

Fossils in pharmacy: from “snake eggs” to “Saint’s bones”; an overview*

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ABSTRACT: During the centuries, fossil remains of invertebrate and vertebrate animals have been widely sold and used as medicines to cure a disease or relieve a symptom, or as amulets to prevent a disease or symptom. The most common fossil materia medica are the invertebrate remains (sea urchins, ammonites, belemnites, trilobites), followed by shark teeth and palatal teeth of bony fishes. More rare, especially in Europe, is the use of fossil mammals, generally considered dragons or saints. Knowledge of the use of fossil medicines in healthcare gives insight into the degree of possible danger for the palaeontological heritage. The use of fossils as medicines or amulets is not restricted to medieval and earlier periods, but is still prevalent, not only in traditional medicine shops in Asia, but in alternative medicine practices in Europe as well. Many people hold strong beliefs in the working principles of the fossils in health enhancement and this should not be dismissed too easily. The working area of fossil medicines have a wide range including internal pains and cramps, infertility and obstetrical problems, sore throats, bladder and kidney diseases, eye infections, diphtheria and poisoning. The working principle is unfortunately more often than not entirely based on psychology (the placebo effect). Exceptions are mineral depletions and stomach acidity. The growing market for traditional medicine forms a severe threat for the palaeontological heritage.

Key-words: *geomythology, geomedicine, traditional medicine, snake stones, toadstones.*

ΠΕΡΙΛΗΨΗ: Από την αρχή της προϊστορίας, οι άνθρωποι σε όλον τον κόσμο χρησιμοποιούν απολιθώματα για τη θεραπεία ασθενειών και για τη προστασία από τις αρρώστιες. Τα πιο συνήθη απολιθώματα της materia medica είναι τα ασπόνδυλα (εχινοειδή, αμμωνιτοειδή, βελεμνιτοειδή, τριλοβίτες), ακολουθούμενα από τους οδόντες των ιχθύων. Πιο σπάνια, ειδικά στην Ευρώπη, είναι η χρήση απολιθωμένων θηλαστικών, όπου θεωρούνταν ως λείψανα δρακόντων ή Αγίων. Η χρήση των απολιθωμάτων ως φαρμάκων και φυλαχτών δεν περιορίζεται στους μεσαιωνικούς χρόνους, αλλά εξακολουθεί να εφαρμόζεται ως τις μέρες μας, όχι μόνο στα παραδοσιακά φαρμακεία της Ασίας, αλλά και σε κέντρα εναλλακτικής ιατρικής στην Ευρώπη. Πολλοί άνθρωποι έχουν την πεποίθηση ότι τα συγκεκριμένα φάρμακα είναι λειτουργικά. Συνήθως εφαρμόζονται για την ανακούφιση εσωτερικών πόνων, σε θέματα γονιμότητας, για τη θεραπεία της οστεοαρθρίτιδας, για προβλήματα της ουροδόχου κύστης και των νεφρών, για μολύνσεις των οφθαλμών και για δηλητηριάσεις. Δυστυχώς, η αρχή λειτουργίας αυτών των φαρμάκων βασίζεται αποκλειστικά στην ψυχολογία και στην πραγματικότητα τα συγκεκριμένα φάρμακα δεν λειτουργούν. Τη μόνη εξαίρεση αποτελούν οι συμπληρώσεις σε μεταλλικά στοιχεία και η ανακούφιση από την όξυνση του στομάχου. Η ολοένα διογκούμενη αγορά παραδοσιακών φαρμάκων αποτελεί μια σοβαρή απειλή για την παλαιοντολογική κληρονομιά.

Λέξεις-κλειδιά: *γεωμυθολογία, γεωιατρική, παραδοσιακή ιατρική, πέτρες φιδιών, φρυνόλιθος.*

INTRODUCTION

The study of fossils belongs to the realm of geology and evolutionary biology, whereas that of therapeutic drugs belongs to medicine and pharmacology. For the common people, however, such a neat classification does not always exist. A widespread use of fossils is that as amulets and in alternative and traditional healthcare. The use of fossils in medicine is not restricted to China and other countries of the Far East. Fossils are part of traditional medicine also in Europe until today, although their importance dropped in the early 20th century. With an increasing impact of alternative healthcare practitioners and a decrease in satisfaction with regular medicine, the use of fossil medicine might rise again. The use of fossils as amulets is equally wide-ranging in geography and time. Several studies have included one or more usages of fossils in medicine (e.g. EDWARDS, 1967; WENDTH, 1968; OAKLEY, 1965, 1975, 1978; KENNEDY, 1976; RUDKIN & BAR-

NETT, 1979; BASSETT, 1982), but an overview seems missing.

The usefulness of fossils in folk tradition is mostly based on the appearance, on similarity with an organ or symptoms of a disease. This working principle is the basis of sympathetic medicine. In this way of thinking, the ability to cure lies in the similarity between the object on the one hand and the symptoms of the patient or the shape of the sick organ on the other hand. For example, the spines of the Jurassic sea urchin *Pseudocidaris mammosa* look like a bladder. Therefore, they were considered useful to treat diseases of the bladder and the urinary tract. The same is valid for amulets. An ammonite looks like a snake, so they protect you against snake bites. Fossils of various kinds, notably sharks' teeth, have been used in amulets. Tales from the folk lore are often woven around these fossils, to emphasize their usefulness. Common themes of such tales are petrified snakes, shipwrecked or slaughtered saints and heroes, and dragon's lairs.

