
International Ocean Discovery Program Publications Style Guide

3 April 2024

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IODP style resources

Primary resources

- General editorial (hyphenation, capitalization, punctuation, etc.): *The Chicago Manual of Style* (17th edition [CMS17]) <http://www.chicagomanualofstyle.org/home.html>
- Spelling and usage: *Merriam Webster's Collegiate Dictionary* (11th edition) <http://unabridged.merriam-webster.com/>
- Geographic terms: Merriam Webster's Geographical Dictionary (3rd edition)
- Geologic descriptors and terms:
 - *IODP Dictionary* https://iodp.tamu.edu/publications/resources/IODP_dictionary.pdf
 - *Glossary of Geology* (5th edition [GOG5]) <https://www.americangeosciences.org/pubs/glossary>
- Undersea features (spelling and capitalization): *GEBCO Gazetteer of Undersea Feature Names* http://www.gebco.net/data_and_products/undersea_feature_names/
- Micropaleontological genus/species (spelling):
 - *Janus Paleo Database* https://web.iodp.tamu.edu/janusweb/paleo/paleo_dict.cgi
 - *Nannotax3* <http://www.mikrotax.org/Nannotax3/>
- Stratigraphic terms: International Commission on Stratigraphy (ICS) <https://stratigraphy.org/chart>

Scientific/Technical resources

- *Scientific Style and Format, Council of Science Editors* (7th edition [CSE7]) <http://www.scientificstyleandformat.org/Home.html>
- *Suggestions to Authors of the Reports of the United States Geological Survey* (7th edition [STA7]) <https://pubs.usgs.gov/unnumbered/7000088/>

Additional resources

- US Government Publishing Office Style Guide (2000)
- *The Copyeditor's Handbook: A Guide for Book Publishing and Corporate Communications* (2011; 3rd edition [CH2011])

Required by NSF in all IODP publications

Disclaimer, Acknowledgments, and Keywords

According to the "IODP Sample, Data and Obligations Policy and Implementation":

1. Acknowledgment of NSF support and disclaimer must appear in any publication based upon or developed under the Cooperative Agreement between JRSO and NSF in substantially the following terms: "*The International Ocean Discovery Program is sponsored by the National Science Foundation and other participating countries. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.*" Support of other agencies or international contributors shall be acknowledged additionally, as appropriate.

The acknowledgments and disclaimer is included on the Publisher's Notes pages of *Proceedings* volumes, *Preliminary Reports*, and *Scientific Prospectuses*.

2. Research results (including data reports and synthesis papers) should contain the following:
 - a. **Abstract:** International Ocean Discovery Program (IODP) or previous program name.
 - b. **Keywords:** Program name and acronym, name of drilling platform, expedition number and short title, site identifier. (See Standard keywords on the Wiki for additional keyword information.)
 - c. **Acknowledgments:** "*This research used samples and/or data provided by the International Ocean Discovery Program (IODP). Funding for this research was provided by _____.*" NOTE: This is suggested text. It is okay to leave the author's wording as long as it mentions IODP and funding information (grant number).

Using AI tools such as ChatGPT

As a member of COPE, we follow the COPE Authorship and AI tools position statement (<https://publicationethics.org/cope-position-statements/ai-author>): AI tools cannot be listed as an author of a paper, and authors who use AI tools in writing a manuscript, making figures, or collecting data must clearly disclose how the AI tool was used and which tool was used.

Abbreviations and acronyms

- Abbreviations with internal punctuation do not have internal spaces (CH2011):
 - e.g.
 - i.e.
 - Miller, D.J.
- Use 2-letter postal codes for states in reference lists and addresses; spell out state names in running text (CH2011).
- Spell out US and UK as a noun in running text; abbreviated form (no punctuation) can be used to modify a noun in text.
- In affiliation lists, use USA and spell out United Kingdom.
- In parenthetical text, citations, and reference lists, acceptable abbreviations include (CH2011)
 - cf. (compare)
 - et al. (and others)
 - e.g. (for example)
 - i.e. (that is; namely)
- Limit less familiar abbreviations to terms that occur frequently enough to warrant abbreviation (**CMS17:10.3**).
- Spell out compass points (N, S, E, W and NE, SW, ENE, etc.) in lowercase in text (**CMS17:10.35**) (exception: compound directions in a range can be abbreviated [e.g., NNW–SSE]).
- The words “latitude” and “longitude” are never abbreviated in text (**CMS17:10.36**).
- Always spell out geologic time periods in text
 - Pliocene–Pleistocene vs. Plio–Pleistocene
 - Pliocene/Pleistocene vs. Plio/Pleistocene
- When months are abbreviated (i.e., tables), use the first 3 letters with no period (**CMS17:10.39**):
 - Jan
 - Apr
 - Jul
- Acronyms may be used without definition if listed as primary entries in *Webster’s Collegiate Dictionary* (**CMS17:10.3**).
- Define acronyms upon first usage in abstract and in main text in every chapter.
- Define acronyms used in a figure/table in the figure caption/table notes if the acronym
 - Has not been defined previously in text or
 - Is nonstandard for IODP or may be unfamiliar to technical readers (exception: we typically redefine everything in Operations tables and tool diagrams).
- Set time zones in parenthesis after a time in hours (**CMS17:10.41**):
 - 0015 h (UTC)
 - 1200 h (ship local time; UTC + 5)
 - 1715 h (UTC – 7)
- Set acronyms and initialisms in all caps without internal periods (CH2011):
 - CHIRP
 - GRA
- Do not use periods with abbreviations that have two or more capital letters, including academic degrees (**CMS17:10.4**):
 - MA
 - MD
 - PhD
- To avoid redundancy, do not repeat the last word of an acronym in text (CH2011):
 - APC vs. APC corer
 - LIMS vs. LIMS system
 - PWL vs. PWL logger
- Check common IODP acronyms/abbreviations against the IODP Dictionary.

Acronym/abbreviation resources

- SI unit prefix abbreviations: **CMS17:10.56**
- Chemical element symbols/abbreviations: **CMS17:10.63**
- US and Canadian 2-digit postal codes: **CMS17:10.27**, **CMS17:10.28**

Capitalization

DO capitalize

- **IODP designations** when preceding a number or identifier (but not “interval”):
 - Expedition 345
 - Site U1309
 - Hole U1309A
 - Core 15R
 - Section 5
 - Piece 7A
- Designations that precede a letter or numeral (may be 1–3 words):
 - Alteration Subtype IA
 - Anomaly M1
 - Lithologic Unit IV
 - Logging Unit 2
 - Marine Isotope Stage 5
 - Seismic Line 2
- Water mass and current names:
 - Antarctic Bottom Water
 - Antarctic Convergence
 - Gulf Stream
 - Kuroshio Current
 - Polar Front
 - South Pacific Gyre
- **Undersea feature names**; include the following types of features (if not found in *Gazetteer of Undersea Features*):
 - Abyssal Plain
 - Bank
 - Basin
 - Deep
 - Fan
 - Fracture Zone
 - Guyot
 - Massif
 - Reef
 - Ridge
 - Rise
 - Plateau
 - Seamount
 - Trench
- **Formally named geographic locations** and/or features (*Webster’s Geographic Dictionary*):
 - Cape
 - Equator
 - Gulf
 - Island
 - Mount
 - North Pole
 - Range
 - Sea
 - Seaway
 - Strait
 - Volcano
- Northern Hemisphere and Southern Hemisphere.
- **Geochronologic/chronostratigraphic divisions** if formally defined (**ICS:9; CMS17:8.135**):
 - Cenozoic
 - Pliocene
 - Quaternary
- Geologic periods or events if formally defined:
 - Greenhouse Earth
 - Heinrich Event
 - Ice Age
 - Last Glacial Maximum
 - Marshall Unconformity
 - Younger/Dryas Event
- **Lithostratigraphic unit names** if listed in ICS (**ICS:5; STA7**):
 - Bishop Conglomerate
 - Hatteras Formation
 - Otaku Group
 - Wildwood Member
- **Magnetostratigraphic polarity divisions** if formally defined (**ICS:8-3b**):
 - Brunhes Chron
 - Chron C2n
 - Cretaceous Long Normal
 - Jaramillo Subchron
 - Magnetochron C1
 - Subchron M-2r
- **Rock-stratigraphic and time-stratigraphic unit modifiers** if formally named: lower/middle/upper or early/middle/late (**CMS17:8.135, CMS17:8.136; ICS:3-5a, STA7**). For example, Cretaceous and Jurassic have these formal divisions:
 - Early/Lower Cretaceous
 - Late/Upper Cretaceous
 - Early/Lower Jurassic
 - Middle Jurassic
 - Late/Upper Jurassic
- **Biostratigraphic zones/biozones** if formally defined (**ICS:7**):
 - *Paralia sulcata* Zone
 - *Rouxia californica* Biozone
 - Subzone NP1a
 - Zone NN12
- **Supragenus and genus names** (**CMS17:8.120**):
 - Subphylum (Sarcodina)
 - Class (Actinopoda)
 - Subclass (Radiolaria)
 - Order (Polycystina)
 - Family (Collosphaeridae)
 - Genus (Polysolenia)
- “Earth” when used as a formal name.
- **Common nouns when part of a proper name** or list of names (**CMS17:8.53**):
 - Atlantic, Pacific, and Indian *Oceans*
 - Bengal *Fan*
 - Columbia *River*
 - Pacific *Basin*
- **Each component of a compound word in titles or headings** (if first word) (**CMS17:8.161**):
 - Core-Log-Seismic integration
 - X-Ray laboratory

- **Proper noun preceded by a hyphenated prefix (CMS17:7.89):**
 - mid-Cretaceous
 - pre-Albian
 - sub-Arctic
 - trans-Atlantic
- **First word of each element of a list** (bulleted, numerical, plain, unit), regardless of punctuation.
- **“Figure,” “Table,” “Plate,” and “Equation”** when followed by a number or letter.
 - Figure **F7**
 - Table **T5**
 - Plate **P1**, figure 2
 - Equation **E4**
- **Abbreviated chemical element and compound names:**
 - BaSO₄
 - Fe
 - HNO₃
 - K
 - Mg
 - NaCl
- **IODP titles** even when used without personal names:
 - Co-Chief Scientist
 - Expedition Project Manager
 - Marine Laboratory Specialist
 - Offshore Installation Manager
 - Operations Superintendent
 - Staff Scientist
- **Trademark names**, if they must be used (<http://www.inta.org>); *preference is to substitute a generic term* (CSE7:9.7.7). See **Brand names/trademarks**.

DO NOT capitalize

- **Structural features and informal stratigraphic terminology**, even when preceded by a proper name (*Gazetteer of Undersea Features*; **ICS:3-5b**).
 - arc, back-arc, fore-arc
 - assemblage
 - atoll
 - bed
 - dike
 - drift
 - fault
 - hotspot
 - margin
 - peninsula
 - plate
 - rift
 - shelf
 - subduction zone
- **Informal modifiers early/middle/late or upper/middle/lower** (or extra modifiers) unless formally defined as a division by the ICS; see ICS geologic timescale charts. NOTE: Do not change recent to Holocene.
 - early Oligocene
 - middle Eocene
 - recent
 - mid-Pliocene
 - earliest Middle Jurassic
- **Species and subspecies names (CMS17:8.120).**
 - *Pseudomiocenica oceanica*
 - *Reticulofenestra umbilicus*
- **English derivatives from Latin taxonomic names (CMS17:8.127):**
 - discoasterids
 - discoasters
 - heterohelids
 - ostracods
- **Proper names used as measurement units:**
 - faraday
 - joule
 - newton
 - pascal
 - tesla
 - watt
- **Laws/theories (CMS17:8.148):**
 - Archie’s relation
 - Boyle’s law
- **Names of chemical ions, elements, and compounds when spelled out (CMS17:8.149):**
 - barium
 - carbon
 - carbon dioxide
 - sulfate
- The generic terms **“web,” “website,” or “internet” (CMS17:7.80).**

Sample identifiers

A full sample identifier for an IODP sample includes the following, in order:

Expedition - Site+Hole - Core+CoreType - Section, interval cm.

Some hard rock identifiers may also include Piece number and offset interval on the piece. In text, section half type (A or W) is generally included only if needed to explain why a sample was taken from an archive half (rare to never). Generally, all

destructive tests are run on working halves (W) and nondestructive tests (half-core scanning: SHMSL, SHIL, XRF) are run on archive halves (A).

- Sample 319-C0009A-9R-1A, 5–7 cm
- Sample 319-C0009A-9R-1, 5–7 cm
- Sample 324-U1356A-5R-3 (Piece 2, 2–4 cm)
- Sample 335-U1256A-119R-1 (Piece 1A)
- Section 366-U1491B-5H-CC
- interval 366-U1491B-4H-3, 47–64 cm

Parts of the sample identifier

- **Expedition:** official expedition number; for IODP a 300-series number
- **Site:** numbered in the order drilled for each drilling platform:
 - **U:** *JOIDES Resolution* site numbers are prefaced with “U” (USIO): Site U1362
 - **C:** *Chikyu* site numbers are prefaced with “C” (CDEX): Site C0002
 - **M:** ESO site numbers are prefaced with “M” (mission-specific platform): Site M0025
- **Hole:** each hole spudded, drilled, or cored at a site is given a new letter, starting with “A”
- **Core:** each core or half-core barrel deployment is given a number, starting with “1” at the top of the hole.
- **Core type:** indicates coring tool used to deploy the core barrel, identifies drilled intervals, or identifies material recovered during drilling:
 - **H:** advanced piston corer
 - **F:** half-length advanced piston corer
 - **X:** extended core barrel
 - **R:** rotary core barrel
 - **G:** ghost (material from unknown depth recovered during drilling or advance without coring)
 - Numerical core type (1, 2, 3, etc.): drilled interval; no core retrieved: drilled interval 366-U1491B-11
- **Section:** each core is cut into 1.5 m long sections for easier handling in the laboratory, numbered starting with “1” at the top of each core. A 9.5 m core with good recovery generally has six 150 m long sections plus the core catcher section (notated as CC).
- **Section half:** each section is split lengthwise into two halves:
 - **A:** archive half (used for core description, SHMSL and SHIL measurements, photographs, and archiving)
 - **W:** working half (used when samples are taken from the core, for most laboratory tests)
 - **WR:** whole-round sample (taken from the section before core splitting; generally for IW and microbiology tests).
- **Piece:** for some hard rock cores, broken but consolidated pieces of the core are numbered sequentially from the top of the core. Subpieces that can be fit together may be lettered and curated (Piece 1A, 1B, etc.).
- **Interval** (offset from top of section): a length of material that was collected from the section; the interval top and bottom are given in centimeters measured from the top of the section.

Sample identifier usage

Reporting data

- In text or tables, use the full sample identifier including expedition, hole, core and core type, section, and interval measured from the top of section or offset from top of section (for single point measurement):
 - Sample 313-M0028A-16R-1, 15–20 cm
 - Sample 313-M0028A-16R-1, 100 cm

Imaging

Images are taken on the archive half sample type. The section half type is not needed in text.

- **Linescan section images:** full section identifier: Section 330-U1375A-15X-6
- **Close-up images:** full sample identifier including interval photographed: interval 330-U1375A-15X-6, 25–105 cm
- **Photomicrographs:** full identifier including interval taken to make the thin section: Sample 329-U1368B-4R-2, 0–2 cm

Biostratigraphy

- Micropaleontological testing is generally performed on either
 - Core catcher samples with no specified interval (Sample 324-U1352A-5H-CC) (note that the core catcher is not split into halves but is used in whole-round form), or

- A specific sample interval collected from a section half (Sample 324-U1352A-5H-1, 2–4 cm) (taken from the working half by default).

