IRIS (the Incorporated Research Institutions for Seismology, an NSF-funded research and education consortium in seismology) announces a program for K-12 science teachers and schools to promote awareness and learning of seismology and related Earth science topics in the pre-college science curriculum. As part of the Seismographs in Schools Program, IRIS provides an educational seismograph (yearly renewable loan) and related materials to selected teachers for use in the classroom. The seismograph can be used in the laboratory to teach about seismic waves, earthquakes, how a seismograph works, and data collection principles. It can also be used to monitor earthquakes on a continuous basis so that, in seismically active areas, local and regional earthquakes can be recorded frequently, and, even in low seismicity areas, large earthquakes from around the world can be recorded at least several times per year. Use of the seismograph by teachers and students and recording actual data from local and significant events from around the world can stimulate interest and motivation to further learning in seismology and Earth science and to explore and use additional information and activities about seismology and the Earth. Using seismograms recorded at the school, one can study seismic waves in the Earth, the distribution of earthquakes, plate tectonics, the concepts of earthquake magnitude and intensity, earthquake location techniques, earthquake hazards, and many other topics that are interesting and relevant to students. The seismograph is easy to set up and use and only requires a Windows-based (Win 95 or 98 or more recent; Pentium processor, 32MB RAM and 100MB available Hard Drive space, internal or external zip drive recommended; available serial port) computer (supplied by the school) to operate.

Initially, the educational seismograph program will be limited to participation by teachers who have participated in one of our earthquake workshops (EARTHQUAKES -- A One Day Workshop for Teachers, at the NSTA meeting or other locations; the EPIcenter or PEPP programs) or teachers who have had substantial education in Earth science or Physics. The operation of the seismograph, computer data handling and seismology topics are most appropriate for the middle and secondary schools. Selection and participation will be based on submission and evaluation of a brief proposal, the teacher's background (experience in seismology and Earth science through workshops or college and university courses), and the teacher's interest and willingness to include seismology and related Earth science teaching in their classroom and to provide assessment and feedback to our program.

The AS-1 Seismograph: The Seismograph in Schools Program will utilize the AS-1 seismograph (Figure 1) and Windows software (AmaSeis, http://www.geol.binghamton.edu/faculty/jones/as1.html) that has been developed for this program by Prof. Alan Jones (SUNY – Binghamton).