The use of fossils as amulets and in powders today is not

* Τα απολιθώματα στη φαρμακολογία: από τα “αυγά των φιδιών” στα “οστά των Αγίων”. Μία επισκόπηση

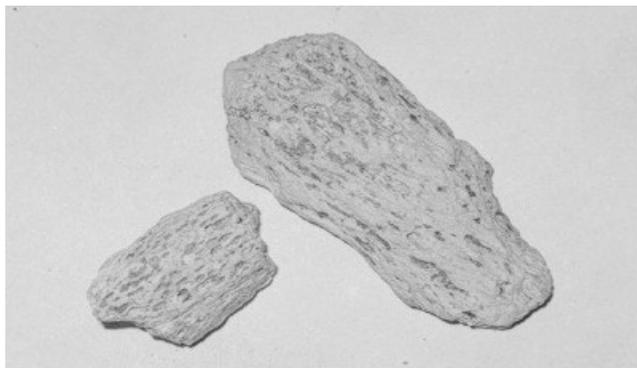


Fig. 1. Fossils are sold on internet to be used as traditional medicines. Companies like TCM (Traditional Chinese Medicine) advertise the fossil bones as Long Gu under the misleading category of Chinese Herbs. Screenshot captured from <http://tcm.health-info.org/herbology/materialia.medica/longgu-properties.htm>.

limited to local drugstores in Asia. There is a substantial export of these fossil bones, mainly to the US. The total trade export has an annual value of 700 million US \$, and the fossil bones contribute to this important profit for China and other Asian countries. The selling of these fossil bones for medicinal purposes has expanded even to Internet. On the World Wide Web you can order them easily; in most cases the advertisement refers to *Long Gu* (“dragon bone”) (Fig. 1). They are claimed to be useful to treat several diseases or problems of the heart and liver.

In this paper, we give an overview of the animal groups of which fossil remains have a worldwide use as amulet or/and ingredient of traditional medicine.

SEA URCHINS (ECHINOIDS)

Sea urchins are invertebrates with a hard exoskeleton. They have a round or heart-shaped form and live in shallow seas. Living sea urchins are completely covered with spikes in all kind of variety and colour. When the animal dies, the spines are lost, and only their rounded exoskeleton remains. Fossil sea urchins then are the petrified remains of these exoskeletons and look very similar to eggs (Fig. 2). Spikes are sometimes also preserved as fossils, but almost always detached. Sea urchins are very common, and that was true also for the remote past. Fossil sea urchins are therefore common findings.

The oldest text reference to fossil sea urchins comes from Pliny the Elder. He referred to them as “*Ovum anguinum*”, and obviously misunderstood them for some kind of snake eggs. The belief that fossil sea urchins are in actual fact magical snake eggs survived the centuries after Pliny, as is evidenced by stories from medieval England. Here, druids thought that the magical snake eggs were formed by froth from snakes congregating at midsummer. The froth, shaped into a ball, could be stolen from the snakes during midsummer’s eve but would only retain its magical powers if the ball was kept on a piece of cloth. To ensure this, the thief was re-

quired to run away with the snake egg from the angry snakes, preferably over a river across which the snakes could not swim (KENNEDY, 1976). Careful observation of a fossil sea urchin learns that there are small, round indentations where the spines were attached during life. These indentations were believed to be the points where the snakes were once attached by means of their teeth. The magical snake egg was said to protect its owner from poisons and deadly vapours (KENNEDY, 1976) as well as from defeat in battle (OAKLEY, 1965).

In other places it was thought that these fossil echinoids were actually tortoise eggs that have hardened into stone (BROOKES, 1763). He noted that they were commonly found in Malta where they are called by the country people the Breasts of St. Agatha, a third century Catholic saint of Sicily, whose breasts were cut-off because she refused to give up her belief and have sex with a Roman governor.

The fossil echinoids that come from the Chalk of Kent have been referred to as Chalk eggs. This chalk provided a good cure for an acidic stomach (WOODWARD, 1729). Given the composition of this chalk, which is calcium carbonate, this is not an unreasonable idea. WOODWARD also suggested that chalk eggs are good for sea-sickness, some sea-farers not venturing on board ship without them. Now that we know that sea-sickness is related to a too acidic stomach, it sounds worth trying a “chalk egg” indeed!

The club-like spines of the Jurassic echinoid *Balanocidaris*, known in folklore as Jewstones, because they were, amongst others, found in Ancient Judea, have a bladder-like shape (GOULD, 2000). Consequently, ingested in powdered form, they were used to treat ailments of the urinary system, such as kidney stones. This is a straightforward example of sympathetic medicine. Their use is of old days, and they have been used as charms since c. 650 BC.

