2. EXPLANATORY NOTES

DSDP Staff

ORGANIZATION AND AUTHORSHIP

Volume 44 comprises two major sections. The first consists of Introduction, Explanatory Notes, and reports on the sites occupied during Legs 44 and 44A (Parts I and II). The second contains more detailed discussions of specific topics from both shipboard participants and other interested investigators. It is subdivided into Special Geologic Studies (Part III), Inorganic Geochemistry (Part IV), Organic Geochemistry (Part V), and Biostratigraphy (Part VI), and Regional Studies (Part VII).

The authorship of the site reports is shared collectively by the shipboard scientific party, although the ultimate responsibility for their content lies with the two Co-Chief Scientists. Each site chapter follows the same general outline, and individual participants assumed the major responsibility for contributing specific sections. The site chapters are largely compiled on the basis of work initiated aboard ship during Leg 44. Additional information from onshore studies has been incorporated to provide a more complete and accurate report. Some discussions are taken from more detailed chapters by shipboard scientists which are presented in the second section of the volume.

General responsibility for authorship for the individual sections of the Leg 44 site reports is as follows: Background and Objectives, William E. Benson; Operations, Robert E. Sheridan; Lithology, Paul Enos (esp. Sites 389-390 and 392), Tom Freeman (esp. Site 391), Leo Pastouret (esp. Site 391), Ivar O. Murdmaa (esp. Site 388); Geochemistry, Daniel H. Stuermer; Physical Properties, Paula Worstell; Biostratigraphy, Felix Gradstein (foraminifers), Ronald R. Smith (nannofossils), and Fred M. Weaver (radiolarians); Sediment Accumulation Rates, Felix M. Gradstein; Correlation of Seismic Reflection Profiles with Drilling Results, Robert E. Sheridan; Summary and Conclusions, W.E. Benson and Robert E. Sheridan; Graphic Core Descriptions, compiled by Paula Worstell on basis of data provided by all shipboard scientists.

SEISMIC SURVEY AND UNDERWAY DATA

The seismic survey data which formed the basis of Leg 44 site selection were provided by Lamont-Doherty Geological Observatory and joint Institut Français du Pétrole and U.S. Geological Survey study aboard R/V *Florence*. Surveys were also made from *Glomar Challenger* during approach to and departure from most of the sites.

Instruments aboard *Glomar Challenger* continuously recorded water depth, intensity of magnetic field, and seismic profiles while the ship was underway. Water depths were recorded underway on a Gifft precision depth recorder and corrected according to Matthews' tables. Depths are given in meters. (The site reports also contain water depth determined by length of drill pipe to bottom less 10 meters, the distance between the sea surface and rig floor.)

The magnetic intensity data were collected with a Varian proton magnetometer and readings were taken at 5-minute intervals from an analog recorder. The sensor was towed 300 meters behind the ship.

The seismic profiling system consisted of two Bolt airguns, a Scripps-designed hydrophone array, Bolt amplifiers, two bandpass filters, and two EDO recorders. Variations in second sweeps, filter and gain settings, and airgun size are recorded on individual profiler records. Seismic profiler records, made while steaming between sites, are reproduced in foldouts in the back cover (Figure 3, Sheridan et al., this volume). Greenwich Mean Time is used on the seismic profiles and other underway data, but in order to be consistent with drilling logs and other ship's operations, the authors used "local time" in the text of the site reports.

BIOSTRATIGRAPHIC FRAMEWORK

Foraminifer Zonation

The Cenozoic planktonic foraminifer zonation follows those of Blow, 1969 (Neocene) and Stainforth et al., 1975 (Peleogene). The Upper Cretaceous planktonic foraminifer zonation of Sites 390 and 392 follows van Hinte, 1976, in conjunction with zonations by Cita and Gartner, 1971, and Bolli, 1966. The Lower Cretaceous foraminifer zonation follows van Hinte's 1976 compilation in combination with data concerning benthic species by several authors including Bartenstein et al. (1957, 1966, 1973); Simon and Bartenstein (ed., 1962); and Bartenstein (1976). Neocomian and Upper Jurassic foraminifers are dated following Bartenstein (1976), Luterbacher (1972), and Gradstein (in press).

Nannofossil Zonation

The Tertiary and Quaternary nannofossil zonation follows Martini, 1971, with some modification when index taxa are lacking. The biostratigraphic study of Gartner (1971) on JOIDES cores from the Blake Plateau also provided a source for comparisons with the Paleocene-Eocene interval. The zonation compiled by Martini (1976) is followed for the Upper Cretaceous (upper Campanian-Maestrichtian) sediments. The zonations of Thierstein (1971; 1973) for the Lower Cretaceous and Barnard and Hay (1974) for the Jurassic are combined to form the zonal framework for the uppermost Jurassic-Lower Cretaceous interval.

Radiolarian Zonation

The radiolarian zonations of Riedel and Sanfilippo (in press) and Nigrini (1971) provided the basis for the radiolarian biostratigraphy.

Radiometric Time Scale

Accurate determinations of the radiometric age of biostratigraphic zones cored by the Deep Sea Drilling Project form the basis for calculating rates of subsidence and sedimentation, spreading rates, rates of evolution of fossil groups, and other quantitative parameters. During the last few years the Cenozoic time scale has reached a mature stage and probable error in radiometric ages has come close to the limit of biostratigraphic resolution. Unfortunately, the pre-Cenozoic radiometric time scale is still imprecise and uncertainties of 5 million years or more may exist in the radiometric age of a biostratigraphic datum.

The Leg 44 shipboard scientists used the "Berggren Scale," with the exception of the 11.5-million year date for the boundary between the middle and late Miocene which follows Ryan et al. (1974). Berggren puts this boundary at 10.5 million years.

The scale for the Jurassic and Cretaceous periods is after van Hinte *in* Berggren et al. (1975). This scale is an updated version of the 1964 London Geological Society Scale for the Jurassic and Cretaceous, and also accommodates the Jurassic stage subdivision proposal by the *Colloque du Jurassique à Luxembourg* (1962).

