



## THE TYPE OF *PALMOCARPON CRETACEUM* MIQ., 1853 DESCRIBED FROM THE CRETACEOUS OF THE SINT-PIETERSBERG, THE NETHERLANDS, IS AN EOCENE *NYPA BURTINII* (BRONGN.) ETTINGSH., 1879, MOST LIKELY FROM THE BRUSSELS AREA, BELGIUM

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**Abstract:** The study of a few putative palm macrofossils from the type area of the Maastrichtian Stage appeared to have important implications for understanding the composition of the fossil flora of the area, as well as for the nomenclature of fossil palm fruits in general. The type specimen of the palm fruit *Palmocarpon cretaceum* MIQ., 1853 described from the Cretaceous of the Maastrichtian type area belongs to *Nypa burtinii* (BRONGN.) ETTINGSH., 1879 from the Eocene, most probably from the Brussels area. The material mentioned by Ubaghs (1885a, b, 1887) as *Palmocarpon cretaceum* does not represent fossil palm fruits. Therefore, palm pollen is the only evidence for the presence of palms (Arecaceae, or Palmae, excl. *Nypa*) in the Cretaceous of the Maastrichtian type area. *Palmocarpon* MIQ., 1853 is proposed here as a nomen rejiciendum, and the genus *Palmocarpon* LESQ., 1878 as a nomen conservandum.

**Key words:** palm fruit, *Palmocarpon*, *Nypa*, Cretaceous, Eocene, The Netherlands, Belgium, Maastrichtian type area, Brussels area

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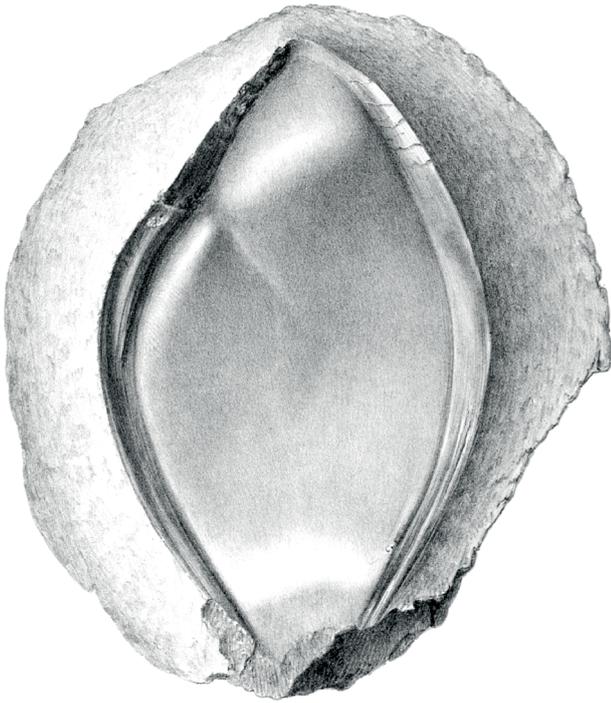
### Introduction

Plant macrofossil material within limestone deposits of the type area of the Maastrichtian Stage is relatively rare (Van der Ham and Van Konijnenburg-van Cittert 2003). As part of an ongoing study to document the plant macrofossils from the type area of the Maastrichtian (e.g., Van der Ham et al. 2001, 2003, 2004, 2007, 2010, 2011, 2017), material described by Miquel (1853) in his work on the Cretaceous plants of Limburg has been reviewed. The palm fruit *Palmocarpon cretaceum* was described by Miquel (1853: 51, pl. 7; Text-fig. 1) from the Cretaceous of the Sint-Pietersberg near Maastricht, based on a single specimen from the collection of Jacob Gijsbertus Samuel van Breda (1788–1867). This description, along with a few records of material of *Palmocarpon cretaceum* MIQ. in the catalogues of Ubaghs (1885a, b, 1887), seemed to offer a promising opportunity to list a palm macrofossil species for the

Maastrichtian type area. Hence, we studied the available literature and tried to locate the specimens.

