# 1. INTRODUCTION

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## GENERAL OBJECTIVES

The main objectives of Leg 17 were:

1. To establish the regional pattern of oceanic crustal ages in the central Pacific. Several types of sites were chosen (see Figure 1).

   a) in areas beyond magnetic anomaly 32, but within the same general system of fracture zones. Site 164, between the Molokai and Clarion Fracture zones but some 1800 km west of anomaly 32, was chosen for this purpose.

   b) on surveyed, but undated, magnetic anomalies. A set of southwest-trending anomalies near the equator had been described in a paper (Larson et al., 1972) still unpublished at the time of the Leg 17 cruise. Site 166 was designed to determine the age of the crust at one point within the band of anomalies. It had been also proposed that one of the "Hawaiian" magnetic anomalies (Hayes and Pitman, 1970) be drilled on Leg 17, but the shipboard scientific party was forced to abandon this objective when time ran out during the drilling of Sites 169 and 170. This objective will now be that of Legs 32 and 33, scheduled for the latter part of 1973.

   c) in areas well beyond any conservative extrapolation from known fracture zone and magnetic anomaly patterns, where very old crust might be anticipated. Site 168, on the far western side of the Central Basin, was chosen for this objective.

2. To obtain cores of the entire stratigraphic succession, especially from pre-Middle Eocene strata. Earlier cruises into the central and western Pacific had poor luck in penetrating the ubiquitous cherts of the Middle Eocene and in sampling the early Cenozoic and Mesozoic sediments beneath. Improved drilling bits were available for Leg 17 operations, and thus the older sediments were the major targets for coring. At least two contrasting facies were desired:

   a) a moderate-depth pelagic facies, deposited mainly above the compensation depth for calcium carbonate. Such a section should yield mainly carbonate sediments, with relatively high rates of accumulation and with good preservation of microfossils, and a nearly continuous section for biostratigraphic zonation. Site 167, on Magellan Rise, was chosen for this purpose.

   b) in deep water, where one might anticipate a record of fluctuating carbonate solution levels and good preservation of siliceous fossils, as well as clayey sediments. Sites 164, 166, and 168 were chosen for this facies.

3. To document the history of growth and subsidence of seamounts located along seamount chains, by drilling on the archipelagic apron of sediments near the foot of individual seamounts. Site 165, midway along the Line Islands Chain, was selected for this objective. It had been hoped that we could also drill at a site close to the foot of Horizon Guyot, in deep water, but the remaining time was so short near the end of the cruise that the site on Horizon Guyot, Site 171, was chosen instead, since drilling at shallow sites requires much less time than at deep-water sites.

4. To sample acoustic reflectors seen on seismic reflection profiles and to establish their physical properties and their ages. Of special interest was a very prominent reflector tentatively associated with Middle Eocene chert layers and possibly similar to "Horizon A" in the Atlantic.

## OPERATIONS

The track of *Glomar Challenger* during Leg 17 is shown in Figure 1. The ship left Honolulu on March 30, 1971 and returned to Honolulu on May 25, 1971, after a voyage of 4783 nautical miles. A total of 10 holes was drilled at eight sites. Details of the operations and coring statistics for each hole are given in the Background and Operations section of the individual Site Reports. A grouping together of all the graphic logs for the eight sites is shown in the final chapter of this volume. All underway data–depth soundings, magnetic field, and seismic reflection profile records–are displayed in Chapter 10, along with details of navigation.

## BATHYMETRIC CHART

A bathymetric chart of the Central Basin, giving somewhat more detail than is shown in Figure 1, is enclosed in the pocket at the end of this volume. The locations of ships' tracks with very reliable depth soundings and good navigation are shown in Figure 2. Although numerous other soundings (mainly U. S. Navy) of generally less reliability were used in constructing the chart, the relative density of tracks shown on various parts of Figure 2 is a reasonable guide to the relative reliability of the contouring. The depths have been corrected for the velocity of sound in seawater, using Matthews' tables (1944).

## DATA PRESENTATION IN SITE REPORTS

Material is arranged in a standardized order as follows (authorship of various sections within the Site Reports is indicated below in parentheses):

Site Data: position, geography, water depth, dates occupied, time on location, depth of maximum penetration, number of cores taken, total length of cored section, total core recovery, percentage of penetrated section cored, and a brief summary of the principal results (Winterer)

Graphic Log, showing lithology, age, and rate of accumulation of sediments.

Background and Objectives (Ewing)

