ES486 Summary / Writing Instructions

Writing Assignments: Students are required to write a 500-800 word (~1-2 typed pages) summary for a series of field trips, speaker topics and journal articles that will be assigned. This exercise is designed to enhance the writing skills of students. The general format should include: (1) Introduction to the Problem / Issue, (2) Summary of Main Points, (3) Final Discussion of the Relevance of the Presentation / Field Trip, (4) References Cited, and (5) pertinent figures and tables (items 4 and 5 are in addition to the 1-2 type-written pages).

A variety of student writing guides are available on the class web site. The summaries should be neatly word-processed, double spaced, with 1 inch margins, and checked for spelling errors with a "spell checker" tool. ***Miss-spellled*** words will not be tolerated. Save your word-processing files as you may be required to modify and edit the summaries.

See attached for an example summary and general geo-writing guidelines.

EXAMPLE ARTICLE Summary

R. Akers
3-10-83
Summary

Baldwin, E.M., 1974, Eocene stratigraphy of southwestern Oregon: Oregon Dept. of Geology and Mineral Industries, Bulletin 83, 40 p.

Baldwin gives a detailed description of the Eocene formations in southwestern Oregon and uses the revised stratigraphy in order to reconstruct the paleogeography of the Eocene coastal margin. Klamath pre-Tertiary strata occupy only a small part of the study area (Fig. 1); however, Baldwin concludes that they were a major source area for sediments and their Cenozoic tectonic history is closely related to that of the Eocene sedimentary basins of western Oregon.

The Eocene formations are dominantly sandstones and siltstones with some conglomeratic and coaly beds (Fig. 3). The earliest Eocene formation, the Roseburg Formation, was closely folded and thrust eastwards soon after deposition. This early Eocene telescoping of Roseburg strata may have been in response to subduction of an oceanic plate to the west. The Paleocene to early Eocene seaway (Fig. 6) in which the Roseburg Formation was deposited reached northward into Washington and volcanic and sedimentary rocks of the Crescent Formation may be correlative.

Deformation of the Roseburg Formation resulted in a brief erosional event prior to the deposition of the overlying Lookingglass Formation. The Lookingglass Formation unconformably overlies the Roseburg Formation and onlaps upon the pre-Tertiary strata along the periphery of the basin, toward the Klamath Mountains (Fig. 6). A brief period of erosion (probably due to crustal uplift), after the depostion of Lookingglass strata, created an unconformity upon which the Flournoy Formation onlapped during the middle Eocene (Fig. 2). The Flournoy seaway was one of the most restricted during the Eocene (Fig. 6). Conglomerate, pebbly sandstone, and coal were deposited in shallow seas with interfingering non-marine strata. The finer grained, thin beds of the upper part of the Flournoy Formation imply deposition in a quiet, deeper neritic environment. The source for the Flournoy strata is questionable; however, some evidence indicates that they may have come from the Klamath Mnts. as end-filling a north trending basin.

The middle Eocene Tyee Formation rests unconformably on the Flournoy, Lookingglass, and Roseburg strata and shows a conspicuous lack of basal conglomerate; indicating that the source area was not adjacent to the basin and that the sediment was delivered by rivers bearing sand and silt. Previous workers (Snavely, 1964; Lovell, 1969) suggest that the sediments came from the south (Klamath province) and were carried northward over a submarine surface that was previously subdued by erosion (Flournoy-Tyee unconformity). The southern portion of this elongate basin (Fig. 13) is dominated by nonturbidite facies while the northern portion is dominated by turbidite deposits. A broad transitional zone between these two lithofacies is present. An offlap towards the north and west restricted the size of the basin toward the end of Tyee deposition and the beginning of Elkton deposition (Fig. 13).

The Elkton Formation is gradational above the Tyee Formation, becoming finer grained upward. The Elkton beds represent deposition at a time when the energy of the streams was diminishing. The overlying Bateman Formation represents the final deposits of the offlapping sea (Fig. 13). Uplift and erosion occurred prior to the deposition of the Coaledo and Spencer Formations. The Coaledo and Spencer Formations were deposited in shallow, encroaching seas during the late Eocene. Sediments for these formations came from the Klamath province and from a possible land barrier that existed at the time of deposition (Fig. 16). The non-marine, late Eocene Colestin Formation consists of lava flows, tuffs, and tuffaceous sandstones and conglomerates that outcrop along the western edge of the Cascade range. The Colestin appears to have been marginal to the late Eocene marine Coaledo strata, but the exact relationships are unknown. The Bastendorff Formation is predominantly shale, whose coarser, near-shore equivalents have been eroded away (Fig. 16).

Basin morphology, numerous unconformities, and northerly directed sediment transport suggest that sedimentation during the Eocene was controlled by tectonism. Although this view has yet to be proven.