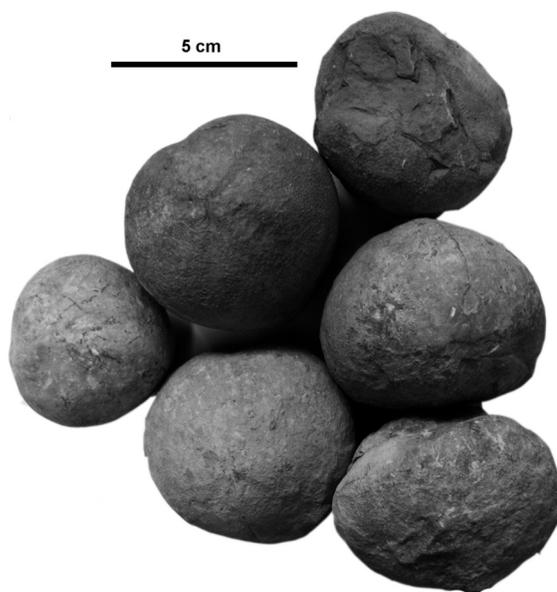


Fig. 2. Fossil sea urchins (Echinoidea) resemble eggs, but are in reality the petrified exoskeletons from which the characteristic spikes or needles are lost.

BIVALVES AND BRACHIONOPS

A bivalve is a marine or freshwater mollusc that has two shells hinged together, such as the oyster, clam or mussel. The two shells are more or less symmetrical, and enclose the soft body of the animal. A bivalve is a filter feeder, and most bivalves are free-swimming species. Bivalves appeared late in the Cambrian explosion (c. 542-530 million year ago), and underwent a huge radiation by the time of the Permian-Triassic mass-extinction event (c. 251 million year ago). Today, bivalves are found all over the world where there is water, and all shells you find on beaches and shores are bivalves.

A brachiopod somewhat resembles a bivalve, but certainly is not a mollusc. It is a marine invertebrate with two differently shaped valves, which are symmetrical in themselves. A brachiopod is a suspension feeder, and uses a lophophore (a ring of ciliated with tentacles) to feed. Most brachiopods are attached to the substrate. Brachiopods are known from the beginning of the Cambrian explosion (c. 542-530 million years ago), and were extremely common throughout the Palaeozoic Era. Today, brachiopods, also known as lamp shells because of their resemblance to ancient oil lamps, are restricted to the extreme cold and deep oceans.

Not many fossil bivalves are used as medicine, possibly because of their close resemblance to living bivalves, which hinder their magical interpretations. An exception, however, is found in the left valve of the Jurassic oyster *Gryphaea* (Fig. 3).

These valves were considered the Devil's toenails in England, based on their superficial resemblance to a toenail. Powdered "toenails" were believed to be effective to cure back problems in a horse in Lincolnshire. In Scotland they were known as *clach crubain*, literally crouching shell (OAKLEY, 1965). They were used in the 17th and 18th centuries to

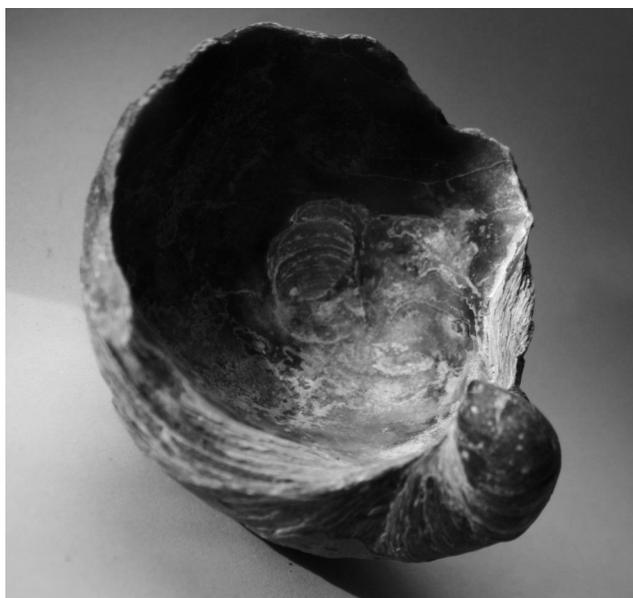


Fig. 3. Petrified valve of the fossil oyster *Gryphaea arcuata*. The shell looks like a toe nail, hence its name Devil's toenails in England. Photograph by Kevin Walsh.

cure pain in the joints. The basis for this therapy may be found in their contorted shape which is suggestive of painful joints.

During the 18th century, it was thought in Germany that brachiopods were a pathological concretion formed in the uterus of a woman (RICHTER, 1797). Based upon this idea, a brachiopod genus was named *Hysterolites* (VON SCHLOTHEIM, 1820), literally uterus stones. Other folk names for fossil brachiopods are venus stone and mother stone, based on the same belief, but also on the resemblance with the female external genitalia.

In traditional Chinese medicine of today, fossil brachiopods, known as *Shiy-Yen*, are used as a cure for rheumatism, cataracts, skin diseases, anaemia and digestive problems, in fact, for a wide range of medical problems. The shells have to be crushed and dissolved in water, and cooked in a clay pot. The carbonates and phosphates of the shells may indeed work in the case of some digestive problems, but that's the maximum of effectiveness one may expect.

BELEMNITES

Belemnites (or belemnoids) are an extinct group of cephalopod marine animals with an internal, cone- or dart-shaped shell, divided into three sections. They are related to the squids, octopuses and cuttlefish of today, and like them, they had an ink sac and tentacles, as is revealed by soft body remains from the Jurassic limestone of Solnhofen (Germany; age about 155 million years ago). Belemnites were common during the entire Jurassic and Cretaceous periods (200-65.5 million years ago), but became extinct at the end of that period. Their soft bodies are hardly ever preserved, and fossil belemnites generally consist of only the posterior section (rostrum) of the internal shell. This rostrum is elongated, pointed and reminds a dart or a bullet (Fig. 4), hence their scientific name: *belemnion* (Gr.) = dart.