### Locating the type of *Palmocarpon cretaceum*

We knew the type of *Palmocarpon cretaceum* only from the description and illustration by Miquel (1853) and wondered about the nature and whereabouts of the material. Dijkstra and Van Amerom (1998) thought it might be found in Teylers Museum in Haarlem, possibly because Van Breda, the specimen's owner, was the director of Teylers Museum from 1839 to 1864. Leloux (2002: 2, 23) supposed that the holotype might be in London, the Van Breda collection having been acquired in 1871 by the British Museum, now the Natural History Museum in London (NHMUK). At first, we were unable to find *Palmocarpon cretaceum* in the NHM collections, but eventually, through scrutiny of the Van Breda

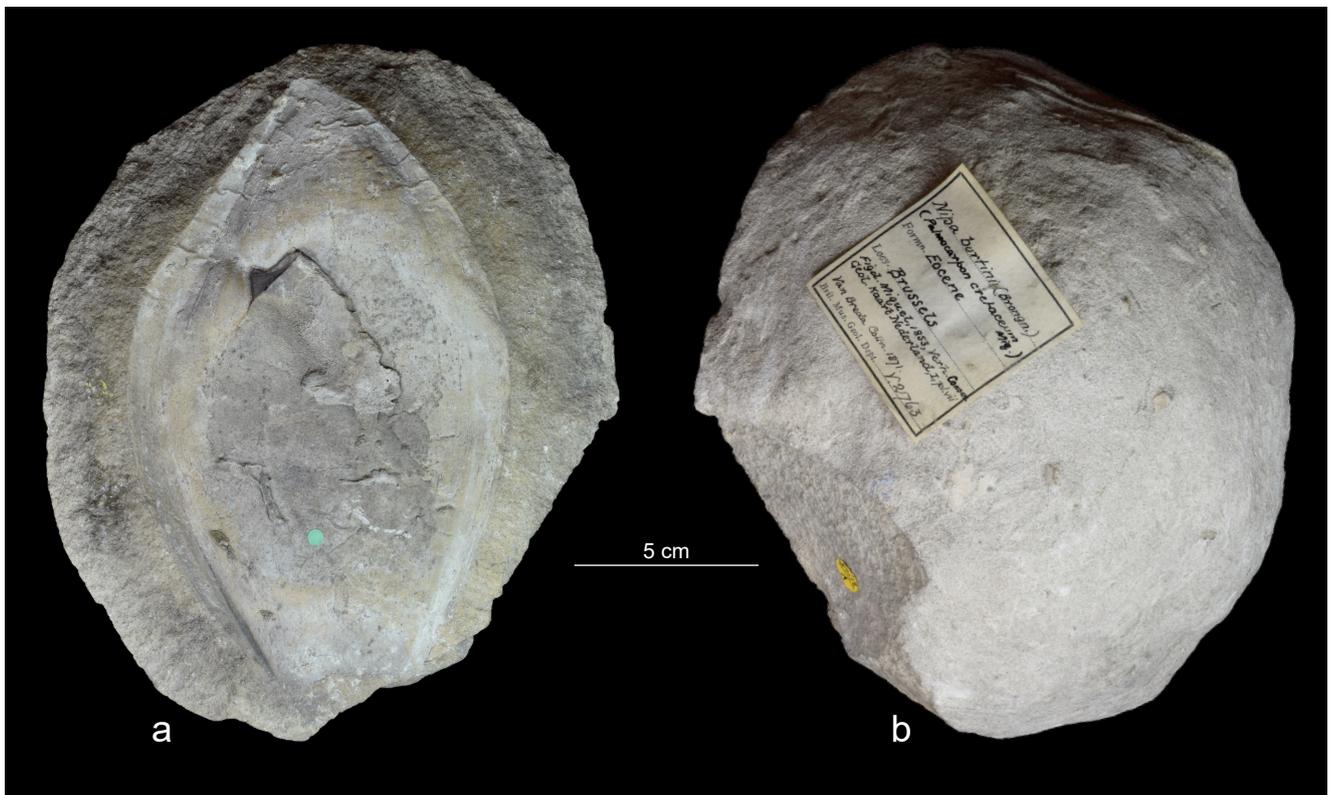


**Text-fig. 1.** Type specimen of *Palmocarpum cretaceum* MIQUEL, 1853, as illustrated by Miquel (1853: pl. 7). This figure does not include the piece of flint covering the central part of the fossil shown in the photograph (Text-fig. 2).

collection purchase records held in the NHM Archives, we (PH) located the specimen under a different name (*Nypa burtinii*) among Eocene material from the Brussels area,

Belgium, numbered as V 21763 (Text-fig. 2). In fact, Reid and Chandler (1933: 119, 127) had included this specimen in their monograph of the London Clay flora as “*Nipa Burtini* (BRONGN.) ETTINGSH., 1879”. They described the similarity to Belgian Eocene specimens (see below) and expressed the view that Miquel’s statement that his holotype came from the Cretaceous of the Sint-Pietersberg near Maastricht was erroneous. Kirchheimer (1957) and Tralau (1964) agreed, but this issue has since been overlooked (e.g., Andrews 1970, Dijkstra and Van Amerom 1998).