OVER →

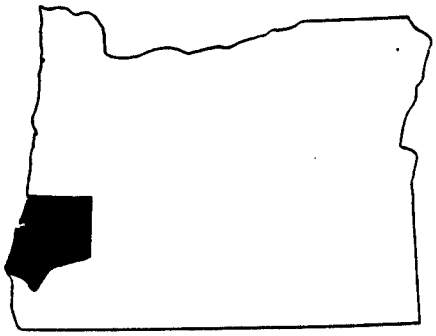

Figure 1. Location map of study area. Pre-Tertiary strata found in southern ⅓ of study area.

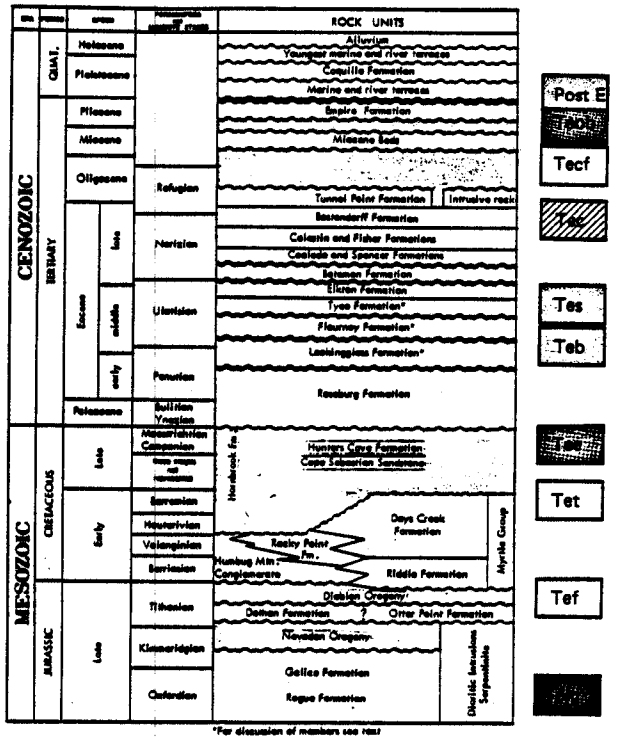

Figure 2. Stratigraphic chart for southwestern Oregon.

UNCONFORMITY

Post Eocene

Bastendorff Formation:
Thinly bedded gray to buff shale and minor sandstone.

Colestin and Fisher Formations:
Flows and volcaniclastic beds, conglomerate tuffaceous sandstone

Coaledo Formation:
Sequence consisting of three members; lower and upper members consist of coal-bearing, cross-bedded, tuffaceous sandstone, and middle member consists of thin-bedded siltstone with minor sandstone.

Spencer Formation:
Sandstone with some coaly beds.

Bateman Formation:
Thickly bedded to cross-bedded, medium-grained, micaceous, deltaic sandstone, coal-bearing locally.

? UNCONFORMITY ?

Elkton Formation:
Indistinctly bedded micaceous siltstone with intermittent beds of massive sandstone.

Tyee Formation:
Thick sequence of rhythmically bedded, micaceous sandstone and siltstone; coal-bearing at Eden ridge.

UNCONFORMITY

Flournoy Formation:
Rhythmically bedded micaceous sandstone passing upward into thin-bedded sandstone and siltstone.

UNCONFORMITY

Lookingglass Formation:
Rhythmically bedded sandstone and siltstone; basal beds are coal-bearing and conglomeratic locally near the base of the section.

UNCONFORMITY

Roseburg Formation:
Thick sequence of sandstone and siltstone; rhythmically bedded locally; contains minor conglomerate and massive sandstone; pillowed and brecciated submarine basalts (Terv) are abundant locally.

Tertiary intrusive rock:
Sills and dikes of basic to intermediate composition.

Pretertiary

Figure 3. Description of Eocene strata in southwestern Oregon.

