Physics *Tempo*

The Newsletter of The St. Louis Area Physics Teachers
an affiliate of the American Association of Physics Teachers
February 1992 **Vol. 2 No. 4**

Notes and News from the January 92 Meeting at the St. Louis Science Center

by Paul Discher

The January meeting of the St. Louis Area Physics Teachers convened at 1:00pm Saturday January 18, 1992 at the St. Louis Science Center. No business was discussed, rather, the meeting was hosted by Dr. Judith Ogilvie Public Programs & Technology Program Director of the St. Louis Science Center Staff.

Dr. Ogilvie, a native St. Louisan, attended Brown University and received her advanced degrees from Harvard. She has been with the St. Louis Science Center for 2 1/2 years. Prior to this appointment she served as a researcher for the Washington University Medical School.

Dr. Ogilvie provided us with an overview of the 1991-1992 Science Center Programs guide as well as some useful planning tips for Science Center visits. The new programs guide can be obtained by request from the Science Center reservation line at 314-289-4424.

Rex Rice and Dr. Ogilvie at the St. Louis Science Center

The Science Center facility is arranged with galleries containing hands-on exhibits, and special theaters for formal programs. The galleries are open to the public free. Dr. Ogilvie suggested that when planning field trips to the center, there should be a ratio of 1 adult for every 10 children. This arrangement allows for more opportunities to "experience" the hands on exhibits while touring the galleries. Other Science Center exhibits, which are formal performances, such as the Omnimax theater, have an admission charge. Reservations for ticketed performances were suggested by Dr. Ogilvie. Some show performances are now being sold out to special parties or groups in advance. Call 314-289-4424 to make personal or group reservations.

The Science Center also conducts a number of off-site activities, including outreach programs for elementary schools, and a unique "sciencing" by mail course. There are many more activities too numerous to mention here, call and get a program guide so you will be able to plan an "experience" to the Science Center for yourself.

The St. Louis Science Center also hosts a number of special events that may be of interest to physics and chemistry teachers as well as students. The upcoming "Science Seminar Series" co-sponsored by the Monsanto Chapter of Sigma XI and the St. Louis Science Center will be presenting a series of talks through June 1992. The listing follows.

Feb. 28, 1992 St. Louis Science Center **7:30pm**
Impact of Forest Fragmentation on Tropical Rainforest Trees *Dr. Victor Sork, Director, International Center for Tropical Ecology*

Mar. 11, 1992 St. Louis Science Center **7:30pm**
Too Many Babies/Not Enough Babies: Reproductive Research at the St. Louis Zoo , *Dr. Cheryl Asa, Reproductive Biologist, St. Louis Zoo*

Apr. 8, 1992 St. Louis Science Center **7:30pm**
Universe and the Big Bang *Dr. Robert Binns, Associate Research Professor, Washington University, Department of Physics*

May 13, 1992 St. Louis Science Center
To be announced later

June 10, 1992 St. Louis Science Center **8:00pm**
A Chemical Weapons Treaty, Reduction to Reality
Dr. Will Carpenter, Vice-President Research, Monsanto Agriculture Company

The February 92 "Optical Communications Workshop", Vianney High School.

by Paul Discher

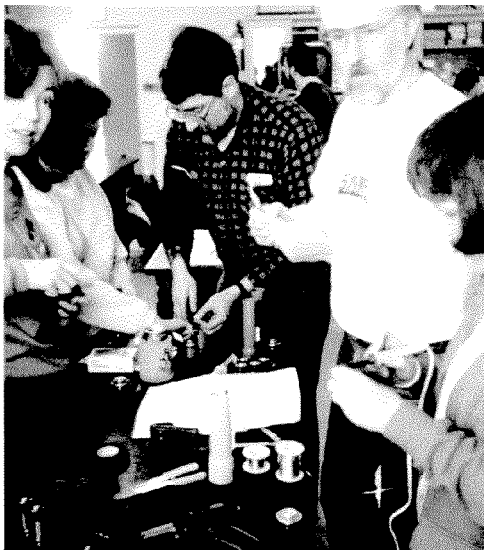
The February meeting of the St. Louis Area Physics Teachers assembled at 8:30am on the campus of Vianney High School, Saturday February 8, 1992. Gene Allard was our host and the objective of the meeting, the optical communications workshop, was presented jointly by Gary Shepak and Gene Allard. This was to be a "make and take" session for the construction of an optical transmitter and receiver system for classroom demonstrations. As with all "make and take" sessions there was high attendance, 20 teachers participated in the construction project.

