Executive Summary:
This CD-ROM is a multimedia learning tool, which will aid the student in mastery of the concepts and principles of zoology.

Statement of Purpose:
The main purpose of this CD-ROM is to serve as a learning tool for the students enrolled in the Xavier University's Zoology class (BIOL 3141). Previous students indicate that learning the scientific classification and taxonomy was one of the most difficult aspects of the course, because of the high number of arcane terms. The CD-ROM will aid the student in mastering animal taxonomy and other important concepts, by encouraging the student to become more familiar with the terms and to associate the terms with concrete images. The success of the project will be evaluated by direct student feedback, the before and after review quiz, and by the overall success in animal taxonomy (as indicated by academic performance).

In the future, this resource may grow in 3 different ways:

(1) Additional animal images and zoological content could be added to the CD-ROM to upgrade it in the future.
(2) The content of the CD-ROM may be adapted to the World Wide Web to provide the resource to all individuals.
(3) A new CD-ROM may be created from this template for the BIOL 2000 (Biodiversity) course. This CD-ROM would cover the entire living world (Plants, Fungi, Protests, Bacteria, Animals) at the kingdom and phylum level.
Content Outline:
This project will include 4 modules and several resource components.

I. Introduction
This screen will introduce the user to "Linnaeus" the nautilus, who is the mascot of the CD-ROM. Linnaeus will provide the user basic instructions and information.

A. What to do first? (Suggestion on how to get started)
B. What is the function of a given exercise or resource?
   (A 2-3-sentence description of the modules and resources)
C. How do you complete an exercise?
   (Discusses the score the user must earn to successfully compete an exercise)
D. FAQ? (In later editions, a FAQ section may be added)

II. Module 1: Animal Identification
This module will have two separate multiple-choice exercises. There will be 5 choices for each question.

A. Animal Image Identification
In the first exercise, the student will view an image of an animal and be prompted to click on this animal's Phylum. After the student receives feedback (correct answer or incorrect answer), the student will be prompted to choose the correct Sub-phylum (if present in that animal group). Finally, after receiving feedback, the student will be prompted to choose the correct Class of the animal (if relevant for that group). In each of these exercises, the student will choose from a list of five taxonomic terms (multiple-choice format) that describes that particular animal.

The exercise will be broken into 2 possible sections.
   1. Non-Coelomate Animals (lower animals)
   2. Coelomate Animals (higher animals)

B. Taxonomic Term Identification
In the second exercise, the student will view a taxonomic term and choose the correct image of an animal, which the term identifies. The student will be asked to choose the correct animal image that corresponds to the Phylum listed. After the student receives feedback (correct answer or incorrect answer), the student will be prompted to choose the correct animal image that corresponds to the listed Sub-phylum (if present in that animal group). Finally, after receiving feedback, the student will be prompted to choose the correct animal image that corresponds to the listed Class (if relevant for that group). In each of these exercises, the student will choose from a list of five animal images. Five new animal images will appear after each choice.

The exercise will be broken into 2 possible sections.
   1. Non-Coelomate Animals (lower animals)
   2. Coelomate Animals (higher animals)
In both exercises, the student will view the entire question bank for a given section. The order of questions will be randomized in order to create a different series each time the user runs the program. In addition, each "animal type" will be represented by 2 (or more) different animal images. The image used will be randomly selected from two possible images. This will increase the programs repeatability value.

At the end of each section of exercises, the student will see an evaluation screen, which will inform the student how many correct responses the student gave during the current section.

III. Module 2: Major Characteristics of Animal Groups
This module will have two separate multiple-choice exercises. There will be 5 choices for each question.

A. Characteristic Identification
In the first exercise of Module 2, the student will view an image of an animal and choose the correct major characteristics of that group from a list of choices. Several questions will be asked based on each animal image. First, the student must choose whether they wish to test their knowledge on a Phylum level (and Sub-Phylum) or a Class level. This exercise will be broken into 4 possible sections (question banks).

