of undisturbed sediment samples and detailed measurements within the drill holes.

Resistance within the scientific community developed early. Small lobbying groups formed, especially after the invitation to the oil industry to participate (*Science*, 8 February 1980, p. 627). By late 1980, concern over the split among academic scientists had become so strong that the executive committee of JOIDES, the DSDP's scientific advisory committee, arranged for a fall 1981 Conference on Scientific Drilling to develop a new consensus on the appropriate scientific goals of ocean drilling. The consensus paper brought out in 1978 supporting an *Explorer*-like program obviously had become outdated.

Amid this doubt, the initial reaction of ocean scientists to Slaughter's proposal has been almost wholly positive. Arthur Maxwell of Woods Hole Oceanographic Institution, chairman of the OMDP's Scientific Advisory Committee, says, "I'm optimistic. I think it's a great thing to happen. I think everybody is really delighted that it's going this way." Even OMDP detractors find the proposal attractive. The one question most observers have is still the cost. Will it be reasonable to pay the higher costs of *Explorer* in part to achieve the goals of a *Challenger*-type program? Comparisons of operating costs for the two ships have been studiously avoided in public. Shinn says *Explorer* costs would "not be way out of line." Figures cited in private by others, which are subject to numerous assumptions, are about \$50,000 per day to operate *Challenger* in 1984, after a required refurbishing and a new contract with its operator, and about \$70,000 per day for *Explorer*. Conversion of *Explorer* might require upwards of \$50 million and the riser would mean additional capital costs.

Although academic scientists have been receptive, the initial reaction of the oil companies has been mixed. Firms that are primarily interested in the development of the deepwater drilling technology promised by OMDP are reportedly disappointed by its delay to 1987, although this is a crucial cost-cutting feature of the new proposal. Many in industry expect that they will be able to drill in water that deep by then with or without NSF's program. Another major problem seems to be convincing enough of the larger companies that the payback on their investment, as risky and as distant as oil and gas production in the deep sea will be, is worth forgoing other, more immediate investment opportunities.

While NSF is attempting to please both oil companies and academic scientists, it has yet to tackle problems on Capitol Hill. Both programs had been surviving scrutiny, but the OMDP has recently hit a snag in a House subcommittee. The proposed cost-cutting, a popular pastime in Washington these days, and the development of a consensus within the scientific community are expected to help out on the Hill.

—RICHARD A. KERR

Experiments Begin at Daresbury's SRS

When the Daresbury Laboratory lost a high energy accelerator, it seemed only natural to build a dedicated synchrotron light source there

Daresbury. The British Rail line from London makes a last stop at Runcorn just before crossing the River Mersey and stretching the last 20 miles to Liverpool in the haze-shrouded distance. A minute or two before the stop, an observant passenger notices over the crest of a hill the uppermost part of an enormous tower looking something like the bridge of a supermodern battleship. Although there is a canal some distance away that is plied by freighters on the way to Manchester, the tower belongs not to a ship but to the Nuclear Structure Facility, a 30-million-volt tandem Van de Graaff heavy ion accelerator. The accelerator is part of the *new* Daresbury Laboratory, which is also the hub of a nationwide scientific computer network and the home of a Cray supercomputer.

The third leg in the triad on which the former high energy physics laboratory now stands is the world's first high energy electron storage ring built expressly for the production of synchrotron radiation. The Synchrotron Radiation Source (SRS) was inaugurated last November, and the first experiments with both vacuum ultraviolet and x-ray light began last month. Allowing for inflation, the SRS storage ring was completed within budget at £5.4 million. But a synchrotron radiation facility has two sides: an electron accelerator to provide the light, and the instrumentation to use it. Because of tight research budgets in the United Kingdom, money originally intended for instrumentation has been diverted to cover the inflation-increased construction costs. So there were at first only three experimental stations operating, although the plan is to have at least 11 in use by May of next year. Already, about 100 research teams have submitted proposals or expressed strong interest in coming here to use the SRS. The intense beams of synchrotron radiation, which comes in a smooth spectrum from below the infrared up to soft x-rays (1 angstrom or longer), can be used for all manner of spectroscopic and diffraction experiments, as well as for x-ray topography and interferometry. Negotiations are under way to allow industrial and foreign scientists to do research at the laboratory, which by charter exists for the purpose of serving British universities.

