Something to Think About

One important characteristic of a symphony hall is reverberation time. Do you know what the definition is for reverberation time?

Note from the Editor

Please send us items for future newsletters and share your teaching experiences with a note to us. If you know of anyone who would like to read the Newsletters, please inform them about the web address below. (You can use e-mail to stumpf@ohio.edu.) Your comments or suggestions are also welcome. Hard copies are no longer available. You can see the Newsletter on the web at www.phy.ohiou.edu/stnl. Look for it in September and January. It is listed in the Ohio University Department of Physics and Astronomy home page.

Why don’t you write or e-mail Burt Stumpf and tell me if these newsletters are helpful and how you use them? Any comments are welcome! Please let me know if you wish a previous newsletter.

Announcements

- The 2012 Southeast Ohio District Science Day will be held on Saturday, March 10, 2012. It will be held at Ohio University in Athens, Ohio. Judges are needed. Would you volunteer? Let Dr. Elizabeth Gierlowski-Kordesch know if you can help at gierlows@ohio.edu. The web address is www.ohio.edu/scifair/

- The 2012 State Science Fair will be held at Ohio State University in Columbus, Ohio, on Saturday, May 5, 2012.
For the next Women in Science and Engineering Workshop at Ohio University in Athens, Ohio, please write to Dr. Tong or call him for information and application blanks. His number is 740. 593. 1733. www.ohiou.edu/wise/

The Ohio Chemistry Contest will be held in October 2011. For information, call Dr. James Tong in the Ohio University Chemistry Department at 740. 593. 1733. www.ohiou.edu/chemcontest/

The International Science and Engineering Fair will be held in May, 2012.

The AMERICAN ASSOCIATION OF PHYSICS TEACHERS APPALACHIAN SECTION (Southeast Ohio, West Virginia and Western Maryland), will hold a FALL 2011 MEETING at West Virginia University. All school and college physical science and physics teachers are welcome. Why don’t you consider joining this AAPT Section or the Ohio Section or the Southern Ohio Section? There are contributed and invited papers, tours, demonstrations, etc. that are included in the meeting. The meetings are an opportunity to meet colleagues (network) and to learn about new developments in physics and physics teaching. Contact Gregory Puskar at g.puskar@mail.wvu.edu. He can provide information.

Teaching Materials Available

Books and Publications


- Nature’s Chemicals: the Natural Products that Shaped Our World by Richard Firn. It describes useful compounds that are produced by plants and microbes. Oxford Univ. Press published this in 2010 for $65. It has 250 pages.
Bursts: the Hidden Pattern Behind Everything We Do. The book author is Albert-Laszlo Barabasi and the publisher is Dutton. It costs 26.95. Topics included are: power laws, bursts, regularity and fractality. A review is found in Physics Today for May 2010 on page 46.

Study Skills: A Student Survival Guide is edited by Kathryn L. Allen and presented by Wiley Publishers. There are seven essays on study that might be helpful to science classes at many levels. The paperback is $30. Read a complete review in Physics Teacher, April 2010 on page 272.

Demonstrations, Equipment, Software, Conferences, Tours, etc.

- There is an online resource center to help Chinese and Western scholars make contacts. It is [http://anianet.com](http://anianet.com).

- [Marie Curie Living History Program](http://mariecurielivinghistory.org) is available for University and Secondary School audiences. For information use: 303.442.4052 or manya@storysmith.org.

- [AAPT has a 14-month program for 2-year college physics faculty](http://www.aapt.org/conferences/newfaculty). It provides training for those in their first 5 years of teaching. Contact: www.AAPT.org/conferences/newfaculty. There are conferences in the summers of 2010 and 2011. You might inquire about further conferences.

- The company [Thames and Kosmos offers Experiment Kits](http://www.thamesandkosmos.com) for ages 10+. The list of kits includes: Genetics and DNA, Solar Power House, Global Warming, Hydropower, Fuel Cell, Wind Power, Earth Lab, and Hydrogen Powered Car. The company is located in Providence, Rhode Island, 02903. For customer service use 1-800-587-2872. Barnes and Noble bookstores have these kits for sale.
National Geographic has an experiment kit “Elements of Science” with 100 experiments for Biology, Chemistry, and Physics. Ages are 10+. Barnes and Noble bookstores have these available for purchase.

For equipment there is a buyer’s guide at www.physicstoday.org/buyersguide.

PASCO has equipment to conduct quantitative experiments in Electrostatics. Included in the equipment list are: Faraday Ice Pail, Proof Plane, Variable Capacitor, Hollow Spheres, Electrometer, Voltage Source, Charge Producers. The Basic Electrostatics System costs $899. Use 1-800-772-8700 or www.pasco.com.