Text

- Discussions of cores, sections, and samples must include Expedition, Site, and Hole: 325-M0051A-5R
- Sites and holes can be referenced without an accompanying expedition number: Site U1353; Hole C0004A
- Holes are always referred to as the full hole name number (Site+Hole) unless generically talking about Hole A at each site: Hole U1603E and U1603F; Holes U1603A–U1603B
- Add “Site,” “Hole,” “Core,” “Section,” “Sample,” or “interval” before a sample or interval identifier whenever possible in text for clarity. The first time a core, section, interval, or sample is mentioned in a paragraph, include the complete identifier:
 - Section 323-U1348B-5H-1
 - Section 323-U1348B-5H-1, 20 cm
 - Sample 324-U1352A-5H-1, 2–4 cm
 - In thin section (TS) Sample 324-U1352A-5H-1, 60–60 cm (TS12)
 - interval 324-U1352A-5H-1, 14–37 cm
 - interval 324-U1352A-5H-1, 20 cm, through 10H-5, 3 cm
- Subsequent references in the same paragraph that refer to the same Hole in can be shortened to Core, Section, and interval (if clarity is retained):
 - Cores 5H and 10H
 - Section 5H-1
 - Sample 5H-1, 2–4 cm
 - Sample 5H-CC
- If in the paragraph a different Site or Hole is mentioned, then the entire identifier, including expedition number, must be repeated to avoid confusion.
- Sections do not have centimeter ranges; use interval. A single point (e.g., 5 cm) in a section can still be a section.
- Note: Take care to clarify between “to” and “through” in interval descriptions with the scientists:
 - Interval 324-U1352A-1H-1, 0 cm, to 5H-CC describes the interval between the top of the hole and the **top** of the Core 5H core catcher.
 - Interval 324-U1352A-1H-1, 0 cm, through 5H-CC describes the interval between the top of the hole and the **bottom** of the Core 5H core catcher.

Captions

- In figure captions, the word “Sample,” “Section,” “Core,” or “interval” can be omitted to save space. Identifiers can be simplified if it is clear which site/hole the sample is from.

Vessel names

Guidance for vessel names comes from the *US Navy Style Guide*. Vessels refer to ships, boats, submersibles, remotely operated vehicles (ROVs), and jack-up/lift boats. Additional guidance can be found at the *Canadian Naval Marine Archive* (http://navalmarinearchive.com/research/ship_names.html).

- For the vessels commonly found in IODP publications, include “the” and the ship type (R/V, D/V, D/P, research vessel, etc.) the first time the ship is mentioned in a chapter or report. On later mentions, simply use the ship name unless there is a noun following:
 - **First use:** On board the research vessel *JOIDES Resolution*, ...on the R/V *JOIDES Resolution*
 - **Subsequent use:** On board *JOIDES Resolution*
 - **Noun following:** The *JOIDES Resolution* operations schedule
- For US Navy ships (rare), follow these guidelines:
 - For first reference, always include USS, the ship’s name and the hull number: USS Harry S. Truman (CVN 75). There should be no hyphen in the hull number.
 - Do not use “the” in front of a ship’s name: “USS San Jose,” not “the USS San Jose.” USS is part of the name here, not the ship type.
 - On second reference, use only the ship's name or reference as “the ship.”
 - Use “the” before the ship type if it is listed: “the aircraft carrier USS George H.W. Bush (CVN 77).”
 - Use only official names of ships, not nicknames.
 - Ship names are not in all caps: USS Seattle, not USS SEATTLE.

- For ships that include “the” as part of their name (e.g. *L'Orient, La Splendide*), do not add another “the” in front of the ship name.
- Italicize the vessel name but not the classification: R/V *JOIDES Resolution*, D/V *Chikyu*.
- Do not use all uppercase for a vessel name: “*Chikyu*” NOT “*CHIKYU*.”
- Do not use vessel nicknames in text (JR).
- Special JRSO case: in some JRSO documents the US vessel is referred to as the SODV (scientific ocean drilling vessel). This is not a ship name, rather a placeholder noun for the US vessel, and therefore takes the article: “the SODV.”

Chronostratigraphy

Chronostratigraphic units encompass rocks formed within certain time spans of Earth history, regardless of composition or properties. See the most current geologic ICS timescale (<https://stratigraphy.org/chart>). Note that the timescale is updated several times per year.

Time/age

“Early,” “middle,” and “late” refer to geologic time duration (expressed as My or ky) and/or age (expressed as Ma or ka):

- The late Eocene hiatus lasted ~3 My. (Specifies HOW LONG it lasted but no idea of WHEN it happened)
- The rock shows a Late Cretaceous age of 65 Ma. (Specifies WHEN it happened and HOW LONG since it happened)
- There was a 3 My hiatus 27 My ago. (This would be clearer changed to: A 3 My hiatus occurred at 27 Ma.)

NOTE: Pliocene does not have a middle, so use mid-Pliocene.

Stratigraphic position

“Upper,” “middle,” and “lower” describe location in the stratigraphic column and are not applicable when discussing ages, which use “early,” “middle,” and “late.” Biozones are defined by strata and therefore should not use early, middle, or late.

- Correct:
 - Upper Cretaceous sediment overlaid the hiatus.
 - A lower Eocene sequence comprises Lithologic Unit II.
 - Lithologic Unit II sediments are Late Cretaceous age.
- NOT correct:
 - Early Eocene Biozone NN15 is placed between Sample 15R-CC and 16R-CC.
 - The interval is dated to the Upper Cretaceous.

Grammar and usage

Global writer/reader considerations

Keep global writers/readers in mind while editing text. Pay attention to the following areas (CSE7:7.10):

- Long, complicated sentences (best average is 15–20 words): split longer sentences or present a series in a bulleted list
- Preposition selection: avoid using *above* when you mean greater than or shallower than; *on* when you mean during; *under* when you mean less than or better than, etc.
- Use correct prepositions in idioms: correspond *to*; overlap *by*; different *from*; filled *with*; replaced *by*; independent *of*
- Avoid phrasal verbs: with regard *to*; to account *for*; cut down *on*; get out *of*; join *up*; focus *on*; figure *out*; end *up*
- Avoid undefined terms: this/these/those; there is.
- Incorrect use/omission of articles: a/an, the
- Wordy phrases: to the north *of*; in the vicinity *of*

Collective/Mass nouns and Subject/Verb agreement

Collective/mass nouns take a singular or plural verb form depending on context and sentence structure (CMS17:5.7). Re-writing sentences in active voice can remove the unclear verb form.

Use the singular verb to emphasize the group:

- We suspended VSP testing while a pod of whales *was* in the area.
- A large volume of seismic data *has* been collected over the past 50 years.
- A total of 156 m of sediment *was* recovered. (sediment was collected all together, not 156 individual meters)
- Seven days and 5 hours *was* spent at Site U1501.
- After reaming, 20 bbl of sepiolite mud *was* pumped.
- Once the pilot hole was drilled, 455 m of casing *was* run in the hole.
- Five milliliters of internal standard *was* added to every sample.
- The methane level of 100,000 ppmv *was* not high enough to suspend drilling.
- For LOI, 3–5 g of ground sediment *was* weighed into a porcelain crucible.

Use the plural verb to emphasize the individual members of the group:

- In total, 15 samples *were* analyzed. (each sample was analyzed individually)
- All the technicians *were* helpful with the instruments.
- Data measured using the NGRl *were* uniformly below average. (“data” is always plural in scientific use)

Tricky subject/verb and pronoun agreement examples:

- A large number of tests *were* run in the laboratory.
- During the transit, the Description Team finished *its* report and then worked on *their* grant applications.
- Mg concentration *increases* to 50 mbsf and *decreases* to the bottom of the hole. (refers to the overall Mg profile)
- Ca concentrations *decrease* to 50 mbsf and *increase* to 500 mbsf. (refers to sample measurements)
- The composition and texture of each sample *were* carefully described.

Verb tenses

- Shipboard procedures (e.g., methods): describe in simple past tense (CMS17:5.130).
 - A 5 mL aliquot of interstitial water was analyzed for heavy metals.
 - We preserved microbiology samples for shore-based analyses.
 - We ran all whole-round cores through the WRMSL before splitting.
 - Archie’s relation was used to calculate formation factor.
- Results, observations, and statements of fact: present tense (CMS17:5.129).
 - Section 328-U1363A-2H-2 contains *E. huxleyi*.
 - Ba reaches a maximum at 57.25 mbsf.
 - Organic carbon is calculated from TOC and IC.
 - We report the cation concentrations run on the IC.
- Discussion and conclusions: present tense or simple past tense, subject to consistency throughout the section (CMS17:5.129, 5.130).
 - These data indicate(d) that barium does not mobilize in the sediments.
 - We place(d) the Zone NN11/NN12 boundary in Core 52X.
- Other work or results that were performed at specific time in the past: past tense (CMS17:5.130)
 - Howe et al. (1982) analyzed samples from Site 1134 and reported the results in Volume 128.
 - Blum described shipboard methods for physical properties in Technical Note 26.
- Actions that took place in the past or continues to the present: present perfect tense (CMS17:5.132)
 - Several investigators have observed the same result.
 - To present, 150 expeditions have been conducted using *JOIDES Resolution*.

Unclear antecedents (this, these, they, them)

Avoid using pronouns that may be difficult to match with their preceding noun; repeat the noun if necessary. Whenever you see “this” in text, ask yourself “this what?”

- Folding and faulting affected Tertiary rocks during the Cretaceous. *This* ended with intrusion of granodioritic stocks. To the north, *this* resulted in northeast-trending folds.
- Close to the faults, the folds are tighter, the fold limbs are steeply dipping, and *they* display bedding-plane schistosity.

Misplaced modifiers, words, and phrases

Check placement of words and phrases in sentences to minimize the chance they might cause confusion in the reader.

- The samples were preserved for analysis in 14 mL Falcon flasks. → preserved in 14 mL Falcon tubes for analysis.
- Because nannofossils are highly sensitive to changes of temperature and salinity, paleontologists use them as indicators of the environment when *they* died. (*who died?*)
- By comparing the core log with the downhole log, it is evident that freshwater was injected in the permeable zones. (*evident to whom?*)
- On closer inspection, burrows were observed. (*who observed burrows?*)
- The western part of the basin has a roughly tabular shape dipping southeast. (*what is dipping?*)
- Their presence can only be determined by tests. → can be determined only by tests.
- Operations were suspended when the weather grew colder and moved south. (*who/what moved south?*)
- Nanofossils were described from the Bering Sea. → Nanofossils from the Bering Sea were described.
- The granite was intruded during a great period of structural deformation. → during a period of great structural...
- Two altered thin vitreous tuff beds → Two thin beds of altered vitreous tuff.
- Thickness ranged from 25 m in the west to 500 m in the east basin. → 25 m in the west basin to 500 m in the east.
- A gravel-floored basin sloping eastward contained basalt fragments. → that slopes eastward...
- They are regarded as being the same geologic age. → regarded as the same geologic age.
- Operations at this site are similar to Site U1495. → are similar to those at Site U1495.
- The conglomerate pebbles are well rounded with loose cement. → are well rounded and loosely cemented.
- The layer had a thickness of from 1 to 2 cm. → thickness of 1 to 2 cm; thickness from 1 to 2 cm.
- Following the discovery of the character of this deposit... → After the character of this deposit was discovered...

Preferred usage

- For a list of prepositions used with common troublesome words, see [CMS17:5.195](#).
 - Correlate *with*
 - Correspond *to*
 - Different *from* (unless followed by a dependent clause, when different *than* is acceptable)
 - Juxtapose *to* (never *with*)
 - Off (not *off of*)
- For a glossary of problematic words and phrases, see [CMS17:5.250](#) and STAT7.
 - about/approximately
 - affect/effect
 - between/among/amid
 - compose/comprise
 - ensure/insure/assure
 - irregardless/irrespective/notwithstanding
 - mantle/mantel
 - partly/partially
 - predominant/predominate
 - proved/proven
 - subsequent/subsequently/subsequent to
 - that/which
- For a list of appropriate scientific word choices, see CSE7:7.3.2.
 - absorption/adsorption
 - demonstrate/exhibit/show
 - employ/use/utilize
 - farther/further
 - homogenous/homogeneous
 - imply/infer
 - mean/median
 - relationship/relation

- For a list of unnecessary and redundant words and phrases and suggested substitutions, see CSE7:7.7.
 - a majority of → *most*
 - as a consequence of → *because of*
 - ascertain the location of → *find*
 - based on the fact that; due to the fact that; on the basis of; in view of the fact that → *because*
 - in close proximity to → *near*
 - it is worth noting that → *note that*
- Avoid using *circa* (ca). If necessary, use only in a temporal sense (i.e., with dates or ages).
- Consult the *IODP Dictionary* and GOG5 for preferred spelling and usage of program-related terms.

U.S. vs. British spelling

Change British spellings to American (use the first entry in *Merriam Webster's Collegiate Dictionary*).

- Common British/American English differences include the following types of words (CSE7:6.1):
 - ize/yse (analyze vs. analyse)
 - double "l"/single "l" (labeled vs. labelled)
 - er/re (center vs. centre)
 - or/our (color vs. colour)
 - Words derived from words ending with "e" (acknowledgment vs. acknowledgement)
 - ense/ence (offense vs. offence)
 - log/logue (analog vs. analogue)
 - en/in (enclose vs. inclose)
 - Diagraphs (paleontology vs. palaeontology)

Hyphenation and compounding

The decision whether to spell a compound term as open (two words), hyphenate, or close up as a single word is determined by its grammatical function and position in a sentence (CMS17:7.81). Note that over time commonly used hyphenated terms tend to become closed, and hyphenation practices in Program publications have evolved.

- Check the **IODP open compounds** list below to avoid unnecessary hyphenation of unambiguous science and engineering terms used in IODP publications.
- Consult the *IODP Dictionary* and *Webster's Collegiate Dictionary* as primary resources for hyphenation guidance. Exceptions are allowed when closed spellings have become widely preferred by writers (e.g., website, dataset) (CMS17:7.83).
- Chicago prefers minimal hyphenation; however, when in doubt, it is rarely incorrect to hyphenate adjectival compounds before a noun (CMS17:7.85, 7.89).
- For guidance on hyphenated line endings, see **Line breaks** in Typesetting.

IODP open compounds

The following terms are open (not hyphenated) as either modifiers or nouns in IODP publications.

A	E	I	N
air fall	echo sounder	ice sheet	normal polarity
air gun	end cap	inorganic carbon	O
alternating field	end point	interstitial water	ocean water
ash fall	equal area	island arc	organic carbon
B	F	L	organic matter
barrel sheet	fluid flow	lower hemisphere	P
bulk density	G	M	physical properties
bottom water	gamma ray	magnetic anomaly	plate tectonic
C	gas hydrate	magnetic field	pore fluid
check shot	geomagnetic field	magnetic polarity	pore water
color reflectance	geomagnetic reversal	magnetic susceptibility	port call
compressional wave	greenhouse gas	magnetic reversal	positive polarity
core catcher	ground water	major element	R
	guide horn	minor element	rare earth
		mud clast	reef front

reversed polarity	shear wave	surface water	triple combo
rig floor	shear zone	T	W
S	site survey	terrigenous matter	wall rock
sea level	smear slide	thin section	water column
sediment accumulation	squeeze cake	tool string	water depth
seismic reflection	stainless steel	top drive	water table
seismic stratigraphic	sonic velocity	trace element	wet bulk
seismic wave	source rock	triple combination	
	sulfate reduction		

Hyphenation guidelines

- Chemical elemental and molecular names are open; element + noun is closed:
 - Fe oxides
 - Mg carbonate
 - K-feldspar
 - Mg-Ti system
- Colors are hyphenated as equal terms; don't hyphenate modifiers (e.g., greenish or olive) (follow Munsell colors):
 - red-brown oxidation
 - The clay was yellow-green
 - The ooze was reddish brown
 - olive brown silty clay
 - dark green clay
 - dark bluish gray ooze
- Foreign phrases are open (no italics) unless hyphenated in original language.
 - in situ measurement
 - en echelon pattern
- Phrases used as adjectives are hyphenated (CH2011).
 - point-to-point comparison
 - signal-to-noise ratio
- Number + abbreviation is open:
 - 33 m length
 - 5 km deep water
- Noun + enumerator/number is always open:
 - mesh size of 63 μm
 - a section 1.5 m long
- Comparators and adverbs are usually open (-er, -est, more, most, less, least, very, and those ending with "ly").

