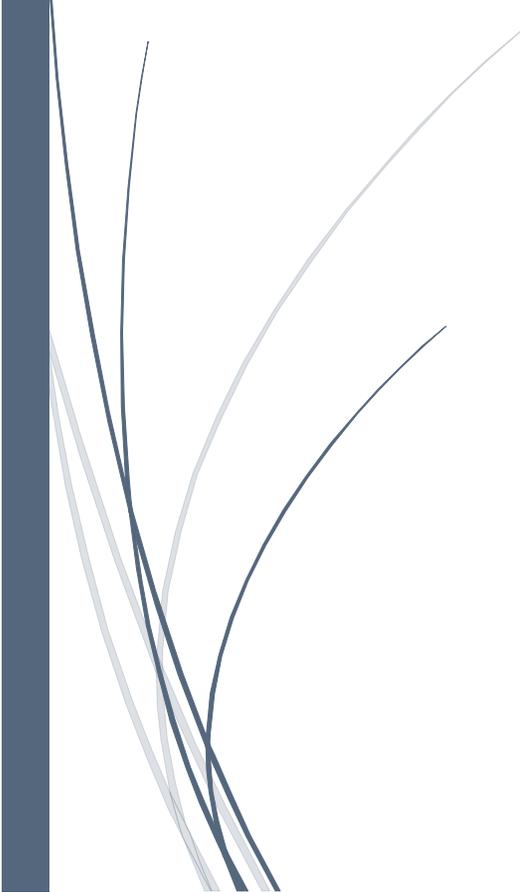


A dark blue vertical bar on the left side of the page, with a lighter blue arrow pointing to the right, overlapping it.

Division of
Invertebrate
Paleontology
(Microfossil Project)
Data Standards



AMERICAN MUSEUM
OF NATURAL HISTORY

A decorative graphic on the left side of the page, consisting of several thin, curved lines in shades of blue and grey that resemble stylized grass or reeds.

1 CONTENTS

2	Introductory thoughts.....	4
2.1	Thoughts on Digitization	4
2.1.1	What is Digitization?	4
2.1.2	Why Digitization?	4
2.2	Classifying Biological Collections.....	4
3	Data Fields Defined	5
3.1	Specimen Identifiers.....	5
3.1.1	Serial Number.....	5
3.1.2	Old Catalogue Number	6
3.1.3	Catalogue Number	6
3.1.4	Division/Unit Name	6
3.2	Taxonomy.....	7
3.2.1	Higher Taxon	7
3.2.2	Lower Taxon	7
3.2.3	Scientific Name.....	9
3.2.4	Identified by	10
3.2.5	Date identified.....	10
3.2.6	Specimen Type Status	10
3.3	<i>Collecting Event Information</i>	11
3.3.1	Collector	11
3.3.2	Date Collected	11
3.3.3	Country/Continent/Ocean	12
3.3.4	Country Code.....	12
3.3.5	State/Province.....	12
3.3.6	County/Parish/District.....	13
3.3.7	Detailed Locality	13
3.3.8	Locality Number	14
3.3.9	Latitude/Longitude.....	14
3.4	<i>Chronostratigraphy/Geochronology</i>	15
3.4.1	System/Period	15
3.4.2	Series/Epoch.....	15
3.4.3	Stage/Age	16
3.5	<i>Lithostratigraphy</i>	16
3.5.1	Group	16

3.5.2	Formation.....	17
3.5.3	Member.....	17
3.5.4	Bed	17
3.5.5	Biozone.....	18
3.5.6	Lithostratigraphic Description	18
3.6	<i>Publication</i>	19
3.6.1	Author/Subsequent Author.....	19
3.6.2	Title of Journal/Book/Periodical.....	19
3.6.3	Title of Publication	19
3.6.4	Publication Date	20
3.6.5	Pagination.....	20
3.6.6	Cited Number	20
3.7	<i>Management Records</i>	21
3.7.1	Collection.....	21
3.7.2	Number of Specimens	21
3.7.3	Repository	21
3.7.4	Donor.....	22
3.7.5	Accession Number.....	22
3.7.6	Storage Information	22
3.7.7	Data Entered by.....	23
3.7.8	Date Data Entered.....	23
3.7.9	Remarks.....	23
3.7.10	Selected for Photo.....	23
3.7.11	Selected for CT	24
3.7.12	Condition of Specimen	24
3.7.13	Status of Specimen	24
3.8	<i>Quality Control</i>	24
3.8.1	Quality Control Status	24
3.8.2	Quality Control Remarks	25
4	Appendix	25
4.1	Glossary of Terms.....	25
4.2	Common Abbreviations used in Taxonomy	32
4.3	Type Specimen Abbreviations	33
4.4	Pagination Abbreviations	33
4.5	Rock Type Abbreviations.....	33

4.6	Useful Keystroke Shortcuts	34
4.7	Taxonomic Suffixes.....	34
4.8	<i>Taxonomic Listings</i>	35
	USNM List of Invertebrate Paleontology Taxonomy, Courtesy NMNH, AMNH archives 1975-1989	35
	AMNH Invertebrate Higher Taxonomy List	36
4.9	International Chronostraphic Chart	36
	37

2 INTRODUCTORY THOUGHTS

Welcome to the data entry portion of collections management. The work you do is very important and should not be taken lightly. It is a very exciting time in collections work as there are major ongoing efforts to digitize collections and YOU are part of this effort. The following text will act as a guide through the extremely important task you now face.

2.1 THOUGHTS ON DIGITIZATION

2.1.1 What is Digitization?

Much of a specimen's value lays not in the specimen itself, but the associated data that supplies context (e.g. identifications, descriptions, geographical and stratigraphic information). Collections digitization is the process by which the associated data about specimens held in collections at museums, or other institutions are converted from analog to digital form and made available to users across the world via the web. In addition, digitization refers to imaging in various forms (e.g. specimen imaging, field notebooks, ledgers, locality images, etc.).

2.1.2 Why Digitization?

Specimens are records of natural history, but have received decreased interest over the years. Digitization has revived these specimens and collections, restoring the story they tell.

The biggest incentive for most curators and collection managers is to make the data available to researchers and other users. In addition, digitization allows for collection managers and curators to save time, by streamlining the process of dealing with basic collections queries and duties, and allowing staff members to spend more time and resources utilizing their specialist expertise and knowledge. A digitized collection accelerates the rate of acquisition and assimilation of new collections and their associated data by providing institutions with readymade solutions of data management and digestion. Ultimately, this would lead to better curated collections and better services to the research community. In addition, the incorporation of networking technologies will supply collective wisdom in order to tackle a variety of problems such as specimen identification and georeferencing at a global level. This also improves the public exposure, and participation in collections and research as citizen scientists, and providing valuable STEM education opportunities. Students around the world will be able to access infinitely larger study sets for labs and lectures, and aid in the understanding of individual organisms, populations, species, and biogeography. The incentives and applications are endless and will develop even more as software progresses.

2.2 CLASSIFYING BIOLOGICAL COLLECTIONS

Classification is an important research tool and is extremely important in the day to day management of natural history collections. The more we learn the more detailed and sophisticated becomes our classification. People collect and classify almost anything – stones, coins, bottle caps, insulators, furniture, architecture, plants, animals, and people. To classify one merely places like things together to make groups with systematic relations – that is there is system to the classification. The groups may be based on color, shape, size, function, and a multitude of the object to be classified. Classifying is a means of organizing knowledge and a robust classification can lead to insights and can be predicative.

Although we all continually classify our surroundings, some people chose to make careers of it. Biologists have developed a complex system of classification of nesting groups based on detailed knowledge of the structure of organisms. The members of each group possess features and characters that define each group. As the number of members of a group increases, it is often clear that secondary groups within the primary group can be recognized.

Biological classifications are artificial or natural, the latter sometimes referred to cladistics. An artificial classification might group things together that fly (eg. bats, birds, and flying insects), things with spines (eg. Sea urchin, porcupines, and walnuts), and things with two eyes (eg. Humans, fish, insects, turtles, and birds). In these classifications, not many predictions can be made. As members of artificial groups are studied more thoroughly it becomes clear that the shared character, as in artificial classifications the group is usually shares only one common characteristic, differs among members of the group. For instance, the wings of a beetle and a bird are different both structurally and in origin – bird wings are modified limbs, while insect wings originate from thoracic lobes.

In contrast, natural classifications are dependent on shared structures of common origin. As members within groups and among groups are studied structurally, we find transitional structures that suggest patterns of modified descent and relationships between organisms. Groups of organisms that share a set of unique features are grouped together. If we examine these groups with uniquely shared features three at a time, we might discover that two of the three share more character than the third. As more clusters of three groups are studied a branching diagram can be constructed where each line can be supported, ideally, by a unique modified structure and soon a tree can be seen – a phylogenetic tree. If a new organism is found it can be placed in the tree based on shared characteristics. These groups with unique characteristics can be and are named. This is the classification of biologists.

Biologists who classify organisms are called taxonomists or systematists. These scientists devote themselves to the theory and practice of arranging organisms in a manner that reflects their characteristics.

As with any endeavor, a vocabulary of terms evolves and that is true of taxonomy. These terms are a means of referring to, and communicating concepts without the necessity of describing the entire concept each time. Some of these terms are commonly used within the walls of the museums, and a basic knowledge would be beneficial in the data entry work. These terms can be found in the glossary found in the Appendix 4.1.

3 DATA FIELDS DEFINED

3.1 SPECIMEN IDENTIFIERS

3.1.1 Serial Number

A unique serial number is assigned sequentially by the program to each specimen record as it is added. The serial number is the number with which the computer stores, sorts and manipulates data in PANORAMA.

