LEARNING PORTFOLIOS AND SUPPORTING EVIDENCE

A portfolio is a collection of materials that provides direct evidence of skills you have developed. Artists and architects use portfolios to show the quality and breadth of their work to prospective clients or schools. Moms, being what they are, usually keep a portfolio of their kid’s elementary school years—my mom still has my horribly illustrated stories, but fortunately the tacky Christmas ornaments made of macaroni have since crumbled into dust. Nowadays, people can place exhibits of their work on websites or other electronic gizmos, but portfolios are basically just something that you can show somebody and say, “This is what I can do”.

While it is tempting to promote your college transcript as a portfolio of class performance, I want to get away from the typical lecture-review-test cycle of science classes that simply results in a letter grade. Instead, you will develop an actual record of skills and ideas you develop in this course. Be aware, however, this is going to take a lot more effort on your part than sitting in lectures taking notes and then asking me what to study for an exam. You will need to actively identify your interests, learn about them, come up with ways to show that you have actually learned something, and then assemble this evidence of learning into a portfolio.

This presents a potential problem, however; how can you possibly know what to learn or show that you have learned it if you know nothing about the subject area? One of my roles as the instructor is to help you identify suitable areas of study within Chemical Ecology. This includes larger concepts such as coevolution, mating behaviors, or defensive strategies as well as the short, individual stories that illustrate these ideas. To access these ideas, we will use assigned readings from to guide us in mini-lectures or class discussions.

It is also my responsibility to devise suitable assignments that illustrate what you have learned. Undertaking the assignments in this class will require research that runs the gamut from finding and analyzing information in the scientific literature to performing lab experiments. In this era of modern informational technology, information is relatively easy to come by and we are fortunate to have useful online references, such as Wikipedia, from which we can quickly grasp the essentials of almost any topic we choose. Because we will be engaging in scholarly work, however, there are some parameters that need to be placed on the use of such references.

References that are used in this class (and most scholarly work) must be traceable to a specific author. In other words, anonymously authored websites such as Wikipedia or trade organizations can be used to increase your general understanding of a topic, but it is not appropriate to cite such sources in a bibliography. I have noticed that online blogs often have accurate and useful information, and because they can be traced to an individual author, they are appropriate references. Nevertheless, if you intend to use a blog or someone’s individual website as a reference, it is your responsibility to ascertain whether or not the author is competent. This usually requires that they are “professionals” meaning that they are either graduate students in training or people working in the field. One way to determine the competency of an author is to see what other publications they have authored. If they have published in scientific journals or written a book, then you may consider them professionals and their information is fair game.

SUPPORTING EVIDENCE FOR YOUR PORTFOLIO

Your portfolios will contain a total of 10 pieces of supporting evidence. While there are many ways to show what you have learned, some are more appropriate for meeting my objectives in teaching this class. Therefore, I am requiring 6 specific items.

1. A written introduction to chemical ecology.
2. An annotated bibliography.
3. A biosynthetic abstract.
5. A lab report (standard format).
6. A reflective learning journal.
Descriptions for these items as well as the 4 additional items that can be used are described below. I encourage you to propose additional ways of providing supporting evidence, but we will need to agree on the specifics before you embark on something that is not outlined below. I will be imposing deadlines on the individual portfolio items to help you be successful in meeting my expectations.

Because this is likely a new experience for you, make the effort to communicate directly with me about the projects you are developing. When I am working with other people on a project, I find that talking with them greatly clarifies the direction and intent of my work and makes the job easier. While I try to layout my expectations of these projects in writing, there are often things I take for granted (or overlook) and both of us end up being frustrated with the final results. So please, talk with me about things you are working on even if it is to ask for feedback on a rough draft or outline. Remember, my primary role is to help you learn effectively.

**Introduction to Chemical Ecology (required)**

This assignment serves as your introduction to chemical ecology. I would like you read the assigned papers and use these to develop your own interpretation of chemical ecology. You should produce a written document about 800 words in length that describes your interpretation of the field based on what you have read. In this interpretation, you should include specific examples that illustrate ideas about chemical ecology that you are trying to convey. It is necessary to provide citations that reference these examples in your paper.