Unfortunately, there is no original label alongside the specimen in the NHM Palaeobotany collections. In an undated, hand-written inventory of Van Breda’s collection (perhaps by Van Breda himself) kept in his personal archive in Teylers Museum in Haarlem, it is recorded as “vrucht afgebeeld door Miquel” (fruit figured by Miquel). In the printed “Aperçu général de la collection paléontologique Van Breda” (Anonymous [undated]: 13), which was probably used as a sales catalogue after the death of Van Breda, the specimen occurs in the “Craie” section (Cretaceous’ section) as “Fruit? figuré et décrit par le Prof. Miquel (carte Géologique) Maastricht” (Fruit? figured and described by Prof. Miquel (Geological map) Maastricht). (F. A. W. Miquel was a member of the “Commissie voor de Geologische Kaart van Nederland” – Commission for the Geological map of The Netherlands). However, there was no mention of *Palmocarpum cretaceum* or any plant material from Maastricht in the list of material selected for purchase from the Van Breda collection held in the NHM Archives. Instead, “Nipadites Burtini Eocene Brussels Figured specimens. (4 pieces) (a-d)” was noted. It is most likely that the specimen



**Text-fig. 2.** Type specimen of *Palmocarpum cretaceum* MIQUEL, 1853 (V 21763 in the NHM, London). a: Shows the front (for comparison with Text-fig. 1), b: shows the reverse, with the label glued to it.

figured by Miquel was one of these. The specimen may have been poorly labelled (e.g., as “fruit figured by Miquel”; see above), or already reidentified and its provenance updated when it was purchased in 1871.

Rendle (1894) did not mention this specimen in his exhaustive revision of all *Nypa* (*Nipa*, *Nipadites*) present in the British Museum (Natural History) (now NHMUK), and neither did Seward and Arber (1903), who studied *Nypa* material in Brussels, Kew and London. Only in 1932 the specimen was registered (V 21763), as “*Nipa burtini* (Brongn.)” from the Eocene of Brussels, probably during the study of *Nypa* fossils from the London Clay by Reid and Chandler (1933). The name on the British Museum Geology Department V 21763 label was: “*Nipa burtini* (Brongn.) (*Palmocarpon cretaceum* MIQ.)”, supplemented with a reference to the specimen being figured in Miquel’s publication and the acquisition information “Van Breda colln 1871”. No explicit remark was made on its status as the type of *Palmocarpon cretaceum* MIQ., 1853, and the specimen is marked with a green dot as figured (Text-fig. 2a), but not as a type (it does not have a ‘T’ on the green dot).

### **The type of *Palmocarpon cretaceum* was not the only *Nypa* in Van Breda’s collection**

The list held in the NHM Archives shows that not one but four specimens of “*Nipadites Burtini*” were selected for purchase from the Van Breda collection in January 1871; all four pieces were stated to be figured specimens from the Eocene of Brussels. In the above-mentioned “Aperçu général”, in the Cretaceous section, the specimen figured and described by Miquel is preceded by two other items of our interest: 1. “Nepadites, figuré par BURTIN, l’original, cadeau du fils de BURTIN” (Nepadites [sic], figured by Burtin, the original, gift of the son of Burtin), and 2. “Nepadites? Maestricht” (Nepadites? [sic] Maestricht). Along with the specimen figured and described by Miquel as V 21763, these two items were registered as V 21762 and V 21764, respectively, in 1932 as *Nipa burtini* (BRONGN.) from the Eocene of Brussels; V 21762 was marked as the type of *Nypa burtinii*.