Figure 1 combines the recent correlations of the radiometric time scales with standard Mesozoic and Cenozoic stages and is the reference scale for the Volume 44 biostratigraphy. (Note: During the preparation of the onshore reports for DSDP Leg 44, two papers on the late Mesozoic time scale appeared [van Hinte, 1976a,b], with minor changes to the time scale. The corrections have little influence on the rates of subsidence and sedimentation of the DSDP Leg 44 sites.)

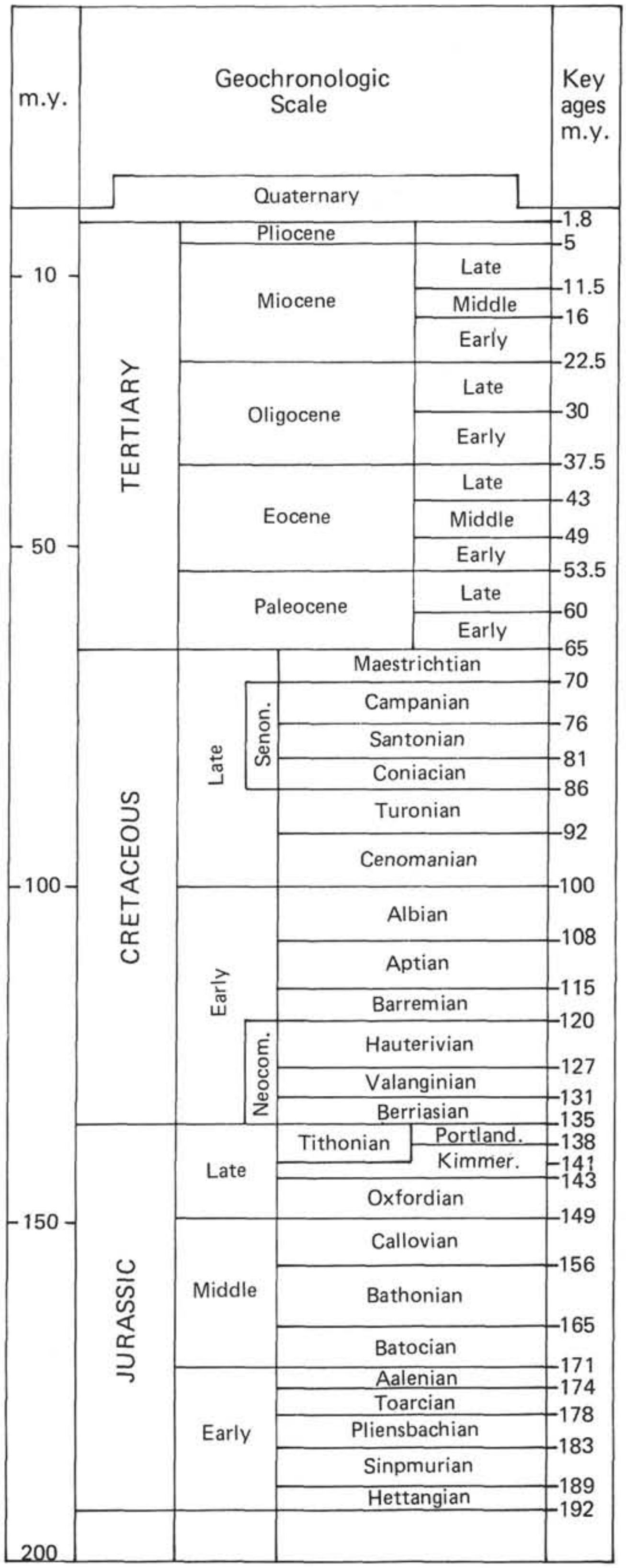

Figure 1. *Radiometric time scale and standard stages for the Jurassic, Cretaceous, and Cenozoic. The radiometric time scale and standard stages are after: J.E. van Hinte* in *Berggren et al., 1975; Berggren, 1972, 1973; Ryan et al., 1975.*

NUMBERING OF SITES, HOLES, CORES, AND SAMPLES

Drill site numbers run consecutively from the first site drilled by *Glomar Challenger* in 1968; the site number is unique. A site refers to the hole or holes drilled while the ship is positioned over one acoustic beacon. Several holes may be drilled at a single locality (site) by pulling the drill string above the sea floor ("mud line") and moving the ship some distance (usually 100 m or more) from the previous hole.

The first (or only) hole drilled at a site takes the site number (e.g., Hole 391). A letter suffix distinguishes each additional hole at the same site (e.g., Hole 391A, Hole 391B, Hole 391C). Note that recovered sediments or rocks from different holes at the same site usually do not come from equivalent positions in the stratigraphic column, thus this distinction is important.

The cored interval is measured in meters below the sea floor from the point at which coring for a particular core began to the point at which it ended. This interval is generally 9.5 meters long (length of core barrel), but may be shorter depending upon drilling conditions and/or time constraints. (The sediment recovered from a 9.5-meter interval may also expand in the laboratory so that recovery of ± meters of sediments from a 9.5-meter interval sometime occurs.

Cored intervals need not be contiguous and may be separated by "drilled intervals." In soft sediments, the drill string can be "washed ahead" without core recovery. This is done by applying sufficiently high pump pressure to wash sediment out of the way of the bit and up the annulus between the drill pipe and wall of the hole or in hard rocks by using a center bit which fills the opening in the bit face. A decision to drill or wash ahead is usually taken to save time during drilling thick, monotonous lithologies, or when a major objective of the hole is to reach and sample specific underlying units.