Because of their particular shape, it was believed that belemnites were cast down from the heavens during thunderstorms (HEGELE, 1997). This gave rise to names like (in translation) thunderbolts, thunder-arrows, Pekunas' stones (Pekunas is an ancient Thunder God), and thunderstones. Belemnites are not only regarded as thunderbolts or stones. They were also known as Devil's Fingers or, quite the opposite, Saint Peter's Fingers. As such, they were once believed to have healing powers. In Southern England it was widely believed that these fingers could be used to cure rheumatism. At first sight this seems strange, but it is not. Belemnites are amazingly straight and strong, ending in a beautiful point. In short, the ideal shape for a finger. Rheumatic fingers on the other hand are distorted and thickened. Belemnites form in this case a perfect sympathetic medicine. Another explanation is their sharp, dart-like ending, causing sharp pains, and thus a good remedy against similar sharp pains. Another medicinal therapy consisted of crushing the fossils into a dust and blow that into the eyes, to cure sore eyes both in humans and horses. It can be easily imagined that such a therapy



Fig. 4. The preserved part of a fossil belemnite has the typical shape of a bullet or dart. Photograph by Rosa Thorns.

makes things only worse, whether the fingers are those of the devil or of St Peter.

In some parts of Western Scotland, the belemnites, regarded as Bat Stones here, could cure horses from distemper, when soaked in their drinking water.

AMMONITES

Ammonites are extinct marine molluscs, usually with a flat spiralled shell; some are helically-spiralled, others are straight and not spiralled at all. They are distant relatives of the squids, octopuses and cuttlefish of today. Ammonites



Fig. 5. The majority of fossil ammonites has a tightly spiralled form like a ram's horn or a coiled snake.

were free-swimming carnivorous molluscs. They first appeared during the Late Silurian to the Early Devonian (c. 400 million year ago), and became suddenly extinct at the end of the Cretaceous (65 million year ago).

Because of their tightly spiralled form (Fig. 5), they were called "*ammonis cornua*" by Pliny the Elder, after the ram's horn of the Egyptian god Ammon.

In ancient Greece and Rome, ammonites were considered a useful remedy against insomnia. They believed that putting an ammonite under the pillow would help. On a coin dated 480 BCE, we read: 'The horn of Ammon which makes beautiful dreams'.

Ammonites were still connected to ram's horns in the Harz Mountains of Germany as late as the 18th century. Local farmers used 'a fossile shaped like a Ram's Horn call'd Drake (Dragon) - stone...for when the Cows lose their milk, or void Blood in stead of it, they put these Stones into a Milk-pail, and by that means expect a due quantity of Milk from these Cows again' (BEHRENS, 1703).

Another medicinal use of ammonites is reported from some parts of the Western Isles, where these fossils are known as crampstones. As MARTIN (1703) remarked: 'These stones are by the Natives called Crampstones because as they say they cure the Cramp in Cows, by washing the part affected with water in which this stone has been steep'd for some Hours'.

But far more commonly, ammonites were linked to curled-up petrified snakes, and were known as *Ophites* after the Greek word for snake (*ophis*). They were kept as charms, protection against snakebites and as a cure for impotence, blindness and barrenness (BASSETT, 1982). The notion that they would be an effective antidote for snakebites is an example of sympathetic medicine - where the cure resembles the cause of the illness. Evidence for the use as antidote is the following phrase (CAREW, 1602), "... the Snakes, by their breathing about a hazell wand, doe make a stone ring of blew colour, in which there appeareth the yellow figure of a Snake; and that beasts which are stung, being given to drink of the water wherein this stone has been soaked, will therethrough recover".

The fertility problems (impotence and barrenness) may refer to snakes as symbols for fertility and virility. That there is such an old link can be inferred from the female aspects of the Egyptian eight gods: they are snakes. The association between snakes and women appears also from a special use of ammonites that has been reported from ancient Rome: customers to a bordel had to show an ammonite as proof of their membership!

The link between snakes and fertility seems to have been preserved on the Ionian islands of Greece. Here, fossil ammonites are found at the surface. It is still custom here to soak such an ammonite in a bucket of water before a wedding takes place. The newly wed couple is supposed to drink water from this bucket for forty days in order to secure offspring.

TRILOBITES

Trilobites are extinct hard-shelled, segmented creatures (arthropods) that lived in reefs of shallow tropical seas of the Palaeozoic. They were extremely successful, and were represented by more than fifteen thousand described species. Trilobites particularly flourished in the oceans of the Cambrian and Ordovician periods (c. 540-440 million years ago).

The small, disc-shaped Cambrian trilobite *Elrathia kingii* is very common in Millard County, Utah. It was a tradition among the local Indian tribes to incorporate *Elrathia* fossils into their necklaces along with other types of beads. They are considered to resemble lizard foot (TAYLOR & ROBINSON, 1976), and help to cure diphtheria, sore throats and other sicknesses.

