepanning (which imitates and exaggerates head injury), the process of 'rebirth' in serious (unconscious) illness could be facilitated by allowing bad spirits to leave or the person's lost soul to return more easily (see shamanism below). Whatever the reasons for trepanation (and they are likely to be a combination of medical and religious, with perhaps the first method of trepanation discussed above primarily therapeutic and the other methods primarily for the acquisition of rondelles) the operation demanded a high degree of anatomical awareness and skill in order to avoid perforation of the *dura mater*. Such awareness and skill must constitute a culturally carried body of knowledge. No trepanations are known from the Upper Palaeolithic suggesting a Mesolithic or Mesolithic/early Neolithic origin for this body of knowledge. That the occurrence of trepanation is so widespread suggests independent foci of origin.

(ii) Amputation

Surprisingly there is no evidence of surgical amputation in the archaeological record prior to the IX Dynasty in Egypt, and even that example is disputed (Roberts and Manchester, 1995). The reasons may be medical, due to an inability to stem massive haemorrhaging, or religious from a belief that when a person dies he/she should be as far as possible whole (Thompson Rowling, 1989).

(iii) Non-skeletal surgery

Without good soft tissue preservation evidence for non- skeletal surgery will be lost. Even where bodies have been mummified in arid (Egypt), cold (Siberia) or wet (Denmark) conditions, evidence for surgery is lacking. In Dynastic Egypt despite medical texts to the contrary (Nunn, 1996), little evidence for surgery other than circumcision has been found (Thompson Rowling, 1989). However, a set of surgical instruments (drills, scalpels, saw,

scoop and denticulated forceps) made from bronze have been discovered in a Mycenaean chamber tomb at Nauplion dated to 1450BC (Arnott, 1996). That such tools were buried with the grave's occupant indicates he was of high social status. Together with the instruments were rasps and grinding stones for making medicinal remedies.

(iv) Dentistry

Zias and Numeroff (1986) reviewed the evidence for ancient dentistry in the Eastern Mediterranean and found it to be meagre, allowing for few if any conclusions other than that no form of dentistry appeared to have been practised. In contrast skeletal remains from Bronze Age (Middle Minoan) cemeteries on Crete, e.g. at Ailias, Armenoi and Agios Haralambos show firm evidence of extracted teeth. Indeed dental extractions seem to have been more widely practised in the towns than in rural areas since there was a lower incidence of abscesses in the urban population despite a higher rate of dental caries (Arnott, 1996; 1997).

Earlier evidence still for dentistry has been reported by Bennicke (1985). A male skull from a Neolithic passage grave in Langeland, Denmark, dated to 3200-1800BC, shows a drill hole in one of the upper molars, still in position in the jaw (fig. 3). The tooth in question had a tooth abscess at the root, presumably prompting the operation. Experimental archaeology on a newly extracted tooth showed that a reconstructed flint bow- drill could produce a strikingly similar bore hole in less than five minutes. Calculus on the surface of the bore hole of the in situ tooth showed the operation must have been undertaken *antemortem*.

(v) Treatment of fractures

Bone fractures healing in a position of poor alignment are a common finding in skeletal remains since muscles surrounding the site of fracture contract (Roberts and Manchester, 1995). Immobilisation and reduction are therefore essential and require manipulation and splinting if full functioning is to be restored.

In tomb Γ of Shaft Grave Circle B at Mycenae, dated to 1550BC, a female skeleton was found to have a perfectly healed mid-shaft, three- part fracture of the right humerus – an injury which could not have healed naturally in this way (Arnott, 1996; 2002/3). The woman's grave goods suggest she was of high status and must have had access to preferential medical treatment, since contemporary graves of lower status showed fractures which had healed with faulty union and consequent dysfunction.

Similar cases of successfully healed fractures suggesting some form of manipulation and artificial splinting have been reported from Agios Haralambos in eastern Crete (ulna and humerus, dated c.2000BC) (Arnott, 1997) and at the Xemxija rock cut tombs on Malta (tibia, dated to 3800-3600BC) (Savona-Ventura, 2003).

