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Coconut "Stones" or "Pearls": Early Descriptions by Alzina, Kamel and Rumphius

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The coconut palm yields so many useful products that it is justifiably referred to in some cultures as the "Tree of Life." If their origin from *Cocos nucifera* L. could be established with certainty, so-called "coconut pearls" would undoubtedly qualify as the most exotic in the long list of coconut palm products and uses. There are relatively few published reports on coconut pearls, however, and most of the more recent of these express considerable doubt as to whether authentic ones really exist. Only one of the standard recent books on coconut to which I have had access even mentions coconut pearls. In *Coconuts* by Child (1964), there is a single page in an appendix that essentially dismisses the pearls by stating they are "actually derived from *Tridacna* species, a group of bivalve molluscs." Child further states that "The story seems (like so many legends) to be traceable back to Rumphius, who in 1741, described the pearls"

Some years ago, without ever having seen Child's book or having been aware of any doubts on the part of others as to their authenticity or coconut palm origin, I read about "coconut pearls" and my curiosity was aroused. When I asked Hal Moore about them, he told me that he knew virtually nothing about coconut pearls and encouraged me to investigate the matter fur-

ther. Sporadically and as circumstances have permitted, I have done this and will probably continue to do so. Because Hal was a perfectionist and had a zest for completeness and an appreciation for what might be called "the comprehensive approach," I am certain that he would have been pleased to be brought up to date on the details as they surfaced. Because the precise facts are important to the overall case but occasionally can become tedious even to the most dedicated and interested reader, and because, in my view, it will be some time before definitive conclusions can be drawn, my intention is to present in parts what is known about coconut pearls. In short, the case will be built "piecemeal." The work is dedicated to Hal's memory as a small token of my appreciation for the friendship, help, and encouragement he extended me since our first meeting at Cornell University in 1959.

In this first paper, by far the greatest attention will be given to the description of coconut "stones" as given by Rumphius, the distinguished 17th-18th century naturalist who spent many years on the island of Amboina, one of the so-called "Spice Islands" [part of modern-day Indonesia]. But before this is done, it is appropriate to note that Rumphius was perhaps *not* the first European to know about co-

conut stones or to comment on them. Coconut stones are clearly described by Father Francisco Ignacio Alzina, S. J. (1610–1674), a Spaniard, in an unpublished manuscript of some 370 folio pages dated 1668 on the people and natural resources, etc. of the Visayas (Philippines) entitled *Historia Natural del Sitio, Fertilidad y Calidad de las Islas, é Indios de Bisayas* (cf. De Backer, De Backer and Sommervogel 1890, p. 260). A part of this manuscript, in English translation, "On the Palms which are Called Cocos and their Great Usefulness", was published as recently as 1931 (Alzina 1931). The specific quotation on coconut "stones" is given in its entirety.

"The white and spongy apple, which is agreeable and sweet in taste, is called *buay* or *boa*. It is eaten with relish and not infrequently there is found within it (I have seen several) a white stone, more or less like a piece of crystal, of the size of an olive, some round, others elongate, and several pearl-colored, although not so fine. This stone is called "sangur" or "mutia", which is the common term for any precious stone. Certain virtues are ascribed to it; I have never verified such claims, although I have many of these stones in my possession; I do not relate them as they are just stories, *but not so is the finding of the stones* [italics mine]" (Alzina 1931, p. 438).

Because Alzina's work was never published, it seems fair to say that it could not have had much circulation or have attracted a great deal of attention. Although I have not seen a copy of the manuscript in Spanish, it appears that the English translation should in no way be suspect since it was translated by one Leopoldo B. Uichancos from a transcription of the

original Spanish by a Rev. Miguel Selga, S. J. Moreover, mention is made of the verification of the translation by Father Selga. Several readings of the translation of the section on coconut leave no doubt in my mind that Father Alzina, who had been in the Philippines since 1632 or thereabouts, was a keen and perceptive observer of nature and I find it difficult to interpret the specific statements on coconut stones as anything but corroboration of their existence by a reliable eye-witness. Unfortunately, no easily interpretable or precise information on the biological origin of the coconut stones is provided. I find it impossible, from Alzina's description, to know precisely what he meant by the not infrequent presence of stones *within* the white and spongy apple. Since the white and spongy apple refers to the haustorium (technically the cotyledon) or absorbing organ of the germinating embryo, one can be certain that it is somehow associated with coconut stones but details are obscure.

Another writer who pre-dated Rumphius a bit was Georg Joseph Kamel, S. J. (1661–1706). (Incidentally, Linnaeus named the genus *Camellia* in his honor.) Kamel was sent to the Philippine Islands as a missionary, arriving in Manila in 1688 and remained there until his death in 1706. Kamel was very knowledgeable in matters of pharmacy, medicine, and botany, and it is clear that he was a careful and accurate observer of the world around him. The distinguished English naturalist John Ray (1628–1705), one of several "professionals" who very much appreciated and admired Kamel's botanical work, invited him to contribute to his *Historia Plantarum*. Kamel wrote three parts or "books" on the Philippine flora but for reasons that we need not be concerned with here, only the first and third were pub-

lished by Ray in 1704 and these as an appendix to the third volume of his monumental *Historia Plantarum*.

The first "book", bearing the title *Herbarum Aliarumque Stirpium in Insulâ Luzone Philippinarum Primariâ Nascentium, A Revido Patre (sic) Georgio Josepho Camello, S.J. Observatarum & Descriptarum Syllabus: Ad Joannem Raium transmissus*, comprises some 42 pages. The second part of the appendix (actually Kamel's second "book") comprises 53 pages and appears under the title *Descriptiones Fruticum & Arborum Luzonis, A Revido Patre Georgio Josepho Camello, S.J. ad Jacobum Petiverium, Pharmac. Londinens. Missae, Anno 1701*. On the first page of this latter part of the appendix, in the course of a detailed description of the coconut entitled *De Palma Coccifera, seu Nuce Indica, Indis Lubi [Concerning the Palma Coccifera, or India Nut, Lubi of the Indians (Native Filipinos)]* may be found Kamel's comments on coconut "pearls." Since they are not extensive, they are presented in full.