There are incongruences regarding the number of *Nypa* specimens between the list of material selected for purchase in 1871, the ‘Aperçu général’ and the acquisition data. Four pieces were selected, but there are only three specimens registered in the collections, while as far as we are aware, V 21764 is not a figured specimen. In the “Tertiaire” (Tertiary) section of the “Aperçu général” (Anonymous [undated]: 19) there is also listed a: “Fruit fossile figuré et décrit par BURTIN, exemplaire unique (cadeau de BURTIN, fils) Nipadites” (Fossil fruit figured and described by Burtin, unique specimen (gift of Burtin, son) Nipadites). An annotated copy of the “Aperçu général” held in the Special Collections of the NHM Library reveals a tick next to the three specimens listed in the Cretaceous section, but a cross next to the specimen listed in the Tertiary section. Possibly, this item was considered to be a fourth specimen and was found to either be a duplicate entry for the Burtin type specimen or another figured specimen unavailable for purchase.

### **The type of *Palmocarpon cretaceum* belongs to *Nypa burtinii***

*Nypa burtinii* (BRONGN.) ETTINGSH., 1879 was described as “*Cocos Burtini*” by Brongniart (1828) based on the account and figure of the “Noix de Coco pétrifiée” by Burtin (1784: 119, pl. 30A). Brongniart (1849) included the species in *Nipadites* BOWERB., 1840 and Ettingshausen (1879) placed it in *Nipa* THUNB., 1782. Currently, the species is included in the same genus as the only Recent species, *Nypa fruticans* WURMB, 1779, the nipa palm. The spelling *Nipa* THUNB., 1782 is considered an orthographical variant of *Nypa* STECK, 1757. The spelling “*burtinii*” is used here in accordance to ICN (2018) Art. 60.8b (Turland et al. 2018). *Nypa burtinii* is a well-known fossil palm fruit from Eocene strata, especially in the Brussels area, Belgium (Rendle 1894, Seward and Arber 1903, Stockmans 1936).

Miquel (1853) was aware of the resemblance between *Palmocarpon cretaceum* and *Nypa* but found the species different enough (“A *Nipadite* [sic] et *Burtinia* differt”; differs from *Nipadites* and *Burtinia* ENDL., 1837) to describe it in a new genus. (Both, *Nipadites* and *Burtinia* are synonyms of *Nypa* that refer to Eocene material; Rendle 1894). However, Reid and Chandler (1933) examined the type (V 21763) in their study of *Nypa* fossils from the London Clay and found that it is “undoubtedly an example of *Nipa Burtini*”. We agree (see below).

### **The type of *Palmocarpon cretaceum* comes from the Eocene of (most likely) the Brussels area**

During a visit by one of us (SR) to the NHM, it appeared that the matrix of the type of *Palmocarpon cretaceum* is totally unlike anything known from the Cretaceous strata of the Maastrichtian type area. Rendle (1894) reports that *Nypa burtinii* fruits from Belgium are “often enclosed in concretionary nodules”. Kenrick (2020: 121, 150) illustrated the type specimen of *Nypa burtinii* (V 21762) from the Brussels area as “preserved in sand that became cemented with lime and then silicified”. Reid and Chandler (1933) remarked about the type of *Palmocarpon cretaceum* that “in matrix and preservation it is identical with Belgian Eocene specimens from Schaerbeek [Brussels area]. There is little doubt that Miquel’s ascription of this specimen to the Cretaceous was an error, especially as in the sale catalogue of the Van Breda collection [probably the “Aperçu général”] other specimens of *Nipa* from Brussels, including that figured by Burtin, are also listed under the Cretaceous of Maastricht”. We agree with Reid and Chandler (1933), strengthened in our opinion by the personal communication (2021, to RvdH) from Carole Gee that the *Palmocarpon cretaceum* specimen in the photos provided by us “looks like fossil fruits typically found in the Eocene of the Paris Basin that have been assigned to *Nypa burtinii*”.

