Ambergris: The Search for Its Origin

*By Karl H. Dannenfeldt**

AMBERGRIS is a rare wax-like pathological growth found in the stomach and intestines of the sperm whale (*Physeter catodon*). Its origin is still uncertain, but the condition may be due to the irritation caused by certain indigestible food, especially when the whale has been feeding on cuttlefish (*Sepia officinalis*), a favorite food. The horny beaks or mandibles of the cuttlefish, almost invariably found in ambergris, are indigestible and cause the irritation. The unnatural growth is usually gotten rid of in the ordinary processes of elimination, but frequently the sperm whale sickens and dies before the apparently morbid condition is remedied. Ambergris is thus found on the coasts of all seas frequented by sperm whales and in the carcasses of dead sperm whales. When fresh, ambergris is black and mixed with blood and fecal matter, and it has an unpleasant odor. When the mass is exposed to air and sun, ambergris becomes light grey (*gris*) and hard, and it has a sweet, musky odor. Ambergris consists largely (80%) of ambrein (a cholesterin), fatty oil, and benzoic acid. Its odor may be derived from the cuttlefish which the whale eats.

Our knowledge of the probable origin of ambergris is the result of relatively recent investigations. This valuable product was unknown to the classical Greeks and Romans, and the absence of an early European tradition resulted in wide speculation, in multiple theories of origin, and much misinformation. Ambergris was first introduced into medicine, cookery, and perfume by the Arabs, who called it *ʿanbar*. In Middle French this became *ambre gris*, or grey amber, to distinguish it from yellow amber, the petrified resin, or *ambre jaune*. Such distinction was necessary because the resinous amber and ambergris were thought to have the same or similar origin. Yellow amber, the *succinum* of the Romans and the *electron* of the Greeks, was well known in the classical world. Various opinions were held as to its origin, but the Roman naturalist Pliny correctly concluded that it came from the Baltic Sea area and was "formed of a liquid seeping from the interior of a species of pine." That view was not really accepted until the early nineteenth century; meanwhile the belief that amber and ambergris had related origins undoubtedly delayed the discovery of the true origins of both materials.[1]

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[1]Beliefs in classical antiquity included that it was the secretion of the poplar tree, the petrified urine of the lynx, and elephant dung (cf. the belief that ambergris was whale dung). See Pliny, *Natural History*, trans. H. Rackham, 10 vols. (Cambridge, Mass.: Harvard Univ. Press, 1938–1963), 36.42; Dioscorides, *De materia medica libri quinque*, ed. Max Wellman, 3 vols. (Berlin: Weidmann, 1906–1914), 1.83; and John M. Riddle, "Amber: An Historical-Etymological Problem," in *Laudatores temporis acti: Studies in Memory of Wallace Everett Caldwell (James Sprunt Studies in History and Political Science*, 46), (Chapel Hill: Univ. North Carolina Press, 1964), pp. 110–120.

EARLY SPECULATIONS

With their lands bordering on the Indian Ocean and the South Atlantic, seas frequented by the sperm whale, the Moslems collected ambergris for its medicinal qualities and speculated about its source. Most writers ascribed its origin in some way to the sea and noted some association with fish or whales. Two Moslems who traveled to China in the ninth century wrote that "ambergris is thrown upon this coast by the flux of the Sea, but its origin is unknown." The best is described as "bluish-white and in round lumps." Some ambergris swam on the surface of the sea and this was sometimes "as big as the body of an ox or somewhat less." A fish named *Tal*, a species of whale, swallowed this floating mass, which, when the fish was killed, was found in its stomach, spoiled and with an unpleasant scent.[2]

Many of the most influential works mentioning ambergris were by physicians. The Persian Rhazes (d. 923) gave only the medicinal properties of *ambra*. Avicenna (Ibn Sīnā, d. 1037) thought that ambergris emanated from a fountain in the sea. Some considered it to be sea foam (*spuma maris*) or the dung of a sea animal. It was obtained from the belly of a fish which had swallowed it and died, but that found in a fish was no good. The best was citrine in color and the black was the worst. It was adulterated with gypsum, wax, labdanum, and other substances. Hot in the second degree and dry in the first, ambergris comforted the brain, the senses, and the heart. Another famous eleventh-century physician, Serapion the Younger (Yuhanna ibn Sarābī), asserted that ambergris was a fungus generated in the sea, just as mushrooms were formed on land, and cast onto the shore by storms. Serapion too reported the eating of such ambergris by the whale (*Azel*) and its recovery when the whale died immediately thereafter. The best was found against the whale's spine; the citrine was best; the white, like an ostrich's egg, was bad. Hot and dry, it strengthened the brain, the senses, and the heart and was helpful to old persons and those with cold temperaments. Averroës (d. 1198) reported that ambergris was a species of camphor which arose from fountains in the sea. The best was called *ascap* in Arabic. He expanded the medicinal qualities, adding that ambergris was good for wind in the intestines and resisted pestilence.[3]

These speculations found their way into fiction. In the *Thousand and One Nights* Sinbad tells how he was shipwrecked on an island and discovered a spring of crude ambergris which flowed like wax or gum to the sea, where it was swallowed by monsters of the deep. The ambergris burned in the bellies of these whales and they vomited it. It then congealed on the surface of the sea, its color and quality were changed, and the waves cast it ashore where it was collected and sold. The ambergris that did not flow to the sea congealed on the banks of the stream and perfumed the whole valley with a musk-like fragrance.[4]

Other types of scientific works also discuss ambergris. The twelfth-century Arab geographer al-Idrīsī related that the Abbasside Caliph Harun al-Rashid (d.

[2]"The Travels of Two Mahometans in India and China in the Ninth Century," in Robert Keer, ed., *A General History and Collection of Voyages and Travels*, 18 vols. (Edinburgh/London: Blackwood, 1824), Vol. I, pp. 92–93.

[3]Rhazes, *Liber ad Almansorem* 3.22, in *Opera parva* (Lyon, 1510–1511); Avicenna, *Liber canonis* (Lyon, 1522) 2.2.63; *Liber Serapionis aggregatus in medicinis simplicibus . . .* (Venice, 1479), fols. 59r–v ("De ambra"); Averroës, *Colliget libri VII* 5.56, in *Aristotelis omnia quae extant opera cum Averrois commentariis*, 11 vols. in 13 (Venice, 1560–1562), Vol. X, fols. 119v–120r.

[4]*The Book of the Thousand Nights and a Night*, trans. Richard F. Burton, 6 vols. (New York: Limited Editions Club, 1934), Vol IV, pp. 2068–2069 (the sixth voyage).

