12. SITE 42

The Shipboard Scientific Party[1]

SITE BACKGROUND

Site 42 is one of the series of sites selected by the Pacific Advisory Panel along the 140th meridian to sample the longitudinal variation in sediment composition in the eastern Pacific. The site is located in an area of abyssal hills between the Clarion and Clipperton Fracture Zones, and is at the northern margin of the thick development of acoustically transparent sediment extending along the equator.

The average water depth in the site area is about 4800 meters. The bottom topography is shown by the *Argo* survey to consist of 40 to 60 meter- high abyssal hills, separated with north-south trending groups by narrow V-shaped troughs. The sediments are uniformly distributed over the area above a reflector between 0.1 and 0.15 second below the sea floor. Piston cores taken by *Argo* consist of siliceous ooze overlying calcareous ooze and the bottom photographs show scattered manganese nodules and current ripple marks.

Because of the uniformity of sediment thickness, little difficulty was experienced in locating the site during the approach of *Glomar Challenger.* The upper flank of one of the groups of abyssal hills was selected as the drilling site. The underway seismic profiles recorded the strongest and most continuous reflector at a depth of 0.15 second with occasionally an indistinct, weak reflector showing below it. The on-site profile (Figure 1) recorded 0.13 second of acoustically transparent sediment above the reflector. Subsequent drilling revealed this reflector (100 meters) to be chert which terminated the drilling and prevented the obtaining of cores from the underlying sediment. Neither from the drilling nor seismic profile can any statement be made on the thickness, age or composition of the sediment between the 0.13 second

Figure 1. *On-site seismic reflection profile at Site 42 (5 second sweep).*

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reflector and an underlying basalt. The nearness of the site to the magnetic equator renders useless the magnetic anomaly method of dating the crust in this region.

Location

Sites 42.0 and 42.1 are located at latitude 13° 50.56′N, longitude 140° 11.31′W on the upper flank of a group of abyssal hills.

OPERATIONS

Coring began on 26 May in 4844 meters of water (Table 1). Continuous coring proceeded to the depth of the resistant material at 100 meters. The sediment in Cores 3 and 4 were somewhat stiffer than in the other cores. The plastic liner collapsed during the taking of Core 3 and the sediment in the barrel had to be extruded. The coring rate for Core 4 was slower than for the other cores; the remainder of the section was cored rapidly. Coring was stopped upon contact with the resistant material at 100 meters, and the ship was moved 200 feet (65.6 meters) to the east after the drill string had been pulled up to the mud line.

The first operation at Hole 42.1 was the attempt at geothermal measurements. This attempt proved unsuccessful and was followed by measurements with an accelerometer in the drill string. The sediment section was then drilled to the resistant bed and coring was resumed (Table 2). Core 1 at Hole 42.1 consisted of the recovery of 23 feet cut in the chert. Since 26 feet were recovered, the significance of the ooze which formed the core is uncertain. Core 2 was taken with a very low rate of penetration and, subsequently, the center bit was dropped in order to drill through the chert into softer sediment. Core 3 was attempted in softer sediment, but as the chert was interbedded with the softer material, the core barrel hit another layer of chert and penetration ceased. No torque was being recorded, and the bit was thought to be worn out. The hole was abandoned. Later examination showed that most of the diamonds on the bit had been lost and the bit had been worn smooth.

LITHOLOGY

Hole 42.0

At Hole 42.0, 100 meters of sediment were cored from the sea floor to the bottom of the hole at 100 meters. This interval was continuously cored, and core recovery was complete except for the 5-foot recovery in Core 3 (18 to 27 meters). Resistant beds which proved to be siliceous to cherty well-cemented biogenous sediments terminated the coring operations. Most cores had some intervals wherein relatively undeformed sedimentary structures could be examined.

TABLE 1
Drilling Summary of Leg 5, Hole 42.0

Date	Core	Depth Below Sea Floor (m)	Depth Below Rig Floor (ft)	Core Cut (ft)	Core Cut (m)	Core Recovered (ft)	Core Recovered (m)	Per Cent Recovered
26 May	1	0-9	15,950-15,980	30	9.1	30	9.1	100
	2	9-18	15,980-16,010	30	9.1	30	9.1	100
	3[a]	18-27	16,010-16,040	30	9.1	5	1.5	17
27 May	4	27-37	16,040-16,070	30	9.1	30	9.1	100
	5	37-46	16,070-16,100	30	9.1	30	9.1	100
	6	46-55	16,100-16,130	30	9.1	30	9.1	100
	7	55-64	16,130-16,160	30	9.1	30	9.1	100
	8	64-73	16,160-16,190	30	9.1	30	9.1	100
	9	73-82	16,190-16,220	30	9.1	29	8.8	97
	10	82-92	16,220-16,250	30	9.1	30	9.1	97
	11	92-100	16,250-16,279	29	8.8	29	8.8	100
			Totals	329	99.8	303	91.9	92

[a]Plastic liner collapsed in Core 3 and the core was extruded.

Note: Sonic water depth (corrected): 4844 meters; 15,901 feet; 2650 fathoms.
Driller's depth: 15,950 feet.

TABLE 2
Drilling Summary of Leg 5, Hole 42.1

Date	Core	Depth Below Sea Floor (m)	Depth Below Rig Floor (ft)	Core Cut (ft)	Core Cut (m)	Core Recovered (ft)	Core Recovered (m)	Per Cent Recovered
28 May	1[a]	100-107	16,279-16,302	23	7.0	26.0	7.9	100
	2	107-109	16,302-16,306	4	1.2	0.5	0.2	13
	3	113	16,322-16,323	0	0.0	0.0	0.0	–
			Totals	27	8.2	23.5	8.1	87

[a]Because of the excessive recovery, much if not all of the core must be considered suspect.

Note: Sonic water depth (corrected): 4844 meters; 15,901 feet; 2650 fathoms. Driller's depth: 15,950 feet.

The sediments at Hole 42.0 consist almost entirely of varying percentages of two biogenous components, radiolarians and calcareous nannoplankton. The calcareous nanonplankton portion is composed mainly of coccolithophorids, a lesser number of discoasters and minor amounts of sphenoliths and other forms. In addition to the biogenous components, the sediments contain small amounts of "red" clay which gives coloration to the strata.

The relative proportions of siliceous and calcareous microfossils can be used to subdivide the 100 meters of sediments into several lithologic units which are gradational, one into the other.

From Core 1 through the upper part of Core 4 (0 to 32 meters), there are beds of pale orange to pale yellow-brown nannofossil ooze and radiolarian nannofossil ooze. This is the only unit containing significant amounts of nannofossil ooze.

The next unit which extends from the lower part of Core 4 to the end of Core 7 (32 to 64 meters), contains a moderate-yellow-brown to moderate-brown nannofossil radiolarian ooze and radiolarian ooze. Significant amounts of radiolarian nannofossil ooze are found in Core 6. The radiolarian oozes have their greatest development in this unit.

The next unit encompasses Core 8 and part of Core 9 (64 to 74 meters), and is exclusively a light yellow brown to light brown gray radiolarian nannofossil ooze.

The lowest unit occurs in the interval 74 to 100 meters. Here, within each bed, radiolarians and calcareous nannoplankton are found in relatively equal percentages as radiolarian nannofossil and nannofossil radiolarian oozes. One interval of radiolarian ooze is present in Core 10.

The hole apparently terminated in a hard opaline-to-cherty cemented biogenous ooze (see Lithology, Hole 42.1).

Two other minor lithologic constituents are found sparsely throughout the hole. Manganese nodules occur in Cores 5, 6 and 9; and, pumice fragments appear in Cores 2, 4, 6, 8, 9, 10 and 11. All the pumice fragments are unaltered, except for one in Core 9 which has developed zeolites along the perimeter of the glass shards.

Most of the bedding seen at this hole occurs in thin-to-medium thick beds. The contacts are sharp to gradational. Commonly, slight-to-moderate burrow mottling can be seen in the undeformed sediments.

Hole 42.1

At Hole 42.1, 113 meters of sediment were penetrated; the upper 100 meters being drilled. Coring commenced at 100 meters, and three cores were taken to the total depth at 113 meters. Core 1 (100 to 107 meters) had complete recovery. Core 2 (107 to 109 meters) only had recovery from the core catcher, and the recovery from Core 3 (109 to 113 meters) was solely from the center bit.

One lithologic unit was penetrated at this hole, consisting of interbedded hard and soft biogenous layers. The soft layers are light gray, light-gray brown and very dark gray-brown radiolarian-nannofossil, nannofossil-radiolarian and radiolarian oozes of which the latter is the dominant lithology. The hard layers are represented by flat dipping beds of hard, dense opaline or chert cemented biogenous ooze, similar in composition to that found in the soft layers. In addition to beds of this material in the core catcher of Cores 1 and 2, chips and fragments are present in the center bit of Core 3 and in Sections 1 and 3, of Core 1. The latter occurrence probably reflects material from a bed just above the top of the cored interval. This bed represents a horizon which should be continuous with the hard horizon that terminated drilling at Hole 42.0. Lithologically, the sediments at this hole represent a continuation of the material present near the bottom of Hole 42.0

The undeformed portion of the soft sediments in Core 1 and the hard layers in the core catchers of Core 1 and 2 had local slight-to-moderate burrow mottling.

PALEONTOLOGY

Nannofossils

Calcareous nannoplankton occur essentially throughout the cores from the two holes (42.0 and 42.1) drilled at this site. The calcareous nannofossils are quite abundant in the Upper Oligocene portion; they are less common in the more siliceous fossil-rich parts of the Lower Oligocene and Middle Eocene sediments; and they are relatively sparse in the *in situ* representatives of the Upper Eocene siliceous ooze sequence. Preservation is quite good in the calcareous-rich sediments, though some forms show enlargement or thickened parts due to some calcification. In the siliceous oozes where the calcareous forms are less common, some etching and disaggregation of specimens is present. The preservation is only fair, with considerable overgrowths noted on specimens scraped from the harder limestones recovered in Core 2 of Hole 42.1

A few diatoms are present at scattered intervals. *Coscinodiscus tuberculatus* Greville, *C. marginatus* Ehrenberg, and *C. vigilans* A. Schmidt occur intermittently in the Oligocene in Cores 2, 3 and 4 of Hole 42.0 *C. radiatus* Ehrenberg, *Liostephania* spp., and *Rhizosolenia* sp. occur infrequently in the Middle Eocene sediments from Cores 9 through 11 of Hole 42.0

Except for the top and bottom-most portions of the Oligocene, an apparently complete sequence representing the remainder of this series was cored (Hole 42.0, Cores 1 to 3 and most of 4). The boundary between the Upper Oligocene and Lower Miocene is not represented; and, possibly, part of the lowest Oligocene is missing at this site.

Dominant calcareous species which occur throughout this Oligocene sequence include *Coccolithus pelagicus* (Wallich), *Cyclococcolithus neogammation* Bramlette and Wilcoxon, *Discoaster adamanteus* Bramlette and Wilcoxon and vars., and *Sphenolithus moriformis* (Bronnimann and Stradner). Other calcareous forms which range throughout this sequence include: *Coccolithus bisectus* (Hay, Mohler and Wade)–more frequent below the middle of Section 3 of Core 2; *C. eopelagicus* (Bramlette and Riedel)–more frequent below Section 1 of Core 2; *C.* cf. *C. scissurus* (Hay, Mohler and Wade) of Bramlette and Wilcoxon–more common and with larger specimens occurring below Section 1 of Core 2; *Coronocyclus nitescens* (Kamptner); *Discoaster deflandrei* Bramlette and Riedel–occurring with greater abundance in the upper part of Core 1; *D. adamanteus obtusus* Gartner; *D.* sp. aff. *D. aster* Bramlette and Riedel; and, *D. woodringi nephados* Hay–quite frequent in the upper part of Core 1 and becomes rare with scattered occurrences below the lower part of Core 2.

Of considerable interest is the lack of certain groups or species in this Oligocene section which have been reported from comparable Oligocene sections in other low latitude areas of the Atlantic and the Indo-Pacific (Bramlette and Wilcoxon, 1967). Most notable is the absence of the variety of species of *Helicopontosphaera* in this eastern Pacific area, with the exception of rare specimens of *H. compacta* (Bramlette and Wilcoxon) occurring in Core 3. Another peculiarity is the sudden disappearance of *Sphenolithus ciperoensis* Bramlette and Wilcoxon just above its development from and the extinction of *S. distentus* (Martini) within the lower part of Core 1. It is doubtful that preservation is the main factor as many other forms of equal or less delicacy are represented in these highly calcareous sediments. Biogeographic distributional factors appear to be the more likely reason for absences and exterpations from this part of the Pacific during the Oligocene.

A number of calcareous nannofossil species have a restricted distribution through these Oligocene sediments (See Diagnostic Fossils, Hole Summary) which allows the recognition of several subzones. These species are: *Coccolithus* aff., *C. bisectus* (Hay, Mohler, and Wade) of Bramlette and Wilcoxon, *Cyclococcolithus lucitanicus* (Black), mostly five-rayed *Discoaster tani tani* Bramlette and Riedel, mostly six-rayed *D. tani nodifer* Bramlette and Riedel, *Pontosphaera vadosa* of Hay, Mohler and Wade, *Reticulofenestra umbilica* (Levin), *Sphenolithus abies* Deflandre, *S. ciperoensis, S. distentus, S. predistentus* Bramlette and Wilcoxon, *S. pseudoradians* Bramlette and Wilcoxon, *S.* sp. aff. *S. belemnos* Bramlette and Wilcoxon, and *Triquetrorhabdulus carinatus* Martini. Most of the specimens of *T. carinatus* are short and narrow triangular rods near the base of its range, but occasional specimens of the form of this species with extensive wide carinae occur in association in this interval. In addition to the species above, a few asteroliths appear to have a local limited stratigraphic distribution. These are *Discoaster saundersi* Hay and *D. woodringi* Bramlette and Riedel–upper part Core 1, *D. woodringi trinidadensis* Hay–within Core 1, and *D. woodringi lidzi* Hay–Section 1 of Core 1.

The location of the boundary between the *Sphenolithus distentus* Subzone and the *S. predistentus* Subzone bears discussion. An overlapping distribution of *Cocco-*

lithus aff. *C. bisectus,* the *Discoaster tani* group and *Sphenolithus pseudoradians* occurs over the interval between the basal part of Core 1 and the upper part of Section 5, Core 2. The coincident limits of these species were given as additional criteria for recognizing the boundary between the equivalent biostratigraphic units, *S. distentus* and *S. predistentus* Zones (Bramlette and Wilcoxon, 1967, Table 2). Because of this conflict, the original primary criterion based on the evolutionary development in the lineage of spiked sphenoliths is used, and the boundary is drawn where the characters of the sphenoliths populations change from dominant *S. predistentus* to more completely that of *S. distentus.* This is essentially equivalent to a change in general configuration of the coccolith assemblage, with the base of *Coccolithus* aff. *C. bisectus* occurring slightly below. *Triquetrorhabdulus carinatus* commences slightly above this horizon.

Highly contaminated or mixed core material as well as reworked nannofossils or repeated stratigraphic sections exist in the more porous and permeable radiolarian-rich siliceous oozes forming the Upper Eocene portion of Hole 42.0 from the lower part of Core 4 down to the lower part of Core 7. This situation creates some difficulty in the enumeration of the characteristic nannofossil assemblages for this part of the hole and the positioning of the lower boundary of this subseries. Frequent streaks on areas of light-colored calcareous-rich ooze occur in the more fluid material in the lower part of Core 4, and in Cores 5 and 7 and, less frequently, in the firmer material of Core 6. This calcareous material, often containing characteristic Eocene asteroliths, is composed essentially of calcareous nannofossil assemblages representing either the higher parts of the Oligocene or the lower part of the Oligocene or mixtures of both. The intermediate less calcareous areas or less disturbed parts contain an Upper Eocene assemblage which differs in numbers and preservation characteristics over these calcareous ooze streaks. Samples from positions adjacent to these lighter-colored ooze areas often contain minor amounts of this Oligocene admixture. These Oligocene ooze occurrences are considered downhole contamination (see discussion on Drilling Disturbances). Consequently, the occurrences of the coccoliths common to both the Upper Eocene and the Oligocene are recorded from these Upper Eocene cores only where samples are void of this downhole material or contain only rare amounts of Oligocene contamination easily recognized by differences in preservation or other characteristics (see Diagnostic Fossils, Hole Summary). The species of calcareous nannofossils usually infrequently present in contamination-free material include: *Coccolithus bisectus* and *C.* cf. *C. scissurus*–as smaller specimens, *C. pelagicus* and *C. eopelagicus, Cyclococcolithus lucitanicus, Reticulofenestra umbilica,* and *Sphenolithus moriformis*–as more delicate specimens. The more common and distinctive asteroliths that characterize the *in situ* Upper Eocene materials, as well as being recognizable in most of the downhole contaminated material, include: *Discoaster barbadiensis* Tan; *D. saipanensis* Bramlette and Riedel–distinctively with long thin spine-like ray extensions (some which approach or encompass the forms named *D. levini* Hay); long-rayed and larger *D. tani tani*–mostly six-rayed though larger five-rayed forms become more frequent in the lower part of Core 6; and, *D. tani nodifer*–mostly with six longer rays. Indeterminate species of asteroliths that are scattered through this upper Eocene section include: *D.* sp. aff. *D. gemmifer* Stradner, and *D.* sp. aff. *D. sublodoensis* Bramlette and Sullivan. This latter species has six quite narrow rays with near parallel sides and a large disc that is often quite thick and rugose. The ray ends are bluntly pointed to narrowly truncate; and, this form appears to be intermediate between *D. sublodoensis* and the *D. tani* group and/or the form identified as *D.* sp. aff. *D. gemmifer.*

Examination of the paleontological samples and interim smear slides from Section 6, Core 4, shows that both *D. barbadiensis* and *D. saipanensis* occur in significant frequency to the top of the Eocene at this site. Where apparent complete sections of the uppermost Eocene and superadjacent Oligocene have been found, an interval occurs above the top occurrence of *D. barbadiensis* which still has diminutive *D. saipanensis* and related forms associated with other calcareous nannofossils species, including fairly common *Ismolithus recurvas* Deflandre and related forms (Bramlette and Wilcoxon, 1967; Maxwell *et. al.,* 1970; and, S. F. Percival Jr., personal communication, 1969). Some of these species, like *I. recurvus,* extend up into the lower part of the Oligocene. The distribution of these forms and the presence of a comparable sequence occurs within the geographic area of the central Pacific (Deflandre and Fert, 1954; Leg 9 material presently under investigation by the author). This situation is not present at Site 42, indicating an hiatus at this boundary with the uppermost part of the Eocene missing and possibly part of the Lower Oligocene as well. An additional possible indication of this is the relatively short sections of Upper Eocene and Lower Oligocene recovered compared to the thickness representing the adjacent subseries.

