Detroit Metropolitan Area Physics Teachers

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DMAPT Today

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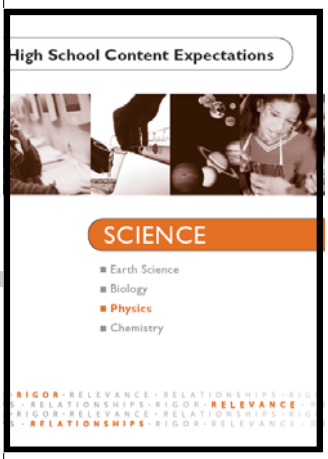
DMAPT 2007-2008 Meetings

Minutes by Mike McIntyre and Laura Ritter

Newsletter by Nicole Murawski

DMAPT September 20th, 2007 – Troy High School

The DMAPT's first meeting of the school year was held at Troy High School on September 20th, 2007. The physics teachers of Troy High School—Trevor Smith, John Morrison, Kate Stevens, Chris Dannug and Laura Ritter—were the hosts. The focus of the meeting was on the Michigan High School Content Expectations (HSCEs). Mike Gallagher, science consultant from Oakland Schools, kindly agreed to join us to help clarify the content expectations. Mike served on the writing team for the companion documents.



The legislature changed high school graduation requirements from simply one course in civics to a large number of course credits, including three credits in science. These requirements apply to students starting ninth grade in Fall 2007. Note that "credits" are not the same as "courses" measured by seat time. Students must have one credit in biology, one credit in either physics or chemistry, and a third science credit, not specified by the legislation. Paul Zitzewitz (University of Michigan – Dearborn) summarized the discussion at the meeting:

The credits are defined by content expectation documents for physics, biology, chemistry, and earth science. Each of these four documents (available at http://www.michigan.gov/science) lists a number of standards. One standard that includes scientific inquiry, scientific reflection, and social implications is common to all four documents. The other standards are specific to the science.

There are four kinds of standards: prerequisite, essential, core, and recommended. One credit must include both essential and core standards.

A credit may be obtained by taking a year-long course, a half-year (or shorter) course, or a course lasting over one year, or by taking a course or courses that includes standards from more than one science. The way credits match to courses is to be determined by the district. Note that these standards are for grades 8-12, and so include a grade that is usually in a middle school.

The Legislature directed the Michigan Department of Education to create exit exams for each of the four sciences. It stated that districts are not required to use the state exit exams. They may develop their own exams. Work on the state exit exams has started, but funding problems will certainly delay and may eliminate these exams.

In addition, there is a second level of assessment of both high school students and schools. The high school MEAP exam has already been replaced by the ACT. When students now in the ninth grade reach the eleventh grade the ACT will be supplemented by the Michigan Merit Exam (MME) that will test knowledge of content as defined by the standards. The MME will be used to determine who well schools meet the requirements of the No Child Left Behind (NCLB) act, and so will be of great importance to them. It may also determine whether or not students obtain state-funded scholarships.

The MME will not examine all standards, just the "essential" standards. Note that this exam, given in the spring of the 11th grade, will test material students will have learned in grades 8-11.

The high school physics teachers at the meeting reported a great deal of turmoil in both their districts and schools. The turmoil is about matching credits to courses, making it possible for the approximate 60% of students who now graduate without either a physics or chemistry course to obtain a physics or chemistry credit, including eighth grade in the mix, and preparing students for the MME.

HSSCE Companion Document

PHYSICS

Unit 1: Motion

Big Idea (Core Concept): The motion of an object may be described using a) motion diagrams, b) data, c) graphs, and d) mathematical functions.

Standard(s):
P2: Motion of Objects

Content Statement(s):
P2.1: Position-Time
P2.2: Velocity-Time
P2.3x: Frames of Reference

Content Expectations: (Content Statement Clarification)
P2.1A: Calculate the average speed of an object using the change of position and elapsed time.

Clarification: The calculation would be for average velocity (not average speed), since it involves change of position and elapsed time.

Mike Gallagher said that LaMoine Motz, of the Michigan Science Leadership Association, proposed that MDE write the companion documents. Kathy Morakovich (Portage High School) led the physics team for the writing of these documents. Twelve units were created to help clarify the content expectations. Currently, the test writers are using the companion documents to write the exams. It is not expected that real-world applications will be tested on the MME. The companion documents can be found on the Michigan government website (www.michigan.gov/science).