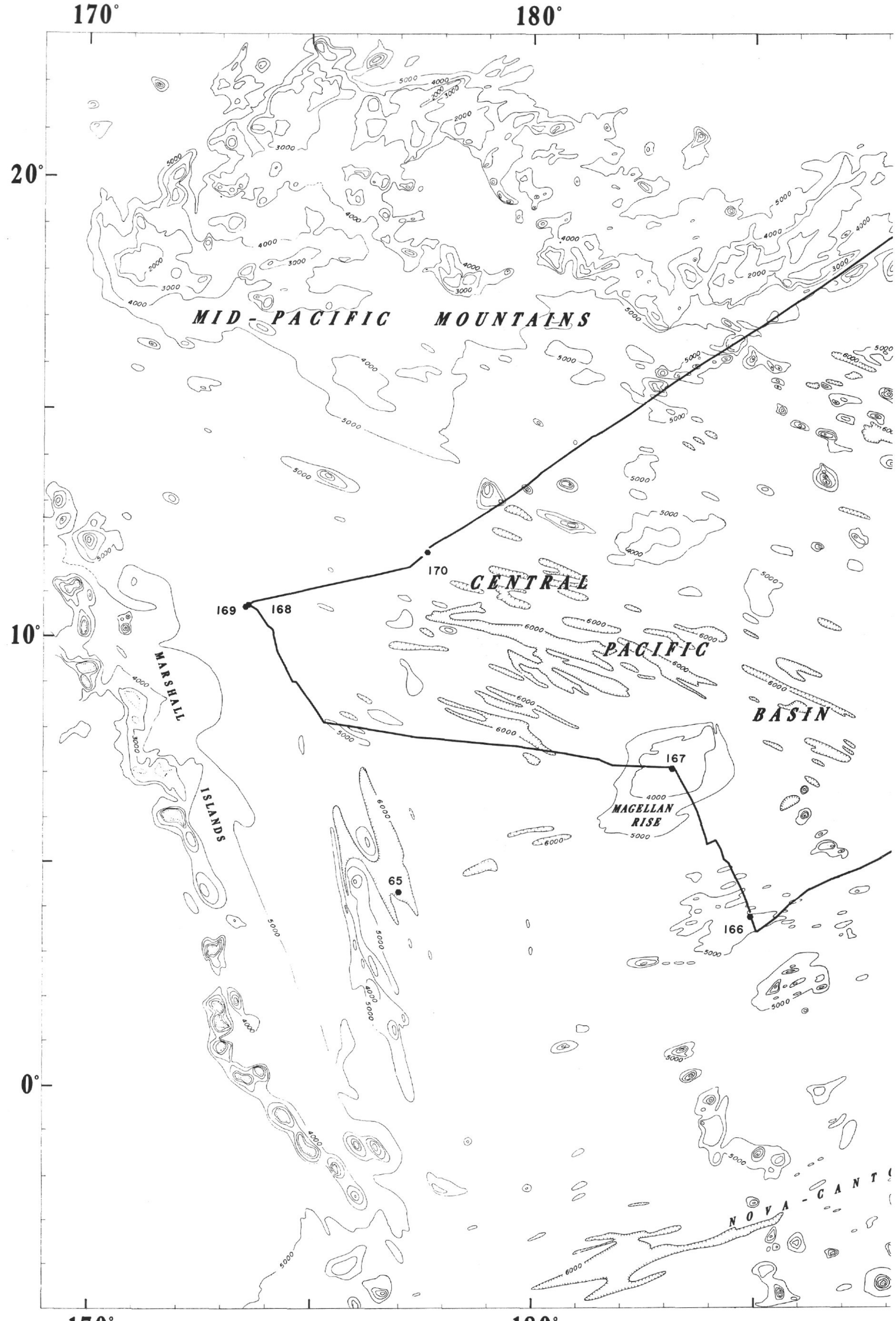



Figure 1. *Generalized bathymetric chart of the Central Basin region of the Pacific Ocean, showing Deep Sea Drilling sites and the track of* Glomar Challenger *during Leg 17. Contours in meters (corrected for sound velocity). Data from Chase et al., 1970; J. Mammerickx et al. (unpublished); P. Lonsdale (unpublished), supplemented in the central part of the chart by the contouring of new data furnished by Lamont-Doherty Geological Observatory, Hawaii Institute of Geophysics, and Scripps Institution of Oceanography.*

