

PEMBERGER AND FUCHSOFFEN QUARRIES TO THE WEST OF KLEIN ST. PAUL

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Topics:

Shallow water limestone with larger foraminifera

Tectonic unit:

Gurktal nappe complex

Lithostratigraphic units:

Gutting Group, Holzer Formation, Sittenberg Formation, Dobranberg Formation

Chronostratigraphic units:

middle Cuisian to middle Lutetian

Biostratigraphic units:

SBZ10 to SBZ14

Location:

Fuchsofen Quarry at Dobranberg

References:

Hillebrandt 1993

The transgression of the Eocene on the Upper Cretaceous was exposed in the Pemberger quarry (Fig. A3.23). Unfortunately, this outcrop was recultivated and destroyed during the last winter. In this outcrop, Upper Campanian marlstone (*Tranolithus phacelosus* Zone, CC23a) of the Pemberger Formation was overlain with an 8 m-thick soft clay of the Holzer Formation. This green and red clay consists essentially of kaolinite (between 73 wt% and 78 wt%) and contains coal lenses and a rich terrestrial palynoflora whereas marine fossils are absent. The top of the clay is formed by 0.5 m of black shale containing 7.6 wt% C_{org} (Fig. A3.24). This organic rich deposits are the base of the Eocene transgression and yield rich and excellent preserved marine and terrestrial palynofloras. More than 90% of the dinoflagellate assemblage are formed by specimens of the peridinoid genus *Apectodinium* (*A. homomorphum*, *A. parvum*, *A. paniculatum*, and *A. spp.*). Beside these taxa *Homotryblium pallidum* and *Spinidinium echinoideum* occur (see Figs. A3.25 and A3.26).

The terrestrial palynomorph assemblages from the Krapfeld are relatively well preserved and terrestrial pollen and spores are preserved with *Botryococ-*

