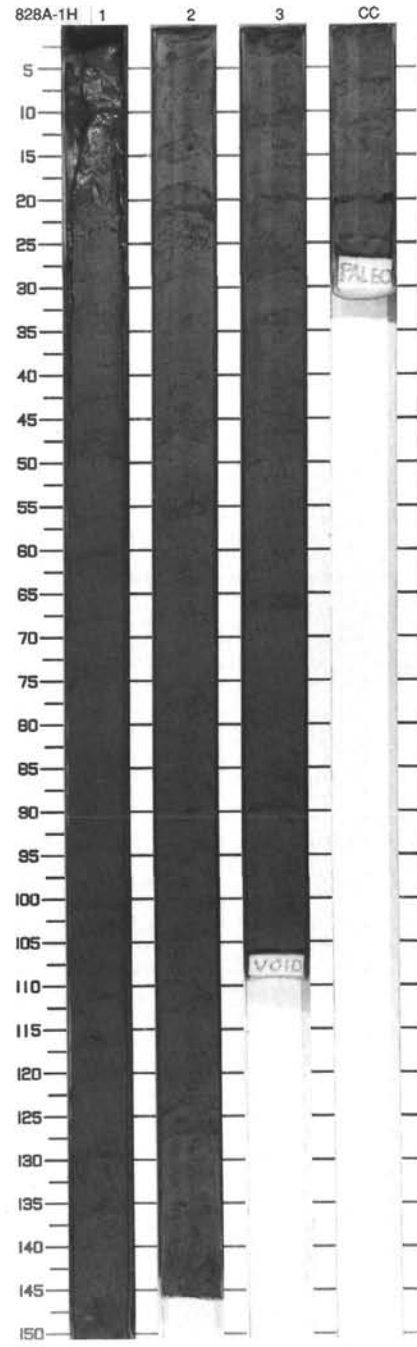
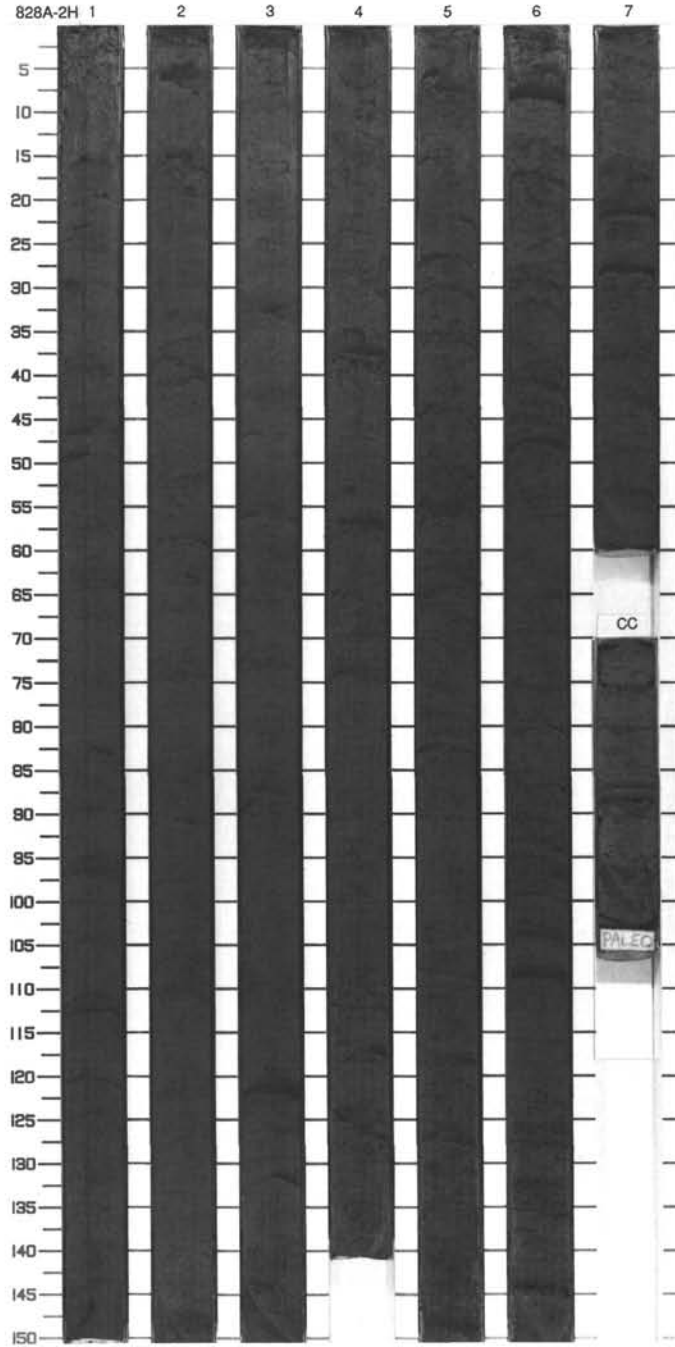
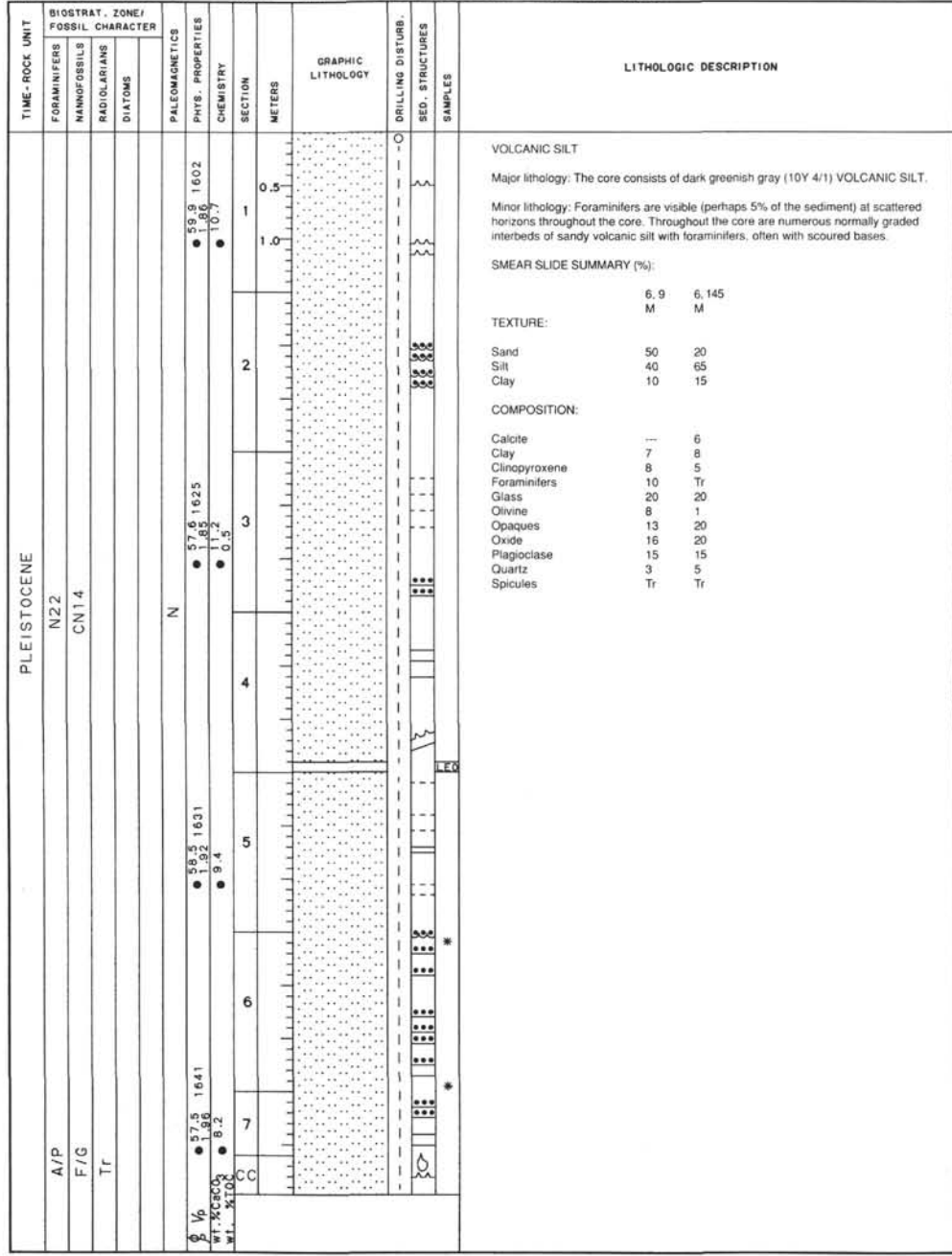


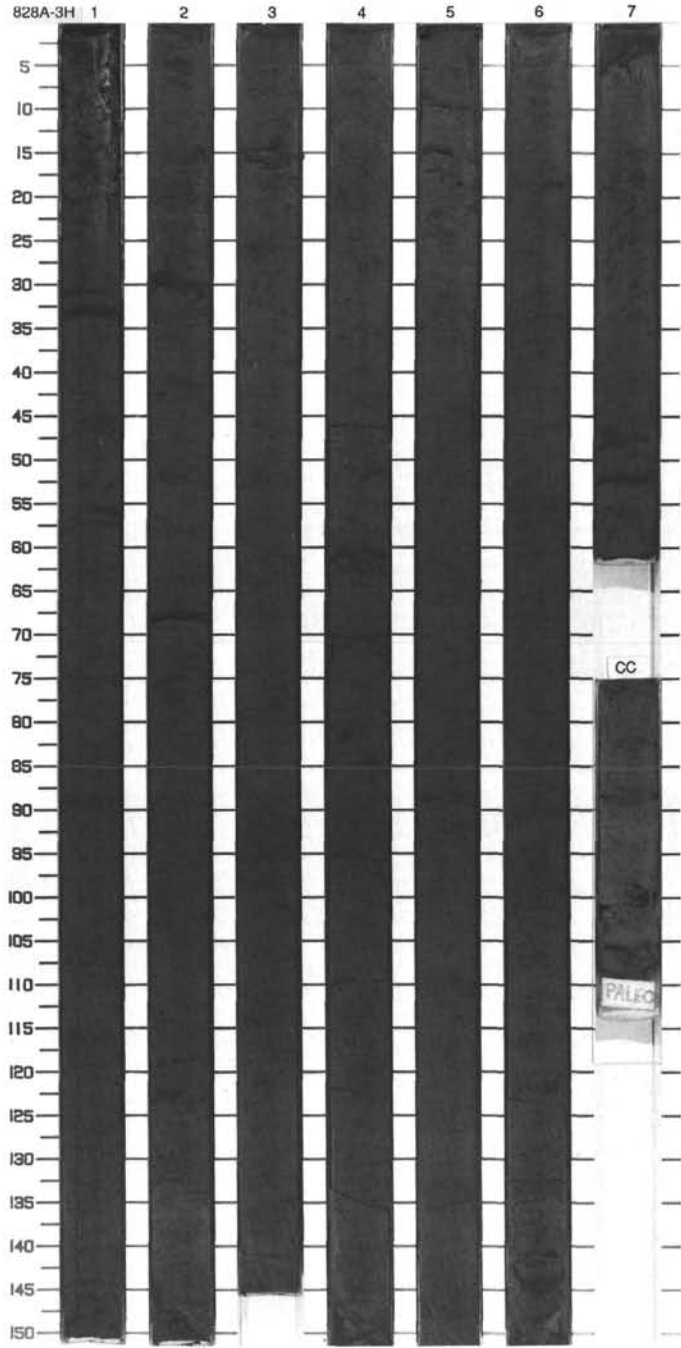
TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER				PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB. SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
	FORAMINIFERS	NAUFOSSILS	RADICULARIANS	DIATOMS									
PLEISTOCENE	N22								0.5	[Dotted pattern]	[Symbol]	[Symbol]	VOLCANIC SILT Major lithology: The core consists of dark greenish gray (10Y 4/1) VOLCANIC SILT with clay. Minor lithology: Throughout the core there are 0.5 to 1 cm normally graded interbeds of sandy silt; the bases of these beds are sometimes scoured. SMEAR SLIDE SUMMARY (%): D 1.80 M 3.90 TEXTURE: Sand 15 35 Silt 65 55 Clay 20 10 COMPOSITION: Calcite 7 8 Celadonite 1 -- Chlorite 12 -- Clay 8 5 Clinopyroxene 8 10 Foraminifers 5 Tr Glass 5 15 Nannofossils Tr Tr Olivine 5 4 Opauques 10 10 Other -- -- Oxide 14 3 Plagioclase 15 20 Quartz 10 15 Spicules Tr Tr
	CN14							1.0	[Symbol]				
									1.5	[Symbol]	[Symbol]	[Symbol]	
									2.0	[Symbol]	[Symbol]	[Symbol]	
									2.5	[Symbol]	[Symbol]	[Symbol]	
									3.0	[Symbol]	[Symbol]	[Symbol]	
									3.5	[Symbol]	[Symbol]	[Symbol]	
									4.0	[Symbol]	[Symbol]	[Symbol]	
									4.4	[Symbol]	[Symbol]	[Symbol]	