Another anomalous situation in this Upper Eocene sequence occurs in Core 6, where scattered poorly preserved parts and rims of a *Chiasolithus* are seen. More complete rims are evident in Sections 4, 5 and the upper part of 6, where the rims have the characteristic inward "teeth" of *C. grandis* (Bramlette and Riedel). Extensive searching failed to uncover complete specimens with the central structure present. Associated with these occurrences in Core 6 are quite common specimens of larger, long-rayed *Discoaster tani tani* and *D. saipanensis* with distinctive longer pointed rays; both of which are more characteristic of the Upper

Eocene. The only other indication of Middle Eocene age for these Core 6 sediments is the possible occurrence of partial or poorly preserved rare specimens of *D. sublodoensis* and *Triquetrorhabdulus inversus* Bukry and Bramlette in the upper part of Section 6 and the single occurrence of *Subbotina senni* (Beckman) in Section 3 (see Paleontology–Foraminifera). Nannofossil assemblages restricted to just those forms characteristic of the *Discoaster barbadiensis* Zone, Upper Eocene, occur below in the basal part of Core 6 and in the uncontaminated samples above the lowest part of Core 7. The present evidence suggests that these anomalous occurrences in Core 6 are due to reworking of some older forms into Upper Eocene sediments. The possibility of having a repeated Upper Eocene section due to downhole slumping with a partial or complete *in situ* dissolution of characteristic Middle Eocene forms, and the consequent masking of the boundary is an alternate that cannot be completely ruled out at this time. The character of the sediments and the conditon of the cores through this interval provide the suspicion in support of maintaining this latter possibility; and, if correct, the top of the Middle Eocene would be at a shallower depth than given in this report.

The top of the *Chiasmolithus grandis* Zone or Middle Eocene is placed within Section 6 of Core 7. Below this, complete specimens of *C. grandis* occur associated with other distinctive Middle Eocene species, such as: *Campylosphaera bramlettei* Kamptner, *Sphenolithus furcatolithoides* Locker, *Triquetrorhabdulus inversus,* and the shorter rayed froms of *Discoaster saipanensis.* The lowest occurrence of *D. tani tani* is a short distance below this boundary within Core 8, and this subspecies becomes a more common constituent of the assemblages above in the Upper Eocene.

Except for the bottom part of Core 7, downhole contamination is not evident in the sampled parts of the *Chiasmolithus grandis* Zone (lower part of Core 7 to the lower part of Core 9). The nannofossil assemblages of the *C. grandis* Zone are dominated by *C. grandis, Coccolithus eopelagicus, C. pelagicus, Cyclococcolithus lucitanicus, Discoaster barbadiensis, Reticulofenestra umbilica,* and *Sphenolithus moriformis.* Less frequent forms include: *Campylosphaera bramlette*–somewhat larger with narrower rims in its higher range; *Discoaster deflandrei*–small forms; *D. saipanensis*–with mostly seven or eight and occasionally five or six shorter rays, which lack the longer spine-like extensions; *D.* sp. aff. *D. sublodoensis; Sphenolithus furcatolithoides; S. radians* Deflandre; *Thoracosphaera saxea* Stradner; and, *Triquetrorhabdulus inversus.* Rare scattered occurrences of identifiable specimens of *Coccolithus bisectus* are present, and a few specimens of *Thorocosphaera prolata* Bukry and Bramlette occur in the lower part (Core 9). Six-rayed and occasional seven-rayed *Discoaster tani nodifer* with nodes and truncate and/or notched ends extend down to the uppermost part of Core 9. In the lower part of its range, this subspecies occurs with a similar form with six-to-eight noded rays, but it exhibits narrow or pointed ray ends. This latter, probably ancestral form is designated *D.* sp. aff. *D. tani nodifer* and ranges down through the remainder of the zone. The top of *D. sublodoensis* occurs in the lower part of Core 8 though a number of thick, more heavily calcified five- and six-rayed specimens with the general characteristics of this species are included in its upper range. Within its upper range, it also appears to intergrade with the form classified as *D.* sp. aff. *D. sublodoensis.*

The *Chiphragmolithus quadratus* Zone extends from the lower part of Core 9, Hole 42.0, to the deepest material collected at this site (Core 2, Hole 42.1). The calcareous nannofossils of this zone include most of the forms found in the zone above. However, the assemblages are somewhat more diverse and contain additional species including: *Chiasmolithus gigas* (Bramlette and Sullivan), *C. solitus* (Bramlette and Sullivan), *Chiphragmolithus quadratus* Bramlette and Sullivan and vars., *Discoaster martinii* Stradner, scattered occurrences of small asteroliths of the *D. nonaradiatus* Klumpp and *D. septemradiatus* (Klumpp) group, and *Reticulofenestra* cf. *R. umbilica.* The upper boundary of this zone is close to and bracketed by the limits of occurrence of *Chiasmolithus solitus, C. staurion* and related forms, *Discoaster martinii,* and the larger, more typical forms of *Reticulofenestra umbilica.* Scattered rare specimens of *Thoracosphaera prolata* also occur in this interval.

Slight amounts of downhole contaminants are present within the samples from this zonal interval. Traces are present in Hole 42.0 within the basal part of Core 9 and the upper-most and basal parts of Core 10. More common contamination, especially from Oligocene material, is evident within Section 1 of Core 11. Only traces are evident in the top of recovery from Hole 42.1 (Core 1, Sections 1 and 2).

The *Chiphragmolithus quadratus* Zone is divisable into two biostratigraphic subdivisions at this site with the boundary at about 100 meters depth. The base of the higher *C. quadratus–Chiasmolithus solitus* Subzone coincides with the lowest occurrence of unquestionable *Discoaster saipanensis* (as small seven- and eight-rayed forms) and the base of the *sensu stricto* forms of *Chiphragmolithus quadratus* which have longer, near symmetrical rays and, if present, a narrow-basal plate which tapers concomitantly with the rays to a pointed end. The lower *C. quardatus–Chiasmolithus gigas* Subzone is found in the recovered cores of Hole 42.1 and contains frequent *C. gigas* and a suite of asteroliths that appear intermediate between *Discoaster saipanensis* and *D. lodoensis* Bramlette and Riedel. These somewhat larger asteroliths have six to seven longer, slightly curved rays and lack the distinctive central structure of either species. Most specimens show more strongly curved ridges on only one or two rays tending toward the character of *D. lodoensis,* consequently, this plexus is recorded as *D.* cf. *D. lodoensis.* The *Chiphragmolithus* in this lower subzone is represented only by a smaller, more compact form with a thick, well-developed, wide quadrate basal plate which, in combination with the weakly developed spine or ray, is quite asymmetrical–giving an overall imbricate appearance to the four radiating parts. This *C. quadratus var.* form is also found less frequently in the upper subzone along with typical forms; and, some specimens there have a slight enlargement or bending of the ends of some of the spines or rays approaching the form described as *C. swasticoides* (Martini).

Foraminifera, Hole 42.0

Foraminifera occurred sporadically in this hole. The most fossiliferous parts were in the upper two core barrels. Selective solution was evident because generally only the larger, thicker-walled species were observed.

Species identified in Hole 42.0 include:

Sample 42.0-1-1, 30-32 cm:
Planktonic foraminifera absent.

Sample 42.0-1-1, 110-112 cm:
Same as above.

Sample 42.0-1-2, 39-41 cm:
Same as above.

Sample 42.0-1-2, 103-105 cm:
Same as above.

Sample 42.0-1-3, 25-27 cm:
Same as above.

Sample 42.0-1-3, 99-101 cm:
Globigerinita dissimilis (Cushman and Bermudez), *Globigerinita unicava* (Bolli, Loeblich, and Tappan).

Sample 42.0-1-4, 8-10 cm:
Globigerina euapertura Jenkins, *Globigerinita dissimilis, Globigerinita unicava, Globoquadrina baroemoenensis* (LeRoy).

Sample 42.0-1-4, 109-111 cm:
Globigerinita unicava.

Sample 42.0-1-5, 20-22 cm:
Globigerina tripartia Koch, *Globorotalia opima nana* Bolli, *Globorotalia siakensis* LeRoy, *Globigerinita dissimilis.*

Sample 42.0-1-5, 95-97 cm:
Globigerina euapertura, Globigerina tripartita, Globorotalia opima opima Bolli, *Globigerinita dissimilis, Globigerinita unicava.*

Sample 42.0-1-6, 5-7 cm:
Globigerina cf. *G. galavisi* Bermudez, *Globigerina tripartita, Globorotalia opima nana, Globigerinita unicava.*

Sample 42.0-1-6, 96-98 cm:
Globorotalia opima opima, Globigerinita dissimilis.

Sample 42.0-2-1, 24-26 cm:
Globigerina tripartita, Globorotalia opima nana, Globorotalia opima opima, Globigerinita dissimilis, Globigerinita unicava.

Sample 42.0-2-1, 101-103 cm:
Globigerina tripartita, Globorotalia opima nana, Globorotalia opima opima, Globoquadrina baroemoenensis.

Sample 42.0-2-2, 22-24 cm:
Globorotalia opima nana, Globorotalia opima opima, Globigerinita unicava, Globoquadrina baroemoenensis, Globoquadrina cf. *G. dehiscens praedehiscens* Blow and Banner.

Sample 42.0-2-2, 100-102 cm:
Planktonic foraminifera absent.

Sample 42.0-2-3, 25-27 cm:
Globorotalia opima nana, Globorotalia opima opima, Globigerinita dissimilis, Globigerinita unicava, Globoquadrina baroemoenensis, Globoquadrina cf. *G. dehiscens praedehiscens.*

Sample 42.0-2-3, 93-95 cm:
Globigerina tripartita, Globorotalia opima nana, Globorotalia opima opima, Globigerinita unicava, Globoquadrina, Globoquadrina baroemoenensis.

Sample 42.0-2-4, 15-17 cm:
Globorotalia opima nana, Globorotalia opima opima, Globigerinita dissimilis, Globigerinita unicava, Globoquadrina baroemoenensis, Globoquadrina cf. *G. dehiscens praedehiscens.*

Sample 42.0-2-4, 103-105 cm:
Planktonic foraminifera absent.

Sample 42.0-2-5, 24-26 cm:
Globorotalia opima nana, Globorotalia opima opima, Globorotalia cf. *G. siakensis, Globigerinita dissimilis, Globigerinita unicava, Globoquadrina* cf. *G. dehiscens praedehiscens.*

Sample 42.0-2-5, 100-102 cm:
Planktonic foraminifera absent.

Sample 42.0-2-6, 25-27 cm:
Globorotalia opima nana, Globorotalia opima opima, Globigerinita unicava.

Sample 42.0-2-6, 100-102 cm:
Planktonic foraminifera absent.

Sample 42.0-4-1, 20-22 cm:
Same as above.

Sample 42.0-4-1, 100-102 cm:
Same as above.

Sample 42.0-4-2, 20-22 cm:
Globigerinita unicava.

Sample 42.0-4-2, 101-103 cm:
Globigerina galavisi Bermudez, *Globigerinita unicava.*

Sample 42.0-4-3, 30-32 cm:
Globigerina galavisi, Globigerina cf. *G. tapuriensis* Blow and Banner, *Globigerinita dissimilis, Globigerinita unicava.*

Sample 42.0-4-3, 90-92 cm:
Planktonic foraminifera absent.

Sample 42.0-4-4, 30-32 cm:
Globigerina galavisi, Globigerinita unicava.

Sample 42.0-4-4, 100-102 cm:
Planktonic foraminifera absent.

Sample 42.0-4-5, 141-143 cm:
Globigerina galavisi.

Sample 42.0-4-6, 54-56 cm:
Planktonic foraminifera absent.

Sample 42.0-5-1, 90-92 cm:
Globigerina galavisi, Globigerina tripartiti, Globigerinita unicava.

Sample 42.0-5-3, 38-40 cm:
Planktonic foraminifera absent.

Sample 42.0-5-4, 51-53 cm:
Globigerina galavisi.

Sample 42.0-5-6, 27-29 cm:
Same as above.

Sample 42.0-6-1, 27-29 cm:
Planktonic foraminifera absent.

Sample 42.0-6-2, 72-74 cm:
Same as above.

Sample 42.0-6-3, 20-22 cm:
Subbotina senni (Beckman).

Sample 42.0-8-1, 11-13 cm:
Same as above.

Sample 42.0-8-3, 122-128 cm:
Small globigerinids.

Sample 42.0-8-4, 35-37 cm:
Subbotina senni.

Sample 42.0-8-5, 18-20 cm:
Small globigerinids.

Sample 42.0-9-1, 36-38 cm:
Planktonic foraminifera absent.

Sample 42.0-9-2, 40-42 cm:
Same as above.

Sample 42.0-9-3, 30-32 cm:
Same as above.

Sample 42.0-9-4, 12-14 cm:
Same as above.

Sample 42.0-10-1, 122-124 cm:
Same as above.

Sample 42.0-10-2, 20-22 cm:
Same as above.

Sample 42.0-10-3, 5-7 cm:
Same as above.

Sample 42.0-10-4, 24-26 cm:
Same as above.

Sample 42.0-10-6, 28-30 cm:
Same as above.

Sample 42.0-11-1, 3-5 cm:
Same as above.

Sample 42.0-11-3, 59-61 cm:
Same as above.

Sample 42.0-11-5, 10-12 cm:
Globorotalia bolivariana (Petters), *Subbotina senni.*

Radiolaria, Hole 42.0

Radiolaria are diverse, common-to-abundant, and well-preserved in all the cores of Site 42.0. The two cores of Site 42.1 were not examined for Radiolaria. Additional species, wihch were identified but not included on the Biostratigraphy Chart, are listed below with their occurrence by cores:

	Cores
Dorcadospyris costatescens	1-3
Liriospyris geniculosa	1-7
Tholospyris anthophora	1
Liriospyris longicornuta	1
Dorcadospyris agrisca	6-11
Dorcadospyris confluens	6-11
Liriospyris clathrata	6-11
Giraffospyris didiceros	6-11
Dendrospyris stylophora	6-11
Dendrospyris inferispina	6-11

SUMMARY

Hole 42.0

Four biogenous units can be identified at Hole 42.0 on the basis of their proportions of nannofossils and radiolarians (Table 3).

At a total depth of 100 meters, a hard resistant layer of unknown composition was encountered and drilling operations ceased, to be continued later 200 feet to the east, in an attempt to continue the section.

Unit 4 (part of Core 9 through Core 11, 74 to 100 meters) contains dark, yellow brown to light gray and gray brown interbeds of radiolarian-nannofossil ooze, nannofossil-radiolarian ooze and radiolarian ooze. Slight to moderate burrow mottling occurs in the undeformed beds of this Middle Eocene interval.

Unit 3 (Cores 8 through part of 9, 64 to 74 meters) is a radiolarian nannofossil ooze also of Middle Eocene age. It is light yellow brown to light gray and light brown gray, firm to soupy. Again, slight to moderate burrow mottles were noted in the undeformed layers.

Unit 2 (part of Core 4 through Core 7, 32 to 64 meters) ranges in age from Middle Eocene to Early Oligocene. Near the base of the unit are 7 meters of Oligocene sediment within an Upper Eocene sequence. Most likely this interval was displaced during drilling operations. The sediments consist of alternating intervals of moderate brown to moderate yellow brown nannofossil-radiolarian ooze, radiolarian ooze and radiolarian-nannofossil ooze.

Unit 1 (Core 1 through part of Core 4, 0 to 32 meters) is characterized by a predominance of nannofossils, consisting entirely of radiolarian-nannofossil ooze and nannofossil ooze in alternating thin sequences; burrow mottling was still evident. This unit is of Early Oligocene age at the base, and Late Oligocene age at the top.

The reason for the basence of younger Cenozoic sediments at this hole is not known. However, the *Argo* site survey indicated the presence of bottom currents here.

TABLE 3
Stratigraphic Units at Hole 42.0

Units	Core	Age	Depth (m)	Lithology	Comments
1	1, 2, 3; part of 4	Upper Oligocene Lower Oligocene	0-32	Nannofossil ooze and radiolarian-nannofossil ooze (pale orange, pale yellow brown)	Pumice fragments, slight burrow mottles, trace glass.
2	Part of 4; 5, 6, 7	Lower Oligocene Upper Eocene Middle Eocene	32-64	Nannofossil-radiolarian ooze, radiolarian ooze, radiolarian-nannofossil ooze (yellow brown, moderate brown)	Manganese nodules, pumice fragments, trace glass.
3	8; part of 9	Middle Eocene	64-74	Radiolarian-nannofossil ooze (light yellow brown to light brown gray)	Manganese nodules, pumice fragments, burrow mottles.
4	Part of 9; 10, 11	Middle Eocene	74-100	Radiolarian-nannofossil ooze and nannofossil-radiolarian ooze streaks, radiolarian ooze (light gray, gray brown)	Manganese nodules, pumice fragments, slight to moderate burrow-mottles. Trace glass.

The depositional record at Hole 42.0 extends from Middle Eocene to Late Oligocene time. During this period only biogenous sediments were deposited, except for minor quantities of red clay. Traces of volcanic ash occur in units 1 and 2, whereas, pumice fragments are found throughout the section. Some of the volcanic ash has become zeolitized. Although manganese nodules occur in units 2, 3 and 4, their subsurface occurrences may be due to down-hole contamination.

Hole 42.1

A continuation of the stratigraphic sequence drilled at Hole 42.0 was encountered at Hole 42.1. Coring commenced below the Middle Eocene resistive bed which had terminated drilling at Hole 42.0.

Only one major lithologic unit was encountered (Cores 1, 2 and 3, 100 to 113 meters) in the interval cored here (Table 4). The lithology consists of radiolarian-nannofossil ooze, nannofossil-radiolarian ooze, and radiolarian ooze and is, therefore, similar to unit 4 at Hole 42.0. There are local indurated equivalents of these sediments which form hard calcareous oozes or strata which are partially replaced by chert. Burrow mottles are well-developed in the indurated beds.

TABLE 4
Stratigraphic Unit at Hole 42.1

Unit	Core	Age	Depth (m)	Lithology	Comments
1	1, 2, 3	Middle Eocene	100-113	Interbedded soft radiolarian-nannofossil ooze, nannofossil-radiolarian ooze, radiolarian ooze and hard silica-cemented sediments (fragments and beds) (light gray, light gray brown, very dark gray brown)	Hard, calcareous fragments in Core 1 probably related to the layer which terminated drilling at Hole 42.0. Slight to moderate burrow mottling is common.

REFERENCES

Bramlette, M. N. and Wilcoxon, J. A., 1967. Middle Teritary calcareous nannoplankton of the Cipero section, Trinidad, W. I. *Tulane Studies Geol.* **5**, 93.

Deflandre, G. and Fert, C., 1954. Observations sur les Coccolithophoridés actuels et fossils en microscopie ordinaire et electronique. *Ann. Paléontol.* **40**, 115.

Maxwell, A. E., von Herzen, R. P., Andrews, J. E., Boyce, R. E., Milow, E. D., Hsu, K. J., Percival, S. F. and Saito, T., 1970. Initial Reports of the Deep Sea Drilling Project. Volume III. Washington (U. S. Government Printing Office), in press.

THE CORES RECOVERED FROM SITE 42

The following pages present a graphic summary of the results of drilling and coring at Site 42. Fig. 2, a summary of Site 42 is at the back of the book. Figures 3 to 16 are summaries of the individual cores recovered. A key to the lithologic symbols is given in the Introduction (Chapter 1).