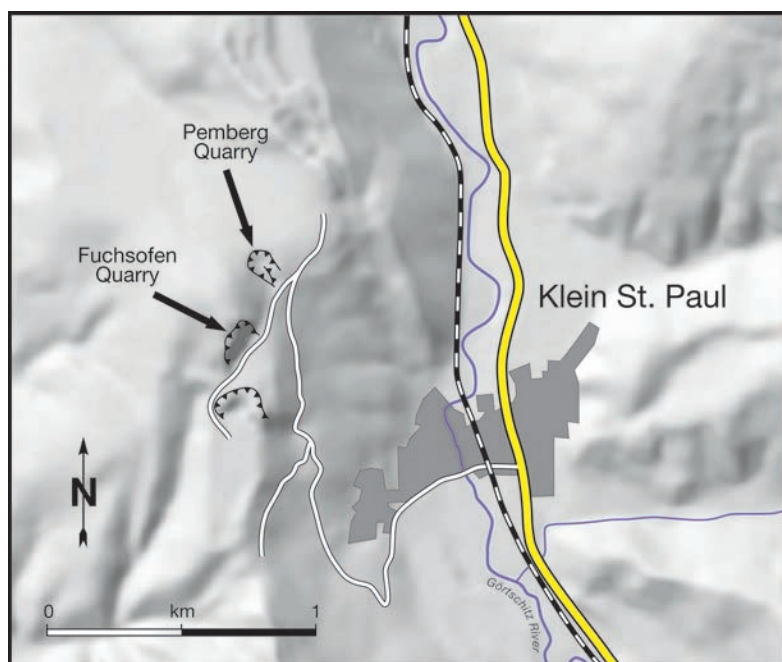


Figure A3.23 ▲
Location of the outcrops to the west of Klein St. Paul

cus colonies. Most common elements are angiosperm pollen from families such as Myricaceae, Juglandaceae (various *Normapolles*, *Engelhardia*, *Platycarya*, *Plicatopollis*, *Subtriporopollenites*), Rhoipteleaceae (*Plicapollis plicatus*, Figure A3.27, 1–3), Fagaceae (*Lithocarpus*, *Eotrigonobalanopsis*), Sapotaceae (5 taxa), Araceae (*Proxapertites operculatus*) and Arecaceae (e.g., *Nypa*, Arecoideae various calamoid palms, Plate A3.28, 10–15) and Restoniaceae. Less common to very rare megathermal elements are Anacardiaceae (e.g., cf. *Spondias*, *Lansea*, Plate A3.27, 7-9), Avicenniaceae (black mangrove, *Avicennia*, Plate A3.27, 10–12), Hamamelidaceae (*Corylopsis*, *Tetrathyrum*), Icacinaceae, Malvaceae (e.g., *Kostermannsia*-type, *Adansonia*-type, Plate A3.28, 1–6), Olacaceae, Picrodendraceae (*Aristogeitonia*-type), Rutaceae (*Zanthoxylon*-type, Plate A3.27, 4–6), Styracaceae (*Styrax*, Plate A3.28, 7–9), Theaceae (two *Camellia*-types, Plate A3.27, 13–15), Thymelaceae (*Wikstroemia*), *Alangium* and many more tropical elements.



Figure A3.24 ▲
The base of the transgressive black shale at Pemberger quarry resting on kaolinitic red claystone.

Generally, in term of taxa diversity, floral composition and temperature affinities of the taxa, the lower Eocene of the London Clay (Collinson, 1996) and the Krappfeld area are very similar, although the former is a macroflora.

In the Pemberger quarry, from the lower part of the marine deposits of the Sittenberg Formation *Asilina placentula*, *Nummulites burdigalensis kuepperi*, *Nummulites increscens*, and *Nummulites bearnensis* have been described (Schaub, 1981; Hillebrandt, 1993). This fauna is indicative of the lower part

Figure A3.25 ►

(The species name is followed by sample location and England Finder coordinates)

