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lab bench. The CPU sits under the bench in modified cabinets while a flat screen panel sits on top of the desk. Tower style CPUs are cheaper to buy and easier to repair and upgrade than notebooks. The flat screens are protected by plastic splash shields we made ourselves. Keyboards and mice have yet to be replaced due to lab damage in hundreds of hours of use. The 12 student PCs are controlled by an instructor PC at the teaching assistant station. "NetSupport School" software allows us to turn the machines on and off, and monitor and control student use. Almost every lab has a worksheet to fill out electronically, a spreadsheet to complete or a graph to make. We also use spectrophotometers connected to the computers for direct data gathering. We plan to add video microscopy to our labs in the near future. Computers do not replace wet labs; they augment them. We will demonstrate the use of the software program used to control the labs, as well as the physical set up and considerations in a computer-augmented wet lab.

A Quantitative Genetics Exercise

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Our general biology students do two simple Mendelian genetics experiments in their first term, one with *Drosophila* and one with C-Ferns. Our students also do a natural selection lab using pillbugs (ABLE workshop, 19:307-316), which requires that students understand a little bit about quantitative inheritance. To prepare students for the natural selection experiment, we introduce the lab with a 30-45 minute simulation of inheritance of a multifactorial trait: susceptibility to colon cancer. Each student represents an individual in a population, and is given two alleles of 8 different genes. Each pair of alleles contributes a negative or positive number to their colon cancer susceptibility. Some of the alleles are recessive, some dominant, some partially dominant, some X-linked, and some have an epistatic effect over another gene. Each student adds up his/her susceptibility – a score of zero indicates average genetic susceptibility, a negative number indicates more than average susceptibility, and a positive number means less than average susceptibility. Each pair of students then assumes the role of a married couple; each member of a couple selects one allele of each gene to contribute to their offspring (1 or 2). We record each parents' and each child's score for susceptibility to colon cancer in an EXCEL spreadsheet and project this on the screen for class discussion. This exercise also helps students learn a little about population genetics, partial dominance, epistasis, X-linked inheritance, etc.

Interactive Computer Keys: Tools for understanding biodiversity

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International concern about the loss of global biodiversity requires that understanding organism diversity be a high priority in biology labs. Instead, systematics, taxonomy, and biodiversity are often a small part of the curriculum, if included at all. One cause of this disparity is that students and teachers are often frustrated when using dichotomous keys to identify organisms. Confusion may stem from inexperience with the characters used in the key or because the key itself is inaccurate or unclear. This exercise has students create two kinds of keys: a dichotomous key and an interactive key designed on the computer. Students test and compare the two keys and investigate the limitations and advantages of each. Students learn how to create their

own key, learn the differences between natural and useful classifications, and gain experience in precisely defining their observations.

Adaptation to an Abrupt Environmental Change

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Spreadsheets can be a fun, cheap and useful way to encourage students to explore evolutionary and ecological topics. Creative students can use spreadsheets as a blank artist's canvas to create simulations for a great variety of natural phenomena. In this workshop, we will explore an example of a spreadsheet model that you or your students might construct. On the spreadsheet, we will manipulate the genetic variation in a simulated population of plants. The genotypes and phenotypes of individuals will be followed over five years. The simulation demonstrates Fisher's Fundamental Theorem of Natural Selection that a population with greater additive genetic variation is more able to adapt to changes than one with less variation. Perhaps even more interesting, the spreadsheet allows you to manipulate how abruptly the environmental change happens. The simulation demonstrates that a population that experiences an abrupt environmental change is more likely to go extinct than one that experiences a gradual change in the environment. The exercise relates well to evolutionary concerns biologists have about global warming.

Instructions to construct the Excel sheets are available in the following:

Puterbaugh, M. N. 2001. Chapter 31 – Adaptation; and Puterbaugh, M. N and L. Lawson. 2001. Chapter 34 – Heritability, *In* C. Welden and T. Donovan (Editors). Volume 1, Spreadsheet Exercises in Ecology and Evolution, Sinauer Associates, Inc.

Puterbaugh, M. N. 2001. Chapter 18 Adaptation, *In* C. Welden and T. Donovan (Editors). Volume 2, Spreadsheet Exercises in Conservation Biology and Landscape Ecology, Sinauer Associates, Inc.

The Value of Field Experiences in a Non-Major Marine Biology Course

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This workshop discusses the costs and benefits of providing real world field experiences for non-science students. We developed and implemented optional field trip experiences for students enrolled in summer term and spring semester marine biology courses that allow students to explore a diversity of marine habitats within 6 hours of the University of Georgia campus. Faculty and students involved with the field trips have contributed to a growing digital photo archive that has been used to develop virtual alternatives for students unable to participate in the field experiences. Cost-sharing and cooperative agreements with the UGA Marine Institute and the Florida State University Marine Lab have helped hold costs to a minimum, while providing the students with experiences that include trawling on a converted commercial fishing vessel, snorkeling offshore in turtle grass beds, canoeing and sea kayaking through coastal estuary areas, seining, and surveying barrier island habitats. Student evaluations suggest the field trip experience is invaluable. It is also a very effective recruiting tool for attracting talented undergraduates early in their academic careers. For graduate students, the opportunity to teach in an informal field setting has proved to be a unique and valuable learning experience. With increased emphasis on study abroad programs at the University of Georgia and other institutions, field teaching experience as a graduate student provides an opportunity for instructional training beyond the classroom.