809) sent agents to the shores of Yemen to inquire into the origin of the ambergris flung onto the shores there after great tempests. It was reported by the natives of Aden and other places that ambergris was a "substance which flows from springs in the depths of the sea, just as naptha flows from the springs of Hit. . . . Some people have thought that it was the excrement of an animal, but it is not so." The thirteenth-century Arab cosmographer Zakarīyā ibn Muhammad al-Qazwīnī wrote of *ambar* among his descriptions of sulfur, asphalt, and naphtha. He listed the various opinions on its mineral source (all agreed that it was generated in the sea and discharged toward the shore). Much of that found was from the belly of sea-fish that ate it and died; this ambergris had no odor. It strengthened wonderously the brain, the senses, and the heart, and because of its subtle warming effect, it was of greatest use to old men.[5]

The Chinese were also acquainted with ambergris. One source shows some resemblance to the Moslem reports. Chao Ju-kua, the Chinese inspector of foreign trade in Fukien, wrote a treatise about the middle of the thirteenth century on maritime intercourse between China and southern and southwestern Asia. Quoting from the *Ling-wai-tai-ta* of Ch'ou Ch'ü-fei (1178), the later author wrote: "In the Western Sea of the Ta-shi [Islamic World] there are dragons in great number. Now, when a dragon (*lung*) is lying on a rock asleep, his spittle (*hien*) floats on the water, collects, and turns hard, and the fishermen gather it as a most valuable substance." Ambergris was white when fresh, red when slightly stale, and black when old. Chao Ju-kua also mentioned that the natives of the Somali coast obtained large quantities of oil from the many dead sperm whales (200 feet long!) driven there. Ambergris was one of the products of Socrota, but "it is not known whence ambergris comes; it suddenly appears in lumps of from three to five catties in weight, driven on the shore by the wind." Ships came across ambergris in the sea and sailors fished it up.[6]

One early non-Moslem source available to later European writers on ambergris was the book on medical botany written in Greek by the eleventh-century Byzantine scholar Simeon Sethus. Two later authorities inform us that of the Greeks only Sethus, Aëtius of Amida (*fl.* 500 A.D.), and Joannes Actuarius (13th cent.) wrote on ambergris.[7] Sethus recounted that fountains of ambergris (*ampar*) abounded in various places in the seas, just like pitch, bitumen, sulfur, and the like. The best, sold in the Indian town of Silache, was grey and fat. Whitish ambergris was found at Sichra in Arabia Felix. The worst kind, gathered from fish that had swallowed ambergris at the fountains, was black. Since ambergris was calefacient and pene-

[5]*Géographie d'Edrisi*, trans. P. A. Jaubert (Receuil de voyages et de mémoires publié par la Société de Géographie, 5–6), 2 vols. (Paris, 1836–1840), 1.7.64 (the story of the caliph's efforts is from Ibrāhīm al-Mahdī's work on medicine); *Zakarija Ben Muhammed Ben Mahmud el-Cazwini's Kosmographie*, ed. Ferdinand Wüsterfeld, 2 vols. (Göttingen, 1849), Vol. I, p. 245.

[6]*Chau Ju-kua: His Work on the Chinese and Arab Trade in the Twelfth and Thirteenth Centuries, entitled Chu-fan-chï*, trans. F. Hirth and W. W. Rockhill (St. Petersburg, 1911; rpt. New York: Paragon, 1966), pp. 128, 131, 237. See also Kentaro Yamada, "A Short History of Ambergris by the Arabs and Chinese in the Indian Ocean," in *Report of the Institute of World Economics* (Kinki University, Japan), 1955, *8*:1–26.

[7]Nicolas Monardes and Juan Fragoso mention these three Greek sources (see nn. 18 and 19 below). See Aëtius, *Tetrabiblos* (Lyon, 1549) 14.4.122 for suffumations containing musk and *ambra*; it is probable that (as Ermolao Barbaro and Amatus Lusitanus thought, see nn. 22 and 23 below) this was yellow amber and not ambergris. Joannes Actuarius lists an antidote *ex ampare* against weakness and to strengthen the heart and an *ex ampare medicamentum* for stomach troubles, weakness, palpitations, and melancholy: *Methodi medendi* 5.6 and 6.8, in *Opera* (Paris, 1556).

trating, some used it for stomach ailments. It strengthened the head and heart and accelerated intoxication when smelled before drinking or when added to wine.[8]

Medieval sources in the Latin West rely on these and other earlier writers. The thirteenth-century Franciscan monk Bartholomeus Anglicus derived the following account of ambergris from Iorath Chaldeus, an unknown Jewish author of a book on animals: "Also in libro Iorath is yseide that the whale hath grete plente of sperme. And aftir that he gendreth with the femel, superfluite thereof fleteth aboue the watre. And if it is ygardred and ydried it turneth to the substance of *ambra*." The Salerno herbalist Matthaeus Sylvaticus (d. *ca.* 1342) listed the usual sources of ambergris, described the preparation of false ambergris, cited Serapion at length on the procurement of ambergris from the whale's belly, and gave the medical uses from Diascorides and Avicenna. Other summaries of late medieval knowledge of ambergris appear in the famous German herbal, *Gart der Gesundheit*, and in a similar work, the Latin *Hortus sanitatis*, in which *ambra* is located among the plants.[9]

THE RESULTS OF EXPLORATION

Within the two decades after these "gardens of health" were first printed, Europeans sailed into tropical seas, the waters much frequented by the ambergris-producing sperm whale. In the spring of 1498 Vasco da Gama traversed the Indian Ocean to reach fabled India. In 1500 Brazil was claimed for Portugal by Pedro Alvarez Cabral, who also on this voyage discovered Madagascar and Somaliland. In 1513 the Pacific Ocean was first seen by an European. The explorations, discoveries, and the resulting trade activity in Asia and North and South America opened up new sources of supply of ambergris for Europe and more information about its origin. Already about 1330 Friar Jordanus, the French Bishop of Columbum in India, had reached Asia and reported: "In this India is found embar, which is like wood, and exceedingly fragrant, and is called *gemma marina* or Treasure of the Sea."[10] In the sixteenth century the reports on ambergris became numerous, and to the earlier speculations on its origin were now added reports from the natives and Europeans resident in the localities where it was commonly found.

One new speculative source was that reported by the natives of the Maldive Islands on the southwest coast of India. About 1516 Duarte Barbosa, the Portuguese navigator, reported that in those islands he found much ambergris of "good quality and in large pieces, white, grey, and brown." The local inhabitants told him that it was the droppings of large birds which lived on uninhabited islands. Perching on the rocks near the sea, they voided this substance "which becomes refined by exposure to the air, the sun and the rain." Storms and wind tore the

[8]Simeon Sethus, *Syntagma de alimentorum facultatibus*, ed. B. Langkavel (Leipzig, 1868), p. 26.

[9]Bartholomaeus Anglicus, *On the Properties of Things* (*De proprietatibus rerum*), trans. John Trevisa, 2 vols. (Oxford: Clarendon Press, 1975), 1.13.26; pp. 685–686; Íorath Chaldaeus (or Jorach) is frequently cited by Albertus Magnus. Matthaeus Sylvaticus, *Liber pandectarum medicinae* (Venice, 1492), Ch. 36; Diascorides, not to be confused with the Greek physician Dioscorides, was a popular medieval compilation drawn from many medical writers. *Gart der Gesundheit* (Mainz, 1485), Ch. 46; *Hortus sanitatis* (Strassburg, 1497?), Ch. 20 ("De herbis").