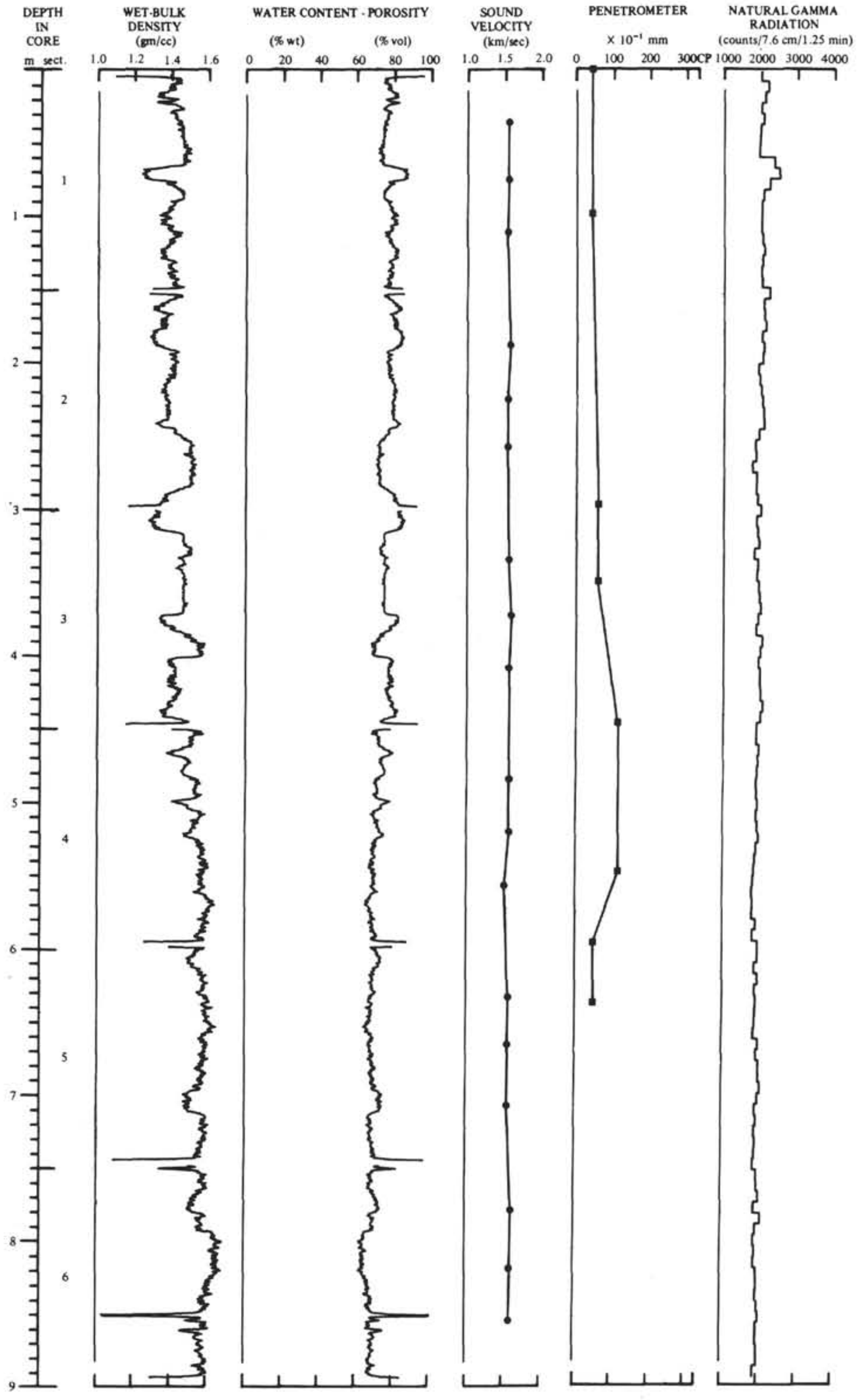

Figure 3A. *Physical Properties of Core 1, Hole 42*

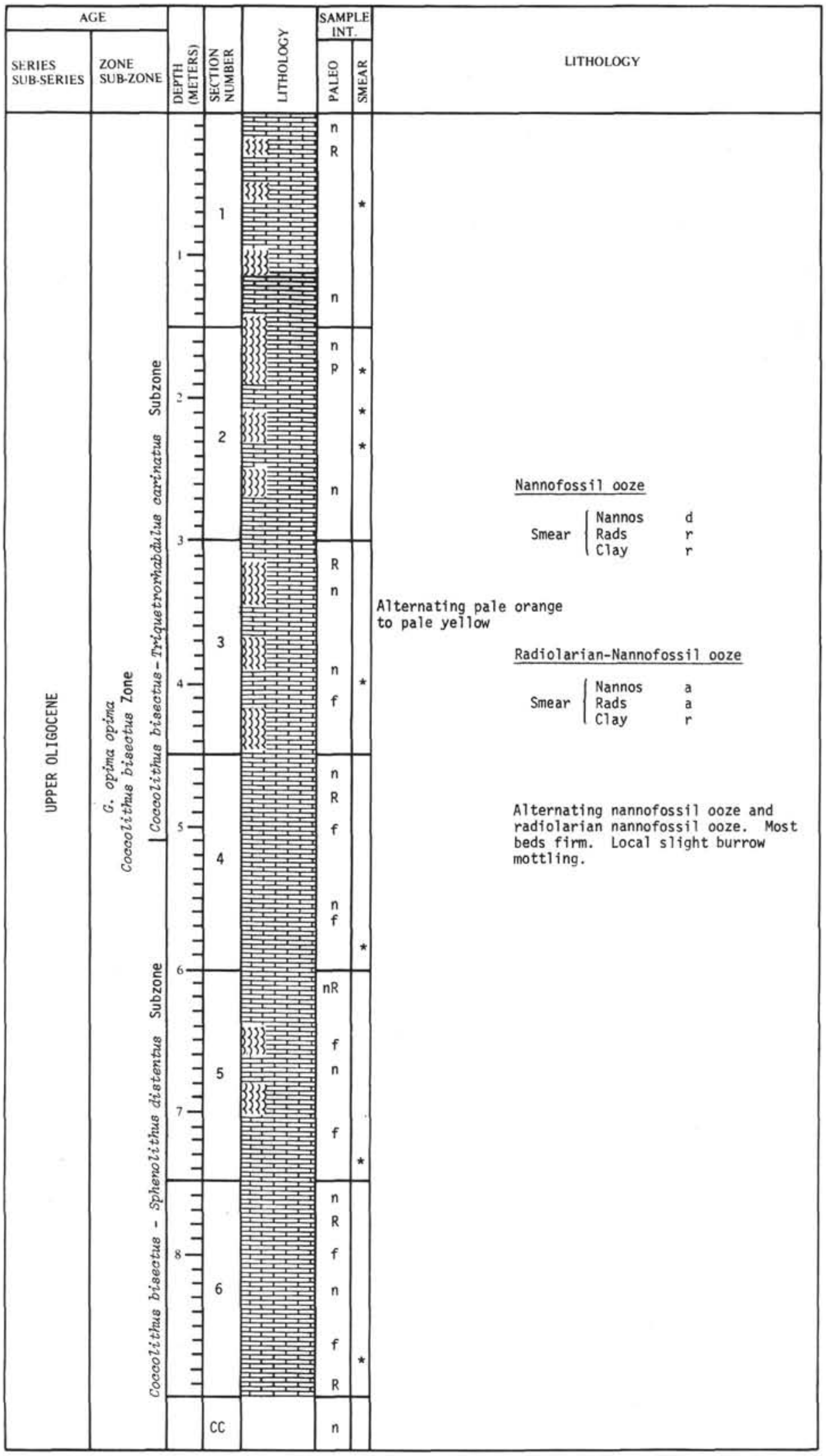

Figure 3B. *Core 1, Hole 42 (0-9 m Below Seabed)*

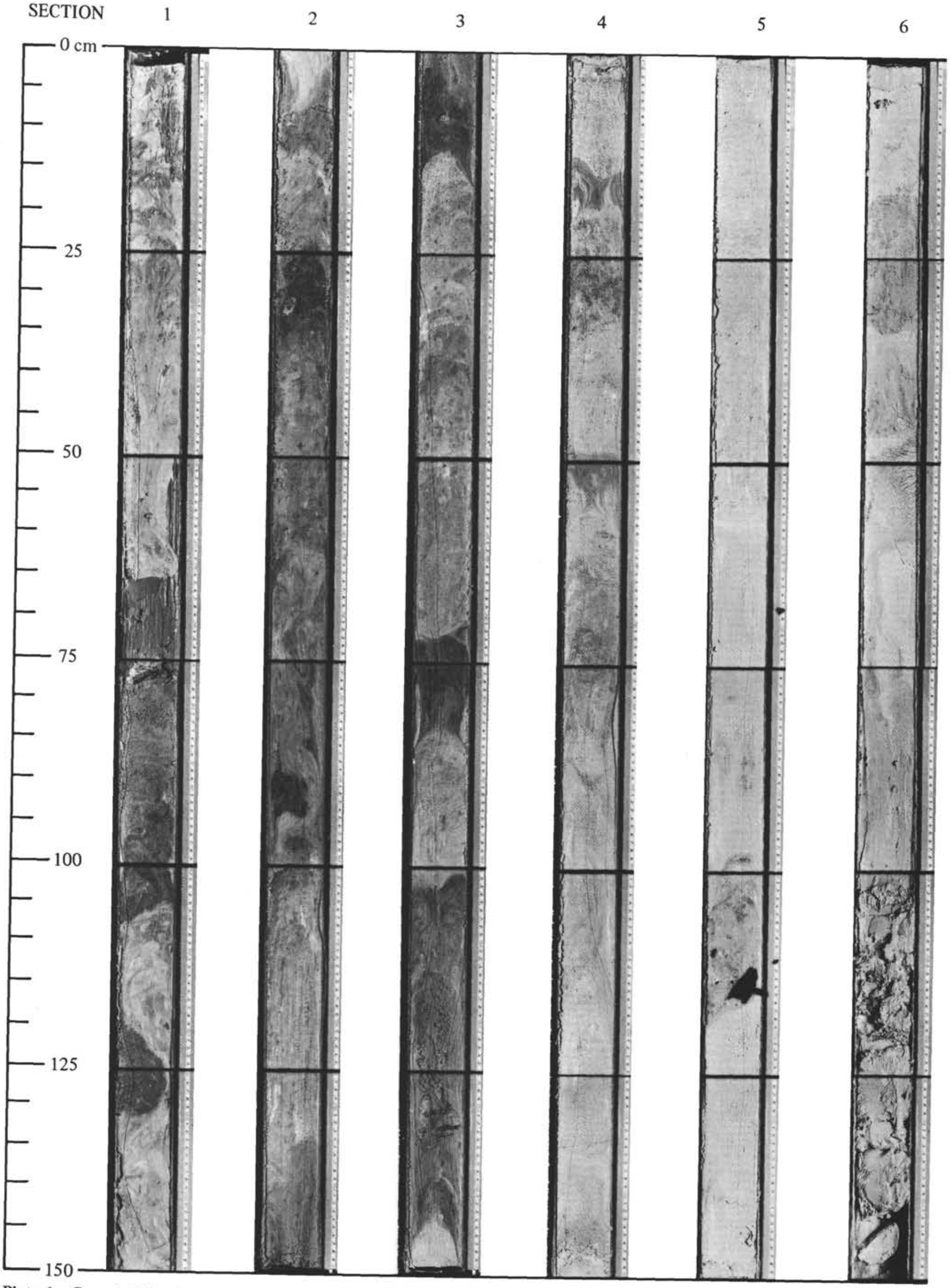

Plate 1. *Core 1, Hole 42*

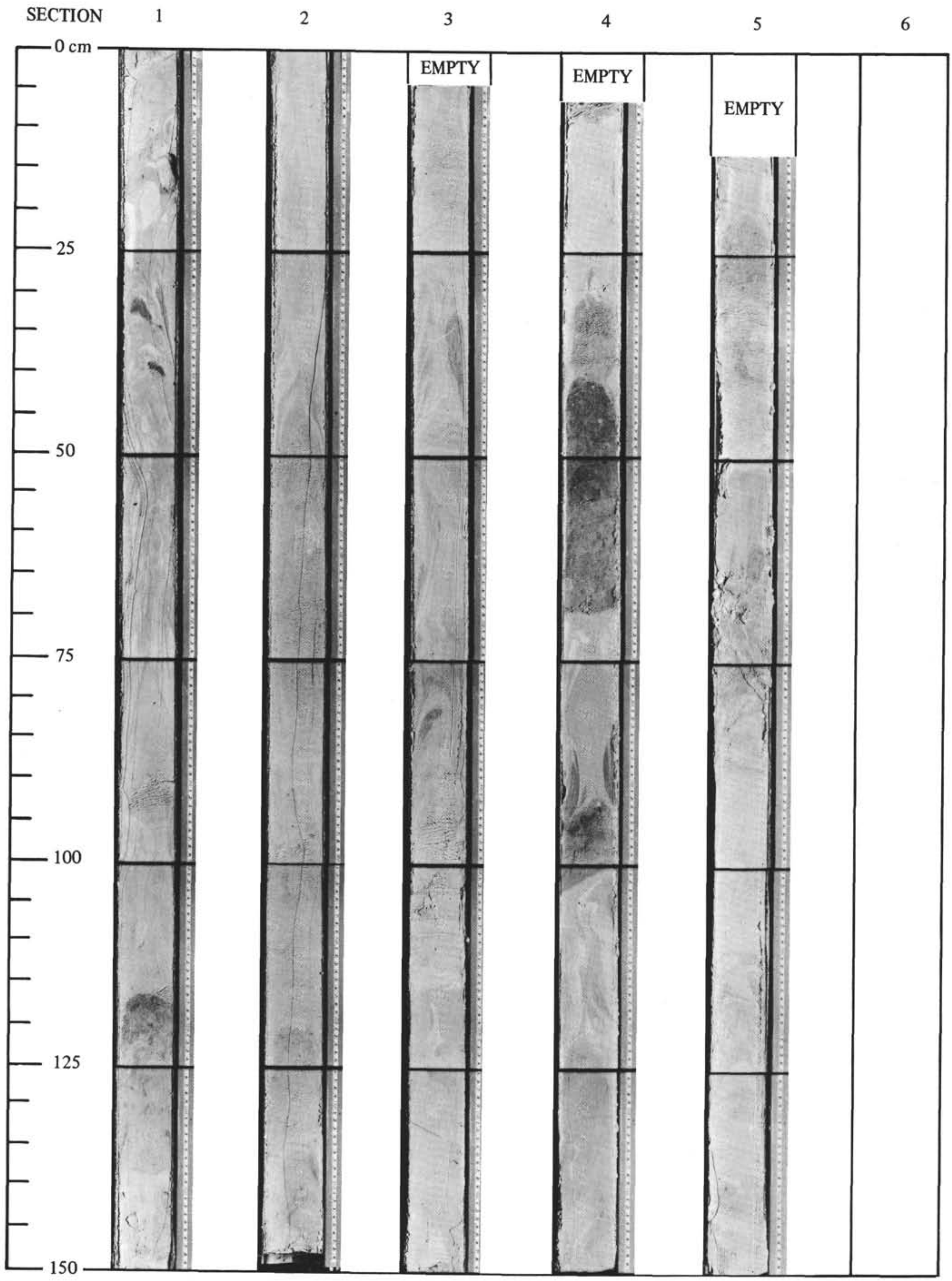

Plate 2. *Core 2, Hole 42*

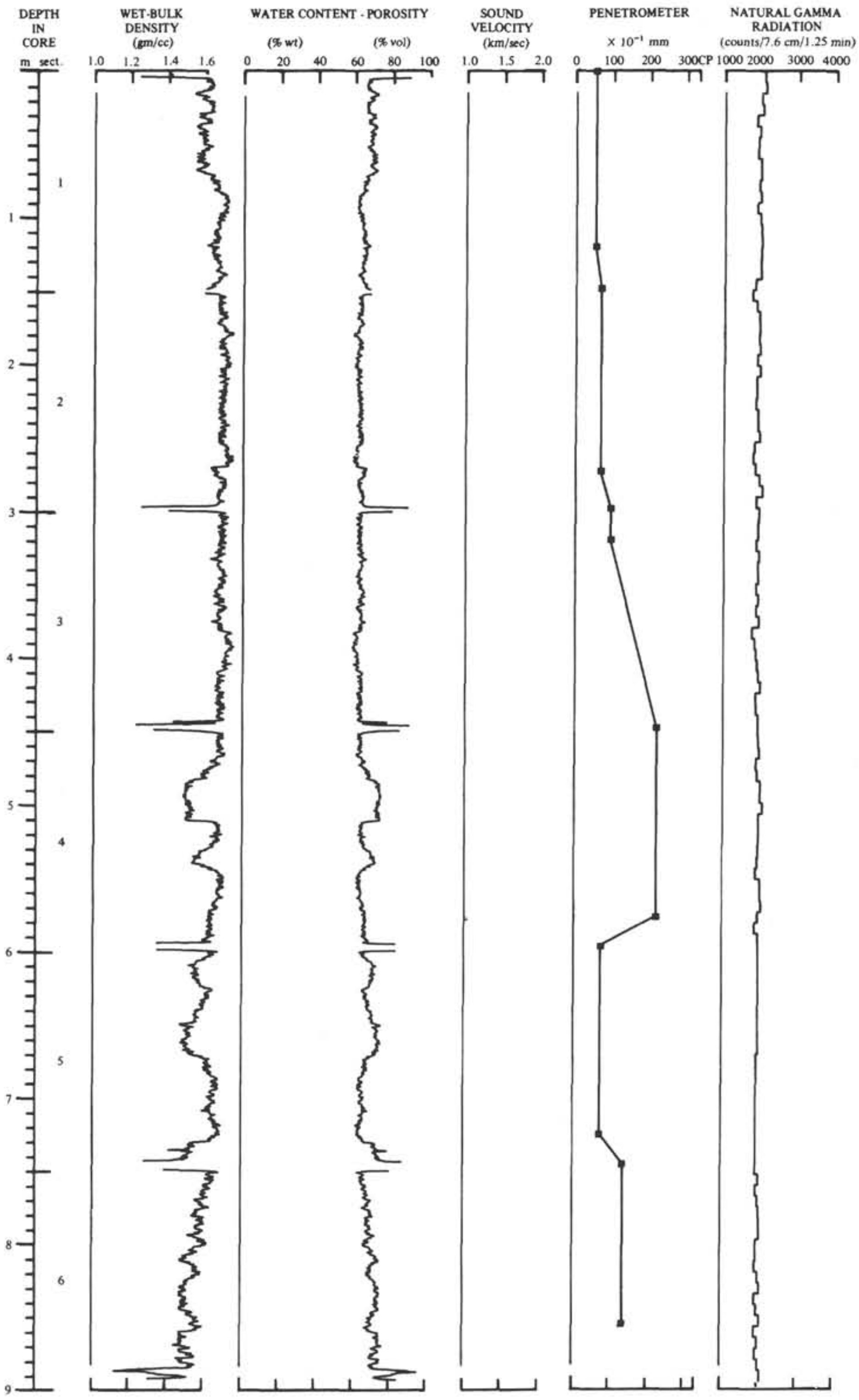

Figure 4A. *Physical Properties of Core 2, Hole 42*

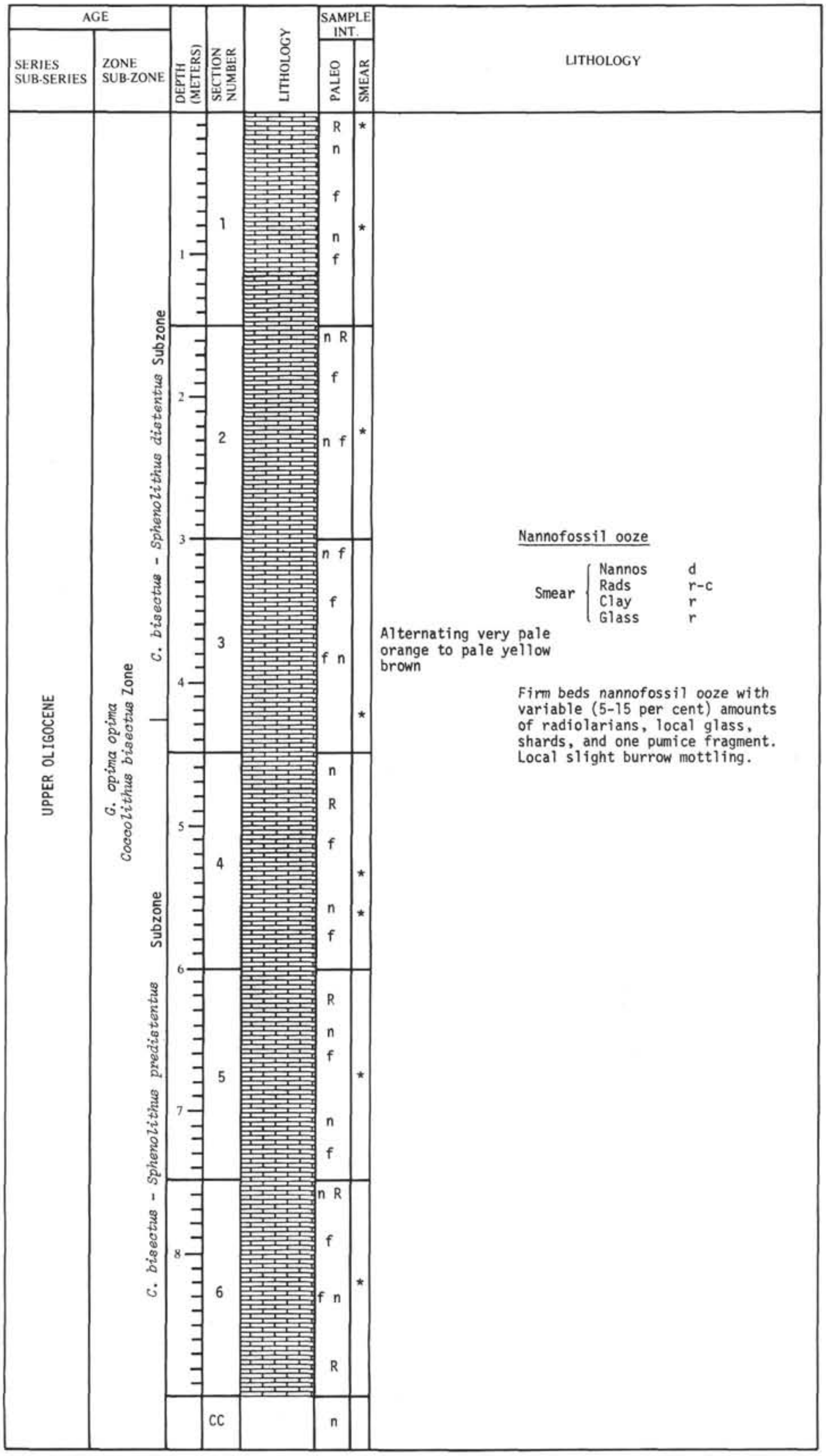

Figure 4B. *Core 2, Hole 42 (9-18 m Below Seabed)*

AGE		DEPTH (METERS)	SECTION NUMBER	LITHOLOGY	SAMPLE INT.		LITHOLOGY
SERIES SUB-SERIES	ZONE SUB-ZONE				PALEO	SMEAR	
UPPER OLIGOCENE	*Coccolithus bisectus* Zone *C. bisectus* - *Sphenolithus predistentus* Subzone	0–1	1	SECTION UN-OPENED			Plastic core liner badly damaged in coring operation and all sediments recovered were put in extra large size plastic liner. Exact position of 150 centimeters of sediment recovered within 10 meters of core barrel is not known. Lithology appears similar to Core 2
			CC		n n	R	
		2					
		3					
		4					
		5					
		6					
		7					
		8					