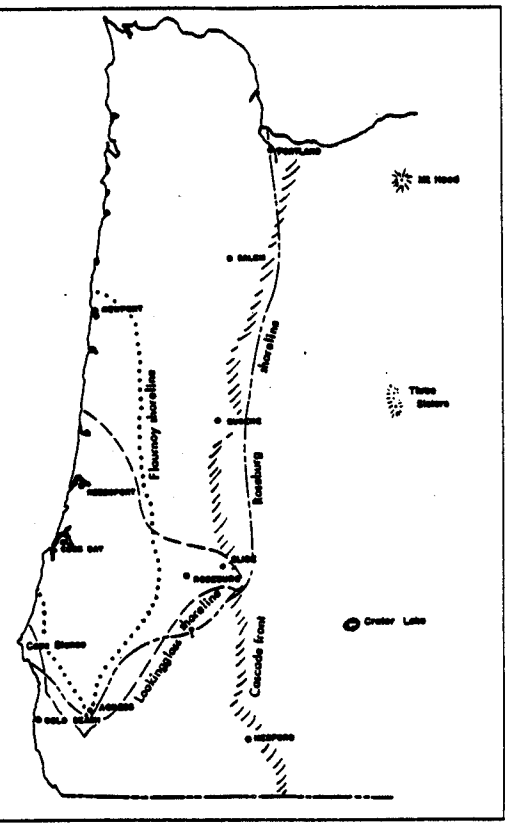

Figure 6. Paleogeographic map of Roseburg, Lookingglass, and Flournoy Formations.

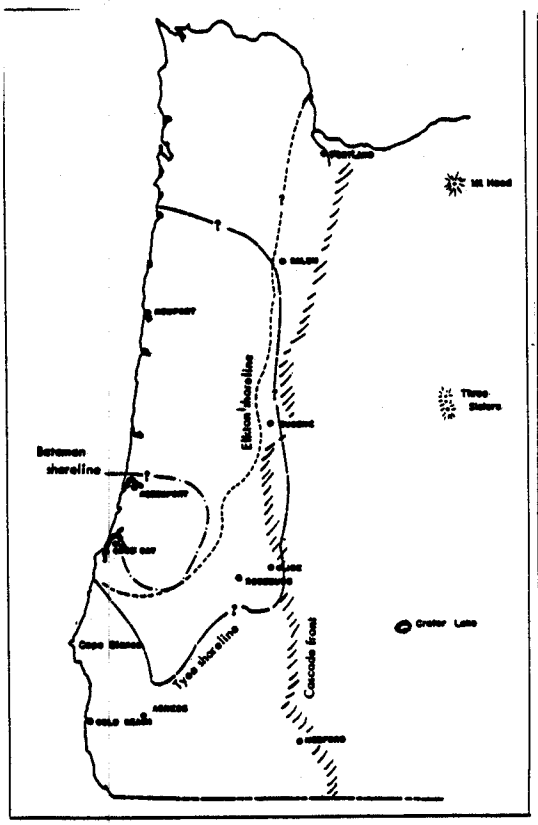

Figure 13. Paleogeographic map of Tyee, Elkton, and Bateman Formations.

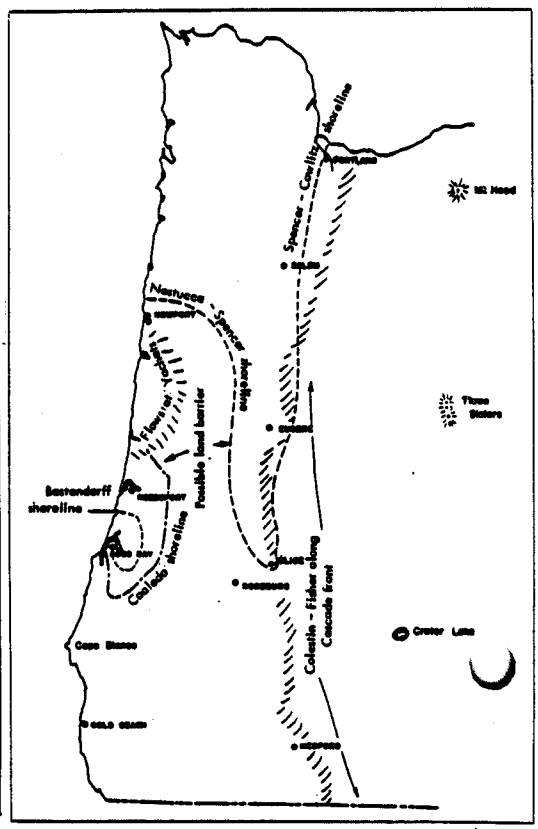

Figure 16. Paleogeographic map of Coaledo, Colestin, Spencer, and Bastendorff Formations

CHAPTER 1

Before You Write — Preparation

Nearly all scientists enjoy research, the actual doing of science. But many say that the most difficult part of their work is sitting down to write about their research. Some find it hard to get started. They're intimidated by staring at a blank page or an empty computer screen. Others find the entire writing process painful, a necessary evil in the accomplishment of their work. Still, writing is unavoidable if they are to record and communicate their results.

Several techniques will help you get started writing. Once you have started, other methods can help you improve your writing. Quite simply, the only way to get better at writing is to write. Like plumbing or cooking or playing basketball, the more you work at writing, the better you get. It may also help to have someone advise you, telling you which mistakes are easily avoidable and giving you hints to improve your work. But the act of writing will help you clarify your thinking and improve your ability to communicate it.