The building program was preceded by a short business meeting, which was opened by Debbie Rice. A number of members spoke on various topics. Debbie covered the topics relating to the

upcoming meetings in March, April, and May. Debbie reminded the membership of the need to select operating officers for the next year. Val Michael briefly reviewed the plans for the next meeting at Parkway High School, more on this later in the newsletter.

Bill Brinkhorst brought up an interesting idea for teachers looking for an air table, as would be used in two-dimensional kinematics experiments. The inexpensive solution to a $500.00 professional air table, was a $50.00 air hockey table one could get at the discount stores. Most notable performance includes a very quiet fan motor—so quiet Bill admitted leaving one powered overnight because he did not know it had been left on.

After the business meeting, the participating teachers modified an Eveready Flashlight to become an optical voice transmitter and converted a Radio Shack AM/FM Radio to act as an optical receiver. The work included sawing the backs off the flashlights and replacing the ends with carbon microphone elements. There was plenty of soldering, and only one cut finger. Costs for the materials were greatly reduced due to the donations we received from corporate sponsors. Special acknowledgement is made at this time to Mitchell Kuduboski, Manager - Battery Engineering at the Eveready Battery Company, St. Louis Missouri. Mr. Kuduboski donated 20 Eveready flashlights and sets of batteries for the program. Southwestern Bell telephone donated the carbon microphone elements that were used on the transmitter. These microphone elements were formerly used on the handsets of unrepairable telephones. Washington University Department of Electrical Engineering donated the light emitting diodes used in the transmitter.



Bill Brinkhorst and company assembling optical communicators at Vianney High School

March 1992 Meeting

Date: Saturday, March 14, 1992
Time: 8:30am
Place: Parkway Central High School
Host: Val Michael and Bill Brinkhorst

The March meeting of the St. Louis Area Physics Teachers will be held at Parkway Central High School, 369 North Woods Mill Road, March 14th at 8:30am. Signs will be posted on the interior of the main building directing you to the classroom meeting area.

Parkway Central High School is situated on the west side of Woods Mill Road, just 1/2 mile north of the intersection of Ladue and Woods Mill Roads. The Senior High shares the grounds with Parkway Central Junior High School and the Parkway School District Offices. Parkway Central can be easily accessed by using Highway 40 (Interstate 64) west to Woods Mill Road and exiting North on Woods Mill Road to the campus. Parking lots are in the center of a one-way circle driveway.

This will be a "make and take" workshop for the construction of the speed of sound apparatus as detailed in the book, Chaos in the Laboratory. Attending teachers can make advance purchase of the equipment and parts packet as well as the Apple II software disk that runs the device from the Vernier Software Company, 503-297-5317. The cost is $20.00 and you can place this order personally by contacting Chris Vernier at Vernier Software. Be prepared to give her a purchase order number or credit card number for billing. If you choose, you may fax her the information at 503-297-1760. The deadline for ordering the packages, is the end of the working day, March 5, 1992. This cutoff will allow the transit time necessary for the merchandise to be shipped in time for our next meeting.

Chris Vernier has also agreed to give the St. Louis Area Physics Teachers a bulk buy discount on their products. Vernier saves money by sending all the material to one site, this being Parkway Central c/o :Val Michael. Val agreed to deliver all ordered materials to the March 14th meeting. Vernier Software will allow 20% off software and 10% off hardware on cataloged products purchased through this plan. There are no discounts available for Macintosh software products. All purchases will be billed individually, only shipping is consolidated. This buying plan expires March 26, 1992. So hurry.