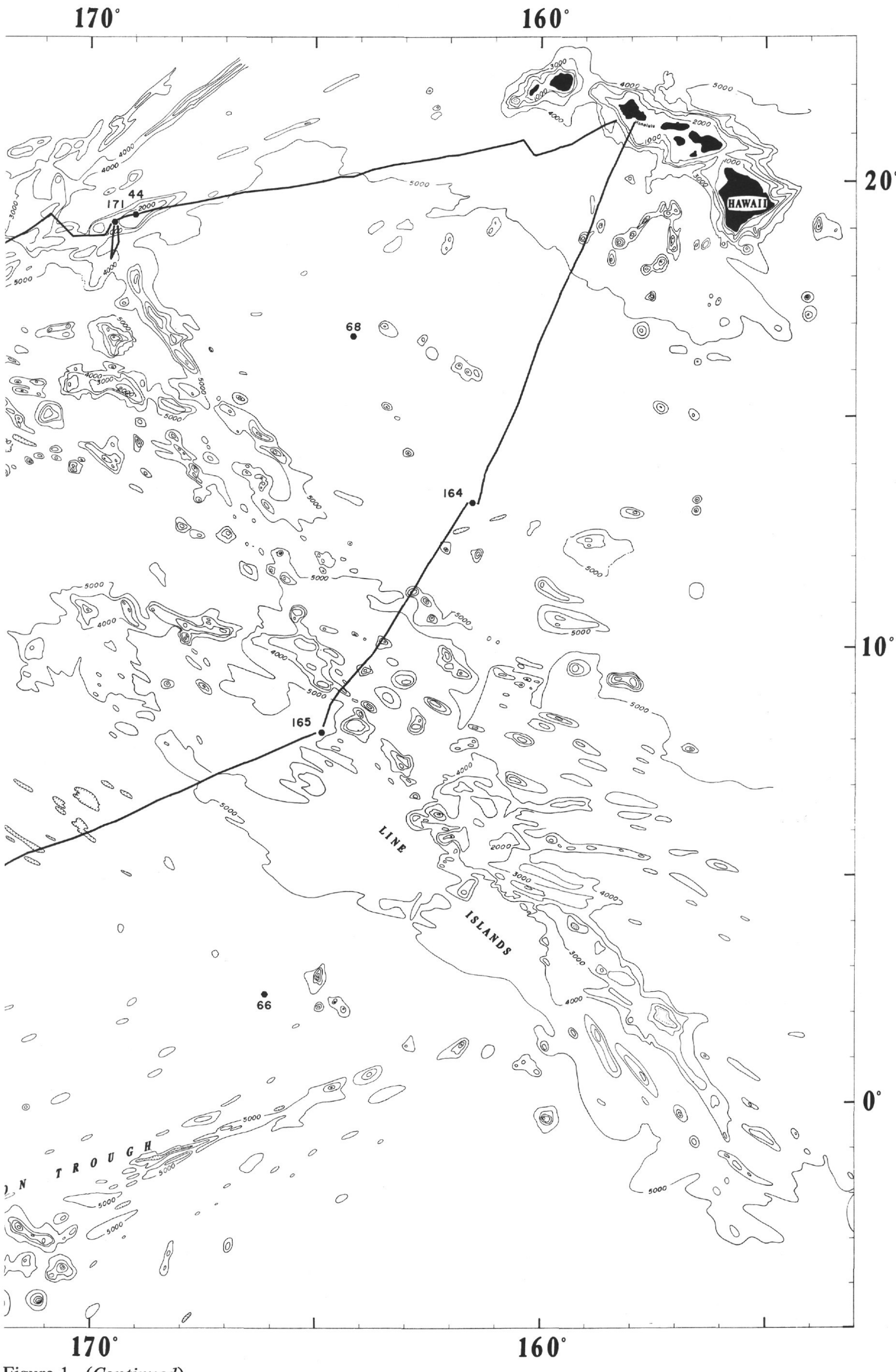



Figure 1. (*Continued*).

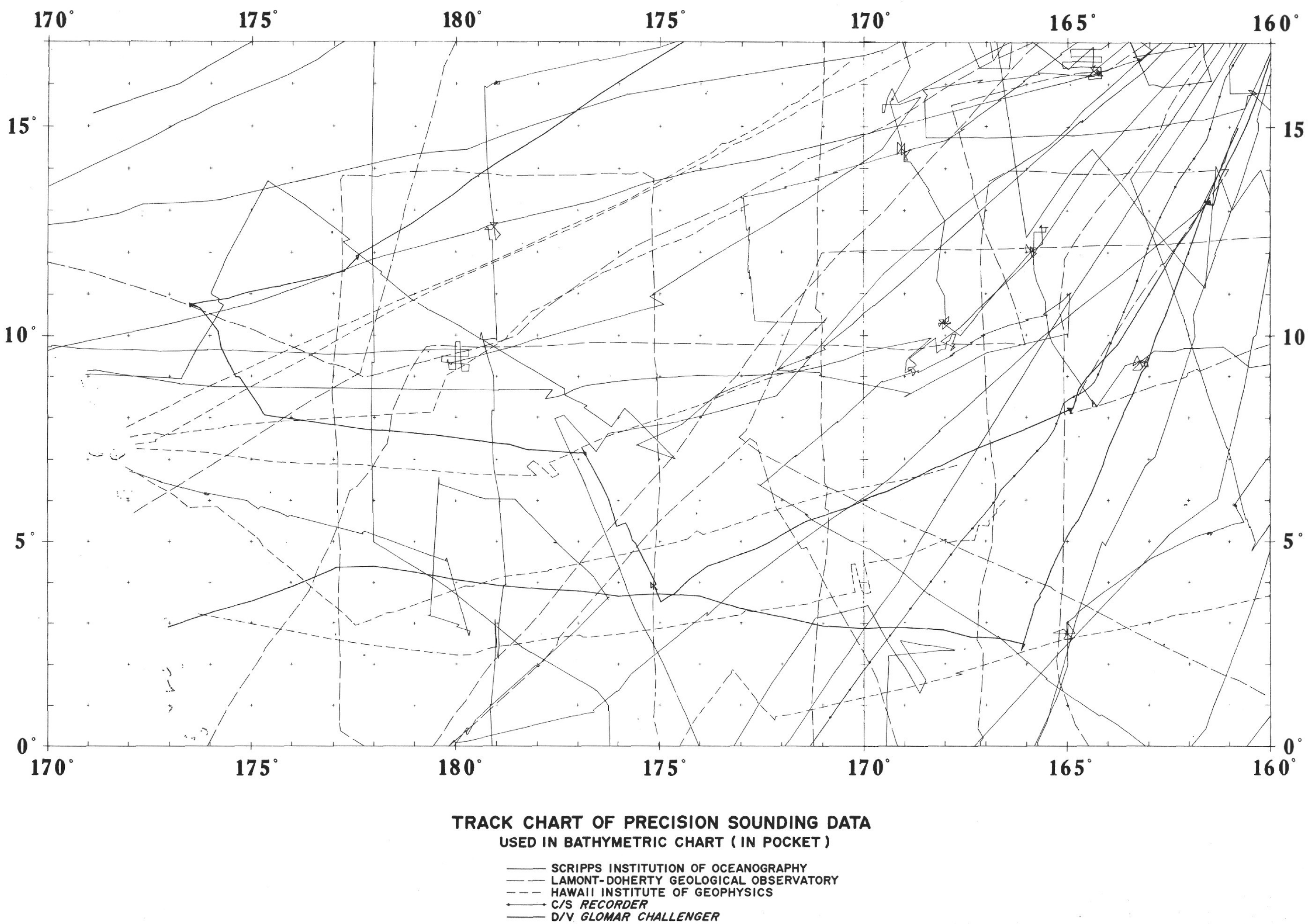



Figure 2. *Track chart showing locations of ships' tracks with precision sounding data used in constructing the Bathymetric Chart of the Central Basin (in pocket). Data from these lines were supplemented by less reliable soundings from other tracks.*