Figure 5. *Core 3, Hole 42 (18-27 m Below Seabed)*

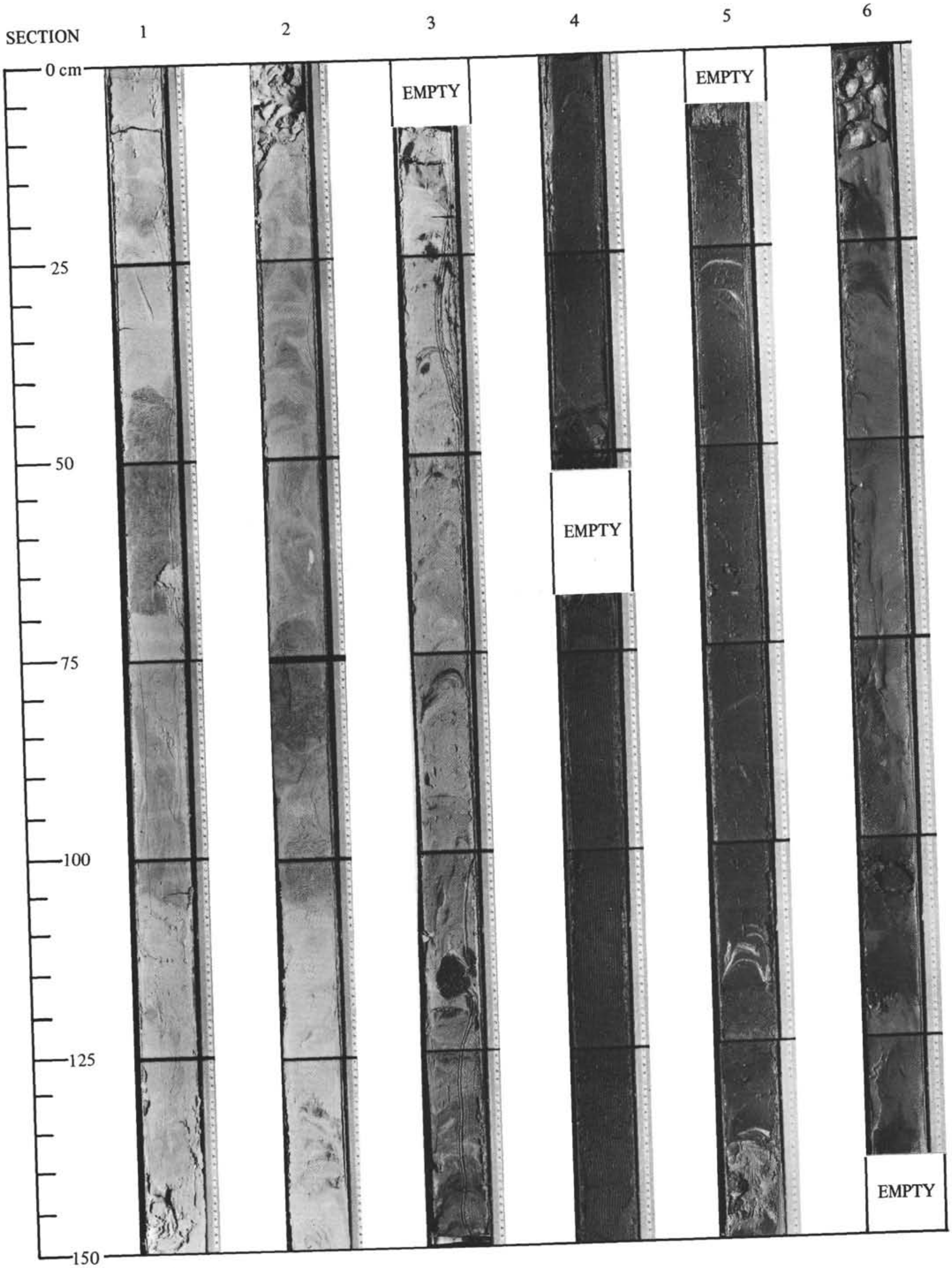

Plate 3. *Core 4, Hole 42*

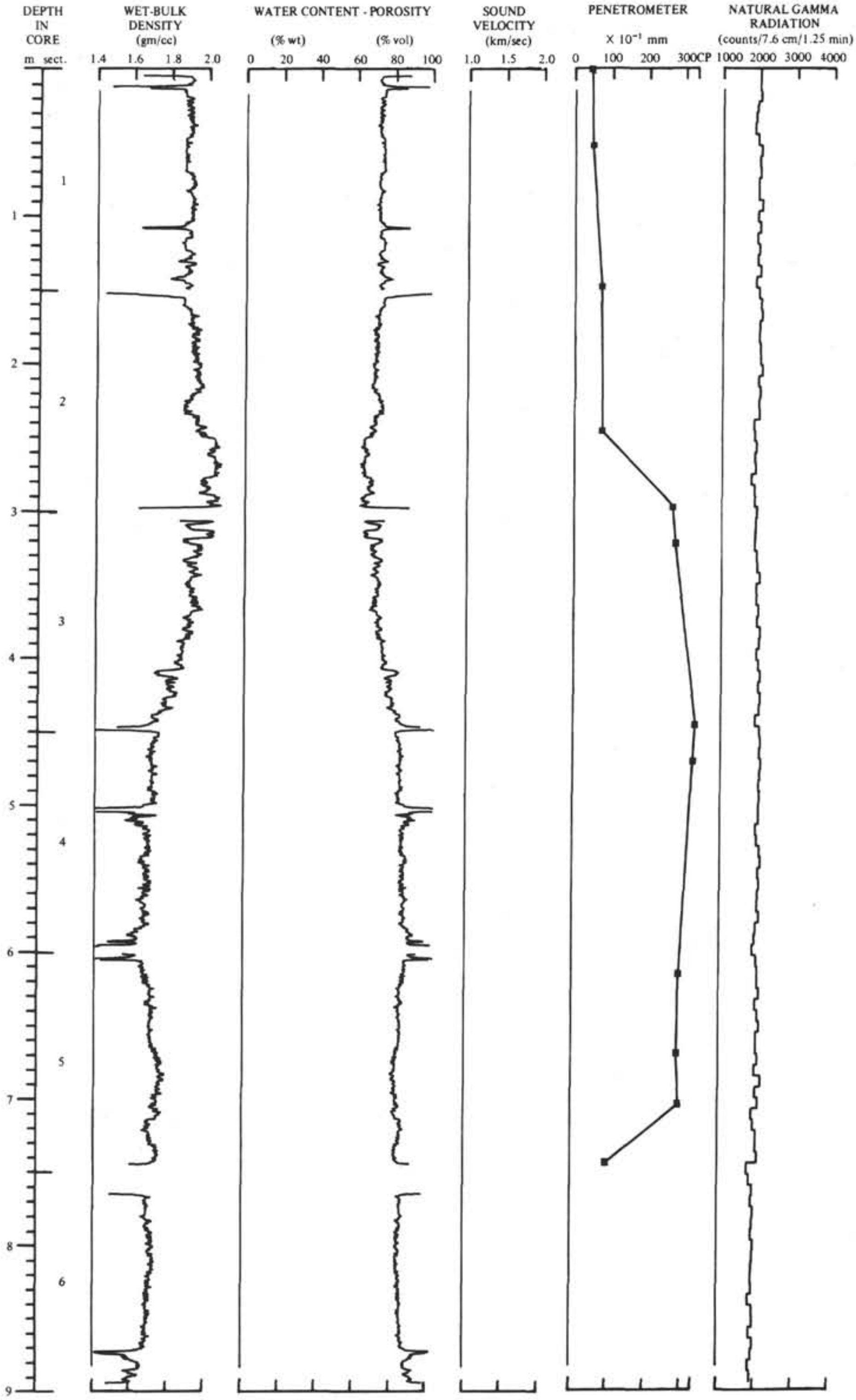

Figure 6A. *Physical Properties of Core 4, Hole 42*

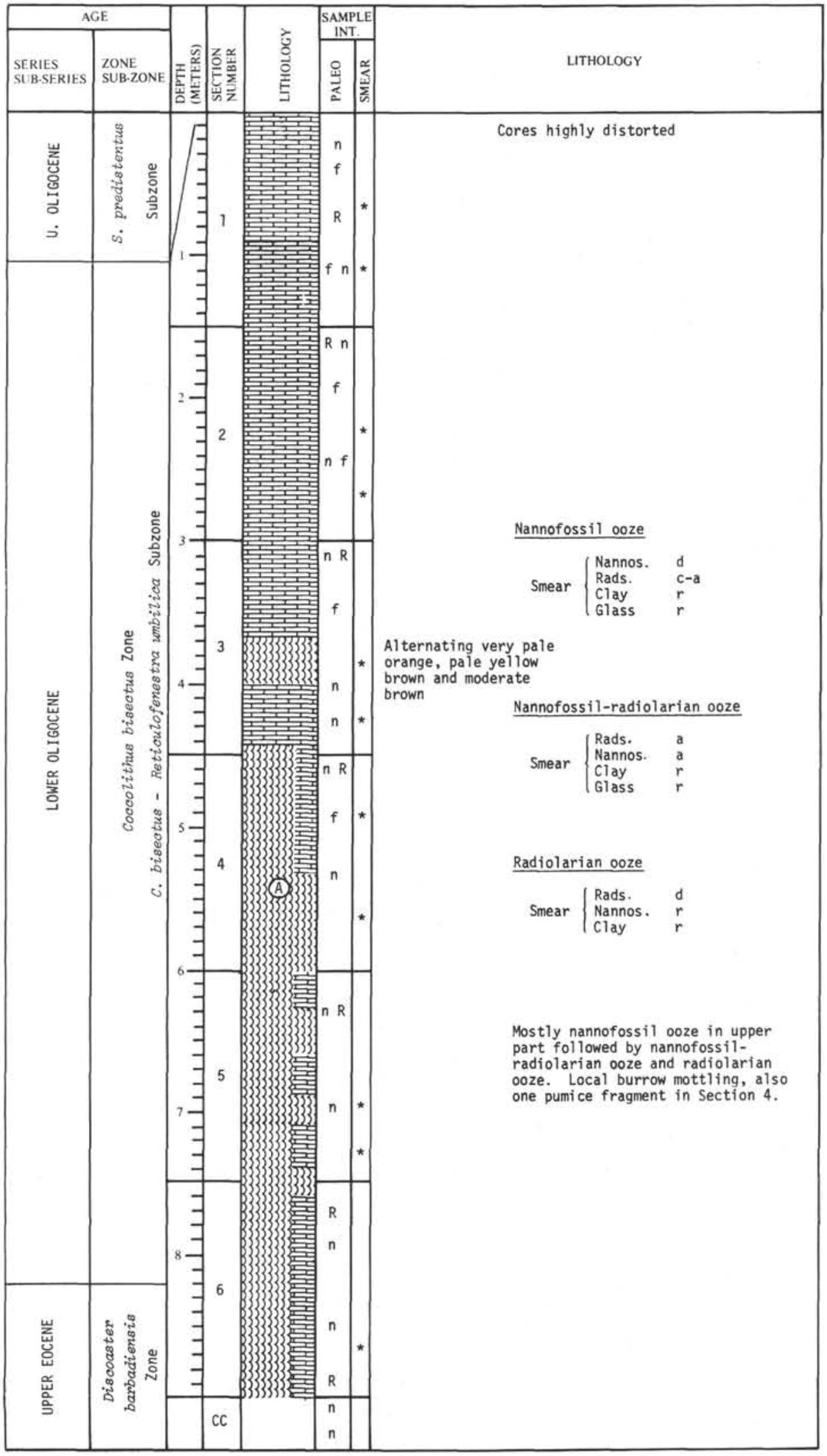

Figure 6B. *Core 4, Hole 42 (27-37 m Below Seabed)*

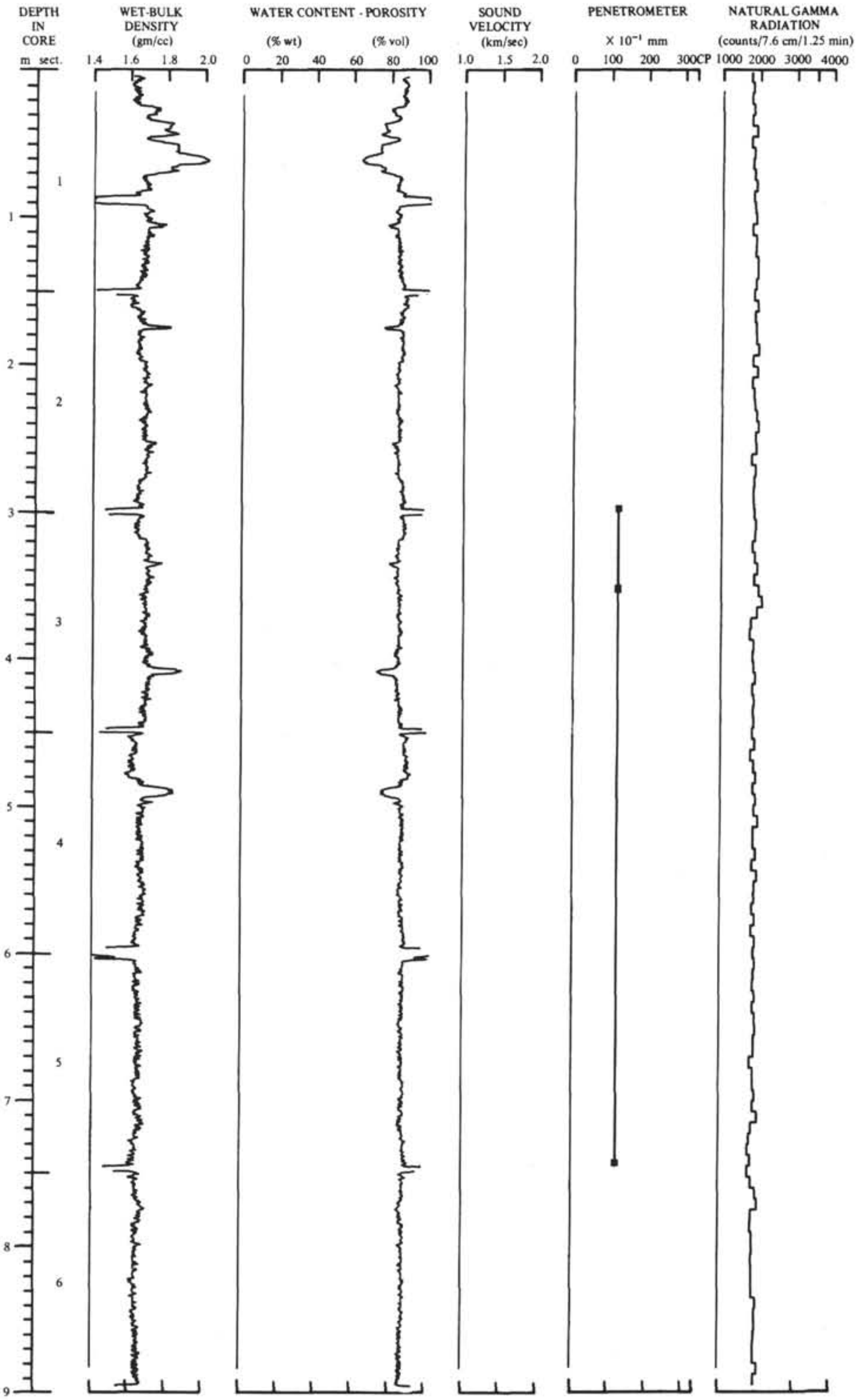

Figure 7A. *Physical Properties of Core 5, Hole 42*

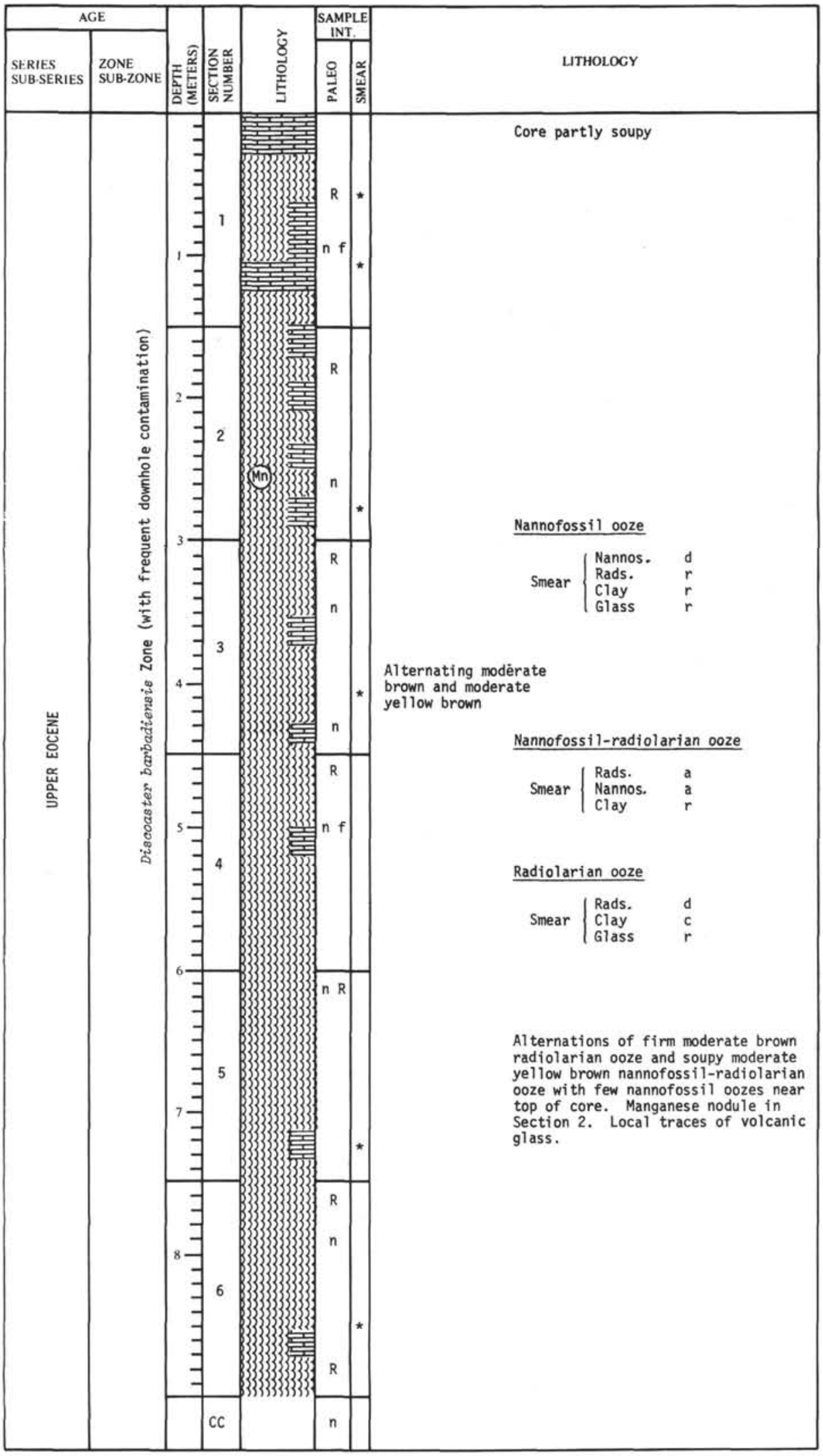

Figure 7B. *Core 5, Hole 42 (37-46 m Below Seabed)*

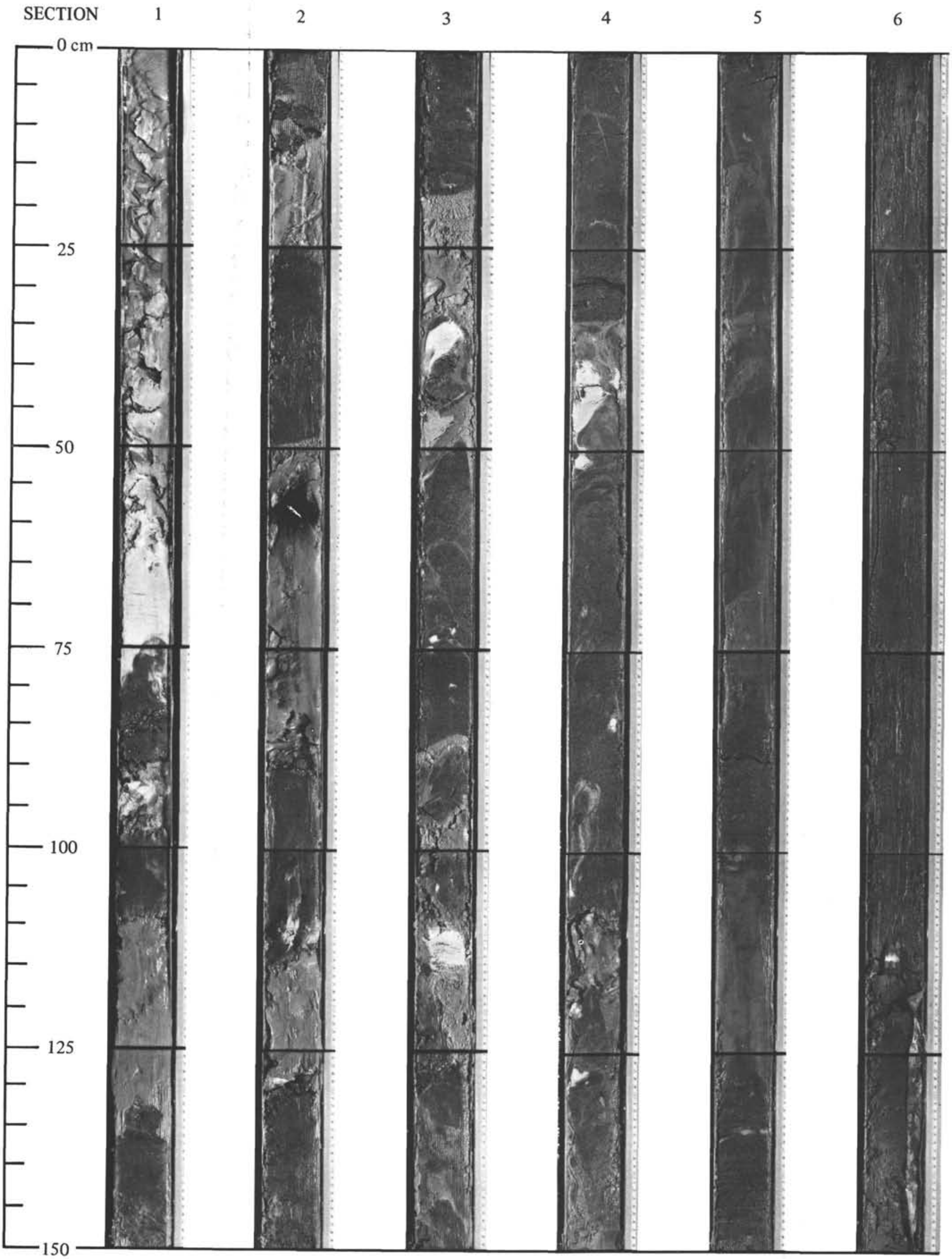

Plate 4. *Core 5, Hole 42*

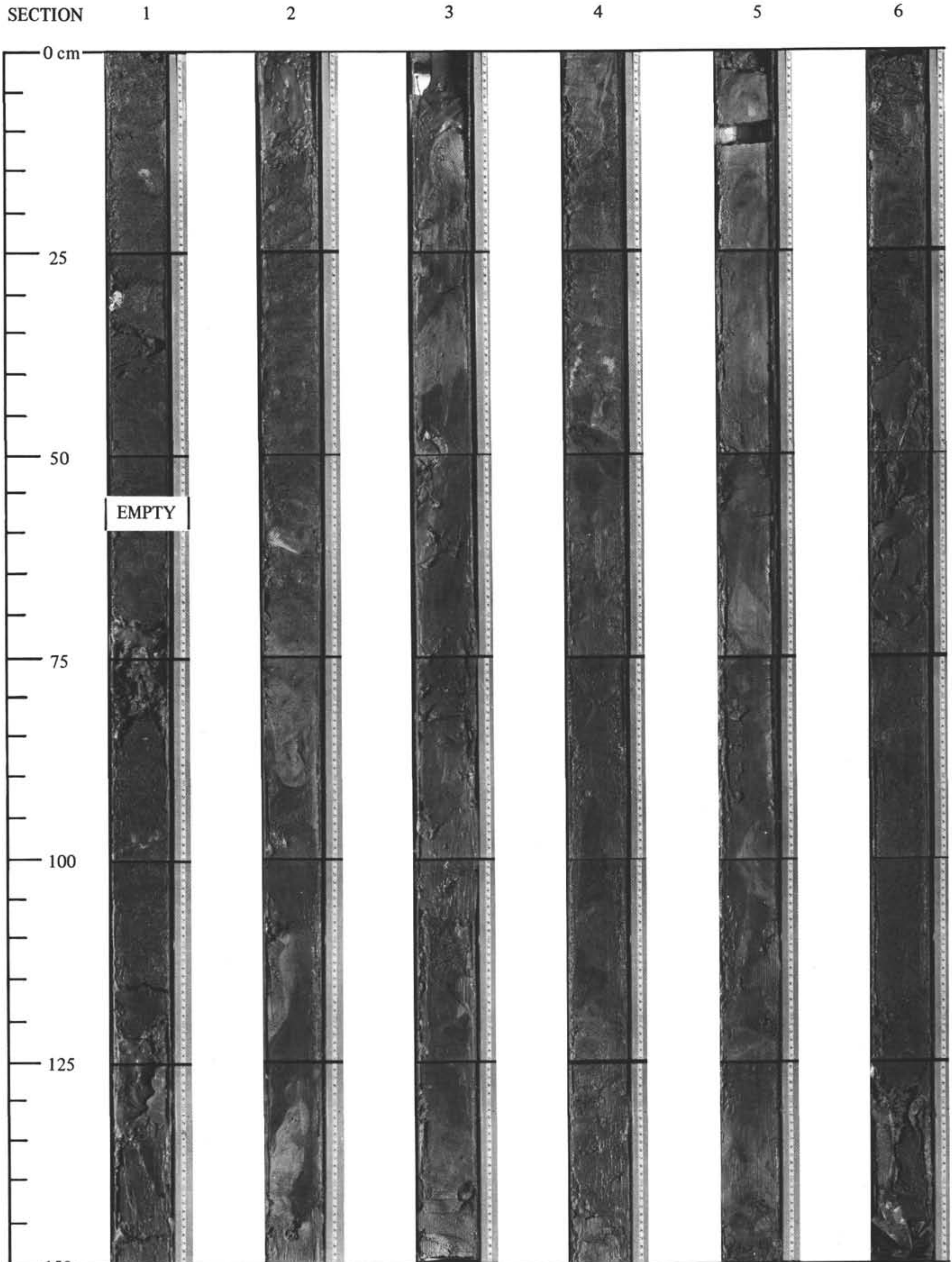

Plate 5. *Core 6, Hole 42*

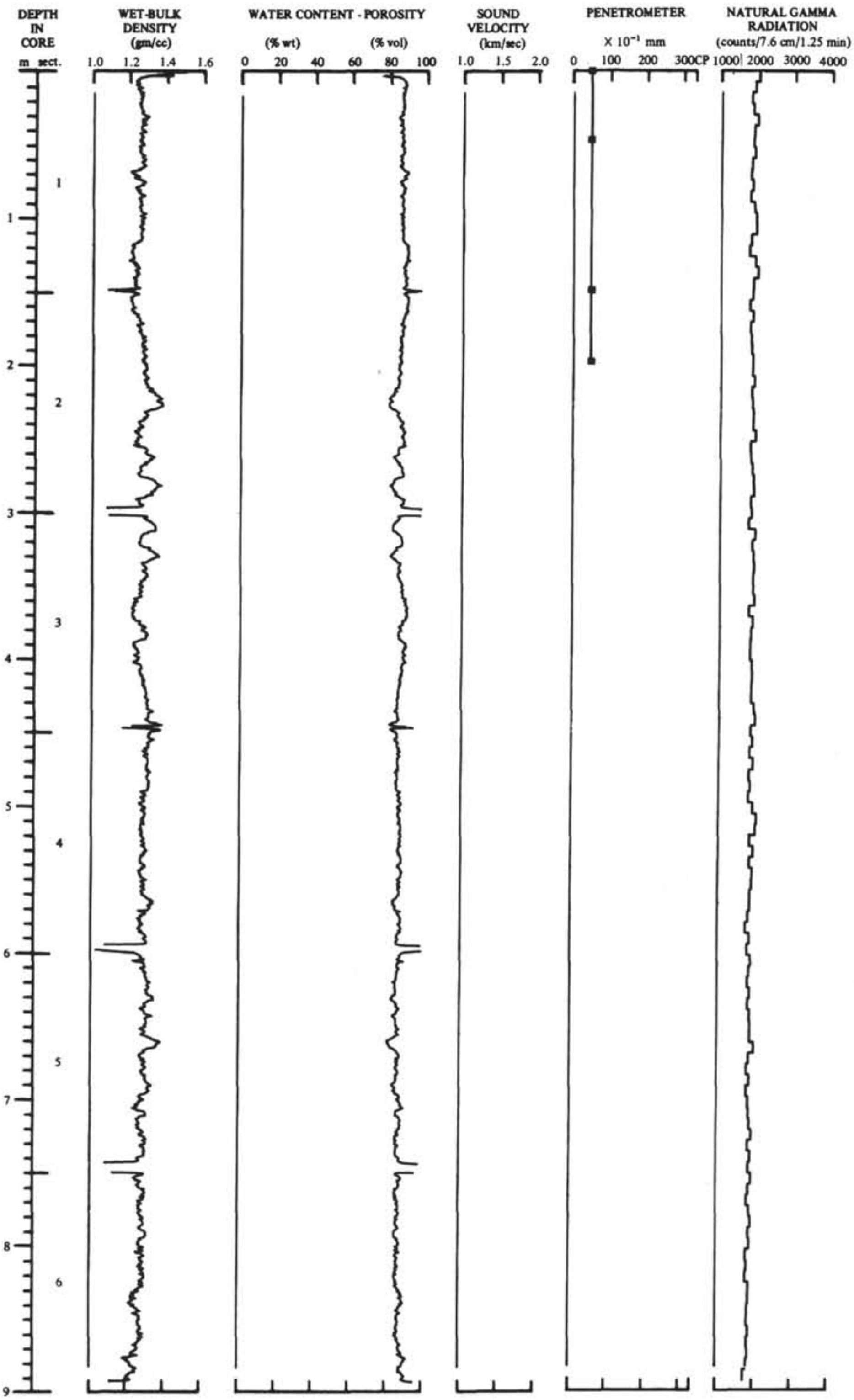