1. Non-Coelomate Animals (Phylum and Sub-Phylum Levels)
2. Non-Coelomate Animals (Class Level)
3. Coelomate Animals (Phylum and Sub-Phylum Levels)
4. Coelomate Animals (Class Level)

B. Animal Identification Using Characteristics
In the second exercise of Module 2, the student will view several major characteristics and choose the correct image of the animal group based on the given characteristics. First, the student must choose whether they wish to test their knowledge on a Phylum level (and Sub-Phylum) or a Class level. The exercise will be broken into 4 possible sections (question banks).

1. Non-Coelomate Animals (Phylum and Sub-Phylum Levels)
2. Non-Coelomate Animals (Class Level)
3. Coelomate Animals (Phylum and Sub-Phylum Levels)
4. Coelomate Animals (Class Level)

The student will view the entire question bank for a given section. The order of questions will be randomized in order to create a different series each time the user runs the program. In addition, each "animal type" will be represented by 2 (or more) different animal images. The image used will be randomly selected from two possible images. This will increase the programs repeatability value.

At the end of each section of exercises, the student will see an evaluation screen, which will inform the student how many correct responses the student gave during the current section.

IV. Module 3: Review Quiz
In this module the student will test his/her knowledge of the zoological concepts in a 20 question multiple-choice Quiz. The questions will be randomly selected from the question banks in Modules 1 and 2.
Students will take a pre-test and a post-test to evaluate their learning success and the learning value of the CD-ROM.

**V. Module 4: Who Am I Learning Game**

In this module, the student will try to identify unknown animals based on clues relating to zoology information found in modules 1 and 2 of this CD-ROM. Students will have to choose the correct animal from a line up of 13 possible animals. They will choose the correct animal based on clues. They will receive 5 clues, one at a time (every 3 seconds), from broad to specific clues. This exercise will last 3 minutes, during which time the student will have to correctly identify as many unknown animals as possible. The more correct answers, the better the student's score.

**VI. Interactive Animal Kingdom Cladogram**

This screen will contain a cladogram of the phylogenetic tree of the animal Kingdom. A cladogram is branching diagram that illustrates the evolutionary relationships between groups. The tree will list all of the major animal phyla. The user may click on any phylum to get a brief description of the phylum and to view a cladogram of the classes contained within that specific phylum.

**VII. Glossary**

This resource will provide a list of important zoological terms, which the student may click on to provide the student with the correct definition.

**VIII. Image Gallery**

This resource will provide a list of all of the animal images on the CD. The student may click on the animal's name in the list in order to view an image of the animals and the correct taxonomic terms associated with that animal.

**IX. Progress Page**

If the student has Internet access, they will be able to access their progress page, which will indicate how many exercises (sections) they have completed. A student must answer 90% or more of the questions correct in order to successfully complete a given section. A student may attempt a given section as many times as he/she would like without penalty. Students will receive full credit for successfully completing all 10 of the sections/exercises in the CD-ROM, regardless of the number of attempts.

A second Internet program, accessed by only the instructor, will store information on individual student attempts and keep track of incorrect/correct responses to specific questions.

**X. Login Page**

Enables user to log in (or not). If user is logged in, user performance is transmitted to the website. (Requires Internet access).
Experiential Flowchart

This chart depicts the user's experience -- how he or she can navigate from screen to screen within the CD-ROM.

Module Screens

Module I: Animal Taxonomy

Module II: Animal Characteristics

Module III: Practice Quiz

Module IV: "Who Am I" Learning Game

Exercise Screens

Pre-Test

Post-Test

Question Batteries

Non-Coelomates

Coelomates

Non-Coelomates (Phylum)

Coelomates (Phylum)

Non-Coelomates (Class)

Coelomates (Class)

Intro

Cladogram

Glossary

Image Gallery

Progress

Results

Exit, Menu are ubiquitous
Interface Mockups. The following illustrations depict what various screens throughout the program will look like. This is the "Main Menu."
Module II

Animal Characteristics

Choose an exercise category:

- Identify Characteristics for a Given Animal
- Identify Animals Based on Characteristics
On this screen the user chooses a specific question battery.