Compound modifiers

- Use an en-dash to connect a one-word noun to a two-word, unhyphenated noun:
 - *stable isotope-tagged* sample
 - *SYBR Green I-stained* smear slide
- Use an en-dash to connect a hyphenated unit modifier to a one-word modifier, all of which form a compound adjective that modifies a noun: *strike-slip-driven* structure
- Use an en-dash to connect two hyphenated modifiers used as a compound adjective: *logging-derived-density-calculated* porosity
- For a list of compound hyphenation based on specific terminology, see [CMS17:7.89](#).
- Look up compound nouns in *Webster's* to ensure they are used correctly (CH2011).
- Editors can depart from *Webster's* to avoid compound nouns that may appear inconsistent (e.g., "passengers report that the backseat feels roomier than the front seat"; i.e., open back seat for consistency with front seat) (CH2011).
- For a list of compound hyphenation based on prefixes, see [CMS17:7.89](#) and CSE7:6.2.1.1.
- Compound modifiers consisting of a prefix + a hyphenated term are hyphenated (CH2011).
 - *non-English-speaking* students
 - *un-air-conditioned* building
- Compound modifiers consisting of a prefix and a proper noun or proper adjective are hyphenated (CH2011).
 - *pre-Jurassic* rocks
 - *anti-American* sentiment
- If the proper noun is itself a two-word item, use an en-dash (CH2011).
 - *pre-World War II* boundaries
 - *anti-New York* sentiment

Prefixes and suffixes

- Compounds formed with prefixes are almost always closed. For example, use no hyphen with the following prefixes:
 - **macro:** macroscopic
 - **micro:** microfossil
 - **over:** overriding
 - **paleo:** paleomagnetism
 - **post:** postcruise meeting
 - **pre:** preexpedition meeting
 - **re:** reexamine
 - **under:** underthrust
- Compound nouns formed with suffixes are almost always closed (**CMS17:7.89**). No hyphen is used with the following suffixes (CSE7:6.2.2.2):
 - **away:** walkaway
 - **down:** standdown
 - **off:** layoff
 - **out:** lockout
 - **over:** carryover
 - **up:** setup
- Compounds formed with suffix “like” are closed if shown as such in *Webster’s Collegiate Dictionary*. If not in Webster’s, then hyphenate. Compounds retain the hyphen both before and after a noun (**CMS17:7.89**).
 - mazelike
 - mousse-like
- Compounds formed with prefix “cross”: close or hyphenate as shown in *Webster’s Collegiate Dictionary*; if not found, noun, adjective, adverb, and verb forms should be open (**CMS17:7.89**).
 - crossbar
 - cross-check
 - cross fire

Punctuation

- Punctuation marks should appear in the same font style (character tags **Bold** or *Emphasis*) as the main or surrounding text rather than the immediately preceding text (**CMS17:6.2**).
- Punctuation marks following text with the “**Link**” character tag must be tagged “Default Font.” See **Text call outs** for specific instructions for punctuation in hyperlinks.
- Colons and semicolons follow closing quotation marks, as do question marks and exclamation points unless they belong within quoted matter (**CMS17:6.10**).
- Use the “minus” ANSI code in text to prevent line breaks between the sign and a numeral (ASCII 8722).
- Use brackets within parenthesis in text (**CMS17:6.97**): “Most intervals contain sections of green-yellow clays (clays in the third interval [12.54–13.87 mbsf] are brown) and have similar...” NOTE: bracket use in equations differs (see **Equations, operands, and chemical formulas**).

Specialized uses of punctuation in technical publications

- **Period on the line** (CSE7:5.2.1.2)
 - Decimal point: 10.7 kg
 - Chemical formulas: bicyclo[2.2.2]octane
- **Period above the line** (CSE7:5.2.1.3)
 - Multiplication symbol: kg/(m·s²)
 - Ellipses in mathematical expression: $x_1 + x_2 + \dots + x_n$
 - Chemical formulas: Na₂B₄O₇·10H₂O
- **Question mark** (CSE7:5.2.2)
 - To indicate uncertainty: *Emiliana? huxleyi*
 - Chron ?2.n
- **Colon** (CSE7:5.3.1.2)
 - Demarcate elements in references: 4(1):125–127
 - Separate parts of a ratio: 1:5 ratio
 - Time datums: 23:45:15 h
 - Chemical names: 2,3,4,5-bis-O-(phenylmethylene)-altro-hexodialdose
- **Comma** (CSE7:5.3.3.3)
 - Chemical formulas: 4,5-difluoro-2-nitroaniline
 - European convention for decimal point (change these to American style decimal): 123,65 = 123.65

- **En-dash** (CSE7:5.3.5.3)
 - Range of values (do not use en-dash if either number in the range is negative): 5°–25°C
 - Represent chemical bonds in structural formulas: C₆H₅CO–O–COCH₃
 - Signify transitions (not from CSE7): Eocene–Oligocene transition; sulfate–methane transition
- **Parentheses** (CSE7:5.3.6.2)
 - Parts of a reference: Journal of Geology, 14(1–2):15
 - Group mathematical elements: $z = k(a + b + c)$
 - Group molecular components in a chemical formula: K₄Fe(CN)₆·3H₂
 - Specify oxidation state of a transition metal in text: Fe(III)
 - Indicate transfer of a species to another genus: *Hymenoxys herbacea* (Greene)
- **Square brackets** (CSE7:5.3.7.2)
 - Mathematical expressions (parens inner, brackets outer): $z = k[(a + b) - y(c + d)]$
 - Chemical formula bracketing: *bis*(bicyclo[2.2.2]octadiene)platinum
 - Chemical concentrations: [Na⁺]
 - Fusion nomenclature: benz[*a,h*]anthracene
- **Hyphen** (CSE7:5.4.1.3)
 - Represent single bonds in molecular formulas: (CH₃)₂-CH-CH₂-CH(NH₂)-COOH
 - Between an element symbol and the atomic or mass number: C-4; iodine-131
 - Molecular configuration prefixes: *S*-benzyl-*N*-phthaloylcysteine
- **Slash** (CSE7:5.4.2)
 - Mathematical symbol for division: $x/(a + b)$
 - Units: m/s²
 - As a character in a URL: http://
 - To close a URL that does not specify a file and will not work without the slash (rarely the case)
 - Signify boundaries or contacts (interface is a type of contact): K/Pg boundary; sediment/water interface
- **Prime symbol** (CSE7:5.4.5)
 - Chemical names: *N,N'*-dimethylurea
 - Minutes (single) or seconds (double) in coordinates: 52°33'05"N

Numbers, units, and symbols

Numbers

- Words or numerals:
 - In text generally spell out single-digit numbers and use numerals for numbers of 10 or greater.
 - A numeral is, however, acceptable to specify a number of objects (We analyzed 5 samples.).
 - If several numbers occur within a paragraph or series of paragraphs, maintain consistency in the *immediate context* between numerals and spelled out numbers (CMS17:9.7).
- **Ordinals**: Letters in ordinals should not appear as superscripts (CMS17:9.6): 15th vs. 15th
- Decimal numbers:
 - Start decimal fractions with a zero: 0.78 m
 - Follow a decimal with a zero only to represent precision; e.g., 27°C and 27.0°C are not interchangeable.
- Time of day:
 - Use the 24 h system: 0000–2359 h.
 - In text and tables, time digits appear with no punctuation (CSE8:13.2.2; CMS17:9.39): 1145 h
 - Include colons in 24 h times if seconds are included (CSE8:13.2.2; CMS17:9.40): 09:27:08 h; 09:27:08.8 h
- **Time duration** units with numerals: Abbreviate seconds (s), minutes (min), hours (h), and years (y); spell out days, weeks, and months: 45 s; 10 min; 2 h; 5 days
- Large numbers:
 - Omit commas from 4 digit numbers.
 - Use commas only to maintain uniformity in a sentence, table, or figure: 5,500–12,000 μM
 - Do not use commas in >4 digit numbers in page numbers, line numbers, and addresses (CMS17:9.54).
 - Retain all parts of the number in ranges of very large numbers: 26 million to 35 million

- **Numerical ranges (CMS17:9.60).** Note the following representations are equivalent and acceptable:
 - From...to: varies from 140 to 150 mm
 - Between...and: are between 140 and 150 mm
 - En-dash (do not use en-dash if either number is negative): 140–150 mm (ranges from 140 up to and including or through 150 mm)
 - For ranges of values, change “from...to...” to en-dash: densities range 1.69–2.84 g/cm³; however, do not change for varies or multipliers (Scientific notation): salinity varies from 1.5 to 1.8; MS ranges from 0×10^{-5} to 22×10^{-5} SI
- Scientific notation:
 - Retain all parts of the numbers in ranges in scientific notation (CSE7:12.1.5): 9.2×10^{-3} to 12.6×10^{-3}
 - Tables/figures may use scientific E notation for exponential numbers (1.98E-02; 1.98E+02).
NOTE: scientific notation (E) differs from the exponential function (e): $1.67e^{3.98}$.
- Do not change approximately, about, or ~; leave them as they come in.

Units

- Spell out a unit of measurement without a numeral, even in scientific contexts (CMS17:9.16):
 - Microbial processes in sediment occur sub-nanomolar cubic centimeters per day rates. (not sub-nM cm³/day)
 - Major element oxides are expressed in weight percent (not wt%).
- Use roman (not *italic*) type.
- Use singular form: lb vs. lbs; kg vs. kgs
- Place a period after a unit only at the end of a sentence.
- Do not hyphenate units that are part of a compound modifier: a 5 mm wide vein
- Leave a space between a numeral and a letter unit (e.g., Kelvin):
 - 16 km
 - 3–4 cm
 - 5 inches
 - 20,000 lb
 - 6500 K
- Close up the space between a numeral and a unit denoted by a *symbol* (e.g., per mil, sigma, or Angstrom):
 - 34.5%
 - 36°C
 - 2σ
 - –3.2‰
 - 0.2°2θ
 - 17Å
- *Do not* repeat letter units in ranges: 10–15 mm
- *Do* repeat letter units when describing dimensions: 5 cm × 6 cm
- *Do* repeat *symbol* units in ranges:
 - 10%–15%
 - 36°–42°C
 - 0.2°–0.4°2θ
- Spell out the unit “inch” to avoid confusion with the word “in.” Where appropriate, use the plural “inches.”
- Do not use hash marks to express inches or feet in text or tables. They can be used on engineering graphics:
 - 16 inch casing vs. 16" casing
 - 15 foot drill collars vs. 15' drill collars
- Use SI (metric) units whenever possible; however, note that drilling bits, pipe, collars, and tools use US units (inches; do not convert drilling operations sizes to metric): 5¼ inch pipe (not 5.25 inch pipe).
- Clarify hybrid mixes of metric and US units: 150,000 lb overpull (not 150 klb).
- Use molarity (M) rather than normality (N) to express concentrations of acids
 - For acids with a single “H” M and N are equivalent: 6 N HNO₃ = 6 M HNO₃.
 - For acids with multiple “H” ask LLP/query author for molarity: 9 N H₂SO₄ ≠ 9 M H₂SO₄.
- See **Common IODP units** for a detailed list of units that are used with shipboard measurements.

Dates

- Dates generally include the year only at first use under each Order1 heading. If the year is not in the Order1 heading, include it in the first use of every subheading.
- Dates follow the format X Month Year (CMS17:9.35):
 - 12 August 2005
 - 14 and 15 August 2005
 - 12–15 August 2005
 - 2 September–4 November 2005
 - 12 December 2005–5 February 2006
 - 5 October

Equations, operands, and chemical formulas

- Operational signs should be surrounded by single spaces when they are preceded and followed by nonoperational terms (exception: forward slash [/] for division does not have spaces surrounding it):
 - $x = y + z$
 - $x = y/z$
 - $R_0 = R_t \times [1 + 0.025 \times (T - 20)]$
 - maximum > 38.2 mM
- When an operational sign is not preceded by a nonoperational term, do not put a space between it and the term it modifies:
 - an error of ± 3
 - contains <5 m of sediment
- Group mathematical elements from outside in using {}, [], and ():
 - $z = \{k[(a + b) - y(c + d)]\}/e$
- Use parens to enclose variables to which a function (ln, log, tan, cos, sin) will be applied: $\rho = \ln(I_0/I)/(\mu d)$.
- Equations do not need to be numbered unless the author refers to an equation in text. In that case, number all equations in that chapter.
- Use Default Font character tag for numerals, punctuation, operators, units, nonmathematical symbols, multiple-letter abbreviations for variables, mathematical constants, and functions. Use italic type for single-letter variables unless they are subscript/superscript.
 - $VR = V_{pw}/V_{solid}$
 - $TOCDIFF = TC - IC$
 - $M_s = s[(M_w - M_d)/(1 - s)]$
 - $F = R_{eff}/R_f = b\phi^{-m}$
- Break equations in the following preferred order:
 - Before the equals sign;
 - Before a plus or minus sign not enclosed in parentheses, brackets, or braces; or
 - Between parentheses or brackets for multiplication of two parts; place multiplication symbol on second line.
- Insert thin spaces around punctuation or italic type if type looks too close in Frame/PDF.
- If more than three variables/constants are defined, set definitions as a vertical list, and set other equations with two or more definitions in the same chapter the same way.
- If all equations in a chapter have three or fewer definitions, the editor can decide to use a run-in or vertical list for definitions.
- To indicate the number of items in a test population, use
 - N if all values in the data set were used or
 - n if a subset of values was used (e.g., outliers were removed)

Complex chemical formulas

- **Numerals** can occur at the beginning or within a chemical name, set off with hyphens [note that there is no space after commas between numbers in a chemical name]: 5,7-dihydroxy-3-(4-hydroxyphenyl)-4H-1-benzopyran-4-one.
- *Italic* type on element symbols denotes attachment to an atom: *O,O,S*-triethyl phosphorodithioate.
- Roman type is used on element symbols in type or reaction used as a noun or adjective: S-methylation.
- *Italic* type for capital H that denotes added hydrogen: 2*H*-pyran-3(4*H*)-thione.
- Greek letters (not spelled out) denote stereochemistry: 5 α , 10 α , 15 α , 20 α -tetraphenylporphyrin.
- *Italic* type indicates positional, stereochemical, configurational, or structural prefixes: *cis*-diamminedichloroplatinum
- *Italic* type within square brackets is used in compound names: dibenzo[*a,h*]anthracene

Symbols

- Do not begin a sentence with a stand-alone symbol (e.g., δ). A sentence can be started with a symbol connected to a word (e.g., β -Endorphins). In this case, capitalize the first letter of the word to which the symbol is connected (CH2011).
- Ampersand (&) is acceptable in company names (CH2011). Else, replace with “and” in text, tables, and taxonomic text.

Preferred symbol codes

- The Warnock Pro font set used for most volume text contains almost all of the symbols needed for IODP publications. The following is a list of some common symbols and their ANSI and Unicode numbers. Use ANSI codes preferentially, if available. NOTE: Some ANSI codes do not work correctly in FrameMaker (e.g., minus). Unicode and Symbol character fonts can be inserted into the Frame file. For additional codes and details on how to add these symbols to text, see [IODP-II Character Codes](#).

Name	Symbol	ANSI (Alt+code)	Unicode
phi (lowercase)	φ	None	03D5 (symbol)
prime	'	8242	2032 (symbol)
plus-minus	±	0177	00B1
en-dash	–	0150	2013
multiply	×	0215	00D7
multi dot	·	0183	00B7
degree	°	0176	00B0
permil	‰	0137	2030
em-dash	—	0151	2014
dagger	†	0134	2020
double dagger	‡	0135	2021
minus	–	8722	2212
mu	μ	0181	00B5

Lists

What type of list?

Lists can be part of a sentence or paragraph (run-in list) or set off from the text (vertical list). Whether a list is run-in or vertical, enumerated or not, each item must be parallel in grammatical construction. See [\(CMS17:6.127\)](#) for examples and discussion of parallel list element construction.

- **Run-in list:** use for short, simple lists. If enumerated, use an Arabic numeral in parentheses before each element.
- Vertical list:
 - Use if list is prominent, long, or contains several or more phrase elements
 - Use if each item of the list consists of one or more complete sentences

Vertical lists

- Set the following types of vertical lists using specific list tags in Frame.
 - **Numbered lists:** use only when the list elements need to show rank, order, or procedure.
 - **Bulleted lists:** use if there is no particular order to list elements, or if the list elements already contain a number.
 - **Unit lists:** unit descriptions are set with no introductory number or symbol.
 - **Equation definition lists:** definition of terms under an equation are set with no number or symbol.
- Introduce a list using a complete phrase or a sentence followed by a colon whenever possible (exception: equation definition lists). Rework if necessary.
- If list elements are phrases that complete the sentence begun in the introduction, divide elements by commas or semi-colons and follow the last element with a period.
- If each list element is a complete sentence, follow each element with a period (includes defining lists using “=” or “:”).
- Bulleted lists with short elements (one or two words) can have no punctuation.
- Begin each list element with an uppercase letter.