Choose your writing instrument

Use whatever mechanics appeal most to you. You may want to make the first pass in longhand, or use a typewriter. A personal computer with a word-processing program can make the logistical aspects of writing much easier: you can revise, rearrange, cut, and check spelling and syntax with the touch of a few keys.

Find your writing method

Professional writers use a variety of mechanical techniques and working conditions. Some writers start early in the morning; some work only late at night. Truman Capote claimed that he wrote the first drafts of all his work while lying in bed. Find the method that works best for you and use it to get the product you want.

Make an outline

An outline will help make the rest of the job easier. The level of detail in the outline will depend on your writing experience, the complexity and length of the work, and the publication for which you are writing. Many scientific journals have a standard format that consists of an abstract, a statement of the problem, a review of pertinent literature, a description of research methods and results, and conclusions. It may help you to outline your work with a few words of summary under each of these categories or the categories a particular journal requests.

Paleontologist Stephen Jay Gould is well known for writing about geology, natural history, and the history of science. But even in his technical articles, Gould uses a fairly unconventional writing style, avoiding the usual stylistic conventions and writing in a more narrative style and organization. If you are a good enough writer, you may be able to get away with the same thing. For almost all writers, however, a journal's format may have the advantage of providing an established framework within which you can work.

Think about your audience

A time-honored axiom of writing is to know your audience. You should know the readers' level of understanding of your subject. Some readers will be able to understand complex technical ideas and polysyllabic words without any explanation. After all, the purpose of scientific jargon is to provide a precise and short (though often inelegant) method of communicating technical information. For other audiences, concepts and words may require some definition. You should always keep that level of understanding in mind. Similarly, the audience's level of interest may vary from publication to publication. If you are writing for readers who are unfamiliar with your particular area of expertise, they may require additional explanation to make the relevance of your work clear.

Imagining your audience as one person may help you visualize your readers. That is, think of a person you know who might read your article, such as a colleague or friend. Try to envision this person reading the article, to see if he or she can understand it. Anticipate your reader's questions, both in terms of subject matter and in the technical level of the writing, and then answer the questions. Also, ask yourself what you would like to know as a reader, and then provide that information. Writers should never leave their audience with questions that they could have answered.

You may be your own best audience. You should know, even before you sit down to write, what you want to communicate, which ideas you want to convey. Obviously, you must be interested in and excited about your specific line of research, or you wouldn't have pursued it. You should bring that same interest and excitement to your writing, using your judgment in deciding what is important. If you write about the things that are important to you, you will almost certainly be a better writer.

Put your ideas on paper

Some writers spend hours on the first sentence of a report. They write nothing beyond that first sentence until they are happy with it, no matter how many times they have to rewrite it. For most researchers, however, a better approach is to get something — anything — down on paper without worrying about the grammar, syntax, or misspelled words. The very act of writing will often help you get started. You don't need to worry too much about the way things come out the first time. There is plenty of time to fix them later.

BEFORE YOU WRITE — PREPARATION

- Choose your writing instrument.
- Find your writing method.
- Make an outline.
- Think about your audience.

CHAPTER 2

Preparing Copy

Editors are busy people. Whatever you can do to make their job easier will help get your work into print.

Match your work to a journal

Now that you are ready to write, you will want to find a journal that is interested in publishing your work. Decide which journal is most likely to use it; don't submit your work unless you are familiar with a journal's recent issues. You want to make sure your paper and a journal will make the best fit. For example, the *Journal of Paleontology* and the Geological Society of America's *Bulletin* may both use a paper on Devonian brachiopods, but the *Bulletin* is less likely to use one on a specialized aspect, such as the morphology of productids. The last chapter of this book gives specific information on current periodicals in the earth sciences.

Follow journal or general guidelines for writers

Editorial policies change, so examine recent issues of the journal you have chosen. Do not depend on old issues or on your impression of a journal's content. If a journal has a stylebook or other standard, follow the instructions closely. Some of the rules may seem arbitrary, but follow them anyway — they are designed to fit an editorial system or to meet mechanical requirements imposed by the journal's design or a printer's equipment. Flouting those rules may make extra work for editors. If a journal has no formal suggestions to authors, apply common sense and use a stylebook, such as the *Suggestions to Authors of the Reports of the United States Geological Survey* or *The Chicago Manual of Style*.

Hard copies. Stylebooks may specify that manuscripts be submitted on good quality white bond paper (some may even specify the weight). Editors must work with the paper, and they object to paper too stiff to handle, too thin for convenience, too shiny for easy reading, or too hard or slick to take sharp, clear pencil marks. Papers with easy-erase surfaces are particularly troublesome.