Figure 8A. *Physical Properties of Core 6, Hole 42*

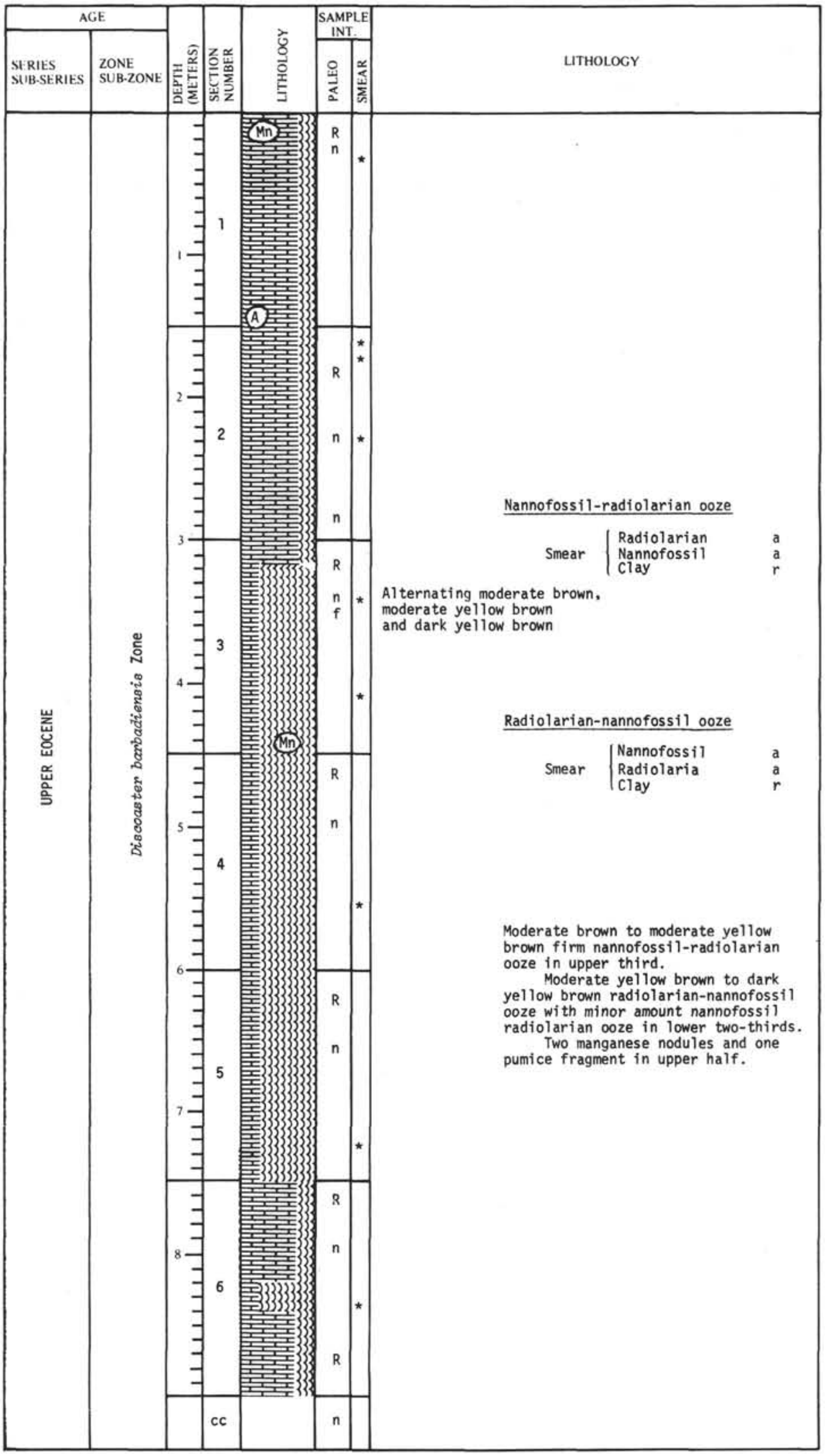

Figure 8B. *Core 6, Hole 42 (46-55 m Below Seabed)*

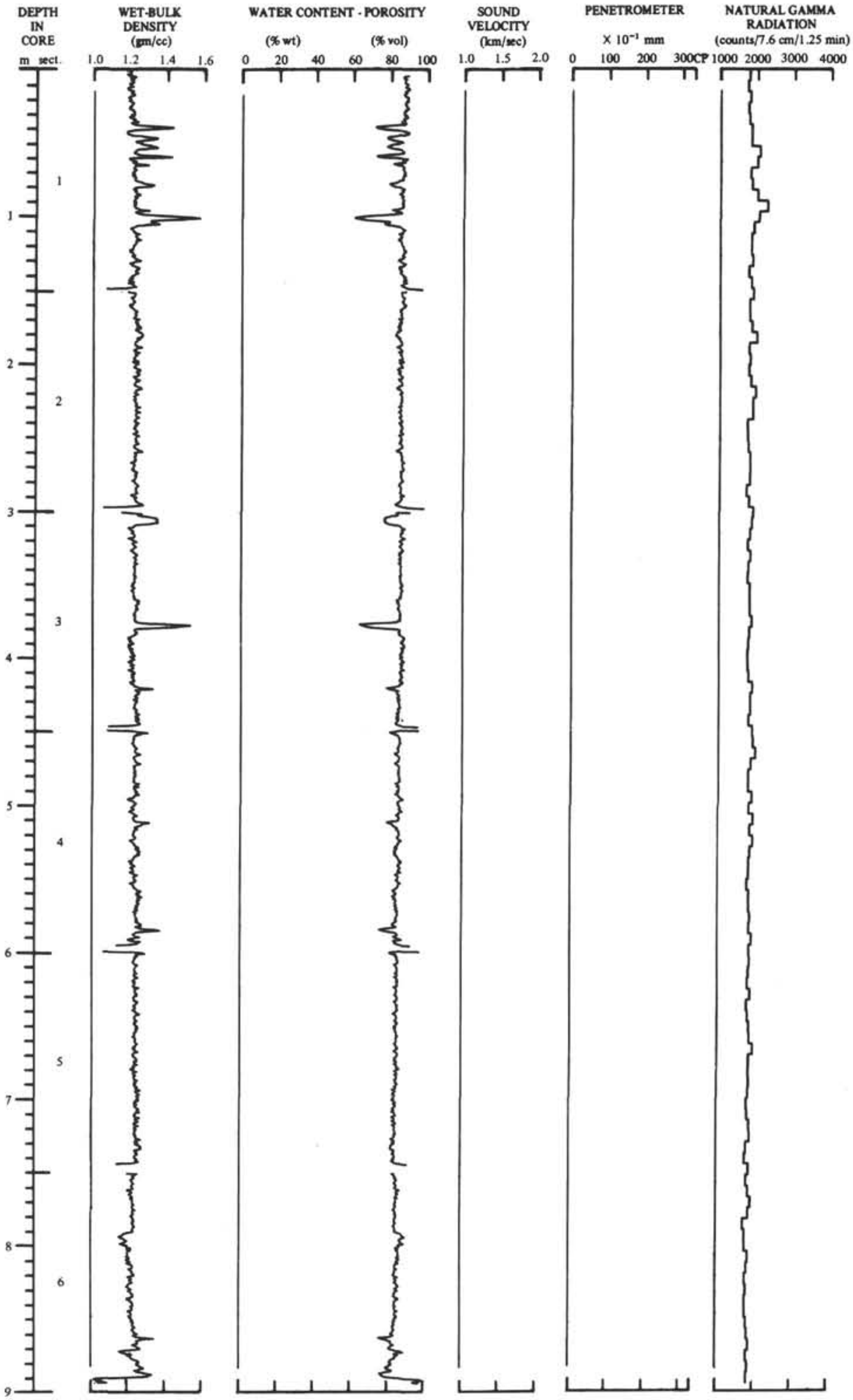

Figure 9A. *Physical Properties of Core 7, Hole 42*

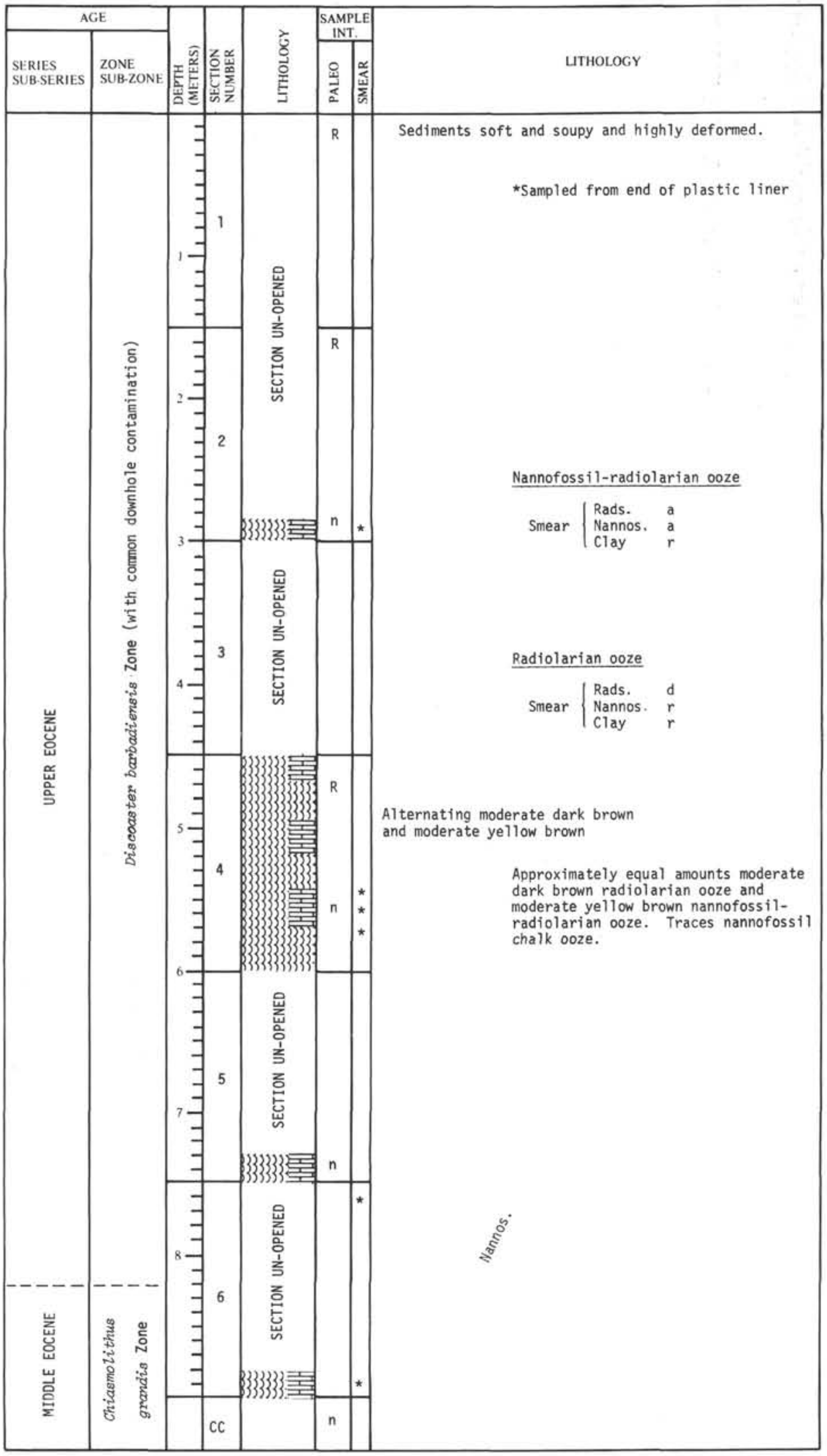

Figure 9B. *Core 7, Hole 42 (55-64 m Below Seabed)*

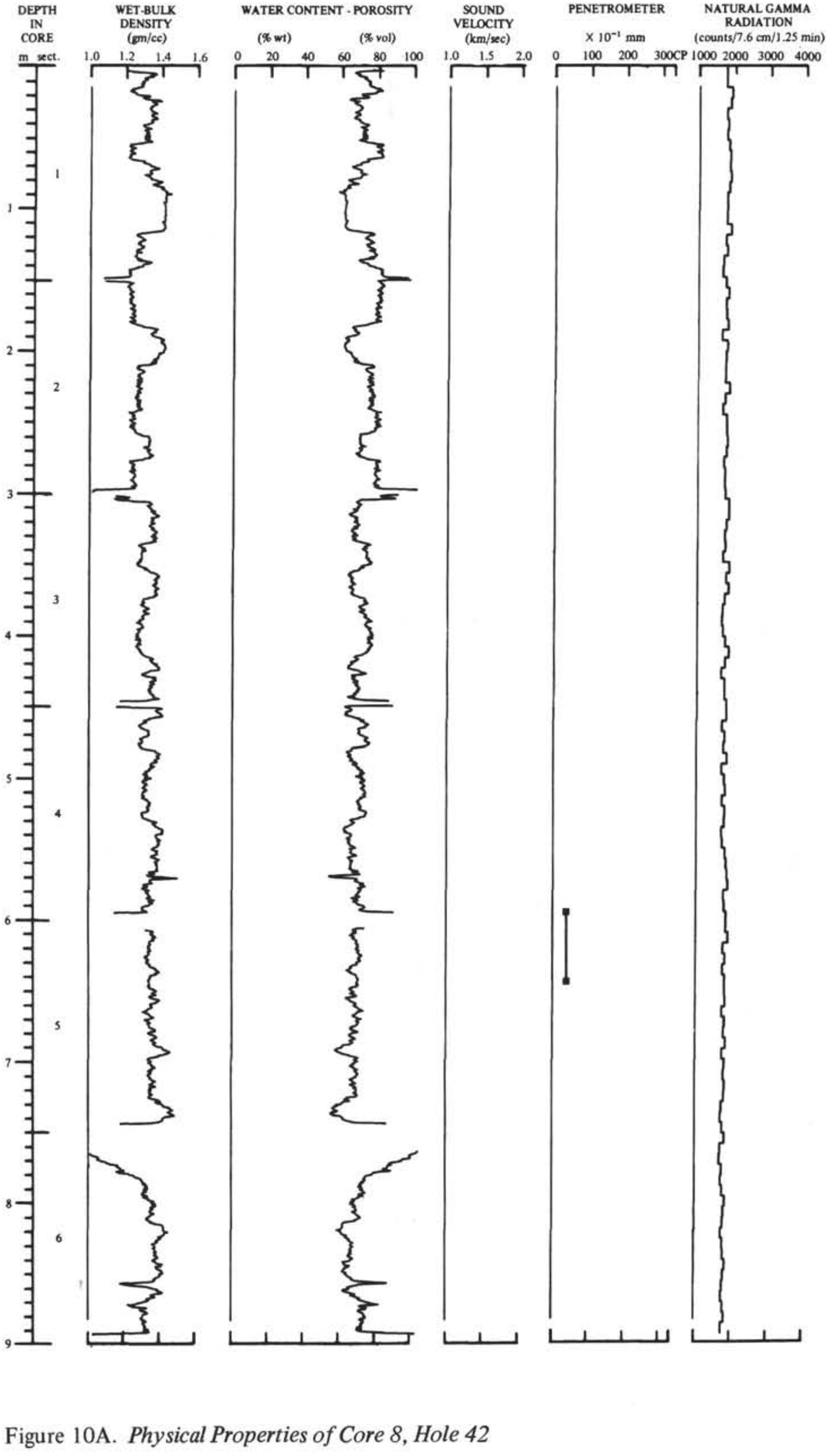

Figure 10A. *Physical Properties of Core 8, Hole 42*

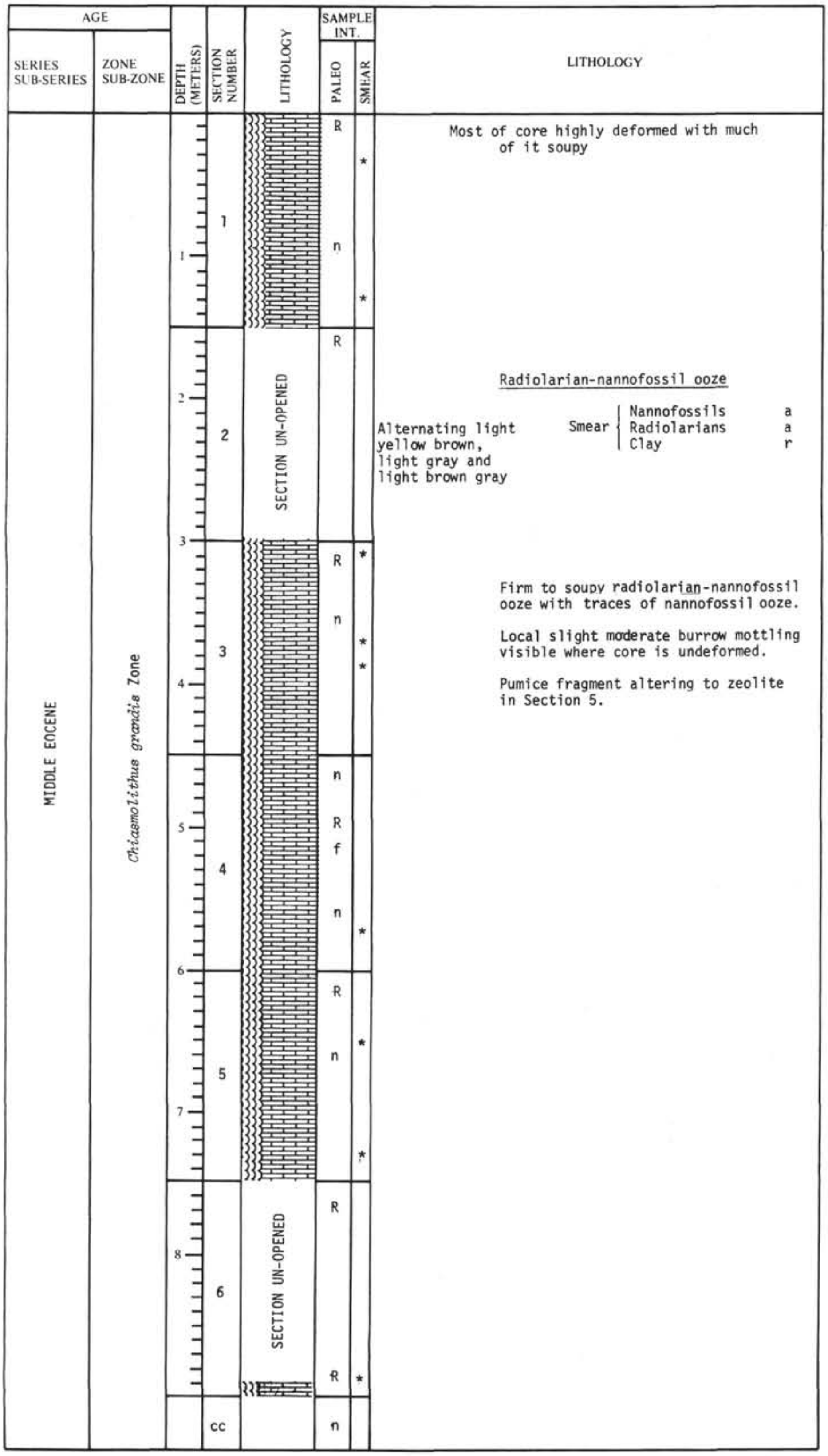

Figure 10B. *Core 8, Hole 42 (64-73 m Below Seabed)*

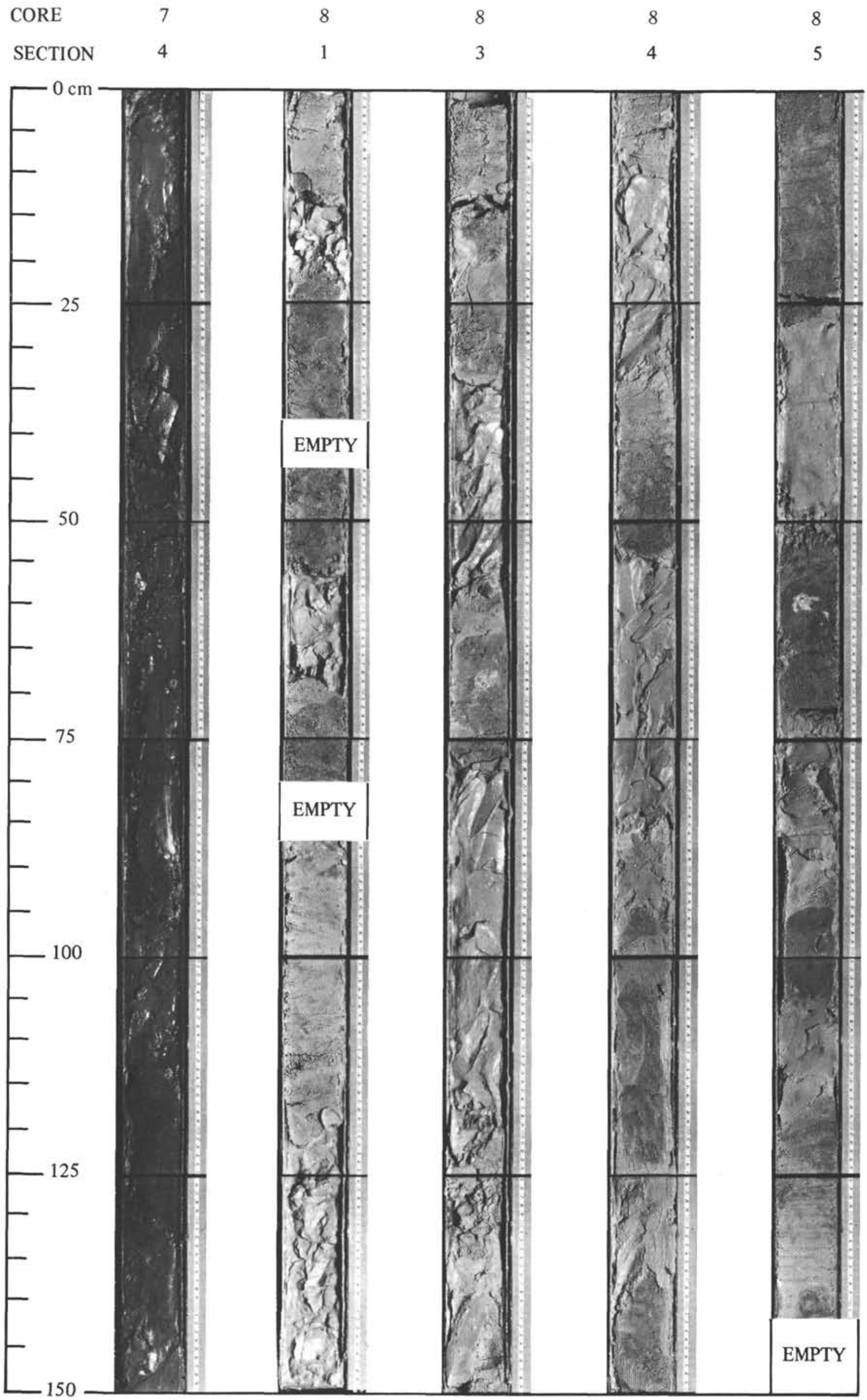

Plate 6. *Sections of Cores 7 and 8, Hole 42*

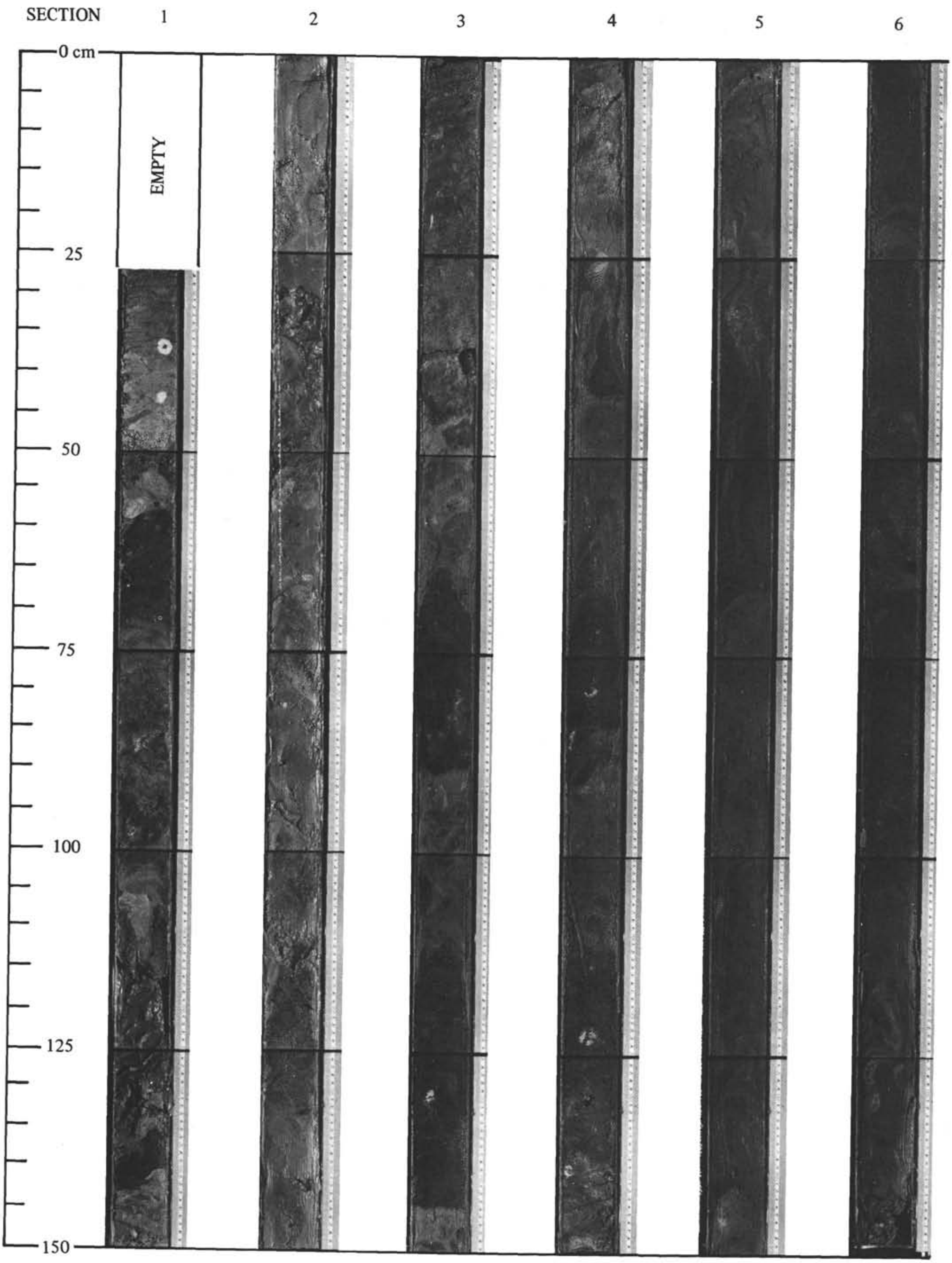

Plate 7. *Core 9, Hole 42*

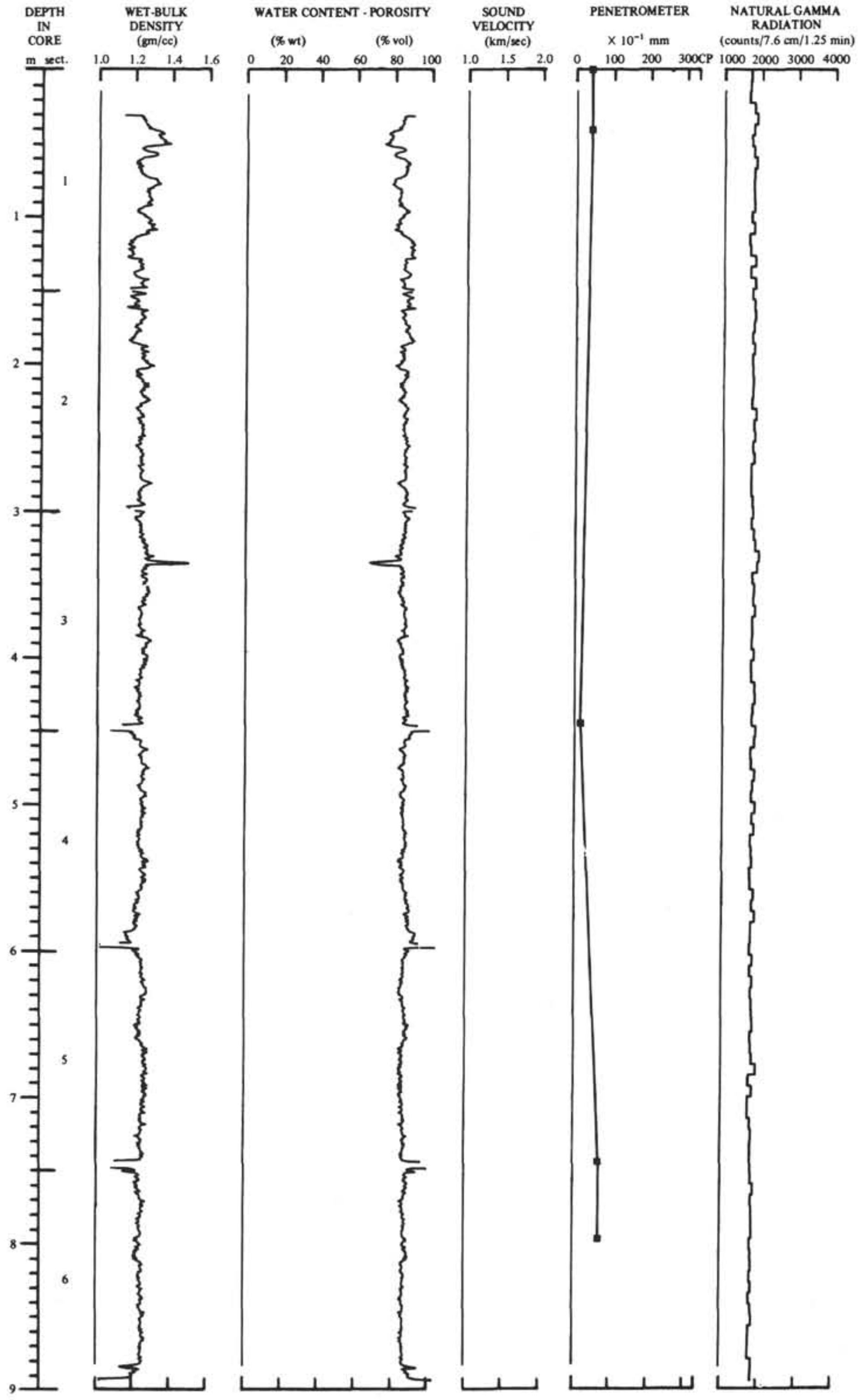