Species lists

Species lists or systematic paleontology descriptions are generally not included in the main body of text but are treated as a Taxonomic appendix. See [Species Lists and Systematic Paleontology](#) for more information.

Reference lists

- It is the author's responsibility to provide complete, accurate reference information. Query the author for cited works that are missing from the reference list or for references that are provided in the list but do not have a corresponding callout in the text.
- If the author cannot provide the full reference, ask for a DOI, URL, or first author, year, and partial title.
- Compile reference lists, place on the server, and notify the Reference Editor.
- All published works and datasets referenced in the chapter (e.g., text, tables, figures, taxonomic lists that include citations to pages, plates/figures, or appendixes) must be included in the reference list, with the following exceptions (see Citing personal communications and unpublished data and Citing software, databases, and user manuals):
 - Software
 - Databases
 - Personal communications
 - Unpublished data
 - Manuscripts in preparation
- See Citation/Reference Format Examples on the Wiki for examples of IODP citation formats and the citation formats of the most commonly used types of reference publications.

Brand names/trademarks

- Capitalize trademarks if they must be used. When possible, substitute a generic term (**CMS17:8.153**).
 - Chlorox (use household bleach)
 - Dispensette (use bottle-top dispenser)
 - Kimwipe (use lint-free wipe)
 - Macor (use ceramic)
 - Mylar (use polyester film)
 - Teflon (use fluoropolymer)
 - Vacutainer (use vacuum-seal tube)
 - Whirl-Pak (use sterile sample bags)
- There is no legal requirement to use the registered [®] or unregistered [™] trademark symbols, and they should be omitted from text, tables, and figures (**CMS17:8.153**).
- Some brands request a specific usage for their products in text, but these guidelines are not legally binding. In fact, *Webster's* lowercases some common trademark brands (**CMS17:8.153**).
- Names with specific corporate capitalization (iPod, eBay, LexisNexis) need not be capitalized at the beginning of a sentence or heading. Mid-caps can be left unchanged (**CMS17:8.154**).

Typesetting

Text

- Full justified tags (block right)
 - Body tags
 - Caption tags
 - Table notes
- Left justified tags (ragged right)
 - Author
 - Lists
 - Keywords
 - Tax tags
- Emphasis: tag italics text with the Emphasis tag. Applies primarily to genus and species names, single-letter variables in equations, vessel names, and journal/book names.
- Bold: tag bold text with the Bold tag. Bold is generally not used in volume text, tables, or figures. Bold is included in some header tags and the Link tag.

Lists

The FrameMaker template has several list tags that are used to set vertical lists.

- The following types of vertical lists are available:
 - AlphaTwo: Level 2 (indented farther than Level 1) list enumerated A., B., C., etc.
 - BulletedOne: Level 1 list bulleted list (diamond-shaped bullets).
 - BulletedTwo: Level 2 bulleted list.
 - NumberedOne: Level 1 list enumerated 1., 2., 3., etc.
 - ListPlainIndentOne: Level 1 list with pica hanging indent (use to define equation variables and for lith unit summary lists; Levels 1 and 2 are also used for methods intro scientists' responsibilities list)
 - ListPlainIndentTwo: Level 1 list with pica hanging indent (use to define equation variables and for lith unit summary lists; Levels 1 and 2 are also used for methods intro scientists' responsibilities list)
- The "First" tag for each list type is used on the first element of each list. It sets the list off from the preceding text and, if the list is enumerated, triggers enumeration restart.
- After completing a vertical list, tag the next paragraph BodySpaceAbove.

Titles and headings

- Titles and headings are sentence case.
- On Order1 and Order2 headings
 - Keep the top line longer than subsequent lines if possible.
 - Use a non-breaking space (esc, space, h) to break long headers onto multiple lines.
 - Keep prepositional phrases intact (no break after preposition) even if bottom line is longer than the top.
 - Break on either side of "and" or "the" to best balance lines.
- On Order3 and Order4 headings, allow long headings to break naturally.

Line breaks

- Use non-breaking space to break authorship only after a last name (keep first name/initials together on the same line with last name).
- Word breaks
 - One-letter word divisions are not permissible (**CMS17:7.37**).
 - Break hyphenated words at the hyphen if possible (CSE7:6.3).
 - A numeral used with an abbreviated unit of measure is best left intact when possible (**CMS17:7.44**; CSE7:6.3).
 - A number or letter used in a run-in list should not be separated from what follows it (**CMS17:7.45**).
 - At least four characters of a chemical name should appear on each line if divided (CSE7:6.3).
 - Do not divide a word so the word on the second line looks like a word alone (path-ologic, not patho-logic) (CSE7:6.3).
 - Do not divide single syllable or short multisyllable words (CSE7:6.3).
- If a word break in FrameMaker is incorrect, report it to the manager via email.

URLs

- Allow URLs to break as they naturally will at the end of a line. URL line break preferences (CSE7:7.42):
 - After a colon or a double slash,
 - Before or after an equal sign (=) or ampersand (&), or
 - Before a single slash, period, other punctuation, or symbol.
 - Do not break a URL at a hyphen or add a hyphen to force a break.

Fractions

- Typeset fractions in text (but not in tables): 10% inch casing (text) vs. 10-3/4 inch casing (table).
- Copy typeset fractions for which there are no codes from the current FrameMaker template reference page.

Systematic paleontology (species lists)

- See **Species Lists and Systematic Paleontology** for typesetting species lists and complex taxonomic presentations.

Taxonomic usage

In IODP volumes, formal taxonomic designations are often used: Ostracoda, Foraminiferida/Foraminifera, Radiolaria, and Bacteria. Capitalization and construction of these designations differs depending on whether the author is speaking of the formal taxonomic group (capitalized) or speaking informally of one or several species (lowercase: ostracods, radiolarians, foraminifer[s]/foraminifera [if both are used, use foraminifera; if only foraminifer[s] is used, don't change it]).

Species nomenclature

- The full, formal species designation consists of four parts:
 - Latin genus name
 - Latin species name
 - Surname of the “author” (discoverer and/or namer)
 - Official date when the species was “published” (named)
- Genera and species names are always italicized, the name and date of the species author, whether or not it is in parentheses, is set in roman type (default font); comma usage in species author and date should be standardized toward the way the list was provided:
 - *Coccolithus radiatus* Kamptner, 1955
 - *Coccolithus radiatus* Kamptner 1955
- A name in parenthesis indicates that the author described the species but referred it to a different genus (CSE7:8.123):
 - *Reticulofenestra minutula* (Gartner, 1967) Haq and Berggren, 1978
 - *Actinocyclus ingens* (Baldauf) Whiting and Schrader 1985
- It is not necessary to include the complete four-part species description in text and tables, especially if there is an alphabetized species list or systematic description included. If there is no taxonomic list, it is preferable that the full four-part designation be used for the first occurrence, but not all authors will do so.
- The author and date that often follow the Latin genus and species name do not constitute a bibliographic reference but are part of the formal nomenclature. A corresponding bibliographic entry in the reference list is required only if the author of the chapter cited page, plate, or figure references.
- The genus name is always capitalized and the species name is never capitalized. This applies in text, titles, tables, indexes, etc. The words “genus” or “species” are not capitalized when used as a classification (CMS7:8.119):
 - the genus *Reticulofenestra*
 - the species *abies*
- A subspecies name following the binomial species name is also italicized (CMS7:8.121): *Noctilio labialis labialis*
- A genus name used as a common name is not italicized or capitalized:
 - discoasters
 - reticulofenestrids
- Verify genus and species name spellings against the taxon database (Janus or Nannotax3) during initial edit. Shared Word and Frame dictionaries contain many genus and species names, so use these for spell checking.

Genus expression

- In text the genus name can be abbreviated using the first letter of the genus, italicized and followed by a period, for each mention of a genus with each particular species after the first (spell out genus on first use), or in a list where genus identification is clear (CMS7:8.120).
 - A relatively pure nannofossil ooze in the top of Section 183-1139A-1R-1 consists of very abundant *Emiliania huxleyi* (90% of the assemblage), which indicates the *E. huxleyi* acme of Gartner (1977) with an age of ~84 ka or less. The second section of the core that contained few *E. huxleyi* is assigned to the lower portion of the *E. huxleyi* Zone.
 - Several species of discoasters were found in the assemblage: *D. deflandrei*, *D. pentaradiatus*, *D. exilis*, *D. variabilis*, and *D. quinqueramus*.
- If both the species and the subspecies are the same, the first one can be abbreviated (CMS7:8.121): *Noctilio l. labialis*
- Some biostratigraphers prefer that a genus name at the beginning of a sentence be spelled out, whether it is the first or subsequent mention. Follow author preference if requested.
- In tabular and graphic material in which species are listed alphabetically by genus name and when the author has provided a full species list to accompany the chapter, the genus name may be abbreviated. Species names are not abbreviated. Generally, genus names should be added to range charts and biostratigraphic event tables if there is room.

Abbreviations

A variety of abbreviations are found attached to species names. These abbreviations are not italicized. Sometimes “ssp.,” “var.,” or “f.” may be inserted before a subspecies name (CSE7:8.121).

Species: *sp.* and *var.*

The abbreviations “sp.” and “var.” without a following name indicate that the species or variety is unknown or unspecified. The plural “ssp.” refers to a group of species (CSE7:8.122). The genus name should never be abbreviated with sp. or var.: *Discoaster* sp.; never *D.* sp.

Confer: *cf.*

The abbreviation “cf.,” meaning “confer” or “compare,” is included after the genus name if there is doubt about the species identification (NOTE: the comparative genus name can be abbreviated):

- *Discoaster* cf. *D. subloidoensis*
- *Reticulofenestra* sp. cf. *R. samodurovii*
- *Gephyrocapsa* sp. cf. *sinuosa*
- *Prunopyle* cf. *titan*

Affinity: *aff.*

The abbreviation “aff.” after the genus name means that the species is closely related to the one given but is possibly a different species. Aff. implies less certainty than cf. Again, the second genus name can be abbreviated:

- *Gephyrocapsa* aff. *G. oceanica*
- *Ceratocyrtis* sp. aff. *C. stigi*

Other abbreviations

Other abbreviations inserted between genus and species names are not italicized and may include

- f. (forma)
- n. sp. (new species)
- s.l. (sensu lato)
- s.s. (sensu stricto)
- subsp. (subspecies)

Examples:

- *Cornutella clathrata* s.s. *profunda*
- *Distephanus speculum notabilis* f. *notabili*
- *Reticulofenestra* spp. (<3 μm)

Question marks

The author may include a question mark if there is some doubt about the identification of the fossil; the position of the question mark indicates different levels of doubt. The question mark should not be separated from the genus or species name by a space and should not be italicized. Parentheses around the question mark should be removed.

- A question mark before or after the genus name indicates that the entire identification is in doubt:
 - *Helicosphaera?* *carteri*
 - *?Helicosphaera carteri*
 - *Amphistylus?* sp. A
- A question mark after the species name indicates the genus identification is certain but the species identification is not: *Reticulofenestra umbilicus?*

Text call outs/citations

Call outs from text to other locations within a volume are hyperlinked. Call outs to any element within a chapter in the same volume, including the entire chapter itself, must include a citation to that chapter in text (after the call out) and the reference for that chapter in the reference list. If supplementary material for the volume is called out in a chapter or a data report has supplementary material, include the supplementary material citation in the reference but do not cite it in text.

- Hypertext links are tagged with the Link character tag.
- In-volume hyperlinks are not made from table or figure captions.
- In an Abstract or Plain language summary (SPs, PRs, summary chapters, or ERRs), do not cite references or call out figures, tables, text sections, websites, databases, appendixes, etc. (i.e., no links). They need to be publishable as a self-contained unit.

Call outs to locations in the same volume

Within a volume, links can be made to the following:

- Any level of heading in any chapter;
- Figures, tables, plates, equations, or appendixes in any chapter;

- Core descriptions, thin sections, or smear slides; or
- Supplementary material

NOTE: Do not link callouts to SPs and PRs from any document. They are standalone documents, not part of a volume.

Call outs to text sections and chapters in the same volume

ER and ERR chapters: links within a chapter:

- Link to a uniquely named header: See [Lithostratigraphy](#).
- Link to a nonuniquely named header: See [Magnetostratigraphy](#) in Paleomagnetism.

ER chapters: links to other ER chapters in the same volume:

- Links to a uniquely named header (NOTE: “See also” is only used if preceded by “see.”):
 - See [Biostratigraphy](#) in the Expedition 350 methods chapter (Tamura et al., 2015).
 - (see [Paleomagnetism](#); see also [Paleomagnetism](#) in the Site U1301 chapter [Mix et al., 2023a]).
- Link to a nonuniquely named header: See [Hard rock cores](#) in Magnetostratigraphy in the Expedition 352 methods chapter (Reagan et al., 2015).
- Link to a chapter appendix: See [Appendix B](#) in the Site U1378 chapter (Fryer et al., 2011).
- Link to an entire chapter in the same volume: See the [Site U1347](#) chapter (Stoner et al., 2010).
- Links to the same section in multiple chapters:
 - XRD data are compiled in separate tables in the Lithostratigraphy sections of each chapter. (no link)
 - (see Lithostratigraphy in the [Site U1301](#), [Site U1302](#), and [Site U1303](#) chapters [Mix et al., 2009a, 2009b, 2009c]). (links to chapter)
 - (see [Lithostratigraphy](#) in the Site U1301 chapter, [Lithostratigraphy](#) in the Site U1302 chapter, and [Lithostratigraphy](#) in the Site U1303 chapter [Mix et al., 2009a, 2009b, 2009c]) (links to Lithostratigraphy section in each chapter)
- Links to multiple sections in a chapter (“both” or “all” are added to clarify that multiple links go to the chapter):
 - (see [Lithostratigraphy](#) and [Physical properties](#), both in the Site U1301 chapter [Mix et al., 2023a]).
 - (see [Micropaleontology](#), [Paleomagnetism](#), and Figure [F31](#), all in the Site U1301 chapter [Mix et al., 2023a]).

NOTE: In ERR chapters, all links to other chapters in the same volume (ER, ERR, and ER authored chapter) are called out by authorship (formatted the same as links to other ERRs in the same volume; see below): (see [Siesser](#), 2014).

ER and ERR chapters: links to ER authored chapters or data reports (ERRs) in the same volume:

- Call out specialty papers and data reports by authorship:
 - ...in the postcruise research of [Morono et al.](#) (2008)
 - (see McNeill et al., 2017a; [McNeill et al.](#), 2017b)
 - (see [Siesser](#), 2014)
- Links to “in press” and “submitted” chapters use the same language as a published chapter. The “in press” link opens a placeholder file. When the chapter is published, the link becomes live. The “in press” text is not updated. Submitted chapters are not linked but are listed in the reference list.
 - For analyses results, see [Screaton et al.](#) (in press).
 - For analyses results, see [Screaton et al.](#) (submitted).

Call outs to figures, tables, and equations

- Call outs for figures, tables, equations, and movies are all handled in the same way except for the letters used with the numbers for each type of material:
 - Figure, table, equation, and movie numbers are preceded by “F,” “T,” “E,” or “M,” respectively.
- When calling out figures, tables, equations, etc. in a different chapter, include the citation for the chapter that contains the referenced items in the text and reference list.
 - Site 1088 is located on Agulhas Ridge (see Figure [F1](#) in the Expedition 345 summary chapter [Curry et al., 2013]).

Call outs to descriptive data

Each *Proceedings* volume contains descriptive data (sometimes called “prime data”) that may include visual core descriptions (VCDs), smear slides, or thin sections in the Core descriptions section.

- If prime data for a particular site is called out from text, the link opens to the Core descriptions heading in the volume table of contents: Characteristics are defined based on smear slide analyses (see Site U1301 smear slides in [Core descriptions](#)).
- If a particular site is not identified in a text callout, the link also opens to the Core descriptions heading in the volume table of contents: Core description forms summarize the descriptive data (see [Core descriptions](#)).