Module II

Animal Characteristics

Identify Characteristics for a Given Animal

Choose an question battery:

Non-Coelomates
- Phylum & Subphylum level
- Class level

Coelomates
- Phylum & Subphylum level
- Class level

Home  << Back  Exit
Module II

Animal Characteristics

Choose an exercise category:

Identify Characteristics for a Given Animal

Non-Coelomates
- Phylum level
- Class level

Coelomates
- Phylum level
- Class level

Identify Animals Based on Characteristics

Non-Coelomates
- Phylum level
- Class level

Coelomates
- Phylum level
- Class level

Home

Exit
Linnaeus the Nautilus, Program Mascot
Module II

Animal Characteristics

Identify Animals Based on Characteristics > Non-Coelomates > Phylum Level

Click the picture of the animal that best matches the characteristic.

Characteristics:
- Blah blah blabbity blah blablabla blah blab blab blah blah blabation.
Multi-media Inventory

Images
The CD-ROM mascot: Linnaeus the Nautilus (several varying themes)

1. Moving arms animation (while giving directions)
2. Non-Mobile image used to mark successfully completed exercises/sessions
3. Non-Mobile image used to exercises tried but not yet completed

The inventory will include a minimum of one animal image from each of the listed taxonomic groups. If additional images are available, 2 to 3 animal images from each group will be used in the project.

1. Phylum Porifera
2. Class Calcarea
3. Class Hexactinellida
4. Class Demospongiae
5. Phylum Cnidaria
6. Class Hydrozoa
7. Class Scyphozoa
8. Class Cubozoa
9. Class Anthozoa
10. Phylum Ctenophora
11. Phylum Platyhelminthes
12. Class Turbellaria
13. Class Trematoda
14. Class Monogenea
15. Class Cestoda
16. Phylum Nemertea
17. Phylum Gnathostomulida
18. Phylum Ctenophora
19. Class Monoplacophora
20. Class Polyplacophora
21. Class Scaphopoda
22. Class Gastropoda
23. Class Bivalvia
24. Class Polychaeta
25. Class Oligochaeta
26. Class Hirudinea
27. Phylum Chondrichthyes
28. Class Cephalopoda
29. Class Monoplacophora
30. Class Polyplacophora
31. Class Scaphopoda
32. Class Gastropoda
33. Class Bivalvia
34. Class Cephalopoda
35. Phylum Annelida
36. Class Palaeonereida
37. Class Oligochaeta
38. Class Hirudinea
39. Phylum Arthropoda
40. Subphylum Trilobita
41. Subphylum Chelicerata
42. Class Merozoa
43. Class Pycnochordata
44. Class Arachnida
45. Subphylum Crustacea
46. Class Remipedia
47. Class Cephalocardiida
48. Class Branchiopoda
49. Class Uniramia
50. Class Maxillopoda
51. Class Malacostraca
52. Class Chilopoda
53. Class Diplopoda
54. Class Pauropoda
55. Class Symphyla
56. Class Insecta
57. Phylum Sipuncula
58. Phylum Echiura
59. Phylum Pogonophora
60. Phylum Pentastomida
61. Phylum Onychophora
62. Phylum Tardigrada
63. Phylum Echinodermata
64. Class Crinoidea
65. Class Concentricycloidea
66. Class Asteroidea
67. Class Ophiuroidea
68. Class Echinoidea
69. Class Holothuroidea
70. Phylum Chaetognatha
71. Phylum Hemichordata
72. Phylum Chordata
73. Subphylum Cephalochordata
74. Subphylum Urochordata
75. Subphylum Vertebrata
76. Class Myxini
77. Class Cephalaspidomorphi
78. Class Chondrichthyes
79. Class Osteichthyes
80. Class Amphibia
81. Class Reptilia
82. Class Aves
83. Class Mammalia

Sound
1. Animal sounds (rainforest) for Title Page
2. Animal sounds (rainforest) for Main Menu
3. Animal sounds for Correct Response
4. Animal sounds for Incorrect Response
5. Animal sounds for Successfully Completing an exercise/session