SHARKS (CHONDRICHTHYES)

A shark is a marine fish with a cartilaginous skeleton, paired fins and a tough skin covered with small, tooth-like scales. Most sharks are carnivorous; some are huge and voracious, but most species are small. A shark has a streamlined torpedo-like body with five to seven gill slits on each side of the head, and rows of replaceable teeth in the mouth. These teeth are not attached to the jaw, but embedded in their flesh; they are replaced constantly throughout life. Sharks with the typical cartilaginous skeleton appeared in the middle Devonian (c. 370 million years ago), and are supposed to have derived from the placoderms, which had a bony skeleton. Sharks are still common at present.

The cartilaginous skeleton of sharks does not fossilize so easy, and is hardly ever found. This is not valid for their teeth. Fossil shark teeth are extremely common, not only because of their resistant nature, but also because sharks grow new teeth all the time.

Fossil shark teeth were sometimes connected with snakes, and called tongue stones. A legend explaining the name and the origin of the tongue stones comes from the island of Malta, where fossil shark teeth are common findings. The legend tells how St Paul the Apostle was bitten by a snake (*N.T.*, Acts 28.3-5), and how he took away their venom teeth (ZAMMIT-MAEMPEL, 1989). The cut-off and petrified snake tongues were used against poisoning, or cure the effects thereof, following the principle of sympathetic medicine. One such use was to suspend the tongue stones from decorative coral trees, called languiers, and used for dipping into wine to protect against deliberate poisoning. Languiers and other ornately mounted tongue stones were placed on side tables during banquets. Guests would select a tongue stone from the languier, immerse it in their wine and rest assured that they would not succumb to poisoning. Fossil sharks' teeth mounted as amuletic pendants were also worn as necklaces or bracelets for their anti-poison powers. Others were mounted in base or precious metals and attached to silver or gold watch chains (ZAMMIT-MAEMPEL, 1989).

During medieval times Malta was the centre of a flourishing trade supplying fossil sharks' teeth to many other European countries. Using tongue stones against poison was practiced as recently as the 1940's. Not only the common people used fossil shark teeth. Indeed, in 1768 they are listed among the medicines available from the pharmacy of Santo Spirito Hospital in Rabat, Malta. Their most common medicinal use was as a cure for - or a safeguard against - poison (ZAMMIT-MAEMPEL, 1989).

Another healing effect of the fossil shark teeth can be attributed to their sharp cutting edges. Sharp, acute pains can thus be counteracted by the use of these equally sharp teeth. For example, fossil shark teeth were placed by the bedside to help Maltese women during childbirth (ZAMMIT-MAEMPEL, 1989). They were also employed in rural Britain to counter cramp and rheumatism. Another example of this sympathetic medical use is seen in the amulets made from fossil shark's teeth that were once hung around the necks of Swiss children to relieve pain when their teeth were erupting.

BONY FISHES (OSTEICHTHYES)

Bony fishes are cold-blooded aquatic vertebrates with a bony skeleton, mobile fins and a body covered with scales. They breath through gills that are covered by a flap. Their teeth are rooted and permanent, in contrast to those of the sharks. Bony fishes appeared during the Late Silurian or Early Devonian (c. 395 million years ago), at first instance only as freshwater dwellers, but later also as marine fishes. One of the classes of fishes with a bony skeleton, the ray-finned (Actinopterygii), are the common fishes of today, and outnumber both the other class, the lobe-finned fishes (Sarcopterygii), and the sharks.

Many fishes bear teeth not only where you expect them, but also on their palate. The white sea bream (*Diplodus sargus*), and its relatives are such fishes with palatal teeth (Fig. 6).

The palatal teeth of sea breams often have a pale yellow or orange-coloured centre called the acrodin cap, surrounded



Fig. 6. The petrified palatal teeth of a fossil sea bream, better known as serpents' eyes or toadstone.

by a darker ring, coloured brown, giving them an eye-like appearance. That explains why fossilized teeth of a Miocene sea bream found on Malta were known as serpents' eyes. The idea that these palatal teeth indeed were the petrified eyes of serpents is connected with the legend of St Paul (*N.T. Acts*, 28.3-5) in which he cursed the snakes so that they lost their tongues and eyes. The use of these serpents' eyes as a sympathetic medicine against snakebites involved either boiling these fossils in water, or grinding them to a powder and add this powder to water or wine. The water thus enriched with the healing power of serpent eyes was then drunk.

Along with tongue stones (fossil shark teeth), serpents' eyes were valuable gifts in medieval Malta (ZAMMIT-MAEMPEL, 1989). For instance, papal delegates to Malta were presented with gold-mounted serpents' eyes and fossil shark teeth to be used as protective amulets. Their importance and value also extended to royalty: serpents' eyes were listed among the jewels owned by King Henry V of England (THOMPSON, 1932).

More widespread, however, is the belief that the fossil palatal teeth of fishes are in fact toadstones. Much has been written about toadstones. In an often-quoted verse from Shakespeare, there is a clear reference to toadstones: "Sweet the uses of adversity. Which, like the toad, ugly and venomous, Wears yet a precious jewel in his head" (*As You Like It*, Act 2, Scene 1).

They seem to have been first mentioned by the Pliny the Elder in the first century AD. He gave the name "*Batrachites*" (frogstone) to these fossils. In fact, it has been suggested that the legends about toadstones originated with his name (LANKESTER, 1920). They were so named because the drab colour resembled that of a toad. Variant names are bufonite, crapandina, batrachos and batrachyte.

