Coral in Petrus Hispanus' 'Treasury of the Poor'

MARIA DO SAMEIRO BARROSO

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Abstract: Coral features among the *naturalia* in the Cabinets of Curiosities in which, from the sixteenth century onwards, nobles and wealthy people exhibited their exotic riches and jewels. Petrus Hispanus (*c.* 1215–77), consecrated Pope John XXI, was also a doctor. This paper surveys the importance of coral as an amulet and a medicine in Petrus Hispanus' work within the folklore and the medical traditions of the time and in the framework of ancient lithotherapy, bringing the therapeutic use of coral into relationship with its chemical compound calcium carbonate.

The coral stone

Corals are skeletons secreted by small marine cnidarian animals, known as polyps. Corals in white, rose, red and blue are composed of calcium carbonate. Red and rose corals from the Mediterranean Sea have been popular since antiquity and commercialized in Europe, India and Arabia (Woodward & Hardins 1992). Black corals, described as arboreal, possessing a branching morphology, were called *antipathies* by Pedanius Dioscorides (*c.* 40–90), a Greek physician and one of the most celebrated pharmacologists and botanists of antiquity (García Valdés 2002, p. 334). These rare deepwater corals form a group of about 150 species called *antipatharians*. They were used as amulets and medicines in ancient times. Their main component is chitin and protein, usually with high histidine content (Goldberg *et al.* 1994, pp. 633–643) (Fig. 1).

Red coral, *Corallium rubrum*, was very valuable. In Greek mythology, coral was seen as the petrified blood of Medusa, killed by Perseus, falling into the sea. The legend of this most wonderful stone is recounted in the Orphic Lapidary (*Orphei Lithica*), one of the Greek Lapidaries, *Orphei Lithica Kerygmata*. The other Greek lapidaries are the *Lapidaries of Orpheus, Socrates and Denys* the *Nautical Lapidary* and the Latin translation of a Greek lapidary, *Damigéron Evax*. They are thought to have been written before the second century BC but our knowledge of these works is based on fourteenth-century manuscripts. They present coral both as an apotropaic device and as a medicine. The *Orphei Lithica Kerigmata* summarizes the alleged virtues of coral. It was considered in magic to help to carry out challenging tasks, in hunting, as a strong protective against all kinds of dangers and was thought to help ward off dangers in seafaring. Coral was also endowed with other divine virtues; when kept at home, it would drive away the evil spirits, ghosts and lightning. As a medicine, it would protect from poisons. Supposedly, when dissolved in pure wine coral was very effective against scorpions and snakebites (Halleux & Schamp 1985, pp. 109–114). When dissolved in water and drunk, it would soften the hardness of the spleen and help to prevent the bloody vomit (Halleux & Schamp 1985, pp. 160–161).

Fossil corals range from the Cambrian to Recent. Fossil coral may have been identified in the *Damigeron-Evax* lapidary, according to three Spanish palaeontologists (Liñán *et al.* 2013, p. 46) who reviewed the fossil samples in ancient lapidaries; they considered that the coral described in this lapidary and in the *Nautic* and *Damigeron-Evax* lapidaries may embrace both recent and fossil corals. (Fig. 2)

In his work *De Materia Medica*, the precursor of modern pharmaceutical texts, Pedanius Dioscorides (*c.* 40–90) dedicated chapter 74 and all subsequent chapters of book V to the description of the properties of metals, minerals and precious stones and their medicinal use (García Valdés 2002, pp. 288–351). Dioscorides (V, 121) described the coral as *lithodendros* (tree of stone), looking like a marine plant which hardens when it emerges from the deep sea and comes into contact with air. He praised the red coral which he said resembled *sandyx,* a Syrian pigment. Coral was described as a fragile homogeneous substance, similar to moss and seaweed. Dioscorides cited its medicinal uses as helping to remove excrescences, softening eye scars and filling tooth cavities. Supposedly it was effective in the treatment of blood-stained sputum and helpful in the treatment of urinary disturbances. When drunk in water, it was believed to reduce the enlargement of the spleen (Fig. 3). Dioscorides (V, 122) described the black coral as possessing the same healing properties (García Valdés 2002, pp. 333–334) (Fig. 4).

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Fig. 1. Coral specimen from Sardinia: Red and Black Sea coral branch (author's collection).

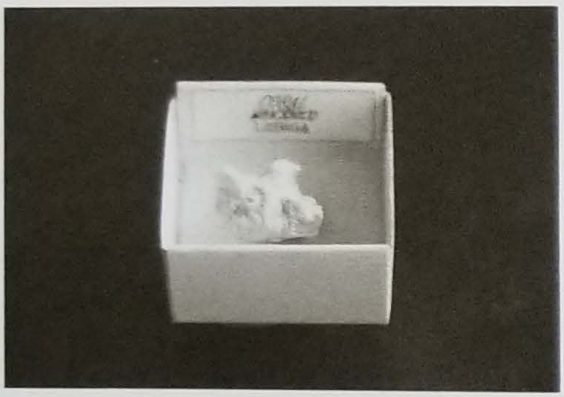


Fig. 2. Coral fossil (Miocenic) from Lisbon (author's collection).

In his work *Naturalis Historia* (*Natural History*) the Roman encyclopaedist Pliny the Elder (23 BC–AD 79), who dedicated books 36 and 37 to earths, minerals and precious stones, also provided information about coral as an adornment and a protective among Indians and Celts, along with its medicinal properties:

> Indian soothsayers and seers think that coral is a very powerful amulet for warding off dangers. Accordingly they take pleasure in it both as a thing of beauty and as a thing of religious power. Before the Indian love of coral became known, the Gauls used to ornament with coral their swords, shields and helmets. At the present day it has become so scarce because of the price it will fetch that it is very rarely seen in the countries where it grows. Branches of coral, worn as an amulet by babies, are believed to be protective, and reduced to powder by fire and taken with water are helpful in

Fig. 3. Coral branch mounted on black wooden stand dated between the sixteenth and the seventeenth centuries, height: 14 cm (Távora Sequeira Pinto Collection, Oporto), photo by Chris Duffin.

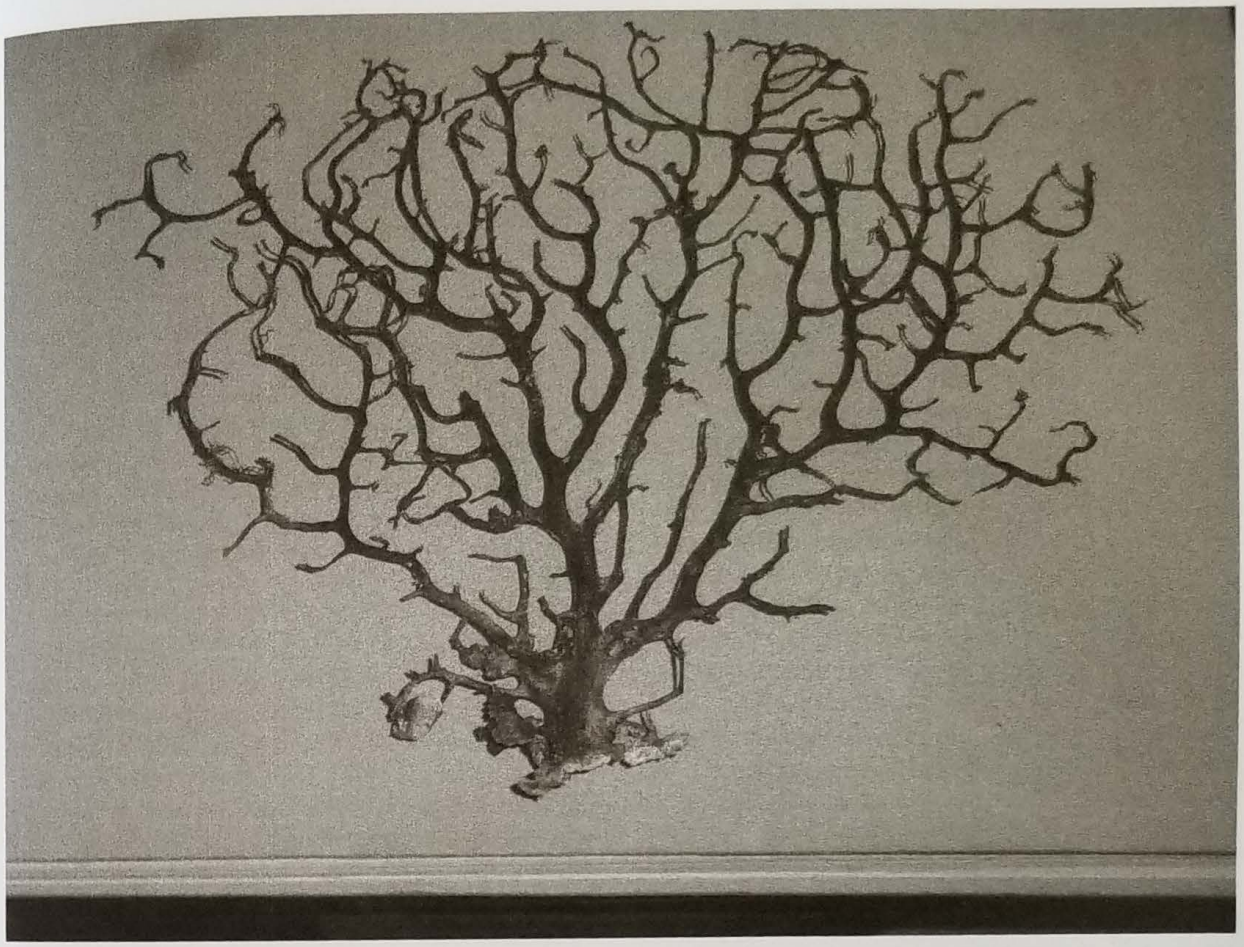


Fig. 4. Black coral branch from Philippines (author's collection).

