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Document Title: Blogs, Bulletpoints, and a Bird's Eye View of Science

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Course: Ecology and Evolutionary Biology 1640

Course Title: Dingos to Dodos: Ecology and Evolution on Islands

Year of Award: Fall 2015

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Winner

Fall 2015 James Slevin Assignment Sequence Prize

We are pleased to invite applications for the James F. Slevin Assignment Sequence Prize. This prize of \$500 will be awarded to the teacher submitting the best sequence of writing assignments for a First-Year Writing Seminar (second place winners, if any, will receive \$150).

Assignment sequences in a writing course are built around a series of essay topics. These sequences probably represent work assigned during a portion of the course rather than all of the essay assignments distributed over an entire semester. Submissions should include a rationale and a description of your plans for eliciting and responding to student drafts and revisions, as well as a description of how you prepare students for each essay assignment, for example by engaging them in preparatory writing exercises, including informal writing designed to help students understand the material on which they subsequently write formal essays. Reflections on what worked well, and why, and what you would change another time, are welcome.

The winner will be announced to the Cornell community. Winning entries will be deposited in the Knight Institute's web accessible archive and made available to other instructors under a creative commons attribution, non-commercial license. (See creativecommons.org for more information about cc licensing.)

To facilitate future searching of the Institute's archive, we ask that you provide a brief descriptive abstract (about 75 words) of your document, and a short list of appropriate keywords that might not appear in the text. Examples might include terms like "rhetorical situation," "style," "citation," etc. Any borrowings such as quotations from course texts or handbooks must be cited properly in the document itself.

Submissions are due in 101 McGraw Hall by Thursday, December 17. No exceptions can be made.

Fall 2015 James F. Slevin Assignment Sequence Prize Application

~Please Print Clearly. Do not staple. Use paper clips only~

Instructor's name Sahas Barve

Department (BIO22) EEB Course # and title 1640 Dmgos to Dodos: Ecology and Evolution on Islands

I understand that I will receive the award for my prize-winning sequence upon submission of the electronic text. I also grant the Knight Institute permission to deposit the assignment sequence in a web accessible archive and make it available under a creative commons attribution, non-commercial license. I am prepared to send electronic versions of my text to Donna O'Hara (dlo1@cornell.edu) in the Knight Institute.

Blogs, bullet points and bird's eye view of Science  
Title of Assignment Sequence

Instructor's signature [Signature]

Date 12/02/15

Sahas Barve  
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2<sup>nd</sup> December 2015,

Knight Writing Institute  
101 McGraw Hall  
Cornell University,  
Ithaca NY 14853

Dear James F. Slevin Assignment Sequence Prize committee,

I have attached to this letter, four assignments that were part of a Freshman Writing Seminar I taught in Fall 2015. These assignments were given out during the first half of the semester. I request you to consider these four assignments for the James F. Slevin Assignment Sequence Prize.

The title of my course (BIOEE 1640) was “Dingos to Dodos: Island ecology and Evolution” and was taught in the Department of Ecology and Evolutionary Biology. The seminar consisted of roughly two halves. The first half included assignments on creative scientific writing for the public and the second half included technical essay writing for a scientific audience. Through these two modules I attempted to introduce them to a wide variety of writing styles to effectively communicate science.

### **Rationale**

With the rise of the internet media, science communication comes in a variety of flavors. Scientific blogs translate papers in dry technical language into an easy to understand, more casual reading, making the science interesting and relevant to the public. Young scientists are now not only expected to do good science but often also have to “market” their papers through blogs which are easier to read and convey key results quickly, even for scientists. Many science communicators write synthesis essays on current “hot” topics to organize information from various sources and present them as an analysis of where the field is heading. While many science blogs might be about one paper, essays distil information from various sources. Both these forms are crucial for scientific writing.