The presentation was followed with demos and announcements. Tim Coleman (Woodhaven High School) told the group about an email mentoring program for which he is a mentor. The program, called eMSS, is a program designed for newer science teachers in the US who need a mentor. More information can be found at http://emss.nsta.org/.

Don Pata had a question for the group. When a student picks up the straw with his finger covering the straw, why does the water stay in the straw? Steve Dickie (Divine Child) answered Don's question. When the straw is lifted, some of the water drops out and the air in the top of the straw expands which causes the pressure to decrease. The pressure imbalance explains why the water stays in the tube.

In a conversation later with our guest, Mike Gallagher, he shared with me how impressed he was with our group. He thought it was great that we had the kind of group where teachers could share ideas and feel comfortable asking questions like Don's straw question.

The meeting concluded with good old fashioned DMAPT demos and discussions by members of the group, including Mike McIntyre and Rick Forrest.

NSTA October 18-20th, 2007 – COBO Center, Detroit

On October 18th, 2007, DMAPT was part of hosting the "Physics Strand Day." Several lecturers were scheduled throughout the day and at the end of the day, the DMAPT hosted a make-and-take session that turned out to be a big hit. An estimated 100 teachers participated in the session. Several make and takes were first presented by DMAPT members, then the participants were allowed to make their own. Don Pata was in charge of the Laserium. Thanks to Mike McIntyre for cutting the PVC pipe. Jim Gell and Steve Rea organized the electrophorous. Chris Deyo prepared and presented the monopolar motor. The color mixing turbine make-and-take was organized by Catherine Jasionowicz is in charge. The color mixing LED was presented by Steve Dickie and Al Gibson presented the standing wave on a string. Several other members manned the tables and helped with gluing and soldering. Thanks to everyone for their help!

November 13th, 2007 – Rochester Adams High School

The second official DMAPT meeting of the school year took place at Rochester Adams High School on November 13th, 2007. Chris Deyo was our host and shared with us her experiences at the Perimeter Institute for Theoretical Physics.

The meeting began with announcements—first and foremost being the nomination and voting for Jim Gell of Plymouth High School as our new VP. Jim graciously accepted the position nad offered to host the nest meeting on December 13th.

Other announcements included a reminder that the DMAPT's 50th anniversary is this year. Members should expect an email to come from Jim and/or president, Beth Kubitskey outlining festivities planned for this event.

Jeff Conn of Wayne State announced that next school year, the university will be offering a major in biomedical physics. Wayne State will be one of just a handful of universities to offer this major. Jeff feels that this program will give students who want to apply to medical school an upper hand. Wayne State will send a representative to your school to talk about the program if you would like. Contact Jeff Conn (jconn@sun.science.wayne.edu) for more details.

Nicole Murawski of Royal Oak High School mentioned that she would like to have a meeting that focuses on technology in the classroom. The group engaged in a short discussion about what kinds of technology they would like to include. Video capture was of particular interest to many members at the meeting. Any other ideas are welcome.

After announcements, Chris Deyo shared her experiences at the Perimeter Institute for Theoretical Physics (http://www.perimeterinstitute.ca/). One of the goals of the institute is to try to give young people the opportunity to engage in research. Chris participated in a week-long institute for teachers called EinsteinPlus. The program focuses on modern physics topics and ways teachers can incorporate these into their curricula.

Chris's presentation centered around quantum physics. She began by explaining a little about the main features of quantum theory. To explain wave-particle duality, she showed the Dr. Quantum double-slit video that can be found on YouTube. She also presented the group with multiple-choice questions followed by an investigation using the ripple tank simulation from http://phet.colorado.edu/new/index.php.

Chris explained photon entanglement to the group. Optically active crystals are used to create entangled photons, which always seem to know what the other one is doing. Quantum computing relies on using polarized entangled photons. To illustrate entangled photons, we played the "entanglement game." Groups of three people represented entangled photons and had to figure out how each would behave when they encountered different kinds of detectors.

If you would like to search for presentations by those who are in association with the institute, visit http://pirsa.org/.

Ramon Torres-Isea of the University of Michigan mentioned that the FOCUS group is building a quantum computer.

Brian Crump (Oakland Christian Academy) shared an activity that he uses called the "quantum nickel lab." Nickels of different quantities are inside opaque film cans. Groups of students are given cans with different numbers of nickels in them and asked to determine how many nickels are in each can.