Text
1. Glossary with about 50-60 terms
2. Question banks (4 Banks with about 40 questions each)
3. Interactive Cladogram

Database
On-line Database (records users' scores and performance records)
Skills Assessment:

The primary skill needed for this project is a basic skill in photography, both terrestrial and aquatic. Dr. Schlueter has this skill. He has used various types of cameras for over 20 years. Dr. Schlueter is also a SCUBA diver with 12 years of experience. Dr. Schlueter owns a SEA & SEA underwater camera and several terrestrial cameras (including a new high-end digital camera suited to animal photography). Animal photo images and audio not acquired by Dr. Schlueter will be purchased.

Bart Everson, the CAT multimedia artist will assist Dr. Schlueter using the Director computer program to write the software needed to produce the CD-ROM. Bart will also create several drawings and simple animations for the project.
Implementation Plan: (Phase 2)

The first step in the implementation plan is to gather animal images and other multimedia needed for the project. Step two involves creation of the text content and incorporating it altogether into the CD using the Program Director.

The first step may be broken into several components:

1. Take photo of animals
2. Research commercial products to obtain any animal group that was not photographed.
3. Select best photos and process the images (e.g. cropping)
4. Acquire audio, select, & process
5. Write the text elements

The second step may also be broken into several components:

1. Combine the images, audio, text into a multimedia program
2. Programing (scripting interactivity)
3. Build databases (on-line)
4. Build CD-Rom/ Web interface
5. Test Beta Version (November 2002)

Timeline

<table>
<thead>
<tr>
<th>Month</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2002</td>
<td>Turn in design document</td>
</tr>
<tr>
<td>August 2002</td>
<td>(1) Florida SCUBA Photo Trip [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(2) Take animal images [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(3) Research commercial sources for royalty-free images [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(4) Research commercial sources for royalty-free audio [Everson]</td>
</tr>
<tr>
<td>September 2002</td>
<td>(1) Use Director to create screen templates [Everson]</td>
</tr>
<tr>
<td></td>
<td>(2) Create text content [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(3) Purchase commercial sources for royalty-free images [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(4) Select best images (personal and commercial) [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(5) Process images [Everson/Schlueter]</td>
</tr>
<tr>
<td>October 2002</td>
<td>(1) Scripting in Director [Everson]</td>
</tr>
<tr>
<td></td>
<td>(2) Finish text content [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(3) Text proofreading [Everson/Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(4) Beta 0.1 version completed (early prototype -- may be incomplete)</td>
</tr>
<tr>
<td>November 2002</td>
<td>(1) Informal one week test of Beta 0.1 with Zoology students [Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(2) Results of informal testing discussed [Everson/Schlueter]</td>
</tr>
<tr>
<td></td>
<td>(3) Continue scripting [Everson]</td>
</tr>
<tr>
<td>December 2002</td>
<td>(1) Beta 0.2 version completed (complete prototype)</td>
</tr>
</tbody>
</table>
**Budget**

Support for Underwater Scuba Trip  
(2 Nights Hotel, 2 days Scuba Diving, Gear Maintenance)  \( \$ 400 \)

Color Photography  
(Film and Film Development 30 rolls @ $10/roll) \( \$ 300 \)

Corel Photo Collection CD-ROM Underwater Super 10-pack  \( \$ 100 \)

Royalty-Free Animal Images (40 images @ $5)  \( \$ 200 \)

Royalty-Free Animal Sounds  \( \$ 100 \)

200 CDs  \( \$ 100 \)

Total = \( \$ 1,200 \)

**Budget justification**

The majority of support requested for the project is to gather animal images (e.g. photographs) of animals in every phylum. Several phyla, for instance Porifera (sponges), Cnidaria (jellyfish, corals), echinoderms (starfish), occur only in marine environments. Thus, a trip to photograph some of these animals will be necessary. Several groups are underrepresented in commercial products because of lack of human interests (e.g. sponges). These groups will be the main focus of photo trip.