> gripings, bladder trouble and stone; similarly, taken in wine, or, if fever is present, in water, coral is soporific (Pliny 1962, p. 479).

As Liñán has pointed out, Pliny also cited the Gorgonia stone (XXXVII, 164), identified as coral: 'It is formed of a stone in the sea . . .'. There is a similar reference in the *Nautic Lapidary* (Liñán 2005*b*, p. 225).

Prescriptions containing coral figure among the recipes of Galen (130–200), the most prominent Greek physician, for uterine haemorrhage (Kühn 1826–30, Book 13, 1865, p. 295), frail, rotten and blunt teeth, as a dentifrice to whiten teeth and in the treatment of haemoptysis (Kühn 1826–30, Book 14, 1865, pp. 418, 427, 430, 432).

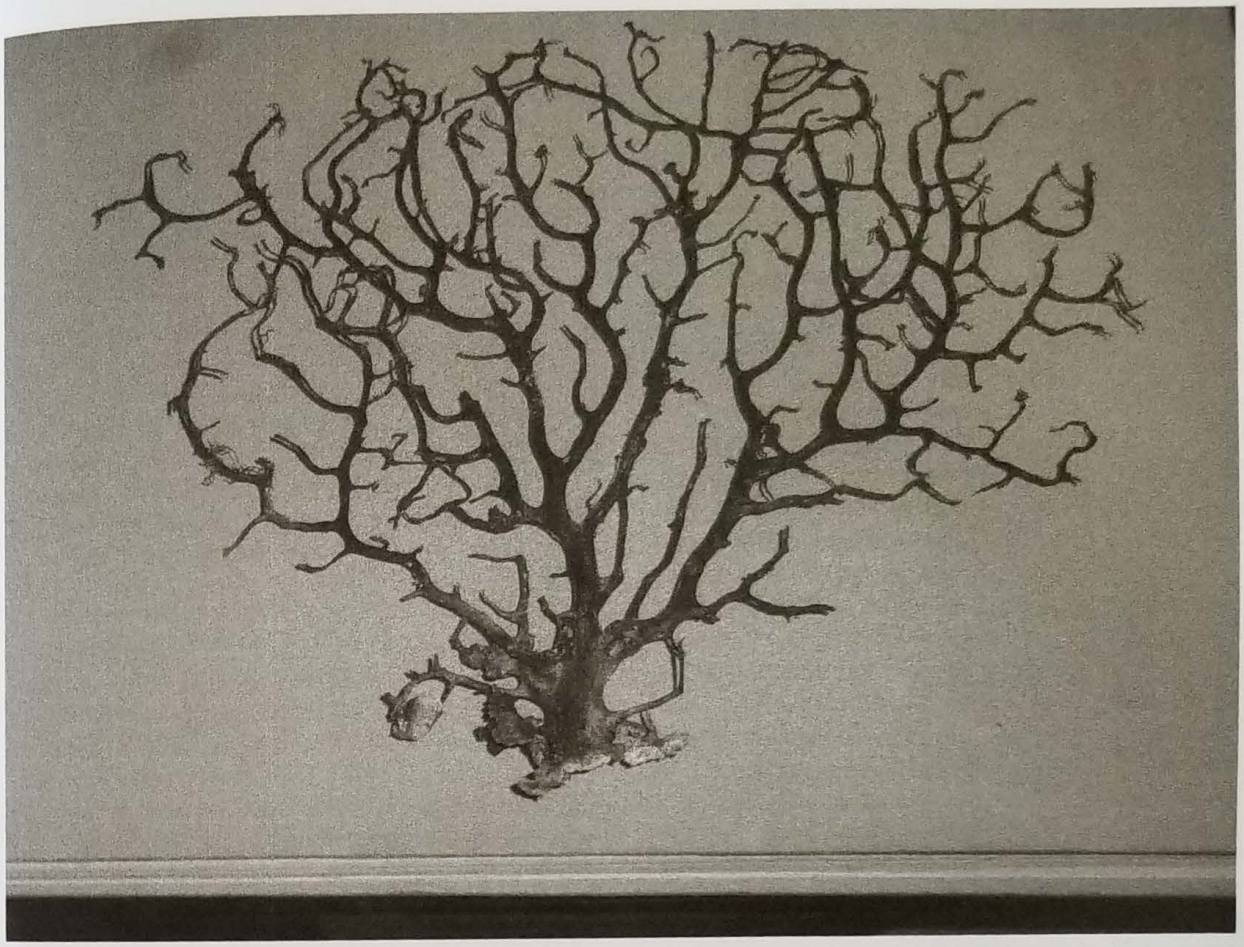
In the Byzantine period, Isidore of Seville (San Isidoro de Sevilla or Isidorus Hispalensis; *c.* 562–638) included coral among the red gems (*De rubris gemmis*). He described coral as having a branching shape and forming in the sea. It was priceless in India. Isidore stated sceptically that, according to magicians, coral could repel lightning (Barney *et al.* 2006, p. 323).

Paul of Aegina (625–690), the last Byzantine compiler of Greek–Roman medicine, also prescribed a troche made from coral and a 'powder composed of the earth called Samian aster, Lemnian earth, coral, confrey and starch, of each, equal parts' for spitting of blood (Adams 1847, III, p. 485).

In his verse lapidary *De Lapidibus* (*On Stones*), a medicinal guide and one of the most popular works of medieval scientific literature of the Western Middle Ages, Marbode (1035–1123), Bishop of Rennes, followed previous authors and described coral as being formed in the sea and hardened in the air. He cited the ancient physician Metrodorus (late first, early second century) who noted the powerful protection afforded by coral against the shades of hell and its medicinal properties to 'calm the tortures that the entrails rend' (Riddle 1977, pp. 59–60).

Saint Albertus Magnus or Saint Albert the Great (1193/1206–1280), the greatest German philosopher and theologian of the Middle Ages who also authored a lapidary in his book *Liber Secretorum Alberti Magni* published in 1502, included the beneficial properties of coral as haemostatic, effective against epilepsy and a provider of wisdom (Best & Brightman 1999, p. 35).

The *Alphabetic Lapidary*, authored possibly by the French monk Philippe de Thaon in the early



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The *Alphabetic Lapidary*, authored possibly by the French monk Philippe de Thaon in the early

twelfth century, includes two poems dedicated to coral. The first focuses on the magical properties of coral – protecting against enchantments, in the battlefield and during storms – stating that it should be kept at home to drive away the evil spirits (Studer & Evans 1924, pp. 216–217). The second poem cites Galen and focuses on coral's healing properties. It was recommended to relieve eye and tooth pain, to treat rotten teeth and gynaecological blood loss, and to staunch haemorrhage (Studer & Evans 1924, pp. 223–224).

Avicenna, Abū 'Alī al-Husatn ibn 'Abd Allāh ibn Sīnā (980–1037), the Arabic 'Prince of Physicians', recommended coral to stimulate and strengthen the breath or prevent it from dissipating rapidly in his treatise *Canon of Medicine* (Avicenna, Lecture 7, 3.6. § 529–535 in Bakhtiar 1999, p. 157).

A recipe book 'El Libro de la Almohada' by an Arabic physician from Toledo, Ibn Wafid (eleventh century AD), was a considered work with no traces of magic, unlike many works of the Arabic tradition. In this book, coral figures as an ingredient of a syrup made of ruby, pearls, amber from Medina Sidonia (actual city of Cadiz, in Andalusia), ambergris and musk. To the minerals, vegetable ingredients and syrup of sweet apples and quince were added. It was recommended for heart palpitations, misanthropy and to strengthen the liver and the stomach (Álvarez de Morales y Ruiz Matas 1980, p. 156). Coral also appears in this recipe book as an ingredient of an anti-haemorrhagic, analgesic and healing powder to be applied as a dressing of surgical wounds after circumcision (Morales y Ruiz Matas 1980, p. 304).

Abu Ray an Muhammad ibn Ahmad al-Beruni (973–after 1050), mathematician, philosopher, astronomer, geographer and encyclopaedist, wrote a treatise devoted exclusively to gems, minerals and metals entitled *Kitāb al-Jamāhir fi ma'rifat aljāwahir* (*Book on the Multiple Knowledge of Precious Stones*). Al-Beruni was one of the best authors representing the Arabic medical tradition. In this work coral was generally considered as a tonic for the liver and stomach, good for hallucinations and epilepsy, and useful as a dentifrice powder (Al-Beruni in Said 1989, p. 274). Al-Beruni's knowledge of mineralogy was linked to his ideas on physics, medicine and philosophy. He was concerned with the provenance of various materials, their physical description, legendary origins and etymology. He collected material from Hellenistic, Roman, Syriac, Indian and Islamic sources, and supplemented them with his own observations. He referred to the wide use of coral. He authored 70 recipes of electuaries of mineral and vegetable ingredients for a wide range of ailments. White and red coral, the root (*bussud*) and the coral tree (*marjan*) figure in his recipes of tonics for vital organs, catarrh, persistent cough and asthma, leucorrhoea and haemoptysis, anti-haemorrhagic, oxitocic (stimulant of uterine muscles) to accelerate parturition and to provoke abortion, anti-arrhythmic, a curative for melancholia and as an antidysenteric (Al-Beruni in Said 1989, pp. 282–370).

Tunisian-born Ahmad al-Tīfāšī (1184–1253) listed from previous Greek and Arabic authors many therapeutic uses of coral: for epilepsy, gout, to clean ulcers, to polish and whiten teeth, to remove tartar and strengthen the gums, to fill up tooth cavities, to cure eye diseases such as watery eyes, suppurations, opacities and cataracts. When reduced to powder and drunk it would fluidize the blood, help against palpitations, promptly heal excoriations, block haemorrhages from any organ, help against urine retention and, when hung around the waist and belly, cure all stomach ailments (Zilio-Grandi 1999, pp. 131–132).