Discussions about modern physics topics in education continued. Jim Gell encouraged the group to check out www.TED.com for other interesting topics and ideas.

December 13th, 2007 – Plymouth-Canton High School

Announcements:

Callie Baylor reported that Allen Park needs a science teacher (Bio and Chem); contact her at Baylor@apps.k12.mi.us if interested in more details.

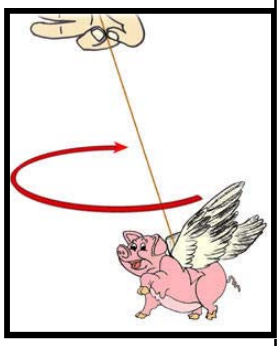
"Get Well Soon!" wishes sent out by the group for Al Gibson

Rhonda Diliberti (586-212-7654) reports that Michigan Virtual Univ. needs an on-line physics teacher for their AP Physics course.

Mike McIntyre reported that Kettering University in Flint has a 3-day workshop on alternative energy; the cost is $95 but lunch is included and participants walk away with a hydrogen fuel cell car that costs about $115 and a solar-powered toy car that sells for about $25.

Keith Bosen shared the positive experience his students have each year with Lawrence Tech's "Robofest" competitions. Students design, build and program totally autonomous robots to solve a new challenge each year. Although the event is in late March/early April, the project is starting now.

Demos/Presentations:



Steve Rea showed us his flying pigs, then demonstrated how he uses "cooperative testing" for a small part of his grading (it's actually more of a formative testing tool). For example, a board (approx. 3" by 24") is centered on a turntable with 5 metal washers arranged along the board's centerline on each side of the centerpoint. Students are formed into small groups and asked to predict which washers will fly off first when the turntabled is turned on. Groups are allowed to see the turntable run without the washers in place. Groups are allowed to discuss the problem and charged with the task of making their prediction with scientific arguments to back it up. He calls upon one student from each group to deliver the team's prediction and explanation. He suggests that the top student in the group not be called on; rather, the lowest student capable of delivering the explanation should be chosen.

Steve Dail also uses cooperative tests. For example, the entire group will be given four problems to solve but only one problem will actually be required per student; students are not told which student will get which problem so students need to make sure that all team members can solve each problem.

Keith Bosen uses similar team challenges. For example, he'll set up a ramp on a table such that a ball placed on top and released will roll down the ramp, pick up speed, then go across the flat tabletop and become a projectile as it leaves the table for the floor. Teams are asked to predict where the ball will hit the floor and explain their solution. They talk it over, reach a solution, place the target on the floor where they expect the ball to land, then test their prediction. The team's bonus points are calculated by adding the score given for their explanation with the score for how close they come to the target.

Steve Dail uses old seat belt mechanisms from junked cars to demonstrate inertia: the belt has an inertia mechanism which causes the lock to engage when there is a sufficient deceleration. Steve also showed how small Styrofoam balls in a plastic zip-lock back can be used to demonstrate static electricity. Another useful demo was the use of two neodymium ball magnets: when rolled toward each other, but not quite on a collision course, they will suddenly capture each other at their closest approach and rotate very rapidly in tandem (conservation of angular momentum, energy). Arbor Scientific has inertial footballs and "flashing brick balls" that are useful for Newton's Laws demos. Putting a $50 wireless mini-camera on the falling monkey in the classic "monkey and the hunter" demo yields an interesting result: from the monkey's perspective, the approaching dart flies in a straight line (not the parabolic trajectory earth-bound observers notice).

Steve Rea uses toy dart guns for the projectile experiments and demos; he attaches steel spheres to one of the suction cups to explore the mass effects.

Robert Parys passed out free skeins of ROYGBIV yarn and resonance tubes (the kind you twirl to make different notes). Note: the drop in air pressure created inside the twirling tubes can be demonstrated by holding a cup of paper circles (from a hole puncher) at the non-twirling end of the tube; the paper pieces get sucked up!

Don Pata demonstrated how he stimulates student inquiry processes by positioning himself in front of a standard student desk and throwing various balls at the floor below the flat desktop area. The balls hit the floor, bounce upward and strike the underside of the desk surface, then bounce back to the floor and out the front of the desk where they came from. The spin, angular momentum, friction, etc. are all different and can produce different refections. The point of the exercise is to get students thinking about the problem and making predictions, based on their understandings of physics principles, before the balls are thrown. Assorted balls are used. "Superballs" with high surface friction produce the most remarkable reversal of direction.