(vi) Acupuncture

The discovery in 1991 of Otzi, the Tyrolean Ice man (dated to c. 3250 BC), (Spindler, 1994; Fowler, 2000) has provided some of the most exceptional and intriguing evidence for a substantial body of medical knowledge in the Neolithic period. This evidence centres around a number of 'tattoos' on the mummified body created by the deliberate sub-cutaneous deposition of charcoal (fig. 4a). A morphometric analysis of the 15 groups of markings on the back and legs of the body was prompted (Dorfer et al., 1998; Dorfer et al. 1999) because they are not random, nor do they occur on visible areas of the body and are unlikely therefore to be ornamental. The possibility existed that they had some therapeutic importance connected with the known arthrosis in Otzi's hips, knees, ankles and lumbar spine, and the presence of substantial quantities of whipworm eggs in his colon. Superimposition of the tattoo marks onto a topographical representation of traditional Chinese acupuncture points indicated that nine of the tattoos corresponded to acupuncture points located on the urinary bladder meridian and three on the gall bladder and liver meridians- significantly points used to treat lumbar arthrosis and abdominal disorders respectively (Dorfer et al., 1999; Acupuncture Today, 2003). Further tattoos located over affected areas such as the knees and ankles correspond to acupuncture points used to treat those joints directly. The findings provide strong evidence that a form of medical therapeutics similar to Chinese acupuncture was already being practised in Europe 5200 years ago. The marks may have been a guide for self treatment or, in the case of the marks on the Ice man's back, a medical report for others who may have been called upon to treat him. Interestingly, very similarly placed non- ornamental tattoo marks were found on the Scythian horseman from Kurgan 2 at Pazyryk in the Altai mountains, Siberia (fig. 4b) indicating a continuity of knowledge over some two millennia and spread over a wide geographical area. Such a complex body of empirical knowledge could not have accumulated overnight and suggests a beginning stretching back beyond the Middle Neolithic. As with trepanation there may have been independent foci of origins for acupuncture- perhaps in the West as well as in the East.

2. Medicinal plant and mineral use.

Many of the most powerful pharmacologically active plants are those containing alkaloids, and this is reflected in the archaeological record of medicinal plant use. In addition it is probably highly significant that almost without exception these plants are also psychoactive (entheogenic). They include opium, thornapple, henbane, ephedra and Syrian rue. Whilst other types of medicinal plants may well have been used (and there is some evidence to suggest they were- see below) the psychoactive properties of alkaloid containing plants would have ensured them a place in the zone encompassing both religious and medicinal use (fig. 1). Such a place may also have been conferred upon

terpene containing botanics (see below). Table 1 lists all those medicinal plants for which there is archaeological evidence of use- either directly as plant remains, or in the form of plant extract residues, or in some cases circumstantial evidence. Their pharmacologically active constituents and physiological effects are also shown.

Botanical Remains	Pharmacologically Active Components	Physiological Effects	Archaeological Sites And Dates Of Samples
Opium Poppy *(Papaver Somniferum)*	Alkaloids- Over 30 Including Morphine	Narcotic, Sedative, Euphoric	Swiss Neolithic Lake Villages; LBK Sites In The Rhineland 5000-4500 BC; Southern Spain c. 4200 BC; Crete/Cyprus c. 1400 Bc.
Henbane *(Hyoscyamus Niger)*	Alkaloids- Hyoscyamine, Hyoscine, Scopolamine	Sedative, Analgesic, Antispasmodic	Balfarg, Scotland 2800-2300 BC; Feudvar, Serbia- Bronze Age.
Thornapple (*Datura Stramonium)*	Alkaloids- Scopolamine, Hyoscyamine, Atropine	Sedative, Analgesic, Hallucinogenic	Early Bronze Age Site, Western Hungary
Ephedra Species *(Ephedra Spp)*	Alkaloids- Ephedrine, Norephedrine	CNS Stimulant, Euphoric, Antiasthmatic	Gonor South, Togolok 1/21, Turkmenistan 2000-1500 Bc.
Syrian Rue *(Peganum Harmala)*	B- Carboline Alkaloids- Harmine, Harmaline	Hallucinogenic	Caucasus, 5th Millenium BC
Fly Agaric *(Amanita Muscaria)*	Alkaloid- Muscimol	Hallucinogenic Intoxicant	Bronze Age Rock Art Depicting Fly Agaric ? Mushroom People
Cannabis *(Cannabis Sativa)*	Cannabinoids- THC	Euphoric, Hallucinogenic	Pit Grave Burial Gurbanesti, Romania Late 3rd Millenium BC; Early Bronze Age Sites Northern Caucasus
Birch Bracket Fungus *(Piptoporus Betulinus)*	Agaric Acid, Polyporic Acid	Antimicrobial, Antimetazoan, Purgative	Otzi, Hauslabjoch, Tyrol c.3250 BC
Pine, Juniper, Cedar	Terpenes	Antimicrobial, Analgesic, Anti-Inflammatory, Narcotic, Aromatic	Cedarwood Oil Used By Egyptians For Embalming. Use Likely To Have Been Widespread