SITE 828 HOLE A CORE 2H CORED INTERVAL 4.4-13.9 mbsf

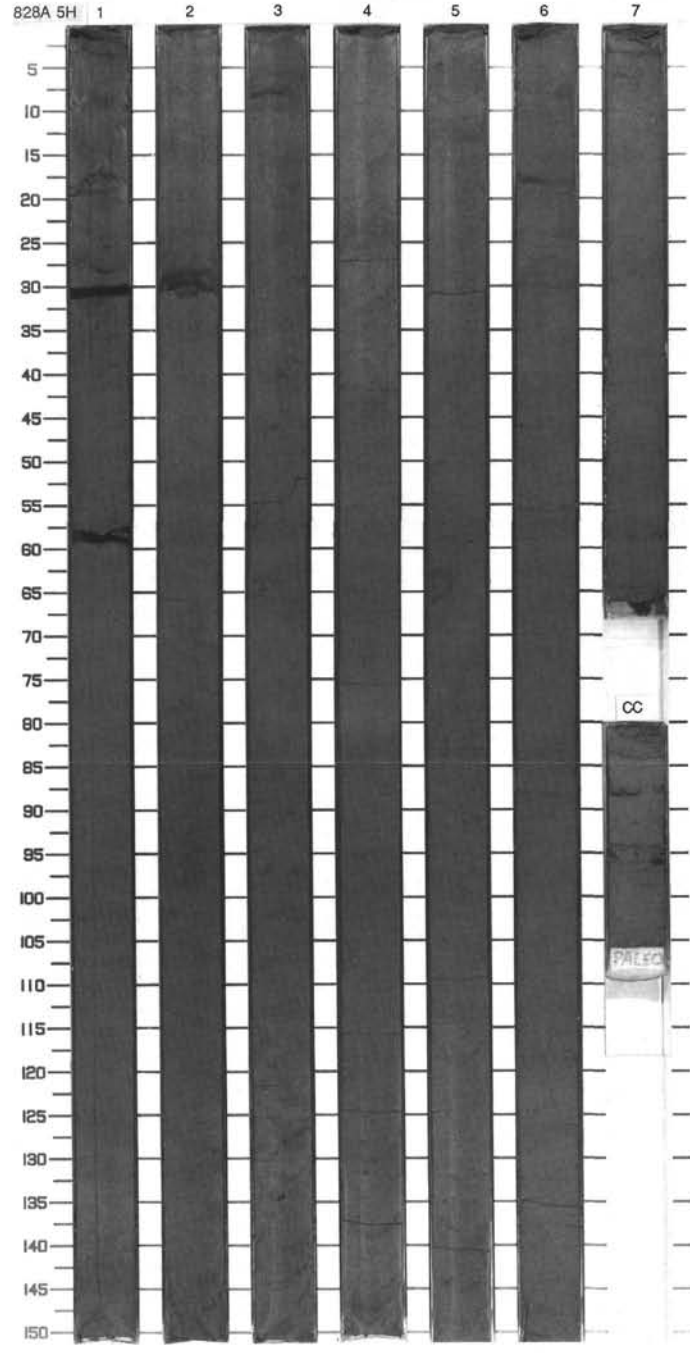
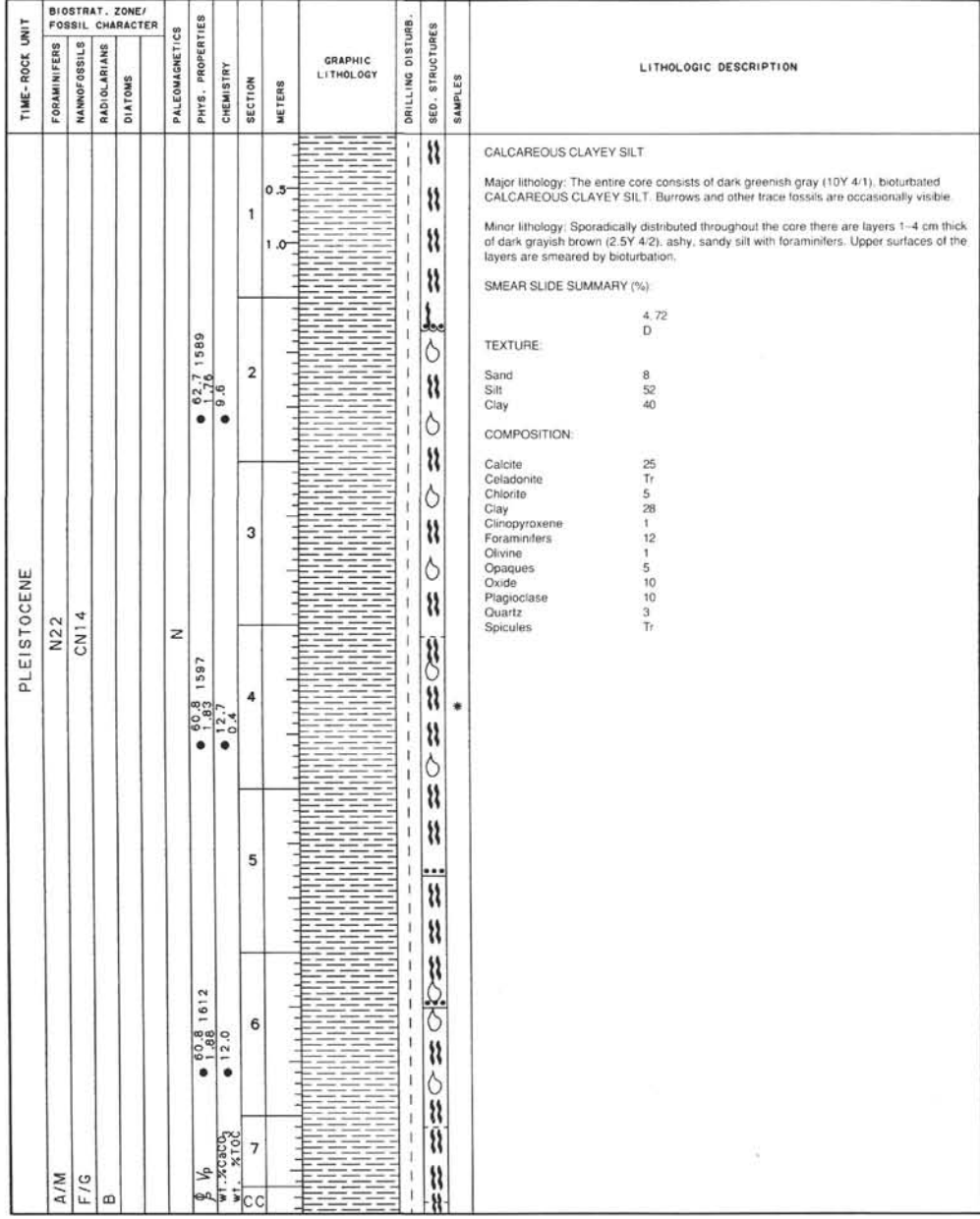