Call outs to supplementary material

- Each volume/data report may include a supplementary material section that contains data tables, figures, raw data, description logs, and so on. Contents of the supplementary material section are cited from text to a specific file or folder (at minimum), and the link opens the volume table of contents for ER chapters and the Supplementary material splash page for data reports. The reader can select the appropriate folder and file from the Supplementary material splash page. If an ERR has supplementary material and calls out the same volume's supplementary material, add "for this data report" after each ERR supplementary material callout link and "for this volume" after each volume supplementary material link.
 - "Velocity data for this site supports this theory (see C0001_DS.XLS in VELOCITY in [Supplementary material](#))."
[C0001_DS.XLS is an Excel file contained in the directory (folder) VELOCITY, which is a link available on the Supplementary material splash page].
- All primary directories (folders) in the supplementary material must be cited from text in a volume/data report.
- See the Supplementary material SOP available on the Wiki for details and examples.

Link language and tagging

- Do not include punctuation in the Link character tag. See the examples below.
- "Figure" is spelled out both in body text and parenthetically.
- If only one figure is called out, "Figure" is singular: Diatom preservation for Hole U1334 is shown in [Figure F3](#).
- If multiple parts of a single figure are cited, "Figure" is singular: ...shown in the position of the layers ([Figure F8A](#), [F8C](#)).
- If multiple figure parts will appear together on the same page, a range of figure parts can be tagged together including internal punctuation:
 - [Figure F2A–F2E](#); in this case the en-dash, can be included in the Link character tag
 - [Figure F12A](#), [F12B](#); both A and B parts are on the same page and can be in a single Link character tag
- If more than one figure is called out, "Figure" is plural: Bathymetry details appear in [Figures F1](#), [F2](#), and [F9](#).
- If all parts of a figure are cited, call out the entire figure: See [Figure F1A](#), [F1B](#), [F1C](#), [F1D](#) vs. See [Figure F1](#).
- If calling out an appendix figure or table:
 - Table and figure numbers in a single appendix are preceded with the letter "A": [Table AT8](#), [Figure AF1](#).
 - Table and figure numbers in multiple appendixes are preceded with the letter of the appendix "A," "B," etc.: [Table AT8](#); [Figure BF1](#).

Parenthetical callouts

- In parenthetical call outs, use a semicolon between table, figure, equation, movie, and plates: "Lithostratigraphy indicates a basement age of 52 Ma ([Figure F1](#); [Table T1](#))."
- Use a comma instead of "and" when referring to two or more items: "...foraminifers are present ([Figures F1](#), [F2](#))."
- If parenthetical information directly relates to the item cited, the information and call out can be placed inside the same set of parentheses, separated by a semicolon: "Such layering can be seen in the clay and ooze interval of the section (interval 10–35 cm; [Figure F2](#))."
- If a text reference refers to a figure in another volume or publication, "figure" is abbreviated and lowercase: "(see [fig. F2](#) in Shipboard Scientific Party, 1998a; see [table 1](#) in Frank et al., 1999)."

Citing references

All works included in a reference list must be cited in text, tables, figure captions, taxonomic lists, appendixes, or other chapter material (except same volume/data report supplementary material). Conversely, all citations in text must have a reference in the reference list. See Reference and citation SOPs available on the Wiki for more information.

- Citation for one or two authors is by last name, comma, year: (Miller, 2012; Winter and Peal, 2015).

- For three or more authors, list the first author, no comma, “et al.” and then comma and year: (Acton et al., 2010).
- It is allowable to use “et al.” possessively: in Junker et al.’s (1977) interpretation.
- To cite an entire volume of the DSDP, ODP, or IODP *Proceedings*, include the full authorship of the volume (including Co-Chief Scientists and Staff Scientist; see the [Wiki](#) volume authorships links): ...as discussed in the *Leg 178 Initial Reports* volume (Barker, Camerlenghi, Acton, et al., 1999; Fryer, Wheat, Williams, and the Expedition 366 Scientists, 2018).
- To cite supplementary material from a different volume, indicate the file/folder and include the expedition number before “Supplementary material” but do not link: (see 362_Structure_Calculations.xlsx in STRUCTURE in the Expedition 362 Supplementary material [McNeill et al., 2017b])
- Citations can appear as body text or parenthetically:
 - In body text, the year of publication is in parentheses: Smith (2003) and Moore and Bosque (2005).
 - In a parenthetical reference citation, authors and publication date are in parentheses: ...sedimentary overload (White, 2013).
 - Separate multiple parenthetical citations with semicolons: (Bell, 1970; Bell and Schott, 1972; Bell et al., 1976).
 - If necessary, square brackets can be used for citations within a parenthetical phrase: “Site 1088 is located on Agulhas Ridge (see Figure [F1](#) in the Site 1088 chapter [Expedition 345 Scientists, 2013]).”
- Multiple citations do not have to be in alphabetical or date order; leave in order submitted by the author.
- Cite ODP or IODP scientific reports (*Scientific Prospectus*, *Preliminary Report*, *Technical Note*) like a journal article: (Gieskes et al., 1991).
- If author names and publication year are identical in successive references, identify them as a, b, c, and so on:
 - (Smith et al., 1990a, 1990b) • Expedition 339 Scientists (2013a, 2013b, 2013c)
- If multiple papers with the same citation authorship appear in the same parenthetical citation list, combine them with commas separating the years: change (Smith, 1999; Moore et al., 1998; Moore et al., 2005; Smith, 2004) to (Smith, 1999, 2004; Moore et al., 1998, 2005).
- For an in press, submitted, or preprint paper, the words “in press,” “submitted,” or “preprint” appear where the publication year would be:
 - (Meyer et al., in press) • Jones et al. (submitted) • (Wolff et al., preprint)

Citing unpublished data and personal communication

- Do not include unpublished papers or personal communications in the reference list. NOTE: in press, submitted, and preprint papers are included in the reference list (but are not in EndNote).
- Unpublished data text citations should include the author’s first initial and does not include a year: “using the procedure described by G. Wheat et al. (unpubl. data).”
- If more information about the unpublished citation exists (link to URL or data of unpublished report), include this information in parentheses to help the reader find the information if needed.
- Personal communication citations should include the author’s first initial and the year the communication occurred: “using the same procedure (G. Wheat, pers. comm., 2007).”

Citing software, databases, and user manuals

- Software: If available, include the URL in text: “using Petschick’s MacDiff version 4 (www.ccp14.ac.uk/ccp/ccp14/ftp-mirror/macdiff/MacDiff.html).”
- Databases: if available, include the URL in text: “basalts in the PetDB database (<https://www.earthchem.org/petdb>).”
- Datasets can be cited in text and included in the reference list (this includes Supplementary material datasets):
 - Fryer, P., Wheat, C.G., Williams, T., and the Expedition 366 Scientists, 2018. Supplementary material, <https://doi.org/10.14379/iodp.proc.366supp.2018>. In Fryer, P., Wheat, C.G., Williams, T., and the Expedition 366 Scientists, Mariana Convergent Margin and South Chamorro Seamount. *Proceedings of the International Ocean Discovery Program, 366: College Station, TX (International Ocean Discovery Program)*.
 - Jordan, E.K., Lieu, W., Stern, R.J., Carr, M.J., Feigenson, M.D., and Gill, J.B., 2012. Data from: CentAm & IBM Geochem Database version 1.02. *Integrated Earth Data Applications*. <https://doi.org/10.1594/IEDA/100053>.
- If a user manual does not have reference information, a URL link to the manual file can be included in the text.

Tables

Table presentation options

- IODP-II volumes offer tabular information in several options:
 - Selected tables are formatted in FrameMaker, appearing within the PDF chapter text.
 - Oversized formatted tables can be linked to an oversized PDF from the table caption in the chapter.
 - Very long or wide tables (more than 1 portrait page width or length) can be linked to an oversized PDF or CSV file.
 - All volume data tables are included as comma separated value (CSV) files.
- Tables smaller than 1 portrait page size are usually considered appropriate for formatting in FrameMaker for display in the PDF chapter. A CSV version of the table is also created and included in the volume. Examples of PDF include
 - Lithostratigraphic, lithologic, seismic, or logging unit boundaries and descriptions
 - Biostratigraphic age datums, zonation, and timescales
 - Tool string types and tool names
- Tables that provide only data for further analytical use are generally offered as CSV files. Examples include
 - Geochemistry data tables
 - Physical properties data tables
 - Splice, tie point, and affine tables
 - Biostratigraphic range charts
- Tables that are too large to display in the PDF chapter can be prepared in a separate oversized PDF file upon request (see **Oversized tables**). Examples include:
 - Interstitial water geochemistry summary tables
 - Biostratigraphic range charts
- In general, most Methods chapter tables and entire coring summary tables are formatted for Frame. At the postcruise meeting, the EPM and Co-Chief scientists approve the final list of tables for presentation in the PDF chapter.
- The HTML chapter contains no tables, only links to CSV versions.
- If the EPM thinks it is important to include a large format table in an SP, a simple oversized PDF can be included in the SP PDF file.

Processing tables

- To ensure consistency of tables, work on them in letter groups across the volume (work on all ops tables together, then all biostrat tables, etc.).
- Resolve consistency problems, for example in datum event tables: use of terms like “first appearance” vs. “first occurrence” and column headers “datum” vs. “event” are often inconsistent.
- Abbreviations:
 - NA (not N/A) may be used for both not applicable and not analyzed. If NA = not applicable in one table, you may want to suggest the author use NM = not measured (not N.M.) instead of NA as not analyzed in other tables.
 - BDL (below detection limit) is preferred over BD.
- Query dashes in cells vs. blank cells, and define either usage in the notes.
- If sample identifiers are separated into columns, keep the "Type" column. If sample labels are concatenated, remove the section half type (A or W).
- For coring summary tables, recovery is in percentages (%); the data should be integers/whole numbers (no decimals).

Table notes

- Table notes follow the caption above the table.
 - PDF tables: the table caption and table notes must be tagged separately.
 - CSV tables: notes are shown above the table and below the table caption.
- Define abbreviations/acronyms used in the table body in the table notes if they are not defined in text, are nonstandard for IODP, or may be unfamiliar to technical readers (exception: redefine everything in Operations tables).
- Place footnote (e.g., *) definitions at the beginning of the note. These symbols are not superscript in the table note.
- Table notes are organized as follows: (1) notes that apply to the entire table then (2) notes that apply to specific parts of the table in order of appearance in table top → right → down (**CMS17:3.76, 3.79**).
- If multiple tables contain the same abbreviations, repeat them in the notes for subsequent tables rather than referring to another table note.

- Use commas to separate table note items when describing things that can be conceptually grouped together. Use periods between table note items that are not grouped. See examples below.
 - APC = advanced piston corer, HLAPC = half-length APC, XCB = extended core barrel, RCB = rotary core barrel.
 - IC = inorganic carbon, CaCO₃ = calcium carbonate, TC = total carbon, TOC = total organic carbon, TN = total nitrogen, TS = total sulfur. TOC concentrations are calculated from the difference between IC and TC concentrations. C/N ratios are calculated from TOC and TN concentrations and are given as atomic ratios.

Biostratigraphic range charts

- When abbreviations denote a range of size, preservation, or abundance but appear in a random order within the table, group the abbreviations by type and list them from largest to smallest—abundance first, then preservation, then other.
 - Abundance: A = abundant, C = common, F = few, R = rare, T = trace. Preservation: VG = very good, G = good, M = moderate, P = poor.
- Check definitions used in table notes against definitions listed in the Methods chapter (abundance and preservation definitions may differ based on type of microfossil).

Typesetting tables in Frame

The following guidelines apply to tables formatted in FrameMaker for presentation as PDF. For CSV tables, see the ER table workflow on the Wiki.

- Formatted tables are offered only in portrait orientation.

Horizontal/Vertical rules

- Most typeset tables require only 3 horizontal rules: above and below the header row and below the last row (**CMS17:3.53**).
- Vertical rules should be used sparingly or not at all (**CMS17:3.53**). Generally, vertical rules can be used between every 5 columns of genus/species on a formatted range chart.
- Biostratigraphic and magnetostratigraphic age model tables formatted for methods chapters have specific horizontal and vertical rules to aid interpretation of the information. See the Table Sample booklet.

Column headers

- Column headers should be as brief as possible (abbreviations are acceptable if defined in the caption or notes) (**CMS17:3.56**).
- Move common elements from columns into the headers (months, years, units, etc.)
- Side headers are right-justified and followed by a colon.

Table body text alignment

- **Single-entry numbers with decimals:** align on decimal *<TableDecimalX>*.
- **Single-entry numbers without decimals:** flush right in middle of column *<TableDecimal>*.
- **Numeric ranges:** center in column *<TableCenter>*.
- **Table section headers** (indented rows below) *<TableTextNoIndent>*.
- **Sample identifiers:** flush left *<TableText>*.
- **Unit numbers:** flush left *<TableText>*.
- **Text:** flush left *<TableText>*.
- **Mixed numbers and letters:** align numerically *<TableDecimal>*.
- **Multiple values with common symbol** (such as a dash): Align on common symbol.
- Multiple values with no common symbol: align on decimal *<TableDecimal>*.
- Combination of data with some operational signs: align on decimal *<TableDecimal>*.
- Every item has an operational sign: center.
- Range data that include other numbers: center all *<TableCenter>*.
- **Roman numerals:** flush left *<TableText>*.
- **Side headers:** flush right *<TableTextRight>*.

Table body formatting

- Fractions are not typeset (use 6-3/4 inch, etc.).
- Add zeros before the decimal point but NOT following the decimal point unless required for significance (as instructed by scientist/author). IODP depths in meters are generally two decimal places.
- Decimal-aligned numbers are aligned on the decimal regardless of the number of digits on either side of the decimal. Center decimal-aligned material in the column based on the widest entry <TableDecimalX>.
- When any number in a table is greater than 9999, all numbers 1000 or greater should contain a comma.
- Sample identifier numbers are flush left <TableText> under the expedition-site-hole identifier <TableTextNoIndent>.
- Vertically spanned table cells are top-justified.
- Headers in horizontally and vertically spanned table cells (age events) are centered both horizontally and vertically.
- Text usually uses first-word initial capitalization except stratigraphic terms appear as they do in text (see **Capitalization**). Thus, in the entry “lower Eocene,” lower is not capitalized, even when it is the first word in the column.
- Use minus symbols for negative signs.
- Use en-dashes for ranges of values (do not use en-dash if either number in the range is negative).
- All data headers must have IODP standard units, where appropriate (see **Common IODP units**).
- In column headings, the singular form is used:
 - Age (Ma) vs. Ages (Ma)
 - Unit vs. Units
- The word “Unit” is not used in table body text if it is defined in the column header.
- Specify and define type of unit in table headings:
 - Lith. unit
 - PP unit
 - Log unit
 - Seismic unit
- “Subunit” is not used in table headers, even if subunits are shown on the table.
- Use symbol designations to reference note information in the following order (no super/subscript in notes):
 - asterisk * (not superscript)
 - dagger † (superscript)
 - double dagger ‡ (superscript)
 - double asterisk ** (not superscript)
 For CSV tables, use incrementing asterisks (i.e., *, **, ***, etc.) because daggers and double daggers do not hold up.
- Columns should be as narrow as possible without being extreme.
- Column headers can be stacked if the header text is much wider than the column text.
- A single line of column text can be moved to the note or wrapped if it is much wider than other column text.
- Use spanned headers only if needed to aid understanding of a complex table. If spanned groups of headers are adjacent, separate them using a 0.25 pica spacer column.

CSV tables

- All volume chapter tables are offered as CSV zip downloads.
- CSV tables are made from Excel files approved at the postcruise meeting before the author galleys are sent.
- See the ER table workflow SOP for instructions for preparing tables before and after postcruise meetings and list of symbols that do not hold up in CSV (e.g., change ° to deg).

Oversized tables

Oversized tables are prepared only when necessary because table content cannot be presented in an alternate easily understandable format. Oversized tables are formatted in a separate PDF file on an oversized page. This PDF file is placed in the volume OVERSIZE directory.

