

"Inquiry"

Fall Meeting of the Illinois Section of the AAPT and IACT

October 16-17, 2009

Illinois Central College, East Peoria, Illinois

Friday, October 16, 2009

- 8:30 - 4:15 Registration - Main Building, Tranquility Room.** Please make out checks to "ISAAPT".
Note: If you wish to attend Workshop 10 or 11 on Saturday morning, please add your name to the sign up sheet on the registration table.
Please Recycle. When you leave the meeting to return home, please place your plastic name tag holder in the box which will be provided. It will be used at the next meeting. Thanks.
- 9:30 - 11:30 Workshop W1. "Levels of Scientific Inquiry"**
Carl Wenning, Illinois State University, 328E.
- 9:30 - 11:30 Workshop W2. "Tasks to Promote Sense Making in General Physics and Chemistry"**
Dave Maloney, Indiana University-Purdue University Fort Wayne, 317E.
- 9:30 - 11:30 Workshop W3. "Inquiry Based Activities for Exploring the Physics of Sound and Music"**
Andrew Morrison, DePaul University, 316E.
- 10:00 - 11:30 Workshop W4. "Inspire Your Chemistry Class with the TI-Nspire!"**
Ray Lesniewski, Jones College Preparatory School, 331B
- 10:00 - 12:00 "The Illinois Articulation Initiative for Physics Majors and iTransfer"** - Panel Discussion
Moderated by George Bart, Truman College and Michael Fortner, Northern Illinois University, 320A
- 12:00 - 1:00 Lunch** - included in your Friday registration, Tranquility Room

Here is the list of those who are doing contributed presentations.

Friday 2:45 - 4:15		Friday 4:30 - 5:30		Saturday 8:45 - 9:45		Saturday 10:00 - 10:45	
2:45	A1. Barbara Gottemoller	4:30	B1. Stanley Abel	8:30	Take Fives	10:00	D1. Tom Carter
3:00	A2. Tom Foster	4:45	B2. Diane Riendeau and Lisa Backus	8:45	C1. Amit Joshi	10:15	D2. Dave Sykes
3:15	A3. Andrew Morrison	5:00	B3. Carl Wenning	9:00	C2. Ken Mellendorf	10:30	Take Fives
3:30	A4. Dave Sykes	5:15	Take Fives	9:15	C3. Bob Widing		
3:45	A5. Bob Widing						
4:00	Take Fives						

1:15 - 2:30

"Using Scientific Inquiry and Nature of Science as Integrative Themes in Teaching Science"

Norman Lederman

Chair and Professor of Mathematics and Science Education, Illinois Institute of Technology
212 C/D

Students' understandings of scientific inquiry and nature of science have been strongly emphasized in recent science education reforms at all grade levels. It is believed that stressing inquiry and nature of science will provide students with a concrete context for the learning of science, enable students to make more informed decisions with respect to scientifically-based issues, and facilitate the learning of "traditional" subject matter knowledge. Nevertheless, there is much confusion about definitions of scientific inquiry and nature of science and few research-based materials and activities have been provided to assist teachers in focusing their instruction on inquiry and nature of science.

This presentation will clearly define what is meant by scientific inquiry and nature of science, as well as provide concrete examples of how science instruction can integrate inquiry and nature of science into "traditional" instruction.

2:30 Break - 320E

2:45 - 4:15 Workshop W5. "Levels of Scientific Inquiry"
Carl Wenning, Illinois State University, 328E.

2:45 - 4:15 Workshop W6. "The Three Pigs Dilemma: Tearing Down Misconceptions and Building Sturdy Ones"

Larry Kellerman, Illinois Central College, 316E.

2:45 - 4:15 Workshop W7. "Accuracy and Precision Lab with Spectroscopy Demo"

Anthony Nelson, Warren Township High School, 331B.

2:45 - 4:15 Session A - 319E - Chair: *Christin Gustafson*

2:45 - A1 - Active Learning

Using Real World Application Projects to Demonstrate Student Learning. *Barbara Gottemoller*, Mount Zion High School, Mount Zion, IL 62549. Several different types of student project ideas will be presented that encourage students to relate what they are learning in the classroom to science in the real world. Students demonstrate their understanding of science by creatively utilizing their knowledge.