Special Note: Please bring your own soldering irons, wire cutters, and other fabrication tools to this meeting. Val and Bill have some spare tools, but it is best to bring you own. If you have any questions, please contact Val Michael or Bill Brinkhorst at Parkway Central 851-8251. See you then!

April 1992 Meeting

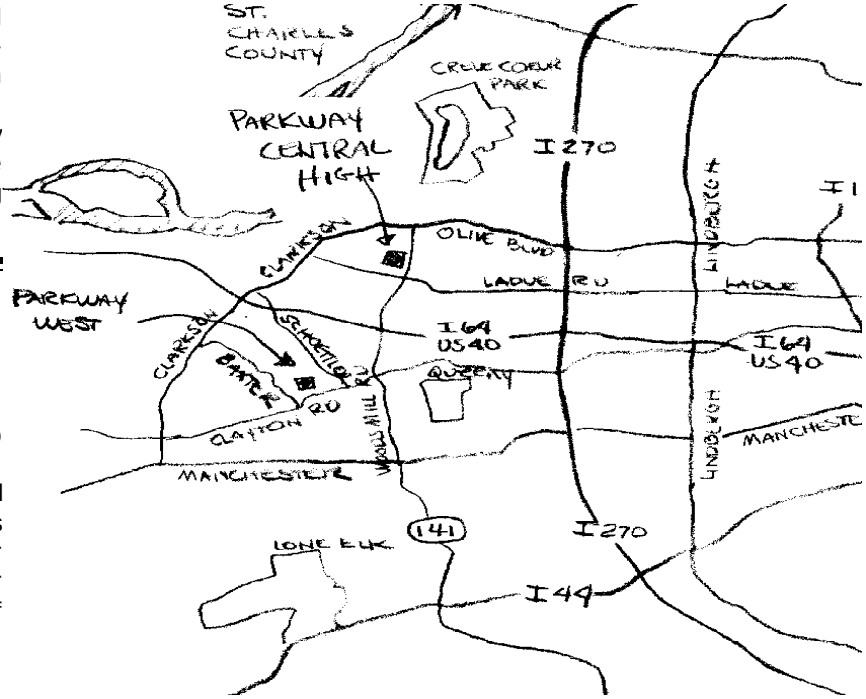
Date: Saturday, April 4, 1992
Time: 8:30am
Place: Parkway West High School
Host: David Bross

The April meeting of the St. Louis Area Physics Teachers will be held at Parkway West Senior High School, 14653 Clayton Road, Room 139, on April 4th, 1992, 8:30am. David Bross will be out host, and he will be demonstrating his own variations of experiments using the Union Electric Radiation Investigation Apparatus. Dave Bross is also seeking additional members to contribute to an open sharing session.

The Union Electric Radiation Investigation Apparatus Kit includes a carrying case for the scaler ratemeter, Geiger tube, radiation sources, (1-alpha, 1-beta, and 1-gamma), and a set of radiation shields (3-lead, 3-plastic). The kit can be checked out pending availability by contacting Krista Kotur, Union Electric Corporate Communications, P.O. Box 149, St. Louis, Missouri 63166, telephone 314-554-3258. The kit is available for loan in 1-week increments, please call Krista to schedule your loan in advance.

Parkway West Senior High School is located on Clayton Road

about 2 miles west of Clayton and Woods Mill Road (141) . To get there one may choose to travel US-40/ I64 west to Woods Mill Road (141), exit south on Woods Mill Road, continue south to Clayton Road, then exit west (right) on Clayton Road. Approximately 2 miles west of Woods Mill Road you should see the entrance to the school. There will be signs directing you the room 139 inside the building.



A Primer on Soldering

by Paul Discher

Soldering is actually a chemical alloying action created by the application of soft solder and heat to the joint or surface of another metal to be soldered. The intent of soldering is to form both a good electrical connection as well as a mechanical bond that exhibits characteristics completely different than the solder or the conductors (metals) by themselves. Solder itself can be designed to meet the varying needs of both the physical and electrical demands of an application.