### ***Palmocarpon cretaceum* not on Bosquet’s lists**

Curiously enough, Bosquet never mentioned *Palmocarpon cretaceum* in his detailed and annotated lists of fossils from the Maastrichtian type area (e.g., Bosquet 1860, 1879,

1881), neither as *Palmocarpus cretaceus*, nor synonymised. He included 11 other species described by Miquel (1853), omitting only a few indistinct fossils. Possibly, the foreign nature of Van Breda's material was recognised only after its description. This is supported by the fact that the specimen does not occur under the name *Palmocarpus cretaceus* in the hand-written inventory of Van Breda's collection and the "Aperçu général" (Anonymous [undated]: 13), but as "fruit figured by Miquel" and "fruit? figured and described by Prof. Miquel", respectively. Countering this supposition, however, is that in the "Aperçu général" the locality is still given as Maastricht. Furthermore, if it was recognised as foreign, we do not understand why Bosquet did not correct Miquel.

### Miquel's error, or Van Breda's?

Van Breda was a passionate collector, especially through buying: for the museum of natural history in Ghent (1822–1830), for Teylers Museum (1839–1864), and for his rich private collection (Matthes 1867, Breure 1979). We do not know how he acquired the specimen which was to be the type of *Palmocarpus cretaceus* for his private collection, nor how the provenance data "In strato cretaceo montis St. Petri prope Maastricht" (Miquel 1853) became attached to it.

Breure (1979) is convinced that the majority of the approximately 12,000 items in Teylers Museum registered by Van Breda's successor Tiberius Cornelis Winkler (1822–1897) was acquired by Van Breda. Winkler (1863: II) was very clear about the state of the collection when he started to compile a catalogue in 1861, at the end of Van Breda's 25 years of directorship. Not one of the specimens was numbered. The largest part was spread over 144 drawers in a systematically unordered way; only 400 to 500 of the approximately 12,000 specimens were identified, and the locality and geological age of a large number were unknown. The hand-written inventory of Van Breda's private collection suggests that order and documentation were as poor as in Teylers Museum. It shows that the collection was stored in at least five rooms, the hall and the stable at Van Breda's home, in many drawers or on many shelves in several cupboards, in showcases, on the floor, on a mantelpiece, etc. Surely, this is a recipe for errors.

Friedrich Anton Wilhelm Miquel (1811–1871) studied medicine and natural sciences (Staffeu 1966). Besides his practice as a physician, he was primarily a botanist, not a geologist. He wrote that the *Palmocarpus* specimen was made available to him by Van Breda from his rich collection (Miquel 1853: 35). We suppose that if this material was not or even erroneously (orally?) documented by Van Breda, it would have been difficult for Miquel to notice that it did not originate from the Cretaceous of Maastricht (Sint-Pietersberg).

### Further reports of *Palmocarpus cretaceus* from the Maastrichtian type area

After the original description by Miquel (1853), *Palmocarpus cretaceus* was reported several times from the Maastrichtian type area by Ubaghs (1885a, b, 1887):

- Ubaghs (1885a: 10, #298, coll. Debey): "*P. cret.* Miq. und *Thalassocharis Bosqueti* De Bey, vereinigt auf einer grossen Tafel. Mittlere Abtheilung der Maastrichter Tuffkreide, Sichem bei Maastricht" (*Palmocarpus cretaceus* MIQ. and *Thalassocharis bosquetii* DEBEY together on a large slab. Middle part of Maastricht limestone, Zichem near Maastricht).
- Ubaghs (1885b: 28, coll. Ubaghs): "Maestrichtien, moyen" (Maastrichtian, middle part).
- Ubaghs (1887: 5, #97, coll. Ubaghs): "Maestrichtien moyen, Sussen près Maestricht" (Maastrichtian, middle part, Zussen near Maastricht).

After the death of Matthias Hubert Debey (1817–1884), his heirs asked Ubaghs to classify and evaluate Debey's collection. Ubaghs made five subsets, of which "Sammlung 1" contained Debey's only specimen of *Palmocarpus cretaceus*, which came from Zichem near Maastricht. It is one of the few specimens in the Debey collection that did not derive from the Santonian Aachen Formation. The destination of the five subsets is unknown (but see below).

The collection of Johan Casimir Ubaghs (1829–1894) was split up and widely distributed after his death. A large part ended up in the Royal Belgian Institute of Natural Sciences (KBIN, Koninklijk Belgisch Instituut voor Natuurwetenschappen/Institut royal des Sciences naturelles de Belgique) in Brussels, with a few specimens deposited in the collections of the Katholieke Universiteit in Leuven (Belgium), the Rijksmuseum van Geologie en Mineralogie (now Naturalis) in Leiden (The Netherlands), while the fossil invertebrate material was purchased by the British Museum (Natural History) (Cleevely 1983). Other parts were purchased by Krantz Rheinisches Mineralien-Contor in Bonn (Germany) and thereafter possibly sold to America (Van de Geyn 1944). However, Krutzter (1963) thought that a considerable part was still missing.