Before 1963, Daresbury was best known as the birthplace of Lewis Carroll. But in that year, construction began on a high energy physics laboratory to service the northern universities, Glasgow, Liverpool, and Manchester at first and Lancaster and Sheffield later on. Operation of a 5-billion-electron-volt (GeV) electron synchrotron named NINA began late in 1966. Interest in using the machine for synchrotron radiation also began at this time when Ian Munro, then at Manchester, inquired about the possibility of a beam line being attached to NINA. By 1970, work had started on a Synchrotron Radiation Facility, which then grew to encompass the research of about 60 scientists working mainly in atomic, molecular, and solid-state physics. Although there was some crystallography and molecular biology as well, British researchers in these fields with an interest in synchrotron radiation tended to go to the DESY laboratory in Hamburg, West Germany, which had started up a few years earlier (see box).

The synchrotron radiation research

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was accomplished in a parasitic mode; NINA was operated primarily for the high energy physicists, and the synchrotron radiation was a mixed blessing by-product. Meanwhile, the European Organization for Nuclear Research (CERN) near Geneva had been hatching plans for a giant accelerator, the 450-GeV Super Proton Synchrotron (SPS), that would ultimately cost almost 1 billion Swiss francs ($500 million at today's exchange rates). To keep up its 15 percent subscription to CERN, the financially strapped United Kingdom had to make some tough choices. After some vacillation, one action taken in 1972 was to phase out its own high energy accelerators, NINA and a 7-GeV proton synchrotron called NIMROD at the Rutherford Laboratory, which were eventually shut down in April 1977 and June 1978, respectively.

Rutherford did not give in easily and for some time pushed its plan for constructing a new electron-positron storage ring in which 15-GeV beams of these particles would smash into one another head on. But, when the Germans started building a similar collider at DESY, Rutherford had to back off because it was looking for international funding of its proposal. The laboratory is now using its accelerator expertise to build a neutron-scattering facility with a proton synchrotron as the generator of a high-intensity neutron beam.

Under Alick Ashmore, who retired this year as director, Daresbury bit the bullet right away and began seeking out less expensive kinds of research. The Nuclear Structure Facility was started in 1974. The laboratory became the center of the computer network in 1977 and acquired its supercomputer 2 years later. Synchrotron radiation users lobbied early and hard for a dedicated facility, and in May 1975 the Science Research Council (now Science *and Engineering* Research Council) approved spending £3 million for a 2-GeV electron storage ring with a circulating current of 370 milliamperes and three beam lines. The new machine, the SRS, was to be constructed on the site occupied by NINA, so much of the work did not begin until after this machine was shut down in April 1977 and subsequently dismantled. During the 4 years without a light source, many Daresbury synchrotron radiation users migrated to European or American centers. Meanwhile, the accelerator engineers who built and ran NINA set to work on the SRS, under the direction of D. J. Thompson, who is now head of the laboratory's synchrotron radiation division.

The Daresbury Laboratory

The Synchrotron Radiation Source is in the circular building on the right.

Daresbury Laboratory

It is safe to say that the construction period was not a terribly happy time, primarily because of money problems. One recent example of the intrusion of financial difficulties came last year when the Rutherford Laboratory found it difficult to stay within budget in building its neutron source, and, according to some reports, the Science Board of SERC seemed to reward that laboratory's overspending at the expense of Daresbury. Between such struggles to keep its share of a not too generous pie and cost increases due to inflation, the laboratory has had to slow down the pace of the SRS project a bit.

An early example of this is cutting back the radio-frequency power by half. To accelerate the electron beam and to replenish energy losses due to the synchrotron radiation, klystron tubes convert electricity into radio-frequency power, which is then fed into special sections of the storage ring called r-f cavities. To save money, only one of the two planned 250-kilowatt klystrons has been installed. This means that fewer electrons can be accelerated to the design energy, so the maximum stored current at 2 GeV is 370 milliamperes instead of the 1 ampere specified in the original design, and the intensity of the radiation is down by the same factor of 3. Thompson told *Science* the hope now is eventually to use a new klystron of the type designed for DESY's largest electron-positron storage ring, which would be twice as efficient as the present tube. This would double the stored current but would not require any additional electricity consumption.

Instrumentation is a second victim of depressed finances. Storage rings are not strictly circular; they curve only where the dipole bending magnets sit. Synchrotron radiation is produced only when the electron trajectory is curved and thus comes out of the storage ring at the bending magnet sites. The SRS has 16 bending magnets, but 3 of these are inaccessible, so there are 13 possible places to "tap" the radiation. From each tap or port, a beam line carries the light to one or more experimental stations. Thompson says that Daresbury has firm plans to instrument 25 experimental stations, primarily in the ultraviolet and x-ray regions of the spectrum.