Alfonso of Castile (1221–84), or King Alfonso X called the Wise, created a great translating centre at Toledo, bringing Western scholars into more intimate contact with Arabian learning (Campbell 2006, p.143). Astrology was part of the Chaldean heritage and, acquired through the Arabian authors, was applied to lapidaries and medicine. The Alphonsine Lapidary is a compilation of four manuscripts, written in very beautiful poetic prose. Book I is attributed to Abolays who classified precious stones according to the signs of the zodiac. Book II is anonymous or probably translated and composed by Yhuda Mosca, and also described the stones according to the phases of the zodiac signs. Book III is anonymous and described the stones according to the planets. Book IV is attributed to Mahomat Aben Quich who described the stones in alphabetical order (Montalvo 1981, p. 12).

Coral is mentioned in Book I '*Della Piedra que a nombre coral*'. Red coral was considered to be the best, especially specimens from the coasts of Sardinia. Belonging to the 11° grade of Taurus, it was useful in the prevention of mental diseases; when diluted in wine it was good for those who spit blood; it helped combat urinary disturbances and could reduce spleen enlargement. The black coral belonged to the 12° grade of Taurus. It shared all the virtues of the red coral. When reduced to powder, it was good for (infected) wounds, to calm trembling of the heart (arrhythmias) and was counted among the drugs that provided happiness. When burnt and reduced to a powder, it was esteemed in the drying up of lachrymation (Montalvo 1981, p. 44, 45).

Peter of Spain

Peter of Spain, the only Pope who was a physician, was a leading figure in Portuguese medicine and

pharmacy (Pita 2000, p. 92). The possible existence not of a single scholar but of three contemporary individuals has been raised, one becoming Pope, a second, Petrus Hispanus Portucalensis, writing about the soul, and the third, Petrus Hispanus medicus, being primarily a physician (Console & Duffin 2012, pp. 82–88). Console has presented an extensive and careful revision of Peter of Spain's life and use of gold in his work *Treasury of the Poor* (Console 2013, 173–175) (Fig. 5).

There is actually very little information about the life of Peter of Spain. His activity as a philosopher and a physician was not entirely compatible with his duties as a pope. There are few reliable sources about his origin, birth and education. He was born between 1210 and 1215, son of Julian, a wealthy physician or pharmacist, in Lisbon. He was educated in Lisbon and in the Spanish city of Léon. As he was very gifted he moved to Paris, the great intellectual centre of the time. In the earliest registers he figures as 'Dominus Petrus Hispanus, dictus Petrus Juliani' or as 'Petrus Lusitanus', 'Petrus Ulisiponensis' or 'Petrus Hispanus Portucalensis', according to his father's name, native country and city. He also studied at the Universities of Montpellier and Salerno and he taught medicine and philosophy at the University of Siena. Around the year 1260 he was Physician to The Count of Lavagna, later Pope Hadrian V. From 1271–76 he went to Italy as Physician to Pope Gregory X. On 8 September 1276 he became Pope and took the name John XXI. He died in Viterbo eight months later, after a wall collapsed (Schipperges 1994, pp. 5–8).

Fig. 5. Peter of Spain (Wellcome Library, London).

Many of the works that have been attributed to Petrus Hispanus have not been published and only a few have been studied. However, his leading treatise on philosophy *Summulae Logicales* was a textbook and essential reference in medieval continental Europe. This work was copied many times, ran to some 200 printed editions, and formed the subject of some 300 published commentaries (Pereira 2014, p. 63). Peter of Spain figures in Dante Alighieri's Paradise, as Pedro Juliano:

> 'Iluminato and Augustine are here,
> they were the first of God's bare-footed poor,
> who wore the cord to show they were his friends.
>
> 'Hugh of S Victor is among them two,
> with Peter Mangiadòr, and Peter of Spain,
> who in twelve books illuminates men below'
> (Alighieri, Paradise, XII, 130–135, in Musa, 1986, p. 148)

This remarkable man of science was suggested by the medievalist Martin Grabmann, who has copied his manuscripts, as being the most important medieval physician whose rich personality remained undiscovered because his extensive work in the fields of philosophy and medicine had not yet been properly studied and understood (Grabmann 1936). According to Schipperges, Codex 1877, a voluminous manuscript from the thirteenth century and housed in the Madrid National Library, is the most extensive manuscript version of his medical works, with the title and possible edition from the seventeenth century, *Petri Hispani opera Medica* (Schipperges 1994, p. 12). The contemporary value of the author and his work *Thesaurus pauperum* is obvious in the title of one of the extant manuscripts, Codex 4504, published as *Summa medicinalis Magistri Petri Yspani* (Schipperges 1994, p. 110).

Among Petrus' most outstanding works is the *Liber de oculis*, the most ancient treatise on ophthalmology. His work *Scientia Libri de anima,* a treaty of psychology translated into nine languages is, for some scholars, his most important work. The *Liber Conservanda Sanitate* is probably one of the first systematic contributions to preventive medicine (Carcassi 1977, p. vii). This treatise on preventive medicine that advocates physical exercise and warns that excess weight leads to disease could be prescribed by a modern doctor. In the introduction, Peter of Spain explained the importance of preserving health. Preventive medicine was not

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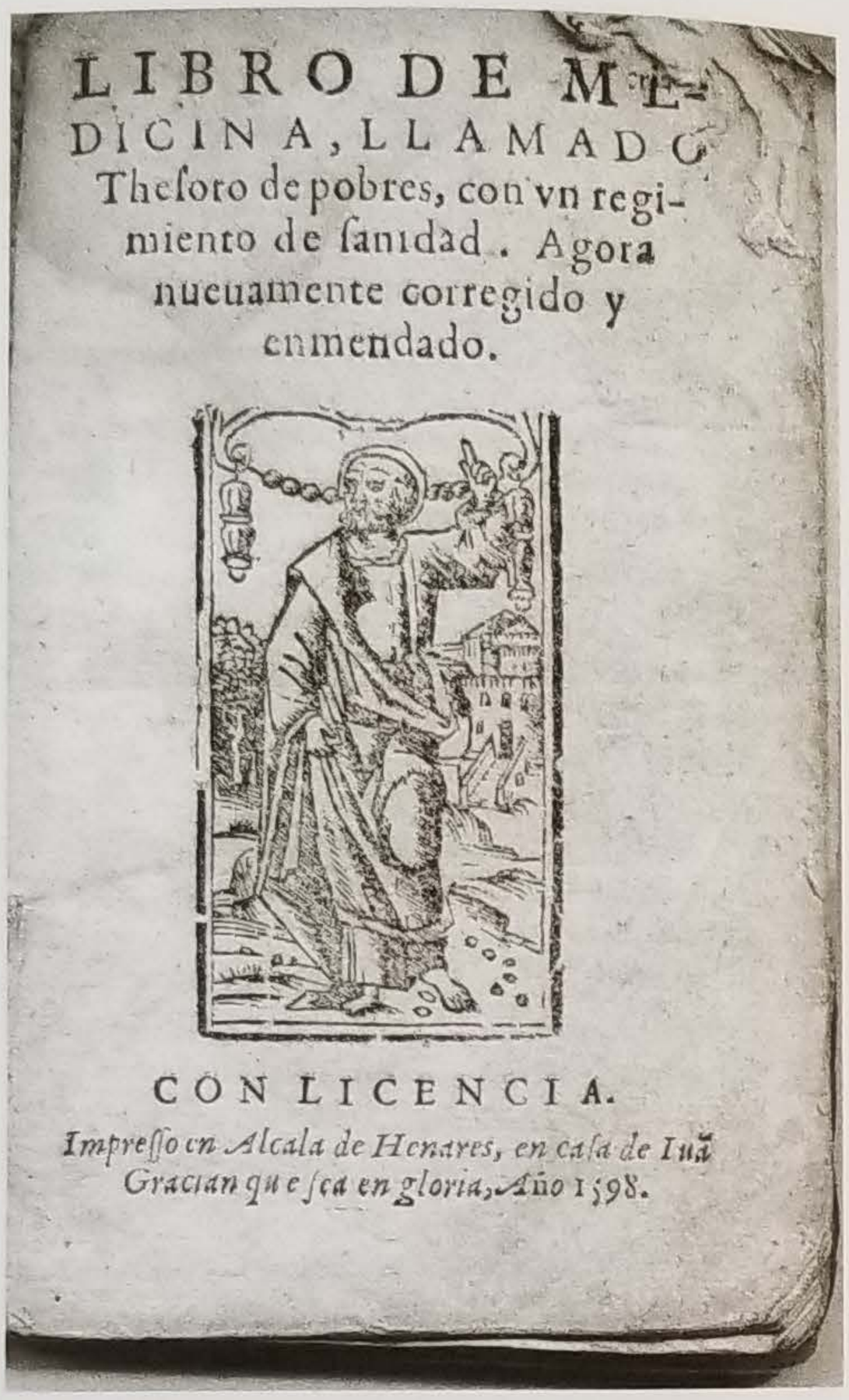
considered an area of medicine at that time, as we can read in his own words:

> I, Petrus Hispanus, considering that the different types of suffering due to affections of the human body are attributable to negligence, have discovered and veraciously motivated some useful and experimented observations that defend and maintain the good health of human life but that do not fall within the art of Medicine. And, because it is preferable to preserve a healthy physical condition than to fend off illness, it is necessary to deal with the matters of health (Hispanus 1997, p. 5).