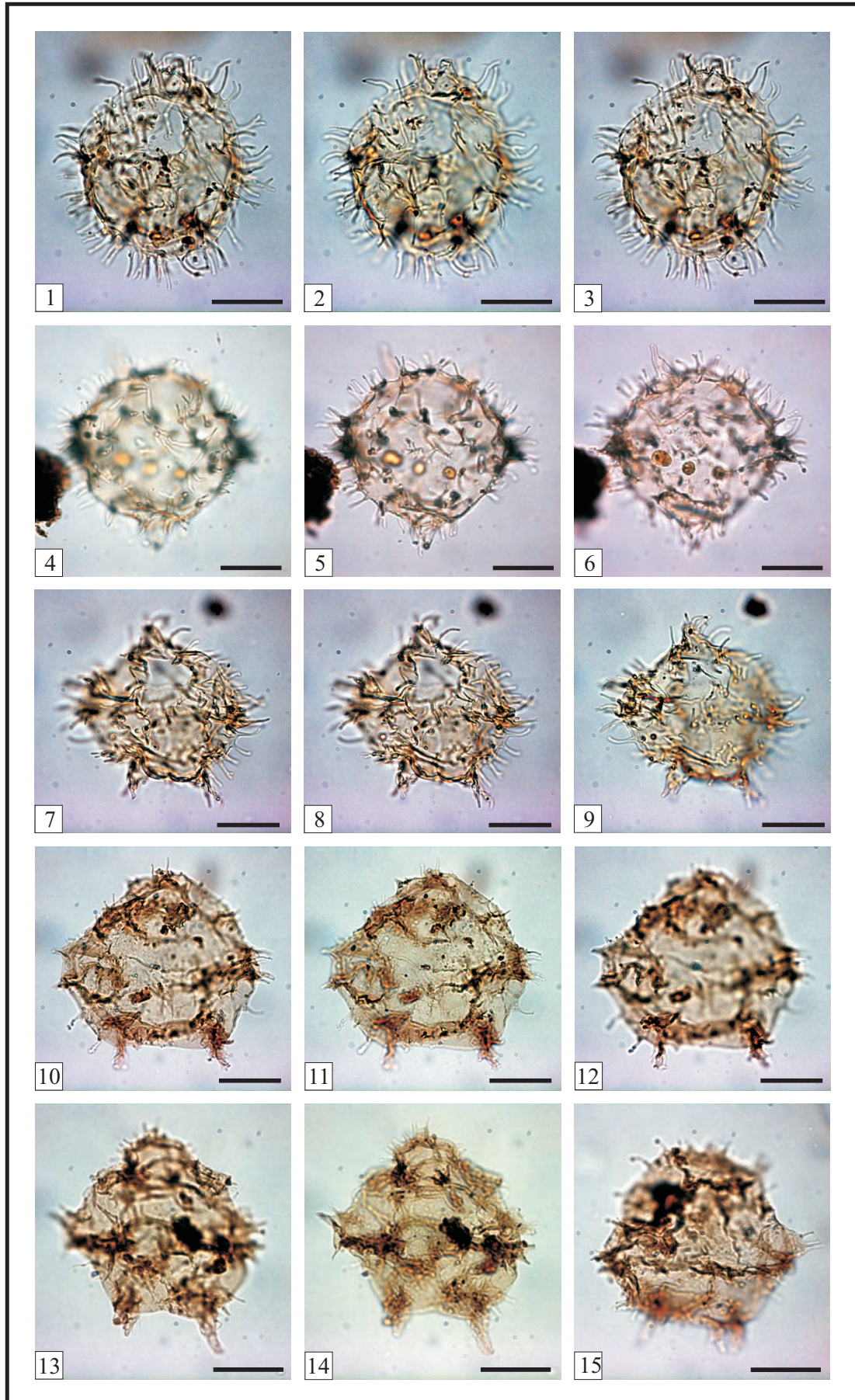
- 1–3 *Apectodinium homomorphum* (Deflandre & Cookson, 1955) Lentin & Williams, 1977; TQ8-10/E, M28/1.
- 4–6 *Apectodinium homomorphum* (Deflandre & Cookson, 1955) Lentin & Williams, 1977; TQ8-10/E, R7/4.
- 7–9 *Apectodinium paniculatum* (Costa & Downie, 1976) Lentin & Williams, 1977; TQ8-10/ G, W24/3.
- 10–12 *Apectodinium parvum* (Alberti, 1961) Lentin & Williams, 1977; TQ8-10/E, B22.
- 13–14 *Apectodinium parvum* (Alberti, 1961) Lentin & Williams, 1977; TQ8-10/E, H21/2.
- 15 *Apectodinium parvum* (Alberti, 1961) Lentin & Williams, 1977; TQ8-10/E, M2.

