LSC # 26
Action Approv
11-29-90

COVER SHEET: Request for Approval to Use W-Designation

TYPE I. PROFESSOR COMMITMENT
(X) Professor Darlene S. Richardson Phone 2379
(X) Writing Workshop? (If not at IUP, where? when? _____)
(X) Proposal for one W-course (see instructions below)
(X) Agree to forward syllabi for subsequently offered W-courses?

TYPE II. DEPARTMENTAL COURSE
( ) Department Contact Person _____ Phone _____
( ) Course Number/Title _____
( ) Statement concerning departmental responsibility
( ) Proposal for this W-course (see instructions below)

TYPE III. SPECIFIC COURSE AND SPECIFIC PROFESSOR(S)
( ) Professor(s) _____ Phone _____
( ) Course Number/Title _____
( ) Proposal for this W-course (see instructions below)

SIGNATURES:

Professor(s) Darlene Richardson 9-10-90

Department Chairperson [signature]

College Dean [signature]

Director of Liberal Studies [signature] 11-29-90

COMPONENTS OF A PROPOSAL FOR A WRITING-INTENSIVE COURSE:

I. "Writing Summary"--one or two pages explaining how writing is used in the course. First, explain any distinctive characteristics of the content or students which would help the Liberal Studies Committee understand your summary. Second, list and explain the types of writing activities; be especially careful to explain (1) what each writing activity is intended to accomplish as well as the (2) amount of writing, (3) frequency and number of assignments, and (4) whether there are opportunities for revision. If the activity is to be graded, indicate (5) evaluation standards and (6) percentage contribution to the student's final grade.

II. Copy of the course syllabus.

III. Samples of assignment sheets, instructions, or criteria concerning writing that are given to students.

Provide 12 copies to the Liberal Studies Committee.
Please number all pages.

WRITING SUMMARY - GS 361 Physical Oceanography

GS 361 Physical Oceanography is proposed for identification as a "W" course. The course is taught every other Fall semester and is occasionally taught during the summer at the Marine Science Consortium. Because of its prerequisites, the students in the class are juniors and seniors who are majors in the Geoscience Department or in related science departments (Biology, Chemistry). Class size is limited to 20. This course is optional for Geology and Geoscience Majors, but is required for students enrolled in Earth and Space Science Education.

There are five basic types of writing which occur in this class:

1. Note-taking: There is no textbook which I use in this class, but I have the students read a variety of oceanography textbooks. They are also assigned journal articles, some of which refute each other. Students must take notes during the lecture; they are given a set of photocopied figures and tables which are incorporated (as overheads) in the lectures. Thus, they can interleave lecture notes with figures and tables to create their own "textbook." I offer to review students' notes to check that they are writing down the main points. These notes add up to a considerable number of pages which are not evaluated and do not contribute to the students' grades, except indirectly.

2. Quizzes: Students take quizzes almost every week. These quizzes are in-class writing assignments where they summarize and explain what they have learned in the previous lectures or in their assigned readings. Six of the quizzes are graded (15 points each); 5 quizzes, or more properly in-class writing assignments, are more of the reflection paper type and are not graded (2 points each for completion, 0 points for not doing the quiz). Quizzes contribute 10% to the student's grade. Each quiz is equivalent to 1/2 to 1 page of writing.

3. Exams: Students take 3 exams which are mainly of the short essay type. Students are expected to show relationships among oceanographic phenomena and to be able to predict how ocean conditions might change given changes in physical, chemical, or biological processes. They are not merely graded on how much of their lecture and reading material they can regurgitate. Students are graded on their responding to the specific question (that is, not telling me everything they know about a certain topic, but understanding how their information and ideas pertain to the specific question asked) with their facts, scientific principles, and causalities correct and logical. Errors in spelling and grammar are not counted in the grading. The exams contribute 60% (20% each) to the student's grade. Each exam is equivalent to 4-6 pages of writing.