Figure 11A. *Physical Properties of Core 9, Hole 42*

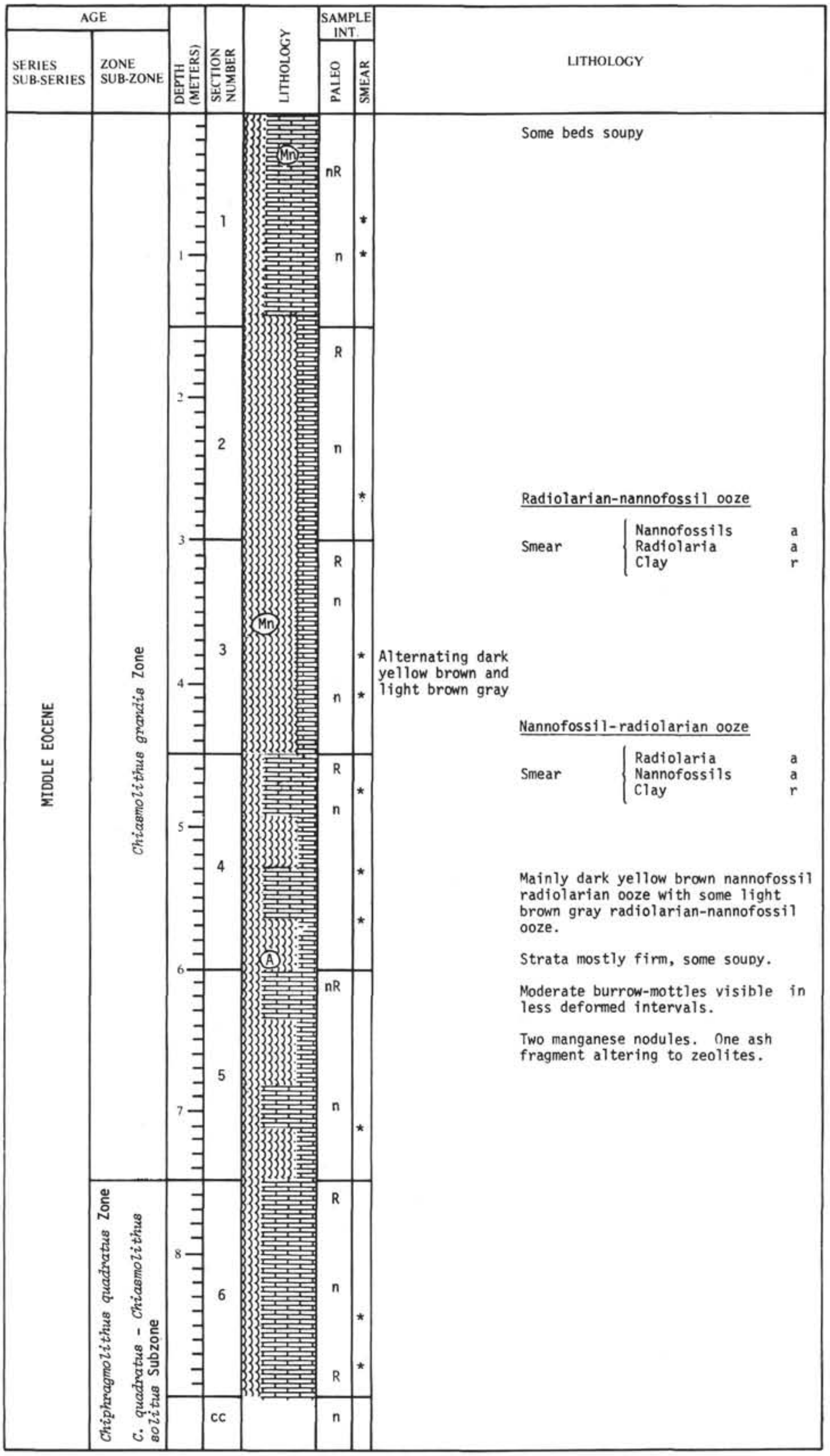

Figure 11B. *Core 9, Hole 42 (73-82 m Below Seabed)*

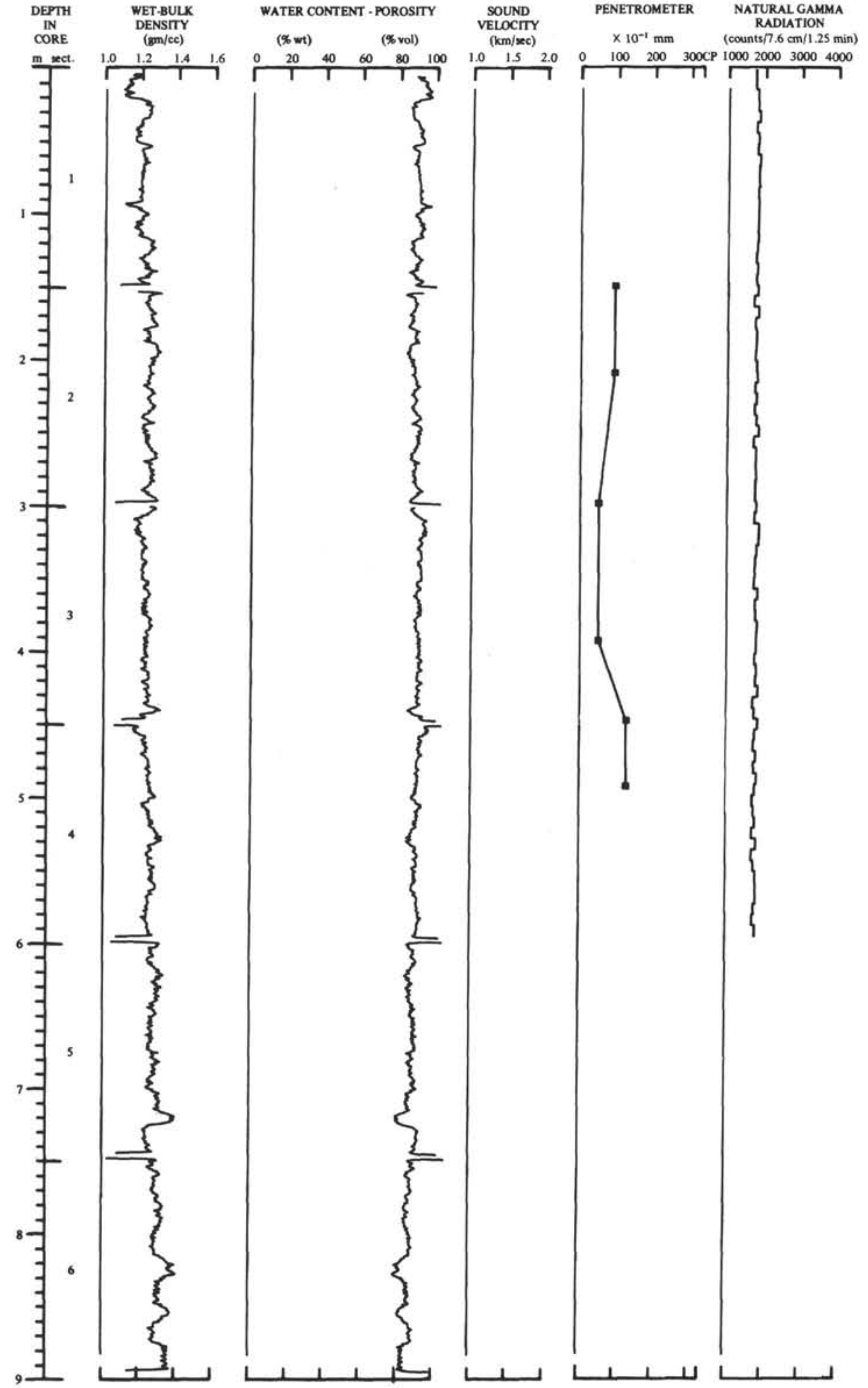

Figure 12A. *Physical Properties of Core 10, Hole 42*

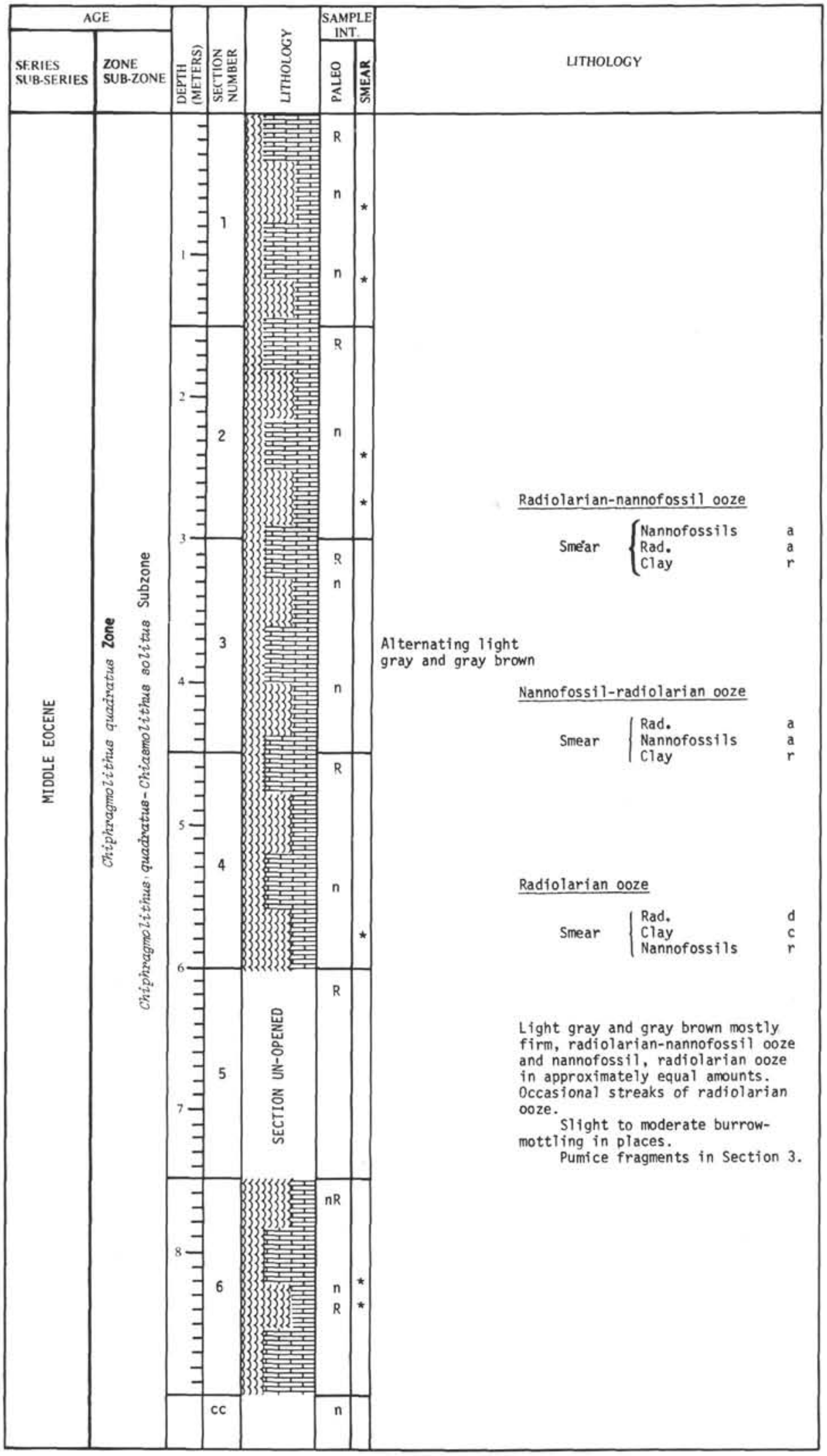

Figure 12B. *Core 10, Hole 42 (82-92 m Below Seabed)*

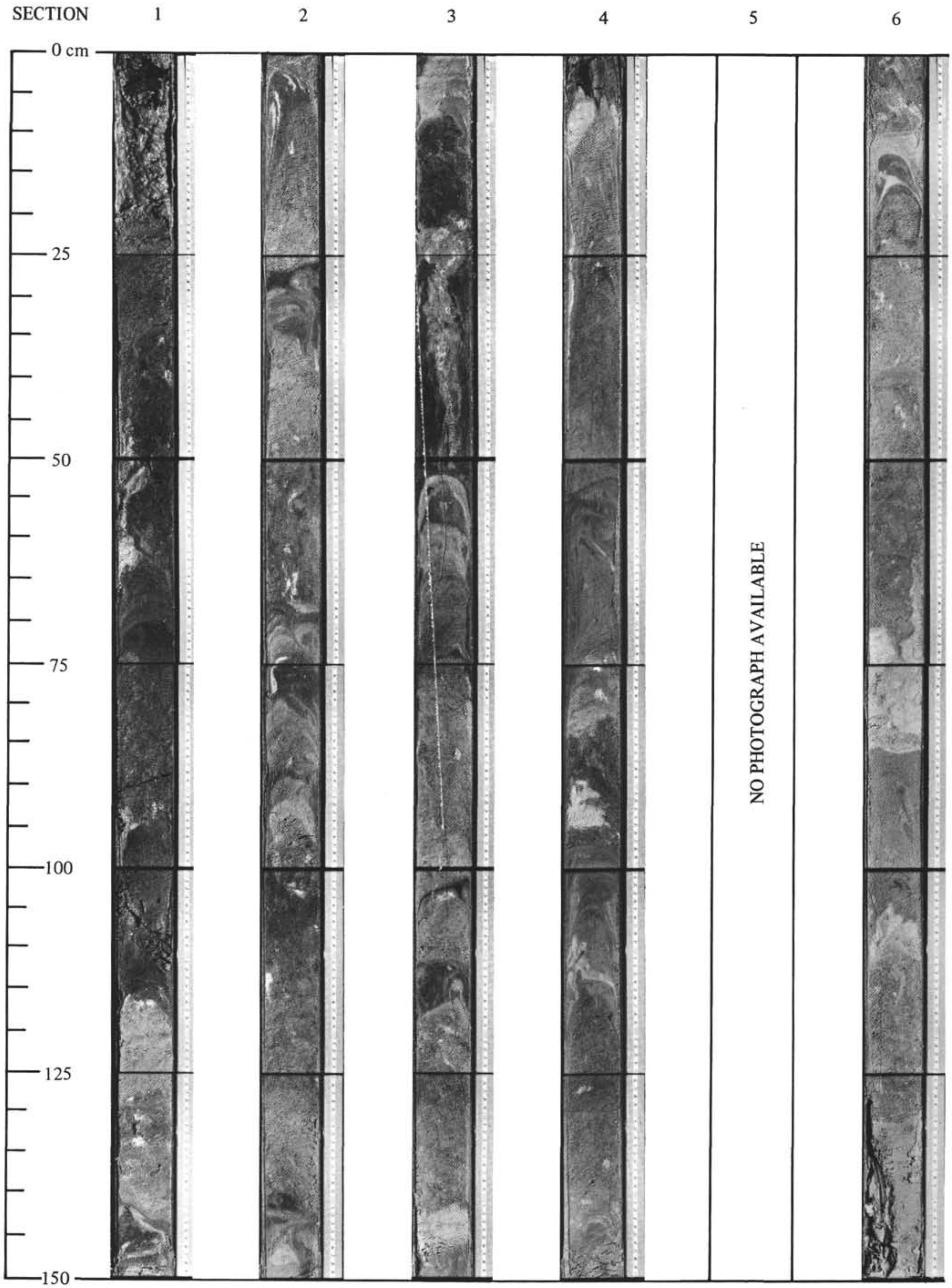

Plate 8. *Core 10, Hole 42*

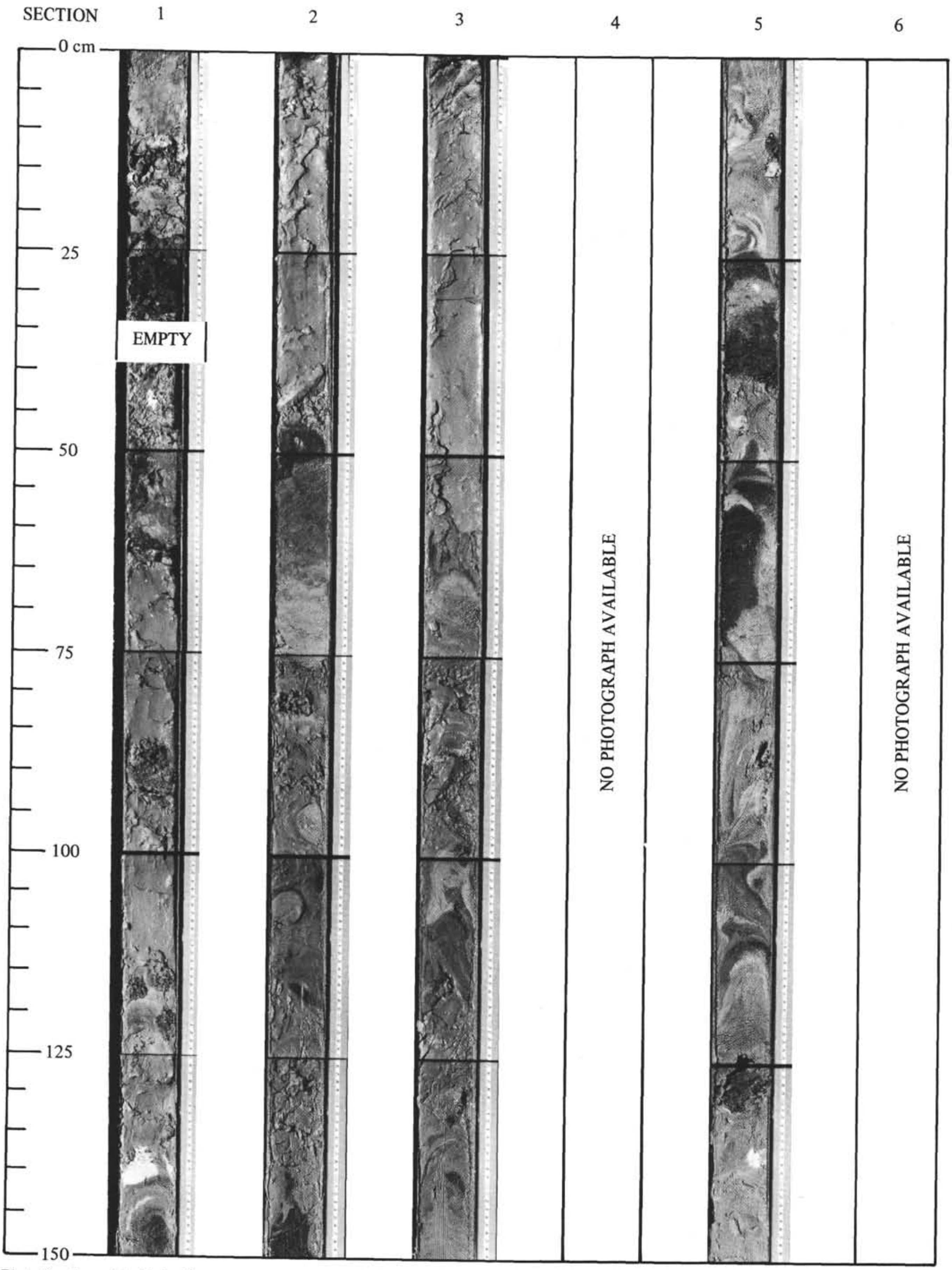

Plate 9. *Core 11, Hole 42*

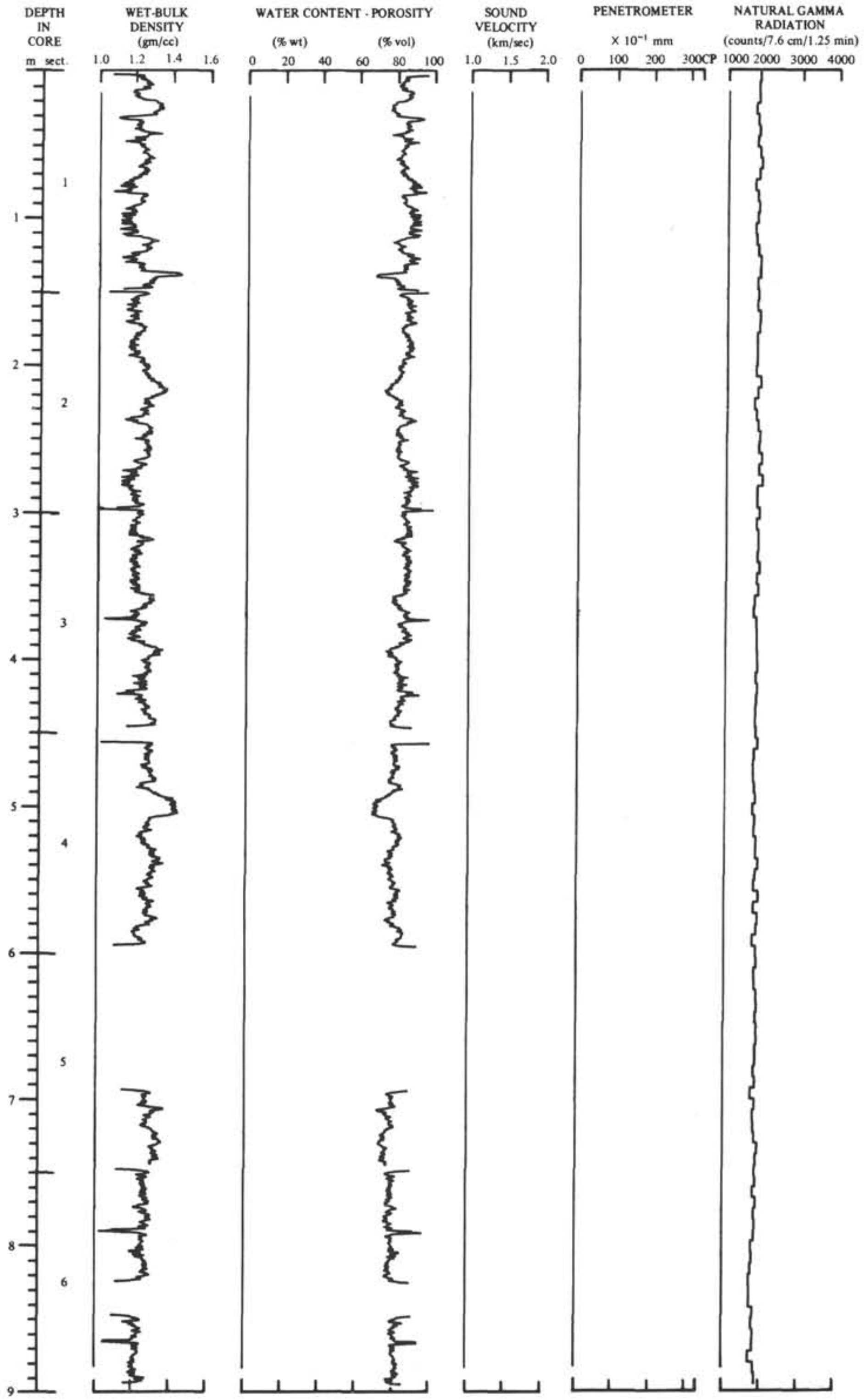

Figure 13A. *Physical Properties of Core 11, Hole 42*

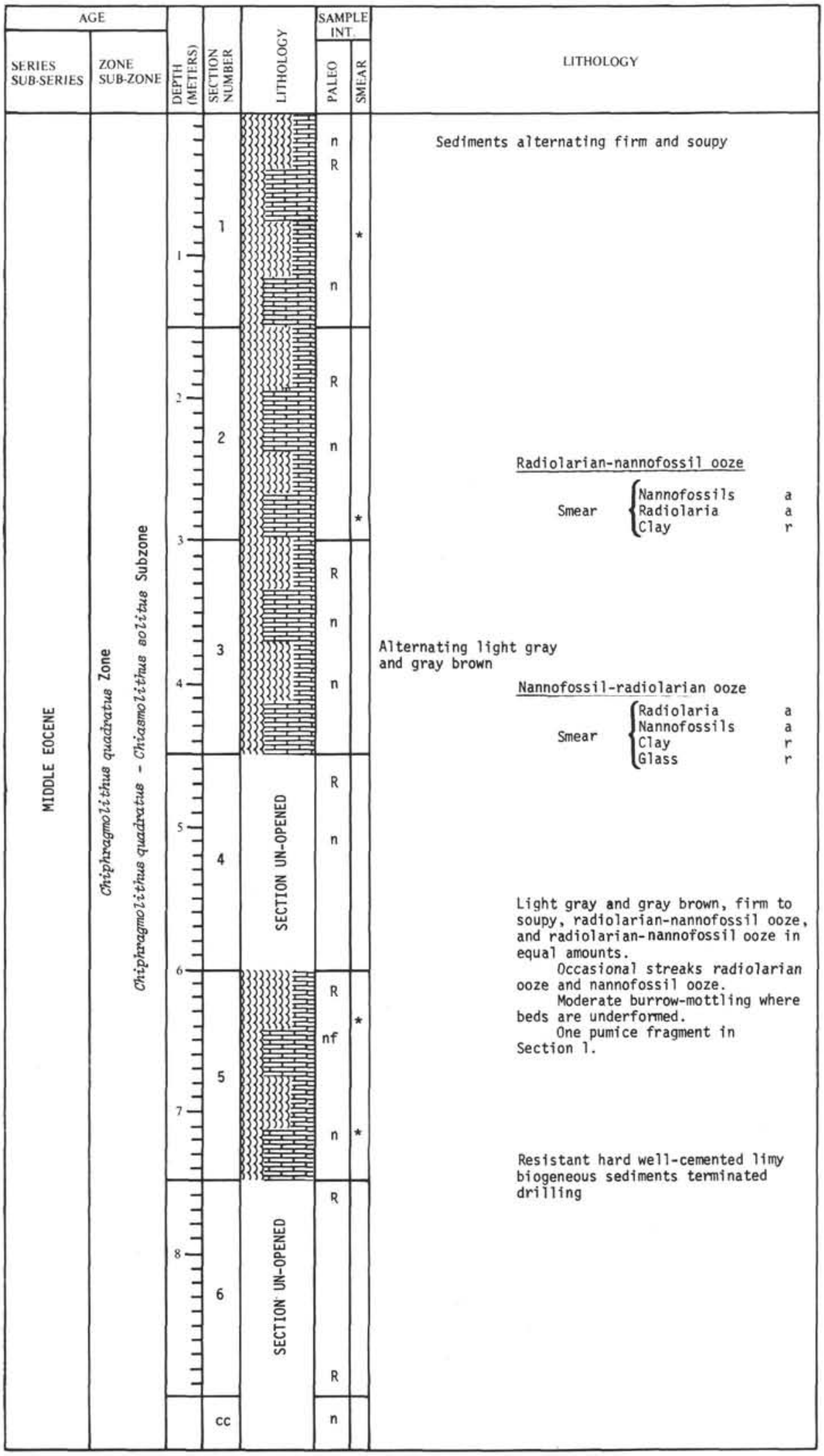

Figure 13B. *Core 11, Hole 42 (92-100 m Below Seabed)*

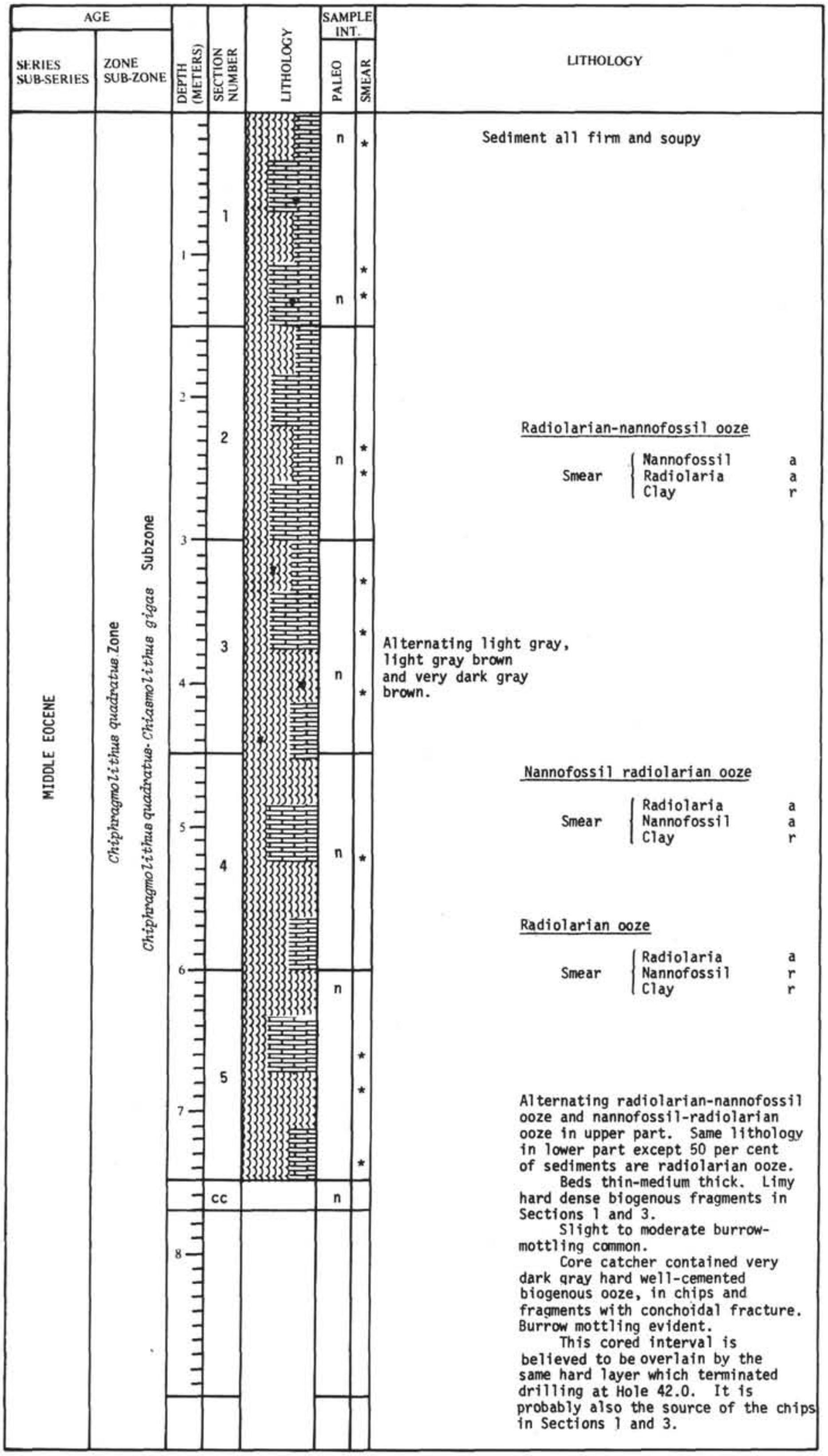