The following assignments (Assignments 3-6) were aimed at helping students attempt multiple forms of science writing. The first assignment required them to write a scientific blog to describe an experiment that was presented to them in video form. In the second assignment they used a writing tool they had learned and used in class to make their last essay more concise. The third assignment challenged them to explain a theory in detail only using bullet points, more importantly without using an all important figure that is considered indispensable when teaching this particular theory. The fourth assignment was

a synthesis essay where they read 6-10 papers on a topic and identified common hypotheses being tested in them and explained the evidence for or against the hypotheses. In all, through these assignments we worked on writing in both technical and non-technical language. We practiced the increasingly important art of writing short but interesting pieces and finally the synthesis of ideas and information from multiple sources to thoroughly understand a scientific question.

### **Preparation for the assignments.**

Assignment 1 (3): Scientific Blog based on a video.

Scientific papers are considered the primary mode of scientific communication for professional scientists. In the week preceding this assignment, we had discussed in detail the various components of a scientific paper (Introductions, methods, results and discussion). We had read and discussed two scientific papers and examined the language used and contrasted it with language they might read in a non-technical piece like a scientific blog. Understanding the basic structure of scientific papers is key to easily looking for and extracting useful information from a paper. We also discussed scientific blogs. We did in class exercises of converting paragraphs from a scientific paper to a language suitable for a blog aimed for a general audience.

Simultaneously we discussed the theory of evolution and some fundamental evolutionary concepts like adaptation and natural selection. To understand natural selection, we watched a video made by the Howard Hughes Medical Institute outlining the research of Dr. Jonathan Losos on *Anolis* lizards of the Caribbean. This video showed an experiment executed by Dr. Losos to demonstrate that biological evolution by natural selection is not a slow process like it was long considered to be but can occur over a few generations. In this assignment the students wrote a scientific blog about the experiment shown in the video. This assignment made the students identify the various aspects of a paper in the video and then write a summary in blog form for the public.

Assignment 2 (4): Using the paramedic method to write concisely.

The instructions/formats for most writing done by scientists (e.g. grant applications, papers, conference abstracts) have length restrictions like word limits. It is crucial to master the art of writing concise sentences, clearly communicating your point without too much “fluff”. The paramedic method is an exceptionally useful writing tool for scientific writing. It gives you a repeatable method to make sentences short without losing information. We did an in-class exercise to understand and use the paramedic method. Working in groups of two, students used the paramedic method on multiple example sentences. We discussed the results and how the paramedic method might be seen as an exercise for both content and style of writing. The following assignment asked them to implement the paramedic method on the scientific blog they had already written based on the video (Assignment 1 in this sequence). The prompt asked them to make a call for either using or not using the paramedic method for any sentence as it might change the overall impact of the sentence.

### Assignment 3 (5): Bullet point theory

Figures, diagrams and graphs are an integral part of scientific writing. They help communicate complex ideas and results, which might be too difficult to describe in prose to the reader. Explaining a theory without figures is thus a challenge. The theory, its major predictions and corollaries can be described by breaking down a theory into simple and short statements. Writing statements as short bullet points is an important skillset for communicating complex ideas especially while presenting them to the public for e.g. a powerpoint presentation.

The Equilibrium Theory of Island Biogeography was a fundamental theme of the course. During class, we discussed the theory in detail. The authors describe the theory primarily by using a figure that is central to the theory. The third assignment required the students to describe the theory without the aid of the figure, using bullet points to explain the basic tenets, predictions and corollaries. This assignment was aimed at distilling the theory into a series of short statements and in general an exercise into communicating complex ideas using short sentences.

### Assignment 4(6): Scientific Essay

An important intended learning outcome of this course was the ability to synthesize information from multiple sources and communicate it effectively. The assignment was focused on three things, 1) reading and understanding scientific papers on the essay topic 2) finding commonalities between papers in the hypotheses that are tested and 3) report and discuss the results based on broader ecological and evolutionary biology theory. Basically, get a sort of bird's eye view of the literature on a particular topic, discerning recurring patterns to understand it well.

We did a number of activities to prepare the students for the essay assignment. First, I introduced them to various ways to look for relevant scientific literature like Google Scholar and Web of Knowledge. The topic of the essay was broad. We discussed various aspects of the topic through discussions of scientific papers. We spent considerable time in each class, carefully dissecting the paper to identify the basic hypotheses tested, the evidence used to justify the hypotheses and the depth of the interpretation of the results.