4. Homework assignments: There are a variety of homework assignments--some of them deal mainly with mathematical problem-solving and thus represent writing in terms of mathematical equations, but some require students to summarize their knowledge in words. They are to do research on an oceanographic instrument and present that information to their fellow students orally and in the written form of an abstract. This particular exercise (the oral presentation) is evaluated by me and the

students in class. Students will also summarize the often contradictory conclusions in their reading assignments--for example, controversies associated with the generation of sea level curves and their paleo-oceanographic significance. Homework and laboratory assignments count 20% toward the student's grade, but only some of them would count as writing assignments. Most of the homework assignments are graded by me, but the oral presentation is graded by everyone in class. The writing component of the homework assignments is equivalent to about 15-20 pages of writing.

5. Field journal: Students keep a journal/log of their activities on the oceanographic field trip which includes 1 1/2 days on board oceanographic research vessels (two different types) and 1/2 day on the beach and marsh investigating reactions between water, sediment, and plants. The journal has a specific format and will include not only the itinerary (locations of oceanographic stations) and compilations of scientific data collected using a variety of oceanographic instruments, but will also include interpretations of those data in terms of daily variations due to tides and the implications of changes in the oceans over days/weeks/years/decades/centuries and so on. Students will also record their data from their marine geological investigations on the coast and again decide what are the implications for longer term changes on the shoreline with the seasons or transgression of the sea. The journal will be collected at the end of the first day at sea and reviewed by me to ensure that the journal is as complete, as truthful, and as oceanographically insightful as possible. The journal contributes 10% to the student's grade and is equivalent to at least 10 pages of written material.

These various types of writing include writing to summarize a point and enhance reading (summaries of journal articles, especially those which present conflicting views), writing for evaluation (quizzes, tests, and homework assignments), and writing to integrate learning (field journal and interpretation of data to predict short or long range changes in oceanographic conditions). The writing assignments are both graded and not graded and in-class and out-of-class. Students have an opportunity to revise some of their homework assignments (abstract on oceanographic instrument), summaries of their journal readings, and field journal.

GS 361 PHYSICAL OCEANOGRAPHY

Dr. Darlene Richardson
116 Welsh Hall

Office hours:
Phone: 357-2379

Course description:

Prerequisites: PY 111 and MA 121 or permission of instructor
2c-3l-3sh
Introduction to the physical, chemical, geological and biological nature of the oceans; topography, submarine geology, and bottom deposits. Includes field trip(s) which may occur on weekends.

Course objectives:

1. You should be able to discuss briefly the oceanographic research that needs to be undertaken in the following fields of studying, explaining why such research would be useful, and identifying general methods by which oceanographic data should be collected in each of the following cases:
   a. oceanic circulation
   b. ocean crust including deep-sea sediments
   c. atmosphere, surface water, life interactions with seawater

2. You should be able to list the actual and potential physical and living resources obtainable from within and beneath the oceans and you should be able to discuss the limitation that govern the exploitation of these resources.

3. You should be able to describe the shape of the ocean basins (major physiographic provinces) and explain the importance of this knowledge of the bathymetry of the seafloor.

4. You should be able to describe the major stages in the evolution of an ocean basin, and given suitable data, to determine the stage of evolution of any ocean basin.

5. You should be able to explain the physical-chemical-biological parameters (listed below) and describe any important effects that variation in one parameter may have on any of the others.
   a. static physical properties: temperature, density, transparency, pressure, sound
   b. dynamic physical properties: currents, tides, waves
   c. chemical properties: salinity, dissolved gases, nutrients
   d. biological properties: productivity, diversity
   e. sedimentary properties: processes and products, preservation vs destruction

6. You should understand what controls the amounts of the principal chemical and biological components of the oceans.

7. You should be able to describe and explain, in general terms, the

following:

a. surface ocean currents
b. thermohaline circulation
c. tides
d. waves and their effects on coastlines

8. You should be able to describe and explain, in general terms, the physical, chemical, biological, and geological processes occurring at the boundaries of the ocean system, including

a. the ocean-atmosphere boundary
b. the ocean-ocean floor boundary
c. the ocean-continent (coastal zone) boundary

9. Given examples of a particular coastal area, you should be able to discuss the activities of humans in that coastal zone and describe how such activities relate to

a. sediment movement
b. fish and other living organisms
c. pollution
d. changes in environment

10. You should understand the processes by which sediments deposited on the ocean floors record the history of the oceans and you should be able to list the major historical changes in ocean size, bathymetry, chemistry, biology and currents.

