

Microcomputer-Based Laboratories (MBL)
April 22-24, 2004 (Thurs. – Sat.)
at Estrella Mountain Community College
Avondale, AZ (near Phoenix)

Ron Thornton at Tufts University, Medford, MA
Tom O’Kuma at Lee College, Baytown, TX
Curtis Hieggelke at Joliet Junior College, Joliet, IL

Recent microcomputer-based laboratory (MBL) tools coupled with an activity-based physics approach provides a better method of teaching physics by enabling the teaching/learning process to build on students’ direct experiences in the physics classroom/laboratory or studio. These MBL tools give students immediate feedback by presenting data graphically in a manner that can be easily and quickly understood. The ease of data collection and presentation afforded by these tools invites students to ask, discuss, and answer their own questions. Thus, students acquire an increased competence in the use and interpretation of graphs as well as a better understanding of the physical relationships, principles, and concepts that underlie their experiences. In this hands-on workshop, participants will work in areas involving force, one-dimensional linear motion, rotation, sound, heat, electricity, magnetism, nuclear radiation, and light. They will explore approaches and curriculum materials from *Tools for Scientific Thinking* and *Real Time Physics* as well as hardware, software, and sensors from Vernier Software (LabPro Interface and Logger Pro software). These curriculum materials are often used with sensors and interfaces from PASCO Scientific.

Recent versions of MBL tools allow the inclusion of movies for some interesting activities. The movies can be synchronized with the sensor data taken at the same time and replayed. Video analysis, frame-by-frame, can provide distance, velocity, and acceleration data in situations where sensors are not workable.

The emphasis of this workshop will be on using these tools (available for both Mac and Windows computers) to teach physics more effectively to TYC and HS students. There will be extensive discussions on how to use these tools in TYC and HS courses, and tactics to overcome problems at TYCs and HSs. In addition, this workshop will be concerned with the assessment of physics learning in these areas and the application of the research findings in cognitive science and physics education as applied to students’ learning of introductory physics, particularly in the context of the use of the microcomputers at TYCs and HSs.

Professor Thornton has received awards for his innovative development and use of software in physics education from Computer’s in Physics and the American Association of Physics Teachers. In addition, he was awarded the Charles A. Dana Award for Pioneering Achievement in Education (with P. Laws) and was honored with the 1992 Smithsonian Award for Computers in Education.

The workshop leaders have many years of experience in developing and refining curriculum for introductory physics students. In addition, and more importantly, the workshop leaders have had extensive experience with the implementation and adaptation of curriculum in a variety of institutions and for many types of introductory physics students along with the training of faculty in using and developing their own curricula for their technology-oriented students. This workshop is designed for TYC and HS teachers who are interested in using computer technology in the lab to improve the teaching and learning in introductory physics courses. The workshop local host will be Dwain Desbien who recently designed and setup an MBL lab using portable computers. Recently, the physics program at Estrella Mountain Community College was selected as one of the ten outstanding TYC physics programs visited during the SPIN-UP/TYC project.

There will also be an opportunity to share and discuss issues relating to teaching physics more effectively, particularly for students enrolled in technician/technology education programs. There will be extensive discussions on how to use various strategies, tools, and tactics to overcome problems and barriers to learning at TYCs and HSs. Important issues such as standards, assessment, diversity, and technology utilization will be addressed at various points during the workshop. Discussion and information on the needs of the technological workforce and its connection with the activities of this workshop will also be presented.