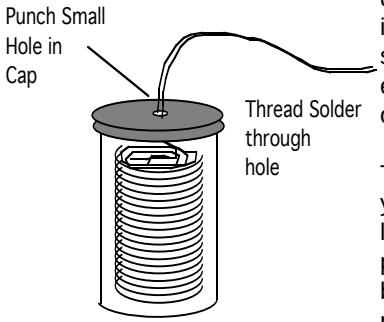
Solder liquefies at temperatures between 361° and 621° F (183° to 327°C). The exact melting temperature of solder is controlled by the mixture ratio of tin to lead contained in the solder. Pure tin melts at 450°F(232°C) and pure lead at 621°F(327°C). When mixed at a ratio of 63% tin and 37% lead, solder melts at an extraordinary low temperature of 361°F(183°C). Solder used in our type of electronic work is 60/40 ...60% tin and 40% lead. A metal such as copper, which has a melting point of 1981°F (1083°C), can be successfully alloyed with solder at temperatures well below this value because of the solvent action of solder when it is liquefied.

Unfortunately the chemical interaction of earth's atmosphere with metals causes thin layers of oxides to form on their surfaces. Oxides, generally are not good conductors. In electronics, we are primarily seeking a bond that provides good electrical conduction. The other bad news is that oxidation increases as metals are heated, and this oxidation degrades the performance of the solvent action of melted solder. Therefore, chemical fluxes are used with solder to abate the oxidation process by removing the oxide film, and the flux also reduces the surface tension of the metals, thereby improving the "wetting" action of the solder. Most electronic grade 60/40 solders today incorporate a flux-core. Think of the flux in flux core solder as jelly is to a jelly donut!

Making good solder joints is neither a well guarded secret nor does it require any artistic skill. The first and best step is to start with the correct tools, and consideration for the work surface in which the soldering is to be performed.

A 40 watt or lower wattage soldering pencil is the best unit for small electronic work. There are certain times when the mass of the area to be soldered will require the brute force of a 100 watt or greater iron. Take care to identify when you need the extra power rather than trying to "sap heat" from a low wattage solder pencil. The latter practice just makes very bad solder joints. The point here is you really need both types of soldering irons if you want to be prepared for all types of electronic work. Another important item that is needed is a moist cleaning sponge. This sponge is used to "wipe" the excess solder and burned flux from the soldering iron tip between joints, and the cleaning action helps the solder iron to develop all of its rated heat to the tip for best performance. If you are lacking a sponge, a wet folded paper towel works well. Any soldering iron that has previously been abused can be cleaned and burnished with a curled piece of 120 grit sandpaper. Immediately after sanding, tin the tip with solder, that is, apply a liberal amount of solder to the tip and immediately wipe it on the sponge. The remaining tip should be shinny and clean. At some point you may need to replace the soldering tip, or if the tip cannot be replaced you may need a new soldering pencil. You should also invest in a holder for the soldering pencil so it will not burn you, your work counter, or start a fire. Many commercial soldering iron holders also have a sponge tray attached to the base combining both items in one unit.

Consider next the solder. Most solder is sold on spools or in dispensers. You should select a 60/40 flux core solder for electronic work. An excellent use for surplus 35mm film canisters is a solder dispenser. To make and fill the dispenser simply coil a length of solder around a pencil or other cylindrical object making a layered solder coil that will fit the insides of a 35mm film canister. Punch a small hole in the lid of the canister and feed the solder <u>from the center of the coil</u> through the hole in the lid. Now attach the lid to the canister and you have an excellent solder dispenser. The solder dispenser is of particular interest if you have a fleet of soldering stations you need to equip for any group, and have only one large roll of solder.