[10]Friar Jordanus, *The Wonders of the East*, trans. Henry Yule (Hakluyt Soc. Ser. I, 31) (London, 1863), p. 43. For other early references to ambergris in India see P. K. Gode, "History of Ambergris in India from about A.D. 700 to 1900," in *Chymia*, 1949, 2:51–56, and Yamada, "Short History," which contains references to the views of al-Masʿūdī (d. 958), Abū Zaid al-Ḥasan (916), and Abu-l Fazl (1595).

dung from the rocks and carried it to the sea, "where it floats till they meet with it." The white ambergris, called *ponabar*, was fresh and most highly valued. That of greyish color, called *puambar*, was considered to have been in the sea for some time. The brown ambergris had been swallowed, "they say," by whales and turned brown in their bodies. Since the whale could not digest it, the material was ejected whole. This least valuable ambergris was called *minabar*.[11]

Barbosa's account of a bird-dung origin resembles that encountered by Fernão Lopes de Castanheda (d. 1559), the historian of Portuguese India, also in the Maldive Islands. The inhabitants informed Lopes that on the largest island there were "many fragrant plants on which the large birds which inhabit these islands feed." The birds, called *Anacangripasqui*, roosted on rocks along the sea "and there drop their dung, which is ambergris." The author saw this ambergris, fine, rare, and called *ponahambar* (gold ambergris), "on these same rocks just as the birds dropped it." The bird-dung, when blown into the ocean in large pieces, lost part of its quality, turned brown, and was eaten by whales and other large fish. It was disgorged as black ambergris (called *manimbar* or fish-ambergris), of little value because it had lost nearly all its virtue.[12]

Two other travelers' accounts supported instead an origin more directly from whales. Leo Africanus, the Moorish geographer and traveler turned Christian, recorded that at Messa in Morocco large amounts of ambergris were found on the seashore; he mentioned whale's dung and whale's sperm as possible origins. He also described among the strange fish of Africa a monstrous fish called *Ambara*. The inhabitants of the sea coast affirmed that "this fish casteth foorth Amber; but whether the said Amber be the sperma or the excrement thereof, they cannot well determine." At mid-century Gian Battista Ramusio published a collection of travels that included Marco Polo's. The latter reported that at the islands "one of men and the other of women" could be found a "greate plentye of Amber, by reason of the greate number of Whales that they do take." Also there was a great abundance of *ambra* found on the island of Socotra in the Indian Ocean. To this latter comment Ramusio added: "The inhabitants find much ambergris upon their coasts, which is voided from the entrails of whales." He then described the harpooning of sperm whales by natives and noted, "They then drag it to the shore, and proceed to extract the ambergris from its belly, whilst from the head they procure several casks of oil."[13]

The association of ambergris with the whales of the South Atlantic was denied late in the century by Duarte Lopes, a Portuguese settler in the Congo. The papal chamberlain Filippo Pigafetta recorded that Lopes told him how the natives obtained oil from the carcasses of whales that kill themselves fighting off the coast. But ambergris did not come from these whales: "For ouer all the coast of *Congo*, where there is an infinite number of them, you shal not finde either *Ambregiz*, or any other *Amber*, blacke or white in any place. And yet if it should come from

[11]Duarte Barbosa, *A Description of the Coasts of East Africa and Malar in the Beginning of the Sixteenth Century*, trans. E. J. Stanley (Hakluyt Soc. Ser. I, 35) (London, 1866), pp. 165–166.

[12]Fernão Lopes de Castanheda, *História do discobrimento et conquista da Índia pelos Portugueses*, in *Scriptores rerum lusitanarum* (Ser. A), 4 vols. (3rd ed., Coimbra: Impressada Universidade, 1924), Bk. 4, Ch. 35.

[13]Leo Africanus, *The History and Description of Africa*, trans. John Pory (1600), 3 vols. (Hakluyt Soc. Ser. I, 92–94) (London, 1896), Vol. II, p. 250; Vol. III, p. 949; Leo reported that ambergris sold at Fez for 60 ducats a pound; Vol. II, p. 309. *The Most Noble and Famous Travels of Marco Polo*, trans. John Frampton (1579), ed. N. M. Penzer (2nd ed., London: Black, 1937), pp. 115, 253.

these creatures, there must haue beene of necessity great store of it founde vpon these Shores."[14]

Also at the end of the century Jan Huyghen van Linschoten (d. 1611), a Dutch traveler to Asia, in his frequently translated *Itinerario* (Amsterdam, 1596) supported the theory that ambergris was "a Betumen or pitch, proceeding out of some fountaine" on the bottom of the sea. It was daily brought from the coast of Soffala, Mozambique, the coast of Malindi, the Maldive Islands, and Cape Comorin (cf. below, Garcia da Orta). Some thought it to be a spongy earth from some unknown island, broken off by the sea in pieces 10 to 12 spans wide and some 50 to 60 broad. It was reported that in India there had been found whole islands of *ambra*. Often "there commeth Amber that is mingled with shels, and all spotted with the dung of Sea foules, that sit thereon." The best was grey with whitish veins, called "Amber Griis"; the black variety was not so good. The best yielded oil when pins were thrust into it. Ambergris was used by the Indian nobles and kings in food and to provoke lust, and in pomanders (*pomum ambrae*) "to smell upon."[15]

The continued use of ambergris in medicine helps explain why its cost and interest in it remained high.[16] Physicians were among the most likely to write about it. One was also a traveler: Garcia da Orta (d. 1568), the Portuguese physician and botanist who resided in Goa, India. He considered at some length the various reputed origins of ambergris. His discussion of the Moslem authorities differs from earlier ones in that he based his opinions at least in part on his own investigations. He had seen pieces of ambergris as big as a man and one piece 90 *palmos* in circumference and 18 long. In 1555 he had found beyond Cape Comorin a piece weighing 30 quintals. Pieces of ambergris sometimes contained the beaks of birds (a reference to *Sepia* beaks) and mollusk shells. Da Orta judged the best explanation of the origin of ambergris to be that it came from a fountain in the bottom of the sea, though he ridiculed Averroës's idea that it was a kind of camphor. (Camphor did not originate in the sea, and besides it was cold and dry in the third degree while ambra was warm and dry in the second degree.) As to the views of Avicenna and Serapion, he thought the fungus origin was "more conformable to the truth" than their other theories, because high winds cast much

[14]Duarte Lopes, *Relatione del Reame di Congo* (Rome, 1591), trans. as *A Report of the Kingdome of Congo of Odoardo Lopes . . . by Philippo Pigafetta*, by Abraham Hartwell (London, 1597; New York: De Capo Press, 1970), p. 25.

[15]*The Voyage of John Huygen van Linschoten to the East Indies*, ed. A. C. Burnell and P. A. Tiele, 2 vols. (Hakluyt Soc. Ser. I, 70–71) (London, 1885; New York: B. Franklin, 1970), Vol. II, pp. 92–94 (Ch. 70). On the medieval use of aromatic pomanders see John M. Riddle, "*Pomum ambrae*: Amber and Ambergris in Plague Remedies," in *Sudhoffs Archiv fur Geschichte der Medizin*, 1964, *48*:111–122.