"Fallen from the tree and now altogether ripe, the nut generates into the floating watery liquor *Butung*, a sphere which is spongy, shining white, light and very sweet, the *Buay*, *Bua* and *Tambong niog* of the Indians [Filipino natives]. In this *Bua* is found a stone, commonly round, and resembling a cheaper pearl in color and quality, called *Mutiang* and *Sangur* by the natives, which they wish to impute with various potent virtues. Of the seven which I have seen and which I had, more were equal to medlar."

[Decidua, & jam omnino matura *Nux*, aqueo liquori *Butung* innatantem spongiosam, candidam, levem & valde dulcem sphaeram, Indis *Buay*, *Bua*, & *Tambong niog*, in hâc

Boa (sic) multoties lapis, communiter orbicularis, colore & laevore viliozem mentiens margaritam, Indis Mutiang, & Sangur dictus reperitur, quem variis pollere virtutibus volunt. Horum ex septem quos vidi, & habui major par erat Mespillo (Kamel in Ray, 1704, volume 3, Appendix p. 43).]

The following conclusions may be drawn from Kamel's account. Although it is too short to provide as much detail as I should have liked, Kamel seems to have made his own observations. Unfortunately, it is not possible to state categorically that he, himself, ever found a coconut "pearl" *in situ*. But, there is nothing to suggest that he drew his account from Alzina, or that what he wrote was "hearsay." Like Alzina, Kamel seems to think the pearls are somehow derived from or associated with the apple or haustorium. Indeed, he clearly states in *this Bua [haustorium] is found a stone*. He seems to be the first to draw the comparison between a coconut stone (lapis) and a poor quality pearl (margaritam). There is no doubt that Kamel, like Alzina, was very skeptical of the alleged magical qualities of the stones. Of special interest is the fact that at the time of his writing, sometime before 1698, Kamel had only seen seven "pearls." Since he arrived in Manila in 1688, it means that in a 10 year period Kamel had encountered relatively few coconut "pearls." Alzina had seen several in a 32 year period and he likened these "white stones" more or less to "a piece of crystal." As far as Kamel was concerned, however, the stones were more like medlars [major par erat *Mespillo*]. One cannot be certain to which "medlar" Kamel refers but Theophrastus states "there are three kinds of *mespile*, *anthon* (oriental thorn), *sataneios* (medlar) and

anthedonooides (hawthorn) as the people of Mount Ida distinguish them. The fruit of the medlar is larger, paler, more spongy and contains softer stones; in the other kinds, it is somewhat smaller, more fragrant and of more stringent taste, so that it can be stored for a longer time" (Theophrastus, *Enquiry into Plants* III. 12, 5-6). Medlar, as we know it today, *Mespilus germanica* L. (Rosaceae), is a fruit so hard that it would have to be allowed to virtually rot before becoming edible. Be that as it may, anything *mespilus*-like would presumably involve or connote something tiny and very hard but not like a "real" rock or stone.

Although Alzina and Kamel provide rather cursory and brief descriptions of coconut "stones," Georg Eberhard Rumpf (1627-1702) gives a much fuller account. Rumphius (the Latinized form of his name) spent some 49 years (from 1653 to 1702) in the town of Ambon on the island of Amboina in the Moluccas, in the service of the Dutch East India Company. He was so respected that a German learned academy bestowed upon him the title of *Plinius Indicus* [*Pliny of the Indies*]. The story of his life, which deserves to be related in much greater detail than can be done here, is at once a series of achievements and personal tragedies (cf. Merrill 1917, Sarton 1937, DeWit 1952, 1959). Despite loss of his eyesight in 1670, Rumphius continued his studies first with the aid of his wife, and then later with his son and other assistants made available to him through the Company. The two greatest works of the "Blind Seer of Ambon," the results of years of painstaking labor attended by all sorts of difficulties, frustrations, and mishaps, remained unpublished in his lifetime. His magnum opus, although entitled *Herbarium Amboinense, Plurimas compectens Arbores, Frutices, Herbas,*

Plantas terrestres & aquaticas, quae in Amboina, et adjacentibus reperiuntur insulis, . . . [*Het Amboinsche Kruid-Boek . . .*] [*An Amboinese Herbal . . .*], was in fact a very detailed flora of the entire Dutch East Indies. It comprised twelve "books" and was published eventually in six big folio volumes between 1741 and 1750 in Dutch and Latin translation in parallel column format. In 1755 a so-called *Auctuarium* (or final gift) or addendum volume was also published. The entire work numbers over 1,660 printed pages and some 699 full-page engravings of plants appear in the work (Rumphius 1741-50; 1755). The *Herbarium Amboinense* is rightly considered the first and most thorough treatment of the flora of the Eastern and tropical world and even today is of great interest and usefulness (Merrill 1917, DeWit 1959).