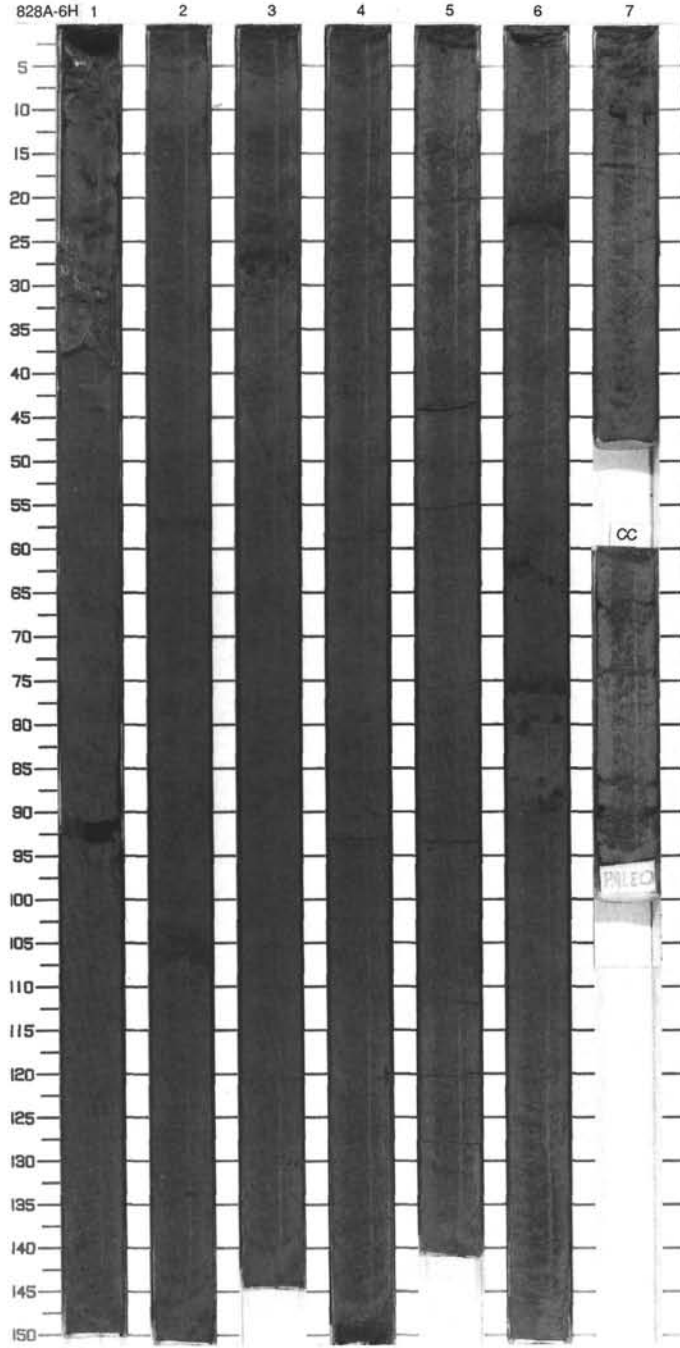
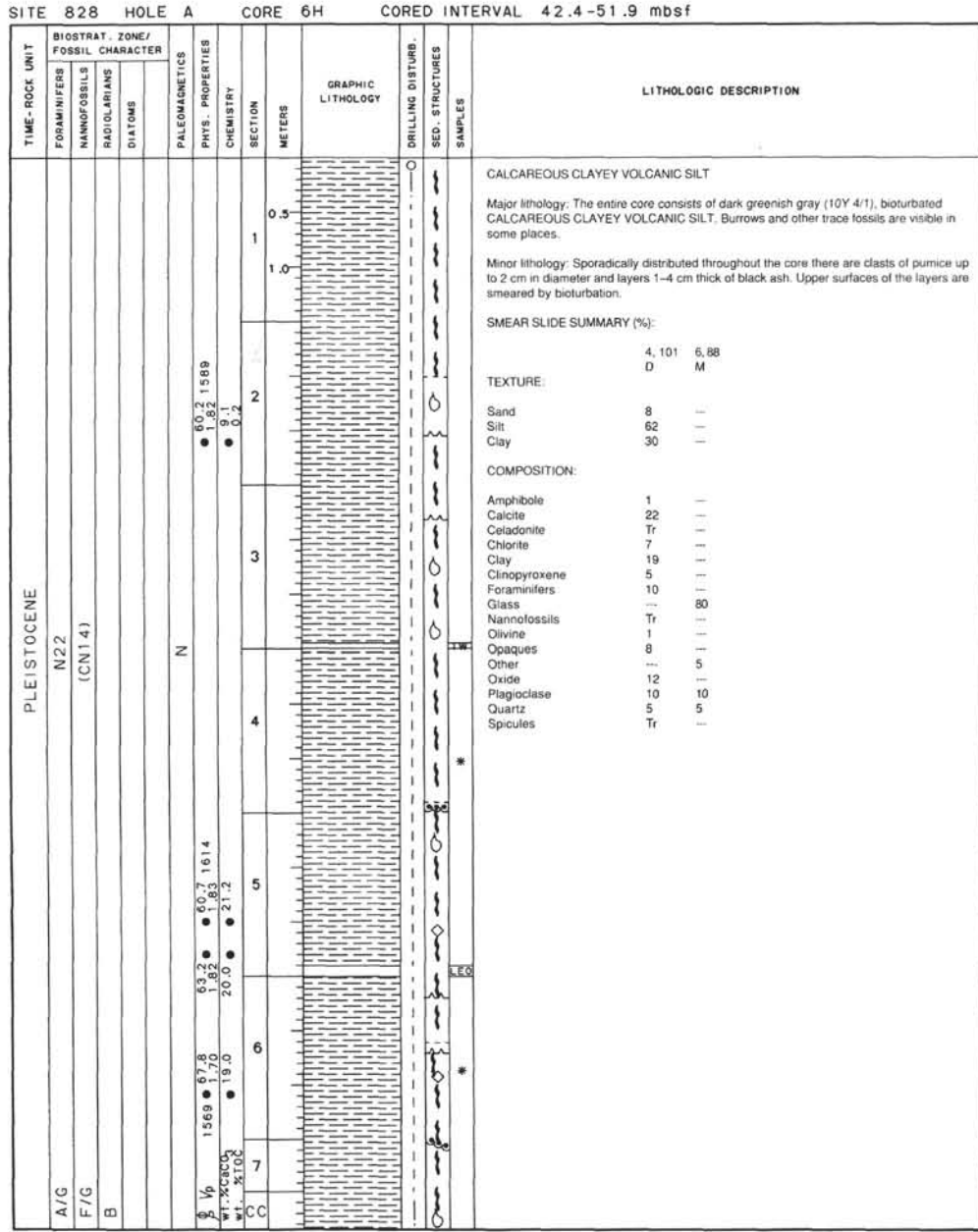
TIME-ROCK UNIT		BIOSTRAT. ZONE/ FOSSIL CHARACTER			PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	LITHOLOGIC DESCRIPTION						
FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS															
PLEISTOCENE																		
A/P		N22			N	● 56.6 1927 ● 58.1 1612 ● 60.5 1821	● 1.90 ● 1.88	● 9.0 ● 10.7	1	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●	VOLCANIC SILT and VOLCANIC SILTY CLAY  Major lithology: The first five sections of the core consist of dark greenish gray (10Y 4/1) VOLCANIC SILT with calcareous grains. Section 6 and below consist of dark greenish gray (10Y 4/1), mottled and bioturbated, VOLCANIC SILTY CLAY.  Minor lithology: Throughout this unit are normally graded interbeds of sandy volcanic silt with foraminifers, often featuring scoured bases. In the lower unit, there are fewer graded interbeds, and bioturbation has visibly smeared the upper contacts of the beds. Worm tubes are occasionally visible.  SMEAR SLIDE SUMMARY (%): M 2.67 D 5.50  TEXTURE: Sand 50 10 Silt 40 40 Clay 10 50  COMPOSITION: Calcite 10 5 Celadonite Tr --- Chlorite 5 10 Clay 4 30 Clinopyroxene 10 5 Foraminifers 2 1 Glass 10 5 Olivine 6 1 Opalines 18 10 Oxide 12 10 Plagioclase 18 15 Quartz 5 8 Spicules Tr Tr						
F/G		CN14											● 76.6 1637 ● 77.4 147	● 1.10	● 11.0	2	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●
Tr													● 80.5 1821 ● 81.1 1111	● 1.11 ● 1.22	● 10.7	3	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●
					● 91.0 1822 ● 91.0 1612	● 1.07 ● 1.88	● 10.7	4	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●	CC							
					● 101.0 1822 ● 101.0 1612	● 1.07 ● 1.88	● 10.7	5	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●								
					● 101.0 1821 ● 101.0 1612	● 1.07 ● 1.88	● 10.7	6	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●	PALEO							
					● 101.0 1821 ● 101.0 1612	● 1.07 ● 1.88	● 10.7	7	[Volcanic silt/clay pattern]	○ ● ○ ● ○ ● ○ ●								

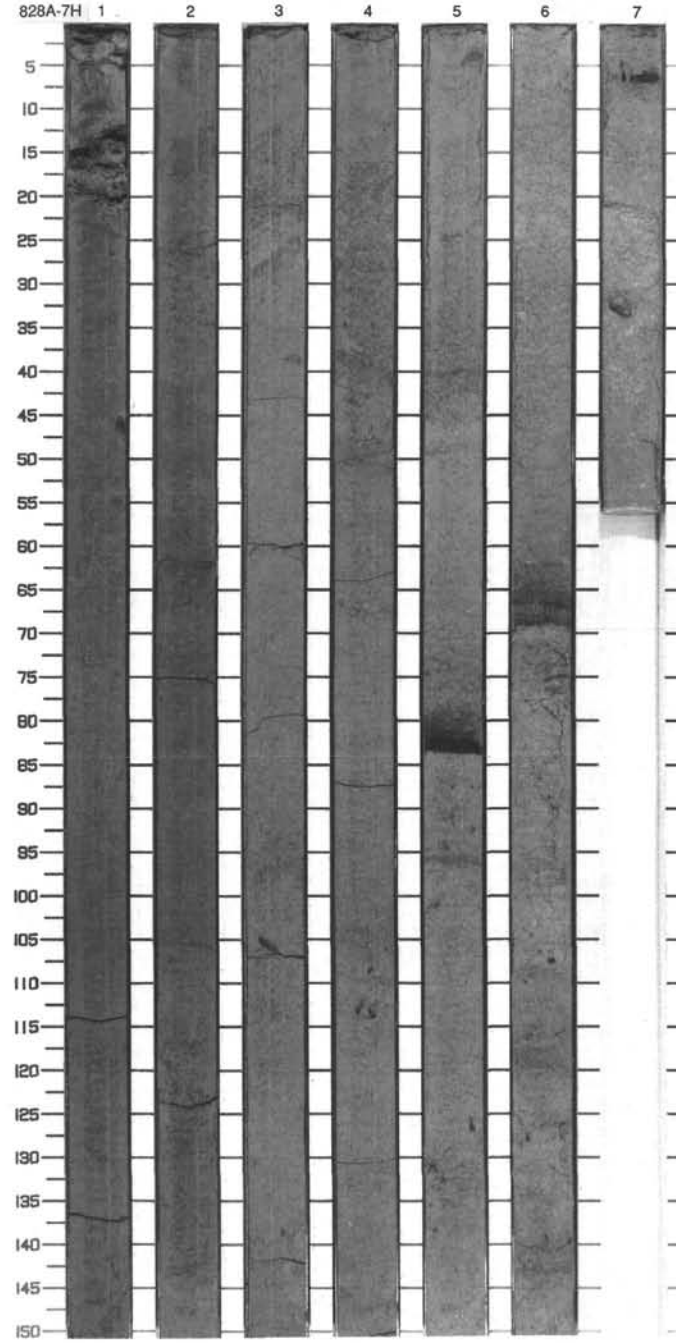
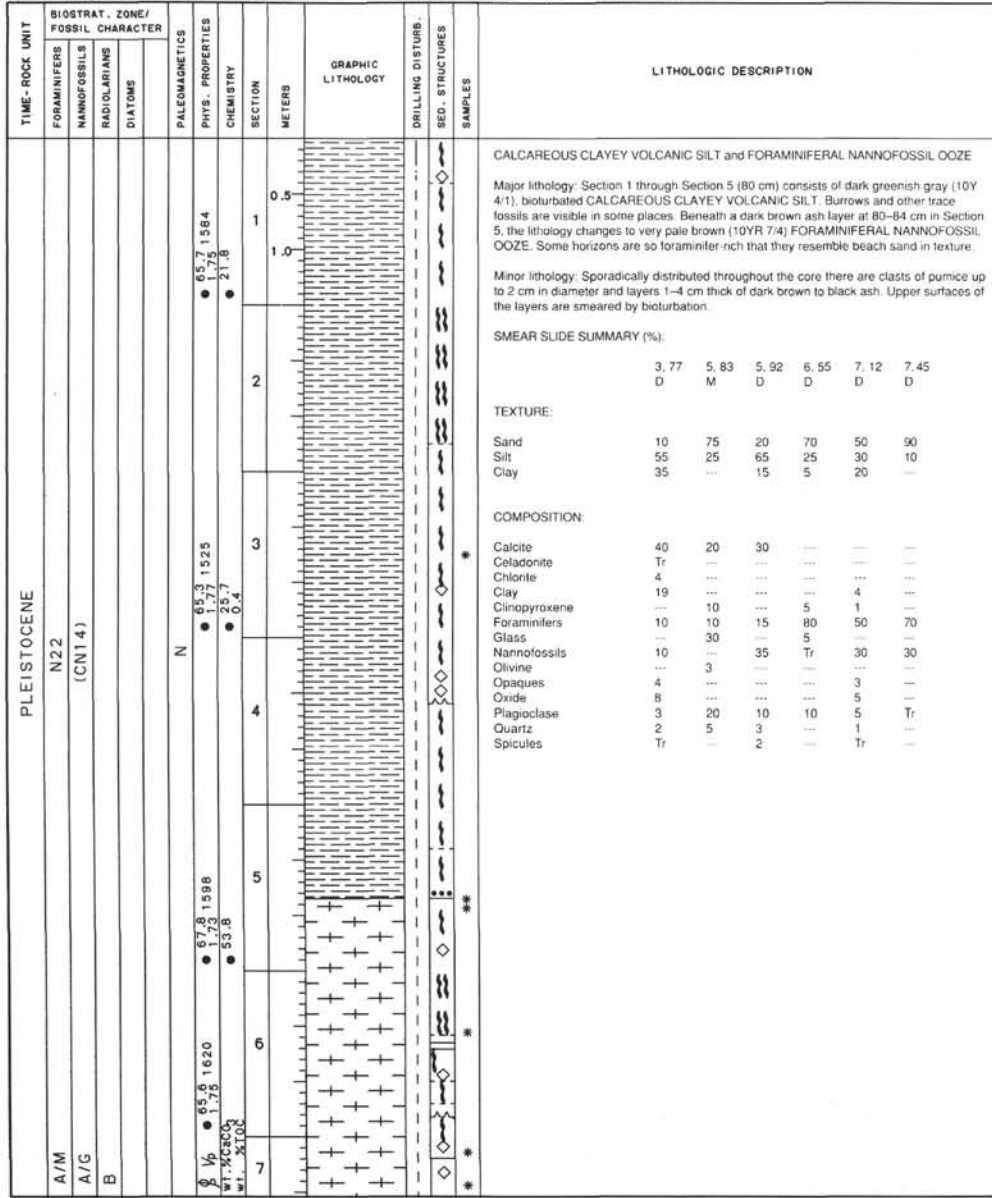