[16]In the *Enchiridion* or pharmacopoeia of Augsburg (1564) *ambra* or *ambra grisea* is included in the following *compositae* (vegetable amber is listed as *charabe*, the Arabic word): *Aromaticum chariophyllatum*, *Mesuae*; *Aromaticum rosatum*; *Diambra*, *Mesuae*; *Diathamaron*, *Nicolai*; *Electuarium laeticiae*, *Galeni*; *Confectio liberantis*; *Electuarium de gemmis calidum*, *Mesuae*; *Dia prassiu*, *Nicolai*; *Dia xyloaloea*, *Mesuae*; *Species cordialles temperatae*; *Dia paeonias*, *Nicolai*; *Electuarium alkermes*, *Mesuae*; *Trochisci aliptae moschatae*, *Nicolai*; *Trochisci de Gallia moschata*, *Mesuae*; *Trochisci de xyloaloes*, *Mesuae*; *Pomum ambrae* (two varieties); *Aqua vitae*; and *Confectio cordialis*. The troches *Aliptae moschatae* and *Galliae moschatae*, both containing *ambra*, are found in a variety of other recipes. It is an impressive list, considering the cost of ambergris: the 1581 edition lists *ambra* at 6 *Kronen* per half ounce; *sperma ceti* was 12 *Kronen* for the same quantity. See *A Facsimile of the First Edition of the Pharmacopoeia Augustana*, ed. Theodor Husemann (Madison: State Historical Soc., 1927), pp. xxiv and *passim* (see index). Cristoph Wirsung, a prominent German physician, included 95 entries for the use of *ambracana* in the index of his *Artzney Buch* (Heidelberg, 1568).

ambergris on the Comoro Islands, Mozambique, the Maldive Islands and other coasts. Da Orta rejected the theory that fish called *Azel* swallowed ambra and thereupon died, so that men found the ambergris in their bodies: he had made inquiries and no one reported seeing it. Similarly, ambergris could not be the foam of a whale (or a fish) or its excrement because he had seen whale oil, which had an abominable odor not like that of ambergris. Besides there were whales in other parts of the world, Spain for example, and no ambergris was found there. Da Orta remarks that ambergris was highly esteemed by the rich Indians and Moslems, who used it for medicine, with an ounce of the best being worth more than precious stones. The Portuguese carried ambergris to the Chinese, selling it at 1500 *crusados* per *cate* (20 oz.). The Chinese considered ambergris good for female ailments, and for the heart, brain, and stomach.[17]

Although not himself a traveler, Nicolas Monardes, the Spanish physician of Seville, relied upon travelers' reports about the ambergris found on the coasts of Florida when he described the drugs of the New World. After mentioning that the Indians anointed "their faces with it and other parts," Monardes turned to the various views on the origin of *ambar*. He supported the position of Simeon Sethus that *ambar* sprang from fountains in the sea, like pitch (Monardes felt that Serapion seemed to agree with this), and specifically denied that *ambar* was the sperm of a whale. That notion had arisen, he said, because it was found in whales, but since *ambar*, "a kinde of Pitche," was light, it rose in the sea and "the Whales doe devour it, . . . and so they doe finde it in their Mawes." Sperm would instead be found in other parts of the body. Monardes had heard of a whale taken on the coast of the Canary Islands which had more than 100 pounds of *ambar*, but in the many other whales taken there was none. A description of how the Indians of Florida hunted and killed whales leads to the information that some held ambergris to originate from a certain fruit growing at the seaside; there whales ate the fruit during April and May, when the fruit had a sweet smell (the physician pointed out that any fruit eaten would be converted into blood and flesh). Monardes concluded with the medical applications of ambergris, twice as valuable as fine gold. It was to be found in lectuaries, confections, powders, pills, preservatives, ointments, plasters, and many other preparations—as the Arabs had taught.[18]

Juan Fragoso, another sixteenth-century Spanish physician and botanist, reviewed the theories of the origin of ambergris in a chapter of his book on the medicaments originating in the East and West Indies. He included yet another report that the origin of ambergris was bird-dung, that of João de Barros (d. 1570), called the Portuguese Livy. Fragoso himself was persuaded that ambergris, like yellow amber, was a bitumen which flowed from certain springs deep in the sea; all other theories were false.[19]

[17]Garcia da Orta, *Colloquies on the Simples and Drugs of India* (*Coloquios dos simples, drogas he cousas mediçinais da India*, Goa, 1563), trans. C. Markham (London: Sotheran, 1913), First Colloquy, pp. 20–27. Christoval Acosta repeated da Orta's information on ambergris in his *Tractado delas drogas, y medicinas de las Indias Orientales* (Burgos, 1578), Ch. 26; see also on Carolus Clusius below.

[18]Nicolas Monardes, . . . *La historia medicinal de las cosas que se traen de nuestras Indias occidentales* (Seville, 1574), trans. as *Joyfull Newes out of the Newe Founde Worlde* by John Frampton (London, 1577; New York: De Capo Press, 1970), Part 2, fols. 82v–86v. In his *Bericht von den wunderbaren bezoardischen Steinen, so wieder Gifft krefftiglich dienen, und aus den Leiben der Thier genommen werden* (Leipzig, 1589), pp. 59–64, Johann Wittig repeated in detail the view of Monardes.

[19]Juan Fragoso, *Aromatum, fructum, et simplicium aliquot medicamentorum ex India utraque, et*

Francisco Hernández (d. 1587), physician to Phillip II of Spain and a naturalist, wrote a voluminous report on his exploration of plants and animals in Central America in which he did not mention ambergris. In his translation of the *Natural History* of Pliny, however, he discussed its origin in his comments on the Roman naturalist's presentation of the refuse of the sea (2.98). Hernández asserted that because it was sometimes found in the belly of some large fish, ambergris was considered to be the sperm of the whale. Some had written that it was the dung of birds in the East Indies. But ambergris was really a mineral and a "superfluidad," just as Pliny had written: "All seas excrete refuse at high tide, some also periodically. In the neighbourhood of Messina and Mylae scum resembling dung is spat out on to the shore."[20]

The opinion of Hernández is symptomatic of the attitudes of many other scholars and physicians of the Renaissance who entered the debate on the origins of ambergris while travelers were increasing the available information. Humanistically trained, they were handicapped by the fact that their beloved classical authors had not written about ambergris.

Symphorien Champier (d. 1537), the French physician and author of numerous publications, could deny that *ambra* was poison, or *sperma ceti*, or *fungus marinus*, or *spuma maris*, but he had to admit: "I frankly confess I do not know what ambergris is." He also wrote: "What *ambra* is, all our pharmacists and physicians do not know." Georgius Agricola (d. 1555), the German physician regarded as the father of mineralogy, believed that amber and ambergris were of the same origin. Claiming that amber "must be related to either sulfur or bitumen," he also discussed the differing opinions concerning "African amber." Psellus (Sethus?) and Avicenna were more correct than Serapion in assuming that *ambra* flowed from springs in the ocean, "although neither denies that it is found in fish." To the view of Marco Polo (d. 1324?) that *ambra* came from whales near the island of Madagascar, Agricola asserted that he did not know "if amber is to be found in the stomachs of our fish." Asiatic ambergris was not brought to Europe except as an artificial substance made "either from benzoin, white wax of a new swarm of bees, rotten ashwood and moss of trees, or from storax, labdanum and shavings of aloe wood." Musk and civet were added to each mixture, which was also washed with rose-water. The substitutes were easily recognized as frauds.[21]

Hieronymous Cardanus (d. 1576), the versatile Italian mathematician and physician, commented that *ambra* was the most fragrant bituminous amber (*succinum*). *Ambra* was found near the Arabian city of Sichrim and believed to be "the semen of the horrifying and monstrous fish of the whale family." In his attack on the views of Cardanus, the learned Julius Caesar Scaliger concluded instead that

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Orientali et Occidentali, in Europam delatorum, quorum iam est usu plurimus, historia brevis, utilis, et iucunda, trans. Israel Spachius (Mainz, 1601), fols. 89r–91r (*Discursos do los cosas aromaticas* . . . , Madrid, 1572). Cf. *Asia de João Barros*, ed. H. Cidade and M. Murias, 4 vols. (6th ed., Lisbon: Divisão de Publicaçãos, 1945–1948) (*Asia de Ioam Barros* . . . , Lisbon 1552, 1553, 1563; Madrid, 1615).