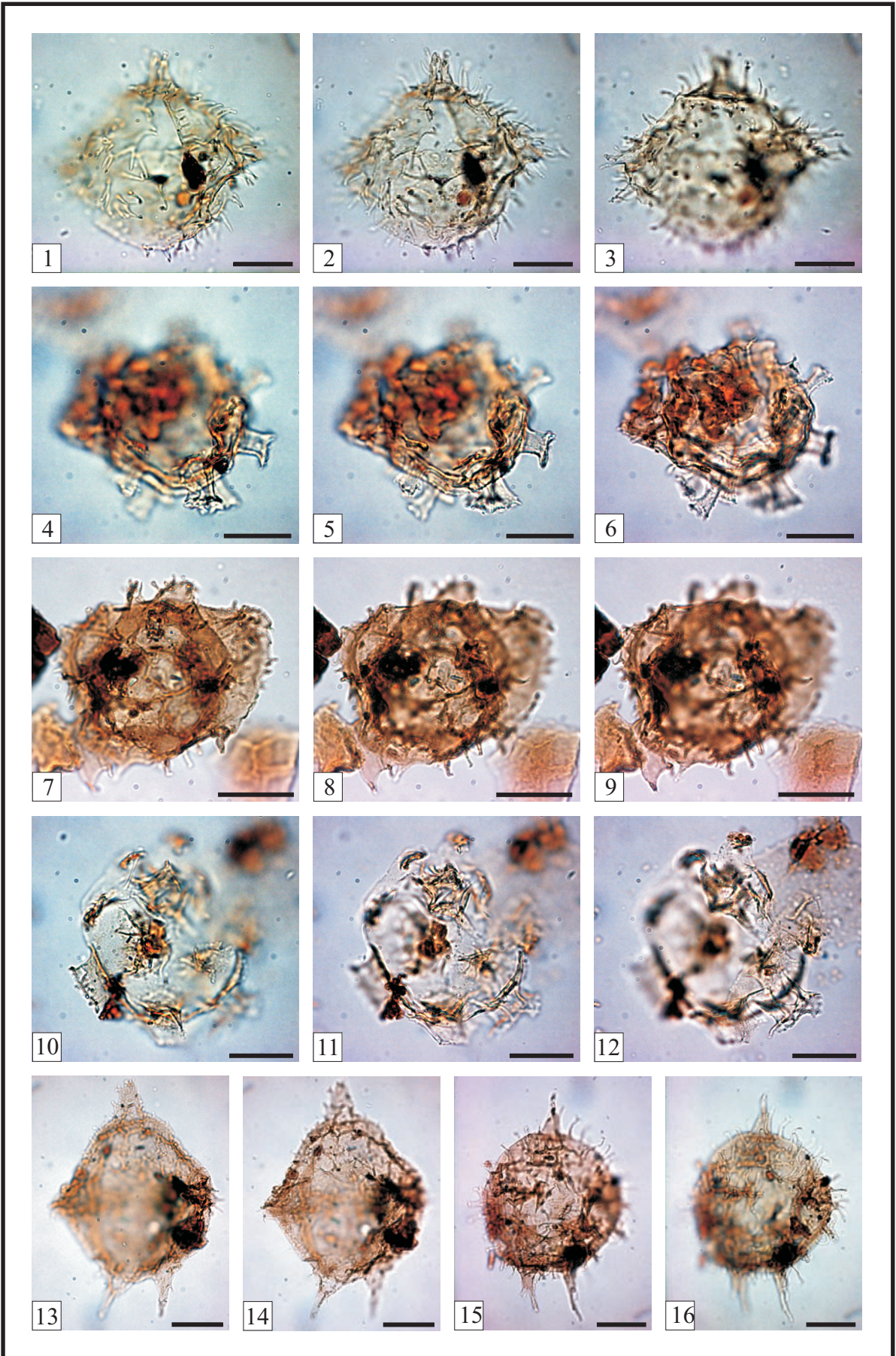
Figure A3.26 (Page 114)