SITE 828 HOLE A CORE 5H CORED INTERVAL 32.9-42.4 mbsf

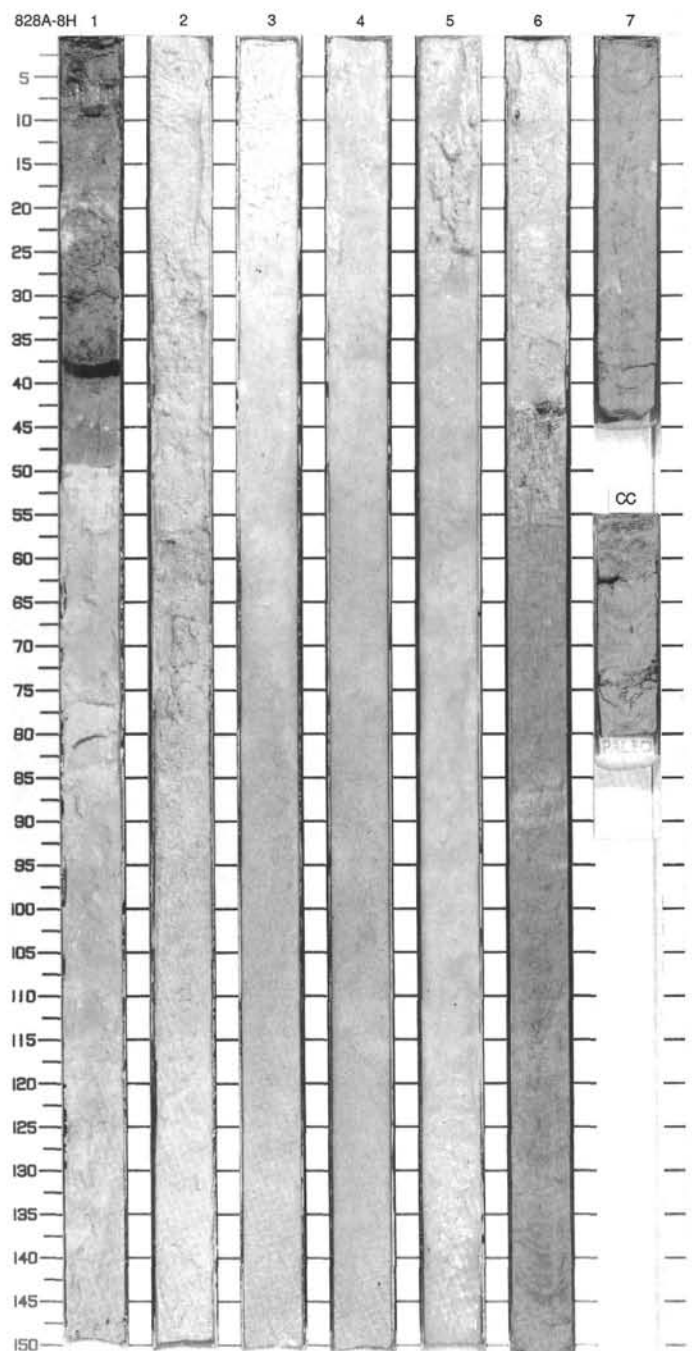




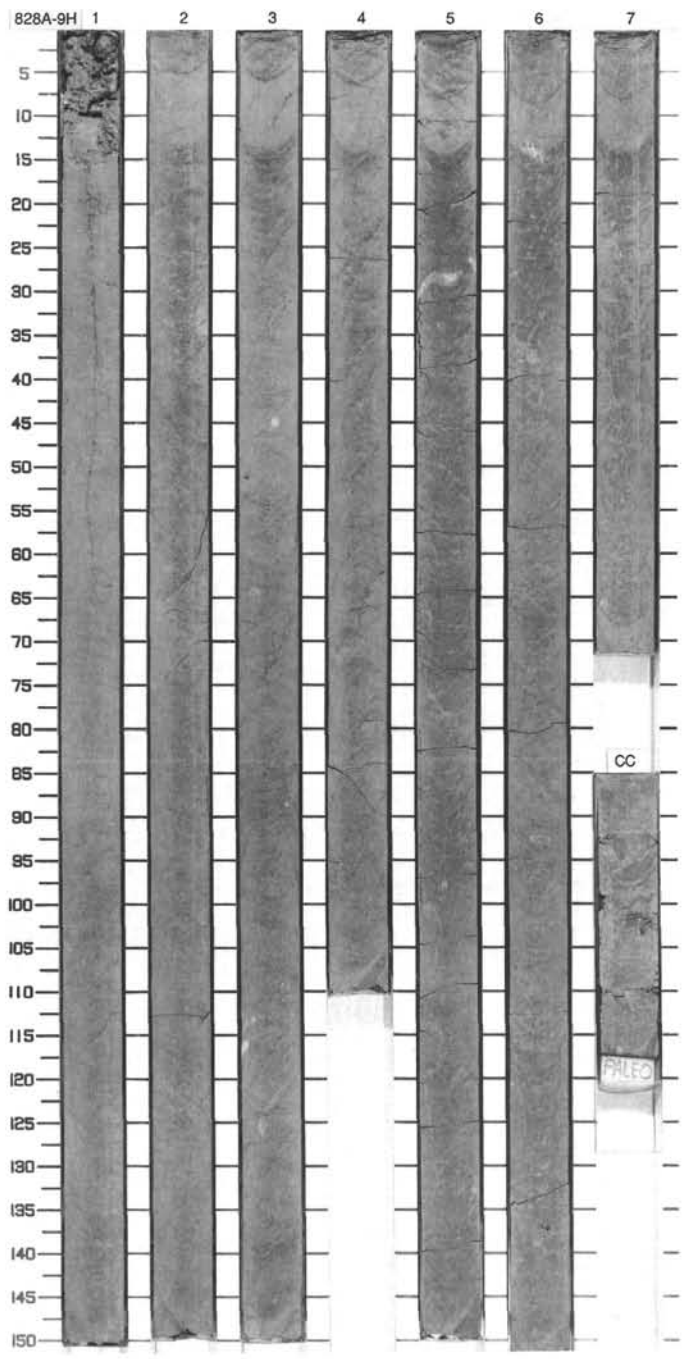
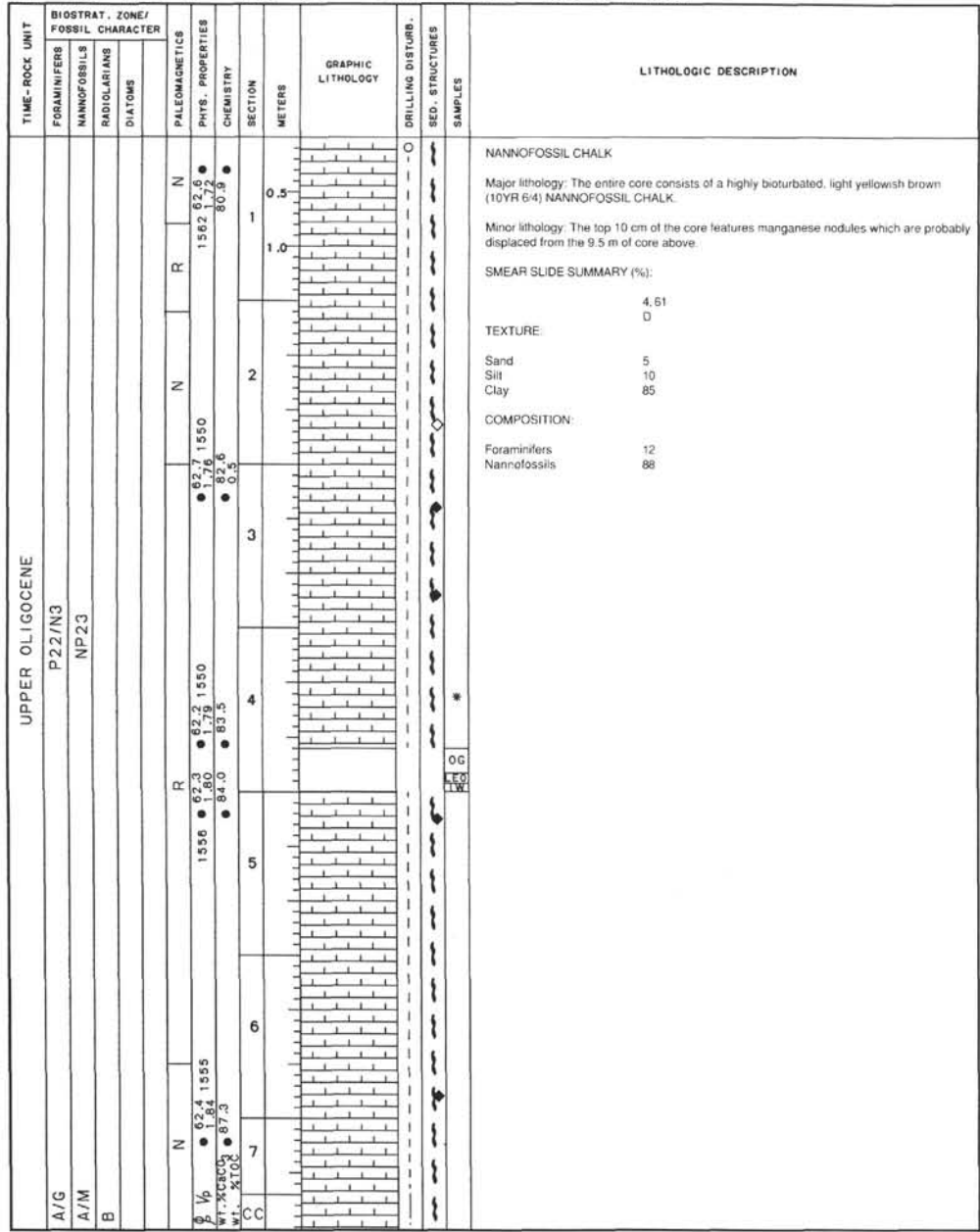