[20]Francisco Hernández, *Historia natural, de Cayo Plinio Segundo*, 2 vols. in 3 (Mexico: Universidad Nacional de Mexico, 1966–1967) Vol. I, pp. 128–129; Pliny, *Natural History* 2.101.

[21]Symphorien Champier, *Castigationes seu emendationes pharmacopolarum ac Arabum medicum* (Lyon, 1532), fol. 47v; *De simplicibus medicamentis* 1.32; *Officina pharmacopolarum*, fol. Xr. Georgius Agricola, *De natura fossilium*, trans. M. C. Bandy and J. A. Bandy (New York: Geological Soc. of America, 1955), pp. 70–78; (Basel, 1546), p. 245. Agricola may have confused Sethus with Psellus.

ambergris was a sort of marine fungus. Antonio Musa Brasavola (d. 1555) discussed *Ambarum* in his examination of medicinal gums. He considered to be fables the opinions that ambergris was the sperm of the whale, or the fruit of a tree under the sea, or the liver or dung of fish. He pointed out that Ermolao Barbaro, the humanist commentator on Pliny and Dioscorides, was the first to call ambergris *succinum orientale*. He also considered Aëtius to be discussing amber (*succinum*) and not ambergris. He was uncertain about a bitumen origin of ambergris.[22]

Two commentators on Dioscorides, Pietro Andrea Mattioli (d. 1577) and Amatus Lusitanus, discussed the origin of *ambarum* or *ambracane* in their comments on musk. Mattioli agreed with Agricola that yellow amber was a kind of bitumen, mentioned the whale's (*Azelum*) involvement, and quoted Simeon Sethus at some length. Lusitanus agreed with Barbaro that Aëtius's references are to yellow amber (*succinum*).[23]

Renaissance scholars did not neglect the accounts of travelers. The physician Bernardus Paludanus (Berent ten Broecke) annotated Linschoten's work (see above) and agreed that ambergris originated as pitch from a fountain in the sea. Ambergris comforted the head, heart, and stomach, was good for epilepsy, problems of the womb, for old men, and "for every cold complection."[24]

In 1574 Carolus Clusius (L'Ecluse, d. 1610), the Flemish botanist, translated Garcia da Orta's work on Indian drugs into Latin. Clusius, on advice from friends, asserted that the bird beaks found in ambergris that Garcia mentioned were really *Sepia* or cuttlefish beaks. In his *Exoticorum* Clusius expanded his comments on Da Orta's views, wrote at length of the bird-dung origin as given by Fernão Lopes de Castanheda, and referred to the works of Monardes and Scaliger. But Clusius believed that "ambergris was nothing other than recrement collected over a long time in the belly of the whale," which, having no real teeth, ate fish and soft objects like polyps, *Sepia*, and similar items that were not properly digested in the stomach. In a year or less this recrement was ejected and floated on the sea as ambergris, in which was embedded the beaks of polyps previously eaten.[25]

Since ambergris was often considered to have a bituminous origin, many discussions of *ambra* appeared in books on mineralogy. Andrea Cesalpino (d. 1603), physician to Clement VIII, presented the views of the medieval Moslem physicians, Sethus, and the Portuguese writers regarding an underwater bituminous source with whales devouring the material. Ulisse Aldrovandi (d. 1605), the renowned naturalist of Bologna, referred in his discussion of *ambra* to Clusius's comments that ambergris contained *Sepia* beaks and cited Sethus, Scaliger, and others in support of his view that ambergris was a species of bitumen. In the seventeenth century the Jesuit Bernardus Cesi (d. 1630) assembled quotations from medieval and Renaissance authorities who supported a bituminous origin,

[22]Hieronymus Cardanus, *De subtilitate rerum*, Bk. V, in *Opera omnia*, 10 vols. (Lyon, 1663; Stuttgart-Bad Cannstatt: Frommann, 1966), Vol. III, pp. 443–444. J. C. Scaliger, *Exotericarum exercitationum liber quintus decimus* (Paris, 1557), 104.10 ("De ambra"). Antonio Musa Brasavola, *Examen omnium simplicium medicamentorum* (Venice, 1539), pp. 397–399.

[23]Pietro Andrea Mattioli, *Opera quae extant omnia* (Frankfurt am Main, 1598), pp. 130–131, 66; Amatus Lusitanus, *In Dioscoridis Anazarbei de medica materia libros quinque* (Lyon, 1558), pp. 57–58.

[24]*Voyage of Linschoten*, Vol. II, pp. 92–94.

[25]Carolus Clusius, *Aromatium, et simplicium aliquot medicamentorum apud Indos nascentium historia* (Antwerp, 1574), p. 9; Clusius, *Exoticorum libri decem: quibus animalium, plantarum, aromatum, aliorumque peregrinorum fructum historiae describuntur* (Antwerp, 1605), pp. 149–150, 243.

and the Danish physician Olaus Wormius (d. 1654) also supported the bituminous origin of ambergris.[26]

SEVENTEENTH-CENTURY EFFORTS

The seventeenth century saw more reports of travelers and an expanded debate. In his description of Ethiopia, Luis de Urreta (*fl.* 1610) wrote that the whales of the Indian Ocean ate a plant growing in the depths of the sea, which made their bodies swell prodigiously. Seeking relief, they congregated at the mouth of the Niger River where the sweet water caused them to vomit what was to be ambergris. This account resembles one given by Sir Richard Hawkins, an English naval officer who embarked on a plundering voyage up the west coast of South America in 1593 and was captured by the Spanish but ransomed in 1602. Hawkins reported that the same whale that yielded *sperma ceti* had "the precious Amber-greece (some thinke also) in his bowells, . . . ingendred by eating a hearbe which groweth in the Sea," but not in all seas. Although not informed why the whales ate this herb, Hawkins surmised that just as vicuña and other beasts that produced the bezoar stone ate the *contrayerva* as a remedy to poisonous herbs or snake bites, so when a whale ate poisonous fish, it cured itself by eating this unknown herb. The herb proving indigestible, "nature converteth it into this substance, provoketh it out, or dyeth with it in his belly, and being light, the Sea bringeth it to the Coast." Hawkins acknowledged that this possible origin was based on imagination, the most probable theory being that ambergris originated as a liquid from fountains in the sea, like yellow amber in the Baltic. The liquid was also swallowed by the whale, with results like those reported for the herb theory.[27]