3:00 - A2 - Active Learning

Structuring the Origins of Forces. *Tom Foster*, Southern Illinois University Edwardsville, Edwardsville, IL 62026. For the past several years, I have been trying to teach my elementary education students the origin of forces as a precursor to Newton's Third Law. I have even used it in my calc-based course with the same goal. Results are definitely mixed and I might be ready to throw the whole approach out. Let me share it with you, get your reactions, and figure out my next step.

3:15 - A3 - Teaching Methods

Teaching Semi-naked in the Physics Classroom. *Andrew Morrison*, DePaul University, Chicago, IL 60614. Inspired by José Bowen, dean of the Meadows School of the Arts at Southern Methodist University in Texas, I have begun experimenting with a variation of what is called "teaching naked." Dean Bowen advocates taking technology out of the classroom, and instead using class time for active engagement between the students and the material. In this talk, I will share how I have used these ideas to stop lecturing in class, what technologies I have taken out of the classroom and what technologies I have introduced outside of the classroom. I will discuss the successes and the challenges of using this approach so far.

3:30 - A4 - Teaching Methods

The Miracle Air Conditioner. *Dave Sykes*, Lincoln Land Community College, Springfield, IL 62794-9256. It is not uncommon that advertisements exaggerate information. However, teaching opportunities often arise when advertisements misrepresent information in the name of science. In this presentation an advertisement for the "Cool Surge" air cooler will be investigated and a method for using it to teach some concepts in thermodynamics will be suggested.

3:45 - A5 - Teaching Methods

Powers of Ten: How to Remember Standards for Judging Metric Sizes. *Bob Widing*, Department of Chemistry, University of Illinois, Chicago. It is necessary to know some values of each type of metric unit to check approximate size for calculations and to make estimates as are needed for Fermi problems. Learning the sizes of everyday objects that happen to be about 1, or 10, or 100, etc. of each unit provides students with greater abilities to check and judge their answers. Examples: An audiotape (audio cassette tape) has a length (longest dimension) of 10.0 cm. A standard "jewel case" for a CD is about 1.0 cm thick.

4:00 - Take Fives

T1. *Jeff Vallosio*, "WYSE Science Competition in Chemistry, Physics, Biology - The Academic Challenge"

T2. *Robert Mason*, "Is the Problem Physics or Math?"

Any others?

4:15 Break - 320E

4:30 - 5:30 Session B - 320A - Chair: *Ken Eckstein*

4:30 - B1 - Teaching Methods

Blood Test Results: A Chemistry Teaching Tool. *Stanley Abel*, Illinois Central College, East Peoria, IL 61635-0001. For a one-semester general, organic and biological chemistry course targeted to allied health professionals, I am using my own blood test results to provide relevant illustrations of chemistry principles. I currently use portions of the laboratory report to illustrate topics in measurements and units, ions, buffers, carbohydrates, and lipids. Those topics will be shown briefly. I will also present other possible areas for use of examples from blood tests.

4:45 - B2 - Teaching Methods

Procedures? We Don't Need No Stinking Procedures!! *Diane Riendeau and Lisa Backus*, Deerfield High School, Deerfield, IL 60015. We aren't going to tell you what we are going to do. We think you have enough information to figure it out for yourself !

5:00 - B3 - Teaching Methods

Dealing More Effectively with Alternative Conceptions in Science. *Carl J. Wenning*, Illinois State University Physics Department, Normal, IL 61790-4560. Many science teachers are aware of the existence of alternative conceptions - notions held by students that are contrary to those generally accepted by mainstream scientists. Authentic alternative conceptions are tenaciously held, and doggedly resistant to change. Only carefully managed efforts by teachers will effectively address them. The author proposes two emphases within the context of the "standard model" for more effectively overcoming alternative conceptions.