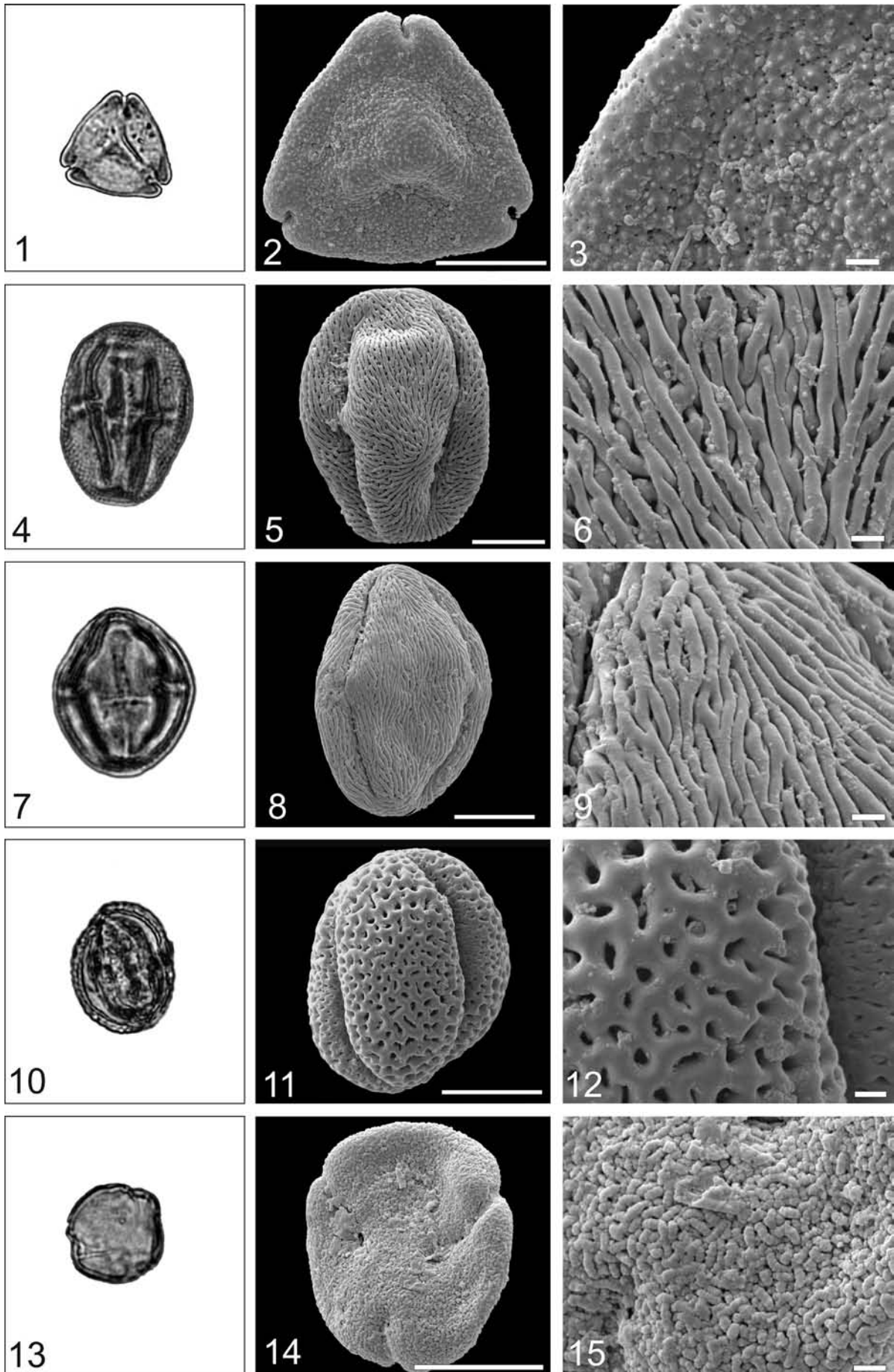
(The species name is followed by sample location and England Finder coordinates)

- 1–3 *Apectodinium* spp.; TQ8-10/E, Y43.
- 4–6 *Homotryblium pallidum* Davey & Williams, 1966; TQ8-10/E, L38.
- 7–9 *Palynodinium grillator* Gocht, 1970a; TQ8-10/A, D19.
- 10–12 *Damassadinium californicum* (Drugg, 1967) Fensome et al., 1993b; TQ8-10/E, J30-3.
- 13–14 *Spinidinium echinoideum* (Cookson and Eisenack, 1960a) Lentin & Williams, 1976. Emendation: Sverdlove & Habib, 1974; TQ8-10/E, T8-1.
- 15–16 *Spinidinium* sp.; TQ8-10/E, L27-3.