Because it is much shorter, and although it reached Holland much later than the *Herbarium*, Rumphius' *D'Amboinsche Rariteitskamer . . .* [*Amboinese Cabinet of Rarities or Curiosities*] was first published in Dutch in 1705. Second editions in Dutch appeared in 1740 and 1741. Rumphius' remarks on coconut stones are, for all practical purposes, the same in both the *Herbarium* and the *Rariteitskamer*. In the *Herbarium Amboinense*, the relevant passages are found in Book I, Chapter 3, pages 21-24. In the *D'Amboinsche Rariteitskamer* editions to which I have had access (1705 and 1741), the description appears in Book III, Chapter 68, pages 319-322. Whereas no illustrations of coconut stones are provided in the *Rariteitskamer*, stones are shown on plate II facing page 16 in volume I of the *Herbarium Amboinense*. Since the *Amboinese Cabinet of Rarities* was published first (although it was written later), and is more detailed, it seems desirable to provide that version in

translation here. But to supplement it, the illustrations from the relevant plate in the *Herbarium* are included. Unfortunately, the original watercolor illustrations intended for the *Herbarium* executed by Rumphius himself or drawn under his direction were lost in a fire in 1687 so they had to be prepared again. Because it would have been prohibitively expensive to issue the work with colored plates, Johannes Burman (1707–1779), Doctor of Medicine and Professor of Botany at the University of Amsterdam, the person granted permission by the Dutch East India Company to assume the task of preparing the *Herbarium* for press, had to have the manuscript drawings copied as etchings for conventional reproduction. Since DeWit (1959, p. 11) states that this inevitably involved the loss of much of their charm and some details, I have taken the trouble to obtain both color and black and white photographs from the *Herbarium Amboinense* manuscript, which is in the Department of Western Manuscripts, Bibliotheek der Rijksuniversiteit te Leiden. Although it is not possible to present here the coconut “stones” in

color, a comparison of the black and white etching-derived illustrations to the “originals” in the manuscript show that a good level of fidelity had been achieved.

Translation of the complete original Rumphian Dutch text follows. Every attempt has been made to retain the original style and flow but, understandably, it has been necessary in places to translate freely so as to render the text intelligible to the modern reader. Even so, the device of annotating some of the more unusual parts of the text with commentary (indicated by superscript Arabic numerals) has been used. These notes may be found at the end of the article on page 119. Words in brackets [] either give the precise Dutch word used or are meant to explain the word a bit further.

Chapter 68 is entitled *Calapites*, a Latinization of the word for coconut [stone] in various Malay languages, *kélapa*, *calappus*; *Klapsteen*, the Dutch word for coconut stones based on *kélapa*; and *Mestica Calappa*, the Malay words for magic stones or precious jewels from the coconut.

CHAPTER LXVIII

Calapites. *Klapsteen*. *Mestica Calappa*.

The *Calappus* stone is partially described in Book I, Chapter III, of our *Amboinese Herbal* [*Het Amboinsche Kruid-boek*] in the “History of the *Calappus* tree”, but will be fully described now. It belongs to those stones which Pliny calls *Dendritides* in Bk. 37, Chap. II.¹ Indeed Pliny includes there numerous types of stones, many of which one can find in these Easterly Islands and in almost all kinds of fruits and trees.² Following Pliny’s model, I have given each one a specific name. It is to be believed that these stones are formed from stone juice [steen zap] which is drawn up by trees and fruits from the ground, where it is concentrated and makes the noblest *Gemma* or rare small stone, which as has been frequently mentioned, is called by the common name of *Mestica* or *Mostica* by the Malays. The best known and most widely used from trees and fruits is the *Calappus*-stone, in Latin *Calapites*, and in Malay *Mestica Calappa*. It is a small white stone which is often taken to be an alabaster pebble. However, the *Calappus*-stone is lighter, does not sparkle, does not have the odor of rocks,³ and several other properties, which separate it from other stones. Divided in long and round: the long ones have the appearance and size of a dove or some other type of bird heart, sometimes also of a lizard egg, thicker on one end with a dark small crown like a tooth which has come out, which is the root, with which it has been connected to the shell [schaal, endocarp] or *Tampoerong*. However, some lack this little crown, which is a sign that they already have become disconnected from the shell and floated loosely in the water, which is similar then to the lizard egg. On the other and smaller end, which slopes like a blunt cone, they

are the clearest and on top with a shining spot like a brilliant sun, which is revealed when one holds them up against the light, and when they lack this brilliance they are considered to be dead [dood].

The *Calappus*-stone is sometimes completely round, like a large pea, sometimes lentil-shaped; as large as a flat fenugreek, surrounded by a small band. These grow in the little apples [appeltje, the haustorium] which one finds in the old *Calappus*-nut, and when they fall off [the little apples] they float loose in the water. Both are pure white, the first type milk-white, the second with slight blue tinge, and sometimes translucent on the edges, because they are all opaque [donker] in general. The round ones also have [p. 314 of the original] on the clearest and raised side the little white sun [brilliance]. On both, one sometimes can notice very small and tiny cracks, which are shallow and do not make the stone any the more fragile. Because the stone grows continually in a moist substance like the innermost cavity of a *Calappus*-nut, so it is to be expected that when the stone encounters dry air, small cracks will develop, [and], which one can also see in the *Umbilicus Marinus*,⁴ when one cuts off the same fresh from its animal. How they grow in the *Calappus*-nuts I learned from an eyewitness, a warrant officer [Faandrig], who was sent to the South East Islands in 1672, who opened there a *Calappus*-nut, mature in the kernel [pit] but not hard, and noticed a small red spot sticking out a little bit beyond the flesh, where there were two small white flat stones, which were still connected to the shell. The natives said that if the *Calappus*-nut had remained on the tree two months more, the little stones [Steentjes] would have ripened and become hard.

One does not find these in the Amboine Islands, although thousands of old nuts are opened there to burn oil. However, many are brought from Ceram's northern coast where they are grown according to the natives in their *Calappus*-nuts, which I doubt, because I met no one who had found them there himself. Most are found on Celebes and Makassar, the land of the *Boegis*, *Cajeeli*, and on *Boëton*. It appears that these lands have a property, which stimulates more stone-sap in their fruits and trees than occurs elsewhere, and therefore also most of the *Mesticæ* come from these places.