Computer printouts should be easy to read and photocopy. Some printers produce hard-to-read type: for example, a lowercase *g* may look like a 9. Some space words so that editors cannot easily count words or characters for estimating printed pages. Many editors actually ban certain types of printouts, notably dot-matrix. Laser printouts are more than adequate. Check a publisher's stylebook for specifications, or send a sample page.

Electronic copies. Many journals request that manuscripts be submitted in electronic form as well as on paper. Confirm with a journal the computer system and software that was used so that you can submit a readable diskette or one that can be translated. Submitting a manuscript via electronic mail may also be acceptable and convenient. A paper copy should also be sent to verify the electronic transmission.

Typing. All copy should be typed, double-spaced, with standard indentions, at least four-centimeter wide margins on all sides, and approximately equal line lengths. That rule applies to all copy, no exceptions. It includes titles, bylines, author identification and affiliation, abstracts, quoted matter, footnotes, tables, lists of references — everything. Doublespace everything. Editors need the space between the lines and in the margins for editorial marks. Also, even spacing and margins help editors estimate how much space your work will occupy in the publication. Try not to use a proportional-space typewriter or printer, which makes copyfitting — estimating space — all but impossible.

Do not add extra spaces between paragraphs or sections. Triple spacing is acceptable, but be sure to use the same spacing throughout. Single spacing is never acceptable. Avoid devices such as single-spacing the abstract, long quotations, or references in an attempt to simulate smaller type. Do not break a word at the end of a line, because an editor or typesetter may mistake the hyphen for a part of the spelling.

Use one side of the paper only. At the top of each page, type a short identification tag in case pages get misplaced — one word, such as your last name, and the page number: *Jones 1, Jones 2, Jones 3.*

Estimating space. Some editors welcome an outline of a prospective manuscript because both a writer and editor can then discuss manuscript length in terms of the number of words, typescript pages, and printed pages. As a guide, one 8 1/2-inch by 11-inch, two-column printed page set in 10-point (elite on a typewriter) type equals about three and one-half double-spaced typewritten pages, excluding figures.

Names. Provide complete names for people. A text reference to a person's name should match a bibliographic reference. Do not abbreviate names or terms, especially journal names, unless a journal specifically requires it. That job is for the editor, who should not have to find out whether your *Geol.* means *Geologic, Geological,* or *Geologists.*

Numbers. If possible, avoid built-up fractions:

$$\frac{a-b}{3(a+c)bx}$$

They are hard to set in type and waste space. Use case fractions: $(a-b)/3(a+c)bx$. If you have typed equations using a word-processing program, find out how to save the file so that the equation format can be retained when the file is accessed. Make sure you send hard copy so that equations can be rebuilt if necessary.

Most science journals use the international metric system. Check to see if the journal you chose does.

Table. Avoid rules, which are horizontal or vertical lines. Remember that the editor can add needed rules quickly and neatly; taking unneeded ones out is much more difficult and time-consuming. Use enough space between columns to make the meaning clear but not so much as to make lines of numbers hard to follow with the eye.

Footnotes. Avoid using footnotes if at all possible. Many journals will not allow footnotes and will incorporate the material into the text.

Verification. Double-check all spellings, quotations, references, equations, formulas, and arithmetic. It is an editor's duty to check some of these, too, but an editor is under time constraints and usually working on several manuscripts at once. The author is responsible for providing correct information and mathematics.

Permissions. If you plan to quote extensively from published material or to reproduce another author's photographs, tables, or diagrams, you must get permission in writing from the copyright owner. Many publishers have standard permission forms, which simplify and speed this task. For more information, please refer to chapter 11, Editing and Proofreading.

Avoid trade names, such as Plexiglas, Geodimeter, and Xerox. Carelessness in using them can result in sharp letters and worse from attorneys. Dictionaries usually indicate trade names, which should be capitalized. The trademark or registration symbol is not necessary.

Artwork. Photographs and other artwork must be identified in such a way that they will not be damaged. You may write the information on a separate piece of paper and tape it to the back of the artwork. Be sure to include location, scale, and any pertinent credit. If you have artwork done on a computer, check with the editor to see if the journal has the same graphics applications. If not, find out how to save your graphics and text files so that they can be accessed. For more information on artwork, please see chapter 7, Artwork.

Design. Do not attempt to specify design or to mark typographic style except for foreign words or phrases, such as names of species. Design and style are an editor's job.

Number of copies. For most editors, the original and one copy will suffice. Some editors require multiple copies, however, so check. Note that some photocopying machines use paper that is hard to write on; test all paper with a soft black pencil. Be sure to keep a copy for yourself. Let a journal know if you want your work back and enclose an envelope with your name, address, and sufficient postage.

PREPARING YOUR MANUSCRIPT

- Select an appropriate journal.
- Match your work to a journal.
- Follow journal or general guidelines for writers.

