## Communicating Ocean Sciences: Undergraduate Session Plan 26 April 2006

**Introduction**: For this advanced undergraduate session plan, I have modified a mid-semester lecture from my undergraduate Invertebrate Zoology course at URI. The specific lecture is intended to be the first of three hour-long sessions covering the phylum Annelida. Class size is approximately 30 students, seated at desks.

**Concept**: The "phylum" Annelida can be arranged into roughly four subgroups (Polychaeta, Clitellata, Pogonophora/Siboglinidae, Echiura), united by the presence of segmentation and chaetae. Annelids live in virtually all Earth habitats. Polychaetes are abundant and diverse.

**General Goals**: This session is designed to introduce students to the functional morphology and diversity of the annelid phylum, focusing specifically on the Polychaeta. Natural history of representative members will also be explored. Further laboratory exercises intended to complement lecture material with a familiarization of the major structures and their functions in the generalized polychaete will be conducted outside of the scope of this session.

**Specific Objectives**: Students will be expected to understand key terms, such as *segmentation/metamerism, prostomium, peristomium, trunk, pygidium, hydrostatic skeleton, septa, nephridia, setae/chaetae*, and *parapodia*, and their relevance to annelids/polychaetes. They should also be able to explain four functions of the coelom in annelids (transport gases and nutritive materials, process excretory wastes, gamete maturation and embryo brooding, hydrostatic skeleton) and to describe annelid locomotion (circular and longitudinal muscle contraction). Students will also be able to compare and contrast three feeding strategies

employed by polychaetes (predators, selective and non-selective deposit feeders, and filter feeders). Additional working vocabulary the students will be exposed to include *trochophore* larvae and *epitoky*.

**Required Materials**: 5 sets of watch glasses with live annelids (e.g., *Lumbricus* sp., *Nereis* sp., *Hirudo* sp., few other marine polychaete family representatives, if available), and/or preserved *Riftia*, echiuran, polychaetes

**Evaluation of Previous Session Experience**: Much of the traditional teaching of invertebrate biology has focused on taxonomy, morphology, and phylogeny, with a subordinate emphasis on natural history. One of the major challenges in implementing each session is the specialized terminology with which students need to become familiar. The fast-paced, detail-driven nature of these lectures intent on surveying all invertebrate taxa is apt to bore all but the most eager students with tedious trivia. Therefore, students most importantly require stimuli to generate interest in the lecture topics.

In general, this course drew heavily from "sage on the stage" lecturing from an overhead projector in front of ~30 students. There was little interaction with or questioning of the students in the class. Strengths of this particular instructor and course included an opportunity to apply what was gleaned from the lectures to laboratory exploration stations of representative invertebrate phyla. However, at the same time, concepts were taught prior to this exploration. Assessment was summative, but the separate laboratory session provided some opportunity for feedback.

**Discussion of Session Modifications**: This modified invertebrate biology session will incorporate preliminary laboratory exploration of annelids (mostly polychaetes) within the

context of the lecture classroom. After a short introduction to find out what students already know and what they first think of when they hear the term "worm," and to provide basic annelid terminology (Learning Cycle – Invitation), students will proceed in groups of five students to mini-lab stations. Each station with have a small array of preserved and live specimens to allow groups of students to observe common traits uniting the annelids, as well as to contrast the diversity within this group (Learning Cycle – Exploration, hands-on guided inquiry). After 10-15 minutes, the class will then regroup at their desks for a more traditional lecture on locomotion, feeding strategies, and basic life history of polychaetes (Learning Cycle – Concept Introduction). The instructor will facilitate periodic questioning to maintain a sense of class participation and retain student interest. The session will conclude with an invitation to explore more of the polychaete/annelid characteristics in a full laboratory session.

**Discussion of Session Evaluation:** Formative assessment will be incorporated into the mini-lab and full laboratory accompanying this session in order to feed back into the following two annelid lectures. Students will need to demonstrate an understanding of annelid morphology in a series of illustrations drawn from various taxonomic representatives. The course instructor will also circulate through the lab classroom to ask questions designed to focus the students' observations and uncover misconceptions and to operate as a guide (Discussion Map). Summative assessment in the form of an exam (incorporating other phyla covered in the second third of the semester) will require students to not only match terms with definitions, but also apply what they have learned about polychaete locomotion and feeding to problem-solving questions. This can include short essay questions asking the student to select and defend their choice of top burrower or polychaete champ in an eating competition for a given environment (Learning Cycle – Application).