**Annotated Bibliography (required)**

The first place you always start when learning about something new is to find existing information and assemble a collection of resources. This resource list is of value to other people interested in the same topic and is often appreciated as a shared resource. It is even more appreciated if each item on the list has been evaluated and summarized as to what it deals with. We call this evaluated list an annotated bibliography, which include not only the bibliographic citation, but also 2-3 sentences that capture the essence of the resource’s focus (see the example below). This requires that you have actually read the resource enough to know what it is actually about.

Below are two examples of an annotated bibliography from a review journal. In addition to the annotation, the journal that these references were taken from requires some ranking of the significance for each reference as indicated by the asterisks preceding the citation (* = of special interest; ** = of outstanding interest). This is a nice way to cue your reader as to where they might go for more information that is particularly worthwhile.

   An updated version of the author’s earlier work on molecular architecture. A collection of synthetic bioactive compounds is compared against collections of pure natural products and semisynthetics. The natural product set was much higher in scaffold diversity, stereocchemical features, and oxygen atoms and less likely to contain aromatic fragments.

   This review describes the historical relationship between combinatorial chemistry and natural products as sources for lead discovery, the reasons why the latter fell out of favor in industry, and closes with probable future developments and strategies for natural product prospecting.

There are two types of references you should include in your bibliography. The first type includes general resources for the field of chemical ecology and may include journals, symposia, review articles, books, documentary videos, etc. To be useful, this collection should contain at least 8 resources that span a variety of aspects within the area of chemical ecology (plant-insect interactions, insect-insect interactions, co-evolution, mimicry, etc). You may not include the textbooks or other assigned readings I have provided for the class.

The second reference type is those for a specific topic within the field of chemical ecology. For example, if you used co-evolution as an area of general reference for the first set of references, you could then identify references...
that dealt with an example of co-evolution such as the ant gardens of Central America. Generally, these references will tell a particular story of a certain species or chemical compound. To be useful, this collection must also contain at least 8 references, but in this case it is permissible to use references that were supplied in class.

**Your annotated bibliography must include both types** of references and thus will contain at least 16 individual citations. You should also not overlook the value of videos as a reference source.

**Biosynthetic Pathway Abstracts (required)**

Uncovering the chemical stories involved in ecological interactions is merely the beginning of interesting and compelling questions to research. Part of the chemical story of each ecological interaction is understanding how the chemicals are synthesized by the organisms. Most of the time, you can structurally analyze a chemical compound and identify from what chemical precursors the final product arises. There are relatively few choices of the biosynthetic origins (amino acids, carbohydrates, isoprenoids, acetate, and/or fatty acids) and in many cases, the pathways and molecular genetics responsible for the target compounds have been experimentally determined.

In this assignment, you will put together a one page abstract outlining the biosynthetic pathway responsible for the production of an ecologically-relevant compound. This is basically a pathway map in which you show chemical transformations, the biosynthetic enzymes, and the molecular genetics for the pathway (with cited references). While a complete map would contain all of this information, it is likely that the story will be incomplete for any given compound. It may be necessary, therefore, to use related pathways to illustrate a likely scenario for your compound. You need to complete two abstracts for chemicals that represent two of the different biosynthetic origins.

**Book chapter (required)**

One of my reasons for using the Agosta text was to convince you that even esoteric science topics can be delivered in a format accessible to the general reader. But Agosta’s stories are not the only ones out there, and this assignment is an opportunity for you to develop your own stories in chemical ecology. Develop and write a book chapter that is suitable for inclusion in a book like Agosta’s. The chapter must have a clear, focused theme with several supporting stories supporting the theme. You should take some time and analyze how Agosta has constructed his chapters and mimic that sort of format. It is permissible to take this on as a collective project with no more than two contributing authors. If this is a collaborative project, organize the chapter into subsections with each of you being the primary author on one or more subsections. The chapter should be about 5000 words in length (roughly 7 pages).