Data from: Serial number generated by computer

Format: 6 digit number, numeric. The serial number must be 6 digits.

Example: 050059

3.1.2 Old Catalogue Number

Old catalogue numbers must be entered to record the history of the specimen. In the Invertebrate Paleontology collections there are two kinds of old catalogue numbers: New York State Museum (NYSM) number written in pencil on old Hall labels or numbers assigned by previous owners and donated collections and AMNH number which have been changed. Both numbers must be recorded when relevant, AMNH number first then NYSM number. Please note the NYSM designation is misnomer and in the future should be changed. It is not absolutely clear who assigned the pencil numbers on the Hall labels.

Data from: Specimen, label, catalogue. Any previous catalogue number, either from another collection or if the number was changed because of a duplication, or some other reason should be entered in this category.

Format: numeric, alphanumeric. Enter number verbatim, with punctuation.

Example: AMNH3456/3; NYSM5432/1

3.1.3 Catalogue Number

The catalogue number is a unique AMNH number assigned to the specimen or specimen lot and takes precedence over all other number referring to the specimen.

Data from: Specimen verified by catalogue or new number assigned if one does not exist

Format: 6 digit number, in addition 2 spaces for letter of suffix. If there are fewer than 6 digits in the catalogue number, leading zeros must be inserted. The 2 blank spaces after the number are for the letter suffixes if needed for multiple specimens in a batch.

Example: 2144 would be recorded as 002144
32456 would be recorded as 032456
12457A would be recorded as 012457A

3.1.4 Division/Unit Name

This field was needed when the database was integrated into a divisional database, to distinguish between departments, divisions or higher taxonomic groups. This will be useful when the museum adopts a company wide database and consolidates all entries. The division/unit field has not been integrated into PANORAMA, although it is already populated in PALEOCAT.

Data from: Name of collection unit or department unit the specimen belongs to.

Format: 2 alphabetic character code, text, all upper case. When assigning new numbers to specimens the code prefaces the catalogue number to indicate the main collection unit it belongs.

Codes:

FI	Fossil Invertebrates
FF	Fossil fishes
FM	Fossil mammals
LI	Living invertebrates

Example: FI222894
FF006459
FM024895

3.2 TAXONOMY

If a specimen has been published more than once, new records are created for subsequent publications in database, rather than overwriting data on original publication record. Data-entry person is advised to look up known genus species name in *Treatise of Invertebrate Paleontology* or other current standard references, such as World Register of Marine Species (WoRMS), for higher taxonomic group information if higher taxon is not provided by researcher for any given taxonomic ID. Verified data can then be added to the database to provide complete classification or taxonomic information. Researcher's handwritten labels rarely have complete taxonomic information above genus level and it is important to validate or verify the correct taxonomic higher group information before entering data into database.

In addition, always validate the spelling of taxon name using the above resources and always double check your entry. Misspelling in taxonomy could be dangerous. When uploaded the data into a database software, the taxonomy tree could already be preset. Therefore, if you have a bivalve specimen with a misspelled genus, and the misspelled version of the name is actually the name of an Ammonite, then the bivalve would be automatically placed with the Ammonites. Therefore, please use caution when entering taxonomy.

3.2.1 Higher Taxon

High taxon refers to the levels of taxonomic groupings are not regulated by the ICZN. These include Phylum, Class, and Order. Each level has a different ending, or suffix. The suffixes are listed in Appendix 4.7.

Data from: publication, treatise, WoRMS, PBDB, USNM or AMNH taxonomic systems (Appendix 4.8.)

Format: Alpha, one word, all upper case.

Example: FORAMINIFERA
GLOBIGERINIDA

3.2.2 Lower Taxon

Lower taxon is another way of referring the levels of grouping regulated by the ICZN. These include Family, Subfamily, Genus, Subgenus, Species, and subspecies. In addition, any questionable nomenclature, also called open nomenclature and the consolidated scientific name are present here. Other useful information in this category is the author of the scientific name and when the species was identified in a publication.

3.2.2.1 Family

Although, family and subfamily are within the lower taxon, by ICZN standards, the data fields will be filled similar to those of higher taxon.

Data from: publication, treatise, WoRMS, PBDB, USNM or AMNH taxonomic systems (Appendix 4.8.)

Format: Alpha, one word, all upper case.

Example: CRINOIDEA

3.2.2.2 Genus

Data from: Publication, label, publication, treatise, WoRMS, PBDB

Format: Alpha, one word, first letter capitalized. If genus name is presented in quotes, write name without quotation marks and acknowledge their use in the remarks. If genus is cited as questionable, the question mark follows the name and is separated by a space. Other modifiers to the genus, also follow the name by a space. If genus is unknown or not given, enter “Genus Indet.” representing the genus is undetermined.

Example: Given—“Lingula”
Recorded as—Genus: Lingula
Remarks: GENUS NAME IN QUOTES

Given—?Lingula
Recorded as—Genus: Lingula
Open Nomenclature: ?

Given—Lingula sensu stricto
Recorded as—Genus: LINGULA
Open Nomenclature: ss.

3.2.2.3 Subgenus

Data From: Publication, PBDB, Label.

Format: alpha, one word, first letter capitalized, enclosed in parentheses. Modifiers to the name are placed outside the parentheses and are entered in open nomenclature, as in genus.

Example: (Linguella)
(Linguella)?

3.2.2.4 Species

The taxonomic level of species includes the most taxa. It is the only level that can be truly validated by scientific study, for anything higher in the taxonomic schema is arbitrary.

Data from: Publication, label, PBDB, WoRMS

Format: one word and/or abbreviation, all lower case. For abbreviations use sp., sp. A, or sp. 1. The “A” and “1” are separated from “sp.” by a space. If the species is unidentified enter sp. in this field. If the species is compared to a known species, “cf.” should be placed in the open nomenclature along with the species name it was compared with.

Example: Given—Cristellaria, a genus, with no species name

Entered as—Genus: *Cristellaria*
Species: sp.

3.2.2.5 *Subspecies*

A subset of species is called a subspecies. This field is entered the same way as Species is (above). The only exception is when there is NO subspecies mentioned, do NOT add the abbreviation for subspecies, which is ssp, but rather leave the field blank.

Data from: publication, label, PBDB

Format: one word and/or abbreviation, all lower case.

3.2.2.6 *Open Nomenclature*

Open nomenclature is an abbreviation following a genus, species, or subspecies that indicates uncertainty about the identification. These abbreviations can be found in Appendix 4.2 and can indicate different levels of uncertainty. In the publication, these abbreviations will immediately follow the genus, species, and subspecies in question. With the exception of the genus being in question, then the question mark is written before the genus when writing the scientific, but include the question in the open nomenclature field.

Data from: Publication, specimen label, catalogue

Format: text, abbreviation, lower case and ending with a period.

Example: cf.

3.2.3 Scientific Name

Scientific names are used to diminish confusion with common names and language barriers. Taxonomic names are usually made of Greek, and/or Latin root words so not to create confusion in common languages. There are instances when a native common name for a specimen is idolized, but it is Latinized.

Data from: publication, specimen label, catalogue.

Format: Then ICZN dictates that the Binominal nomenclature should be comprised of a genus and a species, much like a first and last name. However, the genus will be capitalized and the species name is all lower case. Usually, the scientific name should be underlined or italicized to designate it as, in fact, a scientific name, but this is not the case in data entry. If open nomenclature is included write abbreviate. Usually open nomenclature is denoted before genera and before subgenera, species, or between two or species and subspecies. It should written in order, verbatim from the publication.

Example: Given—Genus: *Quinqueloculina*

Open nomenclature: cf.

Species: *triangularis*

Recorded as— *Quinqueloculina* cf. *triangularis*

Given—Genus: *Quinqueloculina*?

Species: not given

Recorded as—?Quinqueloculina sp.

3.2.4 Identified by

This field is designated for the author of the taxon name, the first person to identify, name and publish on the taxon. Author is the author of the taxon, not the author of the publication. Identifier gives the correct name of the taxon by reference to what has already been published. Identifier is entered if:

- Specimen is a type (see below)
- Specimen is not a primary type (figured or mentioned)
- Specimen is mentioned or figured in a paper subsequent to the original citation either by the original author or by a different author
- Specimen is not a type and identifier is known

Identifier is NOT the person who identifies the specimen visually in the collection. Collection staff or visiting scholar who identifies specimens during curation or examination can be designated as **Determiner**. The name of the **Determiner** can be entered in the remarks if necessary and include the date specimen was determined, if applicable.

Data from: Publication, Treatise, Paleobiology Database, WoRMS, and label.

Format: Name (s), text, all upper case. Enter Last name only of author only. If more than one author, connect last names with addition sign (+), instead of “and” or “&”. If more than two names suffix the name with “et al.”

Example: COOPER
 NEWELL+ADLINGTON
 NEWELL ET AL.

3.2.5 Date identified

Original date of when specimen is described for the first time. Date of publication and Date Identified will have same the entry if specimen is described for the first time.

Data from: Publication, Treatise, Paleobiology Database, WoRMS, and label.

Format: DD MMM YYYY, alpha-numeric, upper case, use abbreviations for month.

Example: 02 AUG 2015
 15 OCT 1990
 SEPT 1972
 2002

3.2.6 Specimen Type Status

If author designates a type and a cotype, we call each holotype and paratype respectively. AMNH does NOT recognize hypotypes, they are either figured or mentioned, enter FIG or MENT in remarks, NOT in type status. Do NOT enter “Study Material” or “Additional Material.”