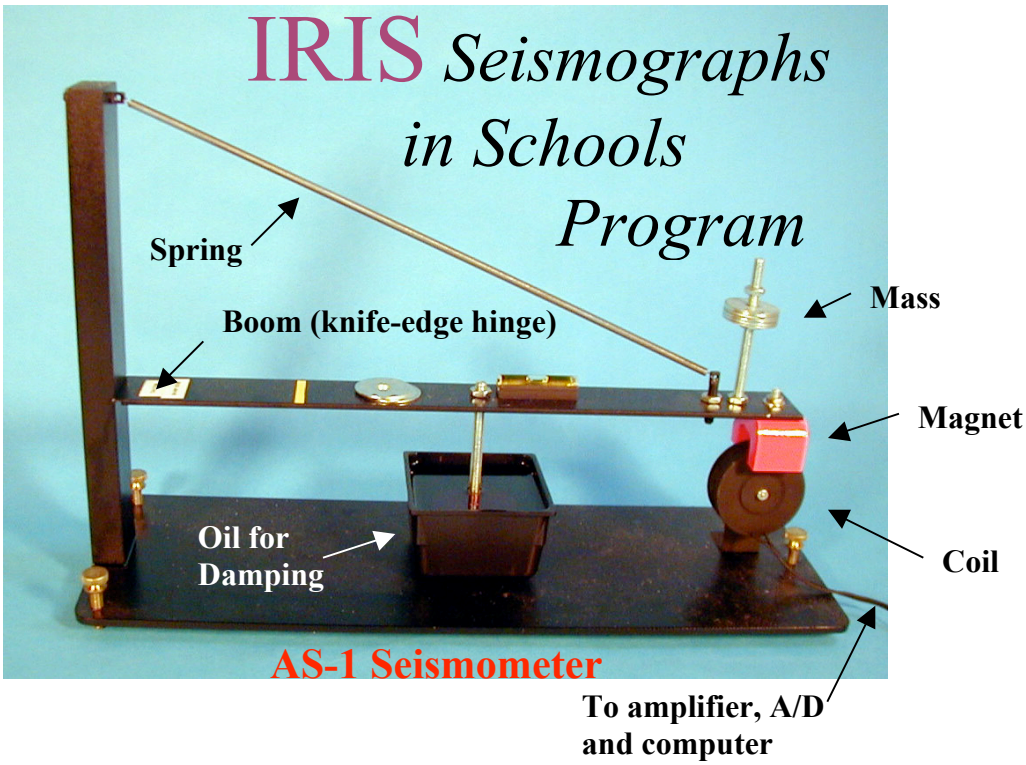
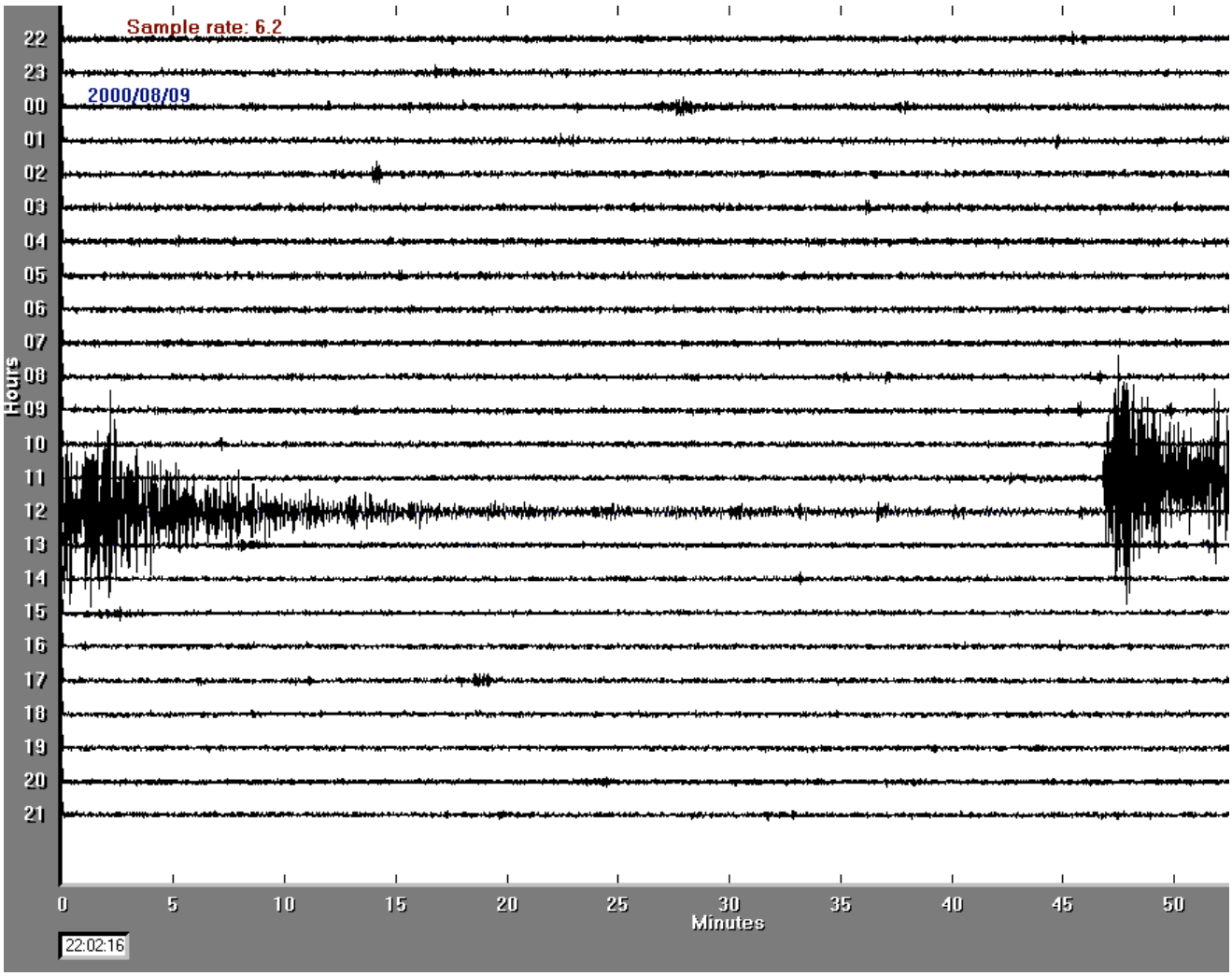


Figure 1. Photograph of the AS-1 Seismometer. When the ground moves up and down (for example, from earthquake vibration), a relative motion between the magnet (attached to the base and suspended by the spring and boom) and a coil of wire produces an electrical signal that is sent to an amplifier (to enhance the small signal), a digitizer (an A/D or analog to digital converter), and the computer for storage and display of the data (see example in Figure 2).