Plate 1







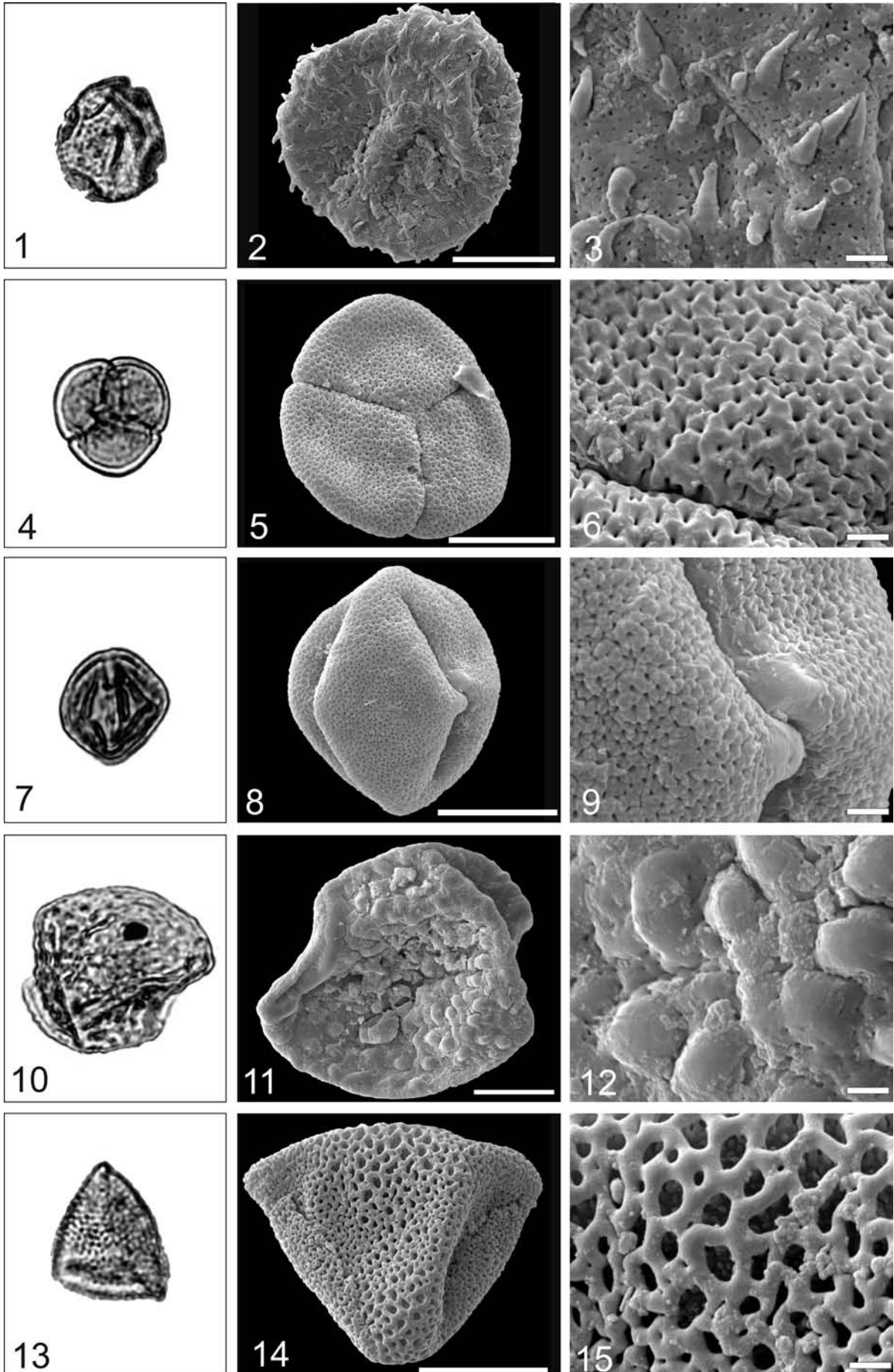


Figure A3.27 (Page 115)

all LM images x 1000, SEM overview bar = 10 µm, SEM detail bar = 1 µm

- 1–3 *Plicapollis plicatus* (Rhoipteliaceae)
- 4–6 *Tricolporopollenites* sp. (Rutaceae)
- 7–9 *Tricolporopollenites* sp. (Anacardiaceae)
- 10–12 *Tricolporopollenites* sp. (Avicenniaceae, Avicennia)
- 13–15 Theaceae, *Camellia*-type