SITE 828 HOLE A CORE 8H CORED INTERVAL 61.4-70.9 mdsf

TIME-ROCK UNIT		BIOSTRAT. ZONE/ FOSSIL CHARACTER		PALEOMAGNETICS		PHYS. PROPERTIES		CHEMISTRY		SECTION		METERS		GRAPHIC LITHOLOGY		DRILLING DISTURB.		BED. STRUCTURES		SAMPLES		LITHOLOGIC DESCRIPTION	
FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIAATOMS																				
UPPER OLIGOCENE		UPPER MIOCENE - LOWER PLEIOCENE																					
A/G	P22/N3	A/G	(N19)	A/G		● 60.6	● 56.4	● 48.6	● 72.2	● 1614	1	0.5	+	+	+	+	+	+	+	+	+	+	+
A/M	CP1B	A/M	CN10?	A/G		● 82.4	● 83.5	● 93.5	● 90.5	3.4	1.0	+	+	+	+	+	+	+	+	+	+	+	+
B						● 81.0	● 93.7	● 0.3			2		+	+	+	+	+	+	+	+	+	+	+
											3		+	+	+	+	+	+	+	+	+	+	+
											4		+	+	+	+	+	+	+	+	+	+	+
											5		+	+	+	+	+	+	+	+	+	+	+
											6		+	+	+	+	+	+	+	+	+	+	+
											7		+	+	+	+	+	+	+	+	+	+	+

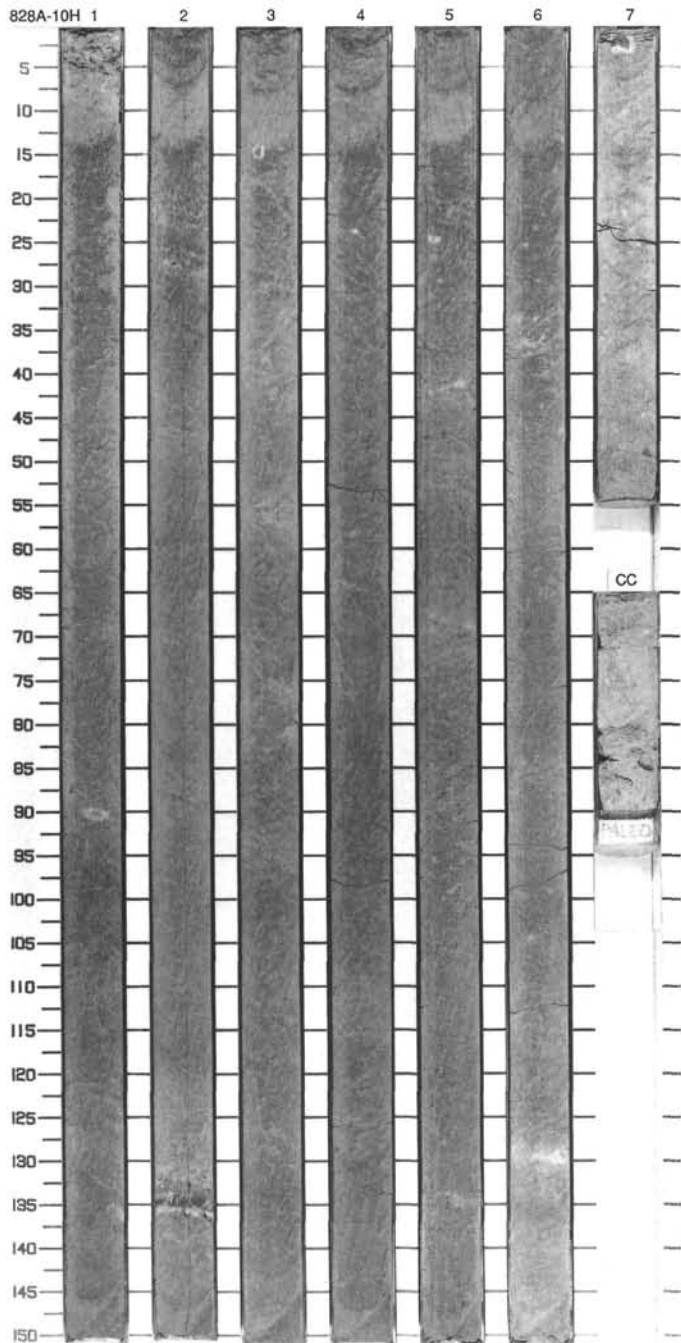






SITE 828 HOLE A CORE 10H CORED INTERVAL 80.4-89.9 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER			PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION																																																																																																																							
	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS																																																																																																																																	
LOWER OLIGOCENE																																																																																																																																				
A/G	P8/P19			N	154.1	59.3		0.5					<p><b>NANNOFOSSIL CHALK</b></p> <p>Major lithology: The entire core consists of NANNOFOSSIL CHALK. The upper 5 sections are light yellowish brown (10YR 6/4). Section 6, 40-100 cm, shows a gradual color change to pale brown (10YR 6/3); Section 6, 135 cm, to Section 7, 35 cm, is light brownish gray. Section 7, 35-55 cm, is pale brown.</p> <p>Minor lithology: A layer of yellowish brown (10YR 5/4) nannofossil chalk with zeolite overlies dark yellowish brown (10YR 7/4), clayey silty sand (altered volcanic material?). Section 2, 133-135 cm.</p> <p>Isolated clasts of highly altered volcanic rock occur throughout the core; these clasts are typically surrounded by a halo of bleached (very pale brown, 10YR 7/4) nannofossil chalk. A similar zone of bleached nannofossil chalk forms a 1 cm thick layer beneath the dark yellowish brown layer in Section 2, 135-136 cm.</p> <p>Vague mottling in Sections 5 and 6 suggests minor bioturbation.</p> <p><b>SMEAR SLIDE SUMMARY (%)</b>:</p> <table border="1"> <tr> <td></td> <td>2, 133</td> <td>2, 134</td> <td>2, 136</td> <td>3, 73</td> <td>6, 129</td> <td>6, 131</td> <td>7, 1</td> </tr> <tr> <td></td> <td>M</td> <td>M</td> <td>M</td> <td>D</td> <td>M</td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>1</td> <td>40</td> <td>10</td> <td>10</td> <td>5</td> <td>5</td> <td>60</td> </tr> <tr> <td>Silt</td> <td>59</td> <td>30</td> <td>60</td> <td>50</td> <td>50</td> <td>50</td> <td>20</td> </tr> <tr> <td>Clay</td> <td>40</td> <td>30</td> <td>30</td> <td>40</td> <td>45</td> <td>45</td> <td>20</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Clay</td> <td>20</td> <td>20</td> <td>20</td> <td>20</td> <td>20</td> <td>20</td> <td>--</td> </tr> <tr> <td>Foraminifers</td> <td>--</td> <td>--</td> <td>Tr</td> <td>10</td> <td>2</td> <td>2</td> <td>--</td> </tr> <tr> <td>Nannofossils</td> <td>60</td> <td>Tr</td> <td>75</td> <td>70</td> <td>75</td> <td>75</td> <td>1</td> </tr> <tr> <td>Other</td> <td>--</td> <td>80</td> <td>5</td> <td>--</td> <td>--</td> <td>3</td> <td>99</td> </tr> <tr> <td>Zeolite</td> <td>20</td> <td>--</td> <td>--</td> <td>--</td> <td>--</td> <td>--</td> <td>--</td> </tr> </table> <p><b>SMEAR SLIDE SUMMARY (%)</b>:</p> <table border="1"> <tr> <td></td> <td>7, 15</td> <td>7, 49</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>5</td> <td>90</td> </tr> <tr> <td>Silt</td> <td>50</td> <td>5</td> </tr> <tr> <td>Clay</td> <td>45</td> <td>5</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Calcite</td> <td>--</td> <td>Tr</td> </tr> <tr> <td>Clay</td> <td>10</td> <td>--</td> </tr> <tr> <td>Foraminifers</td> <td>5</td> <td>--</td> </tr> <tr> <td>Hornblende</td> <td>--</td> <td>30</td> </tr> <tr> <td>Nannofossils</td> <td>80</td> <td>2</td> </tr> <tr> <td>Opaques</td> <td>--</td> <td>15</td> </tr> <tr> <td>Plagioclase</td> <td>--</td> <td>50</td> </tr> <tr> <td>Zeolite</td> <td>5</td> <td>--</td> </tr> </table>		2, 133	2, 134	2, 136	3, 73	6, 129	6, 131	7, 1		M	M	M	D	M	D	M	Sand	1	40	10	10	5	5	60	Silt	59	30	60	50	50	50	20	Clay	40	30	30	40	45	45	20	Clay	20	20	20	20	20	20	--	Foraminifers	--	--	Tr	10	2	2	--	Nannofossils	60	Tr	75	70	75	75	1	Other	--	80	5	--	--	3	99	Zeolite	20	--	--	--	--	--	--		7, 15	7, 49		D	M	Sand	5	90	Silt	50	5	Clay	45	5	Calcite	--	Tr	Clay	10	--	Foraminifers	5	--	Hornblende	--	30	Nannofossils	80	2	Opaques	--	15	Plagioclase	--	50	Zeolite	5	--
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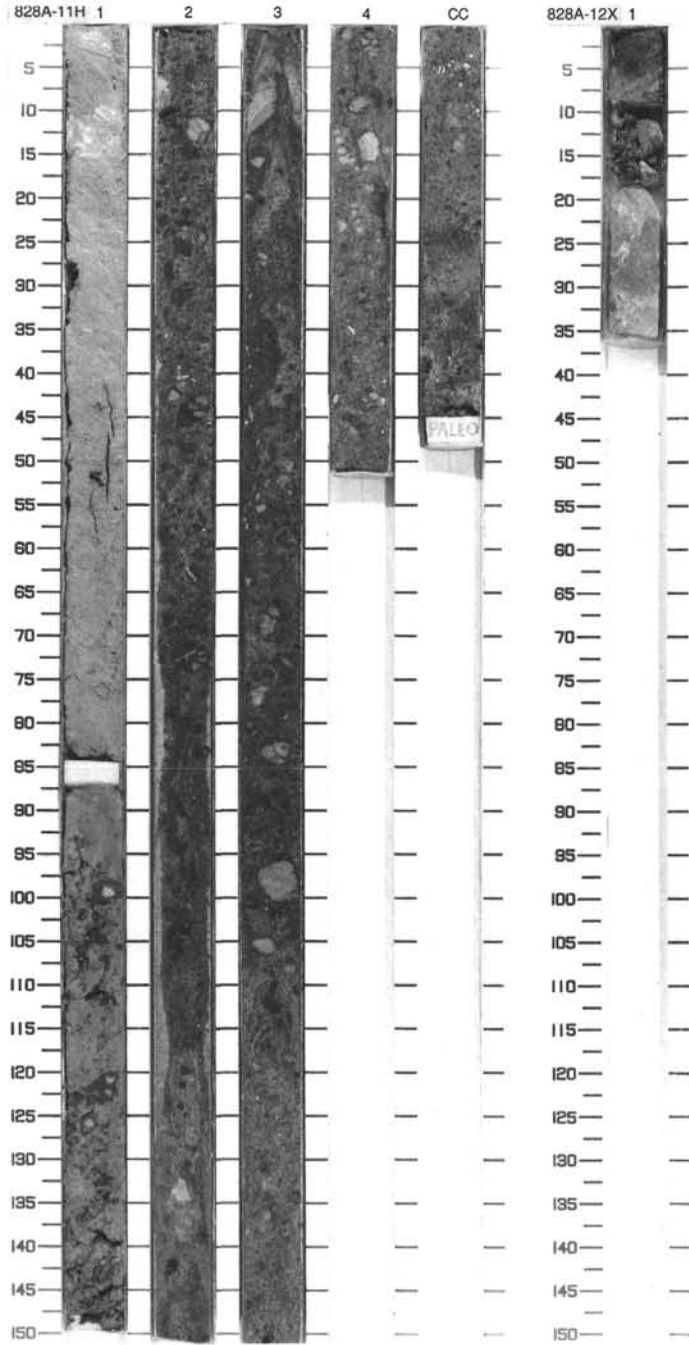