CHAPTER 3

Getting It Written

> Scientific research is not complete until the results have been published. Therefore, a scientific paper is an essential part of the research process. Therefore, the writing of an accurate, understandable paper is just as important as the research itself. Therefore, the words in the paper should be weighed as carefully as the reagents in the laboratory. Therefore, the scientist must know how to use words. Therefore, the education of a scientist is not complete until the ability to publish has been established. (From Robert A. Day, *How to Write and Publish a Scientific Paper.*)

We assume that you have decided where to submit your paper and have the appropriate style manual or sheet of instructions. We also assume that you have written an outline from which to proceed.

Decide on a title

It is wise to devote some care to this label for your product, because readers deserve an accurate statement of an article's contents. Two requirements are involved:

- The title should tell what the paper is about.
- The title should not be long and cumbersome.

Meeting these requirements will also help make your paper easy to cite by future workers. Remember that increasing use is being made of computer-oriented indexing and searching techniques. When indexed, most of the words in your title should help a reader search the literature by key words. Editors sometimes must modify titles of papers; you can help both editor and reader by keeping the title of your article brief and specific. Avoid such words as *introduction, principles, selected, investigations,* and *recent.*

Express the title clearly

After deciding on the title content, be sure to express the title clearly. A succession of words that seems to make perfect sense to you may not be clear to othrs. In *Abandoned Copper Mine Subsidence Study,* the first word, an adjective, can modify any of the following four words, all of which are nouns. Presumably, the author did not want to refer to an abandoned study. The title may be improved by using a modifying phrase: *Subsidence Study of an Abandoned Copper Mine.* The real subject of the paper, however, is not the study but the subsidence. Why not call it *Subsidence at an Abandoned Copper Mine?*

Another title starts with the words *Submersible Observations.* To the author, both these words are nouns, but to many readers *submersible* is an adjective meaning capable of functioning under water. Relating *submersible* to *observations* is difficult. *Observations from a Submersible* would have done the job nicely.

Follow writing guidelines

The following section provides some general guidelines for clear writing. The explanations are not intended to be comprehensive but rather to emphasize specific points. The chapter Reference Shelf lists many excellent references that give detailed information.

Declarative sentences. A straightforward, declarative sentence is the most useful vehicle in scientific writing. A subject (person, process, or thing) acts on or affects an object or result. Such a sentence is a normal forward-action unit, in which the verb is in the active voice:

> The rocks / contain / plagioclase.
>
> Diagenetic changes / may destroy / the open porous structure.

A number of variations on this basic framework exist. In both sentences, the verbs *(contain, may destroy)* may have adverbs as modifiers, for example, *commonly contain,* and *may ultimately destory.* In the second

sentence, the subject and object are modified by adjectives *(diagenetic, open, porous)*. A phrase adds further meaning: *the open porous structure of the diatomite*.

Nonrestrictive clauses. A nonrestrictive, or *which* clause, which is not essential to the meaning of the sentence but adds to it, may be included. Such clauses are set off by commas:

Many of the rocks contain plagioclase, which has normal zonation.

Restrictive clauses. You may need a restrictive *that* clause, which is essential to the sentence meaning and requires no commas:

the open porous structure that typifies normal diatomite

Passive voice. An alternative structure turns the sentence around:

Plagioclase / is contained / in the rocks.

The open porous structure / may be destroyed / by diagenetic changes.

The verbs are in the passive voice. That is, the subject of the sentence is being acted upon and is thus passive. Most good writers view the passive voice unfavorably; the active voice is inherently more dynamic and usually shorter. If the rocks contain plagioclase, that's the way to say it. But we don't lay down an absolute antipassive rule. If the sentence subject is the texture and structure of diatomite, it is logical to place the subject first and use the passive voice. You would then discuss the diagenetic changes.

Beware of the passive voice with weak verbs, such as *is seen, is found, was made,* and *was done*. Avoid passive verbs when preparing an abstract (discussed in a later section).

Subject-verb agreement. The verb in a sentence must agree with its subject in number, even though subject and verb may be separated:

A collection of museum-grade minerals, rocks, and fossils was available.

By putting the verb close to the subject, you will be more likely to notice any disagreement between subject and verb.

There is/There are. Starting sentences with the words *There is* or *There are* is permissible, but in general this usage should be avoided. *There is an abundance of fossils* means *Fossils are abundant.*

Sentence length. Try to vary the length and complexity of your sentences. No reader likes a paper full of short, choppy sentences, or long sentences with numerous subordinate clauses and other decorations. To test how well you are doing, when you finish a paragraph or a page read it out loud. You should be aware of the sounds that "words make on paper," as E.B. White put it. Rework your sentences until they sound right.