Table 1: Earliest Known Examples Of Medicinal Botanics In The Archaeological Record

Probably the earliest evidence for the use of a medicinally active plant is that for the opium poppy. A number of Linearbandkeramik sites in the Rhineland and Swiss Neolithic lake villages dated to 5000- 4500 BC have yielded samples of opium poppy seeds (*Papaver somniferum*) (Merlin, 1984) This species is the cultivated version of the wild poppy species (*Papaver setigerum*) which is native to the Western Mediterranean (Zohary and

Hopf, 2000) and does not naturally colonise north of that area. Significantly however both species have a marked preference for disturbed and cultivated earth. It is possible therefore that the wild species may have been carried (intentionally or unintentionally) north and west in the wave of agricultural advance during the early Neolithic, finding an ecological niche around settlement sites. The wild species was clearly cultivated early on to produce the larger capsular opium poppy. Whether this was for the increased opium yield or food value or both is unclear. Particularly fine examples of opium poppy capsules have been found at the Neolithic site of Cueva de los Murcielagos in Southern Spain (c. 4200 BC), predating evidence for opium use in the Eastern Mediterranean by more than two millenia. In fact it is not until the Bronze Age that evidence for opium poppy cultivation and use is found on Crete, Cyprus and in Egypt, suggesting a west to east diffusion. At Kition in Cyprus a pipe used for smoking opium was found in a ritual context dated to c.1220 BC (Karageorghis,1976), and numerous Bronze Age artefacts depicting, or in the shape of, opium poppy capsules have been found in Greece, Crete, Cyprus and Egypt, including pins, beads, rings and vases. The opium poppy goddess statue from Gazi, Crete, dated to c.1500 BC (fig. 5) (Arnott, 2002/3) is especially noteworthy.

Merrillees (1962) has argued that the base- ring juglets exported from Cyprus to Egypt from c. 1650 BC to c. 1400 BC show a striking resemblance to opium poppy capsules (fig. 6) and this shape was intended to convey visually the contents of the jugs. Whilst such an argument is compelling (and certainly Egypt does not appear to have cultivated its own opium until c.1400 BC and may well therefore have imported opium dissolved in wine or oil prior to that) recent analyses of residues in a base- ring juglet from the tomb of Kha near Thebes failed to detect any opiates (Bisset et al., 1994). Further analyses seem appropriate.

A number of different kinds of prehistoric pottery have skeuomorphic designs- that is their shape and decoration imitate natural objects or artefacts made of other materials. Rudgley (1998) has suggested that the Wessex I miniature vessels known as grape cups dating from the mid- second millennium BC may be imitating the fruit of *Datura stramonium* (table 1) (fig.7). Woodward (2000) like Sherratt (1995) has argued that these cups and the similar Aldbourne cups were used for smoking psychoactive substances. Some show signs of burnt residues though none have been analysed. The so called vase supports or small braziers of the megalithic tomb builders of Western France dating from the 4th millennium BC indicate much earlier ritual and medicinal inhalation of entheogens.

Like the opium poppy, henbane, deadly nightshade, thornapple and hemlock all preferentially colonise disturbed cultivated ground, tending to grow around areas

of human habitation (Podlech, 1996). The interesting possibility exists that these psychoactive and medicinal plants were constant companions of Neolithic communities as farming spread across Europe. Such close proximity would have ensured their use. Archaeological samples of henbane have been found at the Bronze Age site of Feudvar in Serbia (Sherratt, 1995) and at a Neolithic ritual site at Balfarg in Fife, Scotland (Barclay and Russel- White, 1993) far north of the plant's original habitat in the Mediterranean.