11. FINALLY, you should appreciate (and be able to show with examples) that the oceans must be viewed as an interrelated physical, chemical, and biological system and that the sediments deposited on the seafloor record any changes in that system.

Course Outline:

Introduction to oceanography: what is it, why we study it, brief history of ocean exploration, instrumentation, coordinate systems, living and non-living resources.

Chemical and physical properties of seawater: the water molecule, salinity, residence times, heat budget, temperature, density, sound, illumination, dissolved gases, vertical layering of the ocean

Physical oceanography: surface circulation, thermohaline circulation, upwelling, downwelling, waves (including tsunami), tides, coastal oceanography

Geological oceanography: internal structure of the Earth, evolution of continents and ocean basins (plate tectonics), bathymetry, physiographic provinces

Biological oceanography: general principles operating on eco-systems; reefs, humankind's interactions with the ocean

Sedimentological oceanography: distribution of pelagic and hemi-pelagic

sediments; ocean sedimentary record of Quaternary climates

Required text: Photocopy of figures and tables. Students will be assigned readings in a variety of textbooks and journals.

Required viewing:

Nova: Adrift on the Gulf Stream
The Planet Earth Series: The Blue Planet
National Geographic Series: Dive to the Edge of Creation
The Beach: A River of Sand
Challenge of the Oceans
The Deep-Sea Drilling Project
exercepts from The Abyss

Field trip and homework assignments:

We will spend 2 and 1/2 days in the field either on board ship or investigating beach processes. You will keep a field notebook entering where we went and what we did. You will also write up the various instruments which we use, the basic scientific principles behind their operation, the data which we collected, and the analysis and interpretation of these data. The field notebooks will be collected and graded for completeness of entries and oceanographic interpretations.

In addition, there will be up to six homework assignments including your making an oral presentation on one oceanographic instrument. Five of these homework assignments will be graded by me, the other will be evaluated by me and your fellow students.

Course assessment:

The final grade for this course will be determined as follows:

60% Three tests of short-answer and short essay type questions. If necessary, the average on the tests will be adjusted to 75% so that 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, and 0-59% = F.

10% Quizzes (short essay type) on lecture and reading material (done in 10-15 minutes of class time). Six quizzes will be graded and are worth 15 points each; 5 quizzes are ungraded--your doing them is worth 2 points each.

10% Field trip notebook (includes not only itinerary and compilations of scientific data from the instruments used, but will also include interpretations of those data in terms of daily variations and the implications of changes in the oceans over days or weeks)

20% Homework assignments

Sample questions for in-class writing exercises (which, for convenience, I label quizzes) which are not graded:

1. What was the most important scientific contribution of "Alvin's" "dive to the edge of creation?" How do "Alvin's" dives contribute to my contention that new technology and new knowledge go hand-in-hand?

2. You've been in this class for three weeks. List 5 of your questions about the study of the oceans which have been answered. What are 5 questions that you still have?

3. You're the chief scientific officer with the "R/V Bernier" at your disposal. Which area of the oceans would be your first target area for investigation and why?

Sample of gradod quiz

GS 361 PHYSICAL OCEANOGRAPHY
Quiz 6

Dr. Richardson Your SSN: _____

Respond in the spaces provided. Point values in parentheses.

1. Given the following definition:

$$\delta O18 = \frac{O^{18}/O^{16}\ sample - O^{18}/O^{16}\ standard}{O^{18}/O^{16}\ standard} \times 10^3$$

(1) a. What is the δO18 of rain? + δO18 - δO18

(1) b. What is the δO18 of ice? + δO18 - δO18

(1) c. What is the δO18 of seawater during a maximum extent of glaciation (lots of ice covering lots of land)? δ+ O18 -δO18

(4) d. (warning! danger ahead! thought question!) What is the δO18 of modern clams in Chesapeake Bay? Explain your answer.