The proof for these stones is mostly made with strong vinegar or lemon juice. When one puts a little of it in the palm of the hand, then places the *Calappus*-stone in it, then it should quickly boil or send up bubbles all around it. Those which don't are considered inferior or dead. I have rejected this proof frequently, because the stone loses its gloss and is left with a dead color, even if washed with water immediately. The same happens to all weak, dark and porous stones, where the vinegar or lemon juice penetrates the pores and drives out the enclosed air, causing the bubbles, like the *Lapis Victoralis* or *Astroites*⁵ in Europe which acts the same in vinegar. The second test is the following. When one places the stone on a mat and places rice or *Pady*, then no fowl will dare to eat a single grain, as long as the stone is there. However, I had no luck with this. Had I not removed the stone, the fowl would have eaten it with the rice, and I was under the impression that I had a real stone. The third proof, which I heard from an old Malabar *Empiricus*⁶ is even more unbelievable. When one ties the stone to the trunk of the *Calappus*-tree, all the nuts are supposed to fall off the tree. I did not try it.

Pliny ascribes in the above-mentioned reference his *Dendritis* the property that when buried under the root of a tree which one plans to cut down, the axe will not become blunt.⁷ One might give it a try with the next *Dendritis*. The oblong *Calappus*-stone is also very similar to the *Chamites* of the first sort [according to v. Martens 1902, pp. 124–25 *Tridacna gigas*], but can be differentiated in that the *Chamites* commonly have a pearl-like reflection but not the little sun; it also cooks more slowly and less in lemon juice than the *Calappus*-stone. With time the *Calappus*-stone becomes dull, dirty white and dead of color, which need to be cleaned up by this method. One places it for half-a-day in the water of a young *Calappus*, and rubs it with the liplap⁸ [soft endosperm] or washes and rubs it in water in which rice one wants to cook has been washed.

The *Calappus*-stone is considered among the most important *Mesticæ*, which are worn for good health or good luck and for many other purposes [p. 321] which the natives ascribe through superstition and imagination, such as being lucky in commerce, in making gardens, and in protecting someone in war. The latter has no chance, because what does the peaceful Jupiter,⁹ under whom this tree belongs, to do with the war-god Mars? Better reasons include those who use it to break fevers, when one places it in water and then drinks it to put out the feverish fires. Also with water rubbed on a smooth stone and placed in the eye heals the overheatedness of the person. The most beautiful and most round ones are set in silver rings, because it will not stay in gold.¹⁰ The largest are hung on krisses [daggers]¹¹ also closed with silver hoops. The *Malabars*¹² also make ear-rings, worn by the women, set in gold, however, in which they do not remain as clear as in silver. One can buy it for a Rijksdaalder [crown], although the round ones and sparkly ones cost more.

In February, 1691 a young lady came to me, who had opened an old *Calappus*-nut, which was grown on Baguala. On the shell or *Tampoerong* and under the outermost husk [bolster] she discovered a *Calappus* stone, not placed in the eye but on one of the sides of the *Tampoerong* in a shallow hole. In color and substance it was the same as other *Calappus* stones, but it differed in appearance. It was the size of a dubbeltje ["dime"]¹³ and had the appearance of a flat heart, flat on the underside, raised on the top side and with a small hole, in which one could observe something like a small fiber of the husk. On one of the corners a small chip had fallen off, under which was a small bristle [quastje]. The young lady had put it in vinegar, in which it cooked and moved, but because of this it lost some of its lustre.

CHAPTER LXIX. *Dendritis Calapparia*

Another kind of *Dendritis* from a *Calappus*-tree was found on Ceylon in the wood of the trunk of this tree, which had been hit and felled shortly before by lightning. The following day two Dutch [Duitsche]¹⁴ officers passed by with their slaves. The slaves walked to the tree to take out the cabbage [palmyt] from the crown, when they discovered this stone in the trunk. It was readily accepted that it must have grown right there, because it was tightly enclosed by the wood. They gave the stone to their master the captain, who gave it to me in Amboina. This little stone was round with slight unevenness, as big as a black cherry, hard and smooth as a pebble, not translucent, yolk-yellow in color, on which were located many little white eyes or circlets, inside with a yellow area, some large, and some small, as if they were painted. The uppermost eye was the largest, and had within it another dark ring, like the iris of the eye. Some of the other eyes ran over each other, some were also completely white, the sort of circlets one almost sees on a kind of *Lapis Victoralis* or *Astroites*. On one side one saw a white spot, without color [literally: dead of color], where one suspected that it had been hit a bit by lightning. (The captain told me that the Sinhalese told him that such stones were found from time to time in the *Calappus*-wood. However, they could not produce one, nor point one out, although he then was serving as the Dessave, that is the local governing official and exercised authority over these people. His guess was [p. 322] that they had them, but were not showing him, because that nation like so many other Indians held these rare *Mesticæ* to be very valuable and wore them for good fortune, especially in war, which I could accept to some extent, should he have been able to protect his trees against lightning. However, the expression goes: When more comes, less has to give way (*Als meerder komt, moet minder wyken*). I have not heard or seen any more about these stones in these Easterly areas. [The one I received] was set in a ring in 1682, and sent with my other rarities to the Duke of Tuscany with the name *Dendrites Calapparia*.¹⁵ I was not willing to test it in a vinegar or lemon juice because I did not want to affect its shine. But at night, when I hit it against a crystal of agate it sparked only a little, like all hard *Mesticæ* which are entirely or partially translucent.