Data from: Publication

Format: Text, Alpha, Uppercase, abbreviation -limited to 5 characters (abbreviations can be found in Appendix 4.3).

Example: HOLO
PARA

3.3 COLLECTING EVENT INFORMATION

3.3.1 Collector

The collector is the PERSON(s) who collected the specimen in the field. In some cases, it could be a group of people, or a company/organization like a class trip, or a field course.

Data from: Publication, catalogue, label.

Format: Name (s), text, all upper case. Preferred entry is last name with two initials. There are many possible variations. When two or more collectors, use last names only separated by an addition sign. When more than 3 collectors, use lead author's name and et al. If collector has no second initial, use last name or first initial set apart by a comma. If collector is an company or organization enter the name of the company or organization instead of the name(s) of individual persons.

Example: COOPER, G.A.
NEWELL+ADLINGTON
NEWELL ET AL.

3.3.2 Date Collected

Date collected is WHEN the specimen was collected. This field could be one day, month, and year, or a range of dates to indicate a field collecting season. This field is of particular importance for endangered organisms, or in a unstable geographic location because the status of organism could have changed since the date of collection or in the future.

Data from: accession record, catalogue, publication, specimen.

Format: DD MMM YYYY, alpha-numeric, upper case. Collection data is recorded when given. It is recorded with the day of the month first, month abbreviation second, and year last. Insert leading zero in a day of the month if necessary. Use first three letters of month for the abbreviation. All four digits of the year must be included. Do not insert dashes if day and/or month are not given. Use no punctuation.

Examples: 02 AUG 2015
15 OCT 1990
SEPT 1972
2002
14 OCT to 15 OCT 2011
MAY 1962 to JUN 1962

3.3.3 Country/Continent/Ocean

This field records the largest unit of geographic space WHERE specimens are collected. Note, that the invertebrate paleontology collection houses specimens collected in both terrestrial and marine environments. If the specimen(s) was collected in an ocean enter the name of the ocean. If the country is not given, default to the continent where it was collected, however, for terrestrial localities the preference for this field is the country where the specimen was collected.

Data from: publication, catalogue, specimen label

Format: Name, text, all Upper case. Anglicized and spell out name fully, check spelling if needed. Use smallest unit available. Where island or island group is a political entity, its name should be entered in full. Labels with previously used country names will not be changed to current usage. Use country name applicable when specimen was initially collected, DO NOT update to reflect political changes. For instance, USSR will not be replaced if specimen is collected in the 1960s.

Example: GREENLAND
ANTARTICA
ATLANTIC OCEAN
PEOPLES REPUBLIC OF CHINA

3.3.4 Country Code

Country code is an abbreviation of the country where the specimen was collected.

Data from: publication, catalogue, specimen label

Format: Alpha, all uppercase, abbreviation of two letters. Abbreviations can found at <https://www.iso.org/obp/ui/#search>. When visiting the website, make sure to select “Country Code” above the search bar before pressing “enter.”

Example: United States US
Canada CA

3.3.5 State/Province

This field records a geographic space WHERE specimens are collected. State/province is a subunit of country.

Data from: Publication, catalogue, specimen label

Format: Name, text, all upper case. Anglicize or transliterate name and enter in full. Do NOT use abbreviations for states within the United States for they may be confused with Country Codes. For instance the county code for Canada is CA, which is the same abbreviation of the state of California. England, Scotland, and Whales belong in State/Province field, while United Kingdom is in Country field.

Example: NEW JERSEY
WHALES

3.3.6 County/Parish/District

This field records a geographic space WHERE specimens are collected and is a subunit of the State/Province Field.

Data from: Publication, catalogue, specimen label

Format: Name with unit abbreviation, text, all upper case. Enter anglicized name in full and abbreviation following one space after name. Use no punctuation.

Example: EUREKA DIST
WARREN CO

3.3.7 Detailed Locality

This field is used to give a descriptive location of WHERE the specimen(s) were collected. This field could include distance from markers, names of townships and cities, names of roads and highways, and names of nearby bodies of water. Data entered here can vary significantly from just names of towns/cities, to quadrant coordinates, and details within feet or meters of where the specimen was collected. This field is important to accurately GeoLocate and GeoReference specimens. The more specific the better.

Data from: Publication, catalogue, and specimen label.

Format: free style text, upper and lower case. Entry should be written from general to specific. Do not anglicize locality names. For the US geographic names, follow USGS Lexicon standards. Equivalent standards for foreign names are yet to be determined, use foreign spelling without accent marks. Measurements are abbreviated with no space between the numerical quantities and the units of measure. Acceptable abbreviations of units of distance are: MI, KM, FT. DO NOT use an apostrophe to signify feet and convert all fractions to decimals. If quadrant coordinates are given, use common abbreviations for direction (N, S, E, W, NE, SE, NW, SW) and enter from largest to smallest (Corridor, Section, Township, Range). Separate with commas and no spaces. DO NOT convert fractions used in quadrant coordinates, the use of forward slashes are acceptable here.

Examples: Given – V□slau
Enter as – Voslau

Given – two and a half miles north of Postville and United States
Highway 78
Enter as – POSTVILLE, 2.5 MI N of, ON US HWY78

Given – S. cor., SE 1/4, NE 1/4, SEC. 15, T3N., R5W
Enter as – S cor,SE1/4,NE1/4,SEC15,T3N,R5W

3.3.8 Locality Number

This field is a unique identifying number of the locality of WHERE the specimen(s) were collected. This number. Field Numbers are useful when the collector is in the field because it can be written in small script on the specimen, or on the specimen field label and then correlated to the locality description at a later time. Collectors may add their institution or even their last names to avoid confusion among multiple collectors.

Data from: Publication, catalogue, specimen, specimen label, field notes if available

Format: 3 part code, text and numeric, all upper case. Enter name or letter designation, a space, the word “loc,” another space and then the number of the locality. Use any recognizable letter designations or collectors name. Use no punctuation. There may be many variations, especially in the type collection and older collections.

Example: USNM LOC 10708
AMNH LOC 512
USGS LOC 943B
BUTTS LOC 321
JENKS LOT 42
COCKERELL LOC STA14

3.3.9 Latitude/Longitude

Latitude and Longitude are geographic points on a geographic coordinate system which enables every location on the Earth to be specified by a set of numbers or letters, or symbols. Latitude (ϕ) is a geographic coordinate that specifies the north-south position of a point on the Earth's surface. Latitude lines are horizontal parallel with the equator. The equator, has a latitude of zero degrees. Longitude (λ) is a geographic coordinate that specifies the east-west position of a point on the Earth's surface. Longitude lines are vertical lines, perpendicular to the equator, and intersect at the north and south poles.

Data from: Publication, catalogue, specimen label, and field notes if available, and/or generated from GeoLocate and GeoReferencing tools.

Format: Leave no spaces, except in between the latitude and longitude values. Use placement zeros to complete field. Do NOT use dashes if minutes or seconds are not given. Do NOT use slashes, quotation marks, and apostrophes. Due to the conversions of database software, and geo-referencing, the values for latitude and longitude should be: #####N #####E with latitude first, and longitude always second.

Example: Given – 72/09/02N;108/27/34E
Enter as – 0720902N 1082734E

Given – 84° 43' 00" N 99° 5' 15" E
Enter as – 0844300N 0990515E

3.4 CHRONOSTRATIGRAPHY/GEOCHRONOLOGY

Chronostratigraphy is a subdivision of stratigraphy, a branch of geology that studies rock layers, also referred as strata and the process of stratification, or layering. Chronostratigraphy studies strata in relation to time to arrange a sequence of deposition. Similar to taxonomy, chronostratigraphy is arranged in a hierarchical manner with system being the largest group containing series. Then followed by stage, a subsidiary unit of series. The international Chronostratigraphic Chart is provided in the Appendix 4.9 for reference.

3.4.1 System/Period

A system in stratigraphy is a unit of rock layers that were laid down together within the same corresponding geological period. The associated period is a chronological time unit, a part of the geological time scale, while the system is a unit of chronostratigraphy. Systems are unrelated to lithostratigraphy, which subdivides rock layers on their lithology. There are 22 defined, and are equivalent to tens to about one hundred million years.

Data from: Publication, catalogue, International Chronostratigraphic Chart, USGS Lexicon

Format: One word, text, all upper case. Spell name fully, and confirm spelling with chart. Use System/Period name from chart to enter in this field. If label gives lithostratigraphy information, the associated system name is researched using USGS Lexicon. Please note any specimen from the Holocene is entered as recent.

Example: CRETACEOUS
 DEVONIAN
 JURASSIC

3.4.2 Series/Epoch

Series are subdivisions of rock layers made based on the age of the rock and corresponding to the dating system unit called an epoch, both being formally defined international conventions of the geological timescale. A series is therefore a sequence of rock depositions defining a chronostratigraphic unit. Series is a term defining a unit of rock layers formed in a certain interval in time; it is equivalent to the term geological epoch which defines the interval of time itself, although the two words are sometimes confused in informal literature. Series are subdivisions of systems and are themselves divided into stages

Data from: Publication, catalogue, International Chronostratigraphic Chart, USGS Lexicon

Format: One word, text, all upper case. Spell name fully, and confirm spelling with chart. Use series/epoch from chart to enter in this field. If label gives lithostratigraphy information, use USGS Lexicon to determine which series the specimen belongs to, if there is no mention of a series in the given strata, leave field blank. The use of words such as “upper,” “middle,” and “lower” are common as series names and are entered if given on specimen label or in publication.