Early evidence for the use of *Ephedra spp.* (2000- 1500 BC; Sarianidi, 1994), *Cannabis sativa* (c. 2000 BC; Sherratt, 1991) and *Perganum harmela* (Syrian rue) (5th millennium BC; Sherratt, 1995) in central Asia is given in table 1.

Further east the Fly agaric mushroom (*Amanita muscaria*) (fig. 8a) appears to have been used in prehistory. Whilst no material evidence has as yet been found to support this view, petroglyphs at Pegtymel in Chukotka, near the Arctic sea, Siberia, dated to the Bronze Age, clearly depict mushrooms associated with humans (Dikov, 1971) (fig. 8b). Since Fly agaric is one of the few cold hardy mushrooms surviving at such northerly latitudes, it would seem a likely candidate. Amanita use in historical times amongst many Siberian tribes (including the Chukchi of Chukotka) as an entheogen and folk medicine has been well documented. Fly agaric has a mythology surrounding it (including the belief that the spirit of the mushroom appears as a person) suggesting great antiquity and continuity of use (Dunn, 1973; Saar, 1991). Kaplan (1975) has argued for *Amanita* use in Bronze Age Scandinavia based on petroglyphs at sites in Sweden and mushroom motifs on bronze razors.

The Ice man Otzi carried with him two lumps of the birch bracket fungus *Piptoporus betulinus* (fig. 9). This fungus contains compounds that are both purgative and antimicrobial, as well as antimetazoan (Capasso, 1998) (table 1). An analysis of the contents of Otzi's colon revealed eggs of the intestinal parasite *Trichirus trichiura*. As is the case with any medicinal botanic in prehistory, it is difficult to assess the extent to which the use of *Piptoporus betulinus* was the result of innate pharmacognosy or based on a culturally carried body of knowledge. It seems likely that the former would have generally led into the latter. That the Ice man carried the fungus with him suggests he was consciously aware, both of the connection between its antiparasitic properties and the infestation in his colon, *and* that measured and repeated doses were needed (the fungus showed evidence of small pieces having been broken off) thereby implying a body of knowledge.

The case for the medical use of plants is strengthened if that plant has no food value and/or it is toxic. None of the botanical species in table 1 have any food value except the

opium poppy and all are toxic except in small doses. Their presence on archaeological sites strengthens the view that from- in some cases- the Early Neolithic onwards these botanics were being used medicinally and/or ritually. The fact that most are psychoactive as well as having more strictly medical properties implies that the treatment of illness and rituals involving altered states of consciousness were often co- existent (see below).

Care must be taken to differentiate between purely ritual or decorative use (rather than medical use) of medicinal plants e.g. Yarrow in the grave of the Bronze Age Egtved girl (Glob, 1973) and the purely technological use of medicinal plants such as hemp (Godwin, 1967). The burning of cannabis seeds as at Gurbanesti (Sherratt, 1991) is more likely to be medical/ritualistic than the presence of flax for instance.

A class of medical botanics for which there is as yet no significant archaeological evidence are those containing essential oils or terpenes (e.g. pinene, camphor, eugenol, menthol, myrrh etc.). These compounds are strongly antimicrobial (hence the use of cedar oil by the Celts to preserve human heads and by the Ancient Egyptians in mummification). They are also often analgesic and anti-inflammatory, as well as being highly aromatic and moderately narcotic. Their use in ritual settings throughout recorded history would suggest their use back into prehistory and analyses of burnt residues in the types of ceramics already discussed may well reveal the use of extracts of pine, cedar and juniper - trees that have been widespread in Eurasia since the end of the Upper Palaeolithic.

Moving onto therapeutic minerals, little evidence exists indicating which if any minerals were used medically. Exceptions include certain sacred springs. The highly mineralised ferruginous spring of St. Moritz in the Oberengadin shows evidence of Bronze Age use in the form of wooden pipes and bronze offerings and is still in use today. Numerous ordinary springs lie nearby indicating the highly mineralised spring was singled out as special (Sigerist, 1951; Harding, 2000). Several mineral springs on Sardinia also show evidence of use in the Bronze Age or even earlier.