The most close to the truth was BROWNE (1646), who considered them nothing else than just palatal fish teeth, and wisely concluded that nobody would believe that, because then the value of these highly prized items would drop instantaneously. Much later, BROOKES (1763) remarked that: "...and some suppose it to be the tooth of a fish; but this does not seem to agree with its shape". Still scientists did not dare to see the stone for what it really was.

Toads were of particular interest to medical practitioners during the seventeenth century (MORGAN, 1995). It was believed that concoctions made from pulverised toads provided protection against bubonic plague if placed in amulets and worn around the neck or wrists. This was justified on several grounds, notably that the toad's warty skin resembled the carbuncles and spots developed by plague victims.

Not only medicines made of real toads were highly effective in the therapeutic and magical sense, but also the toadstones (MORGAN, 1995). Although in reality they are the button-shaped fossil teeth of fishes such as *Lepidotes*, in folklore they were thought to have come from the heads of living toads. It was a wide-spread belief that toads have a stone or jewel in their head. Already Pliny the Elder writes so, independently of his mention of the fossil batrachites (frog-

stones). Later readers confused matters, and looked for a batrachite in toad's heads. The stone in the head of living toads to which Pliny was referring most likely was nothing else than the stone-like skull cap of many toads. This is clear from his description of how to obtain it: wrap a toad in a cloth, bury it in an ant hill, wait till the flesh is eaten by the ants, and dig the bones up (LANKESTER, 1920).

The early literature records medicinal uses for toadstones as, amongst others, cures for sores (JONSTONUS, 1657), fever (LEONARDUS, 1502), bowel problems (TOPSELL, 1608) and tooth pain (BARRETT, 1801). Toadstones were most widely believed to counteract poison. It was thought that a toadstone set in an open ring would give off heat to the finger on which it was worn if the presence of poison were detected (KUNZ, 1917). This belief goes at least back as far as FENTON (1569), who informs that the stone, called borax or stelon, which is present in the head of old and great toads, gives forewarning against venoms when set in a ring. Toadstones were believed to change colour if a poison was present (KENNEDY, 1976). The use of toadstones as a remedy, not a mere warning, against all kinds of poisons is advertised as follows: "A Tode stone touching any part be venomd, hurte or stung with Ratte, Spider, Waspe or any other venomous Beasts, ceases the paine or swelling thereof" (LUPTON, 1627). Apart from its usefulness in the case of poisons, the toadstone is reported to be a cure for bladder stones (TOPSELL, 1608), likely because of the close resemblance of the fossil teeth with the polished and shiny bladder stones. Other cures include epilepsy (TOPSELL, 1608), nose bleeding and other bleedings (BACON, 1627). Toadstones also ease childbirth (BACON, 1627), but this is likely based upon the older belief that these fossils protect pregnant women from the power of demons (SCOTT, 1833). In that case, the toadstone is not a cure or amulet in the medical sense, but just an amulet against the "evil-eye", as it is against fire in the house and sinking of a boat for Scottish villagers (DALYELL, 1834).

MAMMALS (MAMMALIA)

Mammals are warm-blooded vertebrates, usually covered with hair, and giving birth to alive young, which they feed with milk. They appeared during the late Triassic (c. 251-200 million years ago), but it was only after the end of the Cretaceous (65 million years ago) that they became truly numerous and successful. For this reason, the present era (Cainozoic) is also called Age of Mammals. At present, some 5.5 thousand species are recognised.

The most magic and medicinally most powerful medicine made of mammal remains was, without doubt, the pulverized horn of a unicorn in medieval Europe. Some of these so-called unicorn-horns were nothing more than the straight, spiralled and conic tusk of the narwhal whale. This was called the "*Unicornu marinum*". Other horns, however, were in reality fossils of mammoth and woolly rhinoceros, the so-called "*Unicornu fossile*". People were not familiar with these large bones, let alone the huge mammoth tusks, and could not

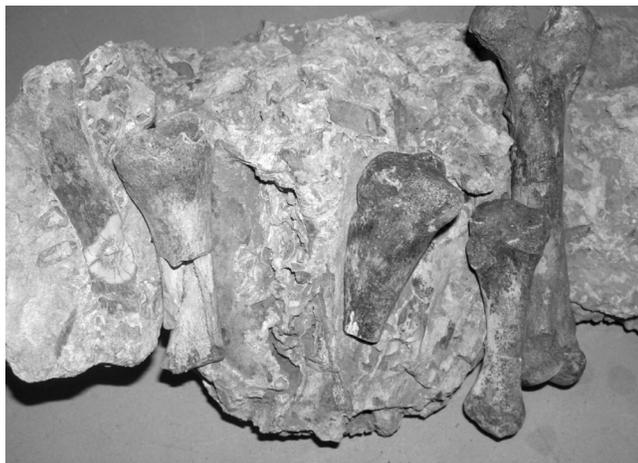


Fig. 7. On Cyprus, bone beds containing the petrified bones of a dwarf hippopotamus (*Phanourios minor*) are found along the coast. The bones are considered not only holy, but also healthy.

judge them for what they really were.