The entire quotation should go far towards setting the record straight as to what Rumphius said about *Calappus* stones. Even so, a few comments are in order about his style or approach to the coconut stone "problem." There should be no doubt that Rumphius, characteristically, was meticulous and painstakingly precise in his description of the *Calappus*-stones. This was very unusual for most scientists of the day in Europe, much less an investigator working under difficult conditions in the tropics. He makes no pretense of having found them himself but he does take pains to corroborate hearsay or to seek out eye-witnesses (cf. page 112). Rumphius categorically

rejects the existence of stones in coconuts grown in the Amboinese Islands. Even if they are rare, he reasoned, surely one could anticipate their discovery since thousands of coconuts were being opened for oil to burn in lamps, etc. He similarly seriously questions their being found on Ceram's Northern Coast since he "met no one who had found them there himself." At the same time, Rumphius goes on to state that "most are found on Celebes and Makassar." Does this not suggest that he, personally, had been satisfied as to their origin by one means or another? One would think so except for the fact that Rumphius repeatedly questions and doubts the var-

ious "proofs" of authenticity. I get the feeling he is troubled by the failings of these tests. In the presence of citric or acetic acids found in lemon juice and vinegar, respectively, carbon dioxide gas was emitted—i.e. the pearls "boiled" and "sent up bubbles." The dissolution of carbonates in acid, resulting in the loss of the luster, was beyond Rumphius but he did conclude the test could not have anything to do with their being "dead." He does not seem to accept anything on face value. His critical attitude is apparent throughout. To counteract his suspicions or his latent doubts, Rumphius seems to have encountered situations

which were close enough at hand to neutralize or even overcome most or all of his reasons for skepticism. The description of the young lady who came to him in 1691 with a *Calappus*-stone complete with a small coconut husk fiber (cf. page 113) is a case in point.

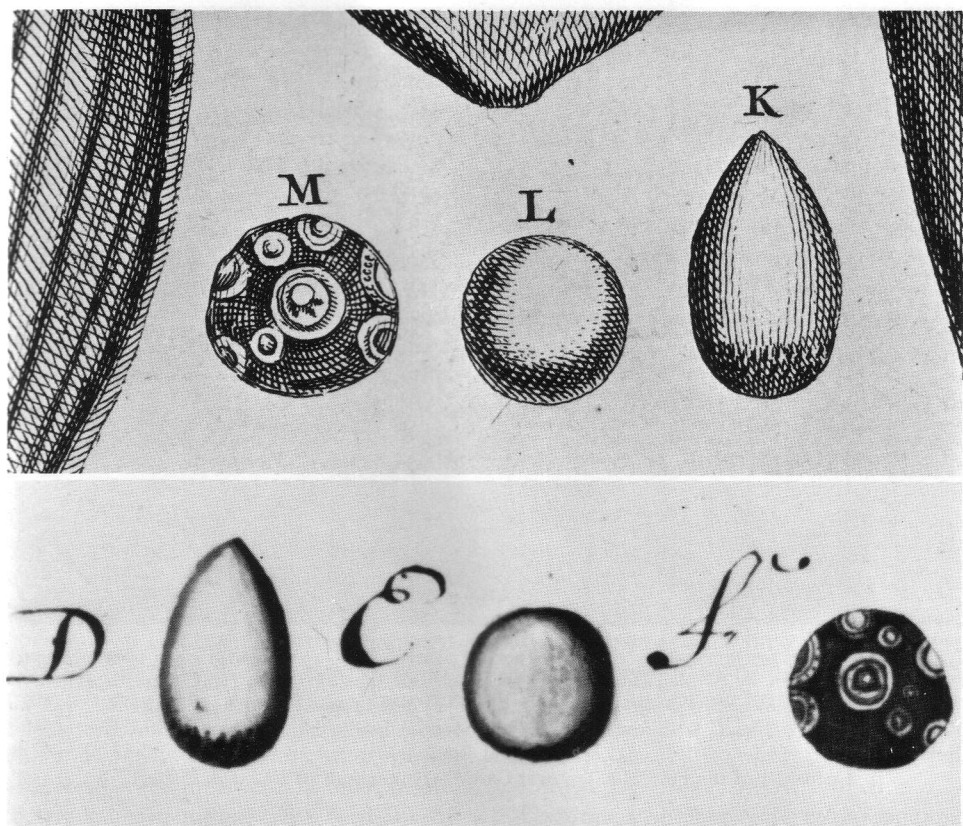
It is particularly significant that Rumphius states that the stones called *Chamites* [from "Chama" species, including the giant molluscan *Tridacna gigas* L. in modern nomenclature] are different from and can be distinguished from real coconut stones. He writes the following about *Chamites*:

"In the *Tendo*, or the band or the encircling *Spondylo*, sometimes are found several pretty little stones [steentjes] very similar to the stone *Calapites* or *Calappus* taken as alabaster. Some are clear white. Some are dirty or yellow-white. Some have a pearl-like reflection, and translucent like agate on one corner. They can be distinguished from the *Calappus* stone by the fact that the *Calappus* stone is smooth and egg-shaped like a salamander egg, commonly with a dark corner, which is the root [wortel] with which it has been attached to the cap [dop] of the *Calappus*. Or, it can be lentil-shaped, like the one found in the little apple [haustorium]. In contrast, these shell-little stones [Schulp-steentjes], which we call *Chamites*, and in Malay is called *Mesticabiagaru*, are uneven [i.e. not smooth], angular, and mostly yellowish. Few are found in the Amboinese [Islands], but more are located in the Makkassar and Papoea Islands. Even in the smoked *Dendeng* have I found small half-translucent ones. Because, those which are not thicker than a pea, are the clearest and most white. But those with the size of a marble [knikker], are angular and dirty-white. Those who earn a living through fishing and shells carry these stones eagerly on themselves [with them]. However, our Amboinese are somewhat superstitious in carrying these large shells in their vessels across the sea, saying that they otherwise would encounter wind and thunder and lightning. . . [and R. continues with several other superstitions] (Rumphius 1705, p. 128)."

If it turns out that Rumphius is wrong about coconut pearls (*and this is not the place where this will be examined or tested*) it is not, I contend, for lack of ability on his part, or any negligence. He clearly took all due precaution in relating his findings. Child (1964) has no ground to make perjorative inuendo—i.e. ". . . (like so many legends) to be traceable back to Rumphius."