As with medicinal plants, springs can be physiologically therapeutic (sulphur springs for instance are known to be beneficial for certain skin conditions); they also fall within the domain of the religious, emphasising the ritual nature of many of the healing practices in prehistory.

Velo (1984) has pointed out that ochre is used as a medicine by Australian aborigines, and that iron salts have astringent, antihaemorrhagic and antiseptic properties. Whilst ochre use as decoration dates back to the Middle Palaeolithic, there are no indications it was actually used as a medicine, and this may point to the danger of drawing too loosely on ethnography.

3. Shamanism and other forms of magico- religious healing.

(i) Shamanism

Shamanism (Eliade, 1964) has been the subject of a great deal of debate- not only with regard to its origins, but also its very nature (Lewis- Williams, 2002; Stone, 2003). However, as any cross- cultural study will reveal (Vitebsky, 1995), certain key features are evident without which it is difficult to see how the terms shamanism or shamanic healing could be used. If an understanding of those key features could be reached it might then allow for a prediction of what archaeological evidence is required in order to be confident of shamanism having been practised in the past. In turn, if evidence of the continuity of those key features in the archaeological record can be established, it may then be possible to propose where in prehistory shamanism had its origins.

An accepted prerequisite for the practice of shamanism is the ability to enter altered states of consciousness (Lewis- Williams, 1997; 2002). Many other mammals share this ability however (Siegel, 1977), making it a necessary but insufficient requirement for shamanic activity. Moreover, conditions such as schizophrenia involve altered states of consciousness, but these are clearly not coherent states. The second prerequisite is therefore that the altered state of consciousness is *structured* – it is experienced or constituted as a cosmology - a spirit world - which the shaman can travel around, interact with and have an effect on. In turn this is seen as having beneficial effects on the normal everyday world. The spirit world is often tiered (low, middle and upper) and populated by beneficent and malevolent spirits. What is important to stress however, is that whatever the details, *the spirit world is structured just as this world is*- when a shaman goes into the spirit world to search for the lost soul of a sick person he/she is searching as he/she would in this world. The schizophrenic cannot benefit others because his world is *fragmented and chaotic- it has no coherence* and native peoples make a clear distinction between shamanism and madness for this reason (Vitebsky, 1995).

The ability to enter altered states of consciousness and structuring of those states are the two essentials for the practice of shamanism. Several other features congregate around these two essentials and are invariably present. The first is the experience of *flying* – the shaman leaves his/her body to enter the spirit world. The second is certain drivers or facilitators are used to produce this change in consciousness. These can be the drum or rattle, entheogens (see medicinal plants above) or deprivations such as fasting, sensory deprivation and postural discomfort (see below). Third, because the shaman flies to and around the spirit world, whatever tools and aids he/she has must be of a size that can be easily carried. This translates into ordinary reality (and the material culture of shamanism) as certain artefacts being *illogically small and fastened to the shaman*

in some way.. For instance, spirit catchers used to retrieve a sick person's soul are much smaller than the human body; ritual weapons used to fight malevolent spirits and dislodge them from the body of someone who is ill may be lighter or distorted copies of actual weapons; *erens* (spirit helpers) are small figures attached to the shaman's clothes.

To be confident of archaeological evidence for shamanism the following should therefore be present –

- Evidence for the means to achieve altered states of consciousness, either materially or by representation.
- Representational evidence of a cosmology – a structured spirit world.
- Representational evidence for flying.
- Evidence of artefacts of illogical size/shape/material in close relationship with skeletal remains.

Other objects, especially unfashioned natural objects - for example those in the Upton Lovell (Piggott, 1962) and Hvidegard (Glob, 1973) graves - may or may not be evidence for shamanism. Likewise human/animal hybrids are not unequivocal evidence of shamanism – they may simply be the product of imagination or symbolism (see below with reference to the Upper Palaeolithic). Only the core features listed above are reliable indicators.

Based on these criteria how far back can shamanism be traced?

