

13. CALCAREOUS NANNOPLANKTON

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The calcareous nannoplankton zonation used during Leg 8 differs from zonations used for sediments exposed on land because the critical species are absent from deep equatorial Pacific sediments. For the Oligocene, we therefore developed a new zonation for use on Leg 8 (Figure 1). For the Neogene, Martini and Worsley (1970) proposed a zonation based on floras from equatorial deep-sea sediments. Their zonation is

based on the first and last occurrences of particular species. The zones thus recognized are not concurrent-range zones, as recommended by the American Commission on Stratigraphic Nomenclature for time correlation. We nevertheless have used Martini and Worsley's Neogene zonation because their zones are easily recognizable in sediments of the eastern tropical Pacific.

REFERENCE

Martini, E., and Worsley, T., 1970. Standard Neogene calcareous nannoplankton zonation. *Nature*. 225, 289.

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QUATERNARY		<i>Emiliana huxleyi</i> Zone	first	<i>E. huxleyi</i>
		<i>Gephyrocapsa oceanica</i> Zone	last	<i>P. lacunosa</i>
		<i>Pseudoemilia lacunosa</i> Zone	last	<i>D. brouweri</i>
PLOCENE	upper	<i>Discoaster brouweri</i> Zone	last	<i>D. pentaradiatus</i>
		<i>Discoaster pentaradiatus</i> Zone	last	<i>D. surculus</i>
		<i>Discoaster surculus</i> Zone	last	<i>R. pseudoumbilica</i>
	lower	<i>Reticulofenestra pseudoumbilica</i> Zone	last	<i>C. tricomiculatus</i>
		<i>Discoaster asymmetricus</i> Zone	first	<i>D. asymmetricus</i>
		<i>Ceratolithus rugosus</i> Zone	first	<i>C. rugosus</i>
MIOCENE	upper	<i>Ceratolithus tricomiculatus</i> Zone	last	<i>D. quinquenarius</i>
		<i>Discoaster quinquenarius</i> Zone	first	<i>D. quinquenarius</i>
		<i>Discoaster calcaris</i> Zone	last	<i>D. hamatus</i>
	middle	<i>Discoaster hamatus</i> Zone	first	<i>D. hamatus</i>
		<i>Catlnaster coalitus</i> Zone	first	<i>C. coalitus</i>
		<i>Discoaster kugleri</i> Zone	first	<i>D. kugleri</i>
	lower	<i>Discoaster exilis</i> Zone	last	<i>S. heteromorphus</i>
		<i>Sphenolithus heteromorphus</i> Zone	last	<i>H. ampliaperta</i>
		<i>Helicopontosphaera ampliaperta</i> Zone	last	<i>S. belemnos</i>
		<i>Sphenolithus belemnos</i> Zone	last	<i>T. carinatus</i>
		<i>Discoaster druggi</i> Zone	first	<i>D. druggi</i>
		<i>Triquetrorhabdulus carinatus</i> Zone	last	<i>R. scissura</i>
OLIGOCENE	upper	<i>Sphenolithus ciperoensis</i> Zone	first	<i>T. carinatus</i>
		<i>Sphenolithus distentus</i> Zone	last	<i>D. tani</i> spp.
	lower	<i>Sphenolithus predistentus</i> Zone	last	<i>R. umbilica</i>
		<i>Discoaster tani ornatus</i> Zone	first	<i>D. tani ornatus</i>

Figure 1. Calcareous nannoplankton zonation used during Leg 8. Neogene portion after Martini and Worsley (1970).

PLATE 1

- Figures A, B *Umbilicosphaera mirabilis* Lohmann. Figure A: Proximal view, 71-1-0; Figure B: Distal view, 71-1-0. *Gephyrocapsa oceanica* Zone. ×10000.
- Figures C, D *Coccolithus* sp. Figure C: Proximal view, 71-1-0; Figure D: Distal view, 71-1-0. *Gephyrocapsa oceanica* Zone. ×10000.
- Figures E, F *Gephyrocapsa oceanica* Kamptner. Figure E: Distal view, 71-1-0; Figure F: Proximal view, 71-1-0. *Gephyrocapsa oceanica* Zone. ×12000.
- Figure G *Cyclococcolithus leptoporus* (Murray and Blackman) Kamptner. Distal view, 71-1-0. *Gephyrocapsa oceanica* Zone. ×12000.
- Figure H *Helicopontosphaera kamptneri* Hay and Mohler. Distal view, 71-1-0. *Gephyrocapsa oceanica* Zone. ×6000.

