



Cold
Spring
Harbor
Laboratory

DNA LEARNING CENTER



Barcode Long Island Proposal Writing *Independent Projects*

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Research Proposals – Independent Projects

- **For Independent Projects:**

- The following sections should be included:

- Abstract
- Introduction (incl. specific aims and hypothesis at the very end)
- Methods (incl. data interpretation plan)
- References

- Remember the following:

- Full sentences *(See video “BLI Developing Project Titles and Scientific Writing”)*
- Grammar *(See video “BLI Developing Project Titles and Scientific Writing”)*
- All proposals should mention DNA Barcoding
- Citations *(See video “BLI Citations”)*
- Include student and mentor biography info

Consult the Proposal Guidelines and Rubric



DNA Learning Center BARCODING 101	
Adapted AmScope Microscope Guide [PDF] (for Barcode Long Island and Urban Barcode Project Student Teams)	Home About Student Programs Citizen Science Laboratory Resources Sign in Sample Database
Taxonomic Resources [PDF]	
Electrophoresis Gel Tracking Sheet [MS Excel]	
DNA Subway Guide [PDF]	
Sequence Alignment Exercise [PDF]	
Evolution of the Chocolate Bar: A Creative Approach to Teaching Phylogenetic Relationships Within Evolutionary Biology [PDF]	
Photo/Video Release Form, Opt-out [PDF]	

UBP and UBRP
Guidelines for the Urban Barcode Project (UBP) [PDF]
UBP Symposium Poster Template [Powerpoint]
UBRP Symposium Poster Template [Powerpoint]
Symposium Poster Example 1 [PDF]
Symposium Poster Example 2 [PDF]

BLI
Guidelines for Participation in Barcode Long Island (BLI) [PDF]
Barcode Long Island Campaign Proposal Form [MS Word]
Illustrated Footlocker Equipment List [PDF]
BLI Student Demographic Form [PDF]
BLI Symposium Poster Template [Powerpoint]
BLI Protocol for Sample Submission for Sequencing [PDF]

Proposal Rubric

The proposals will be reviewed using the following rubric. Each section will be scored out of a maximum number of points, indicated in the points earned column. Reviewers will use the guidelines in the following table when determining how many points to award for each section. Proposals will be ranked based on average points from all reviewers. Proposals that are incomplete or do not conform to the proposal guidelines may be excluded at the discretion of the reviewers and project staff.

Proposal Rubric				
Attributes	Above Standard	At Standard	Below Standard	Points Earned
	(10-9)	(8.5-7)	(7-0)	
Introduction	Identified an interesting and testable question that relies on DNA barcoding to study the biodiversity of Long Island.	Identified an interesting, relevant, and testable question that can be answered with DNA barcoding, but does not need barcoding.	The purpose is incomplete, too easy to attain, does not address biodiversity of Long Island, or does not rely on DNA barcoding.	/10
	(5-4.5)	(4-3.5)	(3-0)	
Hypothesis	Utilized literature search to develop a hypothesis which was reasonable and well substantiated.	Utilized literature search to develop a hypothesis which was reasonable.	Hypothesis is not complete or does not flow logically from research.	/5
	(10-9)	(8.5-7)	(7-0)	
Methods	A well thought out, sequential (step-by-step) procedure is stated that ANYONE could look at and follow. It holds high promise for collecting the information sought. Measurements to be made are systematic and logically controlled (changing one variable at a time) and are repeated to improve reliability of data.	A complete, sequential (step-by-step) procedure is stated but is difficult to follow. It holds promise for collecting the information sought. The measurements to be made are systematic and logically controlled (changing one variable at a time).	The procedure is incomplete, not sequential, or takes effort on the part of the reader to follow. It may not be systematic or logically controlled (perhaps your group has defined many variables to vary at once and have not clearly decided how to measure all variables.)	/10
	(5-4.5)	(4-3.5)	(3-0)	
Data Interpretation	Plans for displaying the collected data are clearly laid out (a table is	Plans for displaying the collected data are clearly laid	The plan is incomplete or does not logically match with	/5

Research Proposals – Independent Projects

- **Remember:**

- Your proposal represents *you*
- You are trying to request funds from a scientific organization

*Proofread, **do not** plagiarize, and make sure that your proposal is logical, precise and well-supported.*

Research Proposals – Our Motivation

Perhaps more than anything else, writing a good proposal is one of the greatest skills to walk away with from BLI

We will take your proposals *seriously* and evaluate them as we feel a scientific funding agency would

Our comments are intended to set you and your project up for success in BLI and when you write proposals in the future