The Underwater Scuba Trip will take place in August 2002. The main focus of this trip is to gather photos of marine animals (sponges, corals, etc.). Dr. Schlueter is a SCUBA diver with 12 years of experience. He will provide the underwater camera with strobe light (Sea & Sea brand) and the basic scuba equipment. He will also cover transportation costs to the Florida Keys. These expenses may be considered as cost sharing. Funds are requested to cover 2 nights at a local hotel in the Florida Keys ($75/night), dive boat expenses for 2 days ($100/day), and basic equipment maintenance/inspection ($50) of the dive gear provided by a licensed dive shop (e.g. Diver's Supply in Jacksonville, Florida). The total request for funds is $400.

Funds ($300) are requested for film and photo development.

Funds are requested for commercial royalty-free products. These include: Corel Photo Collection CD-ROM Underwater Super 10-pack ($100), assorted animal images from multiple vendors ($200), and a few CDs of animal Sounds ($100). Certain animal groups may be difficult for Dr. Schlueter to photograph himself (e.g. groups that live 1000 m below the ocean); thus these images must be purchased.

Funds ($100) are requested for 200 CDs that will be used in the project.
**Evaluation Plan: (Phase 3)**

The evaluation plans involves two main components:

(1) Beta 0.2 testing and assessment

(2) Revision based on results of assessment.

The Beta 0.2 version will be formally tested three ways using an assortment of student volunteers selected by Dr. Schlueter.

(1) Students will take a pre-test and a post-test to evaluate their learning success and the learning value of the CD-ROM. This test is a component of the CD-ROM.

(2) Direct feedback through a survey passed out to students & others testing the Beta 0.2 version [See Appendix A.]

(3) Usability testing will be performed at the Center for the Advancement of Teaching. Bart Everson will coordinate usability testing.

Information from the assessment of the Beta 0.2 from the user success (pre- and post- quiz), the survey, and usability test will be used to make revisions and additions to the Alpha 1.0 version of the CD-ROM.

**Timeline**

January 2003     (1) Refine assessment tools [Everson/Schlueter]
February 2003    (1) Assessment and User Feedback (surveys) [Schlueter]
                 (2) Usability testing at the CAT [Everson]
March 2003       (1) Analyze results, recommend changes [Everson/Schlueter]
April 2003       (1) Continue development [Everson/Schlueter]
May 15, 2003     (1) Alpha 1.0 Version Created

**Budget**

No additional funds are requested for Phase 3 (Evaluation phase).
APPENDIX A
Taxonomic Zoology CD-ROM Survey

Please answer each question. You may write additional comments on the back of this sheet. Thank you for your participation and assistance.

SA = Strongly Agree    A = Agree    D = Disagree    SD = Strongly Disagree

1. The CD-ROM provided information that I did not know.
   SA       A       D       SD

2. The CD-ROM helped me learn taxonomic terms.
   SA       A       D       SD

3. The CD-ROM helped me learn about the major characteristics of each group.
   SA       A       D       SD

4. The hierarchical cladogram helped me understand the evolutionary relationship between groups.
   SA       A       D       SD

5. The CD provided a good review of basic zoological topics.
   SA       A       D       SD

6. The CD provided me the opportunity to see some animals that I had never seen before.
   SA       A       D       SD

7. Navigating in the CD to and from resources or exercises is easy to do.
   SA       A       D       SD

8. Learning was more entertaining & enjoyable compared to reading the information in a textbook.
   SA       A       D       SD

9. The time I spent with the CD was a good investment of my time.
   SA       A       D       SD

10. I would recommend the CD to other zoology students as a useful way to learn the material.
    SA       A       D       SD
11. What was your opinion of Linnaeus the Nautilus?

12. What was your favorite part of the CD-ROM?

13. What was your least favorite part of the CD-ROM?

14. What would you change in this CD-Rom when making a new edition?

15. Which resource or exercise was the most difficult to use?


17. Comments and suggestion on the “Who am I learning Game”.

18. Comments and suggestion on the Hierarchical Cladogram.


20. Comments and suggestion on the Glossary.