There are more than 70 extant manuscripts of *Thesaurus Pauperum* archived in many libraries from Oporto to Moscow. It was printed in Latin versions and translated into Spanish, Italian, Portuguese, English and German. It is one of the most important works for the history of medical recipe collections. The recipes assembled by Peter of Spain were often copied, incorporated into later collections and translated (Hunt 1990, p. 16).

Peter of Spain was famous for his secular writings, mainly philosophy and medicine. His work *Thesaurus Pauperum* includes a sexual guide with recipes to enhance and to suppress erotic desire. The relationship between the Church, sex and celibacy from the thirteenth until the sixteenth century has been revised by Ambrose (Ambrose 2013, pp. 85–94). Peter of Spain became a controversial figure. His activity as a philosopher and a physician does not seem to have been well regarded in the eyes of the Church. This work has not always been assigned to him. A Spanish edition of the *Thesaurus Pauperum* (1569) was printed without the author's name with a 'Prologue to the author', explaining that the book was commissioned by Pope John from a doctor, named Juliano, a very learned and experienced physician (Hispanus 1598, p. 3). In this edition the chapters 'to excite coitus' and 'Suffocation of the erotic desire' were suppressed (Hispanus 2011, pp. 253–265) (Fig. 6).

For this article, the edition translated by the Portuguese classicist Maria Helena da Rocha Pereira and the Spanish edition of 1569 have been used. Maria Helena da Rocha Pereira compared 70 manuscripts and chose two from the fourteenth century which contained more recipes (manuscript 2235 from the Sainte-Geneviève Library and manuscript Pal. Lat. 1259 from the Vatican Apostolic Library; Hispanus 2011, VIII). The *Treasury of the Poor* consists of a prologue followed by 55 chapters, with prescriptions for ailments listed *a capite ad calcem* (from the head to the feet). This methodology was first used by Scribonius Largus (*c.* AD 1–50), Physician to the Court of Emperor Claudius (who reigned during AD 41–54), in his work *Compositiones*, the first Latin recipe book (Helmreich 1887). Hispanus' work also includes a treatise on fevers.


LIBRO DE ME-
DICINA, LLAMADO
Thesoro de pobres, con vn regi-
miento de sanidad. Agora
nueuamente corregido y
enmendado.

CON LICENCIA.

Impresso en Alcala de Henares, en casa de Iuã Gracian que sea en gloria, Año 1598.

Fig. 6. *Libro de Medicina, llamado Thesoro de los pobres, con vn regimiento de sanidad. Agora nuevamente corregido y enmendado,* Alcala de Hennares, 1598. Title page (author's collection).

In the *Thesaurus Pauperum*, Peter of Spain transcribes more than a medicinal recipe for each condition, indicating in addition the authorship, ranging from the great masters of Greco-Roman medicine to European and Arabic authors. He also includes recipes of his own design (Hispanus 2011, VIII) (Fig. 7). He brings together a collection of recipes from 'easy and effective medicines for almost all diseases', being consigned to the 'Father of the Poor, God, who presides over the doctor's help in the treatment of his patients', as indicated in the Prologue.

Experimentation and the effectiveness (or ineffectiveness) of the recipes was not described and therefore in some manuscripts the work is designated *Summa Experimentarum medicarum* (Schipperges 1994, p. 117). According to the medical historian Lynn Thorndike, during Galen's time the Empirics partly relied upon statements of past authors for their knowledge; statements that medicines have been experienced (e.g. 'Experimenter

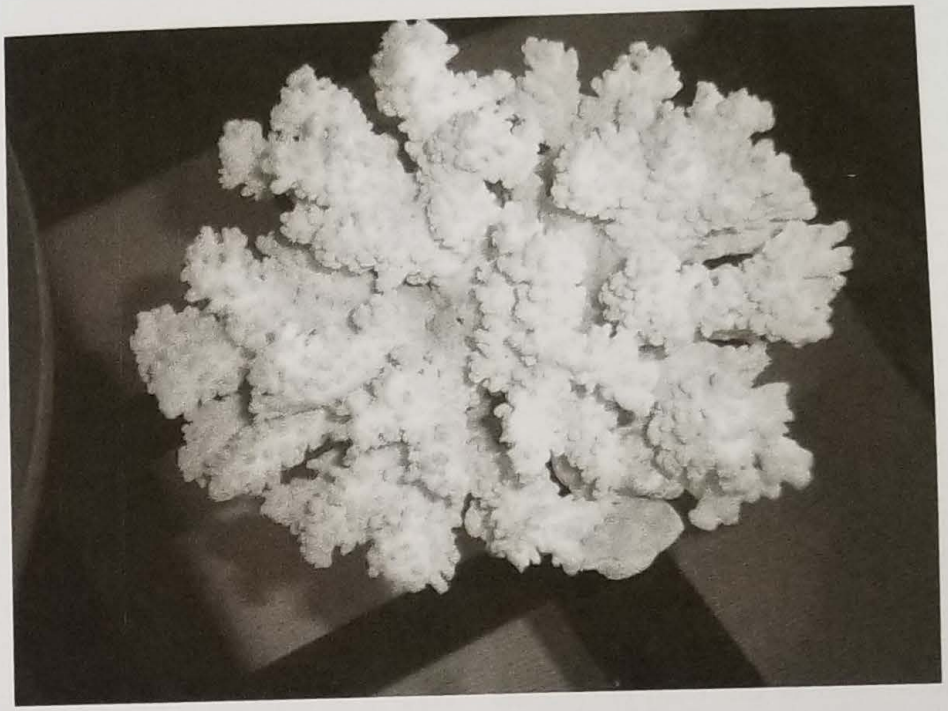


Fig. 7. White coral from the Philippines (author's collection).

has said so' or even 'I have experienced this') abound in the 'Treasury of the Poor' (Thorndike 1923, p. 495).

At the start of his work *Compositiones*, written at the request of the Emperor's freedman Gaius Julius Calistus, Scribonius Largus cited Herofilus, praising the benefit of medicines, and referred to the effectiveness proven by experience:

> Among the greatest physicians, Herofilus, according to Gaius Julius Calistus, used to say that medicines were as valuable as hands of gods. He really said it, in my opinion, not without reflection, because what makes the touch of a god act is approval of medicines after being used and successfully experienced (translated from *Compositiones*, Helmreich 1887, p. 1).

Later, Galen discussed and ensured the concept of experience in medicine:

> ...the art of medicine has taken its origins from experience, and not from indication. By "experience" we mean the knowledge which is based on rational consequence. For perception leads us to experience, whereas reason leads the dogmatics to indication (Walzer & Frede 1984, p. 24).

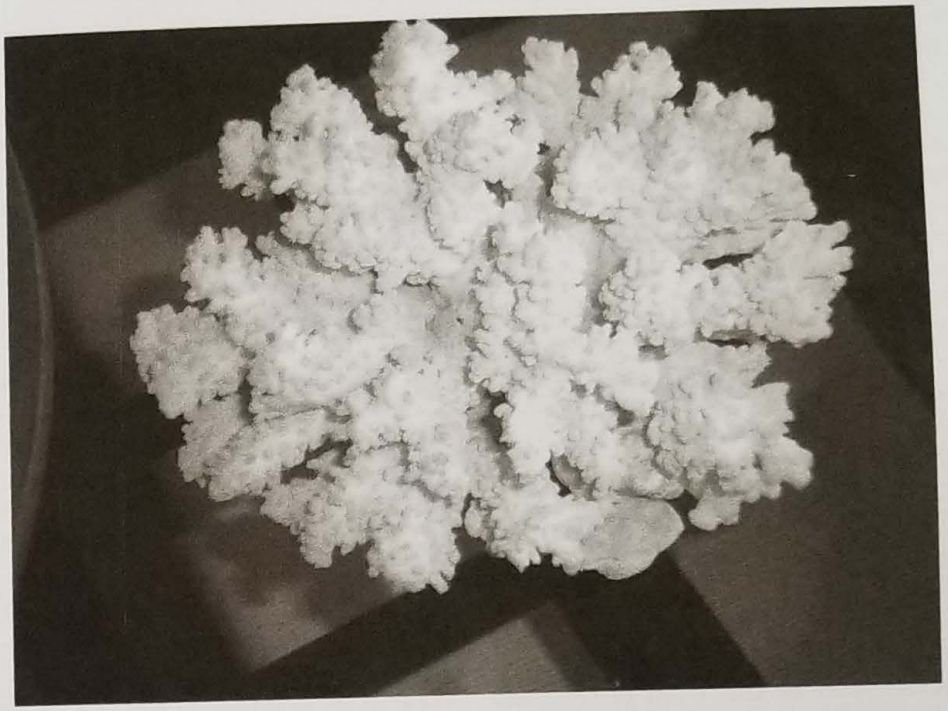
Galen also set the rules for medical experimentation by experts. His method was followed until more accurate scientific methods came to light at the beginning of the nineteenth century:

> Practised, i.e. learned experience, on the other hand, is the only to be had by experts when they are guided by the similarity with things which already have been found by experience. By "experience" [*empireia*], we mean the knowledge of those things which have become apparent so often that they already can be formulated as theorems, i.e. when it is known whether they always have turned out this way, or only for the most part, or half of time, or rarely (Walzer & Frede 1984, p. 24).

Authors of coral-containing recipes

Spices, minerals and animal products are among the ingredients used by Peter of Spain, including pearls, amber, red and white coral, topaz, the Jew's stone, ivory and unicorn scraps, *spodium*, gold, ginger, camphor, pepper, cinnamon, cubeb, sandal, rhubarb, opium and *oculi crancrorum* (calcareous concretions found in the stomach of *Astacus fluviatilis*), the European crayfish, noble crayfish or broad-fingered crayfish and other kinds of crabs (Ebermann & Kartnig 2007, p. 148), among other more common ingredients and numerous animal stones (organic concretions or possible designations of fossils).