Mark Davids lit up a 60W incandescent bulb with a laser pointer; then used canned fog, 2 laser pointers and a concave mirror to show how intersecting light beams will reflect off the mirror and the reflected beams will also intersect somewhere in space. In a variation of the old "swinging bucket of water" demo, Mark tied three strings to the corners of a triangular piece of Plexiglas, placed a plastic champagne glass filled with colored water on the Plexiglas, and walked around the room asking the "class" to predict what would happen as he accelerated linearly, around corners, etc. Swinging the apparatus in the vertical plane produces the most excitement as the glass goes completely upside down on each revolution but does not spilled. Having students perform the demos draws them into the action better and can be used to build confidence and self-esteem. [Note: Arbor Scientific carries both the canned fog and the bright green laser]

Paul Zitzewitz discussed how teacher observation protocols can be reformed to include a peer evaluation procedure that can be highly effective.

Cal Hoeksema discussed how Poisson's spot (refraction effect where constructive interference occurs with light passing a sphere and produces a bright spot in the middle of the shadow) was actually cited as a reason why light must not be a wave (at the time, without a good source of coherent, in-phase light, no spot was observed).

March 19th, 2008 – Eastern Michigan University

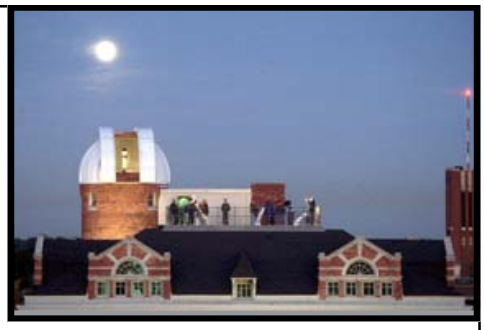
The March meeting of the DMAPT was held in the Sherzer Observatory at Eastern Michigan University. Our hosts were Beth Kubitskey and Norb Vance.

After the introductions, Beth Kubitskey announced the plans for a 50th anniversary of DMAPT picnic that will be held in the fall of 2008. An email will be sent out with more information closer to the date.

The University of Michigan will be hosting the AAPT Summer Conference in 2009. Myron Campbell needs lots of help to serve on the local organizing committee. 1000-1200 participants are expected. If you would like to help, visit the AAPT website or contact Myron (Myron@umich.edu).

The DMAPT would like to switch its means of contact from an email list to a Google Group in the fall. This new format of contact would allow DMAPT members to post messages and other materials to a common site.

Ramon Torres-Isea announced that the University of Michigan would be holding the annual Physics Olympiad competition on Saturday, May 3rd. Students from local high schools competed in physic-related events.



The MiAAPT meeting was held April 12th at Western Michigan University.

Norb Vance gave the group a tour of EMU's observatory. Sherzer Observatory, aka "The Clubhouse", was founded in 1903. It currently hosts many amateur astronomy groups who use the facilities. The new apochromatic refractor telescope was installed in 1991. This refractor was made by the same maker as the famous Yerkes telescope in the Yerkes Observatory. The DMAPT group took a tour of the viewing room and also went out on the roof. Unfortunately, the evening was too overcast to see any celestial objects.

When we came back inside, Norb showed us the SEGA Homestar Planetarium Projector ($250, colorized version $350). This projector is reasonably priced for a classroom and will work on a flat ceiling.

Laura Ritter & Mark Davids were among those honored at the recent MSTA meeting. Laura Ritter won the Teacher of Promise Award. Mark Davids won high school Teacher of the Year.

Mark Davids will also be honored this summer at the 2008 AAPT National summer Meeting in Edmonton, Alberta, Canada. Mark has been named Pre-College Physics Teacher of the Year.

Congratulations Laura and Mark!

April 10th, 2008 – Wayne State University

Nobel Laureate, Eric Cornell, was invited to give the 2008 Vaden W. Miles Memorial Lecture at Wayne State University. The lecture was open to the public and included a poster session highlighting local undergraduate and high school research projects. Dr. Cornell won the Nobel Prize in 2001 for achieving Bose Einstein Condensation. After the lecture, DMAPT members in attendance were abler to meet and talk with Dr. Cornell. A short meeting followed.

