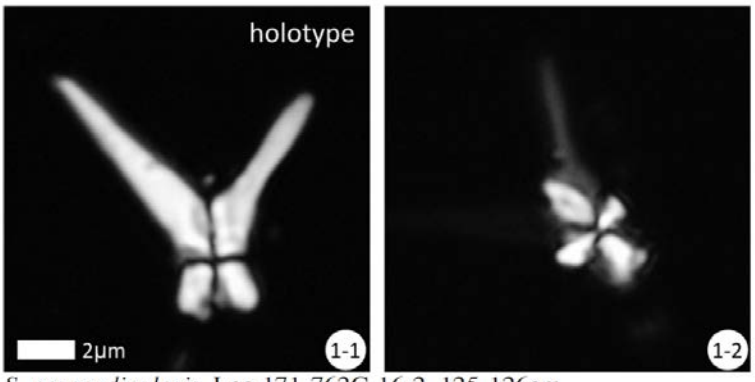
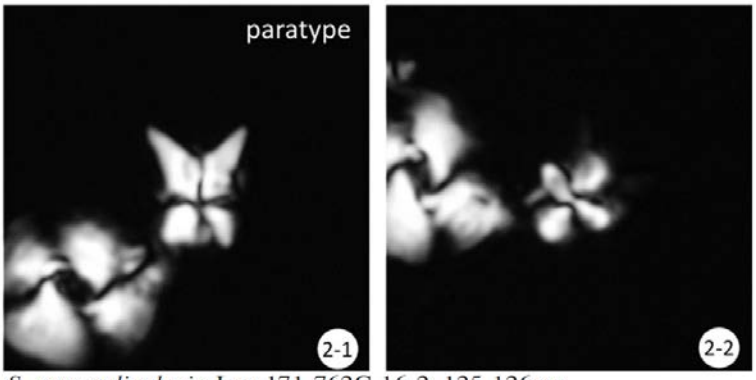
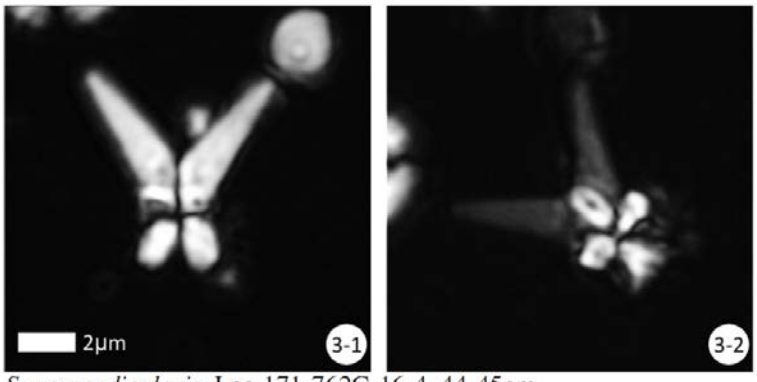
213. Sphenolithus perpendicularis Shamrock (2010)



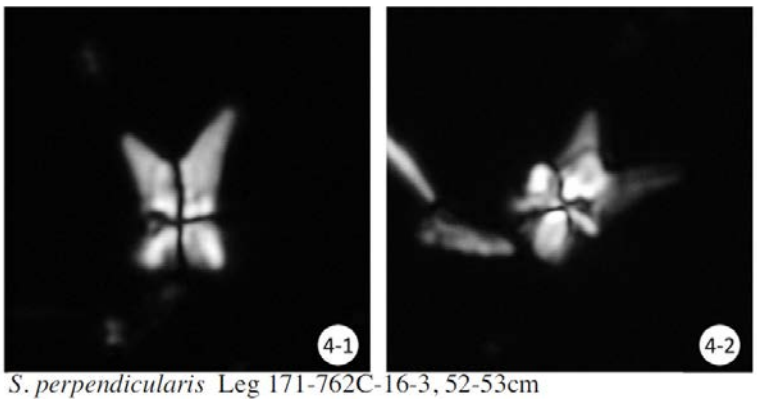
S. perpendicularis Leg 171-762C-16-2, 125-126cm