The precise nature of the association between ambergris and whales remained problematic. One interesting document is collected in Samuel Purchas's *Hakluyt Posthumus*. On 31 March 1611 a commission was issued to Thomas Edge to serve as factor on an English whaling ship off the coasts of Greenland. The commission described various sorts of whales and asserted that spermaceti was found in the head of the whale called "Trumpa." In the same sperm whale was "likewise found the Ambergreese, lying in the entrails and guts of the same, being of shape and colour like unto Kowes dung." The factor and the master of the ship were required to be present whenever a sperm whale was opened, and the factor was charged to put the entrails in small casks and bring them to England. Also, "although it be said, that the Ambergreese is only in this Whale and in none other," the factor was to be present at the opening of any whale and retain the entrails of any whale suspected of having ambergris.[28]

On the other hand John Parkinson, the English herbalist, declared that ambergris was "better knowne to most by sight what sort is better then other, then what

[26]Andrea Cesalpino, *De metallicis libri tres* (Rome, 1596) 1.34, pp. 71–73. Ulisse Aldrovandi, *Musaeum metallicum in libros IIII distributum* (Bologna, 1648) 3.21, pp. 430–434. Bernardus Cesi, *De mineralibus* (Lyon, 1636), pp. 412–414. Olaus Wormius, *Museum Wormianum* (Leyden, 1655), pp. 33–34.

[27]Luis de Urreta, *Historia ecclesiastica, politica, natural y moral de los grandes y remotos Reynos de la Etiopia* (Valencia, 1610), pp. 314–315, as cited in *Some Records of Ethiopia, 1503–1646*, trans. C. V. Beckingham and G. W. B. Huntingford (Hakluyt Soc. Ser. II, 107) (London: Hakluyt Soc., 1945), p. 33. *The Observations of Sir Richard Hawkins, Knight, in his Voyage into the South Seas* (London, 1622; New York: De Capo Press, 1968), pp. 46–47; the *contrayerva* was the root of a tropical American plant of the mulberry family, used as an antidote for snake bite.

[28]Samuel Purchas, *Hakluyt Posthumus or Purchas His Pilgrimes*, 20 vols. (London, 1625; Glasgow/New York: James MacLehose & Sons, 1905–1907), Vol. XIV, pp. 30–32.

it is, or whereof it commeth." Parkinson considered erroneous the opinions that it was "spawne of the Whale," or "the recrement of long continuance in the belly of the true Whale," or the excrement of certain great fish, or the foam of the sea. The most accepted view was that ambergris was a kind of bitumen, as was yellow amber ("whose . . . Fountains are in the Germane Seas") and "therefore have both one name of Amber, being so neere one to another in their originall." In Parkinson's opinion, the best ambergris had an odor "most neere unto dry cow dung." The black was the worst kind. Hot and dry in the second degree, ambergris warmed, resolved, and strengthened. It lessened epileptic seizures, warmed and comforted aged persons, and was "accounted conducible to venereous actions."[29]

Alonso de Ovalle, a Chilean Jesuit, was less dogmatic when writing of the whales along the western shores of South America. There large amounts of ambergris were found floating on the sea, and only recently had the Araucana Indians learned from the Spaniards to search for it on the shores. "Though it is known that amber is a thing which whales cast from them," some thought "this noble product" was formed at the bottom of the sea or on rocks and eaten by whales, who then cast the offending material from their stomachs "because it is naturally extremely hot." Others thought ambergris was the whale's excrement. Ovalle concluded; "It is not my business to decide this dispute." Grey ambergris was best, while the yellow and black varieties had "not so sweet a smell as the grey." Ovalle had heard reports that the difference in color and odor depended only on the amount of exposure to the sun. He himself had observed that black ambergris did in time turn white by being "exposed to the sun in a box." The change became more manifest when the black ambergris was exposed to both sun and rain. The harshness of the odor of black ambergris could be remedied by infusing it with rose water, exposing it to the dews for nine days, and then heating it.[30]

In 1666 Justus Klobius published a work devoted entirely to the problem of the origin of ambergris. He examined the written descriptions of scholars and travelers and came up with eighteen different opinions: ambergris is (1) not natural but artificially made, (2) sea foam (*spuma maris*), (3) the liver of a certain fish, (4) the sperm of whales (*sperma ceti*), (5) the fruit of trees growing under the sea, (6) a species of camphor, (7) a species of naphtha, (8) a gum, (9) a form of sea fungus, (10) a precious stone, (11) genuine native sulfur, (12) soil (*terra*), (13) a fruit growing on the beach, (14) the bituminous discharge of a fountain in the sea, (15) *succinum* (electron), (16) the excrement of a whale, (17) the refuse of whales (*recrementum Balaenae*), and (18) the aromatic dung of an East Indian bird.

Of these, Klobius espoused the last view, that ambergris was the dung of a bird called *aschibobuch* by the inhabitants of Madagascar and *anacangripasqui* in the Maldivian language. He included an illustration of a native catching in a basket the dung as it was voided by a bird about the size of a goose with a large and tufted head. Klobius was also inclined to accept the opinion that ambergris was the excrement of a certain species of whale, but he could not fully accept this origin because ambergris was not found where there were such whales in other seas. Klobius's illustration was based on the description André Thevet gave in his *Cosmographie*. Thevet's statements, translated by Klobius, recall the lengthy

[29]John Parkinson, *Theatrum botanicum: The Theater of Plants* (London, 1640), pp. 1565–1566.

[30]Alonso de Ovalle, *Historical Relation of Chile (Historica relacion del reyno de Chile*, 1646), in John Pinkerton, *A General Collection of the Best and Most Interesting Voyages and Travels in all Parts of the World*, 17 vols. (London, 1808–1814), Vol. XIV, p. 75.

Figure 1. *The theory of the origin of ambergris espoused by Justus Klobius, following André Thevet. Illustrated are the large birds that produce dung and the three odorous sources of their food. From Justus Klobius,* Ambrae historiam *(Wittenberg, 1666). Courtesy of the History of Science Library, Memorial Library, University of Wisconsin—Madison.*

descriptions of Barbarosa and Lopes de Castanheda, based on the same tales. Thevet describes these birds as big as geese, green with brown-black markings, with tufts of feathers on large heads. The dung voided by these birds on the rocks, purified by exposure, became ambergris; in storms it broke off the rocks and washed into the sea. The three kinds are called *Porabat* (the best and freshest), *Puabar* (second rate and longer in the sea), and *Minabar* (black, unpleasant smelling, and regurgitated by whales). The odor of good ambergris was caused by the food which the birds ate: poisonous fruit from a tree called *Assaragaoni*, odorous insects as big as grasshoppers called *Lorpin*, and an aromatic substance sucked out from a protrusion under the belly of an animal called *Aldafarca*.[31]

The seventeenth century also saw relatively systematic attempts to collect new information. About 1667 the Royal Society of London sent a series of thirty-eight inquiries to Surat, India, and other parts of the East Indies, proposed from the statements found in Purchas, Linschoten, and other travelers' tales. Number six asked: "What is the opinion of the more Inquisitive Men in those parts of Ambergris? And whether the greatest quantities and masses of it are found about the Isle of Mauritius?" In 1686 a member of the Royal Society "brought in two shells or