PLATE 1

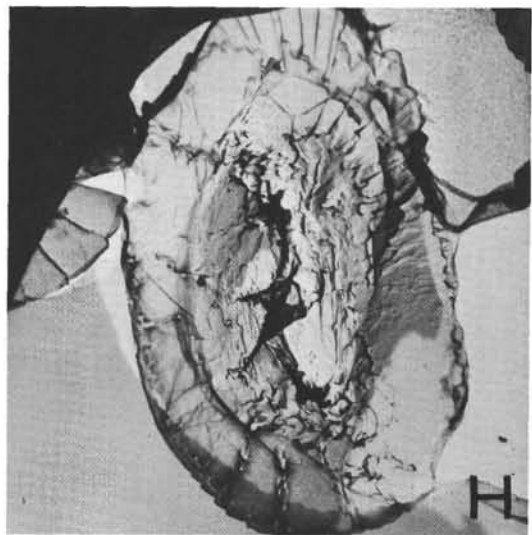
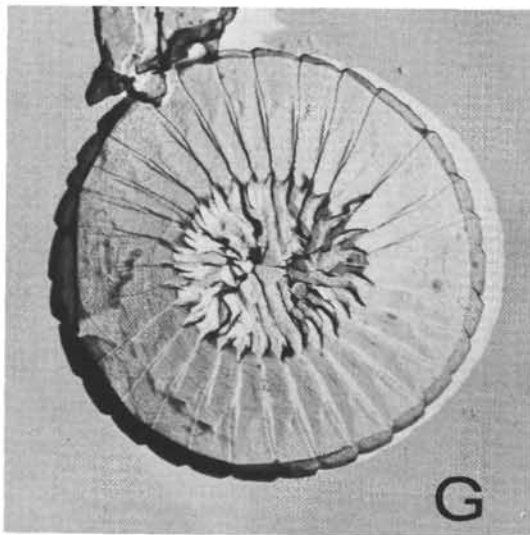
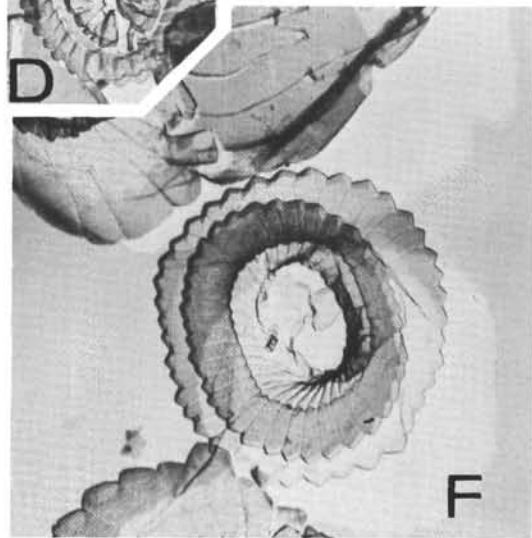
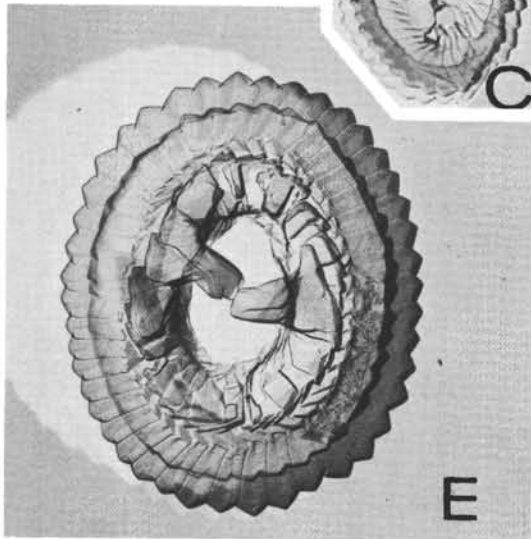
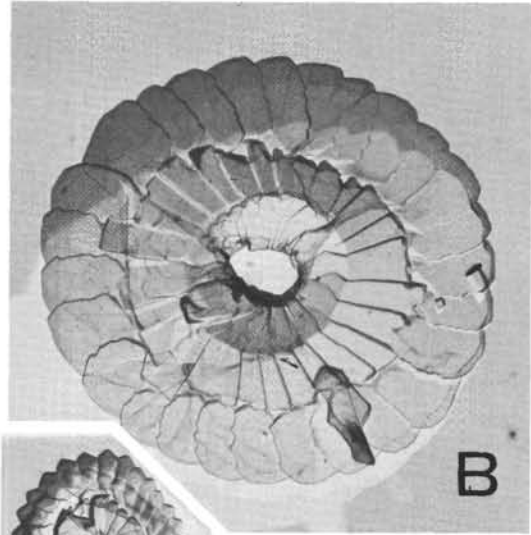
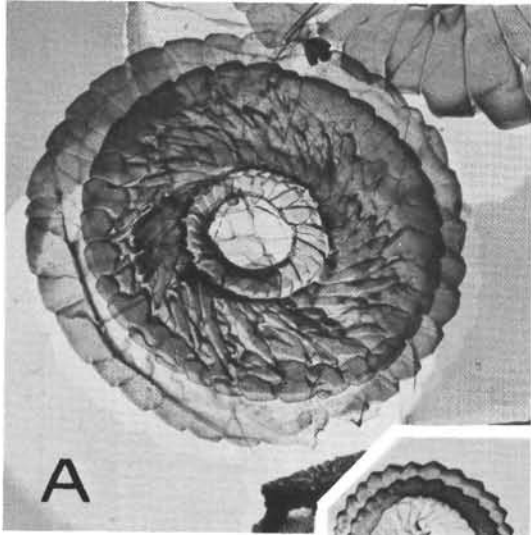