Example: PLEISTOCENE

3.4.3 Stage/Age

A stage is a succession of rock strata laid down in a single age on the geologic timescale, which usually represents millions of years of deposition. A given stage of rock and the corresponding age of time will by convention have the same name, and the same boundaries.

Data from: Publication, catalogue, International Chronostratigraphic Chart, USGS Lexicon

Format: One word, text, all upper case. Spell name fully, and confirm spelling with chart. Use stage/age from chart to enter in this field. If label gives lithostratigraphy information, use USGS Lexicon to determine which series the specimen belongs to, if there is no mention of a stage on label, in publication or in USGS Lexicon leave field blank. Do not use modifiers (“upper,” “middle,” and “lower”) in this field, instead mention in “Detailed Locality” field.

Example: Given – Upper Frasnian

Entered as—the “FRASNIAN” in Stage field and enter “Upper part of stage” in Detailed Locality field. Then look for Frasnian on chart and enter “UPPER” in the Series Field, and “DEVONIAN” in the System Field.

System: DEVONIAN

Series: UPPER

Stage: FRASNIAN

Detailed Locality: Upper part of Stage

3.5 LITHOSTRATIGRAPHY

Lithostratigraphy is a sub-discipline of stratigraphy, the geological science associated with the study of strata or rock layers. Primarily, deals with the description and nomenclature of the rocks of the Earth based on their lithology and their stratigraphic relations. Details of the lithostratigraphy can be found on the specimen label and/or the publication. It is useful to validate the lithostratigraphy with resources such as USGS GeoLexicon. For more information on stratigraphy please visit stratigraphy.org. Abbreviations for rock type can be found in Appendix 4.5.

3.5.1 Group

A succession of two or more contiguous or associated formations with significant and diagnostic lithologic properties in common. Thickness of a stratigraphic succession is not a valid reason for defining a unit as a group rather than a formation. The component formations of a group need not be the same everywhere.

Data from: publication, catalogue, USGS Lexicon

Format: Text, all upper case. Spell out name fully, using the abbreviation GRP, with no punctuation and on space after the name and GPR. Please modifiers after GRP followed by a comma and a space.

Example: HAMILTON GRP
LOWER HELDERBERG GRP

3.5.2 Formation

Formations are the only formal lithostratigraphic units into which the stratigraphic column everywhere should be divided completely on the basis of lithology. The contrast in lithology between formations required to justify their establishment varies with the complexity of the geology of a region and the detail needed for geologic mapping and to work out its geologic history. No formation is considered justifiable and useful that cannot be delineated at the scale of geologic mapping practiced in the region. The thickness of formations may range from less than a meter to several thousand meters.

Data from: Publication, catalogue, USGS Lexicon.

Format: Text, all upper case. Spell out name fully, using abbreviation FM, with no punctuation and one space the formation name. If the formation name is given with the rock type, then use the rock type abbreviation instead. Please modifiers after FM. Add FM only when publication specifically states that a name was that of a formation, or validate the name with the USGS Lexicon. When in doubt, the name is entered without FM.

Example: CHAZY FM
KNOX DOL
HELDERBERG FM, UPPER

3.5.3 Member

The formal lithostratigraphic unit next in rank below a formation is member. It possesses lithologic properties distinguishing it from adjacent parts of the formation. No fixed standard is required for the extent and thickness of a member. A formation need not be divided into members. Some formations may be completely divided into members; others may have only certain parts designated as members. A member may extend from one formation to another.

Data from: publication, catalogue, USGS Lexicon

Format: Text, all upper case. Spell out name fully, using the abbreviation MBR, with no punctuation and on space after the name and MBR. If the member name is given with the rock type, then use the rock type abbreviation (Appendix 4.5). Place modifiers after MBR followed by a comma and a space. Add MBR only when publication specifically states that a name was that of a member, or validate the name with the USGS Lexicon. When in doubt, the name is entered without MBR.

Example: NEW SCOTLAND MBR
SOUTH BEND LS MBR

3.5.4 Bed

The smallest formal unit in the hierarchy of sedimentary lithostratigraphic units, e.g. a single stratum lithologically distinguishable from other layers above and below. Customarily only distinctive beds (key beds, marker beds) particularly useful for

stratigraphic purposes are given proper names and considered formal lithostratigraphic units.

Data from: publication, catalogue, USGS Lexicon

Format: Text, all upper case. Spell out name fully. Add the word, “bed” following the name only if the publication specifically state that a name was that of a bed, and/or validate with the USGS Lexicon. If the bed name is given with a rock type, then use the rock type abbreviation (Appendix 4.5).

Example: AGUA SS BED
 BANDERA QUARRY SS BED

3.5.5 Biozone

A zone is the informal minor body of rock in many different categories of stratigraphic classification, therefore it is not entered into the USGS lexicon. A biozone is a general term for any kind of biostratigraphic unit regardless of thickness or geographic extent based on biological occurrences. Biozones vary greatly in thickness, geographic extent, and represented time span. After initial usage of a formal term, such as the *Globigerina brevis* Taxon-range Biozone, a simplified version of the formal nomenclature may be used, e.g. *Globigerina brevis* Zone.

Data From: Publication

Format: Text. Capitalize all words, with the exception of species names, if present. Spell out name fully, verbatim from the publication, but using no punctuation.

Example: Given—*Globigerina brevis* Taxon-range Biozone
 Recorded as—*Globigerina brevis* Taxon Range Biozone.

3.5.6 Lithostratigraphic Description

This field is used to give a descriptive location of WHERE in the stratum the specimen(s) were collected. This field could include distance from markers, and detailed description of rock layers. Data entered here can vary significantly, but it is used most to give details within inches, or centimeters of where the specimen was collected in the rock column, or core sample. This field is important to accurately place the specimen in the stratum. The more specific the better.

Data from: Publication, field notes if available

Format: free style text, upper and lower case. Entry should be written from general to specific. Do not anglicize locality names. For the US geographic names, follow USGS Lexicon standards. Equivalent standards for foreign names are yet to be determined, use foreign spelling without accent marks. Measurements are abbreviated with no space between the numerical quantities and the units of measure.

Example: CHADAKOIN FM, 2 CM ABOVE LOWER BOUNDARY.
 2 FT BELOW 3RD OIL SAND MBR
 RIPPLE MARKS PRESENT

3.6 PUBLICATION

3.6.1 Author/Subsequent Author

Subsequent author is the author of a published citation (it could be a subsequent citation). It is through subsequent author that one knows that subsequently the name (or identification) was elevated to higher taxon or changed or that it remained the same, but the same specimen was studied by a different person (subsequent author).

There is one variation of this rule. If a specimen is not listed as a type specimen, but was used/cited figured/measured in the original publication by the original author, the author IS the author of the species, but is also listed as the Identifier of the specimen.

Another anomaly is if the original author in a subsequent publication re-identifies the specimen with a different name. Then the same name is recorded as both Identifier and in parentheses. Please be forewarn, each case if different.

Data from: Publication

Format: Name (s), text, all upper case. Enter Last name only. If more than one author, connect last names with addition sign (+), instead of “and” or “&”. If more than two names suffix the name with “et al.”

Example: COOPER
NEWELL+ADLINGTON
NEWELL ET AL.

3.6.2 Title of Journal/Book/Periodical

This is the title of the journal or book where the publication can be found. This is NOT the title of the paper, article, or chapter itself.

Data from: Publication, AMNH Research Library, Google Scholar

Format: Title of Journal, text, all upper care. Use Journal title abbreviations from USGS publication: Serial Publication Commonly cited in Technical Bibliographies of the USGS. See <http://pubs.usgs.gov/unnumbered/70039539/report.pdf>. If journal is not listed, compose abbreviation following examples in USGS guidelines or enter the complete title. For books, use title with or without abbreviations. The title entered in this field should be the same as entered in the bibliography file.

Example: JOURNAL OF PALEONTOLOGY
MIDLAND AMERICAN NATURALIST

3.6.3 Title of Publication

This is the title of the publication that the specimen is mentioned, figured, and/or described. This is NOT the title of the journal or book, but the individual paper.

Data from: Publication, AMNH Research Library, Google Scholar

Format: Title of article or chapter, text, all upper case, complete title of paper (verbatim) as it appears in book, journal, or periodical.

Example: PENNSYLVANIAN OSTRACODA. A STUDY OF THE OSTRACODA FAUNA OF THE EAST MOUNTAIN SHALE, MINERAL WELLS FORMATION, MINERAL WELL, TEXAS

3.6.4 Publication Date

This is the date that the publication was published. It is NOT when the publication was submitted. If it is a book that has several editions, or is a reprint, enter the year of first publication.

Data from: Publication, AMNH Research Library, Google Scholar

Format: DD MON YYYY, the day of the month first, month abbreviation second, and year last separated by a space. Insert leading zero in a day of the month if necessary. Use first three letters of month for the abbreviation. All four digits of the year must be included. Do not insert dashes if day and/or month are not given. Use no punctuation.

Example: 15 OCT 1990
OCT 1990
2011

3.6.5 Pagination

The pagination field is where the specimen is figured, and/or described WITHIN the publication. It is important to include this field because it is a quick reference of where to find the specimen of interest without having to read the paper in its entirety.

Data from: Publication (caption page where illustrations, and figures are located, NOT text descriptions)

Format: Abbreviations (acceptable abbreviations are given in Appendix 4.4), text, all upper case, followed by a period. Use punctuation, but leave no spaces. Hyphens are appropriate here to indicate range of several figures and pages.

