Laboratory Tools for Introductory Physics
November 15-17, 2012 at Lee College, Baytown, TX

Workshop Leaders:
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Recent physics education research (PER) data indicates 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 and motion, energy, waves, electricity and magnetism, and astronomy. They will explore approaches and curriculum materials from *Real Time Physics* (and leader developed labs) as well as hardware, software, and sensors from Vernier Software (LabPro/LabQuest Interface and Logger Pro software), PASCO Scientific, and *Tracker* software. These curriculum materials are often used with sensors and interfaces from other vendors as well.

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. A number of physics and astronomy applications will be explored.

The emphasis of this workshop will be on using these tools (available for both Mac and Windows computers) to teach physics more effectively to two-year college (TYC) and high school (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 PER as applied to students' learning of introductory physics, particularly in the context of the use of the microcomputers at TYCs and HSs. Discussion and information on the needs of the technological workforce and its connection with the activities of this workshop will also be presented.

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 technology in lab and their courses to improve teaching and learning in introductory physics courses.

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), and 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.

The local host will be Tom O'Kuma who has hosted many workshops in the past and has worked with many TYC and HS physics teachers over the past twenty years.