[31]Justus Klobius, *Ambrae historiam ad omnipotentis dei gloriam, et hominum sanitatem* (Wittenberg, 1666). See esp. pages 41–42 for the citation from Thevet. Klobius also referred the reader to the *Cosmographie universelle* of Franciscus Belleforesti.

substances resembling small beaks of birds found in ambergris." The English physicist Robert Hooke "thought them to be the shells of some insects, as the *Scarabaeus nasicornis*." In September 1673 the English physicist and chemist Robert Boyle, who had unsuccessfully made "several tryals and observations . . . about *Amber Greece*," forwarded to the Royal Society an extract from a journal (1672) written, not by a "Philosopher to broach a *Paradox*," but by a merchant or factor in the Dutch East-India Company as advice which could be economically beneficial to his superiors, "and on that score Credible." The journal advised that ambergris was not the scum or excrement of a whale but the fat, tough gum broken from the roots of a tree near the sea by its own weight and the sea currents.[32]

One theory that achieved currency at this time was put forward in 1672 by Jean-Baptiste Denis, councilor and physician in ordinary to the king of France, who asserted that ambergris was "a mixture of wax and honey, gathered upon the sea-coasts by the bees," but dropped into the sea, where it underwent the familiar transformation into ambergris. The theory that ambergris was "nothing else but a Mass of Honey-combs that fall from the Rocks into the Sea" also drew the support of the French botanist Pierre Pomet (d. 1699) in a work on materia medica (1694). He admitted that this view would surprise many, but a friend had assured Pomet that he had seen a piece that was half ambergris and half wax. Also, when ambergris was dissolved in spirit of wine, what remained was a substance entirely like honey. He cautioned against fictitious ambergris composed of other substances. The famous French chemist Nicolas Lemery (d. 1715) likewise remarked, in his well-received *Pharmacopée universelle* (1697), that "of late it seems to be universally agreed" that ambergris was made of honeycombs. Experience confirms this, for several persons had seen pieces of ambergris that were half plain honeycomb while others had broken open pieces of ambergris and found honeycomb and honey. In an earlier work Lemery had categorized both ambergris and amber as types of bitumen; he now considered amber to be a vegetable resin.[33]

This theory was singled out of special criticism by Englebert Kaempfer, the physician to the Dutch Embassy at the court of the Japanese emperor in 1690–1692, in his history of Japan. In "Some Observations Concerning Ambergrease" he reviewed the prevailing theories of origin—bituminous substance, earth or clay, sea sponge, excrement of the whale, or dung of birds. To mention more would be tedious. On the basis of his investigations with Chinese and Japanese whalers, Kaempfer discarded Denis's opinion as a "groundless conjecture." In the countries where ambergris was found, there were no bees on the sea coast, and no ambergris was found on the coasts of countries where bees abound. None of his informants had ever seen bee hives "sticking to rocks under water," and honey,

[32]"Inquires for Suratte," *Philosophical Transactions of the Royal Society*, 1667, *2*:415–419; Robert T. Gunther, ed., *Early Science in Oxford*, 14 vols., Vol. VII (Oxford, 1930; London: Dawsons, 1968), p. 691; "A Letter of the Honorable Robert Boyle . . . concerning Amber Greece," *Phil. Trans.*, 1673, *8*:6113–6115.

[33]"Dissertation touchant de nature et l'origine, tant de l'Ambre gris que du jaune," *Le journal des scavans*, 1672, *3*:224–225. In 1595 Abu-l Fazl, informal secretary to Akbar, had proposed that ambergris might be beeswax (or the excrement of some marine animals, the dung of the "sea-cow called sara," or sea foam); Yamada, "Short History," (cit. n. 6), p. 21. Pierre Pomet, *A General History of Druggs* (London, 1736), pp. 272–274; comments from Lemery's *Pharmacopée* are included in this edition. Pomet considered yellow amber to be bituminous in origin; p. 384. For Lemery's earlier ideas see Nicolas Lemery, *A Course of Chemistry*, trans. Walter Harris (London, 1677), pp. 216–220.

wax, and honeycombs would dissolve and separate when mixed with a liquid. Besides, there were various kinds of ambergris, while honeycombs were homogenous. Also, fresh ambergris was soft and nearly resembled cow dung. It had a "sort of burnt smell, which is quite foreign to any melleous substance." Ambergris also often contained black shining shells (*Sepia* mandibles) and fragments of other submarine substances and never contained bees, wax, or honeycombs. Also, at times pieces of ambergris were found that were much larger than the largest beehives. Kaempfer himself accepted the opinion "allowed of by those, who have taken pains to examine this substance more accurately," that it was "a kind of bitumen generated in the bowels of the earth" and "carried into the sea," where it undergoes a farther digestion; he did agree with Denis that this was in part accomplished "by the admixtion of [the sea's] saline particles." The worst sort of ambergris was that "found in the guts of the whale, where it loses much of its virtues." Ambergris was very common in Japan, and all kinds of ambergris were called *Kunsurano fuu* or whale-dung. The Chinese, Japanese, and others used ambergris to mix with sweet-scented aromatics because it fixed the odors, which would otherwise soon dissipate. Kaempfer also discussed various forms of spermaceti and *succinum*, or "Prussian Amber."[34]

THE DISCARDING OF MYTHS

Despite competing theories, by the eighteenth century the association of ambergris production with the sperm whale was fairly well established. In 1722 further evidence was submitted to the Royal Society by Paul Dudley of New England. In an essay describing various kinds of whales, the author hoped the society would allow his "poor Country the Honour of discovering, or at least ascertaining the Origin, and Nature of Ambergris." He asserted that it was "now at Length found out, that this *Occultum naturae* is an Animal Production, and bred in the Body of the *Sperma Ceti* Whale," analogous to the aromatic substances produced in a particular cyst or bag of such animals as the musk-hog, musk-deer, or "Bezoar Sheep."

Dudley's information had been received from a Mr. Atkins of Boston, one of the first whalers to hunt for sperm whales, in about 1720. Mr. Atkins reported that "The Ambergris is found only in the *Sperma Ceti* Whales, and consists of Balls of globular Bodies, of various Sizes . . . lying loose in a large oval Bag or Bladder . . . with a Spout running tapering into and thro' the Length of the *Penis*, and a Duct, or Canal, opening into the other end of the Bag, and coming from towards the Kidneys." This bag was full of a deep orange-colored liquor that had the same scent as ambergris, in which one to four balls of ambergris floated. Only about a third of the spermaceti whales taken had ambergris in the bag and whalers were generally of the opinion that only the bull whale produced ambergris. On reading Mr. Atkins's views the Reverend Mr. Prince of Boston thought that the bag was the urinary bladder and that the balls of ambergris were concretions formed of the greasy, odoriferous liquor.[35]

[34]Engelbert Kaempfer, *The History of Japan*, trans. J. G. Scheuchzer (1727), 3 vols. (Glasgow: J. MacLehose, 1906; New York: AMS Press, 1971), Vol. I, pp. 174–175; Vol. III, pp. 292–300. The observations were originally included in Kaempfer's *Amoenitatum exoticarum* (Lemgo, 1712), Fasc. III, pp. 632–638.

[35]"An Essay upon the Natural History of Whales," *Phil. Trans.*, 1725, *33*:256–269. Cf. "Ambergris found in Whales," by a Dr. Boylston of Boston, describing ambergris found in a bag near the genitals of the sperm whale, *ibid.*, p. 193.