(5) 2. Are more dikes (dike complexes) emplaced at the axial regions of the Mid-Atlantic Ridge (MAR) or at the East Pacific Rise (EPR)? Briefly explain your answer.

(4) 3. For the following organisms, indicate whether they are animal-like protista or plant-like protista and what is the chemical composition of their shells.

Foraminifera:

Radiolaria:

SAMPLES OF QUESTIONS FOR TESTS for GS 361 Physical Oceanography

Questions selected from three different tests. There are 7-11 questions per test.

General instructions: Answer the questions in the spaces provided. If you need more space use the back of the sheet (but be sure to let me know via an arrow that your answer continues on the back). Be precise and concise. Point values in parentheses.

1. Choose an oceanographic expedition of your choice. Name it. Give the dates of the operation. What are/were its most important contribution to the study of oceanography? What is/are the instruments that were first used or used more effectively by that expedition. (10)

2. If rivers (and chemical weathering on land) are the chief source of the dissolved ions in seawater, why is seawater not simply river water with the same order (of relative abundance) of major elements as in the crust? (10) Use the following table of information:

Major elements in crust (omitting oxygen): Si, Al, Fe, Ca, Na, K, Mg

Major ions in river water: Ca^{+2}, $HCO3^{-1}$ (NB: my WP program has trouble putting in subscripts!)

Major ions in seawater: (you list the 4 most abundant ions)

3. Decide whether the following statement is true or false. Explain your reasoning.

The depth of the photic zone is typically much greater near coasts than in the open ocean. (7)

Circle one: True False because. . .

4. If there were no clouds, the temperature of the oceans would be (choose one) higher or lower than present. Explain your answer. (12) Your logical reasoning and comprehension of the heat budget will be graded here, not whether or not you agree with me.

5. The oceans are more "transparent" to sound than to light. That is, acoustic waves travel much farther and deeper than does electromagnetic radiation. What significance does this hold for marine life and for we who explore the oceans? (7)

6. Given the following diagram of oxygen varying with depth, explain the variations you note. Notice that oxygen can increase a lot or a little below about 2000 m. Explain how either situation could develop. (10)

7. "What if" questions: Give short responses to the following as they pertain to oceanography. Briefly explain your answers. (5 points each)

a) What if the Earth rotated from East to West instead of from West to East (as it does)?

b) What if calcium carbonate were like most other substances and had greater solubility in warm water than in cold?

c) What if the Earth were 100% covered by ocean rather than 71%?

8. The age of deep water masses as determing by carbon-14 analysis has been used to determine the rate of flow of AABW. What is the major flaw in this reasoning (do not say human or analytical error)? Briefly explain your answer.

9. Careful analysis shows that the ratio of the concentration of Ca to total salinity is greater in deep water than in surface water. Briefly explain. Would you expect to see the same variations for the ratio of silica to total salinity? Briefly explain. (10)

10. Located on the map are letters. For each lettered location tell me what type of sediment you would expect to find on the seafloor surface and give the reasoning behind your answer. Also, what type of sediment would you expect to find 5 meters deeper. Give your reasoning behind that answer too (5 points each = 20).

Example of out-of-class short writing assignment

Summer 90

Richardson

GS 361 PHYSICAL OCEANOGRAPHY

HOMEWORK ASSIGNMENT #

Date handed out: _____ Date due: _____

1. Select an oceanographic or marine geological instrument.

2. Use your textbook and other material in the library to understand the scientific principles under which that instrumentation was devised.

3. Summarize the workings of the instrument (scientific principles rather than mechanical working).

4. Briefly describe the type of knowledge that the ocean scientist has gained from this particular instrument and how that knowledge led to greater understanding of the oceans and/or the ocean basins.

5. Orally present the summary of the instrument and its main contribution to the science of oceanography in class within 20 minutes maximum. You may, of course, prepare transparencies or other visual aids. Have a written summary to hand in to me. Include a bibliography with that abstract. The written summary must be typed, word processed or printed. Read the hand-out from "Geowriting" (attached) about how to prepare a good abstr... You may submit a rough draft of your abstract to me beforehand.