The following style of caption is placed in the chapter:

Table TX. Full caption. (This table is available in an **oversized format**.) [Download table in CSV format](#).

In the oversized PDF, the caption appears on the oversized sheet with the following slug placed in the upper left corner of the oversized page:

Proceedings of the International Ocean Discovery Program, Volume XXX
 Full chapter title, Table TX. Full caption and notes.
<https://doi.org/10.14379/iodp.proc.XXX.nnn.yyyy>

Figures

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- If a submitted figure is reproduced from a different publication, the submitting scientist(s) may need to obtain permission to use the figure. Wording in the caption may help determine if permission is needed.
 - **"Taken from" or "From": PERMISSION REQUIRED**
 - **"After"** means possible redrafting but no changes to information in figure: **PERMISSION REQUIRED**
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- The Production supervisor will determine if permission is needed for any figures. Production will contact the scientist for additional information or permissions. For SPs/PRs, the Editor will send the permission information when the file is sent for review.
- Figures taken from ODP and IODP publications do not require permissions, but attribution may be appropriate.

Figure formatting

The objective of formatting figures for the *Proceedings* volumes is to improve presentation and readability and to meet reader expectations for consistency across a volume. Formatted figures should be neater and easier to read than originals.

General formatting guidelines

- Sizing:
 - Figure is appropriately sized to fit portrait orientation on the 2-column PDF chapter page.
 - Similar types of figures are sized similarly for consistency and ease of layout.

- Scale:
 - Once sized, text, line weights, symbols, labels, legends, and colors are distinguishable and readable.
 - Text does not encroach on graphic elements.
- Alignment:
 - Column headers, axis labels, and text elements are spaced/centered/aligned appropriately and consistently.
 - Part letters are consistent; legend elements are spaced and aligned.
- Integrity:
 - All elements from original figure have been retained and figure meaning has not changed.
 - Figure presentation is improved from original.

Standard figure preparation guidelines

- Format figures in letter groups, sorted by figure type, to ensure consistency.
- Figures are presented in portrait orientation.
- Text is san-serif font (i.e., Helvetica or Arial).
- Bold, italic, and underlining is removed (exception: GPTS and biostratigraphic age charts).
- Stratigraphic stages/epochs are abbreviated (if necessary) per [Timescale abbreviations](#) below.
- Labels are sentence case (first letter capitalized).
- Vertical text: beginning of label is closest to bottom of the figure on both vertical axes.
- Legend symbols are same size, color, and shape as they appear in plots.
- Data axis labels and headings have units; ratios may be unitless.
- Depth scale units match those on submitted figures.
- Labels such as “Hole C”: change to Hole UXXXXC.
- Leave sample identifiers the way that are submitted (with or without the hyphen before section type [A or W]; e.g., 330-U1375A-7H-1-A or 330-U1375A-7H-1A); VCDs will also have the hyphen from the L2E download.
- Labels are singular: Age (Ma) vs. Ages (Ma).
- Lithostratigraphic/lithologic units are labeled “Lith. unit”; no use of “subunit” in headings or labels.
- If legend/key is set outside of the figure, do not use a box around it.
- Figures sized for 1 column (21 pica) if possible; maximum figure size is 43.5 pica × 56.0 pica.
- Figure part letters (A, B, C, D) are positioned *across and then down*; if this is adjusted, also adjust the caption.
- Standardize labels and units as follows:

• magnetic susceptibility → MS	• shotpoint → SP
• point magnetic susceptibility → MSP	• radiolaria → radiolarian(s)
• natural gamma (ray; radiation) → NGR	• ostracoda → ostracod(s)
• gamma ray attenuation → GRA	• planktic → planktonic
• graphic lithology → Lithology	• Myr → My
• X-ray diffraction → XRD	• kyr → ky
• X-ray fluorescence → XRF	• mm/a → mm/y
• natural remanent magnetization → NRM	• cm/yr → cm/y
• common depth point → CDP	• hr → h
• two-way traveltime → TWT	• sec → s
• vertical exaggeration (V.E.) → VE	• yr → y

Timescale abbreviations

Cenozoic (Cenoz.)	Quaternary (Quat.)	Holocene (Holo.)	
		Pleistocene (Pleist.)	Upper
			Ionian
			Calabrian (Cal.)
			Gelasian (Gel.)
	Neogene (Neog.)	Pliocene (Plio.)	Piacenzian (Piac.)
			Zanclean (Zan.)
		Miocene (Mio.)	Messinian (Mess.)
			Tortonian (Tort.)
			Serravallian (Serrav.)
			Langhian (Lang.)
			Burdigalian (Burd.)
			Aquitanian (Aquit.)
	Paleogene (Paleog.)	Oligocene (Oligo.)	Chattian (Chatt.)
			Rupelian (Rup.)
Eocene (Eoc.)		Priabonian (Priab.)	
		Bartonian (Bart.)	
		Lutetian (Lut.)	
		Ypresian (Ypres.)	
Paleocene (Paleoc.)		Thanetian (Than.)	
		Selandian (Selan.)	
		Danian (Dan.)	
Mesozoic (Mesoz.)	Cretaceous (Cret.)	Upper	Maastrichtian (Maast.)
			Campanian (Camp.)
			Santonian (Sant.)
			Coniacian (Coniac.)
			Turonian (Tur.)
			Cenomanian (Cenom.)
		Lower	Albian (Alb.)
			Aptian (Apt.)
			Barremian (Barrem.)
			Hauterivian (Haut.)
			Valanginian (Val.)
	Berriasian (Berrias.)		

Figure proofing guidelines

- Reviewers should proof figures in groups by letter as follows:
 - Compare each figure against the original printout.
 - Compare each figure with its caption: right figure, all elements included, and conveys original meaning.
 - Figure sizing and formatting choices are consistent within groups of like figures.
 - Text does not overwrite data, borders, lines, or graphic features.
 - Symbols or patterns are defined in a key or legend within or below the figure or in the caption.
 - All elements are visible and readable.
 - Components are in scale for figure size and meaning.
 - Alignment and centering are appropriate.
 - Figure presentation is improved from original.

Oversized figures

Oversized figures are prepared in a separate PDF file on an oversized page. This PDF file is placed in the volume OVERSIZE directory. Within the PDF chapter file, a reduced version of each oversized figure is placed on the appropriate figure page as a full-page thumbnail view with a link to the oversized file in the caption. This allows readers to print a small but complete version of the figure to a standard printer.

The following style of caption is placed in the chapter:

Figure FX. Full caption. (This figure is also available in an [oversized format](#).)

In the oversized PDF, the caption appears on the oversized sheet (generally ledger size [11 × 17]). The following slug is placed in the upper left corner of the oversized page:

Proceedings of the International Ocean Discovery Program, Volume XXX

Full chapter title, Figure FX. Full caption.

<https://doi.org/10.14379/iodp.proc.XXX.nnn.yyyy>

See the SOP for Oversized figure handling on the Wiki. See handling of oversized tables in [Oversized tables](#).

Captions

Table captions

- Full table captions for both formatted and CSV tables appear in PDF chapter text and bookmarks.
- Captions should be succinct and should not suggest any interpretation of the data ([CMS17:3.54](#)).
- Explanatory material should be moved to the table notes ([CMS17:3.78](#)).
- Standardize caption wording so the hole or site number appears at the end of the caption. When a table is not specific to a site or hole, include the expedition number.
 - Table T1. Coring summary, Hole U1320A.
 - Table T3. Lithostratigraphic units, Site U1320.
 - Table T4. Operations summary, Expedition 327.

Multipage table captions

- If a table spans multiple columns/pages, it is handled as follows:
 - [Page 1] Table T1. Compiled timescale used for Expedition 323. (Continued on next page.) OR (Continued on next X pages.)
 - [Following pages if more than two pages] Table T1 (continued). (Continued on next page.)
 - [Last page] Table T1 (continued).
 - The full caption with notes appears only on the first page of the table.

Figure captions

- Figure captions may consist of a word or two, an incomplete or complete sentence, several sentences, or a combination ([CMS17:3.21](#)).
- Include hole, site, or expedition number in the caption unless figure is generic/not expedition specific.
- Do not repeat information in the caption if it is shown in the figure.
 - If a symbol is defined in a key within the figure, do not define it in the caption as well.
 - If XPL/PPL is shown on the figure, do not repeat in the caption.
- Acronyms not previously defined in the text should be defined in the caption; image lighting (XPL, PPL, etc.) only needs to be defined the caption of the first figure it appears in.
- Use “solid” and “open” to describe symbols rather than “white,” “filled,” etc.
- Do not specify color of symbols in caption if the shape is unique (“squares” rather than “green squares”).
- Make sure core photograph intervals match captions; add information from originals if missing.
- Make sure photomicrograph image light (plane-polarized or cross-polarized as recorded on photomicrograph log) matches caption.
- Use a nonbreaking space (Ctrl + Space) to keep a part letter and caption together on one line.

Multipart figure captions

- If the caption for each part of the figure is a complete sentence or thought, the letter designating the figure part will be followed by a period, preceding the figure part description:
 - Figure F2. A. Bathymetry of eastern New Zealand region, with positions of major fronts at the ocean surface and the Antarctic Circumpolar and Pacific Deep Western Boundary currents. B. Meridional salinity cross section through the Pacific Ocean (data after Levitus, 1982), with location of Expedition 313 sites projected onto the plane of the section.
 - Figure F8. Interstitial water inorganic geochemistry profiles, Site U1365. A. Chloride. B. Magnesium. C. Salinity. D. Lithium. E. Barium. F. Sulfate.

- If the caption for each part of the figure is only a part of a complete sentence or thought, put the letter designating the figure part in parenthesis:
 - Figure F4. Geologic cross sections (A) through the eastern South Island and adjacent shelf and (B) from the shelf edge across the Campbell Plateau to the Southwest Pacific abyssal plain, Expedition 313.
 - Figure F8. Interstitial water inorganic geochemistry profiles for (A) chloride, (B) magnesium, (C) salinity, (D) lithium, (E) barium, and (F) sulfate, Site U1365.
- For multipart figures that are also multipage figures, set caption parts on the same pages as the corresponding figure parts.

Multipage figure captions

- If a figure spans multiple columns/pages:
 - [Page 1] Figure F13. Percent blue and red reflectance at Site 1090. (Continued on next page.) OR (Continued on next X pages.)
 - [Following pages if more than two pages] Figure F13 (continued). (Continued on next page.)
 - [Last page] Figure F13 (continued).
 - The caption can appear only on the first page of the figure, or part captions can appear above the parts on subsequent pages only.

Figure caption examples

Figure F6. Serpentinized ultramafic clasts. A. Radial aragonite crystals in lithified serpentinite mud (U1492A-1H-1, 82–84 cm, TS09; cross-polarized light [XPL]). B. Serpentinite with interpenetrating (left) and mesh (right) textures crosscut by a later fibrous serpentine vein (upper right) (U1492B-4F-2, 90–93 cm, TS21; XPL); orthopyroxene is altered to pseudomorphic bastite (upper left). C. Vermicular spinel intergrown with porphyroclastic orthopyroxene altered to bastite (U1492A-5F-1, 47–49 cm, TS17; plane-polarized light [PPL]). D. Serpentinized harzburgite containing mesh serpentine textures and interstitial primary clinopyroxene (Cpx) and bastite (Bas) (U1492B-13F-1, 62–68 cm, TS30; XPL).

Figure F8. Representative smear slides, Hole U1429B, Unit II. A. Radiolarian and volcanic glass in brown serpentinite mud (2H-2, 76 cm). B. Reddish brown Cr-spinel in dark bluish gray serpentinite mud (5F-1, 70 cm). C. Amphibole grain with brown-green pleochroism in dark bluish gray serpentinite mud (5F-1, 40 cm). D. Calcite grains in bluish gray serpentinite mud (27F-2, 73 cm). E. Euhedral carbonate crystals (31X-CC, 44 cm; bottom of hole). F. Gypsum crystals (31X-CC, 49 cm).

Plate captions

In ER chapters for almost every volume that has SEM photos, the SEM plates are presented as figures. We have been doing this since plates went digital and were no longer compilations of photographs (at least 10 y). We stopped routinely publishing taxonomic type sections at the end of ODP, and since then we retain plates only for the few taxonomic indexes that get published in ERRs.

Plate captions can be grouped by genus species or by sample to save some space on the page. See examples below.

Full plate caption (18 lines)

Plate P1. Nannofossils from Hole U1455A. Taxonomic organization and concepts are generally comparable to those of Young and Bown (1997) and Young (1998). Images with black background are cross-polarized light images; those with light backgrounds are phase-contrast images. Scale bars = 0.5 cm. 1. *Helicosphaera carteri* (8H-CC). 2. *Helicosphaera granulata* (35X-CC cm). 3. *Helicosphaera inversa* (3H-CC). 4. *Helicosphaera inversa* (3H-CC). 5. *Helicosphaera sellii* (13H-5, 15–17 cm). 6. *Helicosphaera sellii* (13H-5, 15–17 cm). 7. *Pontosphaera discopora* (9H-CC). 8. *Pontosphaera discopora* (2H-5, 5–6 cm). 9. *Pontosphaera multipora* (18H-CC). 10. *Syracosphaera pulchra* (8H-CC). 11. *Rhabdosphaera clavigera* (1H-4, 2–3 cm). 12. *Calciosolenia brasiliensis* (1H-4, 2–3 cm). 13. *Cyclicargolithus ?abisectus* (11.4 μm) (32X-CC). 14. *Cyclicargolithus floridanus*, 10.1 μm (27X-CC). 15. *Cyclicargolithus floridanus*, 9.3 μm (32X-CC). 16. *Cyclicargolithus floridanus*, 7.5 μm (32X-CC). 17. *Cyclicargolithus floridanus*, (35X-CC). 18. *Reticulofenestra bisecta*, 10.6 μm (35X-CC). 19. Small reticulofenestrids, ~1.7 μm (18H-CC). 20. *Reticulofenestra minuta*, 2.8 μm (5H-CC). 21. *Reticulofenestra haqii*, 3.1 μm (18H-CC). 22. *Reticulofenestra haqii*, 4 μm (27X-CC). 23. *Reticulofenestra haqii*, 4.3 μm (16H-CC). 24. *Reticulofenestra haqii*, 4.1 μm (14H-CC). 25. *Reticulofenestra haqii*, 4.7 μm (9H-CC). 26. *Reticulofenestra haqii-asanoi*, 5.4 μm (7H-CC). 27. *Reticulofenestra haqii-asanoi*, 6.3 μm (6H-CC). 28. *Reticulofenestra asanoi*; 6.6 μm (6H-CC). 29. *Reticulofenestra asanoi*, 6.8 μm (6H-CC). 30. *Reticulofenestra rotaria* (25X-4, 20–21 cm). 31. *Reticulofenestra pseudoubilicus*; 5.0 μm (27X-CC). 32. *Reticulofenestra pseudoubilicus*, 6.1 μm (26X-CC). 33. *Reticulofenestra pseudoubilicus*, 6.9 μm (26X-CC). 34. *Reticulofenestra pseudoubilicus*, 7.8 μm (19H-CC). 36. *Reticulofenestra pseudoubilicus*, 11.5 μm (28X-CC). 37. *Reticulofenestra pseudoubilicus*, 9.2 μm with grill (18H-

CC). 38. *Pseudoemiliana lacunosa*; (16H-CC). 39. *Pseudoemiliana lacunosa* (4H-CC). 40. *Pseudoemiliana ovata* (9H-CC). 41. *Emiliana huxleyi* (1H-4, 2–3 cm). 42. *Emiliana huxleyi* (1H-4, 2–3 cm).