Operations, including seismic profiler records at site and the track of *Glomar Challenger* on approaching and leaving the site (Ewing)
Biostratigraphic Summary (Douglas, Roth, Moore)
Lithologic Summary (Schlanger, Moberly, Lancelot)
Physical Properties (Jarrard)
Correlation between Stratigraphic Section and Seismic Reflection Profile, including a figure showing correlation of lithology, seismic stratigraphy, drilling rate, and rate of sediment accumulation (Ewing)
Conclusions (Winterer)
Core Inventory (Appendix A)
Physical Properties Table (Appendix B) (Jarrard)
Detailed Graphic Log, showing core recovery, graphic lithology, lithologic description, age, biostratigraphy, and a graphic display of measured physical properties (bulk density, sound velocity, natural gamma)
Smear-Slide Graphic Summary (Lancelot)
Core Forms: detailed presentation of the lithology and biostratigraphy of each core recovered. Symbols used on these forms are explained below, in the section on Conventions and Symbols.
Core Photographs: Photographs of all cores except those not opened or cut or those with only a small amount of recovered material (core-catcher samples); arranged in order, by hole, core, and section

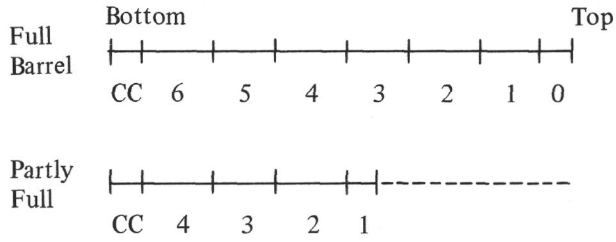
## CONVENTIONS AND SYMBOLS

### Numbering Holes and Cores and Locating Samples

Each drilling site has a number, for example, Site 165. The first hole at each site has the site number, for example, Hole 165. Additional holes at the same site have a letter following the number. For example, Hole 165A is the second hole drilled at Site 165.

The cores recovered from each hole are numbered successively in the order in which they were taken: Core 1, Core 2, etc. The core barrel used on Leg 17 was 9.4 meters in length. Because of the many uncertainties in determining depths in drill holes, the depth from which cores were taken is given only to the nearest meter.

When the core barrel is recovered on deck, the core catcher is removed from the barrel, and any material in the catcher (as much as 25 cm in length) is labeled "core catcher," or CC. The plastic core liner is withdrawn from the steel barrel and cut into 150-cm lengths called sections, beginning at the lower end of the barrel. A 9.4-meter liner can be cut into six such sections, with a short section about 40 cm in length left over at the top end. The numbering scheme for the sections depends on how much material is recovered. In a full barrel, the short top section is called the "zero" section, and the first 150-cm section below that is Section 1, the next, Section 2, etc. When the barrel is only partly filled, the cutting of the plastic liner proceeds as usual, starting from the bottom of the liner. The labeling, however, begins with the uppermost 150-cm section in which there is core material. That section, even if only partly full, is Section 1; the next below is Section 2, etc. The following diagram illustrates the two cases.




Within each section, individual samples or observations are located in centimeters down from the top of the section. This is true even when a section is not full of material, either because of original want of material (a short Section 1, for example), or because of voids produced by compaction or shrinkage.

Samples or observations are identified by a notation, such as 165A-10-3, 140, which denotes a depth of 140 cm from the top of Section 3 of Core 10 of Hole 165A.

In using the core descriptions or core photographs as a guide to ordering samples, the reader is cautioned that the core material, especially if it is unconsolidated or watery, has a tendency to shift up or down within the core liner, and that a feature located at, say, 43 cm on the photograph, may now have shifted to 46 cm on account of compaction caused by handling of the core.

In reporting the depths of samples below the sea floor, or below the derrick floor of the drilling vessel, the convention is adopted that for partly-filled core barrels, all the recovered material comes from the upper portion of the cored interval. The true location is, of course, unknown, and in some cores, where only a small amount of material was recovered, the uncertainty can be as much as 9 meters, and two "adjacent" samples could be nearly 19 meters apart, owing to this uncertainty alone. Additional uncertainties about depths arise from the play in the bumper subs and the heave of the vessel.

### Lithologic Nomenclature and Symbols

Classification of the unconsolidated sediment is shown in Table 1. Generally it follows Olausson (1960). However, pelagic clay, brown clay, or pelagic brown clay are used in lieu of red clay where the color or the origin is obvious. Nannofossil is commonly used rather than Olausson's term nannoplankton, especially for the pre-Pleistocene oozes and chalks.

Most of the consolidated rocks recovered on Leg 17 are carbonates and cherts; their classification is discussed below. For volcanic rocks, the terminology is that of Macdonald (Macdonald and Katsura, 1964; and unpublished notes). For fragmental volcanic rocks the terminology is genetic wherever the origin can be determined (pyroclastic, epiclastic, hyaloclastic). Details of texture and composition generally are given in the core descriptions, thin-section and smear-slide descriptions, and shore-laboratory reports on grain size and X-ray mineralogy. They enable the reader to name the sediment or rock according to the classification he prefers.