Paragraph length. Just as there is no set length for a sentence, there is no predetermined length for paragraphs. When writing for scientific journals, authors should write paragraphs that focus on one idea. They should use as many sentences as necessary, then begin a new paragraph when shifting focus or ideas. Thus, lengthy paragraphs (about eight, 10, or 12 sentences) are permissible in scientific writing, even though they may be frowned on in other types of less formal writing.

Transitions. As you shift focus from one paragraph to the next, be sure to include transitions: words or phrases that connect paragraphs. Such transitions make life easier for your readers by telling them how you are changing directions, how the discussion to come is related to the subject they were just reading. Sometimes a single word provides that transition. Words such as *however* or *although* at the beginning of a sentence wave a flag to the reader that you are about to qualify or perhaps even contradict what was written in the preceding paragraph. Sometimes phrases or even entire sentences are necessary to perform a transition. For example, the first sentence in the third paragraph of this chapter acts as a transition sentence:

After deciding on the title content, be sure to express the title clearly.

The first part of the sentence describes the purpose of the preceding paragraph, and the second part clues the reader to the rest of the paragraph. That transition sentence ties the two paragraphs together.

Avoid fancy writing

This sentence is from a letter sent out by a geological consulting firm:

> *To properly categorize and document current investigative methodologies, an intensive data gathering effort must be initiated.*

How does that sound when you read it out loud? Is that the way we normally talk? Of course not. The sentence has dressed up a simple thought to look impressive. To *properly categorize and document* (we will forgive the split infinitive) apparently means to determine or find out. *Current investigative methodologies* is an elaborate way of saying methods or techniques now being used. The sentence winds up with a typical passive voice construction:

> An intensive data gathering effort must be initiated.

By whom? In this final flourish, we may omit *intensive*, as presumably no one would make a lackadaisical data-gathering effort. Note the hyphen, not in the original, but needed because *data-gathering* is a unit modifier of *effort*. Translated into English, the sentence becomes

> *To find out what methods are now being used, we need to obtain information.*

or even

> *We need more data on methods now in use.*

These two suggested revisions are shorter than the original and may be said aloud without embarrassment.

A type of fancy writing that should be avoided is the use of long terms based on classical Latin instead of shorter equivalents from the Anglo-Saxon. *We initiated measurement of the adjacent arenaceous strata* means *We started measuring the nearby sandstone beds*. There are exceptions, when *approximately* sounds better than *about*, or *subaqueous* better than *under water*. One author, however, wrote that dune sands were moved about by *aeolian mechanisms*. He meant wind.

Don't let your modifiers dangle

Every adjective, adverb, phrase, or clause modifies some term in a sentence. An obvious rule is that the modifier must go near, preferably next to, the term modified. This sentence was in a book:

> *Beginning 4 billion years ago, the authors show how microbes invented all of life;s essential systems.*

To avoid implying excessive age for the authors, the sentence might well have been rephrased:

> *The authors show how microbes, beginning 4 billion years ago, invented all of life's essential systems.*

Keep modifiers next to what they modify, lest absurdity result. A special case is the adverb that floats unattached:

> *Hopefully, the job will be done this week.*

There is nothing in this sentence for hopefully to modify. It should be replaced by *We hope* or *It is hoped*. Floating adverbs do not belong in serious writing. The author who wrote *This study was gratefully supported by the National Research Council* should have said *I am grateful to the National Research Council for its support*. Of course, such adverbs can be used correctly. We speak hopefully when we say you won't misuse them.

Nouniness and how to avoid it

No doubt you will agree that *field* is a fine upstanding noun. So is *oil*. Put them together and you have *oil field*, two nouns end to end. No problem here. We can even take a third noun, *giant*, and place it in line, making *giant oil field*. This phrase hardly poses any difficulty, but from here on things get progressively messier. We have the production record of the field, which we designate *giant oil field production record*. This phrase contains some interesting data, which we analyze, giving us a *giant oil field production record data analysis*. We then construct a diagram based on these data — a *giant oil field production record data analysis diagram* — and

naturally conclude with a preliminary interpretation. So the paper is entitled *Giant Oil Field Production Record Data Analysis Diagram Preliminary Interpretation.*

Readers should never be asked to fight their way through such clotted prose — nine nouns and an adjective, all in a heap. The cure for such writing is the phrase. By using a few prepositions, we can recast the title into English that is immediately understandable:

> *Preliminary Interpretation of a Data-Analysis Diagram of the Production Record of a Giant Oil Field*

or, if you prefer:

> *Data-analysis Diagram of the Production Record of a Giant Oil Field: Preliminary Interpretation.*

We hyphenate *data-analysis* to make it a unit that modifies *diagram,* and we convert the other terms into prepositional phrases. Nothing can be done to make that title a model of graceful prose, but at least we can make it comprehensible.