Petroglyphs around lake Baikal in Siberia dated to c.2000 BC clearly show a figure flying and holding a drum, in a scene depicting some kind of 'world' (fig. 10a) (Devlet, 2001). Fig. 10b shows a twentieth century photograph of a Tuvan shaman for comparison. The similarity is striking. Petroglyphs from the Yenesi and Lena rivers show human figures transforming into birds and flying (fig. 11) dated again to c. 2000 BC (Okladnikov, 1969; 1974). Excavations at the ritual shrine of Togolok 21 in Turkmenistan produced a cylindrical seal dated to 2300- 1800 BC showing zoomorphic figures drumming single headed drums very similar to those found in Siberia (fig. 12) (Francfort, 1994). A grave from Ust'- Uda in Mongolia dated to c.1500 BC (fig.13) had within it carved *erens* (spirit helpers) enabling a reconstruction of the likely costume of the shaman (fig. 14a) (Okladnikov, 1955). Fig. 14b shows a nineteenth century costume for comparison (Alekseyenko et al., 1998). Note the similarity of the spirit helper figures on the costumes. Petroglyphs in parts of Siberia depicting drums, flying figures and figures that are disproportionately large or small or that have grossly exaggerated features may be Neolithic (Novgorodova, 1984) but petroglyphs can be notoriously difficult to date.

Examples of zoomorphic *erens* used for healing are known from the Neolithic and their form can be traced through the Bronze Age into historical times (Vajnstejn, 1978).

Unfortunately hard evidence for shamanism/shamanic healing prior to the Bronze Age, and certainly prior to the Neolithic period, is elusive, yet there is remarkable consistency of form taken by the criteria listed above for shamanism from the Bronze Age into historical times. As with trepanation and the therapies used by Otzi, it is difficult to see how such a systematic approach to illness could have arisen overnight. Without further evidence it would appear shamanism had its origins sometime before or during the Neolithic. This conclusion would run contrary to the arguments of Lewis- Williams (1997; 2002) who sees the parietal art of the Upper Palaeolithic as indicating an origin for shamanism during that time. Certainly Upper Palaeolithic art can be taken to indicate the ability to represent, and probably the ability to represent what is seen in altered states of consciousness. However, what is striking about Upper Palaeolithic parietal (and also mobiliary) art with regards to shamanism is that the images are static, isolated and disconnected- they have no emotional content and the art is lacking any integrated composition; the individual figures do not seem to be interacting in any way. This in turn implies the lack of any integrated view of the world- any cosmology- and without an integrated view of the world (that is a belief structure that explains how everything relates) one can function in the world but one cannot make sense of it as a whole.

Given that many mammals can enter altered states of consciousness (and so therefore presumably could hominids including *Homo sapiens*), the question becomes at what point does the ability to enter altered states of consciousness become the ability to shamanise? The answer must be once what is experienced becomes integrated into (is perceived as) a whole and hence is structured as a world, a cosmology. Is there any indication as to when a coherent integrated view of the world started to occur? Parietal art of the Mesolithic (e.g. Fig.15) is radically different from that of the Upper Palaeolithic. Not only does it include the human figure (so largely and strikingly absent from much of Upper Palaeolithic art) but there is *composition* – the art is dynamic and integrated. This in turn implies an integrated view of the world – a cosmology – a belief structure explaining how the world 'works', how to represent it, and how the human being is part of that world. If the Mesolithic representation of the external world is integrated, it is likely any internal (altered state of consciousness) world would also be integrated, allowing for the emergence of shamanism. The shaman cannot be conceived of without an integrated, coherent and internally consistent spirit world. In fact it could be suggested that no systematic approach to illness (of which shamanism is an example) is possible without some kind of belief structure that gives coherent and integrated form to what is experienced, resulting in worlds, internal and external. Such integration (and hence belief structure) appears to be

lacking in the Upper Palaeolithic, judging by its art.

Based on these arguments the origins of shamanism can be placed sometime between the end of the Upper Palaeolithic (where I suggest there is no evidence for shamanism) and the Neolithic (where there is some evidence for shamanism). More specifically its origins may belong in the Mesolithic.