The following descriptive terms are used for the degree of lithification of carbonate rocks. Oozes have little strength and are readily deformed under the finger or the

**TABLE 1**
**Classification of Unconsolidated Pelagic Deposits**

1. $CaCO_3$>60%
   a. Recognizable calcareous fossil skeletal remains <30% *Chalk Ooze*
   b. Recognizable calcareous fossil skeletal remains >30%, add name of fossil group or groups: *Nannofossil* (Nannoplankton) *Chalk Ooze; Foraminiferal Chalk Ooze; Foraminiferal-Nannofossil Chalk Ooze;* etc.
2. $CaCO_3$ 30-60%
   a. Recognizable calcareous fossil skeletal remains <30%: *Marl Ooze*
   b. Recognizable calcareous fossil skeletal remains >30%, add their names: *Nannofossil Marl Ooze,* etc.
3. $CaCO_3$ 10-30%
   a. The adjective *Calcareous* is added to the name: *Calcareous Diatom Ooze,* etc.
4. Siliceous skeletal remains >30%
   a. Named for the recognizable fossil skeletal remains: *Radiolarian Ooze, Diatom Ooze, Radiolarian Marl Ooze,* etc.
5. Siliceous skeletal remains 10-30%
   a. The adjective *Siliceous* is added to the name: *Siliceous Pelagic Clay*, etc.
6. $CaCO_3$ < 30% and siliceous skeletal remains < 30%
   a. *Brown Pelagic Clay* (Red Clay)
7. Pyroclastic grains (glass shards, etc.) >10%
   a. The adjective *Ashy* is added to the name: *Ashy Chalk Ooze,* etc.
8. Consolidated rocks, turbidites, volcanic rocks, etc. are classified separately.

broad blade of a spatula. Chalks are partly indurated oozes; they are friable limestones that are readily deformed under the fingernail or the edge of a spatula blade. Chalks more indurated than that are simply termed limestones. During the coring process, bedding in chalk ooze is commonly folded but remains coherent, whereas chalk fractures. Generally the chalk in cores is badly shattered, and most of the fragments have irregular tabular shapes normal to the core axis, so that they would be described as shale (for example, fissile) if the rock were argillaceous. Fragments of chalk as thick as 2 or 3 cm are rare; most chips are but a few millimeters thick. On the other hand, limestone has been recovered in pieces many centimeters thick. Portions of cores with any of these lithologies may alternate with portions of mud or slurry of the same color and grain composition as the adjacent ooze, chalk, or limestone, but ground up and mixed with water and injected into the core barrel during some periodic action that affected the bit on bottom, such as the ship's motion or letting out on the drawworks brake. The mud so formed differs from ooze in being wetter, in showing near-vertical flow-folding and diapir-like structure, and in grading to or containing less-homogenized portions that still contain recognizable pieces of ooze or chalk.

The cherty rocks are subdivided on the basis of their degree of silicification. Porcelanites are waxy and dull in luster, and commonly show abundant pores under a hand lens. Where cored specimens are allowed to dry out, their surfaces dry to a matte or checked appearance. Thin-section and X-ray analysis show that the silica in porcelanite is opal and cristobalite and that a large part of the composition is of montmorillonite or other nonsilica minerals. On the other hand, the name chert is restricted for the dense, glassy rocks. Cherts are markedly purer than porcelanites, and their silica is present as chalcedony or microcrystalline quartz. Both porcelanite and chert have conchoidal fracture and both can scratch steel. The more porous and impure porcelanites commonly can be scratched in return by knife-point.

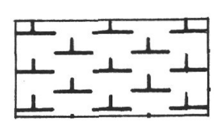
Color symbols are from the Munsell system. Both the soil color charts (Munsell Color Company, 1954) and the rock color charts (Goddard et al., 1948) were used for comparing with the cores. For the reds, yellows, and browns, the soil color charts had more color chips and was used more frequently. However, the terminology in the rock color chart was always used, whether the symbol was obtained by matching to the soil chart or to the rock chart.

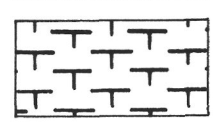
Terminology of sedimentary structures is generally that of the Pettijohn and Potter (1964) atlas and glossary. The term turbidite is used in the sense of many sedimentologists, and is used, for example, in the Leg 1 Initial Core Descriptions (Beall and Fischer, 1969). Graded, partly laminated, sandy beds and laminated silt and clay beds, commonly containing grains of various lithologies (such as foraminifer tests, palagonite grains, large shards, etc.) at the same level, and sharply separated from the underlying sediment, are called turbidites.

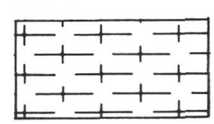
Grain-size terminology is that of Wentworth (1922). The standard sand-silt-clay divisions were employed for granulometric analysis (boundaries at 62 and 4$\mu$). For carbonate-rich deposits a more significant boundary would have been at 20$\mu$ because it separates most microfossils from nannofossils.

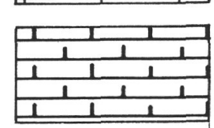
Both optical and X-ray diffraction methods were used for mineralogical determinations. Terminology of minerals identified optically is that of Deer, Howie, and Zussman (1962). The method of mutual standards and the degree of development of recognition criteria in the programs to interpret the digital X-ray diffraction patterns are discussed by Rex, (1970).