6. Assessment: You will be graded on the oral presentation in the following categories (see attached evaluation sheet):

a. Content of talk: factual evidence well-presented; all major points of interest covered; synthesis of data for easy comprehension by class; strong conclusion on the importance of that instrument to the development of marine geology as a science. (50 points)

b. Organization of talk: clear, logical, suitable, and coherent (20 points)

c. Style of talk: proper use of standard English and scientific terminology; emphasis on important ideas or concepts, effective use of illustrations (10 points)

d. Conduct of speaker: voice loud enough, clear enunciation, variation in tone, eye contact with audience (10 points)

e. Effectiveness of talk to the evaluator: was the talk dull or lively, were you interested and attentive; did the speaker attain his/her purpose? (10 points)

Your talk will be assessed by your fellow students (80%) and me (20%). Your fellow student evaluations will be anonymous. You will receive all evaluations with written comments so that you can benefit from this constructive criticism and praise.

The abstract and list of references cited will be graded by me in terms of how well you have followed the instructions:

a. length: 200 words--following the GSA format (10 points)
b. no typographical errors (remember that professional organizations require photo-ready abstracts) (10 points)
c. content: is there as much information as is necessary for us to

remember what you had talked about? Are all the major points of your talk incorporated within this summary? Are these points arranged in an orderly fashion so your reader can clearly follow them? (30 points)
d. are your references cited in the proper format? (again, we'll use GSA) (10 points)

Hint: It will be very useful for both you and your colleagues if you exchange abstracts for peer evaluation. The peer reviewer can ask such questions as: is the information selected pertinent to a review of an oceanographic instrument; is the information presented in an orderly, logical fashion; do you have any questions which the author should answer?

EVALUATION FORM - EXERCISE 1

NAME of person being evaluated: _____

TOPIC: _____

Rate the speaker on the criteria listed below by giving so many points out of the total points for that particular category.

1. **Content of talk**: factual evidence well-presented; all major points of interest covered; synthesis of data for easy comprehension by class; strong conclusion on the importance of that instrument to the development of marine geology as a science. 50 points: any score from 45-50 out of 50 would indicate an excellent talk with all the important points discussed in a clear manner. A score of 40-44/50 would be B quality work, 35-39/50 would be C quality work, 30-34/50 would be D work, and anything less than 30 would be F failure in that category.

Score:_____

Comments:

2. **Organization of talk**: clear, logical, suitable, and coherent. 20 points: 18-20/20 = A, 16-17/20 = B, 14-15/20 = C, 12-13/20 = D, ≤11/20=F

Score: _____

Comments:

3. **Style of talk**: proper use of standard English and geological terminology, emphasis on important ideas or concepts, effective use of illustrations. 10 points: 9-10/10 = A, 8/10 = B, 7/10 = C, 6/10 = D, <6/10 = F

Score: _____

Comments:

4. **Conduct of speaker**: appearance (neat, clean), voice loud enough, clear enunciation, variation in tone, eye contact with audience. 10 points: 9-10/10 = A, 8/10 = B, 7/10 = C, 6/10 = D, <6/10 = F.

Score: _____

Comments:

5. **Effectiveness of talk to the evaluator**: was the talk dull or lively, were you interested and attentive, did the speaker attain his/her purpose? 10 points: 9-10/10 - A, 8/10 - B, 7/10 - C, 6/10 - D, <6/10 - F

Score: _____

Comments:

abstracting the essence

In terms of number of readers, an abstract is easily the most essential part of a technical paper. It is like the bouillon cube and unlike the bouillon-cube's wrapper: the true essence is not in the list of ingredients.

Two views of abstracts follow. The first is Kenneth K. Landes's 1966 classic, "A Scrutiny of the Abstract, II":

A partial biography of the writer is given. The inadequate abstract is discussed. What should be covered by an abstract is considered. The importance of the abstract is described. Dictionary definitions of "abstract" are quoted. At the conclusion a revised abstract is presented.