SCI-SUPPLY sells Crookes Tubes. Find information at 1-800-975-5612 or www.sci-supply.com.

Tours for Middle and High School Students. The Department of Physics and Astronomy at Ohio University in Athens offers tours for classes and also individual students (especially juniors and seniors visiting colleges to attend). Call Wayne Chaisson at 740-593-1712 or use chaisson@ohio.edu. We welcome teachers, parents, and students.

New Developments in Science and Science Education

There is an article in The Physics Teacher entitled Blue Skies, Coffee Creamer, and Rayleigh Scattering for the May 2010 issue. The article is on pages 300 and 301. The demonstrations here use a spectrometer to show the preferential scattering of the shorter wavelengths of light. There are plots of intensity versus wavelength for the different demonstrations. Using the spectrometer is a valuable part of the demonstrations.

AAPT e-Mentor Program for Teachers. This is a program for new pre-college teachers who teach physics or physical science. Master teachers (PTRA or Phys TEC Teachers in
Residence) are the mentors. Phone, email, or video-conferencing is used. For information use: http://www.aapt.org/resources/mentor.cfm.

✦ **Physicists Contribute to Cancer Research.** The National Cancer Institute is forming several centers where multi-disciplinary and multi-institutional research will go on led by a physical scientist. This will help to introduce new ways of thinking about and carrying out cancer research. Read about this in Physics Today, May 2010 on page 27.

✦ **Measuring Very Small Forces.** Using a technique developed at NIST in Boulder, Colorado researchers measured the force between cold Beryllium atoms. The force was applied to the charged atoms by an electric field. Further, the velocity produced by the force was measured by the Doppler effect of the laser light reflected off the atoms. A force of 174 yoctonewtons was measured. Yocto is the factor for $10^{-24}$. Read more on page 11 in Science News May 22, 2010.

✦ **Confronting A Third Crisis in U.S. Science Education** is the title of an article in Science News, May 22, 2010. It discusses such items as: the outlook, Obama’s administration and its science education initiatives, and the council called (PCAST) President’s Council of Advisors on Science and Technology. It is suggested that the 3 crises were associated with: World War II, Sputnik, and the present one involving STEM.

**Feature Article**

This article was written by F.B. Stumpf, an emeritus professor of Physics at Ohio University in Athens. He is an active member of the Acoustical Society of America and the American Association of Physics Teachers. He has taught in science teacher workshops on campus, been involved with science fairs and given advice to students preparing to teach high school physics. His B.S. is from Kent State, M.S. from the University of Michigan and Ph.D. from the Illinois Institute of Technology. He has taught undergraduate and graduate courses in physics and is the author of the text *Analytical Acoustics*.

From reading, teaching physics at Ohio University and discussions with university students, school teachers, college professors and science-fair students, I have derived the
following ideas and suggestions to improve and support high school physics. Those that are evident are added for completeness. These comments may be more useful for new teachers but, it is hoped, useful for others also. There are many areas or facets that contribute to the teaching of physics, and each needs attention and effort to insure a quality program.

1) It is important to have a **thorough and broad understanding of classical and modern physics** at the level of the calculus-based general physics course taught in universities and colleges. Preparation including lab and lecture physics courses at the advanced undergraduate level are also strongly recommended. A strong preparation and proficiency in subject content is necessary. The ability to solve physics problems is important for the teacher and the students. Finally, a strong mathematical background is important including calculus and differential equations.

2) Some **professional organizations** that would be well to join are: The Ohio Section of the American Association of Physics Teachers (AAPT), Southern Ohio Section of AAPT, Appalachian Section of AAPT, National AAPT or National Science Teachers Association. The address for national AAPT is One Physics Ellipse, College Park, Maryland 20740. Information regarding regional sections of AAPT should be available here. The phone is (301) 209-3322. The e-mail address is www.aapt.org.

   These organizations are made up of college and secondary school teachers. The meetings are informative and stimulating. They offer a chance to build a network of teacher colleagues. The Ohio Academy of Science includes members in other fields, also, such as biology, botany, ecology, etc. Joining professional groups is important for career growth.

3) **For the new teacher, help can be offered by a Physics Teacher Resource Agent** (in some areas), who is an experienced teacher in the PTRA program established by AAPT. For information, call (301) 209-3322 or e-mail to www.appt.org. Of course, other teachers in the area can help along with nearby college faculty in physics.