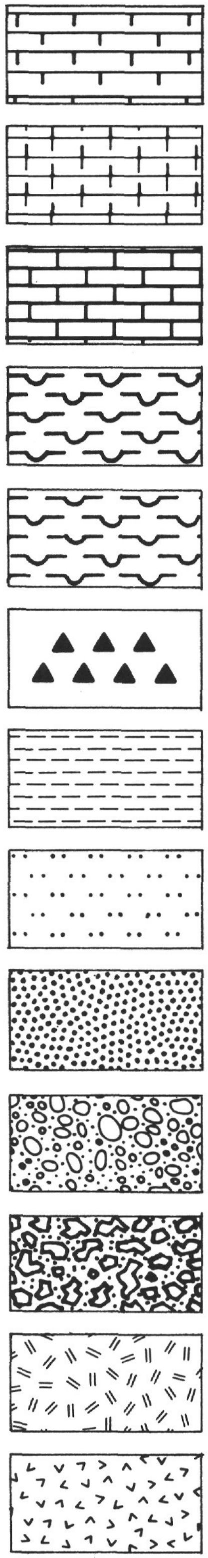
Lithologic symbols used on the various graphs in the Site chapters are as follows:

Nannofossil ooze 

Foraminiferal ooze 

Nanno-foram or Calcareous ooze 

Nannofossil chalk 




z — Zeolitic
n — Nannofossils
d — Diatoms
r — Radiolaria
f — Foraminifera
Mn — Manganese nodules
G — Glauconite
A — Ashy

**Symbols Used on Core Forms**

The basic lithologic and biostratigraphic data are shown on core forms in each Site Report. The symbols and abbreviations used in these forms are as follows:

| | | |
|---|---|---|
| Fossils: | f | Foraminifera |
| | n | Nannofossils |
| | r | Radiolaria |
| Abundance: | A | Abundant |
| | C | Common |
| | R | Rare |
| | B | Barren |
| Preservation: | G | Good |
| | M | Moderate |
| | P | Poor |
| Deformation: | | Slightly deformed |
| | | Moderately deformed |
| | | Highly deformed |
| | ? | Possibly deformed |

Slightly deformed cores exhibit a slight bending of bedding contacts; extreme bending defines moderate deformation. In highly deformed cores, injected bedding planes may approach the vertical. In extreme cases, bedding may be completely disrupted to produce a "drilling breccia." Watery intervals generally have lost any bedding characteristics originally available. Where intervals of alternating hard and soft layers are encountered, the corer will normally recover pieces of undeformed harder material separated by injected softer material, producing what is here termed "biscuit and paste" deformation. A thorough discussion of the causes of disturbances of core materials and the effects of coring and processing procedures on biostratigraphy, physical properties, and petrology is to be found in Gealy et al. (1971, p. 11-16).

## STRATIGRAPHIC SCALE

The stratigraphic scale used in this report is shown in Figure 3, with the ages in millions of years adopted for the boundaries between subdivisions.

## CORE PROCESSING

The contents of 9.4 meter core barrels—commonly in a plastic liner—were received from the drilling crew. The materials were cut into 150-cm sections and capped for processing. Most unopened 150-cm sections which appeared to be full and representative were (1) weighed, the tare weight subtracted, and the saturated bulk density calculated; (2) scanned for natural gamma radiation; (3) scanned by a gamma-ray attenuation device (GRAPE), and the saturated bulk density and porosity calculated.

Upon conclusion of the above measurements, the sections were split in half longitudinally. In the case of plastic sediments, the plastic liner was cut on opposite sides with a circular saw and the sediments were cut with a wire. In the case of semi-indurated materials, the liner was cut as above, the semi-indurated sediments were cut with a