The most important part of a paper may be its abstract. Effective abstracts
- *are concise*
- *summarize conclusions and recommendations*
- *are amenable to computer storage and retrieval.*

For many years I have been annoyed by the inadequate abstract. This became acute while I was serving a term as editor of the *Bulletin* of the American Association of Petroleum Geologists. In addition to returning manuscripts to authors for rewriting of abstracts, I also took 30 minutes in which to lower my ire by writing "A Scrutiny of the Abstract". This little squib has had a fantastic distribution. If only one of my scientific outpourings would do as well! Now the editorial board of the Association has requested a revision. This is it.

The inadequate abstract is illustrated at the top of the page. The passive voice is positively screaming at the reader! It is an outline, with each item in the outline expanded into a sentence. The reader is told what the paper is about, but not what it contributes. Such abstracts are merely overgrown titles. They are produced by writers who are either (1) beginners, (2) lazy, or (3) have not written the paper yet.

To many writers the preparation of an abstract is an unwanted chore required at the last minute by an editor or insisted upon even before the paper has been written by a deadline-bedeviled program chairman. However, in terms of market reached, the abstract is *the most important part of the paper.* For every individual who reads or listens to your entire paper, from 10 to 500 will read the abstract.

If you are presenting a paper before a learned society, the abstract alone may appear in a pre-convention issue of the society journal as well as in the convention program; it may also be run by trade journals. The abstract which accompanies a published paper will most certainly reappear in abstract journals in various languages, and perhaps in company internal circulars as well. It is much better to please than to antagonize this great audience. Papers written for oral presentation should be *completed prior to the deadline for the abstract,* so that the abstract can be prepared from the written paper and not from raw ideas gestating in the writer's mind.

My dictionary describes an abstract as "a summary of a statement, document, speech, etc. . . ." and that which *concentrates in itself the essential information* of a paper or article. The definition I prefer has been set in italics. May all writers learn the art (it is not easy) of preparing an abstract containing the *essential information* in their compositions. With this goal in mind, I append an abstract that should be an improvement over the one appearing at the beginning of this discussion.

revised abstract

The abstract is of utmost importance, for it is read by 10 to 500 times more people than hear or read the entire article. It should not be a mere recital of the subjects covered. Expressions such as "is discussed" and "is described" should *never* be included! The abstract should be a condensation and concentration of the *essential information* in the paper.

Cochran, W. and others, 1979, Geowriting: a guide to writing, editing, and printing in earth science: American Geol. Inst. (Falls Church, VA), pp 35-37.

The second view is illustrated by excerpts from "Standards for writing abstracts" by B.H. Weil:

the abstract defined

An abstract, as defined here, is an abbreviated, accurate representation of a document. The following recommendations are made for the guidance of authors and editors, so that abstracts in primary documents may be both helpful to their readers and reproducible with little or no change in secondary publications and services.

Make the abstract as informative as the document will permit, so that readers may decide whether they need to read the entire document. State the purpose, methods, results, and conclusions presented in the document, either in that order or with initial emphasis on findings.

For various reasons, it is desirable that the author write an abstract that the secondary services can reproduce with little or no change. These reasons include the economic pressures on the secondary services caused by continuing increases in the volume of scholarly publication; the need for greater promptness on the part of the secondary services in publishing information about the primary literature; and the growing value of good authors' abstracts in computerized full-text searching for alerting and information retrieval.

In the proposed standard the term *abstract* signifies an abbreviated, accurate representation of a document without added interpretation or criticism and without distinction as to who wrote the abstract. Thus, an abstract differs from a brief *review* of a document in that, while a review often takes on much of the character of an informative or informative-indicative abstract, its writer is expected to include suitable criticism and interpretation. While the word *synopsis* was formerly used to denote a résumé prepared by the author, as distinct from an *abstract* (condensation) prepared by some other person, this distinction no longer has real meaning.

abstract to inform

An abstract should be as *informative* as is permitted by the type and style of the document; that is, it should present as much as possible of the quantitative and/or qualitative information contained in the document. (Stringencies in publication economics may be governing factors, but they do not in themselves set standards for the quality of an abstract.) Informative abstracts are especially desirable for texts describing experimental work and documents devoted to a single theme. However, some discursive or lengthy texts, such as broad overviews, review papers, and entire monographs, may permit the preparation of an abstract that is only an *indicative* or descriptive guide to the type of document and what it is about. A combined *informative-indicative* abstract must often be prepared when limitations on the length of the abstract or the type and style of the document make it necessary to confine informative statements to the primary elements of the document and to relegate other aspects to indicative statements.