An example of data recorded by the AS-1 seismograph is shown in Figure 2. The seismograph can be operated in a laboratory or classroom environment to learn about how seismographs work, to collect seismic data, and to experiment with ground shaking. For earthquake monitoring, the seismograph works best when placed on a ground level floor in an area where it will be relatively undisturbed. The computer, that continuously displays seismic data (see Figure 2), can be placed a few meters away from the seismometer. In low seismicity areas, one can expect to record about 3-5 distant earthquakes (magnitude 6 or above depending on distance of the seismograph from the earthquake) per month as well as local ground vibrations (seismic noise caused by machinery, people walking, wind, etc.). In active earthquake regions, the seismograph will also record local events depending on magnitude and distance to the epicenter. Time synchronization or corrections (so that reasonably accurate time of arrival can be


Sample rate: 6.2
2000/08/09
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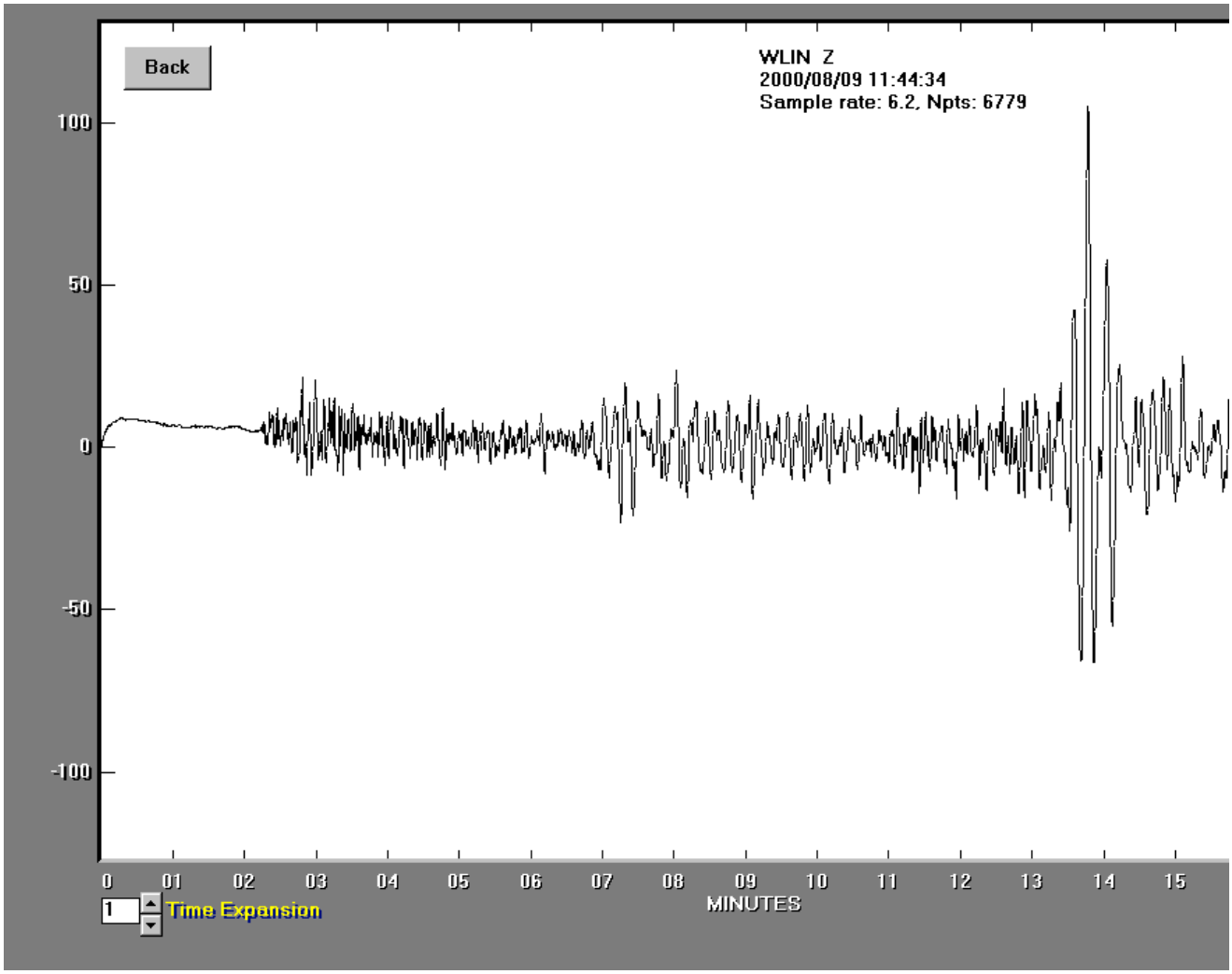