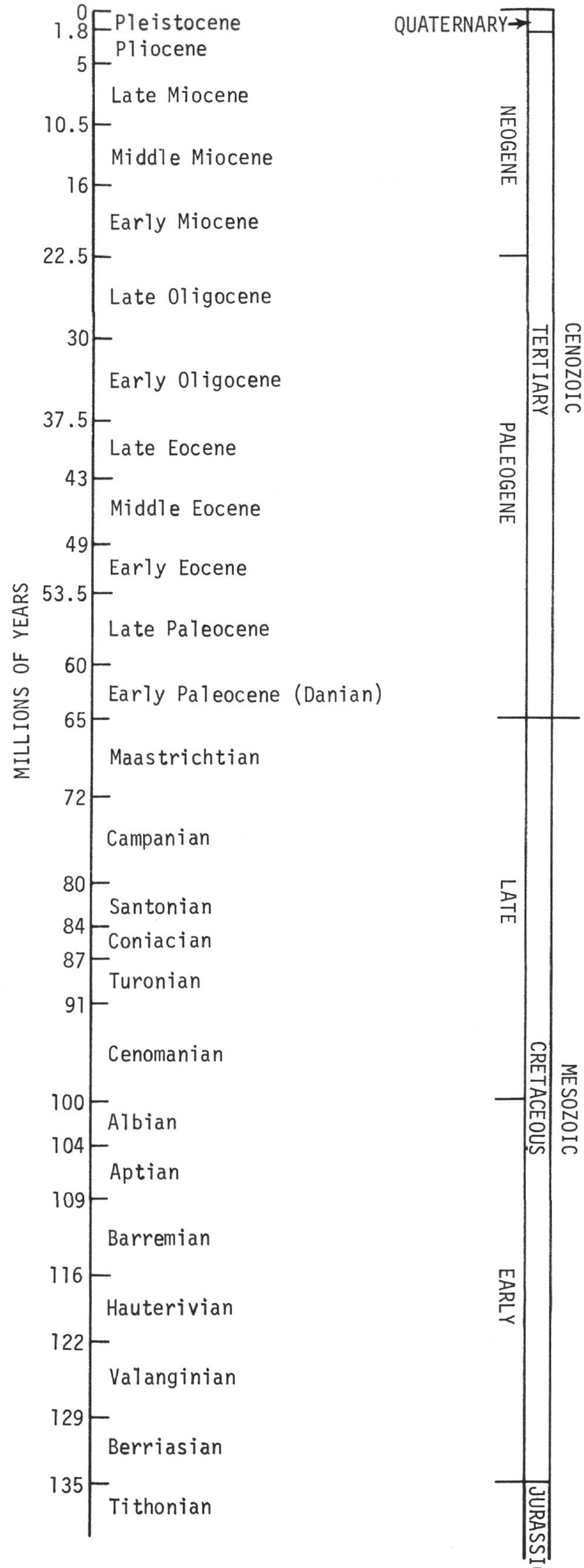



Figure 3. *Time-stratigraphic units and ages of boundaries between units, as used on Leg 17.*

hacksaw blade. In the case of indurated sediments, the sections were split by cutting through the rock with a band or diamond saw. One half of the core was then designated a working half, the other an archive half; and, the two halves were stored in plastic D tubes. The archive half was described, photographed in both black and white and color, and stored at about 4°C. Sound velocity measurements were made on the archive half. The working half was sampled and stored also.

## MEASUREMENTS OF PHYSICAL PROPERTIES

### Wet Bulk Density and Porosity

Shipboard measurements of wet bulk density are made by three methods: (1) by weighing a core section of known volume, (2) by measuring the attenuation of a beam of gamma rays passing through the sediment, and (3) by measuring the weight and volume of a syringe sediment sample. Details of the equipment, methods, and theory are given in the Leg 2 and Leg 9 preliminary reports. Briefly, GRAPE provides continuous analog records of wet bulk density by moving the length of a core section through a thin beam of gamma rays and measuring the proportion of these rays which pass undeflected through the sediment. The equipment is calibrated by running four standard samples prior to running each core: water (1.0 g/cc), sediment (1.25 g/cc), Karo syrup (1.36 g/cc), and aluminum (2.6 g/cc). On Leg 17 only the water standard and, to a lesser extent, the aluminum standard were consistently utilized for calibration of records. The syringe technique, also referred to as "water content," consists of taking a 0.5-cc sample of sediment with a syringe and then weighing the sample before and after drying it. Leg 17 lacked capability for in situ measurement of physical properties.

Wet bulk densities were determined from the GRAPE analog records by visual examination of the range (i.e., highest and lowest representative values) of density within the middle 130 cm of each section. This "range" is not a range in the statistical sense; local very low density values caused by obvious injections of water were ignored in choosing the range. It is probable that the chosen wet bulk density ranges are lower than the in situ densities for many cores which were relatively uniformly injected with water. An attempt to take this uncertainty into account was made by determining, in addition to the overall core range, a range for any undisturbed or only slightly disturbed portion of the core. The criterion of disturbance was visual examination of the split cores. Some uncertainties and inaccuracies are introduced, however, by occasional movement of firm portions of core through soupier portions during core splitting, resulting in a lack of correlation between GRAPE records and visual core descriptions.

The GRAPE is the most consistently reliable indicator of wet bulk density. Continuous analog GRAPE density records can be made on all cores for which density measurement is meaningful, whereas the section weight method can only be used on sections devoid of air or water pockets, and the syringe technique can only be used on relatively plastic sediments. Gealy (1971b) gives a complete discussion of the limitations of each method. She has also compared the measurements from each method with more precise determinations of wet bulk density done on land, finding that GRAPE measurements tended to be slightly higher, in general, than shore methods, syringe technique, or section weights. On Leg 17 we have expressed each core average of GRAPE wet bulk density as a range of values rather than as a single value; therefore, a simple comparison of the magnitudes of values for the three techniques is not suitable. Nevertheless, it appears that the GRAPE wet bulk densities are consistently slightly lower than the syringe or section weight wet bulk densities, in contrast to the Leg 7 results. Of the 66 syringe measurements which were completely outside the range of GRAPE values for the same core, 56% were higher than the GRAPE values. Of the 57 section weight measurements which were completely outside the range of GRAPE values for the same core, 75% were higher than the GRAPE values, although the lower section weight measurements tended to differ from the GRAPE values by a much larger amount than did the higher measurements.

Porosity measurements are made by the syringe technique and by GRAPE. The GRAPE provides continuous analog recordings of apparent porosity based on the assumption of a constant grain density. Because the grain density varies greatly with lithology, we have chosen instead to calculate porosities from the GRAPE wet bulk densities by arbitrarily assigning a grain density based on the lithology. In so doing, we have relied heavily on the shore-based measurements of grain density of Leg 7 sediments (Gealy, 1971b). Porosities were calculated from the relationship $\phi = (\rho_g - \rho_B)/(\rho_g - \rho_f)$ where $\phi$ is porosity, $\rho_G$ is grain density, $\rho_B$ is wet bulk density (from GRAPE), and $\rho_f$ is fluid density and is assumed to be equal to 1.024 (the average density of seawater). Assigned grain densities may be inaccurate by a few percent for most cores and by as much as 10% for radiolarian oozes; a 10% error in assigned grain density causes about a 5% error in calculated porosity. Elaboration of both methods of porosity calculation and their limitations is given by Gealy (1971b). Gealy and Gerard (1970) have shown that such calculated porosities may be lower than in situ porosities by 10% to 20%.