But, when the SRS stored its first electron beam in June 1980, a few months behind the schedule envisioned when the project was approved in 1975, there were no experimental stations. In the year since then, machine engineers have been learning how to handle the storage ring, whose performance is still short of specifications. There seems to be a bit of a trade-off between maximizing the energy and the current, although both need to be as large as possible. A high beam energy is necessary to produce x-rays with wavelengths as short as the 1 angstrom promised in the specifications, while the current determines the intensity of the radiation.

Since the radiation hazard to humans is greater during the beam injection phase than it is after the beam has been created and is circulating in the storage ring, researchers cannot work on the beam lines while this accumulation is going on. Thus, the laboratory cannot simultaneously work on learning how to get a good beam and on instrumentation. With time split between these two activities, experimenters were able to get only three experimental stations into operation, two on an x-ray beam line and one on a vacuum ultraviolet line by the end of June.

Nonetheless there is considerable jubilation that the long experimental drought

DESY Opens New Synchrotron Light Lab

Although founded as a high energy physics institution, the Deutsches Elektronen-Synchrotron (DESY) laboratory in Hamburg made room for other researchers to use one of the by-products of circular electron accelerators, synchrotron radiation, almost as soon as its first machine went into operation in 1964. This spring, DESY officials continued this tradition of hospitality with the inauguration of a 14.4-million-Deutsche mark facility, the Hamburger Synchrtron-strahlungslabor or HASYLAB, which eventually will have up to 24 experimental stations for spectroscopic, diffraction, and other studies. The main problem facing HASYLAB users is that the accelerator that now provides the synchrotron radiation, an electron-positron colliding-beam storage ring named DORIS, must still be shared with the high energy physicists for whom the machine was built. HASYLAB and two other organizations that also use synchrotron radiation from DORIS are negotiating for as many as 5 months of running time each year with the storage ring adjusted to maximize the production of ultraviolet and x-ray light.

While called a storage ring, DORIS is actually shaped more like a race track with two long straight sections, where the electrons and positrons collide. The curved end sections consist of two quadrants, each of which contains six dipole magnets whose function is to bend the particle beams into a curved trajectory. It is from these magnets that the synchrotron radiation emerges. HASYLAB occupies one of the four quadrants, which runs through a 1500-square-meter experimental hall. The radiation emerging from each of the magnets can be split up to service several experiments simultaneously. The present plan is to have 24 experimental stations in three groups identified by the wavelength region being exploited. There will be 4 vacuum ultraviolet, 7 vacuum ultraviolet and soft x-ray, and 13 x-ray stations. Ernst-Eckhard Koch, the vice-head of HASYLAB, told *Science* that 17 stations are in use now, including those that were in use before construction of the new experimental hall and adjoining office building began.

The other two users of DORIS' synchrotron radiation are the European Molecular Biology Laboratory and the Fraunhofer Society's Institute for Solid-State Technology. The molecular biologists came to DESY in 1972 and set up a laboratory around the old synchrotron. When DORIS started up 2 years later, the group opened a second laboratory. The light from particles orbiting at relativistic velocities in circular accelerators spins off tangentially, so that radiation due to the counterrotating electrons and positrons streaks in opposite directions. When DORIS was new and there was no near-term prospect to run the machine to optimize synchrotron radiation, other considerations led the biologists to elect to use the light from the positrons, whereas everyone else used that from the electrons. Now, when operation is dedicated to the production of the most intense light possible, only a single, high-current electron beam is stored. At these times the biologists are left high and dry. So the biology laboratory is building four of the experimental stations in HASYLAB for its use. The Fraunhofer Society, which mainly does applied research, has its own x-ray lithography laboratory in the quadrant next to HASYLAB.

The relationship between the synchrotron radiation users and the high energy physicists sometimes seems to exhibit mostly the hate side of a love-hate affair. For one thing, the physicists adjust the energy of DORIS to produce whatever elementary particles they are interested in. If, as was the case when DORIS was younger, the energy needed was low, then the short wavelength cutoff of the light emitted would move into the ultraviolet, and x-ray experimenters had to sit by in frustration. Also, high energy physicists tend not to care too much about such details as the vertical position of the particle beam in the bending magnets, which can move a little when a tired beam is dumped and a fresh one is stored. But a synchrotron radiation user with equipment precisely aligned to catch as much of the light as possible is understandably vexed if the beam suddenly jumps a few millimeters.