SITE 828 HOLE A CORE 11H CORED INTERVAL 89.9-95.4 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER				PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION																																																																				
	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS																																																																														
MIDDLE EOCENE	F/G	B	B											<p>NANNOFOSSIL CHALK and IG-LITHIC BRECCIA</p> <p>Major lithologies: Section 1, 0-80 cm, consists of pale brown (10YR 6/3) NANNOFOSSIL CHALK. Between 80 and 90 cm, there is a gradual color change to gray chalk (10YR 5/1). At 90 cm, Section 1 the lithology changes to un lithified, matrix-supported IG-LITHIC BRECCIA. Clasts in the breccia are angular to sub-rounded and range in size from 2 mm to 5 cm; most are greenish gray (10Y 4/1) volcanic rocks, but dusky red (10R 3/3) volcanic clasts are common and there are a few light greenish gray clasts (chert?) in Section 3. The breccia matrix grades from gray silt in Section 1 to pale olive (5Y 6/4) and dusky red (10R 3/3) silty, clayey sand with a trace of nannofossils in Section 2 and below. Olive and red matrix are intermixed, but red matrix typically surrounds red volcanic clasts or occurs at the edges of the core.</p> <p>Minor lithology: Laminated, light brownish gray (10YR 6/1), zeolitic silty sand occurs at the outer edges of Section 3, 0-10 cm. This sand may be a bed that was disturbed by drilling. Similar unlaminated sand, which forms a vertical band several mm thick along the margins of Section 2, may have been derived from this layer.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <table border="1"> <tr> <td></td> <td>1, 51</td> <td>3, 9</td> <td>4, 20</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> <td>D</td> </tr> </table> <p>* TEXTURE:</p> <table border="1"> <tr> <td>Sand</td> <td>10</td> <td>---</td> <td>50</td> </tr> <tr> <td>Silt</td> <td>60</td> <td>70</td> <td>30</td> </tr> <tr> <td>Clay</td> <td>30</td> <td>30</td> <td>20</td> </tr> </table> <p>COMPOSITION:</p> <table border="1"> <tr> <td>Calcite</td> <td>1</td> <td>---</td> <td>30</td> </tr> <tr> <td>Chlorite</td> <td>---</td> <td>---</td> <td>20</td> </tr> <tr> <td>Clay</td> <td>10</td> <td>45</td> <td>---</td> </tr> <tr> <td>Foraminifers</td> <td>5</td> <td>---</td> <td>---</td> </tr> <tr> <td>Nannofossils</td> <td>80</td> <td>---</td> <td>Tr</td> </tr> <tr> <td>Opaques</td> <td>---</td> <td>2</td> <td>---</td> </tr> <tr> <td>Other</td> <td>---</td> <td>---</td> <td>20</td> </tr> <tr> <td>Plagioclase</td> <td>---</td> <td>10</td> <td>10</td> </tr> <tr> <td>Quartz</td> <td>1</td> <td>---</td> <td>---</td> </tr> <tr> <td>Rock fragment</td> <td>---</td> <td>---</td> <td>20</td> </tr> <tr> <td>Spicules</td> <td>Tr</td> <td>---</td> <td>---</td> </tr> <tr> <td>Zeolite</td> <td>---</td> <td>40</td> <td>---</td> </tr> </table>		1, 51	3, 9	4, 20		D	M	D	Sand	10	---	50	Silt	60	70	30	Clay	30	30	20	Calcite	1	---	30	Chlorite	---	---	20	Clay	10	45	---	Foraminifers	5	---	---	Nannofossils	80	---	Tr	Opaques	---	2	---	Other	---	---	20	Plagioclase	---	10	10	Quartz	1	---	---	Rock fragment	---	---	20	Spicules	Tr	---	---	Zeolite	---	40	---
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Zeolite	---	40	---																																																																															
	P13				1548 65.4 ● 38.2 ● 71.1 ● 0.8																																																																													

SITE 828 HOLE A CORE 12X CORED INTERVAL 95.4-97.4 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER				PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS										
Indeterminate	B	B	B											<p>IG-LITHIC BRECCIA and BRECCIATED LAVA FLOW</p> <p>Major lithologies: 10 cm of unlithified matrix-supported IG-LITHIC BRECCIA similar to that described in Core 134-828A-11H was recovered. Volcanic clasts in the breccia are 2 mm to 3 cm in diameter and are surrounded by a sandy silt matrix with less than 5% calcite. Core recovery also included 10 cm of lithified BRECCIATED LAVA FLOW; lava clasts are light greenish gray (10Y 7/2) and reddish gray (10R 5/1) and very angular.</p>

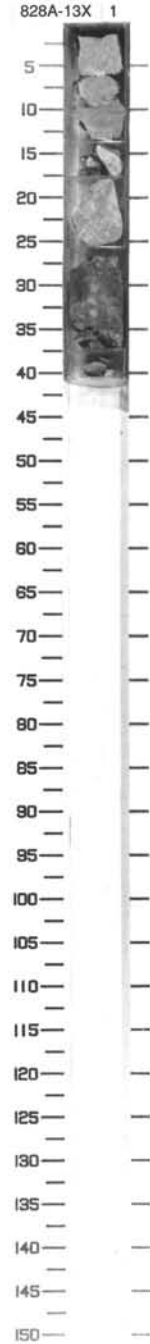


SITE 828 HOLE A CORE 13X CORED INTERVAL 97.4 -106.8 mbsf

TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER				PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB SED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
	FORAMINIFERS	NANCOFOSSILS	RADIOLARIANS	DIATOMS									
indeterminate	D	D	D					1	97.4 97.5 97.6 97.7 97.8 97.9 98.0 98.1 98.2 98.3 98.4 98.5 98.6 98.7 98.8 98.9 99.0 99.1 99.2 99.3 99.4 99.5 99.6 99.7 99.8 99.9 100.0 100.1 100.2 100.3 100.4 100.5 100.6 100.7 100.8 100.9 101.0 101.1 101.2 101.3 101.4 101.5 101.6 101.7 101.8 101.9 102.0 102.1 102.2 102.3 102.4 102.5 102.6 102.7 102.8 102.9 103.0 103.1 103.2 103.3 103.4 103.5 103.6 103.7 103.8 103.9 104.0 104.1 104.2 104.3 104.4 104.5 104.6 104.7 104.8 104.9 105.0 105.1 105.2 105.3 105.4 105.5 105.6 105.7 105.8 105.9 106.0 106.1 106.2 106.3 106.4 106.5 106.6 106.7 106.8			IG-LITHIC BRECCIA and LAVA CLASTS  Major lithologies: Ten cm of matrix-supported IG-LITHIC BRECCIA similar to that described in Core 134-828A-11H was recovered; breccia clasts are 2 mm to 1 cm in diameter. Clasts are subangular to subrounded. Core recovered also included individual clasts, 0.5 to 6 cm in diameter, of gray (10YR 6-1) weathered LAVA with calcite-filled fractures, similar to some of the clasts in the breccia. It is unknown if the clasts are from a breccia or represent an igneous formation.	

828A 14N HARD ROCK

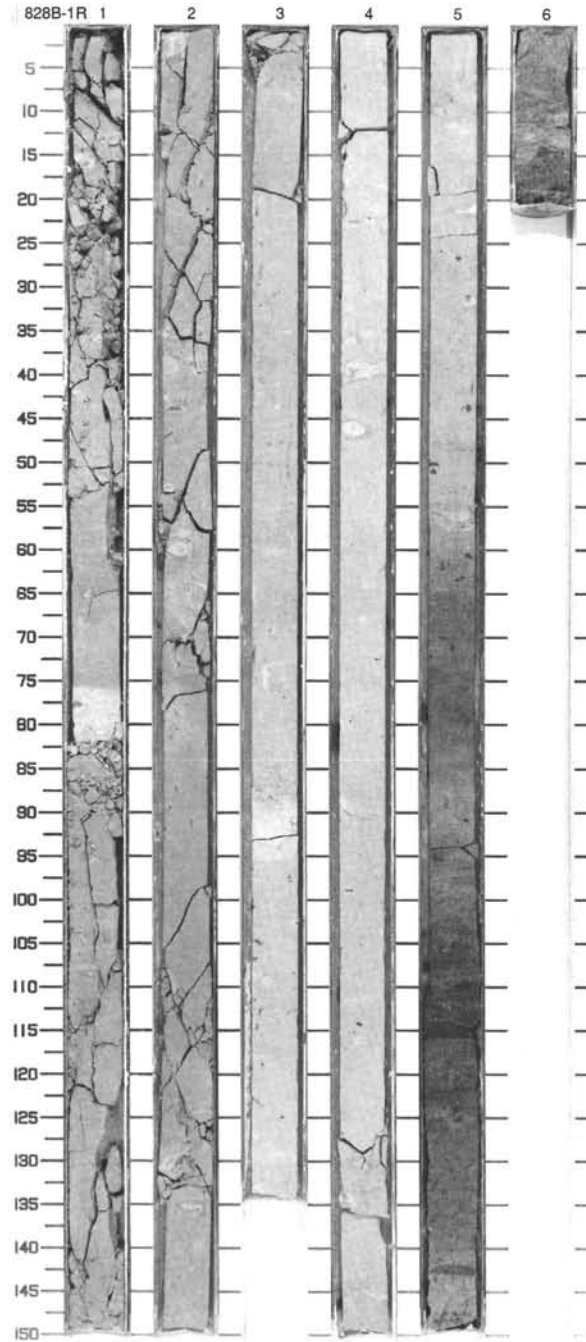
828A 15N HARD ROCK



TIME-ROCK UNIT	BIOSTRAT. ZONE/ FOSSIL CHARACTER				PALEOMAGNETICS	PHYS. PROPERTIES	CHEMISTRY	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURB.	BED. STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS										
UPPER EOCENE - LOWER OLILOCENE	A/G	R/G	B											
	P18 - P21 (CP15)													
					R?									
						66.0 1830								
						63.1 1912								
						1.78								