In spite of Rumphius' attempts to provide the reader with an accurate description of how the stones "grow" in the *Calappus*-nut, and despite my own familiarity with the events of coconut floral biology and the growth of

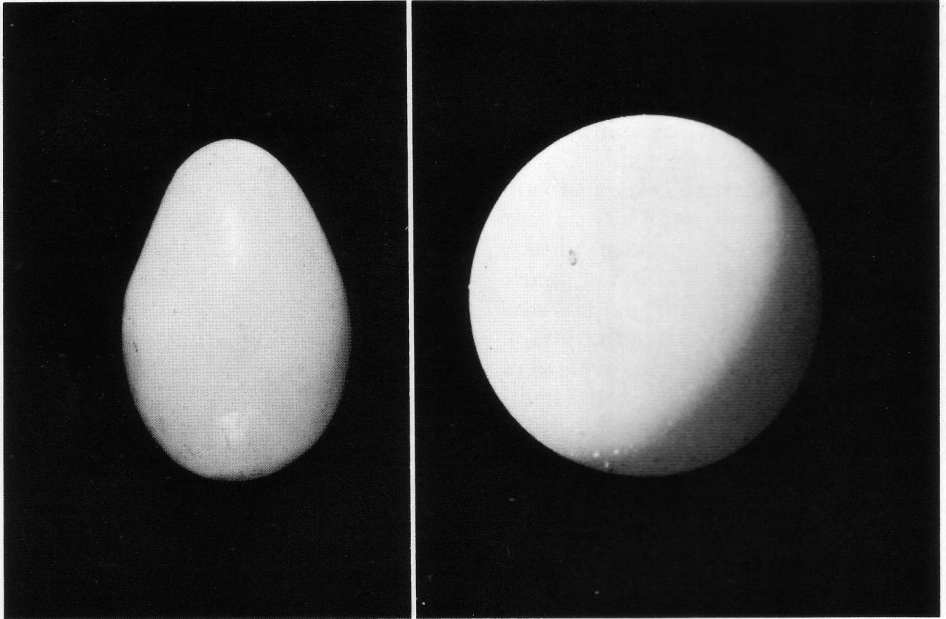
coconut embryos etc., in the nut, I am unable to interpret the text with the degree of precision necessary or desirable to come up with a satisfying explanation. The Dutch warrant officer who "noticed a small red spot sticking out a little bit beyond the flesh, where there were two small flat white stones, which were still connected to the shell" may well have been describing the area of the embryo beneath one of the "eyes." The red spot would in fact be the embryo and I have seen fairly freshly excised embryos of coconut being grown (in the laboratory of Dr. Emerita V. de Guzman, University of the Philippines at Los Baños) aseptic-



1. Upper panel, portion of plate II from the printed version of Rumphius' *Herbarium Amboinense/Het Amboinsche Kruid-Boek* showing K, a "Calappites," or a Calappus-stone from the fruit; L, "Calappus-stone out of its little-apple [haustorium] or its innermost water; M, Dendrites Calapparia, or a Calappus-tree stone, found in the trunk of a Calappus-tree." Lower panel, the original drawing [Shelf Mark BPL 311, Boeck I fol. 29 recto] from which the etching for the above plate was made. Published with the permission of the Department of Western Manuscripts, Bibliotheek der Rijksuniversiteit te Leiden.

ally under *in vitro* conditions and a few were red-pink. My unsubstantiated interpretation of the red color is the presence of anthocyanin pigments that had derived from the oxidation of so-called leuco- or colorless-anthocyanins which can occur in the coconut (cf. Steward 1968, p. 167). Under the circumstances and based on Rumphius' text, that is the best I can do. Unfortunately, it is impossible to do more. The same holds true for the origin of the *Dendritis Calapparia*, or Coconut-tree stone.

Rumphius earned a reputation as an excellent phytographer, or describer of plants. The same may be said of his ability to provide a lucid description of what might be called the "gross morphology" of the stones. The illustrations from the *Herbarium Amboinense* provided in Figure 1 and a comparison with two museum items originally acquired as authentic stones (Fig. 2) underscores how able a describer Rumphius was. One can even see the "little sun" or brilliance on the pear-shaped stone. It has not been possible, and it



2. Photographs of two objects described as "coconut pearls." Left, an alleged stone or pearl presented to the Kew Museum by Sydney Hickson (cf. Hickson 1889, pp. 331-332); right, a pearl, called the "Maharajah", once owned by David Fairchild at the Fairchild Tropical Garden (cf. Fairchild 1943, pp. 124-125). The Kew "pearl" by Crown Copyright, reproduced with the permission of the Controller of Her Majesty's Stationery Office, and of the Royal Botanic Gardens, Kew. The Fairchild "pearl" by courtesy of the Fairchild Tropical Garden (photograph by Dr. Jack Fisher).

probably never will be, to locate the original Rumphius items. In the 1760's, a catalogue was made by Professor Giovanni Targioni-Tozzetti (1712-1783) of all those materials sent by Rumphius in 1682 to Holland and forwarded to Duke Cosimo III de' Medici in Florence. The manuscript copy of this catalogue was published by Professor Ugolino Martelli in 1903. Detailed inventories of objects which undisputably existed at the time of Targioni's catalogue are provided and compared with the Rumphian transmittal letter. But as far back as 1762-1764 Targioni-Tozzetti complained "I have not been able to find these nuclei or *Calappite* stones . . ." (Martelli 1903, p. 162). Therefore, it seems the *Calappus*-stones,

themselves, will have to remain silent on the whole matter.