Research Proposals – Our Motivation

- Poor/careless writing
- Plagiarism/chatGPT are fairly obvious and will be **automatically rejected**.
- Project has flawed scientific basis
- Follow guidelines on DNA Barcoding 101

Research Proposals – Your Motivation

- Communicate your goals/intent
 - Who, what, when, where, how, why
- Writing well is better than using “big, science-y” words
- Get me (as the reviewer) excited about your project



Titles should be scientific and eye-catching

(See video “BLI Developing Project Titles and Scientific Writing”)

Science Writing

- Precise
- Get to the point
- Elevated vocabulary only when necessary
- Inclusion (don't leave your readers in the dust)
- Good flow and organization
- Use an appropriate “voice”
- ***No quotations*** – everything should be in your words and a legitimate use of quotations in science writing is rare.

The Abstract

- The gist of a scientific study.
 - A little background
 - The problem
 - How you planned to solve the problem
 - What you found
 - What your results mean
- Note: typically, you don't see citations in an abstract, but your proposal ***should still have references.***

Recipe for an Abstract

- The most important background information (1-2 sentences)
- Research question and/or hypothesis (1 sentence)
- Objectives (1-2 sentences)
- The most essential materials and methods (1-2 sentences)
- Description of results (2-3 sentences) *when project is completed*
- Interpretation of results (2-3 sentences) *when project is completed*
- A final concluding statement of the most important findings (1 sentence).

Example abstract:

An outbreak of the virulent "*Plantdestroyis*" virus killed many native plants at the DNA Learning Center (DNALC). To determine if this outbreak led to the destabilization of the DNALC ecosystem, we studied the biodiversity of ant species, which can be used as potential indicators of ecosystem health. 100 ants were collected from the same ten locations throughout the DNALC grounds over a period of five years. Species abundance was documented and species diversity was determined through DNA barcoding, a process that can potentially identify a species using sequence information from a specific region of the DNA. The results indicate a progressive decrease in ant richness and biodiversity, suggesting a decrease in overall ecosystem health. These results indicate that a quick response is needed to remove diseased plants and prevent re-infection, to restore biodiversity and ecosystem health at the DNALC.

Pause the video

Resume when you're finished reading!

Introduction

- Provides thorough background
- Reviews the available literature
 - catches the reader up on what is known
- Defines relevant methodology (i.e., DNA barcoding!)
- Describes your specific plan
 - Who, what, when, where, why, how
- (*usually*) ends with your hypothesis.
- Citations are a must!

Introduction

Hypothesis – a potential explanation for an observation

E.g., “It is likely that the creek near the old industrial site will have lower aquatic invertebrate diversity than other areas on Long Island due to suspected heavy metal contamination.”

Introduction

- **Key takeaways:**
 - **The *necessary* background of your particular topic**
e.g., don't go on about the roles of ants in tropical ecosystems for a project on LI

e.g., don't give us a rundown on the life cycle of the malarial parasite for a study on mosquito diversity.
 - **What your study is contributing to further advance this field**
 - **Your testable hypothesis**

Methods

- Describes how you will test your hypothesis
 - Your experimental design
 - Your collection methodology
 - Your DNA extraction method
 - What marker region will you amplify?
 - PCR, gel electrophoresis, sequencing
- Describes how you will analyze your data.
 - DNA Subway and GenBank
 - Statistical analyses?

Methods

- Full sentences, paragraph form
- Please ***do not***:
 - Copy and paste the DNALC protocols
 - For one thing, this is plagiarism.
 - Simply say e.g., “We will use the silica DNA extraction protocol provided by the DNALC” and cite the protocol.
 - Provide a list of materials
 - The materials that you will use are provided in the descriptions.
 - List step-by-step what you will do down to the uL volumes
 - This is awkward to read and not essential to making me as the reader “buy-in” to your project.

Methods

- Full sentences, paragraph form
- The only exception to including listed steps:
 - If your study focuses on modifying known protocols

Methods – Describing Collection Location

- Include relevant information...
 - Habitat type, types of groundcover, level of human activity, etc. – whatever you feel is relevant to your study.
 - Avoid vague descriptions:
 - The fact that your collection location has “many trees and rocks” is *not* relevant.
 - The fact that your collection location is a “typical deciduous forest” *might be* relevant.

Describing Collection Methods

- Detail the following:
 - How/when you plan to collect
 - Be specific about how you collect
 - How will you store specimens?
 - Photodocumentation
 - data recording in the Sample Database.

Describing Collection Methods

- Here's what we *don't* want:

“We plan to collect ants in the fall. We will go to the park, and look for ants. When we find them, we will crouch down, open the tube, place the ant in the tube, and then close the tube.”