35mm Film Canister used as a Solder Dispenser

The table or counter where you solder should be well lighted and covered with a protective board so as not to be burned by the soldering pencil or stray melted pieces of liquid solder. Some type of holder for your work is very helpful. I have wrapped rubber bands around the handgrips of pliers to make spring tension clamps to hold my work. You can buy

commercial “soldering vices” for holding your work as well. Once you ever use the right equipment, you will never want to work without it, and the “soldering vice” is one of my favorite tools when I do printed circuit board soldering.

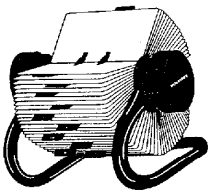
Once you have the tools and the work surface prepared, you are ready for soldering. Locate the joints you wish to solder, and make sure they are clean and in good mechanical contact. Apply a small amount of solder directly to the soldering iron tip. I try to use this initial ball of solder, on the tip, as a heat transfer medium to the joint to be soldered. The smoke from the soldering tip is mostly the flux burning. Since the flux is an important medium of soldering, don’t let it burn away without getting some action with the joint to be soldered. Use the ball of solder and melting flux to warm and lubricate the joint. Once the joint is sufficiently warm, apply more solder directly to the joint, not to the soldering tip. Immediately after completing the joint wipe the soldering tip on the sponge. I don’t think it possible to “over clean” a soldering tip. A good solder joint should be bright and shinny, and solder should completely surround the conductors. Happy soldering!

Mission Statement

Physics Tempo is the free monthly newsletter of and by the St. Louis Area Physics Teachers, an affiliate of the American Association of Physics Teachers (AAPT), and is intended as an organizational support group for the betterment of Physics and Physical Science teachers throughout St. Louis and Illinois.

Physics Tempo is dedicated to report achievements and announce the activities of the St. Louis Area Physics Teachers. In addition, *Physics Tempo* is intended to help disseminate useful and innovative information for teaching Physics and Physical Science. Physics *Tempo* is your newsletter. Editorial contributions are encouraged and welcomed. No idea is too small . Send articles, ideas, and subscription requests/address changes to: Physics Tempo: Editor / Paul Discher, Washington University-Electrical Engineering, Campus Box 1127, St. Louis, Missouri 63130-4899. FAX articles or Ideas to Washington University- Electrical Engineering Fax Line: 314-935-4842. Please mark your fax mail to the attention of the Tempo Newsletter Editor, Paul Discher.

The Physics Teachers ' Employment Rolodex



As you may recall this is the Physics Teachers Rolodex, and just like your own rolodex its where you keep your important addresses and other notes. For February 1992 we are listing area employment opportunities.

The John Burroughs School is seeking a physics Teacher with a minimum of two years experience. The candidate should be interested in teaching highly motivated students in an outstanding day school for grades 7 through 12. Additional athletics coaching or outdoor educational experience is desirable. **Please send resume and cover letter asking for information to Keith Shahan, Headmaster, John Burroughs School, 755 Price Road, St. Louis Missouri 63124.**

The John Burroughs School is also seeking a biology teacher with a minimum of two years biology teaching experience. Additionally, the preferred candidate might pursue an interest in one or more of the following: athletics coaching, chess club sponsorship, and or supervision of technical operations of audio visual and theater lighting/sound equipment. **Please send resume and cover letter asking for information to Keith Shahan, Headmaster, John Burroughs School, 755 Price Road, St. Louis Missouri 63124.**

Mark Twain Summer Institute is seeking a physics or physical science teacher interested in teaching the renown Mark Twain Summer Institute, June 22 through July 31, 1992. Hours are 9:00am thru 12:30pm. **Applicants should send a resume and cover letter to Louise Morgan, Mary Institute / Country Day, 425 North Warson, St. Louis Missouri 63124, telephone: 314-993-5100**

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First Class Mail

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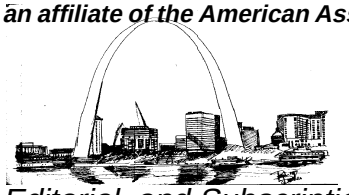

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