Cores are numbered sequentially from the top down. Full recovery comprises 9.5 meters; 9.30 meters of sediment or rock in a plastic liner (6.6 cm diameter) and a short sample (≤ 20 cm) in the core catcher. (The core catcher is a multifingered device which prevents cored materials from sliding out the bottom of the core barrel.) Cores are cut into 1.5-meter sections and numbered sequentially from top to bottom. Because the core barrel is 9.30 meters long rather than 9 meters, a segment of up to 30 cm (or more if sediments expand at surface conditions) may be recovered in addition to six 1.5-meter sections. This segment is designated the "0-section"; it comprises whatever is "left over" at the top of the core after six 1.5-meter sections have been cut.[1]

In cases in which only a part of the entire cored interval was recovered and the sediment was contiguous, the recovered material was placed in the top of the cored interval and the sections are numbered sequentially starting with Section 1 at the top. Because the 150-cm intervals are measured from the base of the recovered core, any "void," which results when the recovered sediment is not evenly divided by 1.5 meters, falls at the top of Section 1. *Sample intervals, however, are measured from the top of the section, not the top of the sediment.* If only a part of the core was recovered and evidence suggested that the separated core fragments were not contiguous, then sections are numbered sequentially from top to bottom and the intervening sections are noted as "void." The core-catcher sample is described in the visual core descriptions beneath the lowest section whether or not it was contiguous. Figure 2 shows the core and section labeling conventions.

To determine sub-bottom depth or depth from the top of a core to a specific horizon, add the length of the "0" section to the top of the core, i.e., measure down from the *top of the recovered sediment.* If no "0" section was recovered, measure down from the *top of Section 1,* whether or not the top of the sediment reaches the top of the section. Note that in this case the sub-bottom depth is measured from the top of the section not from the top of the recovered sediment. Appendix III (at the end of this volume) lists sub-bottom depths of the cores drilled during Legs 44 and 44A. Some authors may not have been familiar with this convention or may not have known the exact length of the "0" sections. Hence, their sub-bottom depth designations may differ a few cm from those given in Appendix III.

Samples are designated by the interval (cm) from the top of the core section from which the sample was extracted. A full sample designation would consist of the following information:

Leg-Hole-Core Number-Section Number-Interval (in centimeters from top of section)

Thus, 44-391A-4-3, 122-124 cm designates a sample taken at 122-124 cm from Section 3 of Core 4, from the second hole drilled at Site 391 during Leg 44. The depth below the sea floor for this sample would then be the depth to the top of the cored interval plus 3 meters for Sections 1 and 2, plus 122 cm (depth below the top of Section 3). If an "0" section had been recovered, the length of the "0" section would also have been added. For example, if the top of the cored interval were 100 meters, and no "0" section were present, this would equal 104.2 meters.

In making a request for samples designate a specific interval within a core section (e.g., Section 3, 122-124 cm) rather than level below the sea floor. A sample from the core-catcher sample of this core is designated 391A-4, CC.

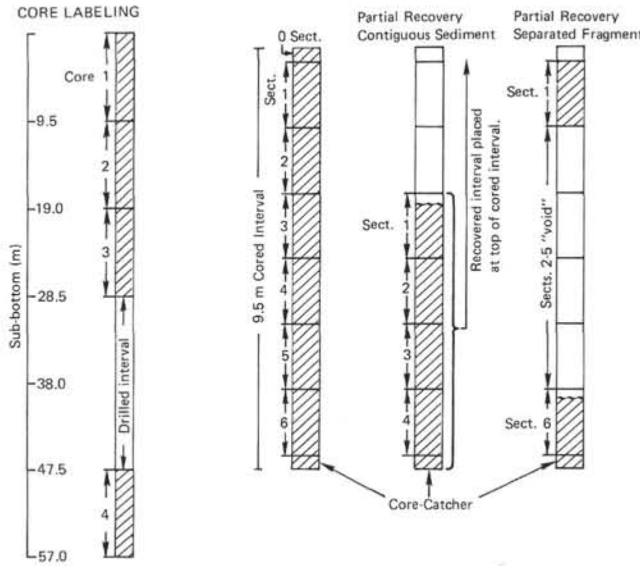

Figure 2. *Conventions for core and section labeling.*

HANDLING OF CORES

On-board ship the shipboard technicians cut the cores into 1.5-cm sections and performed the following determinations. (These measurements were made while the core was "in the round.")

1) Weight of core section — to determine bulk density

2) GRAPE analysis — to determine bulk density and porosity

3) Sonic velocity measurements using a Hamilton Frame. (Some sonic velocity measurements were also made on split core section.)

Following completion of these measurements the cores were split longitudinally into "work" and "archive" halves. Samples, including those for grain size, X-ray mineralogy, water content, carbon-carbonate, geochemical and paleontological determinations were extracted from the "work" half while the Leg 44 sedimentologists described

[1]The section numbering described here applies to DSDP Legs 1-44 cores. Beginning with Leg 45, the sections are numbered slightly differently.

the "archive" half. The "archive" half was photographed in both black and white and color.

After cores were sampled and described, they were maintained in cold storage aboard *Glomar Challenger* until transfer to the DSDP repository. Core segments to be used for organic geochemistry were immediately frozen on-board ship and are presently stored at the DSDP West Coast Repository at Scripps Institution of Oceanography. All other cores from Legs 44 and 44A are stored at the DSDP East Coast Repository at Lamont-Doherty Geological Observatory, Palisades, New York.

GRAPHIC CORE DESCRIPTION

The core descriptions, smear slide descriptions and bomb (% $CaCO_3$) data (all obtained on-board ship), and grain size and carbon-carbonate determinations (obtained following the cruise from shore-based labs) serve as the bases for the graphic core descriptions presented at the end of each site report.

Sediment Classification

The sediment classification scheme used on Leg 44 is, with minor modification, that devised by the JOIDES Panel on Sedimentary Petrology and Physical Properties and adopted for use by the JOIDES Planning Committee in March 1974. The scheme is as follows:

A. Sediment assumes only the names of those components present in quantities greater than 10 per cent.

B. Where more than one component is present, the most abundant component is listed *farthest to the right,* and other components are listed progressively to the left in order of decreasing abundance.