(ii) Votive offerings for healing

The deposition of offerings clearly intended as a petition for healing differs from shamanism in that it is connected more with the religious worship of deities than a direct interaction with spirits (Vitebsky, 1995). The offerings usually take the form of representations of body parts, or whole figures with parts missing or deformed in some way. Examples are those of the Middle and Late Minoan peak sanctuaries of Mounts Juktas (associated with Knosses), Vrysinas, Petsofas and Traostalos on Crete dated to 1900- 1500 BC (Arnott, 1999). Figs.16a and b are of clay figurines found at Vrysinas. Fig.16a appears to show a woman with multiple pathologies, whilst fig.16b may indicate a petition for healing of diseased lower limbs. Rituals enacted on these peak sanctuaries appear to have involved fire ceremonies and Arnott (2002/2003) has suggested the sites were centres of a healing cult.

On Malta the late Neolithic sanctuaries of Mnaidra, Hagar Qim and Hal Saflieni, dated to c. 3000 BC, have yielded clay hands, legs and torsos showing deformities which have been interpreted as votive supplications for healing (Savona- Ventura, 2003).

Unlike shamanism, acupuncture, surgery and medicinal plant use, votive offerings do not represent a body of knowledge or a systematic approach to illness as such and their importance with regard to the origins of medicine is limited since their use is more strictly religious than medical, even though their intention is for healing.

(iii) Figurines

The earliest figurines date from the Upper Palaeolithic. White (1998) has suggested that Venus statuettes were intended to protect the health of mother and child during childbirth. Such a suggestion however lacks any firm evidence and it remains unclear what the purpose(s) of the figurines of this period was/were.

The emphasis of Upper Palaeolithic mobiliary art appears to be on *anatomy* and *morphology* (e.g. fig. 15), and as with the parietal images of the period the pieces have a curious lack of emotional and dynamic content – they look static and isolated. In contrast many of the figurines of the Neolithic period have a marked emphasis on *posture*, giving them a dynamic quality and the sense that they carry an intent beyond their mere form.

Goodman (1990) has noted that certain postures are recurrent. In particular examples of the 'bear' posture have been found in many countries of the world from the Neolithic period to the present. Amongst the Plains Indians of North America both the bear and the bear posture were associated with healing, and in parts of Siberia wooden carvings of figurines adopting the bear posture are given to those who are sick in order to mediate a cure. Examples of figurines exhibiting this posture are shown in fig. 17. Such figurines may have been instructional, since adoption of the bear posture led to marked changes in the state of consciousness, together with increased equanimity and calm, of those who experimented with it (Goodman, 1990).

The Neolithic figurines from the cemetery site of Cernavoda (c.3600 BC) (fig.18) (Berciu, 1960) display extraordinarily awkward postures and adoption of these postures for any length of time led to marked physiological and psychological changes (Gore, 1995).

Quite what the purpose of many Neolithic figurines was is unclear but a didactic one connected with facilitating changes in consciousness is an interesting possibility, and would relate to shamanism/shamanic healing (see above). This would again emphasis the likely connection between ritual and medicine in prehistory.

In conclusion fig. 19 displays a time- line showing the earliest known unequivocal examples of each of the medical approaches discussed above.