   It is through these personal contacts, reading journals and attending professional meetings that one can learn and grow in the profession. This is important and not to be neglected. See the previous suggestion that lists professional organizations to join also.

4) **There have been and are now many interesting innovations in school science teaching.** It is rewarding to learn of them by reading the journals and by attending
professional meetings. A short list of these innovations is: Physics First, Peer Instruction, Modeling Workshops, Interactive Lecture Demonstrations, Classroom Response Systems, eMentoring, PTEC (Physics Teacher Education Coalition), PCK (Pedagogical Content Knowledge) curriculum, etc.

One can learn from these and incorporate elements of these into high school physics courses. These innovations have defined goals for the courses which use them. As one teaches, one needs to develop aims or goals or a rationale for each course. These goals direct what activities take place in the course.

5) Here is a list of journals and magazines that would enhance the school library and the teacher’s personal library. It should be noted also that the national AAPT has published monograph and reports entitled: “Teaching Introductory Physics”; “Apparatus for Teaching Physics”; “Guidelines for High School Physics Teaching”; and “Course Content in High School Physics.”

The list of journals and science magazines is: The Physics Teacher (published by AAPT); The American Journal of Physics (published by AAPT); Physics Today (published by AAPT); Science News; Scientific American; American Scientist; Science; and Nature. This list is, of course, not complete and you may think of others.

The school library should have texts and science books that complement the courses taught. For example, other textbooks similar to the one used in class would be helpful for the students and the teacher to consult. Books about physics (e.g., A Brief History of Time by Stephen Hawking) and biographies of physicists are good library additions. The library support is important for the program and should be included in the budget each year.

6) In addition to building up library holdings, attention needs to be directed to building up equipment for physics demonstrations and for laboratories and also computer facilities. Here is a list of some suppliers of physics equipment that should be helpful to the new teacher. By calling, one can obtain a catalog

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ward’s (Biology/Chemistry)</td>
<td>800 - 962 - 2660</td>
</tr>
<tr>
<td>Magritek (MRI/NMR)</td>
<td>415 - 287 - 0727</td>
</tr>
<tr>
<td>American 3B Scientific (Physics)</td>
<td>866 - 448 - 5846</td>
</tr>
<tr>
<td>Cenco (General Apparatus)</td>
<td>800 - 727 - 4368</td>
</tr>
</tbody>
</table>
PASCO (General Apparatus) 800 - 772 - 8700
Klinger (General Apparatus) 800 - 522 - 6252
Arbor Scientific (General Equipment) 800 - 367 - 6695
Tel-Atomic (General Equipment) 800 - 622 - 2866
Daedalon (General Equipment) 800 - 233 - 2490
Edmund (Optical Equipment) 800 - 363 - 1992
Vernier (Physics) 888 - 837 - 6437

A helpful suggestion might be that the teacher approach the administration and ask for an equipment budget each year to build up demonstration and lab equipment. These are important for a fine program to develop and shouldn’t be neglected.

7) Attention also needs to be paid to the **classroom and laboratory facilities** so that they are providing a good learning environment. For good classroom acoustics, the Acoustical Society of America has published a booklet entitled “Classroom Acoustics.” Use (516) 576-2360 or asa@aip.org. Storage rooms, labs with proper electrical outlets and adequate lab tables, computer facilities and classrooms with audiovisual equipment are important. The older, but still useful, book entitled *Modern Physics Buildings* by R. Palmer and W. Rice has many good ideas for classrooms and labs. It was published in 1961 by Reinhold but many items are still appropriate and no other book treats this subject as thoroughly that I know of.

Note – This article was taken with changes from Science Teachers’ Newsletter #78 for January, 2003.
**Answer to Something to Think About**

Reverberation Time is the time for the initial sound level to drop by 60 db or to $10^{-6}$ of its intensity level after the sound is turned off.

In the graph and table below are shown acceptable reverberation times depending on the size of room, use, and frequency.

![Graph showing reverberation times vs. room volume](image)

**Figure:** Desirable reverberation time at 512 Hz depending on size and use of room.

**Table I. Reverberation Times at Several Frequencies**

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Ratio to Reverberation Time at 512 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1.7</td>
</tr>
<tr>
<td>256</td>
<td>1.2</td>
</tr>
<tr>
<td>512</td>
<td>1.0</td>
</tr>
<tr>
<td>1024</td>
<td>0.9</td>
</tr>
<tr>
<td>2000</td>
<td>0.9</td>
</tr>
<tr>
<td>4000</td>
<td>0.9</td>
</tr>
</tbody>
</table>