C. Induration is indicated by the sediment name. Although the determination of induration is highly subjective, the following criteria provide a usable guide:

1. *Terrigenous sediments:*
   If the material is soft enough that the core can be split with a wire cutter, only the sediment name is used (e.g., silty clay, sand).
   If the core must be cut on the band saw or diamond saw, the suffix "stone" is added (e.g., silty claystone, sandstone).
2. *Biogenic sediments:*
   Ooze — *soft,* with very little strength and readily deformed with a spatula blade.
   Chalk —*firm,* partly indurated calcareous ooze; or friable limestone readily scratched with a fingernail or edge of spatula blade.
   Limestone — *hard,* cemented or recrystallized calcareous rocks.
   Radiolarite, diatomite, or spiculite — *hard,* cemented biogenic siliceous ooze.

D. The class limits of the sediment classification system are defined by percentages of components, as given below:

1. *Terrigenous sediments:*
   >30% terrigenous components
   <30% calcareous microfossils
   <10% siliceous microfossils
   <10% authigenic components
   Sediments in this category are subdivided into textural groups on the basis of the relative proportions of sand, silt, and clay. The size limits are those defined by Wentworth (1922). Textural classification follows the triangular diagram of Shepard (1954) (Figure 3).
   If $CaCO_3$ is 10 to 30 per cent, "calcareous," "nannofossil," "foraminifer," "foraminifer-nannofossil ooze," is used as a qualifier.
   Other qualifiers (e.g., feldspathic, glauconitic, etc.) show that components are present in quantities greater than 10 per cent.
2. *Volcanogenic sediments:*
   Pyroclastic rocks are described according to the textural and compositional scheme of Wentworth and Williams (1932). The textural groups are:
   >32 mm — volcanic breccia
   <32 mm — volcanic lapilli
   <4 mm — volcanic ash (tuff, if indurated)
   Compositionally, these pyroclastic rocks are described as vitric (glass), crystalline, or lithic.
3. *Pelagic clay:*
   >10% authigenic components
   <30% siliceous microfossils
   <30% calcareous microfossils
   <30% terrigenous components
4. *Biogenic calcareous sediments:*
   >30% calcareous microfossils
   <30% terrigenous components
   <30% siliceous microfossils
   The principal components of biogenic calcareous sediments are nannofossils and foraminifers. Qualifiers are as follows:

Foraminifer %	Name
<10	*nannofossil ooze* (chalk, limestone)
10-25	*foraminifer-nannofossil ooze* (chalk, limestone)
25-50	*nannofossil-foraminifer ooze* (chalk, limestone
>50	*foraminifer ooze* (chalk, limestone)

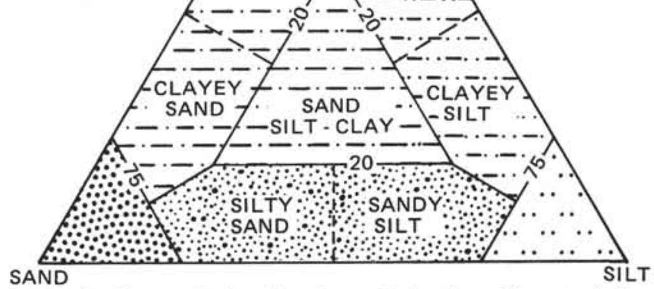

Figure 3. *Textural classification of clastic sediments (after Shepard, 1954).*

The sediment is *calcareous ooze* if it contains more than 50 per cent $CaCO_3$ of unknown origin. Calcareous sediments containing 10 to 30 per cent siliceous fossils are qualified by "radiolarian," "diatomaceous," or "siliceous," depending upon the type of siliceous component.
(See also Item 8, "Special rock types," for more detailed limestone classification.)

5. *Biogenic siliceous sediments:*
   >30% siliceous microfossils
   <30% calcareous microfossils
   <30% terrigenous components
   Radiolarians > diatoms/sponge spicules — *radiolarian ooze (radiolarite).*
   Diatoms > radiolarians/sponge spicules — *diatom ooze* (*diatomite*).
   When mixed, or siliceous microfossil source unidentified — *siliceous ooze.*
   Amorphous lithified silica — *porcellanite, chert.*
   Siliceous sediments containing 10 to 30 per cent $CaCO_3$ are qualified by "nannofossil," "foraminifer," "calcareous," "nannofossil-foraminifer," or "foraminifer-nannofossil," depending on kind and quantity of $CaCO_3$ component.
6. *Transitional terrigenous/biogenic calcareous sediments:*
   >30% $CaCO_3$
   >30% terrigenous components
   <30% siliceous microfossils
   "Marly" qualifies transitional sediments in the biogenic calcareous series (e.g., "marly nannofossil ooze").
   If 10 to 30 per cent siliceous microfossils, appropriate qualifier is used (e.g., "diatomaceous marly chalk").
7. *Transitional terrigenous/biogenic siliceous sediments:*
   >10% siliceous microfossils
   <30% terrigenous components
   <30% $CaCO_3$
   10 to 30 per cent siliceous microfossils — *(name of siliceous fossil) mud* or *mudstone* (e.g., 10 to 30 per cent radiolarians = *radiolarian mudstone).*
   30 to 70 per cent siliceous microfossils — *muddy (name of siliceous fossil) ooze* or *(name of siliceous fossil)* ite (e.g., 50% diatoms = *muddy diatom ooze).*
   If 10 to 30 per cent $CaCO_3$, appropriate qualifier is used (e.g., *calcareous muddy radiolarite).*
8. *Special rock types:*
   The Leg 44 sedimentologists applied Dunham's (1962) classification of limestones, on the bases of depositional texture, to the shallow-water limestones recovered at Sites 389-390, and 392. Frequently used terms are defined as follows:
   a. Original components *not* bound together during deposition and containing clay and/or fine silt-size particles:
      Mud-supported:
      <10% grains = *"Mudstone"*[2]
      >10% grains = *Wackestone*
      Grain-supported = *Packstone*
      Contains mud = *Packstone*
      Lacks mud = *Grainstone*
   b. Original components bound together during deposition and retained in the position of growth (as shown by intergrown skeletal material, laminations contrary to gravity) = *Boundstone.*

Figure 4 contains a key to the lithologic symbols used to denote the standard sediment and rock types on the graphic core descriptions.

Color

Color determinations were made on the basis of the standard Munsell or GSA color charts. The Leg 44 sedimentologists recorded sediment on the graphic core descriptions shortly after the core sections were split.