5:15 - Take Fives

T4. *Ken Mellendorf*, "My Assessment Form"

T5. *Tom Holbrook*, "Mole-ar Concentration"

T6. *Toni Pitts*, "University of Illinois Physics Outreach - physics.illinois.edu/outreach"

T6a. *Mike Heinz*, "Using Online Technologies to Enhance Your Science Course"

5:30 - 6:30 Free time

6:00 - 6:30 Social time/cash bar - Paradise Hotel

6:30 - 7:30 Banquet - Paradise Hotel. Presentation of the *Distinguish Service Citation* to *Brian Davies*, Western Illinois University

7:30 - 9:00

"Science vs. 'Junk Science': Using the Inquiry Method to Tell and Teach the Difference "

Jeanette Madea

Senior Professor of Chemistry, Broward College, Fort Lauderdale, Florida

Paradise Hotel

As our world gets more and more technologically advanced, our citizens seem to be becoming less and less scientifically literate. Popular television shows treat psychic abilities, alleged landings by aliens, and unsupported medical claims as fact. People rush to buy homeopathic medicines, "miracle" fat burning pills, and magnets for their shoes. How do we make judgments about what is "real" and what is fraud or fantasy?

As well as analyzing specific applications of the inquiry method to junk science claims, this presentation will focus on the process of science and how we can feel confident in what we know and don't know. We will explore the philosophical and practical implications of inquiry-based reasoning as a function of education and society as a whole. The emphasis will be on how we can foster critical and rational thinking in our students and use science-based inquiry in our classrooms to not only defeat the illusions of junk science but provide our students valuable skills for the future.

Saturday, October 17, 2009

7:00 - 8:15 ISAAPT Council meeting - Presiding: *Tom Foster*, President. Tranquility Room

8:30 - 10:00 **Registration. Hallway outside of Tranquility Room.** Please make out your checks to "ISAAPT".
Note: If you wish to attend Workshop 10 or 11 this morning, please add your name to the sign up sheet on the registration table.

8:45 - 10:45 **Workshop W8. "Tasks to Promote Sense Making in General Physics and Chemistry"**
Dave Maloney, Indiana University-Purdue University Fort Wayne, 317E.

9:15 - 10:45 **Workshop W9. "Investigations in Electrostatics with Benjamin Franklin"**
Rebecca Vieyra, Cary-Grove High School, 316E.

8:45 - 10:45 **Workshop W10. "Using Vernier LabPro in Introductory and General Chemistry Labs"**
Bill Cook and Meral Savas, Illinois Central College, 332B.
Participants will get a chance to use the Vernier LabPro temperature probe in calculation of calorie content of Cheetos, pH sensor in acid-base titration experiment to calculate the dissociation constant of a weak acid, colorimeter in a kinetics experiment, gas pressure sensor in verification of Boyle's Law, and voltage probes in the comparison of reduction potentials of four metals. Some of these experiments will be in the guided or open inquiry lab format.

8:45 - 10:45 **Workshop W11. "Process Oriented Guided Inquiry Learning"**
Mahesh Alur, Lake View High School, Chicago, 318E.
Process Oriented Guided Inquiry Learning (POGIL) is a research based learning environment where students are actively engaged in mastering course content and in developing essential skills by working in self-managed teams on guided inquiry activities. In addition to learning, understanding, and applying new concepts, students also develop important process skills in the areas of information processing, critical thinking, problem solving, teamwork, communication, management, and assessment. The instructor facilitates student learning by appropriately guiding and questioning the teams as they work through the specially designed activities. Participants will learn how to integrate the POGIL methodology into their high school science classroom.

8:30 - 9:45 **Session C - 319E** - Chair: *Ken Mellendorf*

8:30 - Take Fives

- T7. *Cliff Parker*, "How to Light a Candle - Take Two"
- T8. *Cecilia Vogel*, "SPS Zone Meeting"
- T9. *Joe Bergman*, "Avogadro's Law and Bernoulli's Principle?"

8:45 - C1 - Research

Geometric Phase for Two Coupled Quantum Dot System. *Amit Joshi*, Eastern Illinois University, Charleston, IL 61920. The exponential faster speed of quantum computers over their classical counterparts has motivated several research areas in quantum computation and quantum information processing in recent years. Semiconductor quantum dot (QD) system is one of the practical physical systems for quantum information processing in which, the exciton constitutes an alternative for the usual two-level system. When a system having more than one quantum dot is considered then the coupling and the interaction between quantum dots become important. A prominent interaction called Forster interaction is responsible for transfer of exciton from one QD to another QD. Here, we rigorously investigate adiabatic geometric phases of two coupled quantum dots considered as two spin-1/2 system including Forster interaction between them. For this system the adiabatic Berry's phase can be used to implement conditional phase shifts and thus realization of quantum logic gate operations.