A brief synopsis of Eric Cornell's talk:

Eric Cornell gave a very engaging talk about the Bose-Einstein Condensate (BEC). Temperatures below 3 K can only be found in a laboratory setting. Cornell's laboratory temperature is ten million times colder than 3 K. Atoms can be thought of wither classical balls or quantum waves. According to Dr. Cornell, "as things get colder, they get wavier." This is due to Heisenberg's uncertainty principle. $[(\Delta x)(\Delta p) \geq h]$ The waves overlap as the atoms get colder. To get a temperature low enough for BEC, Cornell used a method called evaporative cooling. A few atoms (sample of 10 million fg or less) are placed in a bowl. A magnetic field pushes the atoms down. The energetic ones roll out of the bowl taking a lot of energy with them. BEC appears at 50 nK.

BEC is very thin, gelatinous in texture (it wiggles and jiggles), and is coherent (all the atoms are behaving in the same way). When two condensates overlap, they can destructively interfere and the density goes to 0. It is a superfluid, which means it flows without resistance. The flow is a rotational one creating vortices. The faster the rotation, the more vortices. The vortices arrange themselves in a lattice pattern. Amazingly, each of the atoms is going around all of the vortices at the same time!

The main advantage to being able to create BEC is that it can aid in measuring small changes in gravity. Also, it may also help us to understand the technology and the behaviors of the very small.

Al's Corner—From the Desk of Al Gibson

Hi DMAPTers,

Hope you all had a restful summer break and are all charged up for a new school year. Cal and I, along with a whole bunch of other DMAPT retirees are all charged up to continue having fun without the need to get up early every morning and grade papers late at night. Your time will come.

This summers meeting in Edmonton was great. Nicole Murawski, our editor, was selected for the PTRA program and spent the week before the AAPT meeting being trained as a workshop leader. She now has even more tools in her workshop belt.

Mark Davids gave a great talk during the Awards Ceremony. Mark was the AAPT Outstanding Pre-College Awardee for 2008. He gave lots of good reasons why organizations like DMAPT are so important in all of our development as physics teachers. One of the points he made was that we get to be great teachers by sharing with one another. I got several comments from AAPT leaders about how great it must be to be part of an active collegial and supportive group of teachers.

I would like to share some neat websites that I learned about while attending sessions. Most deal with particle physics or Cosmology. The folks from Perimeter Institute gave a great talk on Dark Matter. I have a DVD to share with you at some of our meetings.

http://Atlas.ch ATLAS is a particle physics experiment at the Large Hadron Collider at CERN. Starting later in 2008, the ATLAS detector will search for new discoveries in the head-on collisions of protons of extraordinarily high energy. You can download two 20 min videos, get free posters and DVDs as well as watch webcams located around the accelerator.

http://cern.ch/outreach provides lots of info about Cern.

http://www.youtube.com/watch?v=j50ZssEojtM A rap about what goes on in Large Hadron Collider. And who said scientist have to be dull!

http://particleadventure.org give general info about particle theory

http://www-outreach.phys.cam.ac.uk/camphys is part of the Cavendish Laboratory's outreach program. Lots of interesting stuff here. Including flash files of early discoveries.

http://snolab.ca/ has info on neutrinos. Some think the missing mass of the universe is made up of neutrinos.

You can spend hours on these sites. Have fun and pass them along to your students.

Al

Upcoming Dates: The following is a tentative schedule of our 2008-09 meeting schedule. You will be sent reminders as dates are confirmed and approaching. Please notify us if you are willing to host a meeting this year.

Sept 16 or 17; Host: Nicole Murawski @ Royal Oak
Oct 3/4; Host: Jeff Conn @ Wayne State: 50th anniversary celebration; Theme: kid friendly demos/make-and-takes
Oct 18 MDSTA
Nov 11-13
Dec 9-11 Host: Jim Gell @ Plymouth
Feb 3-5
Mar 3-5 MSTA, with an additional March meeting TBD if needed
Late March or Early April MIAAPT
Apr 22 (Earth Day) Host: Mark Davids/Don Pata @ GP

Know someone who teaches Physics or Physical Science and doesn't know about DMAPT? Invite them to a meeting! Share our newsletter, tell them about the wonderful things the DMAPT has to offer!

Not on our Mailing List? Contact Al Gibson at: gibson@oakland.edu

Suggestions? If you have any ideas or suggestions for future newsletters, please email them to Nicole Murawski at: murawskin@royaloakschools.com.