To prepare them to understand and use the appropriate linguistic style, we discussed stylistic elements of each paper we read. I introduced them to various citation styles in science. We discussed and agreed on a style that we used for the remainder of the course. We also did in-class writing exercises to demonstrate for example, differences in the impact of using active vs. passive voice. This essay was developed over four weeks. In the first week, the students searched for literature and sent me a half page proposal telling me what sub-topic they were going to write about and the papers they would use. In the second week they submitted a draft of the essay. After reading the drafts, I realized the students needed more help with the overall structure of the essay which I provided in a

“follow up” email. I personally met with most students to discuss their drafts for this essay. A week later they submitted their final essays.

### **What worked well and what did not**

What did,

Among these assignments, I really liked teaching the paramedic method. I feel it is a really underappreciated method to make writing concise, an extremely useful tool for science writing. Another thing that I think worked well was communicating the importance of synthesizing information from multiple papers into scientific essays. Students, I feel, initially found it difficult in seeing the merit in the essays but later told me that they appreciated it because it helped them see the “bigger picture” beyond just the one paper. Their second and third essays have been successively better as they get used to discussing multiple papers in the light of the background theoretical framework. It was also interesting to notice that the students found it particularly interesting that they could critique the quality of a scientific paper in a field they didn’t have any expertise in, just based on the conceptual theoretical background that they had learnt.

What didn’t,

I have been a scientist for the past few years and understand the scientific method well. I personally still struggle with scientific writing and I am in no way a natural. Teaching scientific writing was obviously hence a novel and formidable challenge. I found it difficult to maintain a balance between teaching science and teaching writing. Since the course is about writing I tried to include a lot of writing in the course. At the same time, its crucial that the students understand the concepts that they write about. Incorporating all this was the biggest challenge.

Another challenge that I continuously faced was giving word-level feedback to students who struggled with bigger “issues” like flow and content in their early drafts. It was especially difficult to communicate all the various kinds of feedback to those students who did not make much effort to modify their essays.

### **Conclusion**

This has doubtlessly been the best teaching opportunity I have had at Cornell. I have been a Teaching Assistant on multiple courses in my department. This course and the preparation it required were worlds apart. I really liked designing the writing assignments to compliment the scientific material we learnt in class. There have been numerous “should have done it this way, not that” moments throughout the course. However, most things worked out in the end. From mapping out the course and the intended outcomes to the fine details of how to use each class, each of these aspects has been great fun. I look forward to teaching a course like this one again.

## Assignment prompts in sequence

### Assignment 1: Anole Adaptations Science Blog

#### Rationale

Islands are great places to study evolution. The isolated nature of islands and small populations of animals means that evolution happens quicker and is easier to study on islands. Over the past week, we have read a couple of scientific papers. We discussed and outlined major components of a scientific paper: the introduction, methods, results and discussion. We then wrote a blog article for a scientific article that you read that summarized the research in the article for the general public. Today we talked about evolution and adaptation in class. Then we watched a video outlining Dr. Losos's research on lizard evolution made by the HHMI. This week's assignment is designed to help you identify the components of a scientific paper when a study is presented in video form. You will write a blog article about the video by first transforming the video into a scientific paper in your head! You will write a blog for this video the same way you did for the paper last week.

**Audience:** You will write this piece for the general public. It should describe Losos's study of Caribbean anole lizards in blog form to communicate his science to a wider audience.

#### Prompt

- ❖ Write a blog article and submit electronically by Monday 09/14/2015 in the Assignments folder on Blackboard.
- ❖ 500 words, typed, 12 point font, Times New Roman, double spaced, include pictures/figures/sketches of figures/ if you feel necessary. One-inch margins at top, left, right and bottom. 500 words is a hard limit. Your article should not exceed this limit.
- ❖ Name the document with your last name and assignment number and title. (For e.g. mylastname#2Anole\_blog.doc).
- ❖ Write a complete citation of the video under references at the end of the piece (not included in word limit but included in page limit) along with any other study you might mention/cite. (Citing other studies is not required but is encouraged).
- ❖ Your blog should have a title that is engaging and sparks curiosity in the minds of the readers.
- ❖ Roughly, each paragraph should be a component of the paper (intro, methods, results, etc.) but you can be creative with the format.
- ❖ This is a piece for the general public. Make sure to define jargon like evolution and adaptation in simple terms to help them understand better.
- ❖ The reader should come away with a better understanding of the pace at which evolution works.
- ❖ ***Please proofread your essays and run a spell-check on it before you submit.***

