James Madison University **Department of Geology & Environ. Studies**

Syllabus
Geology 491

GEOLOGICAL LITERATURE RESEARCH

Fall, 1997

Credit hours: 03

Meeting Place: Miller Hall Room 209, and Carrier Library (Room as announced)
Meeting Time: TT 1:40-2:55 (as announced; see schedule inside)

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PREFACE

Beginning with the 1991 JMU catalog, the BS degree in geology required completion of an independent or honors research project under the supervision of a faculty member. In 1992 the options for completing this research requirement were expanded to include this course in Geological Literature Research. Successful completion of all the requirements for this course thus satisfies the graduation research requirement.

Even though this course satisfies the research requirement, it is not designed just for those wishing to fulfill the requirement. This course was originally conceived to fill a gap in undergraduate geological education. Proficiency in problem identification and literature research is an essential skill for those pursuing graduate school or a professional career in the earth sciences, and anyone may take the course just to learn these skills.

Also, individuals doing independent or honors research projects under supervision of another faculty member may want to take this course as the beginning of their research. The literature review is a good way to gain perspective on a research project and find pertinent research which will aid in your research. For individuals taking this course as part of an independent research project (i.e. Geology 497-498, 499) that satisfies graduation requirements, the seminar presentation part of this course is waived in lieu of their formal presentation of research results.

This course will be offered on a regular basis, and may be taught by different faculty members on a rotation basis. Specific course requirements may vary with individual faculty members.

INTRODUCTION

One of the skills a scientist must possess is the ability to identify a problem, search the scientific literature for all the work previously done on that problem, synthesize that literature into a coherent understanding of the problem, and then present those findings to others in a written and/or oral report. The purpose of this course is for you to learn these essential skills and knowledge.

Geology is one of the more difficult disciplines to do literature searches in. The literature is enormous, diversified, and found in several disciplines. Today there are computer search systems such as GEOREF, but they are expensive and require a good grasp of the problem first. A thorough search can cost hundreds of dollars (at reduced academic prices) and more. There are circumstances where such computer searches are unwarranted or impractical, however, and every geologist should learn the strategies of literature searches.

COURSE GOALS

The goals of this course may differ in a fundamental way from the goals of other science courses you take. In most science courses the goal is to teach and learn what is known and understood about the science at the moment. They tend to be fact based, and are designed to make you a knowledgeable professional.

The goals of this course are to understand a subject historically and/or philosophically. We want to understand how and why the problem originated in the first place, and the ways in which ideas have evolved. We want to identify the sequence of paradigms which have defined the problem, when these paradigms came into existence, who defined them, how the scientific

community responded to new paradigms, how these new paradigms altered research programs, how technological progress has affected a field, what the current paradigm is and how it came into being, and what this all says about the future of the subject.

Even if your research topic is a narrowly focused and technical laboratory experiment, you still need to know what the standards and norms are for evaluating the experimental results, when they came into existence, where they were published, if everyone agrees with these standards, what happened with the invention of new techniques and analytical equipment, if everyone interprets experimental results the same way, and how these scientific results get caught up in debates between regulatory agencies, local communities, and political agencies.

Science is never done in a vacuum, it is always done is a historical/political/social context. Furthermore, practitioners often take on strong philosophical and ethical positions concerning the subject. A clear sign of this is the initial negative response many people have to new paradigms (witness Alfred Wegner's continental drift). Being a scientist and not a technician is to understand this larger context in which you are working. It is this perspective you are to learn in this course.

GRADING

Grading is based on a 12 point scale with A+ = 11-12, A = 10-11, A- = 9-10, etc. Distribution of the grading is as follows:

- 50% Stage Five: Formal oral presentation of results to class.
- 50% Stage Six: Written paper turned in at end of semester

In addition to the above requirements are the following. Failure to satisfy any of these requirements will result in a penalty of 1-2 points each on the 12 point scale.