Describing Collection Methods

- Here's what we *don't* want:

~~“We plan to collect ants in the fall. We will go to the park, and look for ants. When we find them, we will crouch down, open the tube, place the ant in the tube, and then close the tube.”~~

Shows me you have not thought about collection whatsoever.

Describing Collection Methods

- A *better* approach:

“We plan to visit the park at least three times through the fall to collect leaf litter from five sites. After collection, we will return to the lab and process the leaf litter samples in Berlese funnels. Specimens will be retained in >95% ethanol after letting the litter dry for 48 hours in the lab.”

Describing Collection Methods

- A *better* approach:

“We plan to visit the park three times through the fall to collect leaf litter from five collection, we will return to the lab and process the samples in Berlese funnels. Specimens will be retained in ethanol after letting the litter dry for 48 hours in the lab.”



Shows me you have researched proper collection, have a clear plan (even if you don't have the details), and I am confident you will have success.

Collection Methods??



Barcoding US Ants

ANT SAMPLE COLLECTION

PROTOCOL

- Collection Guide (PDF): collection and documentation steps. Detailed instructions for different ant collection techniques are summarized.
- Metadata Worksheet (MS Word): use to document observations about site, ants, and ant nests during collection.

ANT COLLECTION

- Ant Collection Recommendations by Genus (PDF)
- Regional Species Hit Lists (PDF)
- Collecting Ants: Shawn Dash (PowerPoint)

ANT COLLECTION CLINICS

- Collection Clinic, July 20, 2020 Zoom recording:

- Vials (some prefilled 90-95% EtOH)
- Field notebook w/datasheet pencil
- Trowel, gardening shears
- Aspirator
- Forceps (plus extra pair)
- Knife, hive tool or pick to break up material or flip rocks logs, lift bark
- Mobile photo/camera = photos



Collection Guide

I. Collect and Document Specimens

The steps below lay out the Collection and Documentation steps of the US Ants Barcoding Project. Detailed instructions for different ant collection techniques are summarized for reference, but not all collection techniques are necessary for all teams. Gear your collection to your geographical area and the ants that you are trying to collect.

Ants belong to a single family, the Formicidae, within the hyper-diverse insect order, Hymenoptera, and they exemplify the importance of insects as ecological indicators with their astounding biodiversity. Ants dominate the ecology of an area with their substantial biomass. They can manipulate species composition, influence trophic interactions, and shape both the abiotic (e.g., through soil shifting) and biotic (e.g., plant-insect interactions) factors affecting an ecosystem. They fill numerous ecological niches taking on the role of predators, mutualists and symbiotic partners, parasites, decomposers and often acting as “keystone species.” Additionally, ants possess a quasi-stable taxonomic and systematic status, creating a situation where species identification is assessable and widely understood. The extant Formicidae contains 21 subfamilies, 411 genera, and more than 15,600 species worldwide. In North America, there are 9 subfamilies, 70 genera, and nearly 800 species.

Detailing the Molecular Methodology:

- Briefly summarize the workflow of barcoding, and any other analyses you perform:
 - 1) *Use the whole specimen or a leg...*
 - 2) *Extract DNA using silica, chelex, commercial kit, etc.*
 - 3) *PCR to amplify a barcode marker region*
 - 4) *Gel Electrophoresis to check amplification*
 - 5) *Send amplicons to third party (Azenta) for cycle sequencing*
 - 6) *Use DNA Subway to trim sequences and prep barcode*
 - 7) *Compare DNA barcode to those in GenBank to make ID*
 - 8) *Additional analyses...?*

Additional analyses and your data interpretation plan

- Difficult to generalize
- Your methods section should end with a description of additional data analyses
 - Statistics, diversity indices, etc.
 - Phylogenetic trees, alignments, etc.
 - How will your data evaluate the hypothesis
 - Not a conclusion yet...

Methods

- Key takeaways:
 - We want to know your plan
 - We want to know that you understand what you are doing
 - Why?

We want you to be successful and not struggle later when compiling the summary report and poster!

References and Citations

References are important in any scientific/professional writing

(See video “BLI Citations”)

Finished proposals

- Go to your mentor for review first.
- When they are satisfied with your work, they submit to us
- We will review
 - *Great proposals will be accepted (comments will be emailed to mentor)*
 - *Others will be rejected with comments for you to address*

Once accepted, a project is automatically generated in the Sample Database for your team!

Questions?

New (as of BLI 2023):

Opportunity for once a month virtual office hour sessions with a BLI staff member!

Check with your mentor on dates and availability