Figure 2. Example of 24-hour data display (upper image) from the AS-1 seismometer and the AmaSeis software showing an earthquake recorded on August 9, 2000 at West Lafayette, Indiana. The extracted and filtered seismogram is shown in the lower image. The earthquake is a magnitude 6.5 event from Michoacan, Mexico.

determined from the seismogram) can be obtained by comparing the computer clock with WWV radio time signals or periodic automatic time synchronization of the computer clock if an internet connection is available. A computer running Windows 95 or 98 and continuously connected to the seismograph during earthquake monitoring is necessary to run the software. The software is also capable of being used as a viewer for seismic data from IRIS (see WILBER, available from the IRIS DMC at http://www.iris.edu) and other sources.

Experience with operating the AS-1 seismograph and the AmaSeis software during the last year has shown that several distant earthquakes per month can be recorded even in low seismicity areas. Some of these earthquakes produce a record that can be used to estimate the distance from the earthquake epicenter to the seismograph (using the S – P arrival time method) and to measure the magnitude of the event from amplitudes of

arrivals on the seismogram. Compressional (P), Shear (S) and Surface waves are visible on the seismogram in the lower diagram in Figure 2. The difference between the S and P travel times can be used to estimate the distance from the earthquake epicenter to the seismograph station. The amplitudes of the P and Surface wave arrivals can be used to determine the magnitude of many earthquakes. These determinations can be compared to the "official" data available on the Internet shortly after the earthquake occurs. With a little experience, one can make accurate distance and magnitude determinations from the AS-1 seismograms. Additional information about the AS1, including examples of seismograph recordings and magnitude determinations can be found at:
http://www.eas.purdue.edu/~braile/edumod/as1mag/as1mag.htm and at
http://www.iris.washington.edu/EandO/resources.htm .

Application for IRIS Seismographs in Schools Program 2003

Applications for the next distribution of seismographs are due September 30, 2003. If you are not selected to receive a seismometer in this distribution, you will be informed by the end of May, and your application will be retained to be considered again when additional seismometers are available. If you have questions about the program or the application, please email Dr. John Taber taber@iris.edu (phone: 202-682-2220) or Professor Larry Braile at braile@purdue.edu (phone: 765-494-5979).

Please provide the following information:

1. Name, school address, home address, email address, school and home phone numbers (first teacher)

2. Name, school address, home address, email address, school and home phone numbers (second teacher. Although not required, we encourage teams of two or more teachers to apply. Two teachers in a school or district will generally allow more students to have experience with the seismograph. Additionally, teams allow the teachers to support each other and share the effort of seismograph operation. Only one seismometer per team will be provided. Only one seismometer per school will be provided. We encourage teachers to develop mechanisms within their school that will allow more than one classroom to utilize the seismograph. For team applications, and for the initial distribution, at least one teacher in the team must have significant experience with seismology and Earth science or physics as described above.)

3. Position, grade level, classes that you teach (first teacher)

4. Position, grade level, classes that you teach (second teacher)

5. Information about your school and students.

6. Educational background, continuing education courses and workshops that you have completed that relate to seismology, Earth science and physics (if this information is included on your attached resume, then you do not need to repeat it here).

7. Please describe how you expect to use the seismograph in your teaching. It is not necessary to commit to continuous, all-year operation of the seismograph. Please state your willingness to provide feedback to us about the program and its effectiveness. Also, please describe how you or your team expect to utilize the seismograph so that additional students (not students in your class) will be able to have some experience with the seismograph.

8. Is a Windows-based (Win 95 or 98 or more recent; Pentium processor, 32MB RAM and 100MB available Hard Drive space, internal or external zip drive recommended; available serial port) computer available for use with the seismometer?

9. If administrator approval is required for participation in this program, please provide a letter from the appropriate administrator.

10. Please attach your resume(s) and mail the application to Seismographs in Schools Program, IRIS E&O Program, 1200 New York Ave. NW, Suite 800, Washington, DC 20005.