- ❒ Homework exercises assigned by Ms. Cameron as part of learning library search methods. Evaluations will be either Satisfactory or Unsatisfactory.
- ❒ Stage Three: Seminar participation.
- ❒ By the WEEK 8 meetings you must demonstrate significant progress in your literature searching, both in the bibliography you turn in and in your presentation to the class.
- ❒ WEEK 14: STAGE FIVE: Formal presentation of the results of your study to the class.
- ❒ FINAL DUE DATE for paper, Wednesday of Finals Week, 5:00 PM. Penalty is 2 points for each 12 hour period or part thereof the paper is late.
- ❒ STAGE SIX [1]: Presentation of results during the Department Seminar

YOU ARE ALREADY BEHIND !

Because your research must be completed before the semester is over, you have very little slack time in the beginning and middle parts of the semester. Don't procrastinate. Work like you are continuously falling behind, because you are.

[1] For individuals taking this course as part of an independent or honors research project that satisfies graduation requirements, the seminar presentation part of this course is waived in lieu of their formal presentation of research results.

No final grades are assigned until all the requirements are fulfilled. This may during Fall semesters require holding off grade assignment (i.e. an incomplete) until the seminar presentation (Stage Seven) is finished in a following semester. The only exception is for individuals graduating in December.

FACULTY ADVISORS

You may have as many as three or more faculty advisors while doing the work for this course. Two of the advisors are the formal instructors:

Lynn Fichter is the course advisor for questions concerning geology and procedure.

Lynn Cameron is the course advisor for questions concerning use of the library, general information on literature searching, and for conducting your GEOREF search [1].

For a third advisor you are expected to make arrangements and consult with the faculty member(s) who have expertise in the field, and who can guide you through the details of a specific subject. These outside faculty advisors may be your research advisors, and their guidance will take precedence. Even with these advisors, however, you are expected to present a report following the guidelines outlined below and in other instructions handed out later.

TIMING AND SCHEDULING

A three credit course requires 6-9 hours of work a week, and this is the average time we expect you to work during each week of the semester. This amount of work is based on the formula that each hour in class should be accompanied by at least 2 hours of study and preparation outside.[2] Because of the nature of this course some weeks may take more, although others may take less.

There are times when the class meets as a whole, either for instruction, discussion, or reports, but much of the semester is independent work in consultation with either Lynn Cameron (questions on library research), or Lynn Fichter (questions on geology and course procedures), or your other faculty advisors (technical questions). The times the class does meet is officially scheduled on the front page, but this schedule is variable (see below).

The class is divided into seven stages:

STAGE ONE: IDENTIFYING PROBLEMS TO RESEARCH

Each of you must pick a problem to research by the end of the second week of the semester. At the end of this syllabus is a sample list of potential topics, but the list could go on

[1] For some projects computer data bases other than GEOREF are better. Ms. Cameron will help each individual decide the best data base.

[2] This formula for the work required of a college student is not much touted these days. But being a full time college student is just the same as having a full time job. Thus, a 15 hour course load is considered the norm because with 2 hours out of class for every hour in class we get a 45 hour work week. This is longer than the standard 40 hours, of course, but it is also normal for those wanting to get ahead to work much more than 40 hours a week.

indefinitely. You may choose one of these, or one similar to these, or any other topic mutually acceptable to me, your advisors, and you.

One way or another you must present your topic as a written proposal (instructions given later). We must be careful not to pick a topic which is too broad, and it may be necessary to redefine a problem as the search progresses.

On Friday of the second week of classes each person turns in a formal research proposal, and describes and explains the nature of their research project to other members of the class.

DON'T KNOW WHAT TOPIC TO CHOOSE ? ?

If you have no idea what you want to research, the process of making a decision can be confounding. One thing to try: think back over classes you have taken for some topic that caught your interest and study that. Alternatively, if you can decide the broad subject area that interests you, but cannot find a specific topic, come talk to me and maybe I can suggest some topics to pursue. Also talk to other faculty members. Perhaps they have ideas that interest you. Also, go to the library and look through recent copies of journals. You may see something that interests you. Ask me or other faculty for suggested journals.