PLATE 2

- Figure A *Coronocyclus nitescens* (Kamptner) Bramlette & Wilcoxon. 71-26-6. *Sphenolithus belemnus* and *Helicopontosphaera ampliaperta* Zones. X6000.
- Figure B *Cyclococcolithus* aff. *C. bollii* Roth. Distal view, 71-48-3. *Sphenolithus distentus* Zone. X12000.
- Figures C, D *Ericsonia ovalis* Black. Figure C: Proximal view, 71-28-2. *Sphenolithus belemnus* and *Helicopontosphaera ampliaperta* Zones. Figure D: Distal view, 71-48-3. *Sphenolithus distentus* Zone. X6000.
- Figures E, F *Reticulofenestra scissura* Hay, Mohler & Wade. Proximal views. Figure E: 70A-17-2. *Sphenolithus predistentus* Zone. Figure F: 75-6-CC. *Sphenolithus distentus* Zone. X6000.

PLATE 2

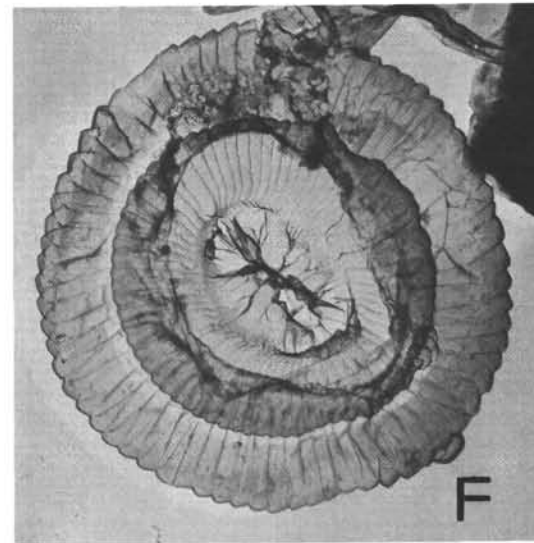