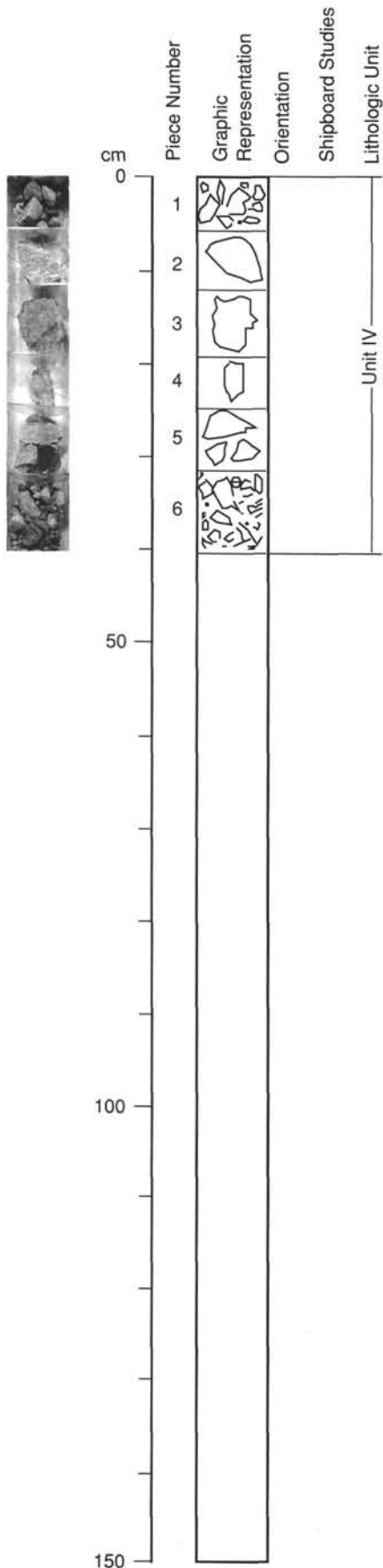
  

SMEAR SLIDE SUMMARY (%):		1, 78	2, 92	4, 46	5, 43	5, 75	5, 115	5, 142
		M	D	M	M	D	M	M
TEXTURE:								
Sand		10	15	---	15	10	20	---
Silt		20	10	10	40	10	15	10
Clay		70	75	90	45	80	65	90
COMPOSITION:								
Clay		---	---	70	---	---	---	90
Clinopyroxene		10	Tr	---	---	---	3	---
Feldspar		15	1	10	2	5	15	10
Foraminifers		---	20	---	---	15	10	---
Glass		75	---	20	25	---	---	---
Nannofossils		---	76	---	50	80	65	---
Opales		---	2	---	5	---	4	---
Oxide		---	1	---	10	---	---	---
Quartz		---	---	---	1	---	---	---
Spicules		---	---	---	2	---	---	---



828B 2R HARD ROCK  
 828B 3R HARD ROCK  
 828B 4R NO RECOVERY

828A-14N-1



**UNIT IV: APHYRIC BASALT**

**Pieces 1-6**

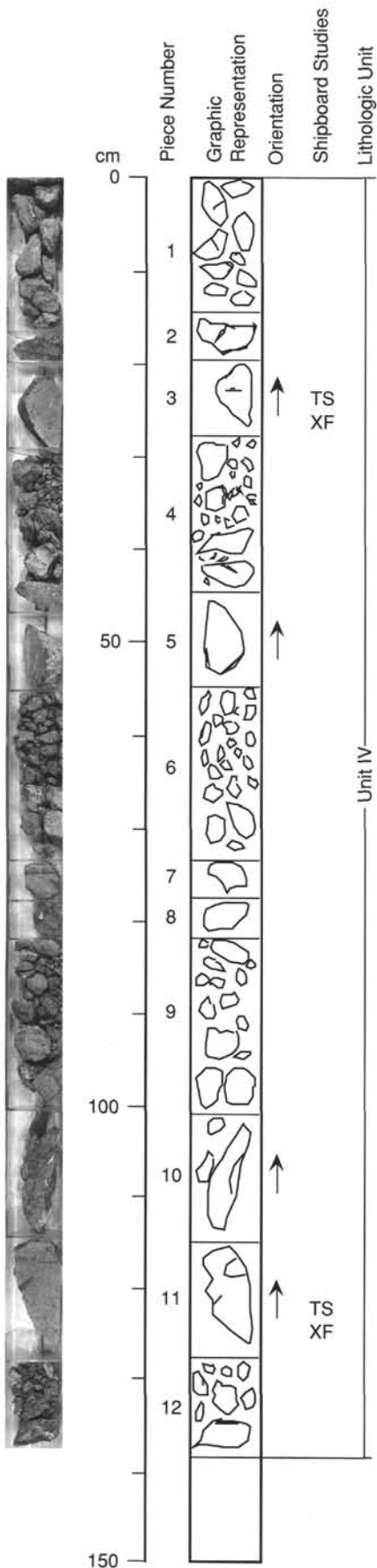
**CONTACTS:** None.  
**PHENOCRYSTS:** None.  
**GROUNDMASS:** Not visible.  
**VESICLES:** 10%, <2 mm, spherical, irregular, filled with calcite and a greenish clay minerals.  
**COLOR:** Gray (2.5Y 4/0)  
**STRUCTURE:** Cobbles, gravel and coarse sand matrix (Piece 6). Unconsolidated. Some brecciation within individual basalt clasts.  
**ALTERATION:** Strongly altered with extensive oxidation.  
**VEINS/FRACTURES:** 2%, 0.2-0.5 mm thick, random, filled by calcite. Irregular hematite-filled fractures.

134-828A-15N-1

UNIT IV: APHYRIC BASALT

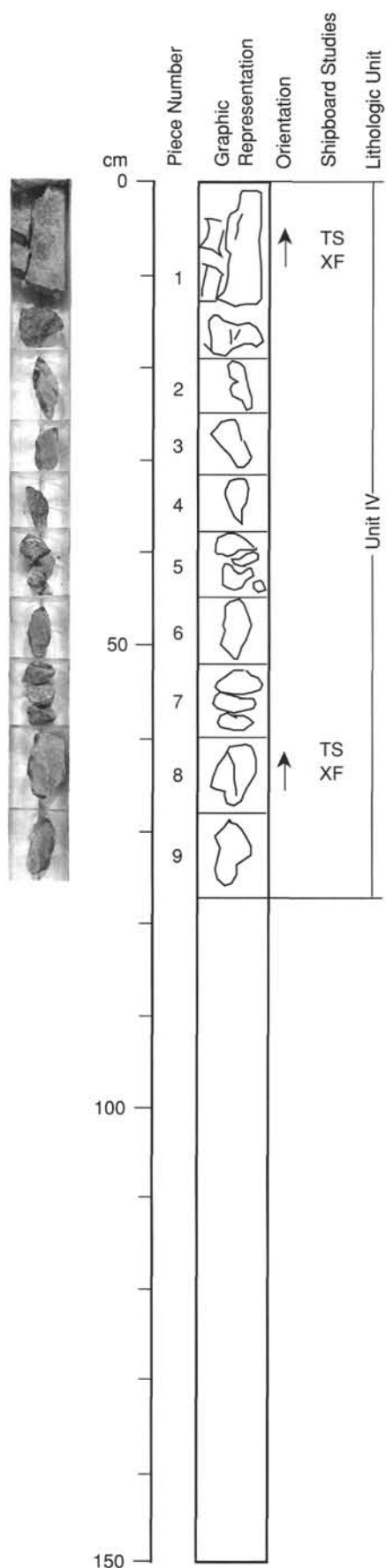
Pieces 1-12

**CONTACTS:** None.  
**PHENOCRYSTS:** None.  
**GROUNDMASS:** Not visible.  
**VESICLES:** 8%, <1 mm, spherical, irregular, filled with calcite and greenish clay.  
**COLOR:** Gray (2.5Y 4/0).  
**STRUCTURE:** Fragments are cobble- to gravel-sized. The rocks are essentially structureless.  
**ALTERATION:** Strongly altered with widespread oxidation.  
**VEINS/FRACTURES:** 3%, 0.1-0.2 mm, random, veined by calcite. Irregular hematite-filled fractures.



**UNIT IV: APHYRIC BASALT**

**Pieces 1-9**



**CONTACTS:** None.  
**PHENOCRYSTS:** None.  
**GROUNDMASS:** Not visible.  
**VESICLES:** 10%, <2 mm, spherical, irregular, filled with calcite and greenish gray minerals.  
**COLOR:** Gray (2.5Y 4/0).  
**STRUCTURE:** Structureless. Development of chlorite.  
**VEINS/FRACTURES:** 5%, <0.2 mm, random, commonly filled with calcite and hematite.



134-828B-2R-CC

**UNIT IV: APHYRIC BASALT**

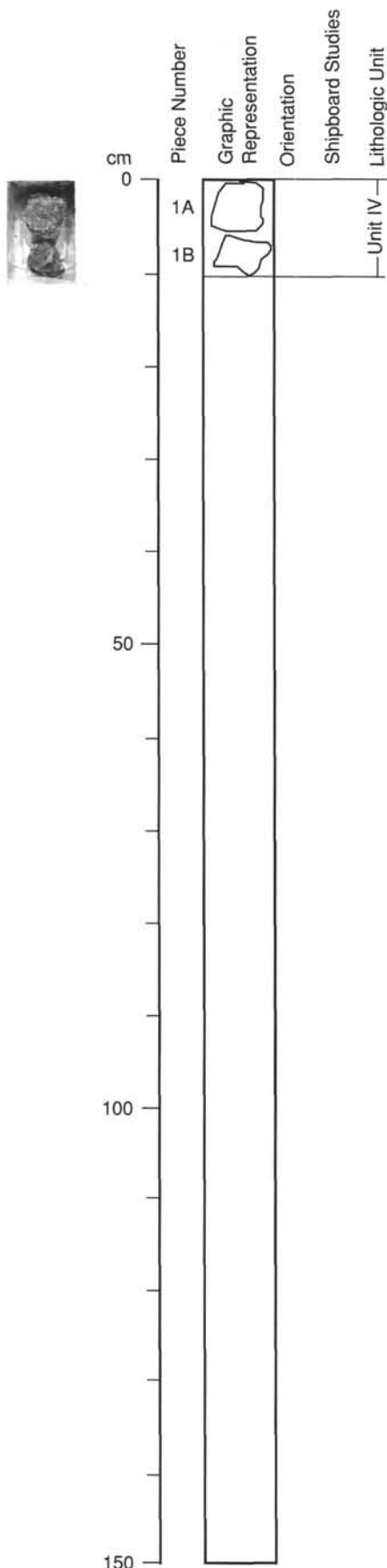
**Piece 1A**

**CONTACTS:** None.  
**PHENOCRYSTS:** None.  
**GROUNDMASS:** Not visible.  
**VESICLES:** 5%, <2 mm, irregular, filled with calcite.  
**COLOR:** Greenish gray (10Y 5/2).  
**STRUCTURE:** Individual cobbles.  
**ALTERATION:** Strongly altered and oxidized.  
**VEINS/FRACTURES:** 10%, <0.2 mm, none, veins filled by calcite. Hematite-filled fractures.