Example: V.6,N.2,P.16,F.7a-c,TF.1,5
N.32,P.45
SER.3,V.2,P.5,TF.6,TBL.7

3.6.6 Cited Number

This category is used because a catalogue number can be incorrectly cited in a publication and consequently users will cite the incorrect number (either through a typographic error or just a mistake by the author) when requesting loans. In addition, the cited number may differ from the catalogue number due to authors using numbers given in the field, and/or the specimen was not accessioned into the collection and given an AMNH catalogue number.

Data from: Publication, specimen

Format: usually numeric, possibly alpha-numeric, all uppercase, no spaces.

Example: 304A
USGS6048

3.7 MANAGEMENT RECORDS

3.7.1 Collection

Generally, when specimens are accessioned into the museum, they are done so in collections. Therefore, the name of the collection assumes the name of the person, or the institution they are coming from. This is an important field because certain collections have strengths in a geochronological time period or a focus in a particular group of organisms. In addition, there may be a researcher only interested in a particular collection from a person or institution.

Data from: Catalogue, label, publication, registrar

Format: Name, text, all upper case. Collection refers to a name, usually of the person whose collection was sold or donated to the museum. It may also refer to a curator's collection that was donated to the museum. The last name only is usually recorded. One exception is the James Hall Collection, should be recorded as Hall, J. This field should also record exchanges. Purchases are not recorded here, but in the "Donor" field.

Example: ELLIS+MESSINA
 HALL,J.
 GREENE
 ZITTEL EXCHANGE
 COLUMBIA UNIVERSITY

3.7.2 Number of Specimens

Not only is this field important so we can keep track of how many specimens there are in the collection, but also signifies if there are any individual specimens missing or lost. Comparing the count with a previous catalogue would be optimal.

Data from: specimen tray or slide, catalogue, publication.

Format: 4 digit number, numeric. Items or pieced are the number of specimens included under one catalogue number. Leading zeros must be added to make a digit number. It is an integer that records how many specimens are assigned to one catalogue number. Number of specimens assigned a catalogue number, either to one individual specimen or to a specimen lot. A slab of rock is assigned one catalogue number, even though the slab is embedded with several fossils, then "SLAB" is entered in remarks. Unless individual specimens on the slab are studied then each published specimens on slab is assigned a unique number.

Example: Given—6 specimens
 Enter as—0006

3.7.3 Repository

This is the general place where the specimen is stored. Due to the vastness of the collections, some collections have been split and stored in separate rooms, buildings, or even at an off-site facility. For this field, simply enter AMNH. For the microfossil project, specifically, enter AMNH Microfossils

Data from: Specimen label, sometimes publication

Format: Institution name, abbreviated, all upper case.

Example: NMNH
 AMNH MICROFOSSILS

3.7.4 Donor

This field indicates WHO and HOW the specimen was acquired and included in the collection. Whether a specimen was gifted, or purchased is important information to know going forward. In addition, some local universities may store their specimens in the museum, but set certain parameters on how they can be used. It would be indicative to speak to the registrar.

Data from: Catalogue, specimen label

Format: name, text, all upper case. Name is entered using the same guidelines for collector. Donor can be an institution or government. When a label says “purchased” enter it in this field.

Example: WARD’S PURCHASE 1919
 SMITH
 HUDSON GIFT
 COLUMBIA UNIVERSITY

3.7.5 Accession Number

Upon arrival into the museum, the specimens are registered in the Registrar’s office and receive a registration or “Accession” number. The assigned number is practically an account number that records the history of specimen (how it was required, the donor, the price, etc.). The assigned number is entered as it is recorded in the accession books (currently accession data managed in a Filemaker Pro database also developed by author). The accession number is entered when present, it would be a gigantic task to go through all 4 million specimens retroactively and record accession information. Complete accession records on Filemaker Pro database available since 1997.

Data from: Catalog, specimen label, Registrar’s Office

Format: numeric

3.7.6 Storage Information

This is the physical location of the specimen WITHIN the collection. This is tremendously important because it gives an address to the specimen. If a researcher requests to see a specimen, it should only take a few minutes to find it. Due to the vastness of the collection, it is housed in several locations. Therefore, the section, floor, room, cabinet/can, and drawer are all essential components.

Data from: Specimen label, catalogue.

Format: Alpha numeric, text uppercase. Hallways are designated as RM000 and basement is entered as FL0. Please note that this is the ONLY section where back slashes are acceptable.

Example: SEC03/FL5/RM111/CN651/D9

3.7.7 Data Entered by

This is WHO is entering the data into the database. This is so in the future if there are questions pertaining to their data entries they can be contacted. It creates a sense of accountability.

Data from: Data input operator

Format: text, all uppercase. Enter the LAST NAME of the person who entered the data.

Example: Given—Charles Darwin
 Recorded as—DARWIN

3.7.8 Date Data Entered

Date on which data-entry staff enters the data into a computer file. Essentially, WHEN the data was entered can be as important as who entered it. This allows managers to see the rate of entry and make projections on data entry workflows.

Data from: Input operator.

Format: MONTH DD, YYYY Full spelling of the month, do NOT abbreviate, the day is entered as is, without filler “0.” The year should be written in full, NOT abbreviated.

Example: AUGUST 14, 2015
 JANUARY 1, 2015

3.7.9 Remarks

Items that should be included in remarks are missing data, and any discrepancies in data found while curating specimen and any additional information that has been given, like a determiner, can be entered here. Do NOT put data that already has a distinguished field here. For example, Do NOT put the locality description or the Latitude/Longitude because they already have specified fields in the database.

Data from: Specimen label, publication, all sources.

Format: No set format is required. Freestyle, alpha, numeric. Put a period at the end of each thought or group related data. Only commas and periods are acceptable punctuation in this field. Do NOT use quotation marks. This field should be kept clear, concise and succinct. Avoid using many words, and writing a paragraph. 1-3 sentences are appropriate.

Example: Specimen found at bottom of tray. Determined by Ellen Thomas.
 Label reads, H.M.S. Challenger.

3.7.10 Selected for Photo

If specimen is a type specimen, figured, or mentioned in publication, a 2D image is required. Enter a yes, if specimen has been imaged, and no, if the specimen has not. This field is important because it allows the operator to know which specimens have associated images to be uploaded.

Data from: Collections staff, curatorial staff, and servers/drives

Format: Alpha, all upper case,

Example: YES or NO

3.7.11 Selected for CT

Specimens selected for CT scanning are determined by the curator or specialist. If the specimen is selected, enter yes and if not, enter a no. This field is important because it allows the operator to know which specimens have associated CT scans.

Data from: Collections staff, curatorial or specialist, and servers/drives

Format: Alpha, Upper case

Example: YES or NO

3.7.12 Condition of Specimen

This is the health of the specimen. It is important to include so at a glance specimens could be determined if they are acceptable to be loaned, sent in the mail, and possibly put on display. Acceptable entries include: broken, part of specimen missing, and falling apart due to Byne's disease. If specimen appears "healthy" leave blank.

Data from: Specimen. After observing the specimen enter the condition of the specimen for conservation purposes.

Format: Alpha, Upper case.

3.7.13 Status of Specimen

This field is different from condition of specimen where the status applies if the specimen is present, missing, or lost. Do not leave this field blank. Enter either present, missing, or lost. In case a spare specimen is found, it may actually be a specimen that just went missing and vice versa, if a specimen was present and then was taken out of storage by someone and went missing, then the manager knows who to hold accountable. Losing is never good, but unfortunately it does happen. If you lose a specimen notify your supervisor immediately.

Data from: Specimen label

Format: Alpha, Upper case.

3.8 QUALITY CONTROL

3.8.1 Quality Control Status

Verifies and validates the data, notes errors, inaccuracies to be checked, and mentions confidence level of data. Quality control condition is your comments about what needs to be done so errors and inaccuracies do NOT go ignored, or are overlooked. Some acceptable entries include: check publication information, taxonomy appears to be incorrect, genus may be misspelled, and verify genus and specific name. These are comments you make about what needs to be checked, or if all is good, then all you have

to say is checked, or verified with your name and the year. This field is for internal uses only, and may eventually be a deciding factor before entry is uploaded online.

3.8.2 Quality Control Remarks

This is the place where you record any revisions you have made to an entry previously entered into the database. Leave a quick, succinct summary of what you modified, your name, and the date

4 APPENDIX

4.1 GLOSSARY OF TERMS

Aberration – an infrasubspecific name forbidden by the ICZN.

Affinis – is Latin for *related to*. An example of its use might be “*Anomalina aff. velascoensis* Cushman”. In this case “aff.” signifies that the person who cited it thought the specimens were near or similar to *Anomalina velascoensis*, but he did not think it to be the same or was not certain. Basically it refers to an unidentified specimen.

Allotype – designated specimen that is the opposite sex of the holotype. Type unregulated by ICZN.

Article – mandatory provision of the Code; currently there are 90 Articles most of which are subdivided (see “Recommendation”).

Author – the person or persons responsible for a publication of name of nomenclature act.

Original author – the first person (s) to publish an available name (see available name), also referred to “Identifier.”

Subsequent author – anyone who publishes about a taxon after the original description.

Available name – refers to names that fulfill the requirements of Articles 10 to 20 and Article 1.3 of the Code. Names that contravene these provision are unavailable.