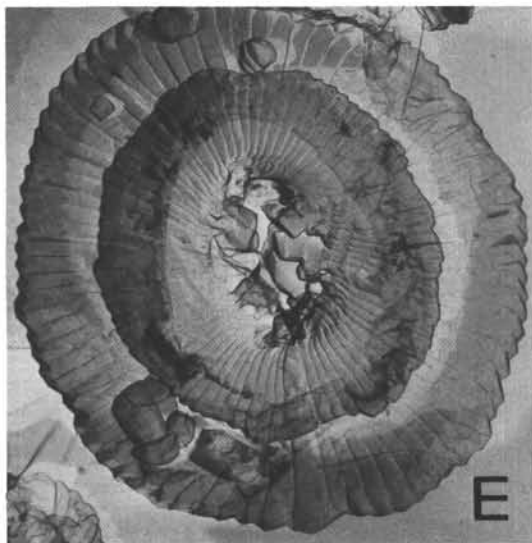
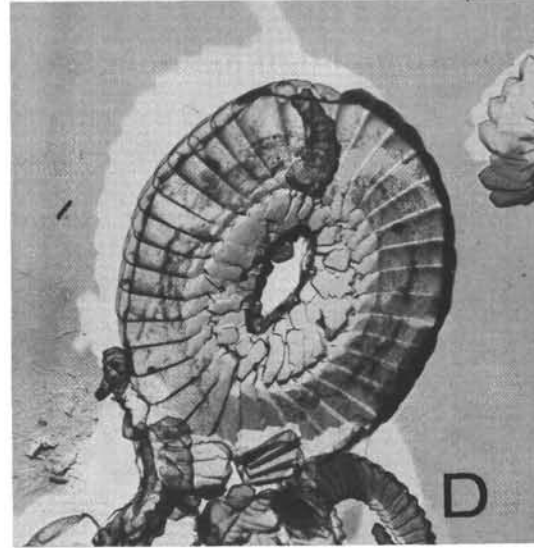
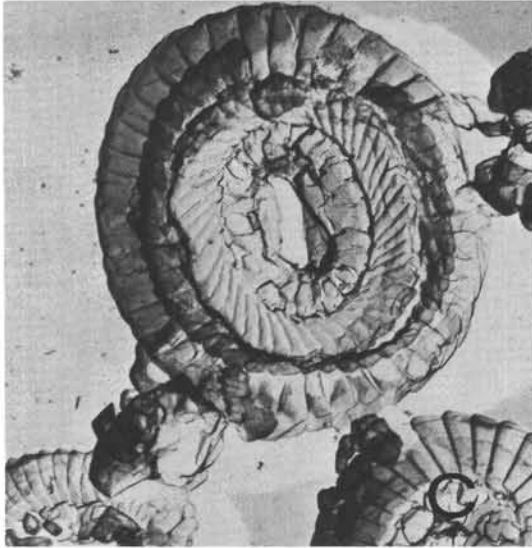
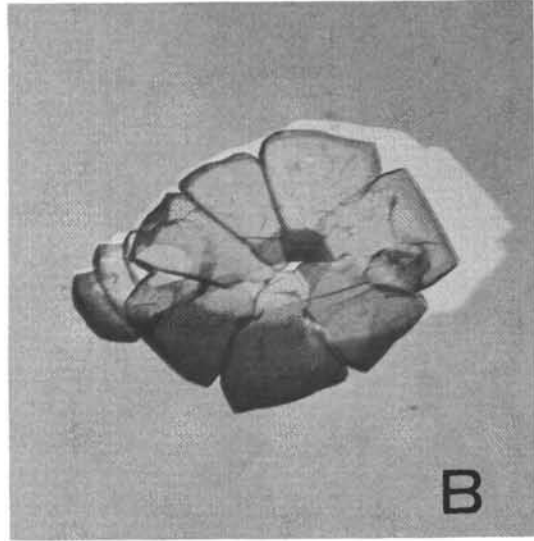
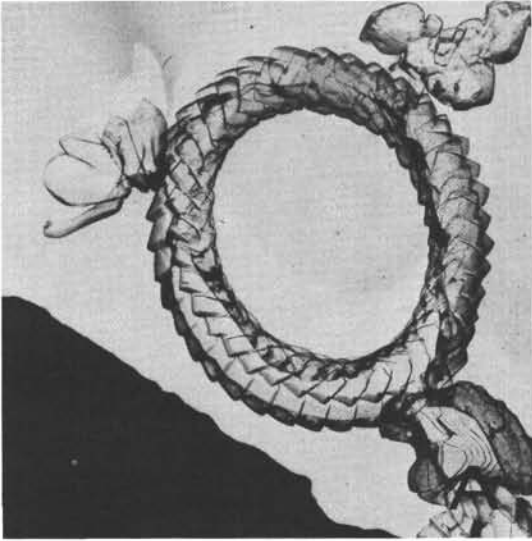


PLATE 3

- Figures A, B *Cyclolithella* sp. Figure A: Proximal view, 70A-17-2. *Sphenolithus predistentus* Zone. ×10000. Figure B: Coccosphere, 71-48-3. *Sphenolithus distentus* Zone. ×6000.
- Figures C, D *Coccolithus primalis* Roth. Figure C: Distal view, 70A-17-2. ×12000. Figure D: Proximal view, 70A-17-2. ×10000. *Sphenolithus predistentus* Zone.
- Figures E, F *Cyclococcolithus neogammation* Bramlette & Wilcoxon. Figure E: Proximal view, 71-48-CC; Figure F: Distal view, 71-48-CC. *Sphenolithus distentus* Zone. ×6000.