No heroic effort has been placed on a thorough search of the very early literature to establish whether Alzina, Kamel or Rumphius were indeed the very first to describe coconut stones or pearls. Even so, it does not seem that a more detailed description than that provided collectively by these authors is likely to emerge. In a classic and definitive work entitled "The Book of the Pearl. The history, art, science and industry of the Queen of Gems," Kunz and Stevenson (1908, pp. 78-79) state that "The Raganighantu of Narahari, a Kashmir physician of about 1240 A.D., reported them [pearls] as coming from bamboos, cocoanuts (sic), heads of elephants, bears, ser-

pents, whales, fish, etc., although it is conceded that these were deficient in luster, which is recognized as the characteristic feature of pearls. We understand, therefore, that this use of the word signifies only hard concretions of a spherical form." Upon checking the authority cited by Kunz and Stevenson for this statement, however, I found no mention of pearls from coconuts! The Sanscrit text transliterated and translated into German lists "pearls" as "from the head of elephants, snakes, fish, bears, bamboo joints, marine and fresh water molluscs as well as pearl oysters" but no coconuts (cf. Garbe 1882, p. 75). Dr. Madhav Singh, a visitor in my laboratory from the University of Lucknow, U.P., India a few years ago confirmed the absence of the word for coconuts in the transliterated Sanscrit version. It was not in the German translation either. Clearly, Kunz and Stevenson were mistaken on this point. Since it would not be a profitable venture, no effort has been made to track down manuscript versions of this work in Sanscrit to see whether there are text variations.

It is fair to say that Alzina, Kamel, and Rumphius are more or less contemporary writers. Alzina wrote before 1668; his work has even today not been published in its entirety. Rumphius announced his intention to write what came to be called the *Herbarium Amboinense* in 1663. The manuscript of the first six books [Book I includes the account of coconut stones] were delivered to the Dutch East India Company

in 1690 but they were not forwarded to Holland until 1692. The ship on which it was to travel to Holland was intercepted and destroyed by the French. Thus, it was not until 1696 that a copy of the first six books safely reached Europe. We have already noted that the *Herbarium* books were not published until about 50 years after they had been written. The manuscript of the *Amboinsche Rariteitkamer* was completed in 1699 but only remained unpublished until 1705 (cf. DeWit 1959)! As best as I can figure out, Kamel's account was written sometime before 1698 (cf. Lankester 1848, pp. 345; 347-348; 377-378; 395; Raven 1950, p. 301) but was not in Ray's hands until after May 20, 1701 and was finally published in 1704. Alzina's writing, as mentioned much earlier in this paper, was sure to have been the least instrumental in bringing coconut stones to the attention of European scholars. Rumphius and Kamel (through Ray and Petiver) were relatively well known by the standards of the day. Coconut stones or concretions became well enough known so that by 1792 Antoine François de Fourcroy (1755-1809), a distinguished chemist and contributor to the massive and comprehensive *Encyclopédie Méthodique*, mentioned them albeit with no reference to Rumphius, Kamel or Alzina (cf. Fourcroy 1792, p. 554-555; 681). By 1818 there is reference to coconut stones under the entry *Mestiques* in the *Nouveau Dictionnaire d'Histoire Naturelle . . .* (1818, pp. 344-345). The article states:

"Mestiques. In the Malay Islands [îles Malaises], one calls stony concretions [mestiques] which one finds in the interior of several fruits or cocos of *Calappa* [cocos du calappa]. The inhabitants of these islands carry these stones as amulettes, mounted in silver. Rumphius has illustrated several (*Herb. Amb.*, vol. I, Tab. 2). One should suppose that these stones have the same origin as tabasheer, a substance of siliceous nature, which collects in the hollows of bamboo. Rumphius asserts that one finds them even in the trunk of coconut trees, and according to what he reports, one must believe that they too are siliceous in nature. One can read, in this author, the ridiculous stories that one attributes to these concretions."

The author of the above entry to the *Encyclopédie*, a man named Leman, a member of the Société Philomatique, clearly had read Rumphius' account in the *Herbarium*. Although he was apparently a member of the Society of Scholars and lovers of learning etc., Leman could not have known much about chemistry, however, for there is no way that a person knowledgeable in even the chemistry of that day and age could have concluded that the coconut stones of Rumphius which "boiled" in vinegar and lemon juice and which lost their shine could have

been silica-containing. Tabasheer found in bamboo joints, about which more will be said in a later paper, is virtually acid resistant and dissolves only in hydrofluoric acid. It is closely related to sand!

The most that can be concluded from all of the above is that coconut stones or concretions were thought to exist. They were appreciated as exotic novelties. Although a few scholars had even seen items described as coconut stones, they could not have been widely known. Fourcroy (1792, p. 681) stated that,

"Several botanists have described vegetable concretions, especially in coconuts, palms, &c. There are several in the collection of de Jussieu [the botanist]. I have seen several, rounded, which, polished like ivory, and which appear to have great hardness. It has not been possible for me to investigate their nature, because of their rarity and the dearness of the concretions. They have been called vegetable bezoars, and the credulity which accompanies all the prejudices of medicine, has even boasted them as heroic remedies".

A substantial block of time was to elapse before the next scene in the story of the coconut pearl was to unfold. This will be discussed in the next installment.

SUMMARY

From time to time reference has been made in the literature about calcareous concretions said to be found in coconuts. These concretions more or less resemble small alabaster stones or poor quality pearls. Certain authorities have disputed the authenticity of these "pearls" and have suggested or categorically stated that they derive not from coconuts but from giant *Tridacna* clams. A careful examination of the early primary literature has been made as a first step towards re-investigating various aspects of the "coconut pearl problem." In this first paper of a planned series, relevant passages from 17th century authors such as Alzina, Kamel, and Rumphius have been fully translated into English and interpreted insofar as has been possible.

The accounts of these authors vary in their detail but one cannot help but be impressed by their attempts to be precise. Unfortunately, the descriptive biology of the day does not permit us to understand unequivocally the origin of the "stones" or "pearls" from coconuts but the haustorium or so-called "apple" is implicated in the descriptions of all three writers. Rumphius stands out in particular as a careful, trustworthy observer. He even points out the great similarity between coconut stones and so-called *Chamites* or certain molluscan stones. Even so, Rumphius enumerates means of distinguishing the two types of stone. The translations presented here provide a base on which to build and should permit a better means of understanding how knowledge of coconut pearls first reached Europe.