Doubts and errors still remained, as the information recorded in various encyclopedias shows. The confusion between amber and ambergris still played a part. Chambers's *Cyclopaedia* of 1728 recorded doubts whether amber was vegetable, mineral, or even animal, but considered Pliny's description of Baltic amber as a resinous juice (*succinum*) from pines and firs to be confirmed by modern observations. (The confusion with ambergris revealed itself in the remark that the opinion that amber was bitumen from a subterraneous spring was being discarded because amber was found at a considerable distance from the sea.) The author of the article on ambergris, listing in eight numbered paragraphs only a selection of the traditional views on its origin, supported the honeycomb theory because some pieces of ambergris had been discovered that were half ambergris and half honeycomb. Samuel Johnson's *Dictionary* (1755) gave yellow amber a "gummous or bituminous" origin and listed all the traditional theories on ambergris. The excremental origin was dismissed because "we have no instance of any excrement capable of melting like wax." The view of Caspar Neumann, professor of chemistry at Berlin and "chemist to the king of Prussia," is also reported: that ambergris was not an animal substance because chemical analysis revealed nothing of that nature. Neumann subscribed to the undersea fountain of bitumen theory; the finding of ambergris in whales indicated only that these creatures had swallowed it. The 1771 *Encyclopaedia Britannica* supported the same theory.[36]

In the famous French *Encyclopédie* of Diderot and d'Alembert several possible origins were cited, including the ascription to bird-dung found in the Maldives and Madagascar, the view that it was formed in a bag in a whale (Dudley), the bee origin of Denis (supported by a long quotation from a manuscript by Formey, Secretary of the Royal Academy of Sciences and Letters of Prussia), and the bitumen origin, presented as supported by chemists (Neumann). For yellow amber both the bitumen origin and a gum or resinous origin were cited.[37]

This attention to the nature and origin of Prussian amber (*De succino Borussico*) eventually led to amber's being completely separated from ambergris. In the seventeenth century Robert Hooke had asserted that yellow amber was nothing but petrified resin, as the research of Thomas Bartholine of Denmark had indicated. In the eighteenth century Mikhail V. Lomonosov (1757), F. S. Bock (1767), and others supported the resinous origin of amber, and finally in the early nineteenth century the research of Johann S. C. Schweigger (d. 1857), a German physicist, firmly established the ancient origin of resinous amber and thus ended two thousand years of debate.[38]

Meanwhile the myths about the origin of ambergris were also being discarded. On 13 February 1783 Sir Joseph Banks read to the Royal Society *An Account of Ambergrise* by Dr. Franz Xavier Schwediawer (Swediaur), a German physician resident in England. The author had examined a large number of pieces of amber-

[36]Ephraim Chambers, *Cyclopaedia*, 2 vols. (London, 1728), Vol. I, pp. 74–75. S. Johnson, *Dictionary of the English Language*, 2 vols. (London, 1755), s.vv. "amber" and "ambergris." For Neumann's views see "De Ambra Grysea," *Phil. Trans.*, 1734, *38*:344–437; for a vindication of Neumann's views by two other chemists, see *ibid.*, pp. 437–440. *Encyclopaedia Britannica*, 3 vols. (Edinburgh, 1771), Vol. I, p. 132.

[37]*Encyclopédie ou dictionnaire raisonné des sciences, des arts et des métiers*, 35 vols. (Paris, 1751–1780; Stuttgart/Bad Cannstadt: Frommann, 1966–1967), Vol. I, pp. 323–326.

[38]Gunther, ed., *Early Science in Oxford*, Vol. VII, pp. 409, 768–786; Patty C. Rice, *Amber: The Golden Gem of the Ages* (New York: Van Nostrand Reinhold Co., 1980), pp. 145–179; J. G. Haddow, *Amber: All about It* (Liverpool, 1892), pp. 29–31.

gris and had not found any "claws and beaks of birds, feathers of birds, parts of vegetables, shells, fish, and bones of fish" as writers on ambergris had reported. However, in all the pieces he had seen he had found a considerable quantity of beaks of *Sepia octopodia* or cuttlefish. From three sea captains of England and Boston he had ascertained that ambergris was found only in the belly of some sperm whales, male and female, and not in any other species. Whalers looked for sperm whales that appeared to be torpid and sickly, for in these they were pretty sure to find ambergris. Such whales often had a morbid protuberance in the lower part of the belly which, when cut open, was found to contain ambergris. The author of this account concluded that "a larger collection of ambergrise in the belly of the whale is a source of disease, and probably sometimes the cause of its death." Ambergris found in the intestinal canal was soft but soon hardened in the air, lost its disagreeable smell, and became greyish.

Schwediawer rejected the view of Clusius that ambergris was "a phlegmatic recrement, or indurated undigestable part of the food collected and found in the stomach of the whale, in the same manner as the bezoars are found in the stomach of other animals." He also repudiated the position of Dudley that ambergris was "a kind of animal production like musk and castoreum." Kaempfer was nearer the truth in describing ambergris as the dung of the whale. Also ambergris was found in both male and female sperm whales and the fresh black ambergris was just as pure and good as the grey variety, the latter achieving its color and pleasing odor upon exposure to the air. The author concluded "that all ambergrise is generated in the bowels of the Physeter Macrocephalus, or spermaceti-whale, and there mixed with the beaks of Sepia Octopodia, which is the principal food of that whale; and we may therefore define ambergrise to be preternaturally hardened dung or faeces of the Physeter Macrocephalus, mixed with some indigestible relics of its food."[39]

Thus by the late eighteenth century the origin of ambergris seemed quite firmly established. In 1820 the French chemists Joseph-Bienaimé Carentou and Pierre-Joseph Pelletier isolated ambrein in ambergris. However, as late as 1896 an article entitled *Mystery of Ambergris* appeared in the *Scientific American Supplement*. The unidentified author wrote that "trustworthy facts relating to this most interesting and singularly valued product are few and far between." He considered that ambergris was "now ascertained beyond a doubt to be generated by the large headed sperm whale and is the result of the diseased state of the animal." Several modern scientists agreed that "the disorder is akin to the now fashionable human peril, appendicitis," primarily caused in the whale by the irritation of the indigestible cuttlefish beaks.[40]

Today, after a thousand years of conjecture and speculation, the story of the search for the origin of ambergris still has not been fully concluded. A modern authority on whales, E. J. Slijper, can still write that "the whole nature of ambergris is shrouded in mystery to this day." He questions the assumption that the substance is the result of disease and concludes that "ambergris may well be comparable to the intestinal stones of otherwise healthy terrestrial animals," and therefore the "pathological product of an otherwise normal intestine."[41]

[39]"An Account of Ambergrise," *Phil. Trans.* 1783, *73*:226–241. Cf. "On the Production of Ambergris," *Phil. Trans.*, 1791, *81*:43–47.

[40]*Scientific American Supplement*, 21 Nov. 1896, *1090*:1427–1428.

[41]E. J. Slijper, *Whales*, trans. A. J. Pomerans (2nd ed., Ithaca, N.Y.: Cornell Univ. Press, 1979), pp. 292–293.