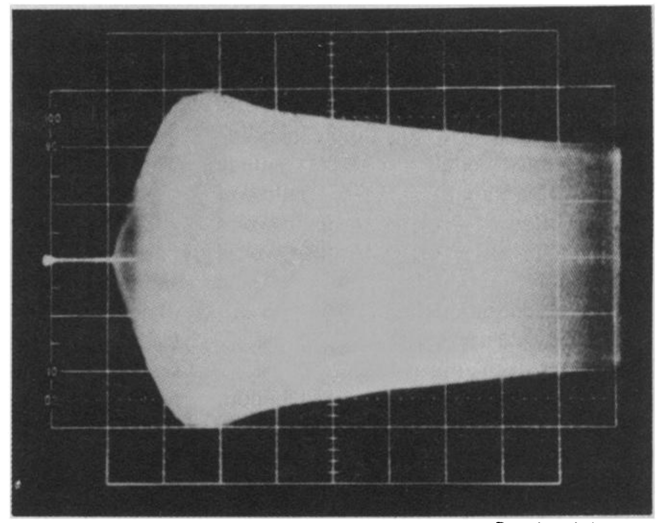
For the last 2 years, DORIS has not been in great demand by high energy physicists as interest shifted to DESY's newer, higher energy machine, a bit of bad timing because this period with more than 9 months of running time dedicated to synchrotron radiation coincided with HASYLAB's construction. Now, with the synchrotron radiation laboratory ready to go full steam, the DESY management has decided to shut DORIS down for 6 months, starting this November, to rebuild the accelerator and make it more attractive for both high energy physics and synchrotron radiation experiments (*Science*, 26 June, p. 1490). When the face-lift is complete, DORIS will run at very high electron and positron beam energies (over 5 GeV each) for particle searches. But under these conditions, the circulating beam current is limited so that the intensity of synchrotron radiation is likewise reduced. Koch says that he is shooting for up to 5 months of DORIS' running time at 3 to 4 GeV to be reserved for synchrotron radiation, but so far the DESY management is talking about 2½ months.

Another subject of some concern is personnel. Although HASYLAB is well financed and is the envy of American and British researchers in that regard, Koch is worried about the limited number of personnel slots at DESY for synchrotron radiation research. He notes that there are only ten authorized positions in HASYLAB where four times that number is needed. One effect of this situation is that development and construction of equipment for many of the experimental stations cannot be done at HASYLAB, but must be farmed out to universities and other laboratories that have an interest in doing synchrotron radiation research. In order to induce investigators to take on this kind of work, HASYLAB is agreeing to permit groups that provide instrumentation to have unrestricted access to synchrotron radiation for 1 year. The policy appears to be working. The floor of the experimental halls bustles with activity, and most of this is due to "permanent postdocs" and only a little to DESY employees.

In the second and third years, the new instruments will gradually become available to outside users who submit approved proposals. Eventually, 15 or more of the 24 experimental stations will be open to all users (new instruments will be tested in the others). But, Koch cautions, this will only happen if staff positions become available to allow HASYLAB to service that many stations.—A.L.R.

may be at an end. EXAFS is an x-ray technique for determining the local atomic structure of materials of all types, from heterogeneous catalysts to biological macromolecules. In early May, researchers recorded their first EXAFS spectrum using light from the SRS. Although it was a routine measurement on a copper foil, many copies of the spectrum were made for passing around, and demand was so great that none was left to show an inquiring visitor.

The second x-ray station is for protein crystallography, while the vacuum ultraviolet station is for angle-dispersed photoelectron spectroscopy.



Storing a beam

Several hundred pulses of 600-MeV electrons from a booster synchrotron are accumulated by the SRS in about 25 seconds. The beam intensity then slowly decays after the injections system is turned off and the beam is stored.

Daresbury Laboratory

Thompson says that the priority now is to get more experimental stations into operation, although how fast this can be done depends on funding. The current SERC 5-year "forward look" shows the SRS being supported to the tune of £5 million annually. At this level of funding, 25 stations are scheduled to be on-line within about 4 years, 11 of them by next May, says Thompson. Munro, who is now at Daresbury, added that most potential users of these stations are interested either in surface science or in biological materials. Looking to the future, Munro mentioned the possibility of a second ultraviolet line with five work stations, a special "wiggler" x-ray line with four stations, an infrared spectroscopy line, and a visible-ultraviolet, time-resolved spectroscopy line.