Binomen (binomina, plural) – the two worded name of a species

Binominal name – the combination of the genus name and the species name. When Linnaeus in his tenth edition of *Systema naturae* (1758) consistently referred to all the species by their genera and specific names his work was deemed that starting point for the binominal system of naming animals, except spiders. Binomina were used long before 1758, but only name published since January 1, 1758 are accepted by the Code.

Character – features, usually morphological, that describes or defines a taxon and that differentiate it from other taxa.

Class – groups of related orders. This category is below phylum and is not regulated by the Code.

Code – a short means of referring to the International Code of Zoological Nomenclature (see below).

Confer – usually cited as an abbreviation “cf.” and used to indicate the author compared the specimens he cited in a publication to the taxonomic name that follows the abbreviation. For example, *Bulimina cf. incisa* Cushman (see White, 1928: 47). Such citations are no definitive identifications, the author likely had some doubt about the identity.

Cotype – originally a syntypes or a paratype, but the term is no longer used and is not recognized by the ICZN.

Dissertation – product written to satisfy the requirements for the degree of M.S. or Ph.D. is explicitly not accepted as a published work by the Code under an Article that excludes “facsimiles or reproductions obtained on demand...”. New Taxa and nomenclatural acts published in dissertations or theses are unavailable names and cannot be used. New taxa described therein might conform to the provision of the Code with regard to description, but the work is not published as defined by the Code. However, an attached proviso suggests that under certain conditions of editorial processing “...it might be considered published.” The Code continually evolves so dissertations might be accepted under specific conditions in the future, but it is unlikely to be retroactive.

Family – a group of related subfamilies and at the level below order and superfamily. Familial names end in “-idae”. For example “Straphylinidae”.

Family-group name – includes all nominal taxa at the ranks of Superfamily, Family, Subfamily, Tribe, and Subtribe and any other rank below superfamily and above genus. It is the highest level category regulated by the Code. The names at each rank are distinguished by their ending or suffix. Each family-group name is based on the root of the generic name which is the type genus.

Form – if published as a scientific name after 1960 a form is an infrasubspecific name and cannot be used. If published as a scientific name before 1961 it is to be treated at the rank of subspecies unless the author of the name gave it infrasubspecific rank. Treated in the same manner as a variety and cited in a similar manner as a variety with “form” or “forma” or “f.” replacing “var.” or “v.” (see variety below). Published as “**Oolina apiculate Reuss, oval form**” (see White, 1928: 210) does not constitute publication of a scientific name. Had it been published and described as, for example, “**Oolina apiculate new form ovalis Reuss**” then it would be treated as the proposal for a scientific name.

Genoholotype – equivalent to type species

Genotype – genetic make up of an individual or a species. Originally genotype referred to the species upon which a generic name was based; the term was replaced by type species, but occasionally authors still use it for type species.

Genus (genera, plural) – a group of species (see species). A genus is the rank below family. A genus can be divided into two or more subgenera (see subgenus).

Genus-group name – includes the genus and the subgenus.

Holotype – one specimen of the type series designated in the original description by the original author of the species. The author can designate the holotype by explicitly writing that particular specimen is the holotype (or type) or stating that only one specimen was examined.

Homonyms – two words with the same spelling but referring to different concepts. For zoological names two species (or genera or families) with the same name are homonyms.

Senior homonym – name made available first, the older name.

Junior homonym – more recent, younger name.

Primary homonym – two (or more) species names with identical spelling described in different genera and later placed in the same genus. Junior primary homonyms are replaced with a new name or nomen novum.

Secondary homonym – two species names with same spelling but original described in different genera and later placed in the same genus. Junior secondary homonyms are replaced with the names remain in the same genus, but under certain conditions specified in the Code they are not replaced.

Identifier – person who identifies a taxon, also referred to original author.

Incertae sedis – Latin for taxa of uncertain placement in a classification.

International Code of Zoological Nomenclature – provisions for naming and regulating the use of names in Zoology. The most recent code (1999) has 90 Articles, a glossary, and two appendices one of which is a Code of Ethics. Compliance with the provisions of the Code is “voluntary,” but names that do not conform are ignored. The Code is revised periodically based on discussions with scientists worldwide. The present Code, the 4th Edition, was published in 1999. An effort to regulate names began long ago as 1842 and the currently applicable provisions are based on an evolution of thought and on efforts to resolve the many complex questions that arise. The first edition of “International Code of Zoological Nomenclature” was published in 1961, the fourth edition in 1999 and a fifth edition is projected for 2018. The objective of the Code “... are to promote stability and universality in the scientific names of animals and to ensure that the name of each taxon is unique and distinct.” The basic principle of zoological nomenclature is “priority of publication.” For example, suppose that in 2005 you name a new species from Brazil and correctly follow the provisions of the Code and in 2010 I describe a species from Argentina, also according to the Code, then if in 2012 someone studying the same group finds that your species and my species are the same and therefore are synonyms, your name takes precedence, it has priority, the act that happened first, applies throughout the naming of animals. So priority, the act that happened first, applies throughout the naming of animals. Priority applies until and unless stability of names will be compromised, then there are explicit rules that overturn priority and the International Commission on Zoological Nomenclature many also act to set priority aside. Basically, priority is overturned when a species (or any taxon) is well known and the name is used often by many author over many years, but is found to have a older synonymic or homonymic name that has rarely been used. In such cases the more recent, but commonly used name can be given precedence. Setting aside priority happens relatively rarely and some zoologists think it should never happen Interpretation of the provisions of the Code can be complex and some question can be mind-twisting esoteric puzzles, but the Code helps provide a stable foundation for the millions of names that have been proposed for animals.

Invalid synonym – see “synonyms.”

Junior homonym – see “homonyms.”

Junior synonym – see “synonyms.”

Lectotype – one of the syntypes that has been designated as the name bearing type for a species-group taxon.

Manuscript name – a name of a taxon that has not been published. Such names are commonly found in collections and sometimes find their way into a publication where, if not described, they are *nomina nuda* (see *nomen nudum*; also see dissertation).

Name bearing type – provides an objective basis for the application of name in species-group, genus-group, and family-group names. Included are the following: Holotype, Syntype, Lectotype, Neotype, Type species, Type genus. When there is doubt about the identity of a taxon the name bearing type can be consulted to resolve the questions.

Neotype – one specimen selected as a species-group name bearing type if the holotypes, syntypes, or neotype is believed to have been lost or destroyed. A neotype is chosen if it is needed to objectively define a species-group taxon. Any specimen of the species-group can be selected, it need not have been a paratype. It is recommended that the neotype be chosen from as near the original type locality as practicable and should be in accord with the prevailing use of the name.

New combination – refers to the first time an already described species is listed in a genus. If a species is described in genus A, then moved to genus B, that is a new combination, and if later moved to genus C, that too is new combination. Whenever a specific name, or species epithet, from the genus in which it was originally described the author is enclosed in parenthesis; of a date and/or page number is also given they too are included in parentheses. For example, original combination: *Planulina membranacea* Ehrenberg; Transferred combination: *Globorotalia membranacea* (Ehrenberg).

New name – a replacement name for a junior homonym.

Nomenclature – the system of naming animals. The rules, the Code, for doing so are published by the International Commission on Zoological Nomenclature.

***Nomen dubium* (*nomina dubia*, plural)** – Latin for a name of unknown or doubtful application. Such names usually arise because the primary type has not been consulted or is lost or destroyed.

***Nomen novum* (*nomina nova*, plural)** – Latin for a new replacement name for a junior homonym.

Nomen nudum – Latin for “naked name,” an explicit type of unavailable name, one that was not described according to the rules of the Code. Specifically it does not conform to the provisions of Article 12 before 1931 or Article 13 after 1930. When a name is discovered to be a *nomen nudum*, it is not used or if already in use can be used no longer.

Nomen oblitum – Latin for “forgotten name,” a senior name that has been unused since 1899 and which, because of action by an author under provisions of Article 23.9.2, does not take precedence over a commonly and currently used junior (younger) synonym or homonym. Names rejected as *nomina oblita* by provisions of earlier editions of the Code remain disallowed.

Nomen protectum – Latin for “protected name,” a junior (younger) name that has been given precedence over an unused senior (older) synonym or homonym under provisions of Article 23.9.2.

Nominal species – species with an available name, one that fulfills the relevant provisions of Articles 10 to 20.

Nominal taxon – scientific names that are available according to the regulations of the Code. They may be valid names of junior synonyms or homonyms.

Objective synonym – see “synonyms”.

Order – groups of related families, a rank below class and above family. This rank is not regulated by the Code.

Original author – see “author.”

Original combination – the genus and species association when the species was first described. Any other combination is a subsequent combination.

Original description – first description of new family-group, genus-group, or species-group as an available taxon.

Paralectotype – former syntypes remaining after a lectotype is designated, type is without name bearing function.

Paratypes – specimen of the type series remaining after the holotype is designated, type is without name bearing function.

Plastotypes – artificial specimens such as casts, molds, 3D models

Plastoholotype – artificial replica of holotype, such as cast, mold, and 3D models.

Plastoparatype – artificial replica of paratype, such as cast, mold, and 3D models.

Primary homonym – see “homonyms.”

Primary type – applied to species-group names and now normally includes the name bearing types: holotypes, syntypes, lectotypes, and neotypes. Some authors exclude lectotype and syntype from the list, the lectotype type perhaps because it is designated after the original description (but so is the neotype) and the syntype perhaps because it often includes multiple specimens. One author stated the primary types are the original type specimens, but that author included neotypes, which is not an original specimen. The other author defined primary types as the single nomenclature type [for species], which would mean that species lacking a holotype designation would be have no primary type.