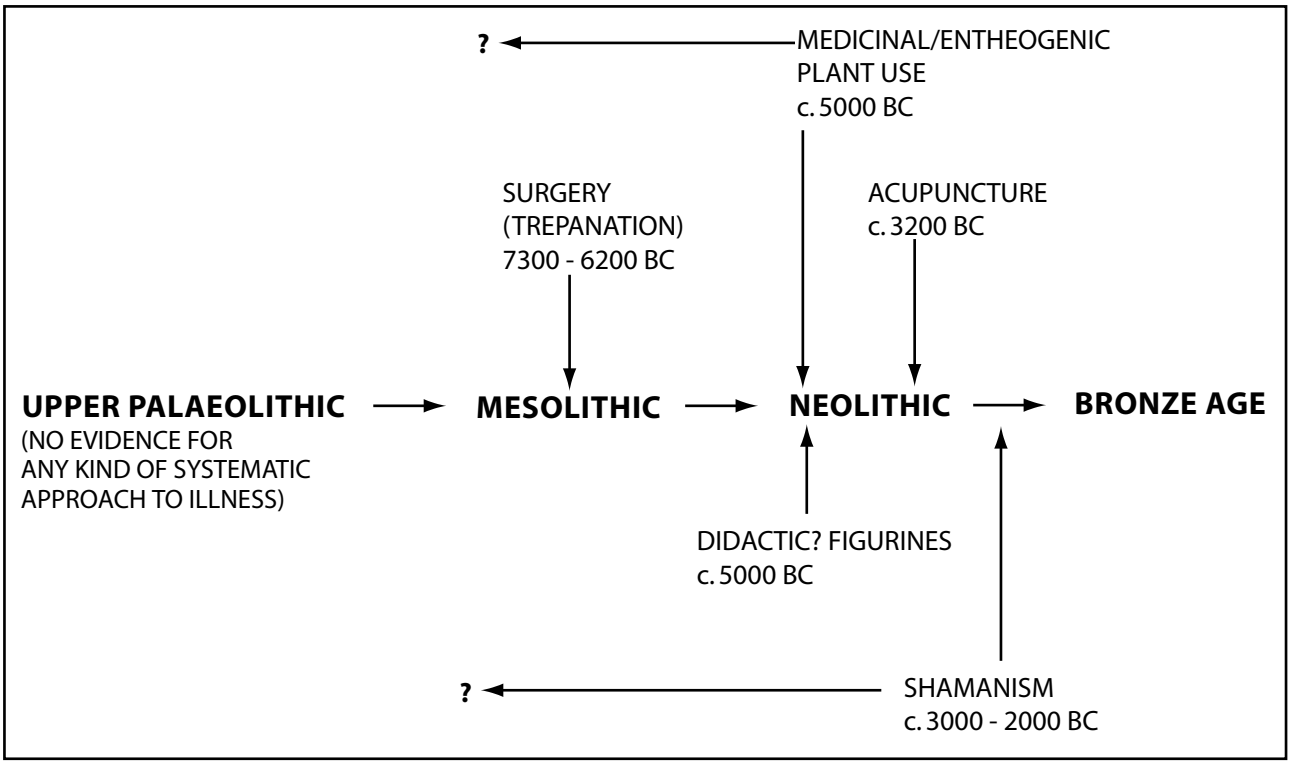

Figure 19. Earliest Known Unequivocal Examples Of The Various Systematic Approaches To Illness Discussed In The Text.

As I have emphasised, by medical I mean *systematic approaches to illness based on culturally carried bodies of knowledge*. These systematic approaches to illness constitute meaningful attempts to explain health and disease within what would inevitably have been culturally determined world views. Consequences follow from these attempts to understand illness (rather than simply responding to it instinctively in the form of genetically determined self- treatment).

First, the bodies of knowledge so developed are likely to have resulted in prestige and power for those who held and implemented that knowledge for the community. There is evidence by the Bronze Age to suggest that practitioners were afforded more elaborate or special burials (e.g. Nauplion,Ust'- Uda). In addition situations had developed in which treatment was preferentially available (e.g. Mycenae).

Second, the evidence suggests that most, if not all, medical approaches were ritualised to a greater or lesser extent, and therefore *were* linked with world views and belief structures.

Third there is the question of the origins of systematic approaches to illness. Whilst there is room for substantially more evidence, what evidence there is at the present points to an origin for surgery in the late Mesolithic; for shamanism between the Upper Palaeolithic and the Neolithic- possibly in the Mesolithic; for systematic medicinal plant use by the early Neolithic (and probably earlier); for a treatment akin to acupuncture by the middle Neolithic (again probably earlier), and for the possible use of figurines as instructional tools before or by the middle Neolithic.

The overall impression then is of a significant shift in approach towards disease, from the instinctive to the systematic and knowledge based, sometime during the Mesolithic, or between the Mesolithic and Neolithic periods. Such a shift may well have resulted from an emerging ability to 'structure' the world and later from the emergence of concepts of intervention, manipulation and control- concepts which would not have been inconsistent with the beginnings of farming and the shift from the wild to the domestic.

Author's Note

Many figures referred to in the text are under copyright and can be found in their respective references. It is hoped that in due course with permission they can be included in the text.

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