## **Assignment 2: Using the Paramedic Method**

### **Rationale**

Writing clear and concise sentences is crucial in science writing. Today we learnt a useful tool, the paramedic method, for making long sentences concise. You will use this tool on your anole video blog and make it concise. We discussed whether the paramedic method could be used as a mechanical tool or a stylistic tool. Use your own judgment and discretion to decide whether you will use the paramedic method on a particular sentence of your blog or not. Please highlight the sentences where you HAVE NOT used the paramedic method for stylistic reasons.

### **Prompt**

- ❖ Use the paramedic method on your blog article and submit electronically by Monday 09/28/2015 in the Assignment 3.2 folder on Blackboard.
- ❖ 500 words, typed, 12 point font, Times New Roman, double spaced. The document should not exceed 2 pages with one-inch margins at top, left, right and bottom. 500 words is a hard limit. Your article should not exceed this limit.
- ❖ Name the document with your last name and assignment number and title. (For e.g. mylastname#3Paramedic.doc).
- ❖ Please proofread your essays and run a spell-check on it before you submit.

## Assignment 3: Bullet Point Theory

### Rationale

Figures and graphs are powerful tools in science communication. It is often very difficult to describe theory and findings without them. We recently discussed the theory of island biogeography. It is one of the most influential theories in ecology, evolution and conservation biology. A cornerstone of this theory is the all-important graph that we saw and pored over for several minutes. It looked like a more complicated version of this Figure 1. In this week's assignment you will explain the theory of island biogeography, its basic predictions and the most important variables without the use of any figure and in bullet points.

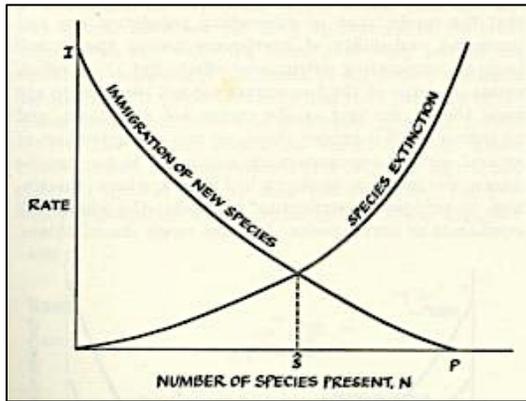


Fig 1: MacArthur and Wilson 1967

Condensing ideas into bullet points is crucial in science. They make you boil

down your ideas into a series of simple statements that are helpful for quickly getting the point across to another person. Bullet points are most important in powerpoint presentations or for use in scientific posters. These modes of science communication need simple, clear and easy to understand language instead of long descriptive sentences. Most often they are accompanied by a narrative by the presenter and hence can often lack specific details.

Prepare a word document explaining the Theory of Island Biogeography without the figure as a series of groups of bullet points (General theory, Immigration rates, Extinction Rates, Equilibrium etc.). For example, the one group of points titled "Immigration rates" might have points like:

- ❖ Immigration rates are affected by the number of species on the island and the distance (isolation) from the nearest continent.
- ❖ Immigration rates are inversely related to the diversity and isolation of the island.
- ❖ Immigration rates increase after a natural calamity on the island.

### Learning outcomes

This assignment is to make you think about the theory clearly and to make sure that you understand it well enough to break it down to simple and short statements like the ones above. This might seem tedious but this skill might just be really helpful for your final project. (Hint hint).