Smear Slides (*, *′)

Smear slide inspection was the basis of most mineral identifications on-board ship. The sedimentologists determined mineral abundances by per cent of smear slide area covered by each constituent. Past experience has shown that abundances so determined may be accurate to within 1 per cent or so for very distinctive minor constituents; but accuracy of ± 10 to 20 per cent is considered very good for major constituents. Consequently, the smear slide data are presented on the graphic core descriptions as relative abundances, according to the following scheme:

D = Dominant — 76%-100% of total sediment
A = Abundant — 26%-75% of total sediment
C = Common — 6%-25% of total sediment
R = Rare — 1%-5% of total sediment
T = Trace — <1% of total sediment

The sample interval is designated by two numbers: section number followed by cm below top of section.

Example: 2-148 = Section 2, 148 cm below top of section. A prime placed next to the smear slide symbol in the "lithology sample" column (*′) or following sample interval (148′) indicates that the smear slide was taken from a *minor* lithology. (See also Figure 6.)

Carbon-Carbonate (€)

Following the cruise, sediment samples were analyzed at the DSDP sediment lab on a Leco 70-Second Analyzer. Procedures are outlined in Boyce and Bode (1972). Accuracy and precision of the results are as follows:

Total carbon = ±0.3% (absolute)
Organic carbon = ±0.06% (absolute)
$CaCO_3$ = 3% (absolute)

[2]Mudstone, as defined by Dunham's classification, appears in quotes in the Leg 44 Initial Reports, to distinguish it from mudstone of the standard classification scheme (Item 7).

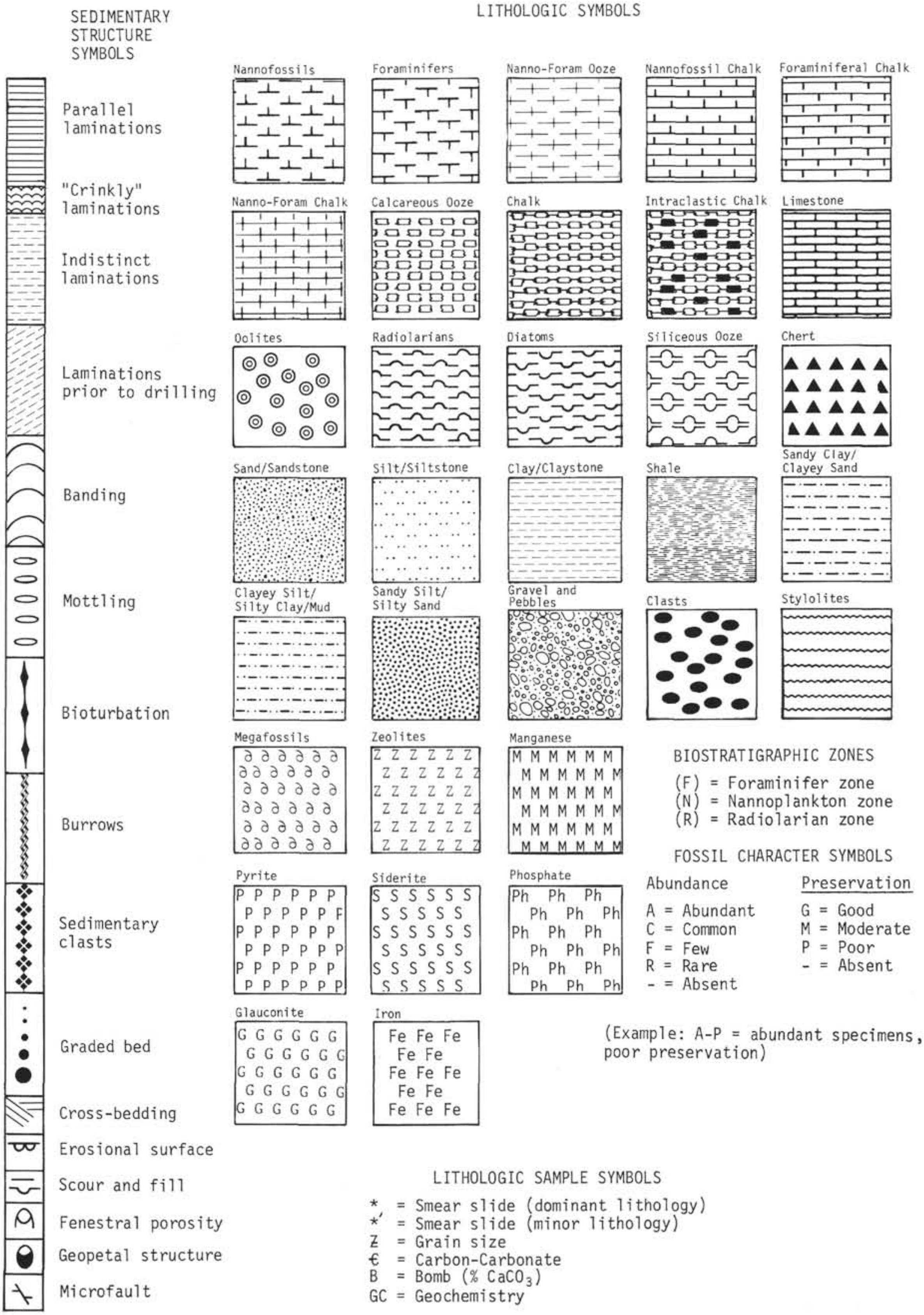

Figure 4. *Key to lithologic and biostratigraphic symbols use on the graphic core descriptions.*

The carbon-carbonate data are presented in Appendix I, and selected data are shown on the graphic core descriptions. The sample interval (1 cm) is designated by two numbers: section number followed by *top* of sampled interval within a section.

Example: 1-15 = Section 1, 15-16 cm below top of section. (See also Figure 6.)