**Lab report (required)**

I don’t think there is much to explain in this other than to say you must include one lab report in your portfolio. There is a standard lab report format that I have outlined on the course webpage. I do expect a proper introduction that places your experiments in context and this does require additional references. I suspect that you should be able to compose an adequate lab report in about 6 pages that are mostly text. Figures are important too, but you need to provide your interpretation with them and not leave it up to the reader to figure out what you are talking about.

**Reflective Learning Journal (required)**

A very large part of learning is about reflecting on your past experiences and connecting them together in some meaningful way. Keeping a reflective learning journal is one way to do this and enables us to create connections and meanings as we engage in learning experiences. Everybody’s reflective journal is unique and you will be judged on the quality of your responses, not the quantity. Your journal entries should demonstrate the expansion of your understanding by taking initial observations and connecting them to past experiences to arrive at greater depth to your knowledge. A reflective journal is not a logbook or diary. These forms of writing are simply a list of events and do not generally contain the reflective component that I am expecting you to develop in your journal.

One helpful tip on writing this way; simply ask the question “What’s the point?” (“So what?” works too but sounds kind of snotty). This is a legitimate question so long as it is self inflicted. There is meaning in the course material from our individual perspectives, and while I strive to share my perspective with you, it doesn’t mean much unless you can somehow connect it to your perspective. Making this connection is what takes work and the reflective writing will help you do that. It also helps if you are creative and imaginative when writing.
My minimal expectations in this assignment are that you reflect on,

- each item completed for your portfolio
- each lab experience
- the assigned reading from the textbooks
- how your understanding of ecology has matured

**Experimental Handbook**

Scientists rely on a toolbox of techniques to help them devise experiments that will answer the questions they are interested in. It is often our lack of tools or our awareness of tools that limits our abilities to do research. Just like in any other career, a scientist often gets hired because of their familiarity with a specific experimental technique(s) that is useful in a variety of ways. This assignment requires you to identify and summarize 10 experimental methods that are used in the field of chemical ecology. These will include not only analytical chemistry techniques, but also bioassays that establish an organism’s response to a chemical. You should structure this collection as a “dictionary” of methods in which you describe the technique using a specific example in which it was applied. Be sure to include the references from which you took the information.

**Field Guide of Chemical Ecology**

Wouldn’t it be cool to have a nature guide to chemical ecology? My thought on this is to put together a user’s guide so that people can find and view firsthand examples of chemical ecology. As with most guidebooks, this should contain graphics and descriptive text to help people find and identify examples in the field. You will also need to include a brief, but illuminating story about the ecological interactions being highlighted. You do not need to worry that all your examples come from the same region (it can be an international guidebook), but you must include a variety of examples (i.e. defensive insect examples). You should have at least 6 well developed examples in your guidebook. You may choose to work on this collectively with another person in which case, your collective guidebook will have 12 examples. You might consider setting this up as webpage or wiki, especially if you want to include photos or video clips.

**Quizzes**

I am not convinced that most students actually read assignments before class when it is most helpful. To train you in actually preparing for class, I will be periodically giving short (3-5 questions) dealing mainly with reading assignments or study questions that arise during the course of our discussions. I will try to have 4-6 such quizzes during the block. Naturally, reasonable scores are evidence of learning and may be included your portfolio. If you decide to submit your quizzes, they should be treated as a collection (i.e. all quizzes count as 1 portfolio item).

**Critical review**

A critical review is a formal, technical report that reviews the current “state of the art” with respect to some topic. An appropriate example of a critical review is the Harborne text. It provides the intimate details underlying examples that illustrate or support the general topic of each chapter. A critical review is not simply paraphrasing published studies, but instead requires you to organize a collection of technical results and explain how they collectively illustrate the point you are trying to make. This review should focus on either a single class of chemical compounds, group of organisms, or ecological system. An appropriate length is around 4000 words (roughly 5 pages).