STAGE TWO: LEARNING TO DO A LITERATURE SEARCH

Ms. Cameron is the geology departments liaison librarian. We spend several formal sessions with her as she shows us the literature available in geology, and strategies for searching it. During this time she will give you several search problems, which must be turned in to her as homework as a requirement of the course, to help you become familiar with literature sources and their use. These problems will, if possible, relate directly to your topic.

This stage continues during Week 8 when each of you begin a GEOREF search with the help of Ms. Cameron.

STAGE THREE: SEMINAR ON THOMAS KUHN'S THE STRUCTURE OF SCIENTIFIC REVOLUTIONS

Thomas Kuhn, in a now classic work, discusses the way in which science progresses. Since you are looking at topics historically, examining them for the way paradigms have evolved, you need some familiarity with these ideas which have profoundly influenced how we view scientific progress. The seminar consists of several 1 hour seminar discussions. More information to follow.

START READING KUHN, NOW ! !

STAGE FOUR: THE LITERATURE SEARCH

This is the major part of the class. You have eight full weeks, and parts of several other weeks, devoted to finding all the literature bearing on your topic (although you should begin searching from the second week of the semester). You are to keep a running bibliography of this literature on a word processor or data base, both a master bibliography by author and publication date, and a working bibliography which divides the papers into categories, such as: primary papers, secondary papers, peripheral papers, papers on one aspect of the topic, or papers representing one paradigm, or historical stage of development, etc [3].

By the Week 8 meetings you must demonstrate significant progress in your literature searching, both in the bibliography to date you turn in (organized as described in previous paragraph) and in your presentation to the class (see schedule below). Also at this time, you may propose that a particularly large or cumbersome topic be redefined or narrowed for Stages Five, Six, and Seven.

STAGE FIVE: FORMAL, ORAL PRESENTATION OF THE RESULTS OF YOUR STUDY TO THE CLASS

Stage Five begins during week 13 when each of you formally present the results of your study to the class. This is a stand-up-in-front-of-the-group presentation. Each presentation has a maximum, timed limit of 15 minutes and the class meets for as many sessions as required for everyone to present. You are evaluated not only on your poise and presentation, but also on the quality of the substance you present. Details to follow.

PRESENTATIONS

You make several presentations during the semester, summarized in the list below.

Tu, Sept 9 - Your chosen topic in writing and orally to the class.

Tuesday, October 14 - Turn in bibliography to date; oral presentation of preliminary results of your study to class

Week of November 27-31 - STAGE FIVE: Oral presentation of results of your study to the class.

Spring Semester - STAGE SIX: Presentation of results of your study at the Department Spring Semina in late April. [4]

December 8 - STAGE SEVEN: Final paper due at 5:00 pm. [5]

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[3] There are an almost unlimited number of ways to write a literature citation, and each discipline has its own way which often differs radically from other disciplines. We use the system defined by the United States Geological Survey for its publications, a format followed, more or less, by most geological publications. A description of this format is provided later.

[4] The requirements for this course are not completed until you have formally presented the results of your research at the Department Spring Seminar, held late in April. The Chair and organizer of the seminar rotates among the faculty, so keep alert in the Spring for announcements.

[5] This deadline holds for those graduating in December. For everyone else there is a liberal Incomplete policy. BUT you must make formal arrangements with me, otherwise you will receive the 2 point penalty. Incompletes are given principally because it sometimes takes a long time for literature to come in on interlibrary loan. Do not lightly put off the project until next semester, though. You do not want to have to be writing a major paper while taking a full class load.

STAGE SIX: PRESENTATION OF THE RESULTS OF YOUR STUDY IN THE DEPARTMENT RESEARCH SEMINAR.