Bomb (B)

Per cent $CaCO_3$ was also determined on-board ship by the "carbonate bomb" technique of Müller and Gastner (1971). In this simple procedure, a sample is powdered and treated with HCl in a closed cylinder. Any resulting CO_2 pressure is proportional to the $CaCO_3$ content of the sample. Application of the calibration factor to the manometer reading ($\times$ 100) yields per cent $CaCO_3$. An accuracy of ± 2 to 5 per cent can be obtained. Generally the "bomb" values calculated on-board ship were higher than those obtained on shore from the Leco 70-Second Analyzer.

The sample interval is designated by two numbers: section number followed by *top* of sampled 1-cm interval within a section.

Example: $CaCO_3$ at 5-11 = 10% means that the $CaCO_3$ content in Section 5 at 11-12 cm below the top of the section equals 10 per cent. (See also Figure 6.)

Grain Size (Z)

Distribution of sand, silt, and clay size particles was determined at the DSDP sediment lab by standard sieve and pipette methods (Appendix III, of Volume IV, *Initial Reports of the Deep Sea Drilling Project*, p. 745), with modified settling times as in Boyce (1972). The sediment name was determined from sediment classification and the sand, silt, and clay boundaries are those defined by Wentworth (1922). The particle size of the sand, silt, and clay fractions ranges from 2000 to 62.5 μm, 62.5 to 3.91 μm, and less than 3.91 μm, respectively.

Biostratigraphy

Relative abundance and preservation of foraminifers, nannofossils, and radiolarians are noted on the graphic core descriptions under "Fossil Character." Figure 4 contains a key to the symbols used. The bases for zonal and age determinations are discussed above (Biostratigraphic Framework).

Core Disturbance and Down Hole Contamination

Unconsolidated sediments are often disturbed by the rotary drilling and coring technique. Bedding contacts in cores may be slightly bent (slightly disturbed) or so extensively bent that the bedding planes are nearly vertical (highly disturbed). And in extreme cases, bedding may be completely disrupted to produce a "drilling slurry."

Consolidated sediments and rocks seldom show much internal deformation, but are usually cracked and sometimes extensively fragmented. Adjacent pieces in the core liner may not be contiguous, and intervening sediment may have been lost. In extreme cases (drilling breccia), pieces have completely lost their original orientation and stratigraphic position. Symbols used on the core descriptions to depict various types of drilling disturbance are shown on Figure 5.

Downhole contamination results when sediment, rock fragments, manganese nodules, chert, and pebbles, are washed or dragged downhole. Fragments may become incorporated into sediments at levels far below their proper stratigraphic position. Displaced sediment and rock fragments are frequently difficult to recognize; but *known* downhole contaminants are, however, recorded on the core descriptions.

REFERENCES

Barnard, T. and Hay, W.W., 1974. On Jurassic coccoliths: a tentative zonation of southern England and north France, *Eclogae Geol. Helvetiae*, v. 63, p. 563-585.

Bartenstein, H., 1976. Practical applicability of a zonation with benthonic foraminifera in the worldwide Lower Cretaceous, *Geol. Mynbouw*, v. 55, p. 83-86.

Bartenstein, H. and Bolli, H.M., 1973. Die Foraminiferen der Unterkreide von Trinidad, W.I. — Maridale Formation (Co-Typlokalität), *Eclogae. Geol. Helvetiae*, v. 66, p. 389-418.

Bartenstein, H., Bettenstaedt, F., and Bolli, H.M., 1957. Die foraminiferen der Unterkreide von Trinidad, W.I. — Maridale Formation (Co-Typlokalität), *Eclogae. Geol. Helvetiae*, v. 66, p. 389-418.

———, 1966. Die Foraminiferen der Unterkreide von Trinidad, W.I. — Maridale Formation (Typlokalitat), *Eclogae. Geol. Helvetiae*, v. 9, p. 129-175.

Berggren, W.A., 1972. A Cenozoic time-scale — some implications for regional geology and paleobiogeography, *Lethaia*, v. 5, p. 195-215.

———, 1973. The Pliocene time scale: calibration of planktonic foraminiferal and calcareous nannoplankton zones, *Nature*, v. 243, p. 391-397.

Berggren, W.A., McKenzie, D.P., Sclater, J.G., and van Hinte, J.E., 1975. World-wide correlation of Mesozoic magnetic anomalies and its implications: discussions and reply, *Geol. Soc. Am. Bull.*, v. 86, p. 267-272.

Blow, W.H., 1967. Late middle Eocene to Recent planktonic foraminiferal biostratigraphy. *Proc. First Plankt. Conf.*, Geneva, v. 1., p. 199-422.

———, 1969. Late middle Eocene to recent planktonic biostratigraphy, *First Plankt. Conf. Proc.*, Geneva 1967. Leiden (Brill), p. 199-422.

Bolli, H.M., 1976. Zonation of Cretaceous to Pliocene marine sediments based on planktonic foraminifers, *Assoc. Venezolano Geol., Min. Petrol. Bol. Inform*, v. 9, p. 1-26.

Boyce, R.E., 1972. Grain size analysis, Leg 9 Deep Sea Drilling Project. *In* Hays, J.D., et al., *Initial Reports of the Deep Sea Drilling Project*, v. 9: Washington (U.S. Government Printing Office), p. 797-816.

Boyce, R.E. and Bode, G.W., 1972. Carbon and carbonate analyses, Leg 9 Deep Sea Drilling Project. *In* Hays, J.D., et al., *Initial Reports of the Deep Sea Drilling Project*, v. 9: Washington (U.S. Government Printing Office), p. 797-816.

Cita, M.B. and Gartner, S., Jr., 1971. Deep sea Upper Cretaceous from the western North Atlantic, *Proc. Second Plankt. Conf.*, Rome, 1970, v. 1, p. 287-320.

Dunham, R.R., 1962. Classification of carbonate rocks according to depositional texture. *In* Ham, W.E. (Ed.), Classification of carbonate rocks, *Am. Assoc. Petroleum Geologists, Me. 1*, p. 108-121.

Gartner, S., Jr., 1971. Calcareous nannofossils from the JOIDES Blake Plateau cores and revision of Paleogene zonation, *Tulane Studies Geol. Paleont.*, v. 8, p. 101-121.