PLATE 3

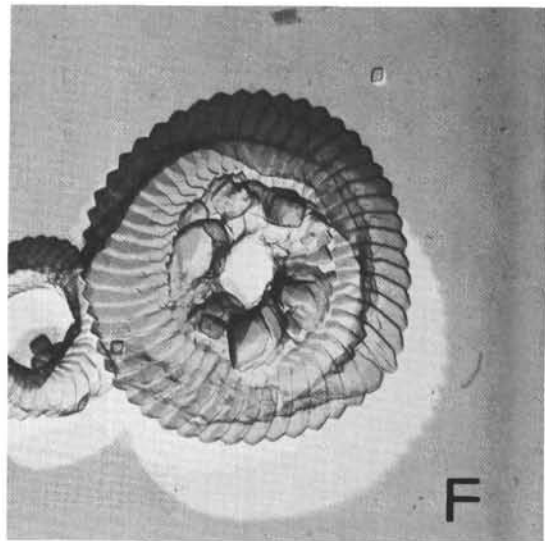
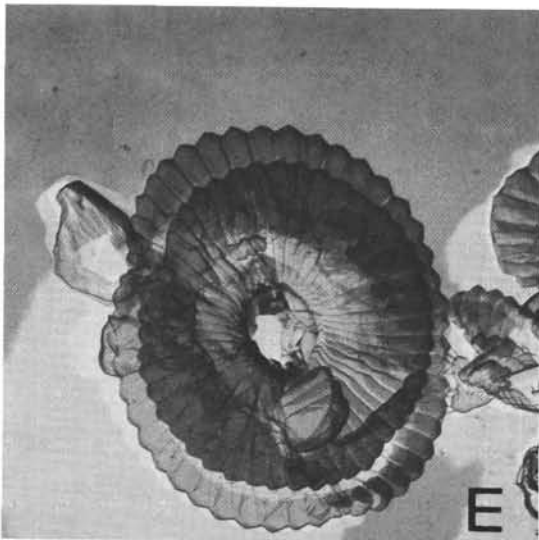
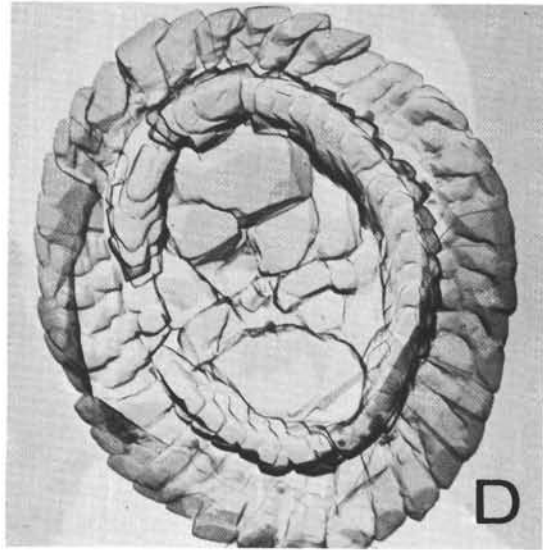
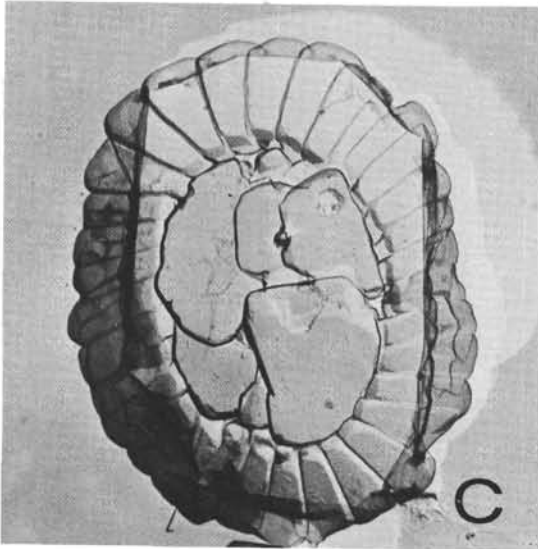
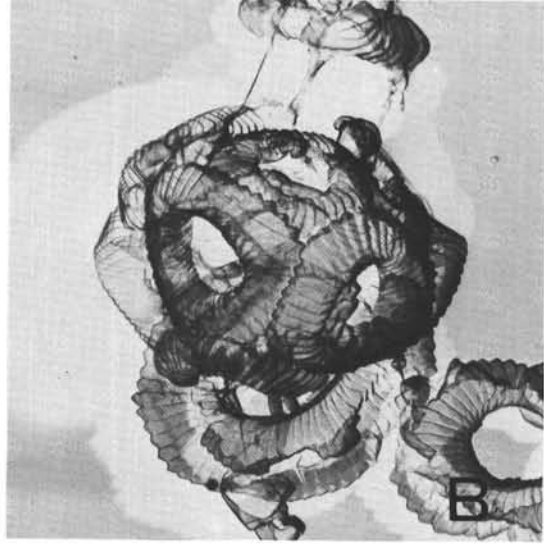
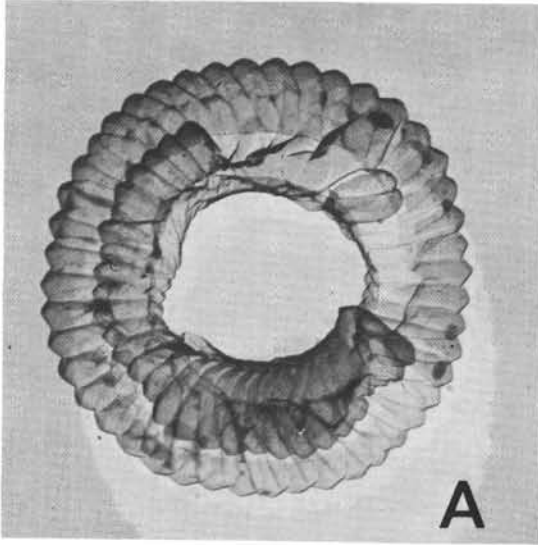