**UNIT IV: APHYRIC BASALT**

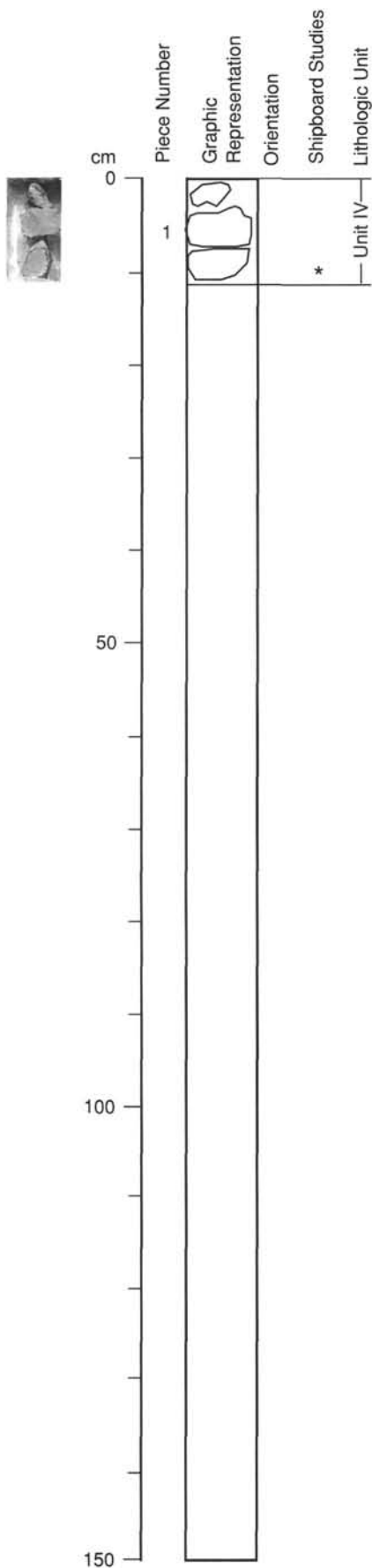
**Piece 1B**

**CONTACTS:** None.  
**PHENOCRYSTS:** None.  
**GROUNDMASS:** Not visible.  
**VESICLES:** 10%, <3 mm, irregular, filled with calcite.  
**COLOR:** Range from very dark gray (5Y 3/1) to olive gray (5Y 4/2).  
**STRUCTURE:** Individual unoriented pebble.  
**ALTERATION:** Strongly altered.  
**VEINS/FRACTURES:** 5%, <0.2 mm, irregular veins filled by calcite.



**UNIT IV: APHYRIC BASALT**

**Piece 1**



**CONTACTS:** None.  
**PHENOCRYSTS:** None.  
**GROUNDMASS:** Not visible.  
**VESICLES:** 2%, <1 mm, irregular, filled by calcite.  
**COLOR:** Yellowish brown (10YR 5/6).  
**STRUCTURE:** Pebble.  
**ALTERATION:** Strongly altered with oxidation.  
**VEINS/FRACTURES:** <5, < 0.2 mm, random, filled by calcite.  
**ADDITIONAL COMMENTS:** Thin section in Piece 3.

134-828A-15N-01 (Piece 3, 23-25 cm)      OBSERVER: HAS      WHERE SAMPLED:

ROCK NAME: Very highly altered basalt.

GRAIN SIZE: Fine-grained.

TEXTURE: Porphyritic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Olivine	-	8	1.0-3.0		Subhedral, partly corroded.	Completely altered to antigorite and clay minerals.
Clinopyroxene	1	12	0.5-2.0		Subhedral.	
<b>GROUNDMASS</b>						
Plagioclase	10	12	0.1-0.3		Slender laths.	
Clinopyroxene	-	10	0.05-0.1		Anhedral.	Completely altered to chlorite.
Glass	-	51	N/A.		N/A.	Devitrified and altered to Clay minerals and chlorite.
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Clay minerals	25	Groundmass/Plagioclase.				
Chlorite	43	Groundmass/Plagioclase.				
Opaque minerals phenocrysts in	10	Groundmass minerals.				Forming ca 1 mm spots which look like hand specimen.
Antigorite	4	Olivine				
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	7		0.1-0.2		Clay minerals	Rounded.

134-828A-15N-01 (Piece 11, 0 cm)      OBSERVER: HAS      WHERE SAMPLED:

ROCK NAME: Highly altered basalt.

GRAIN SIZE: Fine-grained.

TEXTURE: Intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Plagioclase	1	1	0.5-0.9		Subhedral.	
Clinopyroxene	5	5	0.2-0.5		Subhedral.	Some grains show hour-glass structure.
<b>GROUNDMASS</b>						
Plagioclase	23	23	0.05-0.4		Laths.	Shows slight orientation.
Clinopyroxene	12	12	0.005-0.02			Anhedral.
Opaque minerals	5	5	0.02-0.1	Magnetite?	Cubic or rounded.	
K-feldspar	4	9	0.05-0.2		Anhedral.	
Glass	-	35	N/A.		N/A.	Devitrified, altered to clay and chlorite.
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Clay minerals	12	Groundmass minerals.				
Chlorite	18	Groundmass minerals.				
Opaque minerals phenocrysts in	10	Groundmass minerals.				Forming ca 1 mm spots which look like hand specimen.
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	10		0.1-0.8		None.	Rounded, no orientation.

134-828A-15N-2 (Piece 1, 3-4 cm)      OBSERVER: BAK      WHERE SAMPLED:

ROCK NAME: Highly altered basalt.

GRAIN SIZE: Fine-grained.

TEXTURE: Intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Plagioclase	1	1	0.2-0.5		Subhedral.	Showing hour-glass and wavy extinction.
Clinopyroxene	5	5	0.1-0.4		Subhedral.	
<b>GROUNDMASS</b>						
Plagioclase	20	25	0.05-0.2		Laths.	Slightly oriented.
K-feldspar	10	10	0.1-0.2		Anhedral.	
Clinopyroxene	15	15	0.02-0.05		Granular.	
Opaque minerals	6	6	0.005-0.01			Cubic or rounded.
Glass	-	35	N/A.		N/A.	Devitrified and altered to Clay minerals and chlorite.
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Chlorite	25	Groundmass/glass.				
Clay minerals	10	Groundmass/glass.				
Opaque minerals looks like unaltered	5	Groundmass.				Forming veins and ca 1 mm spots which phenocrysts in hand specimen. Enveloping plagioclase and clinopyroxene.
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	3		0.05-0.1		None.	Rounded.

134-828A-15N-2 (Piece 8, 62-63 cm)      OBSERVER: HAS      WHERE SAMPLED:

ROCK NAME: Highly altered diabase.

GRAIN SIZE: Fine-grained.

TEXTURE: Subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Olivine	-	3	0.5-3.0		Subhedral.	Altered to antigorite, chlorite and calcite.
Plagioclase	10	22	0.5-2.0		Euhedral.	
<b>GROUNDMASS</b>						
Plagioclase	10	20	0.05-0.2		Laths.	Cubic or rounded. Altered to clay and chlorite.
Clinopyroxene	5	7	0.01-0.1		Anhedral.	
Opaque minerals	3	3	0.005-0.01			
Glass	-	25	N/A.		N/A.	
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Clay minerals	35	Plagioclase and glass.				
Chlorite	34	Glass.				
Antigorite	3	Olivine.				
Calcite	*	Olivine.				
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	20		0.1-0.5		Clay minerals and chlorite.	Rounded.

134-828B-3R-CC (Piece 1, 9-10 cm)      OBSERVER: BAK      WHERE SAMPLED:

ROCK NAME: Diabase.

GRAIN SIZE: Medium-grained.

TEXTURE: Subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Olivine	10	12	0.1-1.0		Subhedral.	Altered margins and fractures to serpentine.
Plagioclase	50	53	0.2-1.0		Subhedral.	Patchy alteration to sericite
Clinopyroxene	10	30	0.1-0.8		Anhedral.	Extensively altered to chlorite.
Spinel	5	5	0.05-0.3		Anhedral.	
<b>GROUNDMASS</b>						
N/A.						
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Chlorite	15					Widely dispersed as grains.
Epidote	5					
Sericite	3					
Serpentine	2					
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	None.					

SITE 828

134-828B-12X-1 (22-24 cm)      OBSERVER: HAS      WHERE SAMPLED:

ROCK NAME: Plagioclase phyric basalt

GRAIN SIZE: Fine-grained.

TEXTURE: Subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Plagioclase	2	2	0.5-2.0	An <sub>20</sub>	Subhedral.	Altered to sericite.
Olivine	-	1	1.0		Euhedral to subhedral.	Completely altered to antigorite.
<b>GROUNDMASS</b>						
Plagioclase	28	32	0.1-0.3	An <sub>10-20</sub>	Laths.	Turbid and altered.
Alkali feldspar	10	10	0.01		Anhedral.	
Clinopyroxene	30	30	0.03-0.1		Anhedral.	
Glass	-	23	N/A.		N/A.	Devitrified and altered to Clay minerals and chlorite.
Opaque minerals	2	2	0.03-0.1		Cubic or rounded.	
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Chlorite	10	Groundmass.				
Clay minerals	8	Groundmass.				
Calcite	7	Veins and cavities in groundmass.				
Antigorite	1	Olivine.				
Sericite	2	Plagioclase.				
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	<1.0		0.1		None.	Rounded.

134-828B-43R-1 (Piece 1, 133-135 cm)      OBSERVER: BAK      WHERE SAMPLED:

ROCK NAME: Pyroxenite.

GRAIN SIZE: Coarse.

TEXTURE: Allotriomorphic granular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
<b>PHENOCRYSTS</b>						
Clinopyroxene	70	80	1.0-8.0	Augite.	Anhedral.	Exsolution and some alteration to oxide and chlorite.
Orthopyroxene	12	15	1.0-2.0	Enstatite.	Anhedral.	Also as exsolution lamellae in clinopyroxene.
Olivine	-	5	1.0-2.0		Subhedral.	Altered to serpentine and oxide.
<b>GROUNDMASS</b>						
N/A.						
<b>SECONDARY MINERALOGY</b>						
	PERCENT	REPLACING/ FILLING				COMMENTS
Chlorite	7					
Oxide	6					
Serpentine	5					
<b>VESICLES/CAVITIES</b>						
	PERCENT	LOCATION	SIZE (mm)		FILLING	SHAPE
Vesicles	None.					

COMMENTS: Small fragment in sediment.