The recipes are copied from Graeco-Roman and Arabic physicians, although some are original to Petrus himself. Coral is listed mainly for its medicinal properties as a toothache analgesic, cardiac tonic, as a preventative to and in the treatment of gastric and intestinal pain, possibly acting as an antacid and antispasmodic, and supposedly also as an anti-oedema and anti-inflammatory in the treatment of spleen enlargement. White and red coral are used as anti-haemorrhagics and (possibly) antispasmodics as ingredients of a syrup for haemorrhoids, dysentery, vomiting, menstrual flow and similar conditions in the second recipe (Fig. 7). Coral is



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mostly taken dissolved in water or as an ingredient of electuaries, as a cardiac stimulant and possibly anti-arrhythmic, an anti-haemorrhagic against haemoptysis, haemorrhoids, polymenorrheoa, as a tooth analgesic and as a possible antibacterial for tooth problems to help pluck out teeth. Coral is also recommended as a magical device to drive away evil spirits and to help women in labour.

Lynn Thorndike pointed out that the medical authorities of Peter of Spain's 'Treasury of the Poor' include ancient authors including Richard, *Experimenter*, Gilbert of England, Arabic authors including Isaac and Avicenna, and classical authors including Dioscorides (Thorndike 1923, vol. ii, pp. 495–497). Isaac Israeli, Isaac ben-Solomon Israeli or, in Arabic, Abū Ya ʿqub Ishāq Sulayman al-Israāli'īlī (AD 850–*c.* 941) was born in Egypt where he later practised ophthalmology and became physician to several Egyptian rulers (Campbell 2006, vol. I, p. 73). Richard of Wendover (died 1252) was an English physician who appears to have taught medicine at the University of Paris and who was physician to Pope Gregory IX (1227–41) (O'Boyle 1998, p. 34 and note 1). Gilbertus Anglicus or Gilbert (*c.* 1180–*c.* 1250) was one of the most outstanding medieval medical authors; in the Prologue to the *Canterbury Tales*, Geoffrey Chaucer (1340–1400) included him among the greatest physicians up until that time:

> He was well-versed in Aesulapius too
> And what Hippocrates and Rufus knew
> And Dioscorides, now dead and gone,
> Galen and Rhazes, Hali, Serapion,
> Averroes, Avicenna, Constantine,
> Scotch Bernard, John of Gaddesden, Gilbertine.
> (Chaucer (Coghil transl.) 1951, p. 14)

Gilbert is frequently quoted in the 'Treasury of the Poor'. The date of Peter of Spain's death, 1277, is often referred to as the latest period to which Gilbert's most important work, the *Compendium Medicinae*, could have been written (Handerson 1918, p. 19). On the causes of spleen enlargement pointed out by Gilbert (although the associated hepatomegaly does not seem to have been recognized), for example, a modern doctor can surprisingly recognize congestive heart failure: 'Wyndiness of þe spleen comeþ of grete humours þat þen y-gendrid of a feble hete' (Getz 1991, p. 235).

This book is an excellent treatise on internal medicine but Gilbert also discusses the treatment of wounds, fractures and dislocations, lithotomy, herniotomy, fistulae and various diseases on the border between medicine and surgery (Handerson 1918, p. 22). Gilbert's *Compendium* is divided into seven books, following the usual classification of diseases from head to foot. Besides general diseases, the work includes a surprisingly accurate comprehension of physiology, physiognomy, ophthalmology, laryngology, otology, gynaecology, neurology, dermatology, embryology, obstetrics, dietetics, urinary and venereal diseases, therapeutics, toxicology, operative surgery, cosmetics and even travel hygiene and prevention of sea-sickness (Handerson 1918, p. 26).

Coral-containing recipes

Eleven coral-containing recipes feature in Maria Helena da Rocha Pereira's selection from Petrus Hispanus, and one in the Spanish edition. The editions vary considerably. It lies beyond the scope of this paper to compare the versions of the recipes included in the different manuscripts and printed editions, or to compare them with the possible sources that Peter of Spain may have consulted.

First recipe: 'To pull out rotten teeth: Chapter XI. Tooth and gum pain. 64. Put powder of red coral in the tooth cavity and pull the tooth out. Avicenna' (Hispanus 2011, p. 117).

Second recipe: 'Chapter XV. Chest disorders. 18. A syrup against afflictions of haemoptysis. Gilbert says there is nothing more useful, more effective than this: R/ hypocysts, cimolite, bolus armenius, acacia, white and red coral, powder of wild ginger, mummy, peppermint, pomegranate peels, acorn, nuts, wild pomegranate, gum Arabic, tragacanth gum, comfrey, bindweed, seed of plantain, rosarum, sumac, dragon's blood, bucks's horn plantains, aa 8 drachmas, sugar, 3 pounds; make a syrup with decoction of plantain; give with decoction of quinces, lentils and loquats; very good for patients with haemorrhoids and dysentery, vomiting, menstrual flow, and similar conditions. Gilbert' (Hispanus 2011, p. 147).

Third recipe: Chapter XVI. Syncope and starvation. 3. Give the following electuary, R/ gold filings, 1 drachma, pearls, 1 drachma, mace, 2 drachmas, cubebs, spodium, scrapings of ivory, stag's heart bone, burned bullrush, bush basil, rosemary, aa 2 drachmas, white and red coral, aa 1 drachma, cloves, 1 drachma, sugar, 1 pound musk, amber, aa 2 drachmas; very good for giving comfort in all types of syncope. This is of my own (Hispanus 2011, p. 149).

Fourth recipe: Chapter XVI. 5. 'Coral brings good comfort. Avicenne' (Hispanus 2011, 151).

Fifth recipe: 'Chapter XVII. Nausea and hiccups. 9. Drinking ground coral with water immediately calms stomach and belly ache. Isaac' (Hispanus 2011, p. 153).

Sixth recipe: 'XIX. Pleurisy. 4. I learned from a reliable person that the following is tried and tested

and without danger, because it makes the purulence and humours of pleurisy come out immediately: grind root of field scabious, half pound of juice of field scabious and coral powder, then strain; give a good mouthful to the patient; immediately the abscess will burst and the pus will be expelled. This is how he secretly cured all those who were dear to him' (Hispanus 2011, p. 161).

Seventh recipe: 'XXII. Relief for colic and iliac pains. 36. Drinking coral powder with rain water soothes stomach ache and bellyache. Ricardo' (Hispanus 2011, p. 195).

Eighth recipe: 'XXIX. Congested spleen. 18. Drinking coral plant with water dries the spleen. Dioscorides' (Hispanus 2011, p. 225).

Ninth recipe: 'XXXVII. To excite coitus. 25. Having coral plant in the house, undo all the spells. Dioscorides' (Hispanus 2011, p. 257).

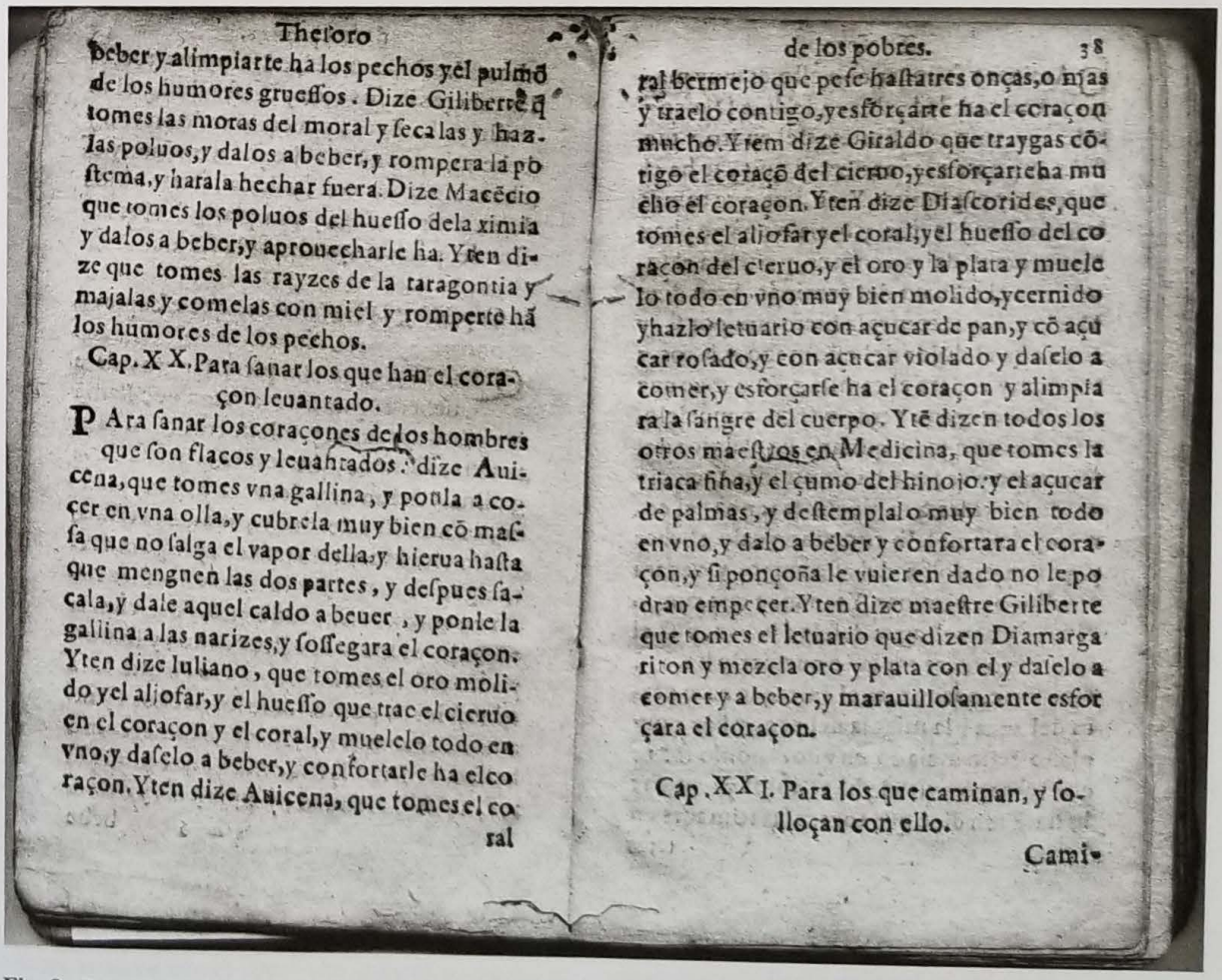
Tenth recipe: 'XLI. Menstrual overflow. 10. Drinking coral plant retains menstruation. Dioscorides' (Hispanus 2011, 277).