Quite similar in idea is the use of dragon bones (*long gu*) and dragon teeth (*long chi*) in Chinese traditional medicine since early historical time. One of the first reports about this use dates back to the early centuries and comes from Shen-nong's famous pharmaceutical handbook. Dragon bones are cooked and ground into a powder. Usually the powder is mixed with a number of herbs and other substances, such as oyster shell and ginger. In traditional Chinese medicine, dragon bone is considered to have sweet and neutral properties, and is associated with the heart, kidney and liver meridians. Its main functions are to calm the spirit, heart and liver, and to prevent fluid loss. Typically, dragon bone is used as a sedative to reduce stress and calm the mind, and to help treat



Fig. 8. The unfortunate young saint Phanourios who died at the steep cliffs of Cyprus in an attempt to escape his enemies.

cases of insomnia and manic behaviour. Dragon bone also has astringent properties, and is often employed to help treat conditions such as excessive perspiration, night sweats and chronic diarrhoea. In reality, the bones have nothing to do with the dragon, but are just remains of rhinoceros, bears, hipparion, stegodon, hyena and so (SCHLOSSER, 1903; CRUMP & CRUMP, 1963).

But we don't have to go that far to find fossil mammals grinded to powder and used as medicines. Along the north coast of Cyprus, large numbers of pygmy hippo remains were found (Fig. 7).

These bones are believed to be the remains of St. Phanourios (Fig. 8), a youth who sailed to Cyprus from Syria to bring the message of Christ, but who died while ascending the cliffs. Until at least the 1970's, local villagers collected these fossilised bones, powdered them and mixed them with water, believing the concoction to be a cure for nearly every known disease.

This traditional medicine has a long history on Cyprus. In a 16th century Italian book about islands (BORDONE, 1528) there is a description of a rich fossiliferous deposit on Cyprus (now known as Kyrenia). The deposit is a mountain, composed entirely of the fossil bones. The author writes that the villagers use the powdered bones as a medicine against fever (in translation): "whosoever is stricken by fever, and drinks a little of the powder scraped from these bones, has no sooner drunk than he is free from the fever".

CONCLUSIONS

From the literature and descriptions of living traditions it becomes clear that the use of various fossils in non-regular medicine is and was as wide-spread as the occurrence of the fossils themselves. Today, the use is mainly known from Asian and Asia-related traditional medicine, but in the past that was not the case. In Europe, too, fossils were eagerly used to help against all kinds of diseases, the effects of poisons and to relieve pain, especially so during childbirth. At present, this use is not forgotten, and still in vogue especially in rural areas.

For most cases the principle of sympathetic medicine can be applied: to cure something, you have to use something that 1) looks like the affected organ, 2) looks like the symptoms of the disease, or 3) looks like being able to inflict similar pains. An example of the first case is the spine of a fossil sea urchin. It looks like a bladder, and can therefore be used against infections of the bladder. An example of the second case are the palatal teeth of some fishes ("toadstones"), which work against a warty skin. Finally, an example of the third case are the shark teeth. They are sharply pointed, and are thus affective against sharp pains, such as labour pains. Under this last category the ammonites ("petrified snakes") fall, which are used against snake poison and other poison.

Putting the most well-known and widely spread fossil taxa together, we get the following overview of their most common uses in traditional medicine (see Table 1).

TABLE 1

Overview of the most common fossil taxa that are used as geomedicines on a large scale with their scientific name, some of their vernacular names and the supposed therapeutic area of their use as medicine.

Therapeutic fossil	Common name	Working range
Echinoids	Snake eggs, tortoise eggs, chalk eggs	poisons, deadly vapour, acidic stomach
Echinoid spines	Jew stones	urinary system disorders
Brachiopod shells	Mother stones, venus stones	rheumatism, skin diseases, eye disorders
Oyster shells	Devil's toe nails	joint pains, rheumatism
Shark teeth	Petrified snakes, snake teeth	poisoning, cramp, rheumatism, labour pains, teeth erupting pain
	Toadstone, snake eyes	snakebites, poisoning, bubonic plague, sores, fever, bowel problems, labour pains
Belemnites	Thunderstones, thunder arrows, Devil's fingers, St Peter's fingers	rheumatism, sore eyes
Ammonites	Petrified snakes, dragons, ram's horns.	snakebites, blindness, barrenness, impotence, cramp, mastitis in cows
Trilobites	Lizard feet	diphtheria, sore throats
Mammals	Dragon bones, saint relics	calm mind, reduce stress, heart and liver problems, insomnia, manic behaviour, excessive perspiration, night sweats, chronic diarrhoea