You present to the department during the Spring Semester Research Seminar,[1] the results of your study. Presentation should last about 15-20 minutes and is a formal affair requiring proper dress. Details to follow.

STAGE SEVEN: WRITING AND REPORTING THE RESULTS OF YOUR RESEARCH

During this week you write (or finish writing) your paper. Cull through all your literature and find the most important papers to read thoroughly [2]. From this you write an analysis of the history of the topic. It is organized like a formal paper with Abstract, Introduction, etc. Instructions to follow:

[1] Announcements of the various topics and their time of presentation will be posted in the department and everyone invited to attend.

[2] It is advisable as you identify critical papers during your literature search that you order copies on interlibrary loan since it may take a couple of weeks for them to arrive. Alternatively you can visit the library at UVa, or Va Tech, or at the U.S.G.S. in Reston, Virginia.

GEOLOGY 491 - FALL, 1997 SEMINAR SCHEDULE (Dates subject to adjustment)		
WEEK 1:	AUG 25-AUG 29	Tu 27th - STAGE ONE: Introduction, and instructions for choosing a research topic. Th 29th - STAGE TWO: Search Strategies for the geological literature
WEEK 2:	SEPT 1-SEPT 5	Tu 2nd - STAGE THREE: Seminar 1 on Thomas Kuhn Structure of Scientific Revolutions Th 4th - STAGE TWO: Search Strategies . . .
WEEK 3:	SEPT 8-SEPT 12	Tu 9th - STAGE ONE: report on chosen topics to class Th 11th - STAGE TWO: Search Strategies . . .
WEEK 4:	SEPT 15-SEPT 19	Tu 16th - STAGE THREE: Seminar 2 on Kuhn Th 18th - STAGE TWO: Search Strategies . . .
(Library instruction and seminar may continue into week five)		
WEEK 5:	SEPT 22-SEPT 26	STAGE FOUR: The Literature Search
WEEK 6:	SEPT 29-OCT 3	STAGE FOUR: The Literature Search
WEEK 7:	OCT 6-OCT 10	STAGE FOUR: The Literature Search Mon 6th - lecture on Boolean search strategies and preparing for you GEOREF or other data base search
WEEK 8:	OCT 13-OCT 17	STAGE FOUR: The Literature Search. Class meets Thursday; each person turns in bibliography to date and makes a progress report. Two point penalty for not being prepared. Identify key words and make appointment with Ms. Cameron for GEOREF or other search.[1]
WEEK 9:	OCT 20-OCT 24	STAGE FOUR: The Literature Search
WEEK 10:	OCT 27-OCY 31	STAGE FOUR: The Literature Search
WEEK 11:	NOV 3-NOV 7	STAGE FOUR: The Literature Search
WEEK 12:	NOV 10-NOV 14	STAGE FOUR: The Literature Search
WEEK 13:	NOV 17-NOV 21	STAGE FOUR: The Literature Search
WEEK 14: (Thanksgiving)	NOV 24-NOV 28	STAGE FIVE: Oral presentation of results of your study to the class. Penalty of 2 points for not being prepared.
WEEK 15:	DEC 1-DEC 5	STAGE SEVEN: Writing your paper.
WEEK 16:	DEC 8-DEC 12	Final Exam Week. FINAL DUE DATE for paper, Wednesday, Dec 10, 5:00 PM. Penalty if late, unless special arrangements are made.

[1] There will be a nominal charge of $5.00 for each person to do their GEOREF search. Not a bad deal since they normally run well over $100.00.

SOME SUGGESTED TOPICS TO RESEARCH

The number of possible topics is virtually unlimited. The ones below, listed in no particular order, are just to stimulate your imagination. You may also have a topic in mind from one of your classes. You may choose one of these, or one similar to these, or any other topic mutually acceptable to me, your advisors, and you. If some of those listed below are unfamiliar, ask.