### Prompt

- ❖ Prepare a bulleted summary of the theory of island biogeography and submit electronically by Monday 11:59 pm 10/05/2015 in the “Bullet Point Theory” in the Assignments folder on Blackboard.
- ❖ NO WORD LIMIT but ofcourse it has to be short. 12 point font, Times New Roman, single spaced. No pictures sketches or drawings. One-inch margins at top, left, right and bottom.
- ❖ Name the document with your last name and assignment number and title. (For e.g. mylastname#1 IB bulletpoint.doc).
- ❖ Please proofread your essays and run a spell-check on it before you submit.

Figure from MacArthur R., and Wilson E. 1967. The Theory of Island Biogeography. Princeton University Press.

#### **Assignment 4 (6): Sky island scientific essay**

##### **Rationale**

In the past five weeks, we have looked at the theory of island biogeography and gone through the drivers of evolution. We have worked on assignments where you read and understand scientific literature but write about it in a non-scientific, “popular” style and language. The next assignment is your first scientific writing assignment for the class.

Sky-islands are unique habitats on mountain-tops that mimic oceanic islands in many aspects of their biology. They make an interesting case for testing predictions of island biology on land! For this next assignment, you will write a 4-page essay on sky-island biology. You will synthesize information from 6-10 scientific papers about a topic related to sky-islands. Within this broad topic you can choose a subject of your choice. It could be a taxon (ants, bacteria, birds, bees) that you are interested in or it could be a process or pattern that you are fascinated by (species-area concept, effect of migration on evolution on islands). However, the papers have to be related to sky-islands.

The goal of the essay is to get you to look at multiple sources of information and then distil those data to draw and comment on general patterns. A kind of meta-analysis of literature. As you perceive these patterns in the species diversity and distribution, think about possible mechanisms from the ecological and evolutionary theory you have learnt. For eg. if you look at grasshopper diversity across sky-islands, you can look at whether they follow the species-area relationship or how you think mutation or migration might drive the pattern you see.

Drawing patterns from multiple sources of information is the first step towards looking at the “big picture” of things and deducing potential broad, overarching mechanisms.

The general outline of the essay might be as follows.

Introduction: Introduce the system. Tell us why it's cool. What's the theme of your literature search.

Results: Report what the findings were from the papers. Include any figures from the papers or meta-analysis figures that you might create.

Discussion: The most important part. Talk about things that are common between the papers and things that are different. Why do you think they are that way? What ecological and evolutionary principles did you use to reach your conclusion?

Conclusion: A short 10-sentence part about your overall findings.

### **Prompt**

- ❖ Prepare a four page essay and submit electronically by Wednesday 11:59 pm 10/15/2015 in "Sky-Island Essay" in the Assignments folder on Blackboard.
- ❖ NO WORD LIMIT but no longer than four pages. 12 point font, Times New Roman, double spaced. One-inch margins at top, left, right and bottom.
- ❖ Name the document with your last name and assignment number and title. (For e.g. mylastname# Sky-island essay .doc).
- ❖ Use the (author-date) format for references.
- ❖ The language should be as scientific as possible.
- ❖ Please proofread your proposal and run a spell-check on it before you submit.

### **Follow up email for essay:**

Hi Everyone,

I know the essay assignment was hard and it felt like being thrown into the deep end of the pool. Since the next two assignments are also based towards a very similar learning outcome I wanted to outline some of the expectations I had while designing these essay assignments. The main skill that I want you to acquire from these assignments is to see common themes in multiple sources of literature, describe them and discuss the results, putting them in an ecological and evolutionary framework. When writing the next drafts of your essay and the next two essays, ask your self these questions, if they are applicable, as you outline your essay. Whats the common theme/pattern in the results of the papers that you read about a particular system? What broad common hypothesis (es) is tested in the papers across all the taxa studied (ants, grasshoppers, bears, jaguars, butterflies whatever you have used)? Which ecological or evolutionary mechanism that we have learnt might result in this pattern?

Use the answers to these questions to have a paragraph where you clearly state these hypotheses before you describe the studies. In the final discussion talk again about the hypotheses and discuss the results in the light of the ecology and evolution you know. Let it be a lot of educated hand waving, its totally fine. It will show me you understand the theory and can see or predict its effects in the patterns/organisms you see. Again I know its difficult but you guys have already done a great job with the first draft.

Hope this helps.