PLATE 4

- Figures A, B *Sphenolithus belemnus* Bramlette & Wilcoxon.
71-26-6. *Sphenolithus belemnus* and
Helicopontosphaera ampliaperta Zones. X8000.
- Figures C, D *Sphenolithus* (?) *ciperoensis* Bramlette & Wilcoxon.
75-6-CC. *Sphenolithus distentus* Zone. X6000.
- Figure E *Sphenolithus* (?) *distentus* Martini) Bramlette &
Wilcoxon. 71-48-3. *Sphenolithus distentus* Zone.
X6000.
- Figure F *Sphenolithus predistentus* Bramlette & Wilcoxon.
71-48-3. *Sphenolithus distentus* Zone. X10000.

PLATE 4

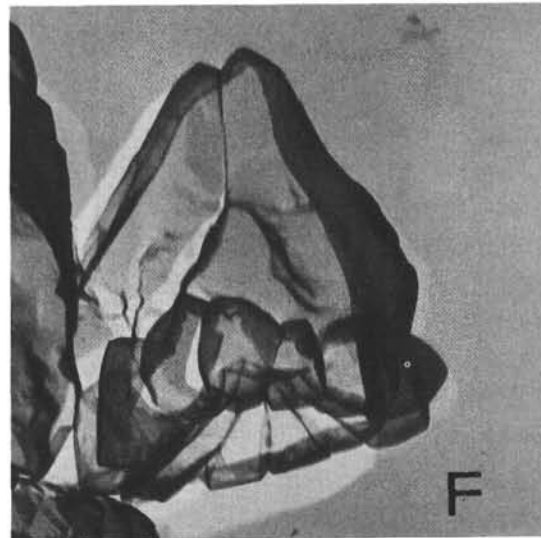
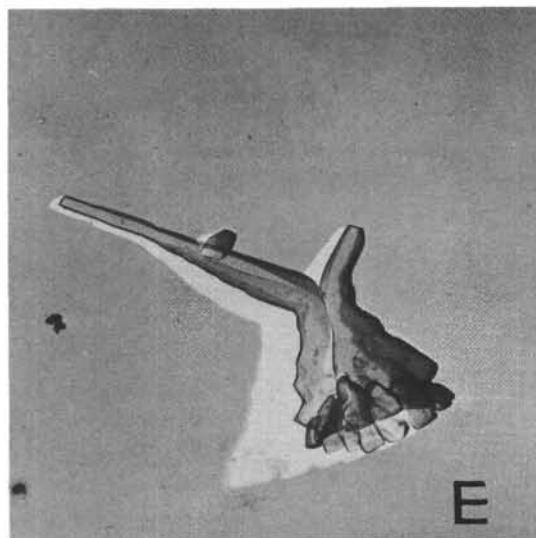
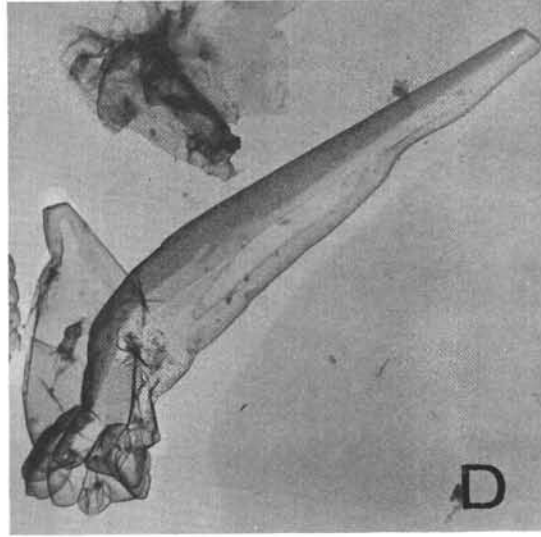
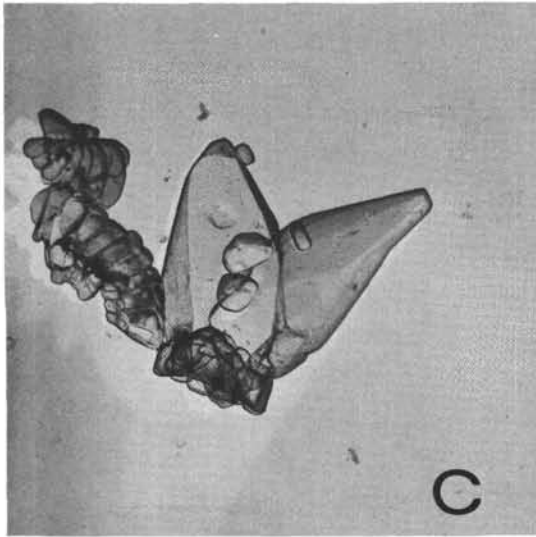
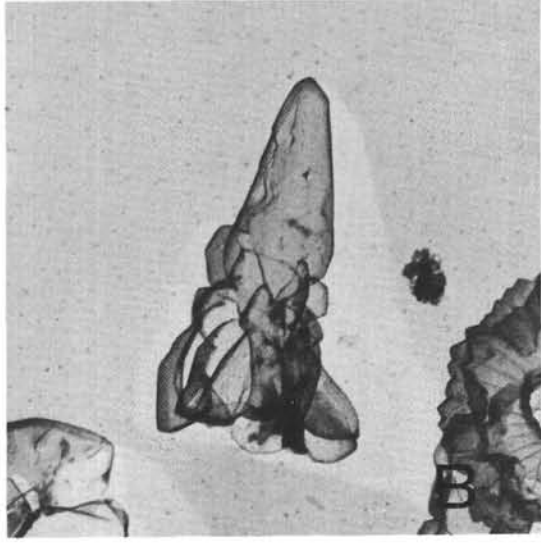
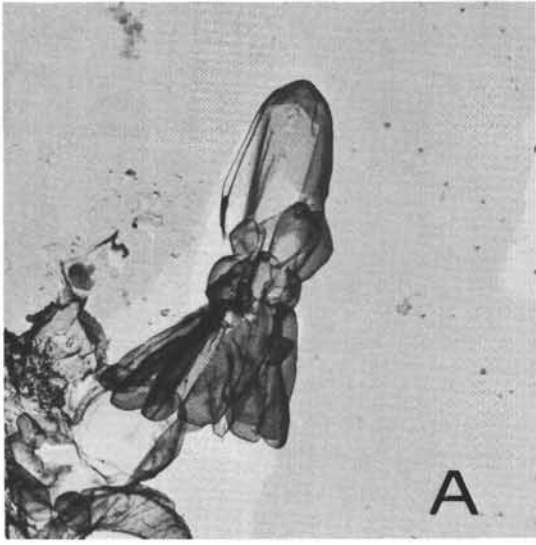