Figure A3.28 ◀

all LM images x 1000, SEM overview bar = 10 µm, SEM detail bar = 1 µm

- 1–3 Malvaceae, *Adansonia*-type
- 4–6 *Bombacidites* (Malvaceae, *Kostermannsia*-type)
- 7–9 Styracaceae, *Styrax*
- 10–12 *Diporites*, Arecaceae, Calamae
- 13–15 *Dicolpopollis*, Arecaceae, Calamae

of shallow benthic zone SBZ10, which has been correlated with calcareous nannoplankton Zone NP12 (Serra-Kiel et al. 1998). This suggests that the marine transgression took place within this biochron.

The clay-rich deposits of the Sittenberg Formation are overlain by the pure limestone of the Dobranberg Formation, which is excellently exposed about 300 m to the south, in the Fuchsofen quarry (Fig.A3.29). The limestone is quarried for the cement plant at Wietersdorf. In the lower quarry limestone particularly rich in *Alveolina* spp. occurs (Fig.A3.30). *Alveolina distefanoi* and *A. schwageri* (deter. Drobne) indicate the lower to middle Cuisian (SBZ10-11). For the detrital and partly rhodolithic limestone in the northern part of the upper quarry *Nummulites burdigalensis* cf. *cantabricus* and *Asilina laxispira* indicate a middle Cuisian age. The limestone in the southern part of the upper quarry is assigned to the Middle Lutetian due to the occurrences of *Nummulites beneharnensis*, *N. hilarionis*, and *N. krappfeldensis* (Hillebrandt, 1993).

The sedimentation of the Gosau Group at Krappfeld ended in the Lutetian. Hillebrandt (1993) reported both *Nummulites hilarionis* and *Nummulites boussaci*, which indicate shallow benthic zone SBZ14, and *Nummulites millecaput* evidencing shallow benthic zone SBZ15. These foraminiferal zones can be correlated with the upper part of calcareous nannoplankton zone NP15 and the lower part of zone NP16 (Serra-Kiel et al., 1998).

It is interesting to compare the Krappfeld outcrops with the Eocene in Slovenia. There, next to the Ivartnik and Kogovnik farm estates, 24 species of alveolinas and 12 species of nummulites were found. Cuisian age was assigned to the samples from Ivartnik and Lutetian age to those from Kogovnik. The presence of several species was also confirmed in cobblestones collected between Mežica, Slovenj Gradec, along the SW foot of Pohorje mountains and Stranice near Slovenske Konjice (Drobne et al., 1977, Pavlovec, 2005). These sites prove the original wide distribution of Eocene marine deposits in this area.



Figure A3.29 ▲
Photograph of the Fuchsofen Quarry (view towards north).

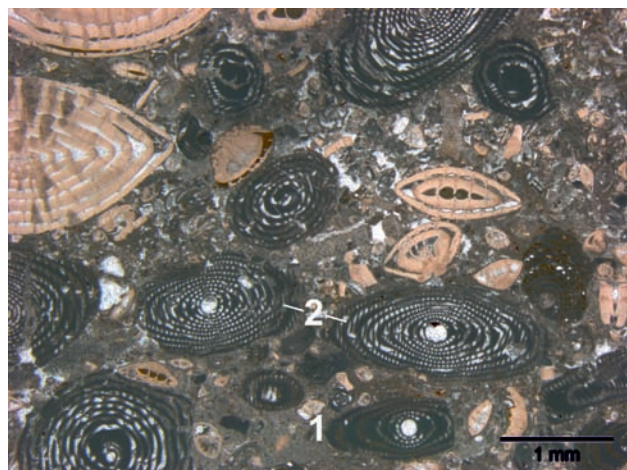


Figure A3.30 ▲
Image of a thin-section of a limestone with nummulites and alveolinas (1... *A. distefanoi* Checchia-Rispoli, 2...*A. schwageri* Checchia-Rispoli), Fuchsofen quarry.