Phenotype – appearance of an individual resulting from the interaction of its genotype and the environment.

Phylum – groups of related classes, at a level below domain. The level is not regulated by the Code.

Pleisiotype – specimen other than the name bearing type, used for redescription or for a figure by someone other than the original author. Also, referred to as apotype or hypotype. Type unregulated by ICZN.

Rank – the level of a taxon in a taxonomic hierarchy.

Recommendation – advisory statements in the Code each of which is attached to a particular Article; they are not required provisions; they are denoted by the same number as the Article to which it refers followed by a capital letter. For example, “Recommendation 16A. Mean of explicitly indicating names as intentionally new.” Refer to Article 16.1.

Scientific name – words used to denote taxa. Scientific names, as opposed to vernacular names, observe provisions of Article 1 of the ICZN.

Secondary homonym – see “homonyms.”

Secondary type – secondary types are even more problematical than primary types because specimens that were and were not part of the type species have been included. Among these types included in this category are hypotypes, topotypes, homeotypes, syntypes (cotypes) and paralectotypes. The author who included the first three types listed in the previous sentence defined secondary types as “any type not a primary type,” but his list excluded Topotype, allotype, paratype, paralectotypes, plesiotypes and a long list of others that are rarely use now. Note that although paralectotypes were included in the list paratypes were not. Also note that paralectotypes and syntypes are from the same type series.

Senior homonym – see “homonyms.”

Senior synonym – see “synonyms.”

Species – there are competing definitions of species. A commonly used one is groups of actually or potentially interbreeding populations that are distinct from other such groups; this is the biological species concept. Nomenclatural “species” is the rank below “genus.” The name of a species is always a binomen or bionimal ame – two words. It is the only category for which the name f the taxon is two words. The name of a species is the combination of the generic and the specific name (or better, but not much used, “specific epithet”). The name of species, genus + specific name, is italicized and the first letter of the generic name is capitalized. For example, *Globo truncana conica* White.

Species-group name – includes species and subspecies.

Speciose – refers to taxa with many species. A genus with 100 species is more speciose than one with ten.

Subfamily – a group of related tribes, a level below subfamily. Subfamilial names end in – “inae.”

Subgenus – a named division of genus; two or more named clusters of related species in a genus. If a subgenus is separated in a genus then there are automatically two subgenera, the nominate subgenus and the new one. In written works a subgeneric name is immediately recognizable because it is follows the generic name and is enclosed by parentheses – both words are italicized. *Polymorphina (Polymorphina)* and *Polymorphina (Guttulina)* are example of a nominate subgenus and second subgenus respectively. See “genus.”

Subjective synonym – see “synonyms.”

Subsequent author – see “author.”

Subspecies – geographically separated populations of a species that have distinguishing morphological features; the populations can normally interbreed given the opportunity. Nomenclaturally, a subspecies is one rank below a species. A species can be comprised of wo or more subspecies. The name of each subspecies is a trinomen, genus name + species name + subspecies name; each name is italicized. For example, if a subspecies is named, the species automatically has two subspecies, the subspecific name that includes the name bearing type for the species. For example, *Globo truncana conica conica* White and *Globo truncana conica*

plicata White; in this came the first subspecific trinomen is the nominate subspecies. Names below subspecies are infrasubspecific names and are not accepted by the Code.

Subtribe – a group of related genera, a rank below tribe. Subtribal names end in “-ina.” For example, “Philonthina.”

Superfamily – a group of related families, a rank above family. This superfamily name ends in “-oidea.” For example, “Staphylinoidea.”

Synonyms – two different words for the same concept. For organisms, synonyms are two or more scientific names that have been applied to one species (or genus or family etc.). Some common species found in many parts of the world can have been named dozens of times. These species might be named originally in the same genus and found to be synonyms or they might be named originally in different genera and discovered to be synonyms when brought together in one genus.

Junior synonym – younger name of two names.

Senior synonym – older name of two names.

Subjective synonym – based on the opinion of the author. This is the most common type of synonym.

Objective synonym – based on the same type. Most commonly this refers to two genus-group names that share the same type species. Under special circumstances two species-group taxa can share the same name bearing type.

Valid synonym – name used for the taxon whether the oldest or not.

Invalid synonym – an unused name for the taxon.

Synonymy – the list of synonyms for a taxon.

Syntype – each specimen of a type series from which neither a holotype nor lectotype has been designated.

Taxon (taxa, plural) – a group of animals that includes whatever species or individuals a biologist at the time considers it to contain and based on the character used at that time. The composition of the taxon usually changes over time. The composition of the taxon usually changes over time as species are newly discovered, as species are transferred to other taxa, or as different characters are used to define it. The current ideal is to base taxa on the shared possession of unique features. As taxa become larger there is often an effort to break it into smaller groups, ideally the included species of each new group share unique characters that permit separation from other groups of the same level. Each zoological taxon is placed at some level in a hierarchy.

Taxonomic category – a level or rank in a hierarchic classification. Each zoological taxon is placed at some level in the zoological hierarchy. The commonly used levels include, from most to least speciose: Domain, Phylum, Class, Order, Superfamily, Family, Subfamily, Genus, Subgenus, Species, and Subspecies.

Thesis – see “dissertation.”

Topotype – specimen from the type locality, unregulated by ICZN.

Tribe – a group of related subtribes below the level of subfamily. Tribal names end in “-ini.” For example, “Stenini.”

Type locality – the geographical place (and geographical stratum for fossils) from which the name bearing type of a species-group taxon was found.

Type series – one or more specimens used by an author to describe a new species or subspecies. Specimens may be explicitly excluded by the author for one reason or another. The holotype or lectotype is selected from the type series. Remaining specimens of the type series become paratypes when a holotype is designated. If no holotype is designated then the specimens of the type series are syntypes and become paralectotypes upon designation of a lectotype.

Type species – the nominal species that is the name bearing type of a genus or subgenus. The type species must be selected from among the species that were explicitly included in the genus by the author of the genus when it was originally described. The Code requires the designation of a type species for a genus after 1930 or it is an unavailable name that cannot be used.

Unavailable name – does not conform to the requirements of Articles 10 to 20 or is excluded under Article 1.3 of the Code. These names cannot be used and are not sanctioned by the Code.

Valid species – accepted name of a species

Variety – if published after 1960 is of infrasubspecific rank and is forbidden by the Code. If published as scientific name before 1961 it is to be treated at the rank of subspecies unless the author of the name gave it infrasubspecific rank. An example citation: *Globigerina velascoensis*, var. *compressa*, n. var. (see White, 1928: 196).

Vernacular name – also called the common, it is the name for an animal in language used for general purpose. For example, grizzly bear, razor clam, and blue crab.

4.2 COMMON ABBREVIATIONS USED IN TAXONOMY

ab. – aberration

aff. – *affinis* (Latin) – having affinity with but not identical with

auct. – *auctorum* (Latin) – of authors

ca. – *circa* (Latin) – about, with reference to dates

cf. – *confer* (Latin)

e.g. – *exempli gratia* (Latin) – for example

emend. – emended, emendation

et. al. – *et alia* (Latin) – others

f. – form

ibid. – *ibidem* (Latin) – in the same reference

ICS – International Commission on Stratigraphy

IUGS – International Union of Geological Sciences

ICZN – International Code of Zoological Nomenclature

iDIGBIO – International Digital Database of Biodiversity

i.e. – *id est* (Latin) – that is

in litt. – *in litteris* (Latin) – in correspondence

loc. Cit. – *loco citato* (Latin) – in the place previously cited

n. gen. / gen. n. / n.g. / gen. nov. – *genus novem* (Latin) – new genus

n. comb. – new combination

n. fam. – new family
n. n. / nom. nud. / nom. nov. – *nomen novum* or *novem nudum* (Latin) – new name
no. – number
nob. – *nobis* (Latin) – to us, or referring to author of a name
nom. dub. – *nomen dubium*
n. sp. / sp. n. – new species
PBDB – Paleobiology Database
ssp. / subsp. – subspecies (singular)
sspp. – subspecies (plural)
ssp. nov. – new subspecies
s. str. – *sensu stricto* (Latin- in the strict sense)
Treatise – Treatise of Invertebrate Paleontology
v. / var. – variety
viz. – *videlicet* (Latin - namely)
WoRMS – World Registry of Marine Species

4.3 TYPE SPECIMEN ABBREVIATIONS

Holo – Holotype	Topo – Topotype
Para – Paratype	Pneo/P-neo – paraneotype
Syn – Syntype	Plty/Pl-ty – plastoype
Neo – Neotype	Plho/Pl-ho – plastoholotype
Lecto – Lectotype	Plpa/Pl-pa – Plastoparatypes
Plec/P-lec – Paralectotypes	Non – Nontype
Type – Type	

4.4 PAGINATION ABBREVIATIONS

V. – volume	BD. – band (German)
N. – number	PT. – part
P. – page	TM. – tome (French)
PL. – plate	FAS. – fascicle (French)
F. – figure	NS. – new series
TF. – text figure	SER. – series
TBL. – table	ART. – artic

4.5 ROCK TYPE ABBREVIATIONS

LS – limestone	CL – clay
DOL – dolomite	CGL – conglomerate
SS – sandstone	SLTS – siltstone
SH – shale	

Marl and Slate are NOT abbreviated.