Wigglers have caused quite a stir within the synchrotron radiation community in the last few years, and most laboratories either have or plan to have them. According to Phillip Duke of Daresbury, the wiggler here will consist of three dipole magnets of 2.5, 5, and 2.5 teslas. Electrons passing through the wiggler are bent into a sine-wave-shaped trajectory. Because of the sharper radius of curvature of this path as compared to their normal orbit, the particles radiate more intensely and at shorter wavelengths, down to 0.1 angstrom in this case. Daresbury's wiggler was built from superconducting magnets by a group from Rutherford. In initial tests, the magnets exceeded their design fields. Duke says the wiggler should soon be shipped north for further testing off-line and then installation in the SRS by this autumn. There is room for a second wiggler in the more distant future.

Most of the instruments for the SRS will be built at Daresbury expense, either at the laboratory or elsewhere. The only cost to principal investigators is that of actually doing the experiments, which comes out of their research grants. They must obtain these independently from the SERC. This practice varies somewhat from that in the United States, where the synchrotron radiation laboratory at Stanford University has relied, and the soon-to-open center at the Brookhaven National Laboratory will depend even more extensively, on researcher-supplied instrumentation. Only a little of this will go on at Daresbury. Researchers at Warwick University, for example, are under contract to develop an electron analyzer and monochromator for SEXAFS, an x-ray technique for determining the atomic geometry of solid surfaces. For 12 months, the group will have priority access to the SRS for getting the instrument into shape for routine operation, and this will allow them time for early experiments of their own.

Otherwise, both in-house and university scientists will compete equally for time on the SRS, with selections made according to the merit of the proposals. Thompson estimates that Daresbury staff may spend about one-third of their time on independent research and the rest helping outsiders use the facility, building equipment, and so on. Also under way are discussions leading to the possibility of broadening the user base. Researchers in the Medical Research Council laboratories, for example, do not have automatic access to SERC facilities except by way of collaborations with university scientists. Similarly, in the final stages of negotiations are new rules that would allow industrial researchers to use the SRS without first finding university collaborators and sponsoring students. The intent is to allow companies to do experiments of greatest interest to them with more privacy. Finally, Dutch and Swedish researchers have asked for time on the SRS and detailed arrangements are now being worked out. Laboratory officials would like to be able to encourage more international use of their facility.

Even without these additions, the influx of visitors to Daresbury will overwhelm the facilities here. Munro notes that, if all came at once, up to 300 people could descend on the laboratory, which is small, is in an out-of-the-way location, and has limited facilities for guests. So far, former director Ashmore regretfully had to write in his final annual report, the SERC has been unable to find funds to meet these needs for expanded laboratory space and guest dining and housing accommodations.

With the opening of Brookhaven's National Synchrotron Light Source later this year, which houses two dedicated electron storage rings, one for vacuum ultraviolet and one for x-rays, the SRS will have only a short time in the limelight. One reason for this is that the SRS designers created a machine with a much lower brightness than Brookhaven's. For many experiments, it is not just the intensity of the radiation but also the size of the source that is important. A small source of a given intensity is brighter than a large one emitting the same number of photons. Thompson admits this fault in the SRS and attributes it partly to the fact that the machine was designed much earlier than Brookhaven's in 1972 before the desirability of high brightness was appreciated, and partly to that old bugaboo, limited finances. Quadrupole magnets are used to focus the electron beam to a small cross section. With a small ring dictated by a limited budget, the options for the magnet lattice (arrangement of dipole bending magnets and quadrupole focusing magnets) were constrained to those containing a small number of magnets that did not allow focusing to as small a beam size as others would have.

A future option that is being actively planned is to add 16 more quadrupole magnets. But space around the ring is so tight this is barely feasible, especially since the area near the dipole bending magnets must be left free to capture the synchrotron radiation. Duke notes that the use of superconducting quadrupoles would help in this regard. These would be smaller and thus take up less space than conventional electromagnets. Although no particular "high brightness" option has been approved for the laboratory, Duke adds that the liquid helium refrigerator for the superconducting wiggler was deliberately chosen to be large enough to serve several more magnets.