Eleventh recipe: 'XLVI. Against childbirth difficulty. 12. To bind the coral plant to the thigh makes labour easy. Avicenna' (Hispanus 2011, p. 315).

Twelfth recipe: 'Chapter XXV. For dorsal and lumbar and belly pain Take red coral 5 ounces, bring it with you and you will never have belly, stomach or lumbar pain. Gilbert' (Hispanus 1598, p. 45).

The first recipe, taken from Avicenna, is a powder to fill the tooth cavity and help to pluck out the rotten tooth. It is the only recipe where coral is used for dental problems.

Several recipes refer to coral being used to relieve gastric complaints. The fourth recipe, also taken from Avicenna, reads 'Coral brings good comfort' may be related to the use of calcium carbonate as an antacid. In the fifth recipe, taken from Isaac, coral is also possibly used as anti-acid and (or) antispasmodic, dissolved in water to calm stomach and belly ache. In the seventh recipe, coral powder dissolved in rainwater is also given possibly as an antacid and antispasmodic to relieve



Theſoro

beber y alimpiarte ha los pechos yel pulmõ de los humores grueſſos. Dize Giliberte q tomes las moras del moral y ſeca las y haz las poluos, y dalos a beber, y rompera la põ ſtema, y harala hechar fuera. Dize Macẽcio que tomes los poluos del hueſſo dela ximia y dalos a beber, y aprouecharle ha. Yten dize que tomes las rayzes de la taragontia y majalas y comelas con miel y romperte hã los humores de los pechos.

Cap. X X. Para ſanar los que han el coraçon leuantado.

PAra ſanar los coraçones de los hombres que ſon flacos y leuantados: dize Auicena, que tomes vna gallina, y ponla a cocer en vna olla, y cubrela muy bien cõ maſſa que no ſalga el vapor della, y hierua haſta que mengnen las dos partes, y deſpues ſacala, y dale aquel caldo a beuer, y ponle la gallina a las narizes, y ſoſſegara el coraçon. Yten dize Iuliano, que tomes el oro molido yel aljofar, y el hueſſo que trae el cieruo en el coraçon y el coral, y muelelo todo en vno, y daſelo a beber, y confortarle ha el coraçon. Yten dize Auicena, que tomes el coral

de los pobres. 38

ral bermejo que peſe haſta tres onças, o mas y traelo contigo, yesforçarte ha el coraçon mucho. Yten dize Giraldo que traygas cõtigo el coraçõ del cieruo, yesforçarteha mucho el coraçon. Yten dize Diaſcorides, que tomes el aljofar yel coral, yel hueſſo del coraçon del cieruo, y el oro y la plata y muele lo todo en vno muy bien molido, y cernido yhazlo letuario con açucar de pan, y cõ açucar roſado, y con açucar violado y daſelo a comer, y esforçarſe ha el coraçon y alimpiara la ſangre del cuerpo. Ytẽ dizen todos los otros maeſtros en Medicina, que tomes la triaca fina, y el çumo del hinojo, y el açucar de palmas, y deſtemplalo muy bien todo en vno, y dalo a beber y confortara el coraçon, y ſi ponçoña le vuieren dado no le podran empeçer. Yten dize maeſtre Giliberte que tomes el letuario que dizen Diamargariton y mezcla oro y plata con el y daſelo a comer y a beber, y marauilloſamente esforçara el coraçon.

Cap. XX I. Para los que caminan, y ſolloçan con ello.

Cami-

Fig. 8. Pages from *Libro de Medicina*, 1598, with Juliano's recipe (author's collection).

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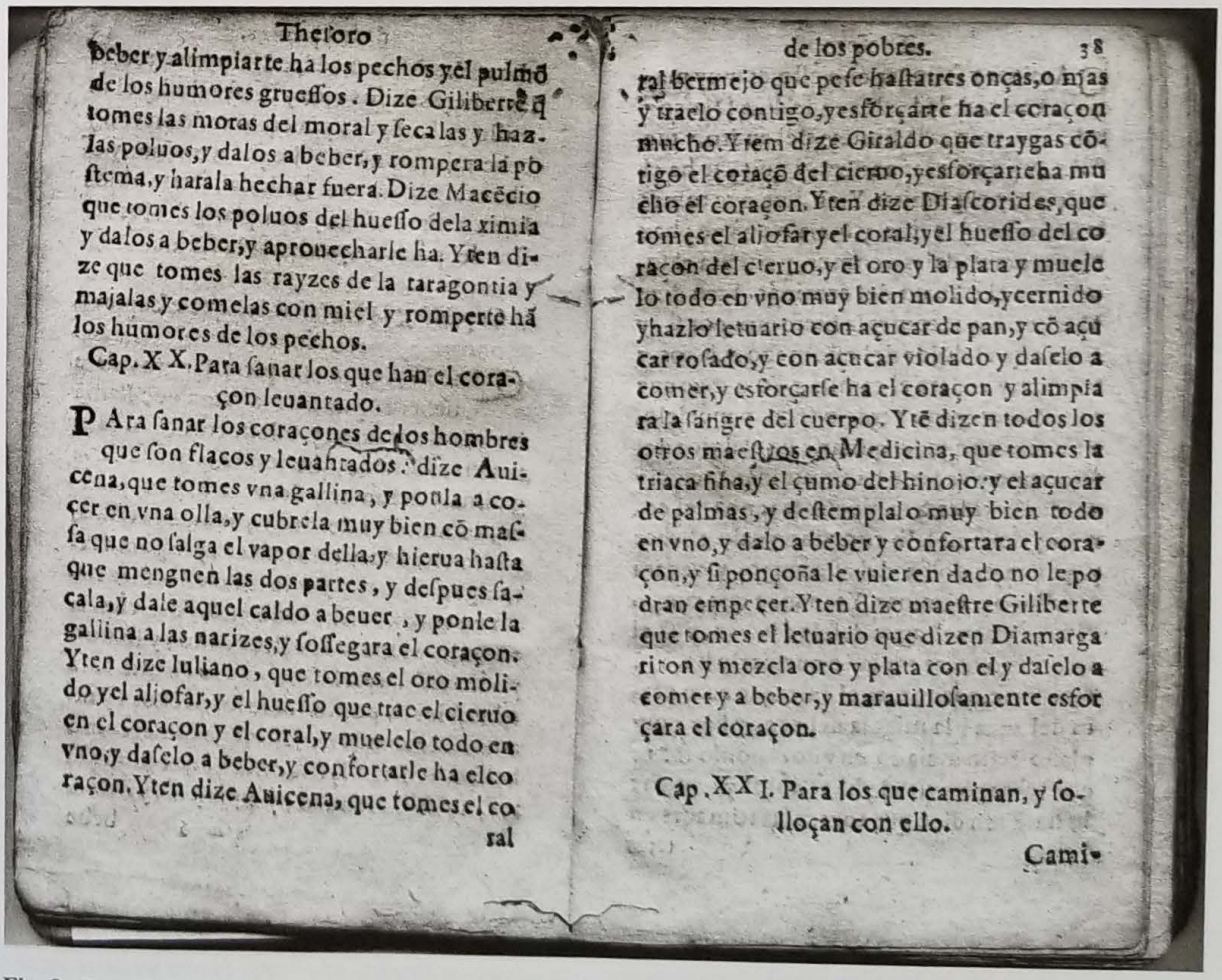

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Cap. XX I. Para los que caminan, y ſolloçan con ello.

Cami-

Fig. 8. Pages from *Libro de Medicina*, 1598, with Juliano's recipe (author's collection).

stomach and abdominal cramps. In the twelfth recipe taken from Gilbert, 'to carry coral will drive away belly, stomach or lumbar pain' may mean not just to carry but may be related to the intake of calcium carbonate as an antacid and as a calcium supplement in lumbar pain (due to osteoporosis).

The use of coral as an anti-haemorrhagic and in blood disturbances is stated in three recipes. In the second recipe, taken from Gilbert, red and white coral are also possibly used as antispasmodic in a syrup against haemorrhoids, dysentery, vomit, menstrual flow and similar conditions.

In the tenth recipe, taken from Dioscorides, coral is also used as anti-haemorrhagic in gynaecological bleeding. In the eighth recipe, taken from Dioscorides, coral dissolved in water is used to treat spleen enlargement. Calcium carbonate takes part in the coagulation process, so its haemostatic properties are justified. This salt has been used due to its healing and antacid properties until recent times (Carrasco & Liñán 2013, p. 49).

Most of these recipes share the most important traditions in the use of coral in medicine by several authors cited except for the sixth recipe, learned from a reliable person, in which coral was used in pleurisy to help drain an abscess, maybe as an absorbent and/or an antimicrobial. Earlier authors did not refer to this use.