Acknowledgments

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York at Stony Brook, for without his help, the English translation of Rumphius presented here would not have been possible. I am also grateful to the Bibliotheek der Rijksuniversiteit te Leiden, especially Dr. P. J. J. Obbema, Keeper of Western Manuscripts, for making available the photographic copies of the relevant Rumphian plates. Appreciation is also extended to Dr. Jack Fisher of the Fairchild Tropical Garden and to the Royal Botanic Gardens at Kew for photographs of the "pearls" shown in Figure 2.

Acknowledgment is also made to the National Science Foundation for aid in the form of a Visiting Scientist Grant which permitted me to visit the University of the Philippines at Los Baños in January 1979. During the visit, among other things, I was able to make inquiries about so-called "coconut pearls" in the Philippines and to gain much first-hand knowledge about coconut embryos and their growth. Thanks go especially to Professor Emerita V. de Guzman for serving as my "scientific counterpart" during that visit.

Notes

1. I have been unable to find anywhere in Pliny even a nominal discussion of a class of gemstones called *dendritides* although all of Book XXXVII deals with gemstones. Book XXXVII, Chapters 11 and 12, deal with amber (fossil resin). Pliny complains "But there is no end to the names given to precious stones, and I have no intention of listing them in full, innumerable as they are, thanks to the wanton imagination of the Greeks" (Pliny Book XXXVII, Ch. 74 §195). "As for the white 'dendritis' or 'tree stone'," Pliny says, "it is said that if it is buried beneath a tree that is being felled the edges of the axes will not be blunted. There are many more stones that are even more magical; and these have received foreign names from men who have thus betrayed the fact that they are ordinary, worthless stones, and not precious stones at all" (Pliny XXXVII, Ch. 73 §192). Eichholtz, the translator and commentator of our copy of the *Natural History*, states that Pliny thus "implies that, had it not been necessary to conceal the intrinsic worthlessness of the stones, they would have been given intelligible Greek names" (Pliny, *Natural History* Vol. X, p. 321, 1938). I couldn't agree more!
2. I will comment later on some of the different kinds of concretions that have been reported from fruits and trees. Suffice it to say that deposits of calcium carbonate, some rather substantial in size, have been described (cf. Ball 1880). Rumphius described a number of these besides coconut stones. A commentary has been provided by Huth (1887) of the so-called pearls from flowers of *Jasminum Sambac* described by Rumphius.
3. This is a beautiful example, in my view, of Rumphius' ability to draw a so-called "word picture." The reader may agree that rocks do have a characteristic smell.
4. The *Umbilicus marinus*, according to v. Martens (1902, p. 113), is now in the genus *Turbo* (L.) Lam. It is described by Rumphius on pp. 69-72 of the *Rariteitskamer*.
5. I have been unable to ascertain what is meant by the "Victory Stone." "Astroites", mentioned by Pliny in his *Natural History* Book XXXVII, Ch. 49 §133, refers to some unidentified precious stone of "magical power", perhaps moonstone (cf. loc. cit., p. 272).
6. The *Ἐμπειρικοί*, or Empirics, were a sect of ancient physicians who drew their rules of practice entirely from practice rather than from philosophical or theoretical bases.
7. See quote in note 1 above.
8. The Dutch referred to the soft "marrow" [endosperm] as liplap. The Malays, according to Rumphius, called it *Calambir* (cf. Rumphius, *Amb. Kruidb.* 1, 4).
9. Rumphius' attitude here reflects belief in what has been called "homeopathic or imitative magic." Inanimate things, as well as plants and animals, may "diffuse blessing or bane around them, according to their own intrinsic nature."
10. Illustrations of some of the jewelry settings will be given in a later paper.
11. From the Malay *kéris*. These daggers often have two scalloped cutting edges and a ridged serpentine blade.
12. Malabars or Malabaris came from the Southwestern coast of India, the Malabar coast.
13. A silver coin about 19 mm in diameter minted in Holland since 1614 and then worth two "pennies." It was, according to the *Woor-denboek der Nederlandsche Taal* III, II p. 3541-3543 (1916), still in use in Amboina at

- as late a date as 1916. I thank the American Numismatic Society for the measurement of the coin in their collection.
14. The Dutch apparently drove the Portuguese from Jaffna, their last Ceylonese stronghold, in 1658. The English took control of Ceylon in 1796.
 15. Zaunick (1961) provides a detailed analysis of the Rumphius-Cosimo III, Duke of Tuscany "connection", including a complete copy of the letter of transmittal of six cases or caskets of the "rarest and strangest objects" written and dated by Rumphius from the "Island of Amboina . . . the 15th of August 1682." The asking price for the rarities sent to the Duke was some 650 Crowns or Imperials.

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Lethal Yellowing in Mexico

Lethal yellowing (LY) has been found in the Cancun and Puerto Juarez areas in the State of Quintana Roo, Mexico according to a report from Dr. W. B. Ennis, Co-Director of the International Council on Lethal Yellowing. The report states further that Dr. Randy McCoy traveled to the northeastern region of the Yucatan Peninsula in January, 1982 at the request of the United States Department of Agriculture—Animal and Plant Health Inspection Service, and the Direction General de Sanidad Vegetal, Mexico, to survey dying coconut palms. He found the symptomatology to be the same as noted in LY-affected coconut palms in Florida. Electron microscope examination of specimens brought back from Mexico showed presence of mycoplasma-like bodies in the phloem tissues.

The infestation is small now, but the presence of LY on the Central American mainland poses a serious threat to LY-susceptible coconuts throughout the region.

Request for Palm Seed

Brent Tisserat, USDA Fruit and Vegetable Chemistry Laboratory, 263 South Chester Avenue, Pasadena, CA 91106, is conducting research on tissue culture of all palms. His plan is to survey as many palms as possible and he would like to receive donations of palm seed for this purpose. He will provide self-addressed postage labels to potential seed donors.