Each of the following titles has appeared in geological literature. Can you translate them into English?

> *Canadian Superior Harmattan Area Gas Processing Plant Sulphur Recovery Exemption Application*
>
> *Multiple Pulse Incoherent Scatter Correlation Function Measurements*
>
> *Heavy Mineral Magnetic Fraction Stream Sediment Geochemical Exploration Program*

Unit modifiers

We have already mentioned a type of three-word expression in which the first two words modify the third — as in *three-word expression.* Although putting a hyphen between the first two words clearly aids the reader, this bit of help is often omitted. For example, a tectonic lineament roughly coextensive with a part of the 38th parallel has been referred to as the *38th parallel lineament.* This phrase is poor usage; it implies that there are a lot of parallel lineaments and this is the 38th. The expression is given its correct meaning by a hyphen: *38th-parallel lineament.* The first two words make a unit that modifies the third.

Such expressions as the following require a hyphen: *high-level terrace, rare-earth element, low-angle fault, mean-dip map.*

Somethimes editors will remove hyphens for reasons that are not obvious to authors. If you think a hyphen is needed, discuss its value with the editor. Its inclusion may be needed.

Sexist language

Sentences that refer only to one sex when they could equally apply to both can often be corrected (and shortened) by using plural constructions. For example:

> *The geologist should use the reflection and refraction profiles when he is uncertain of the dip of underlying formations.*

might be rewritten:

> *Geologists should use reflection and refraction profiles when they are uncertain of the dip of underlying formations.*

Instead of writing

> *When the geologist begins, he or she should visit the site immediately,*

write

> *Geologists should begin by visiting the site immediately.*

Spelling

If you have trouble remembering that *consistent* is spelled with an *e* and *resistant* with an *a*, don't feel bad; our language is full of teasers like that. Help is always available. The most obvious source is the dictionary. Keep one nearby and don't be embarrassed to use it. The *Glossary of Geology* and the *Dictionary of Geology* are also helpful. If you use a word processor, use the spelling checker with it.

For quick reference, you may want to make a list of words that give you trouble. The following list seems to bother some geologists.

symmetrical (two m's)

consistent, persistent

desiccate (one *s*, two *c*'s)

discernible

eustasy, isostasy (no *c*'s)

fluorite, fluorspar

liquid, liquefy

occurred, occurrence (two *c*'s, two *r*'s)

permeable, permeability

phosphorus

predominant, resistant

soluble

Mohs

Punctuation

The best way to learn about this subject is to note how various punctuation marks are used in material that you read, and to use references such as those listed in the chapter Reference Shelf. Counsel here is brief.

Comma. A comma, which seems to give the most trouble, marks a slight pause in the flow of words. For example, in the preceding sentence, the *which* clause stands out from the main sentence and is enclosed by commas.

Semicolon. A semicolon marks a slightly longer pause than a comma.

Period. For a full stop, or period, William Zinsser remarks that there isn't much to say about it except that "most writers don't reach it soon enough." (*On Writing Well*)

Colon. The most common use of a colon is to tell what's coming.

Dashes. A long dash separates:

No vestige of a beginning — no prospect of an end.

Some writers also use dashes to denote a more emphatic form of parentheses:

The sea left behind layers of shale and limestone — generally shale in the shallow sea and limestone where it was deeper — along with deposits of coal.

A hyphen connects, as in unit modifiers such as *low-angle fault*, and between syllables at the end of a line of type.

Apostrophe. An apostrophe denotes possession. The general rule is an apostrophe goes inside an s if the possessor is singular, outside if plural: *the rock's age, the pebbles' average size.* Depending on your stylebook, you may write *the 1980's* or *the 1980s*.

Quoting

You may sometimes want to quote the words of another writer. You should repeat these words verbatim, enclose them in quotation marks, and cite the source from your list of references, for example (*Snarf, 1984*). Copyright permission is necessary for quotations of several paragraphs or a page or more. Or you may rephrase another author's remarks in your own words — as long as you give the source.

References

You should have a list of references at the end of your article. The entries must be in the format required by the journal to which you send your paper. Journal editors are fanatics in this matter, so be sure to follow the instructions in the journal's guidelines to authors. If guidelines are unavailable, use a recent journal issue as a model. If you aren't writing for a publication but are preparing a document such as a company report, adopt a format for the references and use it consistently. Spell authors' names correctly and verify all information. Listing references is loaded with opportunities for error.

Software packages are now available that let you compile references as you work, then make style adjustments according to your avenue of publication. These packages can help you make sure that your reference style is appropriate and consistent.

TO GET YOUR MANUSCRIPT WRITTEN

- Decide on a title.
- Express the title clearly.
- Follow writing guidelines.
- Avoid fancy writing.