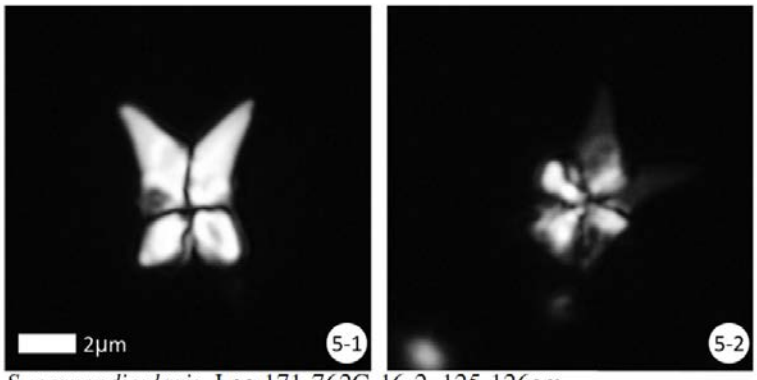
S. perpendicularis Leg 171-762C-16-2, 125-126cm



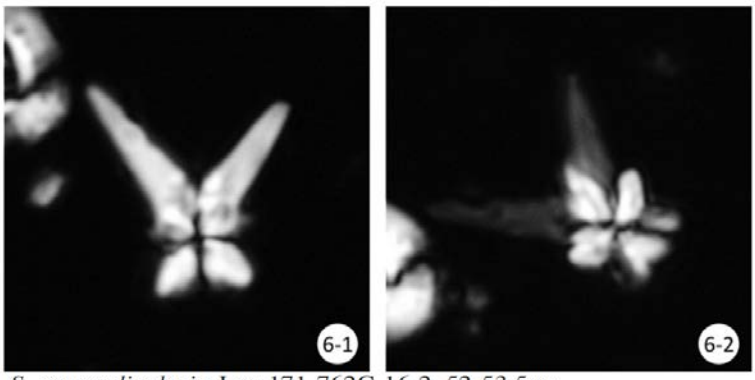
S. perpendicularis Leg 171-762C-16-4, 44-45cm



S. perpendicularis Leg 171-762C-16-3, 52-53cm



S. perpendicularis Leg 171-762C-16-2, 125-126cm



S. perpendicularis Leg 171-762C-16-2, 52-53.5cm

Pl. 1, figs 1-6

Derivation of name: From the Latin '*perpendicularis*', referring to the near-perpendicular angle between the apical spines immediately above the proximal base.

Diagnosis: Sphenolith with a small- to medium-sized base, bearing two tapering, apical spines that diverge to ~90° just above the basal cycles.

Description: Proximal cycle consisting of about 10 elements, greater than half the length of the base, supporting a lateral cycle that is equal to or less than the width of the proximal cycle, giving a generally square outline. The base supports two prominent apical spines centered about the median axis, which are widely divergent just above the base. Measurement of 30 specimens yields a mean angle of divergence of 96.1°. These spines may be more than twice the length of the base in well-preserved specimens, but may break or dissolve in more poorly-preserved forms. When the long axis is oriented at 0° under XPL, the outer elements of the proximal base, upper lateral cycle and apical spines are highly birefringent. When oriented at 45°, the central elements of the proximal base and the lateral cycle are highly birefringent, with the prominent apical spines being extinct (Figure 5). Specimens may also show an enlarged element in the upper cycle, centered about the median axis, which projects above the base between these larger spines. In less well-preserved specimens, this enlarged element may approximate the length of the spines, giving specimens a more tricuspid appearance.

Imaging of these specimens was difficult due to poor preservation and high birefringence.

Differentiation: *Sphenolithus perpendicularis* can be differentiated from *S. capricornutus* by the birefringence pattern observed at 45°, as shown in Figure 5. These species can be further distinguished by a prominent stratigraphic separation of more than 15Myr. *S. perpendicularis* may be differentiated from *S. furcatolithoides* by the significantly wider angle of divergence of the spines. In addition, there appears to be little, if any, stratigraphic overlap of these two species.

Dimensions: (N = 30 for base width, height and interior angle). Base width: 3.2µm (min.), 4.8µm (max.), 4.0µm (mean), 0.08 (std. error), 0.21 (variance). Base height: 3.2µm (min.), 4.8µm (max.), 4.0µm (mean), 0.08 (std. error), 0.21 (variance). Apical spine interior angle: 85.5° (min.), 115.8° (max.), 96.1° (mean), 1.3 (std. error), 0.51 (variance). Spine length: 2.0 to 8.5µm, dependant on preservation.

Holotype: Pl.1, fig.1.

Paratype: Pl.1, fig.2.

Type locality: ODP Leg 122, Exmouth Plateau, western Australia.

Type level: Middle Eocene (Lutetian), Hole 762C-16-2, 125-126cm.

Occurrence: CP13a; 762C-16-4, 45-46cm to 762C-15-3, 48-49cm.

Shamrock, J.L., 2010. A new calcareous nannofossil species of the genus *Sphenolithus* from the Middle Eocene (Lutetian) and its biostratigraphic significance. *Journal of Nannoplankton Research*, **31(1):** 5-10.