Plate caption grouped by nannofossil (14 lines)

Plate P1. Nannofossils from Hole U1455A. Taxonomic organization and concepts are generally comparable to those of Young and Bown (1997) and Young (1998). Images with black background are cross-polarized light images; those with light backgrounds are phase-contrast images. Scale bars = 0.5 cm. 1. *Helicosphaera carteri* (8H-CC). 2. *Helicosphaera granulata* (35X-CC). 3, 4. *Helicosphaera inversa* (3H-CC). 5, 6. *Helicosphaera sellii* (13H-5, 15–17 cm). 7, 8. *Pontosphaera discopora*; (7) 9H-CC, (8) 2H-5, 5–6 cm. 9. *Pontosphaera multipora* (18H-CC). 10. *Syracosphaera pulchra* (8H-CC). 11. *Rhabdosphaera clavigera* (1H-4, 2–3 cm). 12. *Calciosolenia brasiliensis* (1H-4, 2–3 cm). 13. *Cyclicargolithus ?abisectus* (11.4 μm) (32X-CC). 14–17. *Cyclicargolithus floridanus*; (14) 10.1 μm (27X-CC), (15) 9.3 μm (32X-CC), (16) 7.5 μm (32X-CC), (17) 35X-CC. 18. *Reticulofenestra bisecta* (10.6 μm) (35X-CC). 19. Small reticulofenestrads (~1.7 μm) (18H-CC). 20. *Reticulofenestra minuta* (2.8 μm) (5H-CC). 21–25. *Reticulofenestra haqii*; (21) 3.1 μm (18H-CC), (22) 4 μm (27X-CC), (23) 4.3 μm (16H-CC), (24) 4.1 μm (14H-CC), (25) 4.7 μm (9H-CC). 26, 27. *Reticulofenestra haqii-asanoi*; (26) 5.4 μm (7H-CC), (27) 6.3 μm (6H-CC). 28, 29. *Reticulofenestra asanoi*; (28) 6.6 μm (6H-CC), (29) 6.8 μm (6H-CC). 30. *Reticulofenestra rotaria* (25X-4, 20–21 cm). 31–37. *Reticulofenestra pseudoumbilicus*; (31) 5.0 μm (27X-CC), (32) 6.1 μm (26X-CC), (33) 6.9 μm (26X-CC), (34, 35) 7.8 μm (19H-CC), (36) 11.5 μm (28X-CC), (37) 9.2 μm with grill (18H-CC). 38, 39. *Pseudoemiliana lacunosa*; (38) 16H-CC, (39) 4H-CC. 40. *Pseudoemiliana ovata* (9H-CC). 41, 42. *Emiliana huxleyi* (1H-4, 2–3 cm).

Plate caption grouped by sample (17 lines)

Plate P1. Nannofossils from Hole U1455A. Taxonomic organization and concepts are generally comparable to those of Young and Bown (1997) and Young (1998). Images with black background are cross-polarized light images; those with light backgrounds are phase-contrast images. Scale bars = 0.5 cm. 1, 10. 8H-CC; (1) *Helicosphaera carteri*, (10) *Syracosphaera pulchra*. 2, 17, 18. 35X-CC; (2) *Helicosphaera granulata*; (17) *Cyclicargolithus floridanus*; (18) *Reticulofenestra bisecta*, 10.6 μm . 3, 4. 3H-CC; *Helicosphaera inversa*. 5, 6. 13H-5, 15–17 cm, *Helicosphaera sellii*. 7, 40. 9H-CC; (7) *Pontosphaera discopora*; (40) *Pseudoemiliana ovata*. 8. 2H-5, 5–6 cm, *Pontosphaera discopora*. 9, 19, 21. 18H-CC; (9) *Pontosphaera multipora*; (19) small reticulofenestrads, ~1.7 μm ; (21) *Reticulofenestra haqii*, 3.1 μm . 11, 12, 41, 42. 1H-4, 2–3 cm; (11) *Rhabdosphaera clavigera*; (12) *Calciosolenia brasiliensis*; (41, 42) *Emiliana huxleyi*. 13, 15, 16. 32X-CC; (13) *Cyclicargolithus ?abisectus*, 11.4 μm ; (15) *Cyclicargolithus floridanus*, 9.3 μm ; (16) *Cyclicargolithus floridanus*, 7.5 μm . 14, 31. 27X-CC; (14) *Cyclicargolithus floridanus*, 10.1 μm ; (31) *Reticulofenestra pseudoumbilicus*, 5.0 μm . 20. 5H-CC, *Reticulofenestra minuta*, 2.8 μm . 22. 27X-CC, *Reticulofenestra haqii*, 4 μm . 23. 16X-CC, *Reticulofenestra haqii*, 4.3 μm . 24. 14H-CC, *Reticulofenestra haqii*, 4.1 μm . 25. 9H-CC, *Reticulofenestra haqii*, 4.7 μm . 26. 7H-CC, *Reticulofenestra haqii-asanoi*, 5.4 μm . 27–29. 6H-CC; (27) *Reticulofenestra haqii-asanoi*, 6.3 μm ; 28. *Reticulofenestra asanoi*, 6.6 μm ; (29) *Reticulofenestra asanoi*, 6.8 μm . 30. 25X-4, 20–21 cm, *Reticulofenestra rotaria*. 32, 33. 26X-CC; (32) *Reticulofenestra pseudoumbilicus*, 6.1 μm ; (33) *Reticulofenestra pseudoumbilicus*, 6.9 μm . 34, 35. 19H-CC, *Reticulofenestra pseudoumbilicus*, 7.8 μm . 36. 28X-CC, *Reticulofenestra pseudoumbilicus*, 11.5 μm . 37. 18H-CC, *Reticulofenestra pseudoumbilicus*, 9.2 μm with grill. 38. 16H-CC, *Pseudoemiliana lacunosa*, 39. 4H-CC, *Pseudoemiliana lacunosa*.

Short captions for tables, figures, and plates

- Short captions are used in the HTML navigation frame.
- Short captions should be a single line (two at most) (CMS17:3.40).
- In general, to prepare short captions, follow these guidelines:
 - Remove parenthetical information.
 - Remove sample identifier information.
- Each short caption should be unique.

Chapter appendixes

Appendixes appear at the end of the chapter text, after the references. Start the first appendix on a new page, and run in other appendixes after the first.

- Appendixes are generally set on a 2-column body page.
- If there is one appendix, label it “Appendix.” If there is more than one appendix, label them alphabetically: “Appendix A,” “Appendix B,” and so on.

- Figures and tables in appendixes take the appendix letter to precede the table/figure number; if there is only one appendix, use “A” in figure and table numbers: Figure AF1, Table BT3.

Supplementary material

Supplementary material can be included in the volume associated with expedition reports or research results. This can include any information or data the author wants available to supplement their results and usually includes data files in non-standard file formats other than PDF, ASCII, or CSV. If an author wants to include formatted Excel tables in the volume, place them in Supplementary material.

Supplementary material is not edited for volume style and is not converted to accessible formats but is rather presented as submitted by the author. The Editor provides Production with introductory descriptive text (see [Supplementary material](#) in Volume structure). The author may provide a readme.txt file with explanatory information for their data.

The Supplementary material HTML splash page shows a complete directory structure of the supplementary files. Readers should be given enough information in the chapter to find the appropriate data in the Supplementary material directory (e.g., see CRSC in [Supplementary material](#)). See the Supplementary material SOP for instructions on directory structure, file naming, and material handling.

Volume structure

Volumes front matter is structured as follows.

Title page

Contains the following information:

- Volume number and title (short expedition name)
- Platform, ports of call, and sites visited
- Expedition start and end dates
- Volume authorship
- Cover photo and site map
- Publisher information

Publisher’s notes

Each platform operator has specific publisher’s notes pages (see Master Pages in the FrameMaker template):

- Acknowledgment of NSF and other program funders
- Disclaimer
- Where to find shipboard core data and logging data
- Cover photo caption
- Copyright/license information
- ISSN and volume DOI
- Publication date

Contents

Volume contents are divided into five standard sections. From the contents page, the entire PDF volume can be downloaded in a zip file.

1. Expedition reports
2. Core descriptions
3. Supplementary material
4. Expedition research results
5. Drilling location maps

Expedition reports

Chapters

This section contains a list of all ER chapters, with links to HTML and PDF versions, selectors to download chapter figures and/or tables, and button links to current CrossRef Cited-by statistics, oversized materials, updates (IODP-II)/errata (IODP-I), and other information:

Expedition 362 summary

L.C. McNeill et al.

[HTML](#) [PDF](#) [Download figures](#) [Download table](#) [Cited by](#)

Expedition 362 methods

L.C. McNeill et al.

[HTML](#) [PDF](#) [Download figures](#) [Download table](#) [Cited by](#)**Site U1480**

L.C. McNeill et al.

[HTML](#) [PDF](#) [Download figures](#) [Download table](#) [Cited by](#)**Site U1481**

L.C. McNeill et al.

[HTML](#) [PDF](#) [Download figures](#) [Download table](#) [Cited by](#)**Core descriptions**

This section contains the expedition descriptive (“prime”) data, which includes visual core descriptions (VCDs), thin section reports, and/or smear slide tables. The standard text for this section is as follows:

“Visual core descriptions (VCDs) are presented in PDF files for each site.”

Site U1480 · Site U1481

“Thin sections and/or smear slides for each site or hole are presented in CSV or PDF format in the CORES directory and in Excel format in DESC_WKB in Supplementary material. The entire set of core images in PDF is available in the IMAGES directory.”

Supplementary material

The general content of the supplementary material is described as follows (customized for each volume):

“Supplementary material for the Volume 362 expedition reports includes DESClogik workbooks in Microsoft Excel format; amorphous silica extraction procedures and data in PDF; WRMSL magnetic susceptibility calibration error and MAD sample drying technique information in Microsoft Word and Microsoft Excel formats; images of sediment ripples, smear slide description sheets, and XRD data in JPG and EVA formats; and structural and drilling data and calculations in Microsoft Excel format and PDF. A full list of directories can be found in SUPP_MAT in the volume zip folder or on the [Supplementary material for Volume 362 expedition reports](#) web page.”

Expedition research results

Expedition research results will be populated during the postcruise research period. It contains one subheading:

Data reports

Pending.

Drilling location maps

“A site map showing the drilling locations for this expedition and maps showing the drilling locations of all International Ocean Discovery Program (IODP) expeditions, produced using QGIS (<http://www.qgis.org>), and all Integrated Ocean Drilling Program, Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DSDP) expeditions, produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.F. Smith (<https://www.generic-mapping-tools.org>), are available in PDF.”

IODP Expedition 362 site map**IODP map****Integrated Ocean Drilling Program map** (Expeditions 301–348)**ODP map** (Legs 100–210)**DSDP map** (Legs 1–96)**Dedication and/or Acknowledgments**

These sections are optional, to be decided by the science party. If a dedication is to a deceased person, include a photo if available (include photo credit).

Foreword

Standard page for all volumes; changes when IODP Form Chair changes (every 3 years).

Reviewers for this volume

Not populated until expedition research results are accepted and published (only listed in HTML).

International Ocean Discovery Program

Contact information for all platform operators and core repositories.

Expedition 3XX participants

Affiliations and contact information for the expedition scientists and education and outreach officers. Author affiliation information is always listed in the same order regardless of country (Department, University, Country) for SPs, PRs, front matter, and ERRs.

Operational and technical staff

Operational staff, shipboard personnel and technical representatives, and Publications Services staff.

Expedition-related bibliography

The bibliography shows the *Scientific Prospectus*, *Preliminary Report*, and volume chapters, which are added when the volume is published. Journal papers, book chapters, abstracts, and other expedition-related publications and presentations are listed on the bibliography as we are notified of them.

Chapter/volume updates

If a volume or manuscript contains an error that is corrected after publication, an update is noted. See the Chapter/Volume updates/errata SOP on the Wiki for more information.

Volume update page

- The corrected table, figure, or text replaces the original in the HTML, PDF, and download zip folders volume.
- An “updates” button is added to the chapter on the volume contents, which opens the volume Updates page, entitled “Updates for the *Proceedings of the International Ocean Discovery Program* Volume 3XX.”
- The volume updates page lists chapter name (linked back to chapter), where and what was fixed in the chapter, and the date it was fixed. What was fixed must be specific:
 - **Yes:** **Expedition 319 summary:** The latitude for Site C0010 was corrected in Table T1. (20 July 2012)
 - **Yes:** **Data report: summary of XRF scanning on core sections, IODP Expedition 381:** In Methods text, XRF current settings were changed from 40 mA to 0.04 mA and from 500 mA to 0.5 mA. (12 March 2019)
 - **No:** **Expedition 319 summary:** Table T1 was corrected. (20 July 2012)

CrossMark metadata update

- Deposit CrossMark updates for changes that are likely to effect “the interpretation or crediting of the work” or editorially significant changes (not minor changes such as spelling corrections, formatting changes, etc.).
- The CrossMark metadata updates the publication history and indicates that a post-publication change has been made. CrossMark update deposits can be made for addendum, clarification, correction, corrigendum, erratum, new_edition, new_version, partial_retraction, removal, and withdrawal.
- When the correction is made in situ (i.e., replaces the earlier version completely), then the DOI of the corrected content is the same as the DOI for the original CrossRef deposit.
- For extensive changes, a new DOI is assigned the chapter and the CrossMark deposit shows the relationship between the original and new DOIs.

Style guide supplements

Common IODP units

Inorganic geochemistry

Measurement	Unit	Abbreviation
Loss on ignition (LOI) in sediment/rock	weight percent	wt%
Salinity (IW)	dimensionless	none
Dissolved minor constituents in IW (Sr, Ba, Fe, Mn, Li, B, Si, Cu, Mo, Ni, V, Zn)	micromolar	μM
	parts per billion	ppb
Dissolved oxygen	micromolar	μM
	micrograms per liter	μg/L
Dissolved anions in IW (PO ₄ , NO ₃ , NH ₄)	micromolar	μM
Dissolved cations/anions in IW (alkalinity, Cl, SO ₄ , Ca, Mg, K, Na)	millimolar	mM
Major element oxides in sediment/rock (SiO ₂ , TiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , MnO, MgO, CaO, Na ₂ O, K ₂ O, P ₂ O ₅)	weight percent	wt%
Trace elements in sediment/rock (Ba, Cr, Sc, Sr, V, Y, Zr, Zn, Co, Cu, Nb, Ni)	parts per million	ppm
Elemental ratios	dimensionless	none
Total N and total S in sediment/rock	weight percent	wt%
pH	dimensionless	none
Manheim squeezer pressure	megapascal	MPa
Solution concentration	molar	M
Standard deviation	same as measurement	
ICP wavelength	nanometer	nm

NOTE: μM = μmol/L, mM = mmol/L

Organic geochemistry

Measurement	Unit	Abbreviation
Total organic carbon (TOC)	weight percent	wt%
Total carbon (TC), inorganic carbon (IC)	weight percent	wt%
Total inorganic carbon (TIC)	weight percent	wt%
Calcium carbonate (CaCO ₃)	weight percent (see Lithostratigraphy table below)	wt%
Hydrogen index	milligrams hydrocarbon per gram sediment	mg HC/g sediment
Oxygen index	milligrams CO ₂ per gram sediment	mg CO ₂ /g sediment
Hydrocarbon gases (C ₁ , C ₂ , C ₃ , C ₄ , etc.)	parts per million by volume	ppmv
C ₁ /C ₂ ratio	dimensionless	none

Lithostratigraphy

Measurement	Unit	Abbreviation
XRD wavelength	Angstrom	Å
XRD plot x-axis unit	degree 2-theta	°2θ
XRD plot y-axis unit	counts	counts
Mineral composition by thin section	percent, modal percent, or volume percent	%, mod%, vol%
Calcium carbonate (CaCO ₃) by smear slide	percent (see Organic geochemistry table above)	%
Grain size	phi	φ
Color reflectance wavelength	nanometer	nm
Color reflectance unit (L*, a, b)	percent	%
Brightness/Lightness	percent	%

Paleomagnetism

Measurement	Unit	Abbreviation
NRM and ARM intensity	ampere per meter	A/m
Magnetization	ampere meter squared per kilogram	Am ² /kg
Magnetic moment	ampere per square meter	A/m ²
Applied field	tesla or millitesla	T or mT
Inclination and declination	degrees	°
Magnetic susceptibility (κ)	dimensionless (SI)	none
Coercivity (B)	millitesla	mT

Physical properties

Measurement	Unit	Abbreviation
Density (GRA, bulk, dry, grain) (ρ)	grams per cubic centimeter	g/cm ³
Moisture	weight percent	wt%
Temperature	degrees celsius	°C
	degrees kelvin	K
Thermal conductivity	watts per meter degree kelvin	W/(m·K)
Compressional wave (P -wave) velocity	meters per second	m/s
	kilometers per second	km/s
Natural gamma radiation	counts per second	counts/s
Heat flow	milliwatts per square meter	mW/m ²
Porosity (ϕ)	percent	%
	fraction	none
Vane shear strength	kilopascal	kPa
Pressure	bar	bar