4.6 USEFUL KEYSTROKE SHORTCUTS

- Ctrl + c** – copy
- Ctrl + x** – cut
- Ctrl + v** – add verbatim / paste
- Ctrl + d** – fill down
- Ctrl + f** – find

For more keyboard shortcuts visit, <http://www.instantshift.com/2013/07/01/useful-keyboard-shortcuts/>

4.7 TAXONOMIC SUFFIXES

	Plants	Algae	Fungi	Animal	Bacteria
Division/Phylum	-phyta	”	-mycota		
Subdivision/Subphylum	-phytina	”	-mycotina		
Class	-opsida	-phyceae	-mycetes		-ia
Subclass	-idae	-phycidae	-mycetidae		-idae
Superorder	-anae	”	”		
Order	-ales	”	”		-ales
Suborder	-ineae	”	”		-ineae
Infraorder	-aria	”	”		
Superfamily	-acea	”	”	-oidea	
Family	-aceae	”	”	-idae	-aceae
Subfamily	-oideae	”	”	-inae	-oideae
Tribe	-eae	”	”	-ini	-eae
Subtribe	-inae	”	”	-ina	-inae

Genus, Species and Subspecies – the suffixes of genera, species and subspecies are dependent on the origin of the root of the name. If the root is a word, the word may have an assigned gender in the native language. Commonly, masculine words are denoted in taxonomy with “-a,” if feminine, the suffix would commonly be “-ae.” If the root word is a name to honor someone, if the name is of a man’s the species name would represent a masculine suffix, such as, “-i, -ii”. If the name is of a woman, the species would represent a feminine suffix, such as, “-ae.” If the root word is a place or locality, the suffix will be “-ensis,” denoting it named after a place of significance. Not all authors follow these rules set by ICZN. Therefore, there are some “oddball” suffixes.

4.8 TAXONOMIC LISTINGS

USNM List of Invertebrate Paleontology Taxonomy, Courtesy NMNH, AMNH archives
1975-1989

Protozoa	Crustacea
Foraminifera	Ostracoda
Fusulinidae	Insecta
Radiolaria	Mollusca
Porifera	Amphineura
Receptaculitidae	Gastropoda
Archeocytha	Pelecypoda
Coelenterata	Scaphopoda
Scyphozoa	Cephalopoda
Conularida	Nautiloidea
Hyrdozoa	Ammonoidea
Stromatopoeida	Coleoidea
Anthozoa	Rostroconchia
Rugosa	Echinodermata
Scleractinia	Crinozoa
Tabulata	Cystoidea
Bryozoa	Blastoidea
Cheilostomata	Crinoidea
Ctenostomata	Asterozoa
Cyclostomata	Asteroidea
Trepotomata	Ophiuroidea
Cryptostomata	Echinozoa
Fenestrata	Helicoplacoidea
Cystoporata	Edrioasteroidea
Brachiopoda	Echinoidea
Arthropoda	Graptolothina
Onychophora	Conodont
Trilobitoidea	Incertae Sedis
Trilobita	Ichnofossil
Eurypterida	Pseudofossil
Arachnida	Annelida

AMNH Invertebrate Higher Taxonomy List

Protozoa

Foraminiferida

Radiolaria

Porifera

Bryozoa

Tubuliporata (=Cyclostomata)

Cryptostomata

Cheilostomata

Treptosomata

Cystoporata

Fenestrata

Ctenostomata

Coelenterata

Hydrozoa

Scyphozoa

Anthozoa

Rugosa

Scleractinia

Tabulata

Conulariida

Stromatoporoidea

Brachiopoda

Mollusca

Gastropoda

Bivalvia

Cephaholpoda

Nautiloidea

Ammonoidea

Coleoidae

Actinoceratoidea

Endoceratoidea

Bactritoidea

Hyalithida

Monoplacophora

Polyplacophora

Aplacophora

Rostroconchia

Annelida

Scolecenodonts

Arthropoda

Crustacea

Ostracoda

Trilobita

Merostomata

Arachnida

Insecta

Myriapoda

Echinodermata

Eocrinoidea

Paracrinoidea

Edrioblastoidea

Cystoidea

Blastoidea

Crinoidea

Parablastoidea

Echinoidea

Helicoplacoidea

Cyclocystoidea

Edrioasteroidea

Camptostromatoidea

Ophiocistoidea

Stelleroidae

Ophiuroidea

Homoiostelea

Honostelea

Stylophora

Machaerida

Graptolithina

Conodonts

Receptaculitids

Tentaculitids

Archeocyatha

Ichnofossils

Pseudofossils

Incertae sedis

Plantae

*Some vertebrates are found within Hall Collection, mostly Pisces.

4.9 INTERNATIONAL CHRONOSTRAPHIC CHART

The figure below is the international Chronostraphic chart prepared by the International Commission on Stratigraphy (ICS), a subordinate body of the International Union of Geological Science (IUGS). ICS is a working committee with the sole purpose of defining global geologic

INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

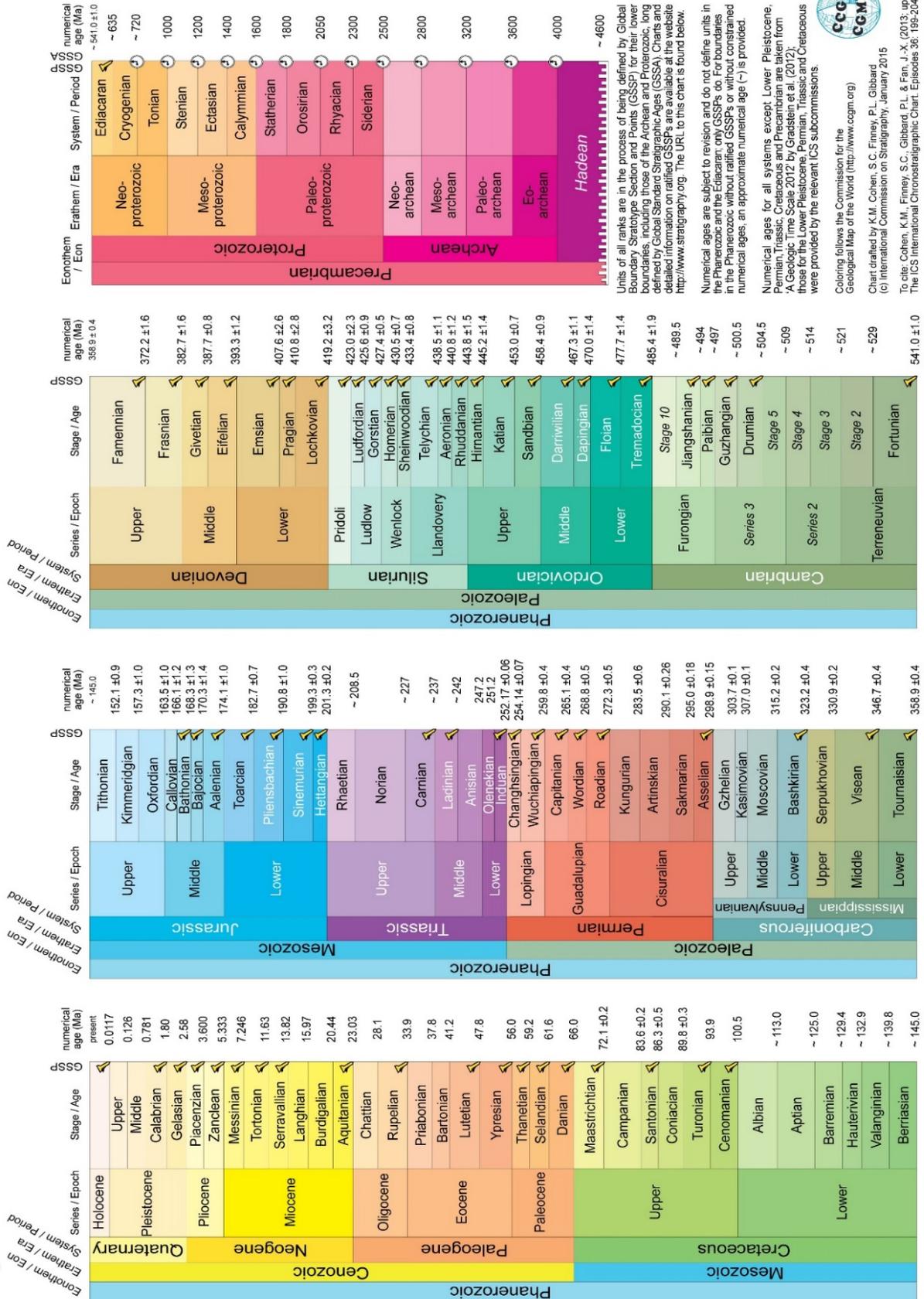
www.stratigraphy.org International Commission on Stratigraphy



www.stratigraphy.org

International Commission on Stratigraphy

v 2015/01



Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on defined GSSPs are available at the website <http://www.stratigraphy.org>. The URL to this chart is found below.

Numerical ages are subject to revision and do not define units in the Phanerozoic and the Eoarchean. GSSPs for boundaries in the Phanerozoic and GSSAs for units contained in the Phanerozoic are provided by the relevant ICS subcommissions.

Numerical ages for all systems except Lower Pleistocene, Permian, Triassic, Cretaceous, Paleogene and Neogene are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012). Those for the Lower Pleistocene, Permian, Triassic and Cretaceous were provided by the relevant ICS subcommissions.

Coloring follows the Commission for the Geological Map of the World (<http://www.cgmw.org>)

Chart drafted by K.M. Cohen, S.C. Finney, P.L. Gibbard (c) International Commission on Stratigraphy, January 2015

To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013, updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.

URL: <http://www.stratigraphy.org/CSChart/ChronostratChart2015-01.pdf>