Abstracts should not be confused with the related, but distinct, terms *annotation*, *extract*, and *summary*. An *annotation* is a note added to the title or other bibliographic information of a document by way of comment or explanation. An *extract* signifies one or more portions of a document selected to represent the whole. A *summary* is a restatement within a document (usually at the end) of its salient findings and conclusions, and is intended to complete the orientation of a reader who has studied the preceding text. Because other vital portions of the document (e.g., purpose,

methods) are not usually condensed into this summary, the term should not be used synonymously with "abstract"; i.e., an abstract as defined above should not be called a summary.

A well-prepared abstract enables readers to identify the basic context of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether they need to read the document in its entirety. Readers for whom the document is of fringe interest often obtain enough information from the abstract to make their reading of the whole document unnecessary. Therefore, every primary document should include a good abstract. Secondary publications and services that provide bibliographic citations of pertinent documents should also include good abstracts if at all possible.

completeness and accuracy

For most papers and portions of monographs, an abstract of fewer than 250 words will be adequate. For notes and short communications, fewer than 100 words should suffice. Editorials and Letters to the Editor often will require only a single-sentence abstract. For long documents such as reports and theses, an abstract generally should not exceed 500 words and preferably should appear on a single page.

Begin the abstract with a topic sentence that is a central statement of the document's major thesis, but avoid repeating the words of the document's title if that is nearby.

In abstracts specifically written or modified for secondary use, state the type of the document early in the abstract when this is not evident from the title or publisher of the document or will not be clear from the remainder of the abstract. Explain either the author's treatment of the subject or the nature of the document, e.g., theoretical treatment, case history, state-of-the-art report, historical review, report of original research, Letter to the Editor, literature survey.

Write a short abstract as a single, unified paragraph, but use more than one paragraph for long abstracts, e.g., those in reports and theses. Write the abstract in complete sentences, and use transitional words and phrases for coherence.

active verbs

Use verbs in the active voice whenever possible; they contribute to clear, brief, forceful writing. The passive voice, however, may be used for indicative statements and even for informative statements in which the receiver of the action should be stressed.

Avoid unfamiliar terms, acronyms, abbreviations, or symbols; or define them the first time they occur in the abstract.

Include short tables, equations, structural formulas, and diagrams only when necessary for brevity and clarity.

Sample of out-of-class "mathematical writing"

Summer 90 Richardson

GS 361 PHYSICAL OCEANOGRAPHY

Homework assignment #

Date handed out: _____ Date due: _____

Waves

Show equations and all work. Include proper units.

1. a. The period of a wave is 20 s. At what speed will it travel over deep water?
   b. At what speed will a wave of wavelength of 312 m travel over deep water?
   c. At what speeds will each of the waves in (a) and (b) above travel in water 12 m deep?

2. a. For a deep water wave, what is the energy per square meter of a wave field made up of waves with an average wave amplitude of 1.3 m (use density = $1.03 \times 10^3 g/m^3$)?
   b. What would the wave power in kW per meter of crest length if the waves had steepness 0.14? (1 watt w = 1 J/s and 1 kilowatt kW = 10^3 W; steepness = H/L)?

3. The highest reliably measured wave at 34 m was encountered in 1933 by the US tanker "Ramapo" in the North Pacific. The "Ramapo" was 146 m long. Assume the tanker was going at a speed of 10 knots (5.14 m/s) and the wave crests took 6.3 s to pass from stern to bow.
   a. What was the actual wave speed (apparent speed of overtaking waves plus ship's speed) in m/s and knots?
   b. What was the wave steepness?
   c. What was the wave period? How does this compare with the period of 14.8 s reported by "Ramapo." How do you explain the difference/similarity?
   d. What is the maximum wave steepness associated with the 34 m wave height with a period of 14.8 s? This turns out to be a very steep wave indeed.