9:00 - C2 - Teaching Methods

Interactive Learning Spreads to Other Majors. *Ken Mellendorf*, Illinois Central College, East Peoria, IL 61635. Interactive methods such as clickers and discussion questions are used by many physics teachers. I find such methods spreading throughout my college. Concepts such as Peer Evaluation and TIPERs are becoming popular in other sciences and outside of science. What my colleagues once considered the toys of physics instructors are becoming topics of discussion across the board.

9:15 - C3 - Teaching Methods

Mnemonics to Avoid Painful Memorization in General Chemistry, Organic, and Biochem. *Bob Widing*, Department of Chemistry, University of Illinois, Chicago. There are some facts, equations, and chemical structures that must be learned if one is to be a successful student of chemistry. If the instructor shows ways to easily remember such facts, it empowers the student because they know key facts and can make higher-level decisions. Many examples will be shown.

9:45 - 10:00 Break - 320E

10:00 - 10:45 Session D - 320A - Chair: *Ray Spilsbury*

10:00 - D1 - Active Learning

Using Sequenced Questions in Peer Instruction. Tom Carter, *Neville Reay, Lin Ding, Lei Bao, and Albert Lee*, College of DuPage, Glen Ellyn, IL 60137. I will introduce the use of sequenced questions in Peer Instruction. I will provide CD's of question sequences which were created and validated by the Ohio State Physics Education Research Group team. I will briefly discuss the validation process.

10:15 - D2 - Active Learning

Estimation Practice Revisited. Dave Sykes, Lincoln Land Community College, Springfield, IL 92794-9256. Recently 37 Physical Science students at Lincoln Land Community College participated in an exercise to determine their ability to make reasonable estimates of 10 physical quantities. The results of the exercise will be presented along with some possible teaching techniques that enhance a student's ability to make estimates.

10:30 - Take Fives

T10. *Tom Foster*, "SIUE Physics: Good, Bad, and Pretty"

T11. *Bill Cook*, "The Chemistry Shoppe Web site"

T12. *Cherie Lehman*, "Photon Phun"

10:45 - 11:00 Break - 320E

11:00 - 12:00

***"Teaching Science at the Introductory Level
with CALM (Computer Assisted Learning Method)"***

Romualdo de Souza

Professor of Chemistry Indiana University, Bloomington, Indiana

212 C/D

Students at the introductory level often perceive physical science as synonymous with equations. Solving a problem in physics or chemistry is to them just a question of applying the correct equation. Quite often however they fail to understand the relationship between equations. In contrast, scientists approach solving scientific problems in a quite different way and a qualitative understanding often if not always precedes a quantitative one. On the other hand, a lack of familiarity with and an inability to utilize equations often hampers a student's success in science.

In teaching almost twenty years at Indiana University (IU), I have developed course materials and exercises aimed at addressing some of these issues. In particular I will describe CALM, a free online learning tool developed at IU to help students learn general chemistry and improve their problem solving skills. Based upon a Socratic pedagogy, CALM presents students with individualized algorithmically generated questions on a given topic. Each question and its solution are generated when the question is requested. The program thus provides instant feedback on the correctness of the student's answer. Students are not penalized for incorrect answers but are encouraged to reconsider the question and re-answer it.

Inherent with its Socratic pedagogy CALM can present a student who incorrectly answers a question with a leading question. The program also provides instantaneous feedback to faculty/instructors via the Web about the comprehension of a particular topic either by a particular student or a group of students. Since 2001 CALM has been implemented at the high school level as well. It is presently utilized in more than 70 HS across Indiana and several states across the US.

12:00 - 1:00 Lunch - *It must be ordered with Registration.* Your sandwich choice is on your name tag. Tranquility Room

ISAAPT Business Meeting - Tranquility Room

IACT Business Meeting - 212 C/D