Microbiology

Measurement	Unit	Abbreviation
Perfluorocarbon tracer in sediment	nanograms PFT per gram sediment	ng PFT/g sediment
Seawater contamination of cores	microliter seawater per gram sediment	μ L seawater/g sediment
Radioactivity	milliCurie	mCi
Radiotracer activity	becquerel or kilobecquerel	Bq or kBq
Microbial growth	colony formation unit	cfu
Cell counts	cells per cubic centimeter	cells/cm ³

Biostratigraphy/Age models

Measurement	Unit	Abbreviation
Sedimentation rate	meters per million years	m/My
	centimeters per thousand years	cm/ky
Accumulation rate	grams per square centimeter per million years	g/cm ² /My
Age	millions of years old	Ma
	thousands of years old	ka
Time span (duration)	millions of years	My
	thousands of years	ky
Carbon stable isotope ($\delta^{13}\text{C}$)	permil	‰
Oxygen stable isotope ($\delta^{18}\text{O}$)	permil	‰

Downhole logging

Measurement	Unit	Abbreviation
Photoelectric effect	barns per electron	b/e ⁻
Resistivity	ohm meters	Ωm, Ω·m
Thermal gradient	degrees per meter	°C/m
Velocity	milliseconds per foot	ms/ft
Acceleration	milliseconds per square second	ms/s ²
Azimuth	degrees	°
Gamma radiation	American Petroleum Institute units	gAPI
	counts per second	counts/s, cps
NGR: formation thorium and uranium	parts per million	ppm
NGR: formation potassium	weight percent	wt%

Operations

Measurement	Unit	Abbreviation
Rate of penetration (ROP)	meters per hour	m/h
Ship speed	knots	kt
Ship distance traveled	nautical miles	nmi
Weight on bit (WOB)	kilo-pounds (conv. to pounds)	klb, lb
Time	hours Universal Time Coordinated	UTC, h
Pumping rate	gallons per minute	gal/min
PDR frequency	kilohertz	kHz
Pressure	pounds per square inch	lb/inch ²
Mud pumped volume	barrels	bbl
Mud weight	pounds per gallon	lb/gal

Seismic

Measurement	Unit	Abbreviation
Acoustic impedance	grams per square centimeter per second	g/(cm ² ·s)
Two-way traveltime	seconds or milliseconds	s or ms

Mechanical properties

Measurement	Unit	Abbreviation
Stiffness modulus	kilopascal	kPa
Strain	percent	%
Effective stress	kilopascal or megapascal	kPa or MPa
Permeability	square meters	m ²
Diffusivity	square meters per second	m ² /s
Sediment consolidation	cubic centimeters	cm ³
Applied flow rate	cubic centimeters per second	cm ³ /s
Viscosity	pascal seconds	Pa·s

Species lists and Systematic paleontology

Species lists or systematic paleontology descriptions are generally not included in the main body of text but are treated as a Taxonomic appendix.

Species list formatting

Simple species list

A simple species list, consisting only of the formal species name with or without references and/or plate citations is formatted as follows:

- The first line of the entry is set flush left, with carryover lines indented `<TaxHangingIndent>`.
- The font size of tax text is one point smaller than body text.
- The genus names of each entry are spelled out.
- Master page can be 1 column or 2 column portrait.

Actinocyclus ehrenbergii Ralfs in Pritchard, 1861; Hustedt, 1929, p. 525, pl. 1, fig. 298.

Actinocyclus ellipticus var. *javanica* Reinhold, 1937; Barron 1985a

Actinocyclus tennellus (Jørgensen) Andrews, 1976, p. 14, pl. 3, figs. 8, 9; as *A. ehrenbergii* var. *tenella* (Jørgensen) Hustedt, 1929, p. 530, pl. 1, fig. 302.

Extended species description

The extended species description is used if descriptive material, remarks, or other information is given in addition to the usual one- or two-line entry.

- The primary entry is tagged `<TaxHangingIndent>`.
- Additional information is given in a new paragraph, first line indented `<TaxText>`.
- List entries should be separated by a 6-point space `<TaxHangingIndentSpaceAbove>`.
- The genus name of each entry should be spelled out.

Crucidentacula nicobarica (Grunow) Akiba and Yanagisawa, 1986, p. 486, pl. 1, fig. 9, pl. 2, figs. 1–7, pl. 5, figs. 1–9; Akiba, 1986, pl. 26, figs. 1–4; Yanagisawa and Akiba, 1990, p. 232, pl. 1, figs. 23–29.

Remarks: *Crucidentacula paranicobarica* vars. described by Akiba and Yanagisawa (1986) are tabulated together.

Actinocyclus ingens var. 1 (Plate P1, figures 7, 12).

Description and Remarks: This precursor form to *A. ingens* is characterized by closely packed areolae and light silicification of the central area. In Hole 1138A, *A. ingens* var. 1 has a lowest occurrence in Sample 183-1138A-23R-CC (210.85 mbsf), just below the FO of *A. ingens* s.s.

Araniscus lewisianus (Greville) Komura, 1998, pp. 6–8, figs. 20–22, 87–104, and text fig. 1.

Basionym: *Coscinodiscus lewisianus* Greville; Schrader, 1973, p. 703, pl. 8, figs. 1–6, 10, 15; Schrader, 1976, p. 631, pl. 14, fig. 3; Harwood and Maruyama, 1992, p. 702, pl. 6, fig. 13.

Azpeitia harwoodii Bohaty and Shiono n. sp. (Plate P3, figures 1–6, 10–13).

Synonym: *Azpeitia* sp. B of Shiono, 2000a (doctoral thesis), pl. 34, figs. 1–6; pl. 35, figs. 1–6.

Description: Valve is heavily silicified and circular in outline. Two to three areolae are present on the mantle between the valve face and valve edge. Some specimens display a weakly developed central hyaline ring on the exterior of the valve and/or increased silicification between the central areolae.

Type Level and Locality: Sample 183-1138A-11R-6, 100–101 cm, Hole 1138A, Central Kerguelen Plateau.

Holotype: Plate P3, figure 1 (high and low focus).

Type Specimen: Slide deposited in the California Academy of Science microfossil slide collection, CAS Slide Number 221034, CAS Accession Number 619994.

Stratigraphic Distribution: *A. harwoodii* is documented in Pliocene sections from both the Southern and North Pacific Oceans. The stratigraphic range for *A. harwoodii* in Hole 1138A (corresponding to Core 183-1138A-11R), falls within Subchron C2Ar, with an estimated age range of ~4.2–3.7 Ma.

In the northwest Pacific, *A. harwoodii* is recorded in Pliocene samples from DSDP Hole 579A. In this section, rare specimens of *A. harwoodii* were observed in middle Pliocene Sample 86-579A-11-2, 30–31 cm. The Pliocene interval of Hole 579A is assigned an age of ~3.6–3.4 Ma, which is a slightly younger occurrence than documented at Southern Ocean Site 1138.

Remarks: A pseudonodulus on the valve margin of *A. harwoodii* was not identified in SEM examination of specimens from Hole 1138A but was, however, noted on some specimens from Hole 579A (Shino, 2000b, pl. 34, fig. 4). Pending further SEM work on this taxon, we have elected not to include the presence of a pseudonodulus as part of the description of *A. harwoodii*.

A. harwoodii belongs to the “*Azpeitia nodulifera* group” described by Shiono and Koizumi (2002) and is taxonomically similar to *Azpeitia nodulifera* (see Fryxell et al., 1986, p. 19, 20, figs. XVII, XVIII-1, 2, 4, 5, and XXX-3, 4), a modern species found in warm-water regions. *A. harwoodii*, however, is typically smaller in diameter (18–55 µm) than *A. nodulifera* (20–100 µm).

Paleoecology: Given the warm-water affinity of modern taxa in the “*Azpeitia nodulifera* group” (Hasle and Syvertsen, 1996), the presence of *A. harwoodii* at Sites 579, 1138, and 1165 may be associated with local Pliocene warming at these sites in the North Pacific and Southern Oceans.

Derivation of Name: This species is named in honor of Dr. David Harwood at the University of Nebraska-Lincoln for his contributions to the development of Southern Ocean diatom biostratigraphy.

Authorship: The description of this new taxon is co-authored by Dr. Masamichi Shiono at Hokkaido University, Sapporo, Japan.

Systematic paleontology

Systematic paleontology is a section containing an extended, formal description of anything from two or three to a hundred species, usually including level(s) of subheads above the species level (genus, family, class, order, etc.) and subheads within the species description itself.

- All entries down to and including the species designation should be marked for bold and centered <TaxCenteredFamily> and <TaxCenteredSpaceAbove>.
- Tag <TaxCentered> for the non-bolded plate entry.

Subclass RADIOLARIA Muller, 1858
Order POLYCYSTINA Ehrenberg, 1838; emend. Riedel, 1967
Suborder SPUMELLARIA Ehrenberg, 1875
Family COLLOSPHAERIDAE Muller, 1858
Genus POLYSOLENIA Ehrenberg, 1872; emend. Nigrini, 1967

Polysolenia murrayana (Haeckel)
 (Plate **P2**, figure 2)

Choenicosphaera murrayana (Haeckel) Benson, 1966, p. 120, pl. 2, fig. 3.

Polysolenia murrayana (Haeckel) Nigrini and Moore, 1979, p. 517, pl. 2, figs. 4a, 4b.

Subfamily ARTISCINAE Haeckel, 1881, emend. Riedel, 1967
Genus OMMATARTUS Haeckel, 1881, emend. Riedel, 1971

Ommatartus avitus Riedel
 (Plate **P1**, figures 9–11)

Ommatartus avitus riedel, Riedel and Sanfilippo, 1971, p. 1588, pl. 4, fig. 6; Zachariasse et al., 1978, p. 10, pl. 2, fig. 9.

Remarks: The polar caps of this species frequently are broken, so it is sometimes difficult to distinguish this species from *O. penultimus*. *O. avitus* is characterized by its tuberculate (knobby) cortical shell. In this study, the extinction of *O. avitus* (~3.2 Ma) is considered a chronostratigraphic datum level.

Genus BACHMANNOCENA Locker, 1974, emend. Bukry, 1987

Remarks: For discussion on our use of *Bachmannocena* see McCartney and Wise (1990).

Bachmannocena apiculata (Schulz)

Mesocena oamaruensis apiculata Schulz, 1928, p. 240, fig. 11.

Bachmannocena apiculata (Schulz); Bukry, 1987, pp. 403–404; McCartney and Wise, 1990, pl. 2, figs. 6–10; McCartney and Harwood, 1992, pl. 1, fig. 9.

Remarks: This taxon is not subdivided into multiple subspecies (see Bukry, 1987) in this study because of the low number of specimens that were observed and the lack of biostratigraphic significance.

Bachmannocena circulus (Ehrenberg)

Mesocena circulus (Ehrenberg), Ehrenberg, 1844, p. 65.

Bachmannocena circulus (Ehrenberg); Bukry, 1987, p. 404; McCartney and Harwood, 1992, pl. 2, figs. 1, 2; McCartney et al., 1995, pl. 4, figs. 1, 7; pl. 8, fig. 8.

Remarks: *B. circulus* has a large polygonal ring with small pointed spines. It was the dominant taxon in Sample 183-1138A-15R-CC, occurring two cores below the base of the *Distephanus speculum speculum* f. *pseudofibula* plexus. In low latitudes, *B. circulus* can be abundant in the Pliocene but is less common in the Miocene (McCartney et al., 1995).

Bachmannocena diodon diodon (Ehrenberg)

Mesocena diodon Ehrenberg, 1844, pp. 71, 84.

Bachmannocena diodon (Ehrenberg); Bukry, 1987, p. 404.

Bachmannocena diodon diodon (Ehrenberg); McCartney et al., 1995, pl. 4, fig. 8.

Remarks: This taxon was abundant in Sample 183-1138A-21R-CC and co-occurs with the dominant *B. circulus*.

Bachmannocena elliptica (Ehrenberg)

Dictyocha (Mesocena) elliptica Ehrenberg, 1840, p. 208; Ehrenberg, 1854, pl. 20(1), fig. 44a, 44b.

Mesocena elliptica (Ehrenberg); Bukry, 1978a, p. 819, pl. 6, figs. 6–13.

Bachmannocena elliptica (Ehrenberg); McCartney et al., 1995, p. 145.

Remarks: Only three specimens of this taxon were found in Sample 183-1138A-21R-CC. These specimens were fairly small, 30–50 µm, in comparison with other silicoflagellates viewed in this study, which placed them in *B. elliptica* rather than the somewhat larger and typically younger *Bachmannocena quadrangula*.

Genus CORBISEMA Hanna, 1928, emend. Frenguelli, 1940**Corbisema triacantha (Ehrenberg)**

Dictyocha triacantha Ehrenberg, 1844, p. 80.

Corbisema triacantha (Ehrenberg); Busen and Wise, 1977, p. 713.

Genus DICTYOCHA Ehrenberg, 1837**Dictyocha aculeata (Lemmermann)**

Dictyocha fibula var. *aculeata* Lemmermann, 1901, p. 261, pl. 11, figs. 1, 2.

Dictyocha aculeata (Lemmermann); Dumitrica, 1973, p. 907, pl. 9, figs. 5–10; McCartney et al., 1995, pl. 9, fig. 2.

Dictyocha calida calida Poelchau

Dictyocha calida Poelchau, 1976, p. 169, pl. 1, figs. c, d; pl. 3, figs. a–f.

Dictyocha calida calida Poelchau; Bukry, 1979a, p. 560, pl. 1, fig. 7; McCartney et al., 1995, p. 146.

Dictyocha extensa extensa (Locker)

Dictyocha varia f. *extensa* Locker, 1975, pp. 99–101, figs. 1/2, 3/3.

Dictyocha extensa (Locker); Locker and Martini, 1986, pp. 903, 904, pl. 2, figs. 10–12; pl. 11, fig. 3; McCartney et al., 1995, pl. 3, figs. 2–5; pl. 5, figs. 3, 7; pl. 8, fig. 8.

Remarks: This is an important taxon in the late Miocene and Pliocene of low latitudes, where it and *D. varia* form an evolutionary transition (see McCartney et al., 1995). It was found in the upper Miocene and lower Pliocene, with a single specimen in the lower Miocene. This taxon is typically more abundant at lower latitudes (see McCartney et al., 1995).

Dictyocha fibula fibula Ehrenberg

Dictyocha fibula Ehrenberg; Locker, 1974, p. 636, pl. 1, fig. 6 (= lectotype).

Dictyocha fibula fibula Ehrenberg; Locker and Martini, 1986, p. 904, pl. 5, figs. 1, 2; pl. 11, figs. 8, 9; McCartney et al., 1995, pl. 2, fig. 1; pl. 5, fig. 5.

Remarks: This group of dictyochid silicoflagellates is abundant in Miocene sediments of low and middle latitudes and are less abundant in higher latitudes. Specimens of *D. extensa* were smaller in size and had a higher basal ring aspect ratio than those of *D. fibula*. In this study, we accept Locker's (1974) designation of a large skeleton with a short-axis bridge as the lectotype for *D. fibula*; note that there is an error in the remarks for this taxon in McCartney et al. (1995), which states that the lectotype has a long-axis bridge.

Queries to author

Queries to the author should be concise and avoid sounding casual, pedantic, condescending, or indignant (**CMS17:2.69**).

- Tag author queries with the Query character tag.
- Use square brackets around each query.
- Start each query with “AUTHOR:”
- Because Production moves queries (except for those in References section) to the page margins during layout to reduce layout changes during later stages, make sure the author can tell exactly what the query is about (be specific in the query and change the color of the relevant text to red).
- Queries might be used for the following:
 - To point out a reference is not called out: **[AUTHOR: Please cite in chapter/document or remove from list.]**
 - To request a missing reference: **[AUTHOR: Please provide reference.]**
 - To ask for clarification: **[AUTHOR: Do you mean X?]**
 - To confirm genus/species spelling if unable to verify
 - To point out a discrepancy, possible error, or omission: **[AUTHOR: Please define WIPB in Table T3.]**