The combination of 16 more quadrupoles of some type with the higher beam current permitted by use of the DESY klystron design would raise the SRS's brightness by more than a factor of 10 and would put it in Brookhaven's class. This is a future development, however. For the present, Munro hopefully argues, what one does with available facilities matters just as much as their intrinsic capabilities. Some of the traditional (if a field of research this young can have traditions) areas of investigation are already passé, and it is critical to be ready to open new ones. Among several possibilities, Munro has considerable enthusiasm for time-resolved spectroscopy, a technique for following the changes in the spectrums of rapidly changing specimens. This kind of investigation is possible because the circulating electron beam actually consists of discrete "bunches" of particles, each of which emits a pulse of radiation as it passes a port. With a high (500 megahertz) r-f frequency, the SRS has quite a short bunch length and hence emits a rapid pulse of light with a pause before the next pulse. The duration of the pause depends on the number of bunches. The SRS operates most easily with 160, which gives too short a pause for time-resolved spectroscopy, but a single bunch mode of operation is also possible, and the SRS operators are learning how to run this way.

—ARTHUR L. ROBINSON

Domesday Book of the World's Volcanoes

The newest compilation of volcanic eruptions runs the gamut from smallest to largest, and warns that the worst may be yet to come

Scientists in many fields may find *Volcanoes of the World** as fascinating reading as any best-selling novel. Its characters are the 1343 volcanoes of the world, its action the 5564 known eruptions of the past 10,000 years. It has violence, death, and destruction on a mind-boggling scale. The plot is rather thin, but the heart of the book, 200 pages of computer printout prepared at the Smithsonian Institution's National Museum of Natural History, makes up for that. It provides easy access to perhaps the most complete record of volcano behavior available.

Its possible uses are numerous. A biologist might ask which eruptions have formed new islands, ideal places to study plant and animal colonization. Details of all 96 island-forming eruptions are there. An anthropologist could ask how often the cultures of coastal Papua New Guinea have been disrupted by volcanic activity. During this century alone, the 11 volcanoes just off New Guinea's north coast produced 66 eruptions. A geologist could ask which volcanoes in historic times formed lava domes like those of Mount St. Helens. There are 86 such volcanoes, which have had 217 known dome-forming eruptions. Kamchatka's Bezymianny alone, whose initial eruptive behavior closely resembled that of Mount St. Helens, has had 15 dome-forming eruptions since 1955. A researcher can extract this information and more from this latest compilation of the history of volcanism by consulting the three separate listings of eruptions arranged by region, by volcano name, and by date. A bibliography of 709 references can lead to additional details.

Volcanoes of the World is also something of a *Guinness Book of World Records*. It includes the highest volcano having eruptions in the historic record (Llullaillaco, at 6723 meters in the Chilean Andes), as well as the briefest major eruption on record (the draining of a 20-million-cubic-meter lava lake in Zaire in less than an hour). The smallest eruption included in this volume occurred at Krafla in Iceland. In 1977, startled researchers watched 1.2 cubic meters of lava spurt out of a borehole that they had drilled as part of a geothermal study.

Which eruption was the biggest in history depends on what is meant by bigness. If the volume of erupted lava is the gauge, Iceland also has the record for the largest historic eruption—12.3 cubic kilometers of lava flowed from Lakagígar in 1783. If brute power counts, then perhaps the A.D. 186 eruption of New Zealand's Taupo is the winner. It lofted 80 percent of all of its ash, or 20 cubic kilometers, to a distance of more than 220 kilometers, according to George Walker of the University of Hawaii. Lacking a Richter-type scale for volcanic eruptions, the compilers of *Volcanoes* have included values of a volcanic explosivity index (VEI) developed by Christopher Newhall of the U.S. Geological Survey in Vancouver, Washington, and Stephen Self of Arizona State University. They combined eight measures of eruption size—including the volume of ejecta, eruption column height, duration, and degree of stratospheric injection—into a scale ranging from 0, nonexplosive, to 8, more explosive than any known eruption of the past 10,000 years. Only one event, the 1815 eruption of Tambora, received a VEI of 7, but 16 received indexes of 6. The eruption of Mount St. Helens on 18 May 1980 rated a 5, or "very large," but just barely.

As replete with information as *Volcanoes of the World* is, its authors warn that it, and all other such compilations, are in one respect seriously flawed. Even in recent decades, they say, significant eruptions have probably gone unrecorded because of haphazard reporting. If true, that would cause real problems for those searching the record for cycles of alternating high and low volcanic activity. Such cycles have been identified by some researchers and connected with changes in global climate. The likelihood that an eruption would be both observed

*Tom Simkin, Lee Siebert, Lindsay McClelland, David Bridge, Christopher Newhall, and John Latter, *Volcanoes of the World*: A Regional Directory, Gazetteer, and Chronology of Volcanism During the Last 10,000 Years (Hutchinson Ross Publishing Co., Stroudsburg, Pa., August 1981). Available from Academic Press, 111 Fifth Avenue, New York 10003. $19.75.

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