Figure 14. *Core 1, Hole 42.1 (100-107 m Below Seabed)*

AGE: SERIES SUB-SERIES	AGE: ZONE SUB-ZONE	DEPTH (METERS)	SECTION NUMBER	LITHOLOGY	SAMPLE INT.: PALEO	SAMPLE INT.: SMEAR	LITHOLOGY
MIDDLE EOCENE	*Chiphragmolithus quadratus* Zone; *Chiphragmolithus quadratus*-*Chiasmolithus gigas* Subzone	1	1				
		2	2				
		3, 4	3				Core catcher sample only: Very dark gray and light brown gray hard, dense to cherty well-cemented siliceous limestone with slight burrow mottles, conchoidal fracture of chips and fragments. Opaline to cherty material as cementing agent in small to large amounts, seemingly varying in direct proportion to the amount of siliceous fossils originally present. Same material as fracture fillings and replacement of siliceous fossils. Harder fragments with conchoidal fracture have higher amounts of chert.
		5	4				
		6, 7	5				
		8	6				
			cc		n		* Core catcher

Figure 15. *Core 2, Hole 42.1 (107-109 m Below Seabed)*

AGE		DEPTH (METERS)	SECTION NUMBER	LITHOLOGY	SAMPLE INT.		LITHOLOGY
SERIES SUB-SERIES	ZONE SUB-ZONE				PALEO	SMEAR	
		1 2 3 4 5 6 7 8					After third core was taken unsuccessfully, the center bit was brought up. It contained granule-sized chips of well cemented biogenous ooze and firm pellets of same. The lithology is therefore similar to the first two cores.
							No recovery in core catcher.

Figure 16. *Core 3, Hole 42.1 (113 m Below Seabed)*