Gradstein, F.M., in press. Biostratigraphy and biogeography of Jurassic Grand Banks foraminifera, *Proc. First Benthonic Conf. "Benthonics 75,"* Halifax, Nova Scotia, 1975.

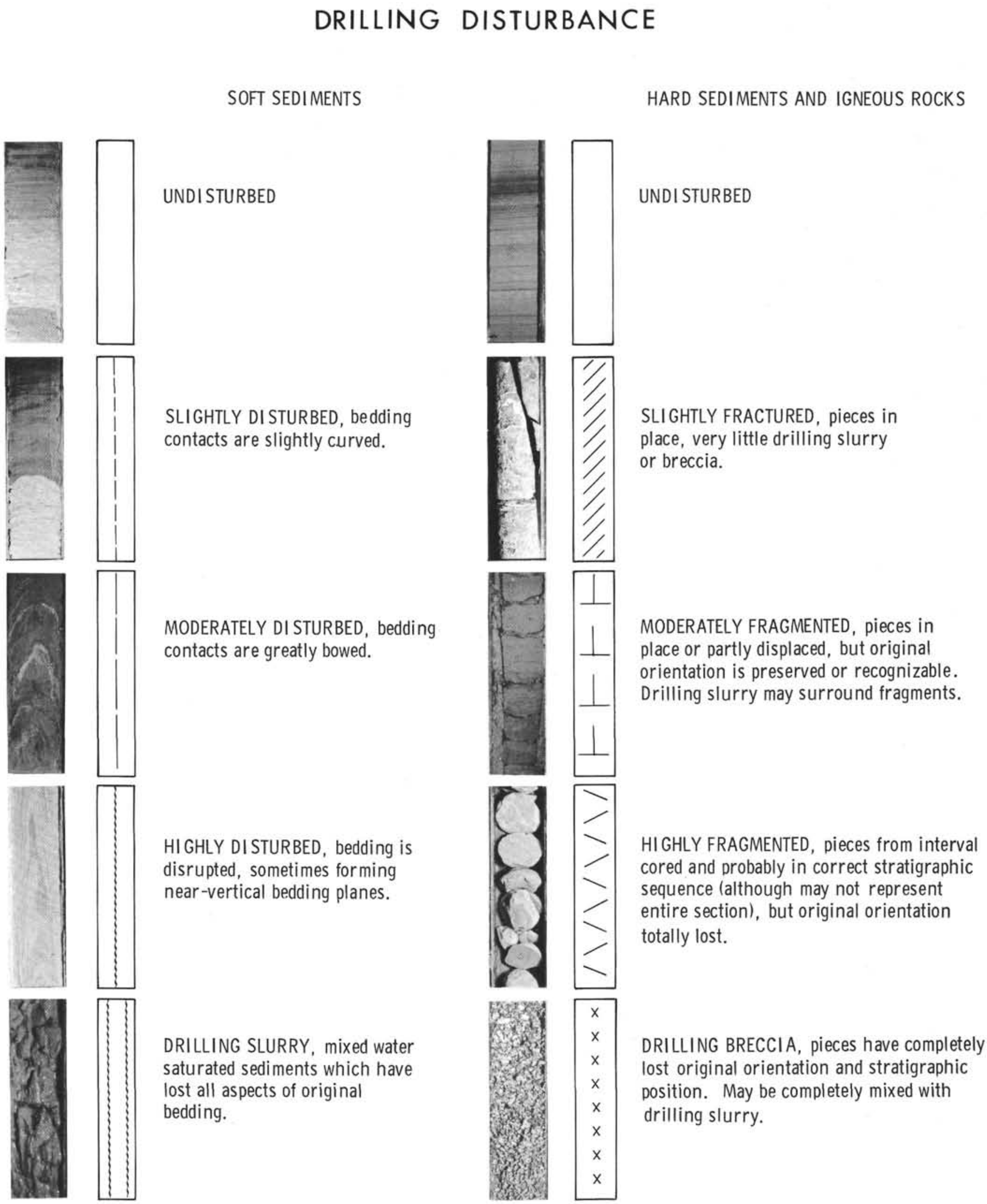

Figure 5. *Key to drilling disturbance symbols used on the graphic core descriptions.*