- Global warming controversy
- Origin of channel scablands
- Antarctic and Greenland ice drilling projects and discoveries
- Near Earth Asteroids
- Asbestos and public policy
- Radon - how great the danger
- Deep earth drilling projects
- Are global extinctions periodic?
- Were dinosaurs endothermic?
- Extraction of paleo DNA from fossils
- Human evolution - an up to date view
- Paradigm shifts from geosynclinal to plate tectonic theory
- History of geosynclinal theory
- History of ideas about the Coronation/Wopmay orogenic belt
- Floods, floodplains, and public policy
- Origin of petroleum
- Future of petroleum supplies
- Plate tectonics and the origin of metallic mineral deposits
- The desert varnish dating method
- The fission track dating method
- Comparative planetology - why are the planets different, or are they?
- Seismic tomography and the earth's interior
- The anorthosite problem
- The Taconic orogeny in New England
- The Brevard fault zone
- Suspect terrane theory
- Cretaceous-Tertiary extinction debate
- The dolomite problem
- The origin of micrite
- Origin of B.I.F.s
- The Ancestral Rockies
- Peneplains in the Appalachians
- History of attempts to regulate use of barrier island systems
- Recognition of paleosols
- Proterozoic anorogenic igneous activity
- History of transcurrent faulting (e.g. San Andreas) in the Cordillera
- The fish-amphibian transition
- The influence of WW I and II on geological research
- History of soil classification
- How old is the earth?
- What is the earth made of inside?
- Isostasy and the origin of mountains
- Age of the Precambrian
- Making earthquake predictions
- Origin of evaporite deposits
- History of attempts to control and regulate the Mississippi river basin
- The classification of arthropods
- The Precambrian-Cambrian boundary
- Dynamics of thrusting in the Appalachians
- The origin of granite
- The granitization problem
- Measurement of metamorphic grade (geothermal/barometer indicators)
- The Grenville orogeny
- Causes of glaciation
- The Mid-continent gravity high and transcontinental arch
- Origin of the Basin and Range
- Columbia plateau and the origin of flood basalts through geologic time
- Pegmatite genesis
- Kimberlite (diamond pipe) genesis
- The discovery and causes of glaciation
- Mass extinctions (recognition and causes)
- Origin of multicellular animals at the Precambrian-Cambrian boundary
- Theories of landform development
- Development of water quality standards
- History of the Mediterranean
- Kimberlites and diamond genesis
- History of Cordilleran (Rocky Mtn) mountain building

A SAMPLING OF PREVIOUS RESEARCH TOPICS

An Historical Perspective on Agricultural Nonpoint Source Pollution

The Historical Development of an Extraterrestrial Cause for the Cretaceous-Tertiary Extinction

The Evolution of Federal Water Quality Standards: Point Source Pollution Regulations in America's Surface Waters

The Historical Development of Federally Controlled Levees on the Mississippi River

The Historical Conflict Between the Natural Forces on the North Carolina Outer Bank System and Human Development of the Outer Banks

The Origin of Multicellularity in the Cambrian

Historical Evolution of the Global Warming Theory

The Historical Development of Beach Replenishment in the United States

A Historical Study of Radon-222 and the Models Used to Explain Radon Transported from Soil Pores into Homes

The Historic Development of Soil Conservation in the United States

A Historical Trace of the Theories Created to Explain El Nino

Historical Analysis of Glacial Movement Theory

The Evolution of Water Quality Standards in the Chesapeake Bay Traced Through the Impact of Agricultural Runoff

History of Global Warming

History of Soil Classification in the United States

The Historical Interpretation of the Structure of the New Madrid Seismic Zone

The Historical Development of the Dolomite Problem with Emphasis on Concepts and Models of Dolomitization

Major Developments in the Study of Aeolian Dune in Arid Deserts

The Evolution of Barrier Island Research: Terminology, Delineation, and Morphology

A History of the Theories Explaining the Causes of Deep Focus Earthquakes