4. What sort of waves would you expect to see on a beach of intermediate slope (explain the reasoning behind your answer):
   a. after a prolonged spell of calm weather
   b. during a severe gale (Force 9 wind 40-47 knots) blowing onshore

Example of out-of-class long writing assignment

GS 361 PHYSICAL OCEANOGRAPHY
Sea Level Curves: Fact or Fiction, Global or Local?
Homework Assignment #

Date handed out: _____ Date due: _____

1. Read the following articles which present different approaches to the study of climate change and sea level history and their causes.

Lamont Newsletter, 1990, Barbados coral cores establish first continuous and detailed record of sea level change during las deglaciation: LDGO Newsletter, Spring 1990, pp. 1-8.

Weisburd, Stefi, 1987, Sea cycle clock: Science News, pp. 154-155.

Lamont Newsletter, 1989, Peter Vail and Lamont: sequence stratigraphy--yes; global sea link--no: LDGO Newsletter, Winter 1988, pp. 4-6.

Vail, P.R. and others, 1977, Global cycles of relative changes of sea level in: Payton, C.E., ed., Seismic Stratigraphy--applications to hydrocarbon exploration: AAPG Memoir 26, pp. 83-97.

Pitman, W.C., III, 1978, Relationship between eustacy and stratigraphic sequences of passive margins: GSA Bull, v. 89, pp. 1389-1403.

2. Write a paper of about 7-10 pages contrasting Vail and Lamont. Be sure to include the following items. Notice that I have organized the items from models which exist today to what type of model you would propose and how you would go about substantiating your model.

a. Summarize the views (i.e. sea level curves and causal agents) of Vail and associates and the methods; summarize the views of Pitman and the other geophysicists at Lamont.

b. What are the main points of divergence of these models? Do you think that these different constructs are due to the methods of investigation?

c. What are the main points of agreement in these models? Do you think that most changes in sea level are local or global?

d. Vail and his associates worked for EXXON in oil and gas exploration when they devised their global sea level curve whereas the scientists at Lamont are in "basic research"--that is, most of their funding is from NSF. Do you think the argument that there are often antagonistic goals between applied research versus basic research enters into this controversy?

e. Do you think oxygen isotope curves have something to say on changes in sea level? Which view do O-18 curves support--Vail or Lamont or neither?

f. How would you go about resolving the controversy of deciphering the geologic history of changes in sea level? What is your model? How would you go

about setting up a research program to prove/disprove your hypothesis?

3. It is important for you to realize that both Vail and Lamont may be right on some aspects of sea level change and that both Vail and Lamont may be wrong on other aspects. Your opinion is very important, but you should have as convincing arguments as possible for your opinions.

See the checklist to ensure that your paper is ready to be read and graded by me.

STUDENT CHECKLIST FOR LONGER OUT-OF-CLASS WRITING EXERCISES

Note: this checklist is taken from a variety of sources which were handed out at IUP's Writing Workshop. The contributors are many. The checklist progresses from the simple to check to the more difficult.

_____ I have typed or word-processed this paper with double-spaced lines and appropriate margins.

_____ I have checked this paper to catch errors in spelling, grammar, and punctuation.

_____ I have used the suggested GSA format for each of my references cited.

_____ This paper is honest--other people's work is meticulously cited by me.

_____ I have answered the questions which were asked.

_____ I have made no major errors in stating facts and I have done my best to avoid misrepresenting opinions, interpretations, or prejudices as facts.

_____ I have supported my position or opinions well. I have marshalled the evidence necessary to convince others of my position and I have presented that evidence in a clear, logical manner.

_____ I have utilized my knowledge from my other science courses to back up my opinions.

Writing Intensive Proposal: Physical Oceanography

No new or additional resources are required to present this course