During visits to the KBIN in 2003 and 2008, we (RvdH and JvKvC) photographed a number of Ubaghs' specimens, among which were a *Palmocarpus cretaceus* specimen from Zichem (I.G. 6521, #375) and one from Zussen (I.G. 6521, #368). Both are accompanied on the slab by *Thalassocharis bosquetii* DEBEY in Miquel (1853). The latter, from Zussen, is probably the one mentioned by Ubaghs (1887). The other, labelled "Sichem près Maestricht" (original Ubaghs label), might very well be the specimen from the Debey "Sammlung 1" (Ubaghs 1885a). It is possible that Ubaghs acquired part of Debey's collection. The villages Zichem and Zussen are situated in Belgium, on either side of a small narrow outcrop of the Maastricht Formation, some three kilometres west of the Belgian part of the Sint-Pietersberg (Montagne Saint-Pierre) south of Maastricht. When we found both pieces in the KBIN, we noticed that they were very unlike the type figured by Miquel (1853). The typical shape of (*Nypa*) palm fruits is absent, and the surfaces show parallel striation instead of the curved converging lines observed on *Nypa* fruits. Thus, these specimens do not represent palm fruit fossils, but rather wood imprints/remains.

### Further reports of palm fossils from the Maastrichtian type area

Gregor (2011) reported a possible *Nypa* fruit base from the Santonian Aachen Formation (see also Knoll and Knoll

2015), which would be unusual because Cretaceous *Nypa* fruits are only known as early as the Maastrichtian of Egypt (El-Soughier et al. 2011) and *Nypa* pollen as early as the Campanian of Egypt (Gee 2001). Because of its poor preservation, we consider the specimen from the Santonian Aachen Formation as doubtful.

*Nypa* pollen (*Spinizonocolpites* spp.) is unknown from the Maastrichtian type area. Pollen of palms (Arecaceae, Palmae, excl. *Nypa*), designated as *Arecipites* WODEHOUSE, *Bacumorphomonocolpites* SOLÉ DE PORTA and *Monocolpopollenites* PFLUG et P.W. THOMSON, was reported from the Maastrichtian (Gulpen and Maastricht Formations) and Danian (Houthem Formation) by Kedves and Herngreen (1980) and Herngreen et al. (1986, 1998).

## Conclusions and nomenclatorial consequences

The type of *Palmocarpon cretaceum* does not come from the Cretaceous of the Sint-Pietersberg near Maastricht (The Netherlands), but from the Eocene, most likely from the Brussels area (Belgium). The material mentioned by Ubaghs (1885a, b, 1887) does not represent fossil palm fruits, but rather wood imprints/remains. The report of *Nypa* from the Santonian Aachen Formation is dismissed here as doubtful. Therefore, as a result of our investigations, it is shown that no macrofossil evidence of palms occurs in the Maastrichtian type area and that the only evidence for the presence of palms is provided by pollen (Arecaceae, or Palmae, excl. *Nypa*).

Since *Palmocarpon cretaceum* MIQ., 1853 is the type of the genus *Palmocarpon* MIQ., 1853, the conclusion that *P. cretaceum* is a junior synonym of *Nypa burtinii* means that the genus *Palmocarpon* is a younger taxonomic synonym of *Nypa* and thus presents nomenclatorial consequences for the (few) other species that have been described in the genus *Palmocarpon* (e.g., Manchester et al. 2016). These species should be assigned to another genus as new combinations. This systematic treatment is, however, outside the scope of our paper and should be done by a scientist with a good knowledge of palm fruits. If *Palmocarpon* MIQ., 1853 is considered to be a nomen rejiciendum, the genus *Palmocarpon* LESQ., 1878 can be proposed as a nomen conservandum.

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We dedicate this paper to the memory of Zlatko Kvaček who, despite being a "Cainozoic palaeobotanist", was always interested in our Maastrichtian plants. We think that he would have appreciated the transfer of the type of *Palmocarpon cretaceum* from the Cretaceous to the Eocene.

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