The third recipe, Hispanus' own recipe for syncope and starvation, is very special. In the Spanish edition from 1598, he gives the recipe as follows (Fig. 8):

> Juliano says you should take and grind gold, seed pearls, stag's heart bone, and coral, mix it up and give it to drink. It shall comfort the heart (Hispanus 1598, p. 38). This recipe is simplified.

The recipe from Maria Helena da Rocha Pereira's edition shares some similarities with Al-Beruni's recipes for similar purposes and with Ibn Wafid's syrups. The most popular recipe of this kind was the Gem Electuary. Comminuted gems and white and red coral were important ingredients of ancient lithotherapy until the end of the eighteenth century and are components of Pseudo Mesue's or Johannes Damascenus' Gem Electuary (thirteenth century) (Damascenus 1581, 95). The history and the composition of this electuary has recently been fully revised (Duffin 2013).

A recipe from Gilbert comprising vegetable ingredients, coral being the only mineral, to strengthen the brain and the body shares similarities with Peter of Spain and the other restoring electuaries:

> An electuarie þat restoriþ a man-is mynde and comforteþ his brayn and / al his body: Take of canel, roses, violet, ginger, cardamomum, of eueriche, oz, ii; of dragagantum, antos, bawme þat is an herbe, maioran, þrynde of myrtille, ciperi, liquoris, siler, of eueriche, oz. Ii; of squinantum, spike, clowes, quibibis, folii, galange, auence, borage, sene, bean, spodie, coral, mastike, macropir, storax, brent silk, of eueriche, oz. $\frac{1}{2}$ sc.. i; of sirep of roses, quantum sufficit (Getz 1991, p. 20).

Coral as a magical device features only in two recipes, taken from Dioscorides. In the ninth recipe, coral is used to undo all spells. In the eleventh recipe, taken from Avicenna, coral bound to the leg of a woman in labour helps against difficulty in childbirth. In Marbode of Rennes' Lapidary, a similar recipe features with a different stone, galactite (probably chalk or limestone):

> Tied round the thigh of in parturition's pains, the trembling wife an easy labour gains (Riddle 1977, p. 79).

These recipes do not feature in Dioscorides. Claude Lecouteux referred to a book by Costa Ben Luca (Qustâ ibn Lûqâ), an Arabic author of the tenth century, translated into Latin by Constantine the African (twelfth century), a doctor and a Benedictine monk from the abbey of Monte Cassino.

Fig. 9. Coral branch with Oriental fruit seeds, mounted on a silver stand from a German *Kunstkammer* (sixteenth century), height 6 cm (Távora Sequeira Pinto Collection, Oporto), photo by Chris Duffin.

Costa Ben Luca took the use of stone amulets from the Arabic Aristotle (apocryphal), classical authors including Galen and Dioscorides and Arabic authors including Avicenna, attempting to legitimize the medicinal use of stones by the great authors in a wider popular tradition (Lecouteux 2005, pp. 104–105). Peter of Spain might have based these recipes on this book and not on the works of the real ancient and Arabic authors.

Stones were widely used in folk medicine to help in fertility and in labour. In the 'Treasury of the Poor', to hold a magnet stone would help immediately in the delivery of the foetus (Hispanus 2011, p. 313). Jasper would act in the same away (Hispanus 2011, p. 321).

Other stones, bound to the leg of women in labour, appear in other lapidaries. In *Damigéron-Évax* Aetitis (the Eagle Stone) is recommended for pregnant women. When bound to the left arm it would prevent abortions, and when laid on the lumbar region it would accelerate the delivery (Halleux & Schamp 1985, p. 235).

Stones were among countless remedies used as amulets in empiric medicine to treat physical ailments and to prevent evils with unknown causes.

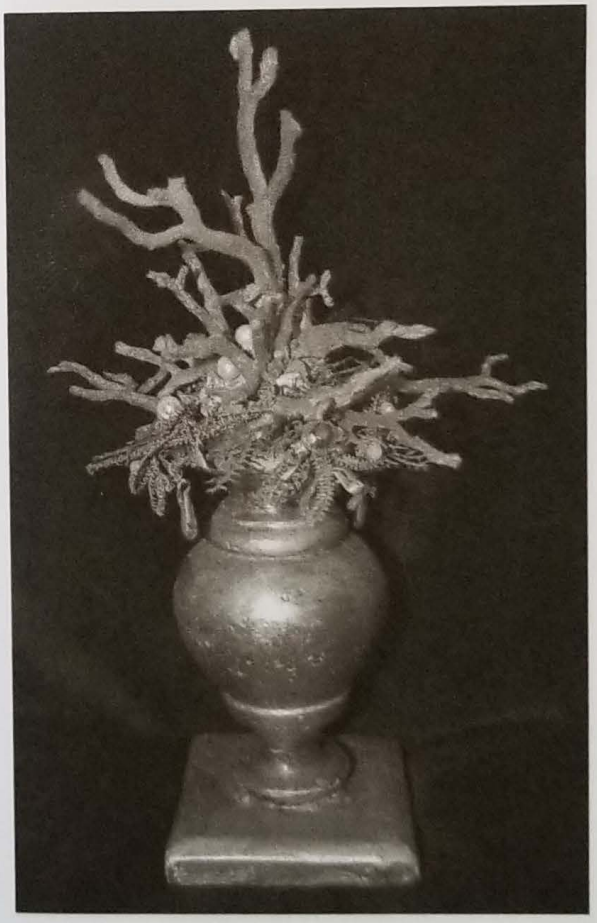

Fig. 10. Gilded vase with coral branches, seventeenth century, height 14.5 cm (Távora Sequeira Pinto Collection, Oporto), photo by Chris Duffin.

Fig. 11. Gilded sculpture of an angel topped by a small coral branch on a golden *sphera mundi*, seventeenth century, height 15.8 cm (Távora Sequeira Pinto Collection, Oporto), photo by Chris Duffin.

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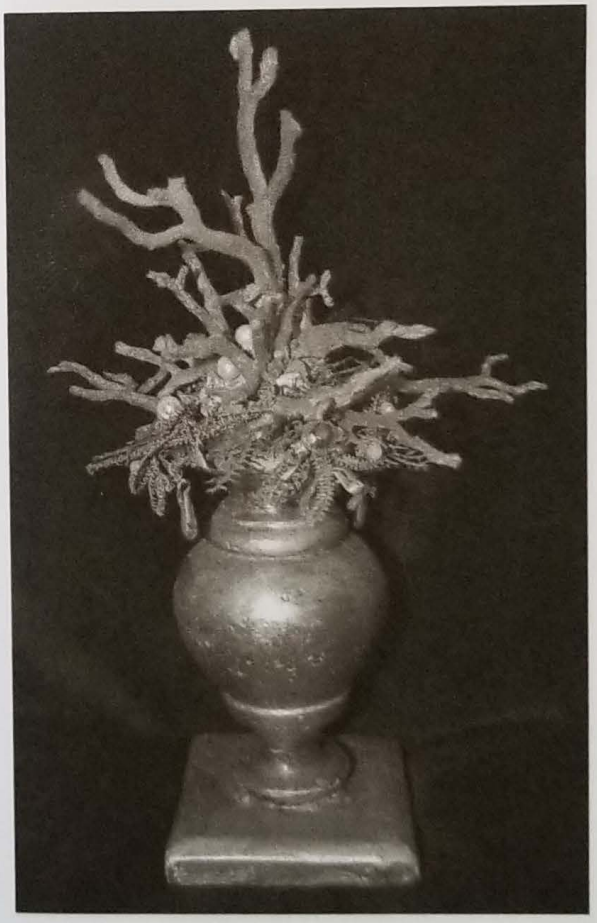

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According to the medical historian Guiseppe Penso, the word amulet was first used by Pliny (Penso 1984, p. 65). Pliny the Elder (BC 23–AD 79), the great Roman encyclopaedist, wrote that 'Tied to the part as an amulet sideritis reduces varicose veins and does its work without pain' (Pliny 1956, p. 341).

The supposed medical properties of coral were also associated with Christian symbolism; many magical properties attributed to coral are due to its shape resembling the Cross of Christ, as was the case with deer horn (copied from Cantimpré in *Hortus Sanitatis*, V, 42, chapter devoted to coral; Carrasco & Liñán 2013, p. 71).

In the eighteenth century, in the *Real Botanica del Escorial* founded by the King of Spain Felipe II, coral was also indicated to treat diabetes as well as a compound of eye drops (García Cabrero 1755; Liñán & Liñán 2006).

Calcium carbonate is the main component of the shells of marine organisms, currently used as a calcium supplement when exogenous calcium is required as an antacid, in blood coagulation and as a component of toothpaste. Calcium hydroxide (calcium oxide mixed in water) approaches the recipe of Peter of Spain used in dentistry to fill the root canal in dentistry. Carrasco and Liñán reviewed the wide use of calcium carbonate in general modern therapy (Carrasco & Liñán 2013, p. 71). Calcium is an important mineral in human metabolism, as it has been recently stressed:

> Calcium is one of the most abundant minerals in the body and its metabolism is one of the basic biologic processes in humans. Although historically linked primarily to bone structural development and maintenance, it is now recognized as a key aspect of many physiologic pathways necessary for optimum health including the cardiovascular, neurological, hormonal, renal and gastrointestinal systems. Calcium serves as a cofactor for many extracellular enzymes, most notably the enzymes of the coagulation cascade, and as a source of calcium ions that function as signalling molecules for a great diversity of intracellular processes. These processes include automaticity of nerve and muscle; contraction of cardiac, skeletal and smooth muscle; neurotransmitter release; and various forms of endocrine and exocrine secretion (Patel *et al.* 2012, pp. 2–7 digital edition).