REFERENCES

- BACON, F. (1627). *Sylva Sylvarum: or A Naturall Historie. In Ten Centuries*. London: William Lee.
- BARRETT, F. (1801). *The Magus*. London.
- BASSETT, M.G. (1982). *Formed stones, folklore and fossils*. Cardiff: National Museum of Wales.
- BEHRENS, G.H. (1703). *Hercynia Curiosa*. Reprinted 1899. Nordhausen.
- BORDONE, B. (1528). *Isolario*. Venetia.
- BROOKES, R. (1763). *A New and Accurate System of Natural History*, 6 vols. Volume 5: *The Natural History of Waters, Earths, Stones, Fossils and Minerals, with their Virtues, Properties, and Medicinal Uses, to which is added, the Method in which Linnaeus has treated these subjects*. London: J. Newbery.
- BROWNE, T. (1646). *Pseudodoxia Epidemica III or, Enquiries into Very many Received Tenets, and commonly Presumed Truths*. No place of issue.
- CAREW, R. (1602). *The Survey of Cornwall. And an epistle concerning the excellencies of the English tongue*. No place of issue.
- CRUMP, I. & J. CRUMP (1963). *Dragon Bones in the Yellow Earth. The story of archaeological exploration & research in northern China in the present century*. New York: Dodd Mead.
- DALYELL, J.G. (1834). *Darker Superstitions of Scotland*. Edinburgh.
- EDWARDS, W.N. (1967). *The Early History of Paleontology*. London: Trustees of the British Museum of Natural History.
- FENTON, E. (1569). *Certaine Secreate Wonders of Nature, containing a descriptiō of sundry strange things, seming monstrous. Gathered out of diuers authors*. Translation of *Histoires Prodigieuses* by Boiastuau P. London: Henry Bynneman.
- GOULD, S.J. (2000). The Jew and the Jew Stone. *Natural History*, 6, 26-38.
- HEGELE, A. (1997). Donnerkeil und Teufelsfinger: Belemniten in Volksglauben und Volksmedizin. *Fossilien*, 1, 21-26.
- JONSTONUS, J. (1657). *Historiæ Naturalis. De Quadrupedibus Libri Cum aeneis figuris*. Francofurti ad Moenum (Frankfurt am Main): Mattheus Merian.
- KENNEDY, C.B. (1976). A fossil for what ails you. The remarkable history of fossil medicine. *Fossils Magazine*, 1, 42-57.
- KUNZ, G.F. (1917). *Rings for the Finger. From the earliest known times to the present, with full descriptions of the origin, early making, materials, the Archaeology, history, for affection, for love, for engagement, for wedding, commemorative, mourning, etc*. Philadelphia: Lippincott.
- LANKESTER, E.R. (1920). *More Science from an Easy Chair*. London: Methuen.
- LEONARDUS, C. (1502). *The mirror of stones; in which the nature, generation, properties, virtues and various species of more than 200 different jewels, are distinctly described. Also certain and infallible rules to know the good from the bad, how to prove their Genuineness, and to distinguish the Real from the Couterfeit. Extracted from the works of Aristotle, Pliny, Isidorus, Dionysius Alexandrinus, Albertus Magnus etc*. Translation of *Speculum lapidum*. No place of issue; 1502. Reprint London: J. Freeman, 1750.
- LUPTON, T. (1627). *A thousand Notable things of sundrie sortes: Whereof some are wonderfull, some strange, some pleasant, divers necessary, a great sort profitable, and many very precious*. London: Wright & R. Bird.
- MARTIN, M. (1703). *A Description of the Western Islands of Scotland, Circa 1695*. London: A. Bell.
- MORGAN, A. (1995). *Toads and Toadstools: The Natural History*,

- Folklore and Cultural Oddities of a Strange Association*. Berkeley: Celestial Arts.
- OAKLEY, K.P. (1965). Folklore of fossils, Parts I and II. *Antiquity*, 39, 9-17 and 117-125.
- OAKLEY, K.P. (1975). Decorative and symbolic uses of vertebrate fossils. Pitt Rivers Museum, Univ of Oxford, *Occasional Papers on Technology*, 12, 1-60.
- OAKLEY, K.P. (1978). Animal fossils as charms. In: PORTER J.R. & M.S. RUSSEL (Eds), *Animals in Folklore*. Cambridge: D.S. Brewer and Rowman & Littlefield, 207-240.
- RICHTER, J.P. (1797). *Das Kampaner Thal oder über die Unsterblichkeit der Seele; nebst einer Erklärung der Holzschnitte unter den 10 Geboten des Katechismus*. Erfurt: Wilhelm Hennings.
- RUDKIN, D. & R. BARNETT (1979). Magic and myth. Fossils in folklore. *Rotunda*, 12, 2, 12-18.
- SCHLOSSER, M. (1903). Die fossilen Säugethiere Chinas nebst einer Odontographie der recenten Antilopen. *Abh d. math.phys.C. der kgl.bayer. Akad. d. Wiss.* 22, 1.
- SCOTT, W. (1833). *On the Fairies of Popular Superstition. Introduction to The Tale of Tamlane, Minstrelsy of the Scottish Border*. Poetic Works, vol. 2. Edinburgh: Ballantyne.
- TAYLOR, M.E. & R.A. ROBISON (1976). Trilobites in Utah folklore. *Brigham Young University Geology Studies*, 23, 1-5.
- THOMPSON, C.J.S. (1932). A Mediaeval poison cup made from the Terra Sigillata. *British Medical Journal*, 1, 73-74.
- TOPSELL, E. (1608). *The Historie of Serpents*. London: Jaggard.
- VON SCHLOTHEIM, E.F. (1820). *Die Petrefactenkunde auf ihrem jetzigen Standpunkte durch die Beschreibung seiner Sammlung verteinerter und fossiler Überreste des Thier-und Pflanzenreichs der Vorwelt erläutert*. Gotha: Beckersche Buchhandlung.
- WENDT, H. (1968). *Before the Deluge*. Garden City: Doubleday.
- WOODWARD, J. (1729). *An attempt towards the natural history of the fossils of England*. London.
- ZAMMIT-MAEMPEL, G. (1989). The Folklore of Maltese fossils. *Papers in Mediterranean Social Studies*, 1, 1-29.