PLATE 5

- Figures A, B *Sphenolithus moriformis* (Brönnimann & Stradner)
Bramlette & Wilcoxon. 70A-17-3. *Sphenolithus*
predistentus Zone. X12000.
- Figure C *Discoaster* cf. *D. incomptus* Hay. 71-48-CC.
Sphenolithus distentus Zone. X6000.
- Figure D *Discoaster rufus* Roth. 71-26-6. *Sphenolithus*
belemnus and *Helicopontosphaera ampliapertura* Zones.
X6000.
- Figure E *Discoaster adamentus* Bramlette and Wilcoxon.
71-48-CC. *Sphenolithus distentus* Zone. X6000.
- Figure F *Discoaster trinidadensis* Hay. 71-48-CC. *Sphenolithus*
distentus Zone. X6000.

PLATE 5

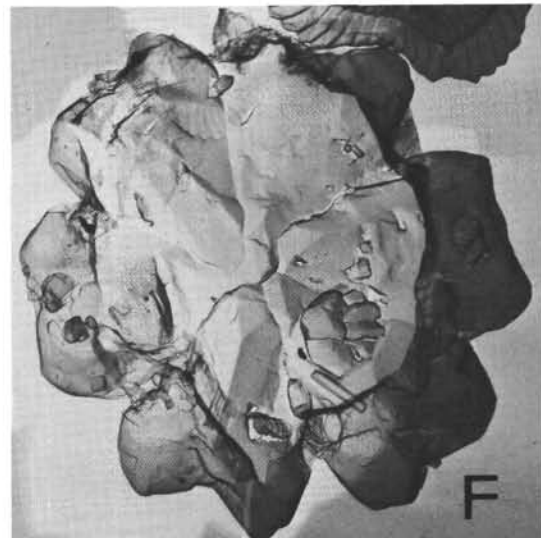
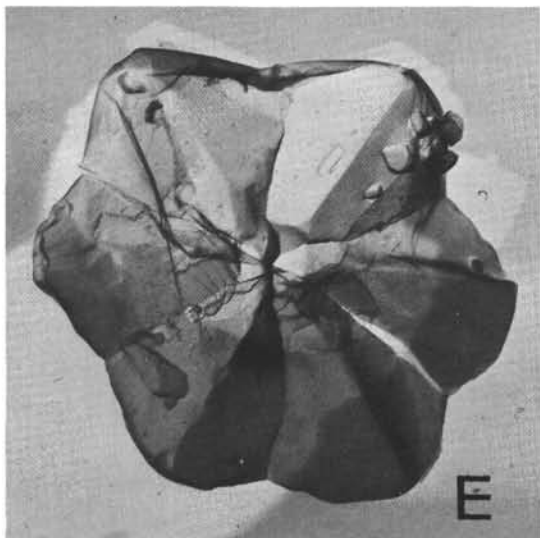
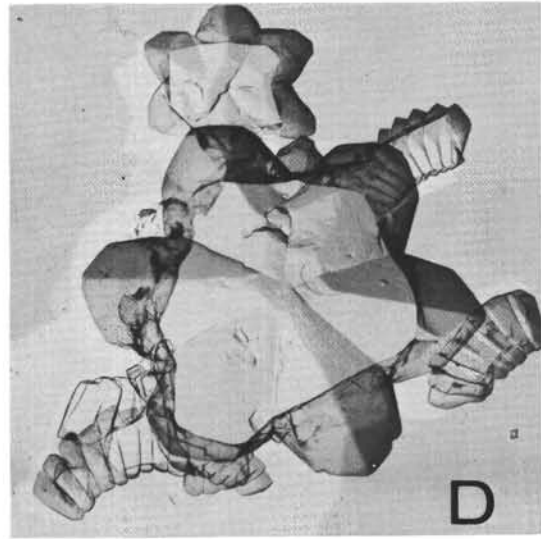
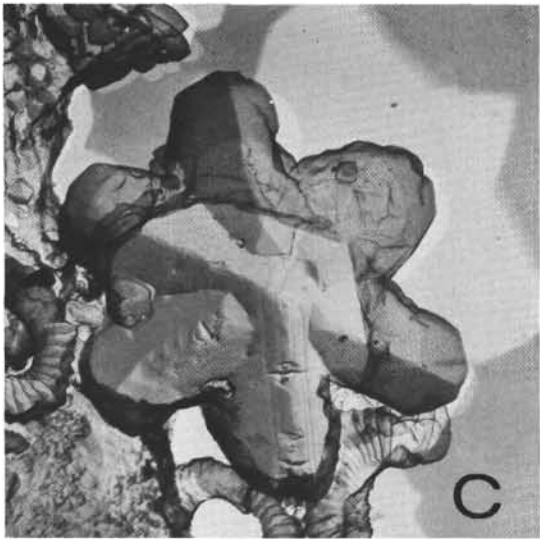
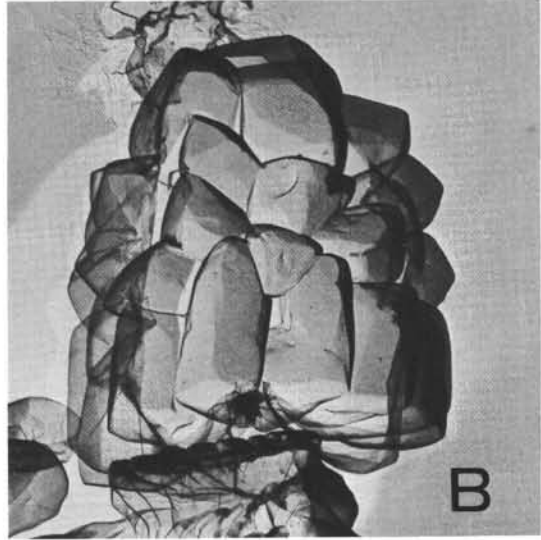
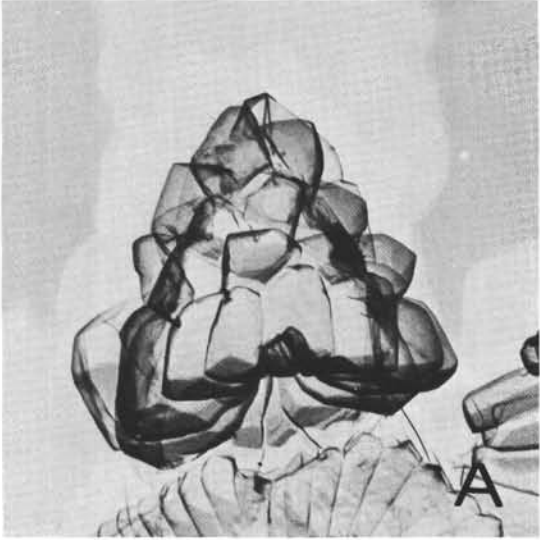


PLATE 6

Thoracosphaera cf. *T. deflandrei*. Scanning electron micrograph showing irregular, interlocking plates and pore (left). $\times 11,500$. 73-21-CC.