Corals from German *Kunstkammern* or 'cabinets of curiosities'

Coral has attracted human fancy beyond its medicinal properties. Exuberant pieces of coral figure among the *naturalia* in German *Kunstkammern* or cabinets of curiosities in which nobles and wealthy

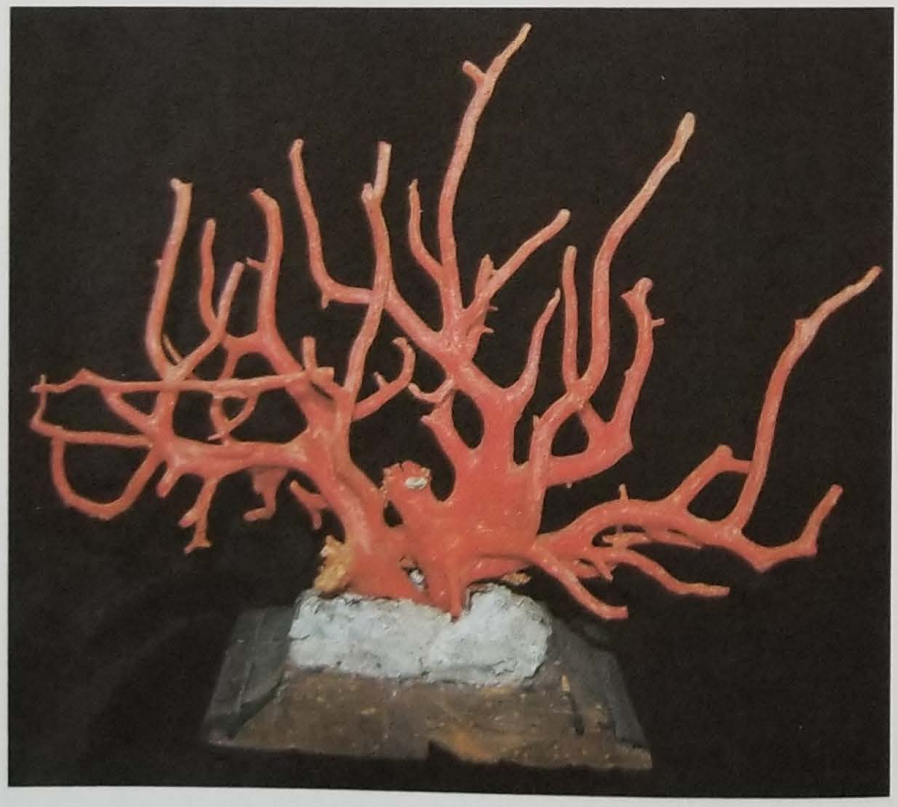


Fig. 12. Red coral branch from a German *Kunskammer* (seventeenth/eighteenth centuries), height 18 cm (Távora Sequeira Pinto Collection, Oporto), photo by Chris Duffin.

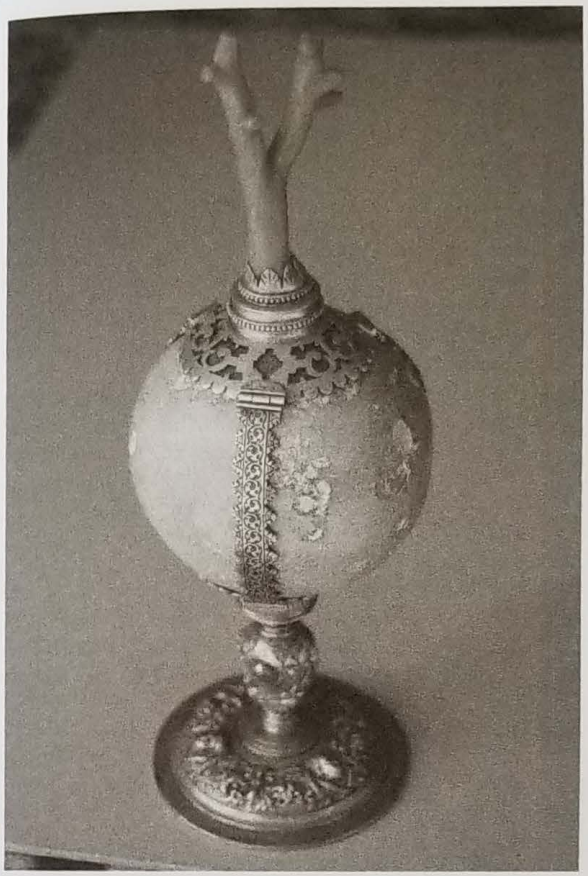


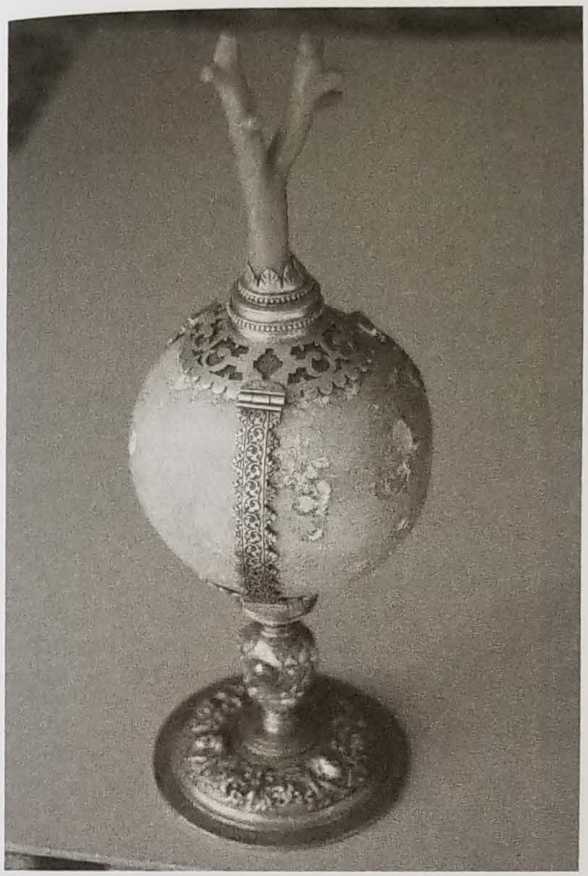
Fig. 13. Oriental bezoar stone mounted on a golden filigree stand, decorated with a coral branch on the top, eighteenth century (Távora Sequeira Pinto Collection, Oporto).

people exhibited their exotic riches and jewels from the sixteenth century onwards. The cabinets collected antique figurines and coins, artistically crafted artefacts, scientific instruments, books, pictures, objects brought from far lands and natural specimens. Francisco I de Medici, Grand Duke of Tuscany, established one particularly large cabinet built on older precursors in around 1570 in Florence. One of the largest and most famous cabinets belonged to the Emperor Rudolf II around 1600 in Prague (Müsch in Seba 1734, 1765, pp. 7–8).

Scientists also collected much exotic *materia medica*. Albert Seba (1665–1763), a pharmacist from Amsterdam, collected all sorts of exquisite pieces, mainly *naturalia* (plants, animals and minerals) recorded in 446 copperplates. Branches of red, white and black coral figure in Albert Seba's *naturalia*, in wonderful plates depicting different kinds of corals (Seba 1734–65, pp. 304–322).

Five pieces from the private collection of the art collector Álvaro Sequeira Pinto, dated from the sixteenth to the eighteenth century, illustrate the value of this highly appreciated marine tree-like skeleton. Some originally belonged to German *Kunstkammern*: a coral branch with Oriental fruits, mounted on a decorated silver stand (Fig. 9); a coral branch mounted on a black wood stand (Fig. 10); a gilded vase with coral branches (Fig. 11); and a golden sculpture of an angel with a small coral branch on a golden *sphera mundi* (Fig. 12) all state the European taste for Oriental rare, valuable and exotic materials.

Fig. 14. Branch of coral (eighteenth century). Lisbon Museum of Pharmacy.



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A coral branch on the top of an Oriental bezoar stone mounted on a golden filigree stand from the eighteenth century is a rare piece, combining both apotropaic properties attributed to coral and bezoar stones, the widely known alexipharmic activity of bezoars and the alexipharmic activity of coral, active against asp's bites since the *Orphei Lithica Kerigmata* (Halleux & Schamp 1985, p. 160; Fig. 13).

An ostrich egg goblet topped by a coral branch and worked with gilded silver by Clement Kickinger from Augsburg dated about 1570/1575, housed in the Kunshistorishes Museum Wien, Kunstkammer (Inv. Nr. KK_897), resembles this bezoar.

A coral branch from the Lisbon Museum of Pharmacy, mounted on a black wooden stand, also originally belonged to a German *Kunstkammer* (Fig. 14).

Conclusions

Coral was used mainly: for its protective and apotropaic properties against evil and dangers; to favour harmony in the home; as a magical device to protect against diseases; and among wonderful *exotica* for Renaissance scientists and art collectors. Coral was taken or used externally as a medicine and listed in the treatment of various ailments, mainly as haemostatic, antacid and analgesic for bone pain and dental problems, analeptic (as a tonic for vital organs), as an anti-epileptic, for urinary disorders, in gynaecological ailments, eye and lung suppurations, and as a healing powder in surgical dressings.

Arabic authors were more enthusiastic about coral. Al-Beruni also listed it as oxytocic (to stimulate uterine muscle in order to hasten parturition and to provoke abortion), as an antidysenteric and a cure for melancholia.

Peter of Spain gathers the influence of European and Arabic authors, prescribing coral applied externally and taken orally. Calcium carbonate, the main chemical component of the coral skeleton, is listed in modern pharmacopeia as a calcium supplement. Coral as an exogenous source of calcium and calcium carbonate was included in many appropriate prescriptions of ancient authors, including Peter of Spain.

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