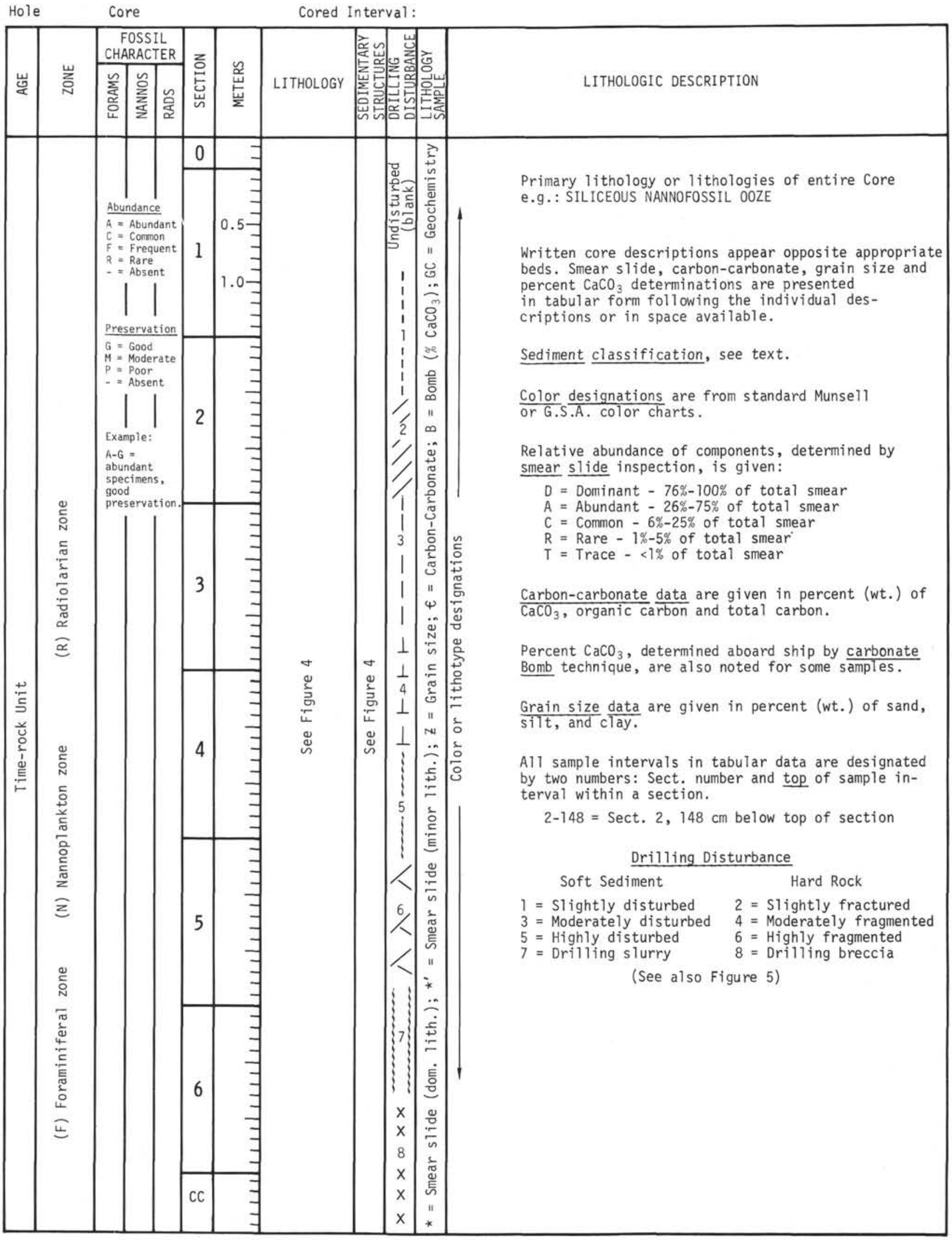

Figure 6. *Key to graphic core descriptions.*

Krumbein, W.C. and Pettijohn, F.J., 1938. *Manual of sedimentary petrography:* New York (Appleton-Century).

Luterbacher, H.P., 1972. Foraminifera from the Lower Cretaceous and Upper Jurassic of the northwestern Atlantic. *In* Hollister, C.D., Ewing, J.I., et al., *Initial Reports of the Deep Sea Drilling Project,* v. 11: Washington (U.S. Government Printing Office), p. 561-593.

Martini, E., 1971. Standard Tertiary and Quaternary calcareous nannoplankton zonation, *Proc. Second Plankt. Conf.,* Rome, 1970, v. 2, p. 739-785.

________, 1976. Cretaceous to Recent calcareous nannoplankton from the central Pacific Ocean (DSDP Leg 33). *In* Schlanger, S.O., Jackson, E.D., et al., *Initial Reports of the Deep Sea Drilling Project,* v. 33: Washington (U.S. Government Printing Office), p. 383-424.

Müller, G. and Gastner, M., 1971. The "Karbonat-Bombe," a simple device for the determination of the carbonate content in sediments, soils, and other materials, *N. Jb. Miner, Mh.,* v. 10, p. 466-469.

Nigrini, C.A., 1971. Radiolarian assemblages in the north Pacific and their application to a study of Quaternary sediments in Core V-20-130. *In* Hays, J.D. (Ed.); Geological Investigations of the north Pacific, *Geol. Soc. Am. Mem. 126,* p. 139-183.

Riedel, W.R. and Sanfilippo, A., in press. Stratigraphy and evolution of tropical Cenozoic radiolarians, *Plankton and Sediments Symposium,* Fourth Planktonic Conference, Kiel.

Ryan, W.B.F., Cita, M.B., Dreyfus Rawson, M., Burckle, L.H., and Saito, J., 1974. A paleomagnetic assignment of Neogene stage boundaries and the development of isochronous datum planes between the Mediterranean, the Pacific and Indian Oceans in order to investigate the response of the world ocean to the Mediterranean "salinity crisis," *Riv. Ital. Paleontol.,* v. 80, p. 631-688.

Schlanger, S.O., Jackson, E.D., et al., 1976. *Initial Reports of the Deep Sea Drilling Project,* v. 33: Washington (U.S. Government Printing Office), p. 383-423.

Shepard, F.P., 1954. Nomenclature based on sand-silt-clay ratios, *J. Sediment. Petrol.,* v. 24, p. 151-158.

Simon, W. and Bartenstein, H. (Eds.), 1962. Leitfossilien der Micropalaeontologie, *Sebr. Borntraeger,* Berlin.

Stainforth, R.M., Lamb, J.L., Luterbacher, H., Beard, J.H., and Teffords, R.M., 1975. Cenozoic planktonic foraminiferal zonation and characteristics of index forms, *The University of Kansas Paleont. Contrib.* 62.

Thierstein, H.R., 1971. Tentative Lower Cretaceous calcareous zonation, *Eclogae. Geol. Helvetiae,* v. 64, p. 459-488.

________, 1973. Lower Cretaceous calcareous nannoplankton biostratigraphy, *Abh. Geol. Bundesanstalt,* Band 29, p. 1-52

van Hinte, J.E., 1972. The Cretaceous time scale and planktonic foraminiferal zones, *Proc. Nederl. Akad. Wetensch,* ser. B, v. 75, p. 1-8.

________, 1976a. A Jurassic time scale. *Am. Assoc. Petroleum Geologists Bull.,* v. 60, p. 489-497.

________, 1976b. A Cretaceous time scale, *Am. Assoc. Petroleum Geologists Bull.,* v. 60, p. 498-516.

Wentworth, C.K., 1922. A scale of grade and class terms of clastic sediments, *J. Geol.,* v. 30, p. 377.

Wentworth, C.K. and Williams, H., 1932. The classification and terminology of the pyroclastic rocks, *Rept. Comm. Sedimentation, Bull. Nat. Res. Covnc.,* no. 80, p. 10-53.