Since the syringe method gives both wet bulk density and porosity, grain density can also be calculated by using the equation of the previous paragraph. However, the errors in both wet bulk density and porosity will be magnified by the calculation, resulting in such a large error in the calculated grain density that it is practically useless.

Grain densities and porosities calculated from syringe measurements are consistently lower than assigned grain densities and porosities calculated from GRAPE measurements. During syringe sampling we deliberately sampled the firmest portions of cores (presumably least disturbed and most representative of in situ conditions), but because the wet bulk densities calculated tended to be only slightly higher with GRAPE than with syringe measurements, selective sampling cannot be the cause of the discrepancy. Because this discrepancy is present regardless of lithology, it seems unlikely that it is caused by consistently high assigned grain densities. Incomplete drying of the syringe samples between weighings could result in underestimation of the water content and a low calculated grain density.

Consequently, we consider the assigned grain densities and the GRAPE porosities to be more reliable and representative than the syringe grain densities and porosities. On Leg 7, both syringe and GRAPE porosities were found to be similar to porosities calculated under more precise shore laboratory conditions.

GRAPE wet bulk density and porosity ranges for entire sections and for undisturbed or slightly disturbed portions of sections, as well as assigned grain densities, section weight wet bulk densities, and syringe wet bulk densities, porosities, and grain densities, are tabulated for each site in the chapter for that site. Wet bulk densities are plotted on the 1 cm = 10-meter site summary logs as follows: "x" indicates wet bulk density from syringe technique; "o" indicates section weight technique; "–" indicates total density range of section from GRAPE; " " is added to the range line to indicate range of any undisturbed or slightly disturbed sediments. The scale, in grams per cubic centimeter, is indicated near the top of the page next to the symbol $\rho$.

### Natural Gamma Radiation

Routine shipboard measurements of natural gamma radiation were carried out on sediments recovered on Leg 17. The method, described fully by Evans and Lucia (1970), consisted of moving the unsplit core incrementally through a fixed-window gamma radiation detector and recording the output both in digital and analog forms. Output is in terms of total counts per 1.25 min per 3 in. of core length. Core averages were determined by visually averaging values recorded on a strip-chart recorder. Background count was monitored by running the detectors empty and with a short core of seawater prior to running each core. Because of the large long-term (several hours to days) fluctuations in this background count, we have chosen to subtract from the total average count of each core an amount equal to the average value of the previous background run. Both the total gamma count and the net gamma count are listed in the tables of physical properties within each site report. However, discussions of gamma counts within this report will be concerned exclusively with net gamma counts. Core-average net gamma counts are shown as solid dots on the site summary sheets within each site chapter; the scale, in net counts per 1.25 min per 3.0 in. is indicated to the right of the symbol "δ" near the top of each page.

The natural gamma radiation instrument records gamma rays emitted by radionuclides, primary potassium, uranium, and thorium. Rough calculations indicate that a gamma count of 500 could be caused by the presence in the sediment of about 2.7% potassium, 35 ppm uranium, or 45 ppm thorium (see Gealy [1971a] for details on the mathematics and assumptions involved in such an estimate); however calibration of the machine using samples of known gamma activity has not been carried out. High gamma counts are commonly caused by montmorillonite, pyroclastic ash, the potassic zeolites clinoptilolite and phillipsite, and potassium feldspar. As discussed in the Site Reports, different lithologies often have characteristic gamma counts; consequently gamma logging can be valuable for correlation of lithologies. However, this potential is lost with the present gamma program because no downhole (in situ) gamma logging was carried out on Leg 17 (Gealy and Gerard [1970] discuss downhole gamma logging on Leg 4). Because the cores are split and described shortly after lab measurement of gamma counts, the value of shipboard gamma measurement as a method of lithologic correlation is rendered marginal.

### Sound Velocity

Sound velocity measurements on soft and semi-consolidated materials were made on cores that had been split longitudinally. The measurement was made, using the Hamilton Frame, with one transducer directly in contact, through a film of water, with the cut surface of the core material; the other was in contact with the wetted surface of the plastic core liner beneath the core. To make velocity measurements on more rigid materials, such as hard limestone, chert, or basalt, rectangular blocks of the rock were cut on a diamond saw, the faces were smoothed on a lap, and the transducers were placed directly against the wetted surfaces of the rock specimen.

A pulse method was used to measure, with an oscilloscope, the differences in time for sound (400 kHz) to travel through the sediment or rock sample. The length of the sound path was measured for each specimen, and the ambient temperature noted. The velocity was then calculated from the time-distance measurements. The method is described in DSDP Volume XV.

## ACKNOWLEDGMENTS

I have drawn extensively on earlier introductory chapters of Initial Reports of the Deep Sea Drilling Project (especially Volume VII) in preparing this chapter. Richard D. Jarrard wrote the sections on Wet Bulk Density and Porosity and on Natural Gamma Radiation.

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